Sabina
GOLD & SILVER CORP.

The BACK RIVER PROJECT

Management Plans

Volume 10

Prepared by:

Rescan
an ERM company

December 2013

Document Structure

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Back River Project Fact Sheet

December 2013

Location

- Located in the western Kitikmeot Region of Nunavut at approximately 65° north latitude, and 106° west longitude. About 400 km south of Cambridge Bay and 525 km northeast Yellowknife.
- Primary communities: Kugluktuk, Cambridge Bay, Gjoa Haven, Kugaaruk and Taloyoak
- 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

Reserves

- Six mining areas within the Goose and George Properties. Three locations at the Goose Property (Goose, Umwelt, and Llama) and three locations at the George Property (Locale 1, Locale 2, and LCP North).

Site Preparation and Construction Phase

- Site preparation may begin in 2014 (winter roads, fuel depots, laydown areas)
- Full construction of the project could commence as early as 2016 – two years to complete construction
- Approximately $605 M initial capital investment

Operational Phase

- Goose Property: open pit at Llama, Umwelt and Goose deposits; underground at Umwelt deposit
- George Property: Open pits at Locale 1, Locale 2, LCP North

Production

- Production Rate (Ore): 15.0 million tonnes of mill feed for life of mine
- Projected annual 300,000 ounces of gold for about up to 10 years

Processing

- 5,000 tonnes per day
- Standard gravity separation and cyanide leaching circuit
- Tailings facility at Goose Property

Transport

- Gold doré bars shipped out by aircraft

Access Roads

- All-weather roads within George and Goose properties
- Winter road between George and Goose properties
- Winter road to link properties to the Marine Laydown Area at Bathurst Inlet
- Short term winter road link to Tibbett-Contwoyto Winter Road

Re-supply

- Marine supply via open water seasonal shipping (max of 10 ships, average of 3 to 5 per year)
- Year-round by aircraft
- Winter road to the Marine Laydown Area
- Winter road connection to Yellowknife (short term)

Environment

- Extensive baseline studies including terrestrial environment, wildlife (particularly caribou), marine environment, freshwater environment, air quality and resource utilization
- Traditional knowledge information collected and analyzed through an Inuit owned major study - Naonaiyaotit Traditional Knowledge Project
- Will form the foundation of Environmental Impact Statement , and provide information for development of mitigation and management plans

Employment

- Fly-in/fly-out operation
- Direct construction employment up to 1200 person years over a two year period
- Direct operations employment up to 4442 person years for 10 years

Social and Economic Benefits

- Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association
- Opportunities for local businesses
- Royalties and taxes to governments

Closure and Post-closure Phase

- Closure will ensure that the former operational footprint is both physically and chemically stable in the long term for protection of people and the natural environment
- Post closure environmental monitoring will continue sufficient to verify that reclamation has successfully met closure and reclamation objectives

BACK RIVER PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Supporting Volume 10:
Management Plans

December 2013
Project #0194096-0040

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Prepared by:

Rescan Environmental Services Ltd., an ERM company
Vancouver, British Columbia

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1. Overall Environmental Management Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Overall Environmental Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
OVERALL ENVIRONMENTAL MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AANDC	Aboriginal Affairs and Northern Development Canada
DFO	Fisheries and Oceans Canada
EC	Environment Canada
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPP	Environmental Protection Plan
GN	Government of Nunavut
IQ	Inuit Qaugimajatuqangit
KIA	Kitikmeot Inuit Association
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
PDCA	Plan, Do, Check, Adjust
QA/QC	Quality Assurance/Quality Control
TC	Transport Canada
VEC	Valued Ecosystem Component
VSEC	Valued Socio-economic Component

1. Introduction

This volume describes how Sabina Gold & Silver Corp. (Sabina) intends to implement a range of environmental monitoring and management measures throughout the life of the Back River Project (the Project). These measures demonstrate how Sabina will avoid, or minimize to an acceptable level, the potential negative environmental effects identified in this draft environmental impact statement (DEIS).

Specific environmental management plans (EMPs) outline the potential impacts, objectives, targets and indicators, some of the key management measures, and the monitoring, reporting, auditing and review requirements. Each EMP is focused on a specific activity or issue and these are provided as chapters to this volume. These plans will be used to provide the overarching direction for environmental and socio-economic management for the Project and form the basis for the ongoing development of further detailed environmental documentation through permitting and the different phases of the Project. They have been developed through the EIS process and, where applicable, are in accordance with regulatory requirements and are designed to meet the expectations of agencies and the community.

Sabina's environmental policy and the associated Environmental Management System (EMS) provide the framework through which the EMPs will be delivered. The EMS is the system through which Sabina will ensure that the conditions set at the time of authorization, and legal requirements are met. They will also ensure that standard operating procedures reflect legal requirements pertaining to the Project.

The EMS will offer flexibility for each EMP to respond to changes in the mine execution plan, the regulatory regime, the biophysical and socio-economic environments, technology, research results, and the understanding of traditional knowledge or any other situations that arise. Threshold values and indicators will be established and will be used to trigger management actions that are outlined in each EMP. A system of accountability will also be implemented.

Future refinements to the EMPs will include detailed construction level environmental documentation for plans, processes and procedures that will be prepared either directly by Sabina's Environmental Department or by specialist consultants and contractors in conjunction with Sabina.

2. Sabina's Environmental Management System

Sabina is committed to operating in a safe and environmentally responsible manner. Change is continual and thus an adaptive management approach is essential. The strategies and measures outlined in this volume have been developed and anchored on an effective adaptive management philosophy. As part of continual improvement, the management plans herein will be revised periodically to accommodate new and amended legislation, evolving industry standards, emerging community concerns, or changes to the project's design or schedule. By taking an adaptive management approach, rigorous plans can be developed early based on the best information available before project detailed engineering and construction. After the detailed engineering design phase, these plans can be adjusted, if needed, and monitoring implemented to measure whether the actions in the management plans are working as designed.

Monitoring programs are designed to provide early warning of changes in environmental media that might be of future concern. With these early warnings, additional mitigation measures can be implemented and the appropriate EMP modified. This process is a continuous one and will occur through all phases of the project with changes to environmental management made when required.

The company has developed an Environmental Management System that provides Sabina with a tool for managing the effects of its activities on the environment, as well as providing a structured approach to planning and implementing environmental protection measures.

The EMS has been based on a continuous improvement model as defined in the internationally recognized standards ISO 14001:2004, Environmental Management Systems. The model is shown in Figure 2-1.

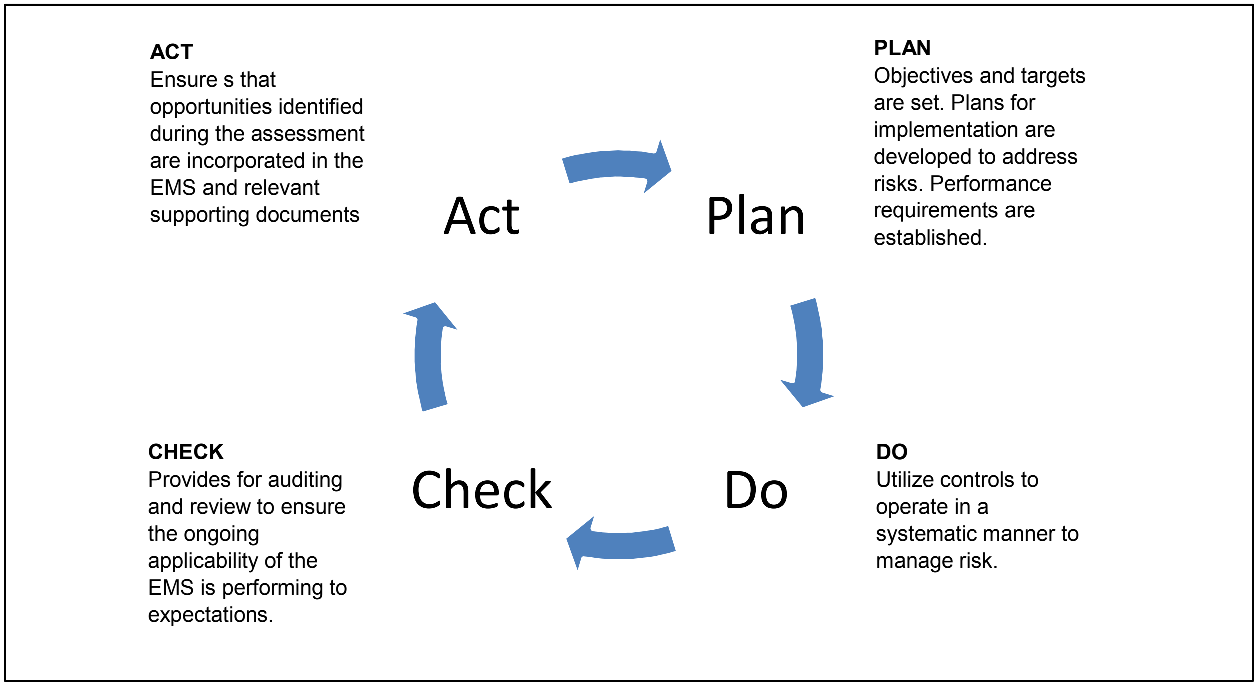

Figure 2-1. Continuous Improvement Model

Throughout all phases of the cycle community engagement will be an integral part of decision making. As well, the application of the Precautionary Principle will be a fundamental consideration in any action.

The EMS is structured around 10 core elements with associated sub-elements (Table 2-1). Each of the elements is addressed in additional detail below. The EMS elements are interrelated and each one is essential for the effective operation of the process as a whole. As well, environment, health and safety are interrelated and in the EMS process each element describes an essential part of the overall management of matters relating to all three components.

The final section of this chapter outlines the follow up and adaptive management programs that will be conducted through all phases of the mine life. These provide an overview of the monitoring plans for the biophysical and human environment required of operating mines. It is expected that these plans will be modified and refined through discussions with regulatory authorities and during the permitting phase.

Ownership of the EMS resides with Sabina's management team, who will make provision for the resources necessary to assure the successful implementation and sustainability of the process.

Table 2-1. Core Elements of Sabina's Environment Management System

Element	Title
1	Environmental policy and leadership
2	Planning
3	Organization and resources
4	Documents and records
5	Risk management
6	Regulatory requirements
7	Implementation, monitoring and measurement
8	Emergency and crisis management
9	Monitoring and audit
10	Management review

3. Element 1: Environmental Policy and Leadership

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.

Sabina is committed to managing environment, health and safety issues to the highest standards and has set out its commitment in the form of an environmental policy. The policy, approved by Sabina's Executive Directors, clearly states Sabina's commitments to continuous environmental performance improvement.

Sabina considers leadership accountability and transparency to be key components in the successful implementation of the environmental management process. The commitment of Sabina's executive and management team will demonstrate to employees, contractors, government and the community that the company regards excellence in environmental performance a priority.

3.1 ENVIRONMENTAL POLICY

Sabina Gold & Silver Corp. takes its responsibility to act as a steward of the environment seriously.

To fulfill this responsibility, Sabina strives to:

- *Ensure that we design our activities and operate in compliance with all environmental regulations to minimize our impact on the environment.*
- *Promote responsibility and accountability of managers, employees and contractors to protect the environment and make environmental performance an essential part of the management/contractor review process.*

- *Provide resources, personnel and training to enable management, employees and contractors to implement programs and policies to protect the environment.*
- *Communicate openly with employees, contractors, local stakeholders and government on our environmental protection and sustainability programs and performance. We will also address any concerns pertaining to potential hazards and impacts.*
- *Promote the development and implementation of systems and technologies to reduce environmental risks.*
- *Establish and maintain appropriate emergency response plans for all activities and facilities.*
- *Maintain a self-monitoring program at each facility to ensure compliance and to proactively address plans to correct potential deficiencies.*
- *Work cooperatively with government agencies, local communities and contractors to develop and enhance systems and technologies to improve environmental and sustainability practices.*
- *Encourage all employees, contractors or stakeholders to report to management any known or suspected departures from this policy or its related procedures.*

4. Element 2: Planning

Planning is an essential part of the EMS as it assists Sabina in fulfilling its Environmental Policy. Sabina will establish, implement and maintain documented objectives and targets consistent with the requirements of each EMP. The objectives and targets will be set alongside business targets during the business planning process to give a clear indication of the importance placed by Sabina on EMS performance. Programs will be developed to ensure that these objectives and targets are achieved.

The following subsections detail the key elements to our planning.

4.1 PRECAUTIONARY APPROACH

The Precautionary Principle stipulates that lack of certainty regarding threats of environmental harm should not be used as an excuse for not taking action to avert that threat. It also recognizes that delaying action until there is compelling evidence of harm will often mean that it is then too costly or impossible to avert the threat. The use of the Precautionary Principle promotes action to avert risks of serious or irreversible harm to the environment.

Sabina integrates the application of the Precautionary Approach throughout the design of the Project. This approach forms the basis for project design criteria, the effects assessment volumes of the DEIS, the alternatives assessment and the management practices.

Sabina is fully committed to acting as a socially responsible steward of the environment throughout the lifetime of the project. To this end, the precautionary approach will be integrated into decision making on all aspects of implementation. In the absence of scientific consensus regarding risk to the public or the environment of a specific action, that action will be assumed harmful unless and until further conclusive scientific evidence determines that no harm shall result.

In gathering data to achieve scientific consensus, Sabina has conducted extensive research to establish baseline data, and where data is not yet available, incorporated examples from other similar, established operations. Extensive consultations with local stakeholders ensures that local and traditional knowledge will be fully evaluated and incorporated in order to support the goal of achieving scientific consensus.

Where there is uncertainty or some plausible risk, conservative approaches, together with a dynamic process of adaptive management will be implemented. A flexible approach will be supported by the design of monitoring programs to address all areas of uncertainty, provide a process for mitigation, and to further support the ongoing collection of scientific data.

4.2 TRADITIONAL KNOWLEDGE

Sabina recognizes that Traditional Knowledge (TK) is an "indispensable element both as baseline information and as an Inuit lens through which impact analyses can be better understood and can also result in a more active and meaningful community engagement" (NIRB EIS Guideline – April 2013). Volume 3, Chapter 4 summarizes the efforts undertaken by Sabina to incorporate TK into the Project development.

A detailed characterization of the biophysical environment is presented in Volume 5 (Chapters 1 – Geology, Chapter 2 – Permafrost, and, Chapter 3 – Landforms and Soils). The harsh Arctic climate, soil conditions, and permafrost form the prime design considerations for the viability of the Project.

4.3 PROJECT DESIGN CONSIDERATIONS

A number of considerations in project design, operational safeguards, and contingency plans have been incorporated to mitigate potential impacts. Highlights of the mitigation measures incorporated into Project design include:

- Minimize project footprint, thus minimizing the loss of habitat and reduction of habitat effectiveness.
- Contain the Project mining activities within the Goose and George watersheds.
- To the extent possible, avoid known archaeological sites and prioritize avoidance of important (unique and/or old) sites.
- Maintain a 31 meter buffer from streams and waterways.
- Use of winter roads for access to the Goose and George sites.
- Maintain a buffer zone from important bird nesting areas.
- Maximize sourcing of aggregate and borrow materials from open pits.
- Select water sources in which Project water withdrawals will minimize the potential for drawdown and effects to fish habitat and the aquatic environment.

Construction activities will utilize the existing Project infrastructure and footprint to the greatest extent practical to minimize land disturbance and improve the overall efficiency of construction activities. Where possible, permanent support infrastructure will be built at the onset of construction, to be used during both construction and operation phases of the Project. In many instances, temporary infrastructure will be constructed or positioned at Project sites for the duration of the construction phase only. This temporary infrastructure will be removed at the completion of the construction phase.

4.3.1 Climate Change

Sabina recognizes the importance of climate change and a discussion of climate change and its potential impact on the project is presented in Volume 9. The design incorporates measures to cope with potential effects of climate changes. These considerations and adaptive measures were identified in two recent studies commissioned by the Government of Nunavut:

- Golder Associates, Vulnerability Assessment of the Mining Sector to Climate Change – Task 1 Report, March 2012; and,
- Journeaux associates, Engineering Challenges for Tailings Management Facilities and associated Infrastructure with Regard to Climate Change in Nunavut, March 2012.

4.3.2 Ecosystem Integrity

Comprehensive baseline studies have been undertaken to characterize the various biophysical components of the Project. A range of mitigation measures have been identified that will enable Sabina to minimize effects on the receiving environment. These mitigation measures are presented in Volume 4 through 8 of this DEIS.

- Volume 4 for the atmospheric environment.
- Volume 5 for the terrestrial environment.
- Volume 6 for the freshwater environment.
- Volume 7 for the marine environment.
- Volume 8 for the human environment.

Impacts to freshwater fish and fish habitat due to current and future activities includes directly removing or altering fish habitat due to drilling activities and culvert installations and potentially affecting water quality or sediment quality. The main mitigation measure employed for the permanent alteration to, or destruction of, fish habitat (PAD) will be avoidance. A range of specific and generally accepted techniques for sediment control, riparian care, site isolation, timing/sequencing, reclamation and rehabilitation will be used to avoid a PAD, prevent the introduction of deleterious substances to watercourses, and to minimize adverse effects of disturbances to fish habitat. Effects associated with work in or around water will be minimized through adherence to Best Management Practices as outlined in Sabina's current Landfill and Waste Management Plan, Closure and Reclamation Plan, DFO Operational Statements, and the DFO Under-Ice Water Withdrawal Protocol. The following DFO Operational Statements will apply to current and future activities: Mineral Exploration, Culvert Maintenance, and Ice Bridges and Snow Fills.

In addition to these measures, Sabina's EMS and associated environmental management plans are presented in Volume 10. The EMS and management framework defines the sequence of policy, planning, implementation and operation, checking and corrective actions, and, management review processes that must be established to ensure that the Back River Project is executed in an environmentally acceptable manner and in a spirit of continuous improvement.

4.4 ENVIRONMENTAL MANAGEMENT PLANS

Sabina will update environmental management plans on an annual basis to target specific issues and ensure that responsibilities for individual actions are clearly assigned. Development of these plans is carried out on the basis of a continuous-improvement cycle and will define objectives that are clearly measurable and achievable. The development of EMPs will be formalized and will be scheduled to coincide with the budget planning cycle.

4.5 SCOPE

The scope of the EMS applies to all operations and consists of the following issues as they relate to health and safety and environmental management:

- Mining: all aspects of the evaluation of the ore reserve; design of mining approaches and considerations in the management of mine Mill: crushing and processing of the ore, maintenance and deposition of tailings.
- Finance, Procurement, Warehouse, Information Technology and Administration.
- Site safety and security.
- Human Resources: employee recruitment and training, medical services, catering and personnel.
- Environment: monitoring, waste management, project site reclamation.
- Worker health: workplace exposures and occupational disease.
- Community health: community exposures and other determinants of health and well-being.

4.6 OBJECTIVES AND TARGETS

Environmental, health and safety objectives and targets for the Project have been identified in the individual EMPs contained in this volume. Key objectives will be to:

- Protect worker health.
- Prevent incidents or workplace accidents and injuries.
- Maintain productivity by directly or indirectly enhancing social conditions to positively affect the well-being of workers.
- Provide a safe and healthy workplace for all employees, contractors and visitors.
- Ensure all people understand that “no task is so important that time cannot be taken to complete work safely.”
- Identify and make provisions to address the needs of all individuals with respect to health and safety; in a manner that their ability to do work is not compromised.
- Recognize that social responsibility and environmental management are among the highest corporate priorities.
- Establish and maintain relationships with internal and external stakeholders.
- Maintain information on legislative requirements and environmental and social aspects associated with the organization’s activities.
- Assign clear accountability and responsibility for environmental protection and social responsibility to management and employees.
- Facilitate environmental planning through project life cycle.
- Provide a process for achieving targeted performance levels.

- Provide appropriate and sufficient resources, including training, to achieve targeted performance levels on an ongoing basis.
- Evaluate environmental performance and social responsibility against Sabina's environmental and other policies, objectives and targets and seek improvement where appropriate.
- Establish a management process to audit and review the Sabina EMS and to identify opportunities for improvement of the system and resulting environmental performance.

Objectives and targets will be reviewed regularly through the operations phase to ensure that there is continuous improvement in environmental performance.

4.7 DAILY TASK CONTROL

Sabina will ensure that the planning required for daily task management benefits from risk identification (e.g., through job hazard analysis and environmental effects assessments), feedback from employees, tailgate meetings, work reviews, and other permitting reviews.

5. Element 3: Organization and Resources

Sabina will identify and provide the resources required to implement, maintain and improve the EMS and environmental commitments. Similarly, key contractors will be required to demonstrate to Sabina's satisfaction that they have appropriate resources and that they have an appropriate organizational structure to meet environmental commitments and Project conditions. Responsibilities and accountabilities for the provision of environmental management are assigned to all personnel throughout the organization by means of management plans, procedures and position descriptions.

5.1 ROLES AND RESPONSIBILITIES

Roles and responsibilities will be documented in position descriptions for all Sabina positions. The descriptions for key roles are described in each management plan in this volume. These roles will be expanded in future iterations as the Project develops.

5.2 TRAINING, AWARENESS, AND COMPETENCE

Sabina and contractor personnel will undertake environmental awareness training to provide an understanding of Sabina's Environmental Policy, the environmental aspects and sensitivities of the proposed activities, and the EMS. All employees will be appropriately trained and qualified to carry out their duties under the scope of the EMS. The three key aspects of training are general environmental, cultural awareness and job specific training. This will be undertaken through onsite/offsite staff inductions and targeted training programs for specific activities or positions. Environmental training programs will be developed and implemented prior to the commencement of the construction and operations phases of the Project. Contracts awarded for the construction, commissioning, operations or decommissioning phases of the Project will detail specific requirements for contractors in respect of environmental training needs.

5.3 COMMUNICATION

Effective internal and external communication processes, including responding to public concerns, are an integral part of effective environmental management. The environmental requirements of the EMS will be communicated through site communication meetings, Health, Safety and Environment committee meetings (executive and employee), toolbox meetings, training, inductions, as well as through the distribution of plans, procedures and work instructions. Procedures have been implemented in this volume for receiving, documenting and responding to communications from external sources on environmental matters, including accidents, incidents and emergency response.

5.4 CONTRACTOR MANAGEMENT

Sabina pre-evaluates candidate contractors and service providers to assess their technical capabilities, their experience, and their commitment to health, safety, environmental protection and quality assurance. The preparation of an EMP will be required for long-term or higher risk third-party contracts. No work will be permitted to commence on site until all appropriate documentation has been approved by Sabina.

A process will be established to ensure that effective communication channels are established between Sabina and its major contractors and service providers. This communication may include regular "toolbox" or other meeting topics, and will be used to discuss any relevant issues, including critical interfaces, permits to work, risk assessments, process changes, and performance monitoring and evaluation.

6. Element 4: Documents and Records

Sabina will maintain documented programs and procedures to address hazards and risks, regulatory requirements, and operating standards identified in the EMS elements.

Detailed environmental documentation, for example plans, procedures and processes, will be developed for the Project to assist in the successful implementation of the EMS.

6.1 DOCUMENT CONTROL

Sabina has implemented a document control system which will be utilized for all Project documents. The information will be maintained in a suitable medium, in both printed and electronic form, to provide direction to related documentation and to describe the core elements of the management system and how these elements interact.

6.2 CONTROL OF ENVIRONMENTAL RECORDS

Sabina will ensure that all environmental records will be legible, identifiable and traceable to the activity, product or service involved. Environmental records will be stored and maintained in such a way that they are readily retrievable.

7. Element 5: Risk Management

Sabina has developed a risk management process to describe the methods and responsibilities to be used to ensure that risk management is planned and executed effectively. The Risk Management Process ensures the systematic assessment and management of risk. The risk assessment methodology applied in this DEIS is described in Volume 9, Chapter 3.

Change in the work environment can pose particular risks and the mining industry clearly recognizes the risks that can arise from temporary and permanent changes to organization, personnel, systems, processes, procedures, equipment, products, materials or substances, laws and regulations. Work cannot proceed unless a "management of change" process is completed. All proposed changes will therefore be managed by implementing the following steps:

- Identify the change.
- Assess the risk associated with the change.
- Establish responsibility to manage the change.
- Develop a plan of action.

If an alteration is approved by the Sabina management, then the relevant EMPs will be revised, or an addendum added to reflect the agreed-upon change.

8. Element 6: Regulatory Requirements

Sabina will implement a compliance framework to manage and monitor its regulatory obligations and ensure that performance expectations are met. In its Environmental Policy the company has committed to meet or exceed all relevant laws, regulations and standards for the protection of the environment.

Sabina will ensure that it achieves full regulatory compliance by the following means:

- Implement awareness training for its employees and contractors.
- Actively use and maintain a regulatory compliance matrix.
- Conduct regular audits of its systems and activities to monitor compliance.

A summary of the government approvals and legislative requirements applicable to the Project will be provided in the FEIS revision of this document.

9. Element 7: Implementation, Monitoring, and Measurement

The following details the key elements of the implementation, monitoring and measurement component of the EMS.

9.1 WORK PROCEDURES

Procedures will be developed to minimize the exposure to actual or potential hazards associated with the work to be performed. The need for procedures will be identified by reviewing processes, activities, tasks and assessing their potential impact on personnel, assets and the environment.

9.2 REGULATORY COMPLIANCE MATRIX

As future permits are received, Sabina will review the terms and conditions. A Regulatory Compliance Matrix will then be populated and maintained to capture the permit conditions and compliance requirements from the permits received. The spreadsheet will be reviewed as required to update status, incorporate new conditions and edit or remove conditions that have changed or no longer apply.

The matrix can be used to display conditions that are specific to timing, type of condition, or responsible party. These can be applied by Project phase to further develop environmental performance checksheets used in daily monitoring activities. A template of the matrix is provided below and will be populated prior to construction.

Administering Agency	Legislation	Permit Type and No.	Commitment	Status	Responsibility

9.3 PERFORMANCE MONITORING

Proactive and reactive key performance indicators (KPIs) will be developed by Sabina to monitor performance against EMS objectives and to promote continuous improvement. The KPIs will be tracked and monitored by using environmental checklists. These will be developed for the project as a whole to ensure that there is alignment and consistency in achieving performance goals. Performance statistics based on the checklists will be compiled and distributed to internal and external stakeholders as appropriate. Environmental indicators and monitoring programs associated with the aspects or activities of the Project will be refined as the project develops.

9.4 INCIDENT NOTIFICATION, REPORTING, AND INVESTIGATION

Sabina has developed and implemented an incident management and investigation procedure. The intention of this procedure is to ensure that all incidents, including “near misses,” no matter how minor, are recorded, investigated and reported, where applicable. This will achieve the following objectives:

- At risk behaviours will be identified.
- Deficiencies in workplace conditions will be identified.
- Improvements to methods and equipment will be identified.
- Failures in management systems and controls will be identified.
- Lessons will be learned.
- Regulatory-authority and industry reporting obligations will be fulfilled.
- Management systems will be continuously improved.

This procedure follows clear and documented guidelines to ensure that all incidents are uniformly, methodically and effectively investigated to a degree commensurate with their potential severity. The objective is to establish the facts, determine the root cause(s) and to take the appropriate action to prevent a recurrence of the event.

All incidents, investigations and corrective and preventive actions will be inputted to an incident reporting database and tracked until closure.

9.5 ASSET INTEGRITY

Sabina will emphasize the importance of ongoing asset integrity in contributing to a safe and environmentally sound operation. Asset integrity is a key component in the prevention of major accident events. Systems will be established to ensure the ongoing integrity of plant and equipment. These systems will include maintenance, inspection, testing, calibration and certification of equipment at frequencies appropriate for the level of risk associated with the equipment and/or as determined by manufacturers' requirements.

10. Element 8: Emergency and Crisis Management

Plans and procedures are detailed in the subsequent chapters to identify all potential emergency threats associated with Sabina's operations. A rapid and effective response to emergency situations can significantly reduce any impact on personnel safety, the environment and nearby communities. This response is achieved by implementing prevention, preparation, response and recovery strategies.

Potential for accidents and emergencies will be identified utilizing the hazard identification and risk assessment tools discussed in Chapter 9 of this volume, the Risk Management and Emergency Response Plan. Operating procedures will be further developed in order to keep control of such situations and to reduce the risk of environmental impact. Procedures that are directly related to response to environmental spills and incidents are presented in relevant EMPs (e.g., the Spill Contingency Plan and Hazardous Materials Management Plan).

Emergency management plans will contain the identification of resources (personnel and equipment), key roles and responsibilities, and the procedures to be followed if the plans are activated. Relevant personnel will receive sufficient training to ensure that they have the skills and competence to respond to an emergency.

In addition to emergency management plans, a Project oil-pollution emergency plan (OPEP) has been prepared (Chapter 6) to ensure that Sabina can respond rapidly and effectively to an oil spill at the Marine Laydown Area.

Third party plans must also be advanced by Sabina's contractors. For example, Section 27 of the Vessel Pollution and Dangerous Chemicals Regulations requires the owner of every Canadian oil tanker of 150 tons gross tonnage or more, and every other Canadian ship of 400 tons gross tonnage or more that carries oil as fuel or cargo, to submit four copies of the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) to Transport Canada. All Plans must be ship-specific. Transport Canada pollution prevention officers who have also been appointed as marine vessel safety inspectors will examine SOPEPs for Canadian vessels.

A SOPEP must also provide guidance to help the master meet the demands of a catastrophic discharge, should one occur.

11. Element 9: Monitoring and Audit

Review audits, both internal and external will be conducted to ensure the following:

- That there is compliance with regulatory requirements, Project approval conditions, and licence conditions.
- That the identified objectives of the Project are being achieved.

A formalized audit schedule will be developed in future iterations of the EMS that will define the scope and frequency of audits.

12. Element 10: Management Review

In order to maintain continuous improvement, formal reviews of the suitability and effectiveness of the Management Process and its associated implementation documents will be scheduled periodically.

Management reviews will be based on the following considerations:

- Audit and incident investigation outcomes.
- Changes in organization and/or operational practices.
- Changes in statutory environmental requirements.
- Assessments of targets and performance standards have been met.
- Analyses of the continuing adequacy of the EMS.

Implementation documents (e.g., management plans, procedures and monitoring programs) will be reviewed periodically to assess their effectiveness and to ensure that they remain applicable to current operations.

Management review outcomes, including observations, conclusions and recommendations, will be documented and tracked through to completion.

13. Overview Environmental Management Plans

The development and implementation of the EMPs in this volume are key tools for the environmental protection and management measures necessary to avoid, reduce or mitigate the potential effects of the Project on the environment. Figure 13-1 shows where the EMPs are placed in relation to other EMS documentation.

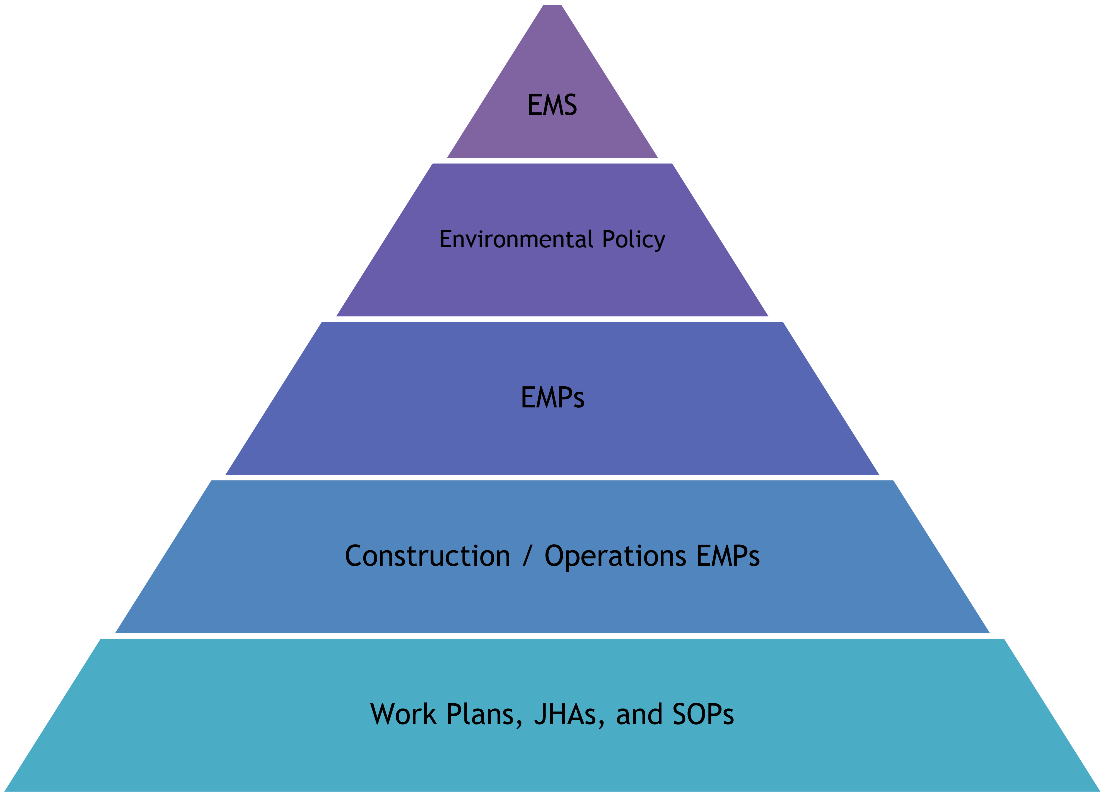

Figure 13-1. Hierarchy of Environmental Management

Certain EMPs are further advanced (e.g., OPEP) than others at this time, with certain plans at a conceptual stage of development (e.g., AEMP). Refinements to EMPs will be developed as permitting progresses prior to the construction and operations phases in order to manage the identified potential impacts on the social, marine, and terrestrial VECs and VSECs assessed for this Project.

In addition to these plans, work instructions and procedures will be developed to support the EMPs and ensure that they are effectively implemented. A greater level of detail on the technical input and practical application of the management and control measures will become available as the Project moves towards the construction phase. These further details will be used in an ongoing program of improvement and refinement of EMP documentation to ensure that the objectives are achieved.

These EMPs will serve as a guide and framework for the development of more detailed construction EMPs and, in due course, operations EMPs.

13.1 OBJECTIVES AND TARGETS FOR MANAGEMENT PLANS

For each of the EMPs, Sabina has set out environmental objectives and targets with consideration of the following:

- Sabina's Environmental Policy.
- Environmental aspects and impacts.
- Relevant Nunavut and federal standards.
- Legal and other requirements.

- Measurable objectives.
- Opportunities for continuous improvement.

Environmental objectives, targets and indicators are described below to promote consistent application and to ensure that all parties concerned interpret them in the same way:

1. An 'environmental objective' is a specific environmental goal. Each EMP will have high-level objectives which will be consistent with Sabina's environmental policy and the commitments set out in the DEIS.
2. In order to gauge the extent to which environmental objectives have been achieved, 'threshold values' or narrative statements are outlined in the EMPs for specific indicators which, if reached, will trigger specified management responses.
3. The setting of target thresholds in the EMPs will be based on an Environmental indicator which is a significant physical, chemical, biological, social or economic variable which can be measured in a defined way for management purposes.

An example of an indicator could be the number and diversity of organisms in a waterbody. These can indicate whether an aquatic ecological system is functioning normally or not. To be effective, an indicator must be relevant, representative and able to show concerned parties something about the system that they need to know. It must be easy to understand, even at a non-technical level. It must be reliable, so that the information the indicator provides is trustworthy. And it must be timely, so that the information is made available while there is still time to act.

13.2 BIOPHYSICAL AND SOCIO-ECONOMIC PLAN IMPLEMENTATION

Plans contained in this volume will include all Project components including the construction, operations and reclamation and closure phases. Different Project components will require different combinations management plans. Table 13-1 illustrates how the current EMPs may be applied across various phases of the Project.

Prior to the commencement of activities, Sabina will review and approve construction level EMPs, and subsequently operations level documents to ensure that they meet all commitments made in the final EIS as well as in any other legislative requirements or ministerial conditions.

14. Follow-up and Adaptive Management

Follow-up monitoring is an essential tool for ensuring that a project is implemented as planned, that mitigation measures are effective, and potential adverse impacts are avoided or minimized. It is through monitoring that any unanticipated adverse environmental impacts can be discovered and prevented through adaptive management.

14.1 MONITORING

The requirements for monitoring the effects on the biophysical environment will be an integral part of the Project Certificate terms and conditions, Type A Water Licence, Land lease and other authorizations, permits, or licences.

Table 13-1. Application of Current EMPs to Phases of the Project

Chapter	Document	Site Preparation	Construction	Operation & Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post Closure
1	Environmental Management Plan overview (including EMS and follow-up)	x	x	x	x	x	x
2	Environmental Protection Plan (outline)	x	x	x	x	x	x
Biophysical Monitoring & Mitigation Plans							
3	Risk Management and Emergency Response Plan	x	x	x	x	x	
4	Fuel Management Plan	x	x	x	x	x	
5	Spill Contingency Plan	x	x	x	x	x	
6	Oil Pollution Emergency Plan	x	x	x	x	x	
7	Site Water Monitoring and Management Plan	x	x	x			
8	Ore Storage Management Plan			x	x		
9	Mine Waste Rock and Tailings Management Plan			x	x		
10	Landfill and Waste Management Plan	x	x	x	x	x	
11	Incineration Management Plan	x	x	x	x	x	
12	Hazardous Materials Management Plan	x	x	x	x	x	
13	Road Management Plan	x	x	x	x	x	
14	Shipping Management Plan	x	x	x	x	x	
15	Borrow Pits & Quarry Management Plan	x	x	x	x	x	
16	Explosives Management Plan	x	x	x	x	x	
17	Air Quality Monitoring and Management Plan	x	x	x	x	x	
18	Noise Abatement Plan	x	x	x	x	x	
19	Aquatic Effects Management Plan	x	x	x	x	x	
20	Wildlife Mitigation and Monitoring Plan	x	x	x	x	x	
21	Fish Offsetting Plan	x	x	x			
22	ML/ARD Management Plan	x	x	x	x	x	x

(continued)

Table 13-1. Application of Current EMPs to Phases of the Project (completed)

Chapter	Document	Site Preparation	Construction	Operation & Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post Closure
Socio-economic Management Plans							
23	Socio-economic Monitoring Plan	x	x	x	x	x	
24	Business Development Plan	x	x	x	x	x	
25	Occupational Health & Safety Plan	x	x	x	x	x	
26	Community Involvement Plan	x	x	x	x	x	
27	Cultural & Heritage Resources Protection Plan	x	x	x	x	x	
28	Human Resources Plan	x	x	x	x	x	
Mine Closure							
29	Mine Closure and Reclamation Plan (includes Care and Maintenance Plan)				x	x	x

The objectives of the monitoring program are:

- To track performance of mitigation measures implemented.
- To identify environmental changes in the receiving environment.
- To validate environmental effects predictions.

Monitoring will be conducted by appropriately qualified personnel in a systematic and scientifically defensible manner. Monitoring initiatives will be periodically reviewed and modified to ensure continued suitability and value. These reviews will consider:

- The timing, frequency and relevance of monitoring.
- Effectiveness of monitoring design to assess environmental performance requirements.
- Closing date for individual programs.

Reporting will be conducted promptly in accordance with permit requirements. Deviations from expected outcome will be investigated and corrective action implemented.

14.2 ADAPTIVE MANAGEMENT

The mitigations incorporated in the Project are based on best management practices and are expected to prevent or minimize adverse effects on the receiving environment. Ongoing monitoring will inform Sabina regarding the effectiveness of these mitigation measures. If any unforeseen adverse effects are identified during the life of the project, measures will be taken to correct them and prevent them from occurring in the future. Adaptive management (Figure 14.2-1) is an iterative approach based on a learning process gained from monitoring which improves long-run management outcomes.

As part of the adaptive management framework, the monitoring provisions may include the following:

- Measuring the condition of the system with selected indicators (e.g., numbers, size and health of fish populations, and water quality in external receiving bodies).
- Identification of goals and setting performance criteria and standards such as target numbers of fish in offset habitat, water quality at or below predetermined thresholds.
- Measures for evaluating root causes and the extent of deficiencies to make a decision on what actions to take: do nothing, implement corrective actions, or change the goal.

For the VEC being monitored, should the indicator (monitored parameter) approach a predefined threshold, adaptive management would trigger a response which may include increase monitoring frequency, studies to identify root causes, and/or specific action or mitigation measures to address the concerns.

The figure below (adopted from the Mary River Project) provides an example of an adaptive management framework that could be applied to a number of situations or activities, along with triggers for various actions, and management responses.

The concept of alert and action levels could be applied to a wide range of environmental concerns including this example for freshwater fish and fish habitat:

- Predicted water quality in external receiving waterbodies and tributaries.
- Survival, growth and health of fish in monitoring sites.
- Trophic status and capability of target lakes to support and sustain populations.

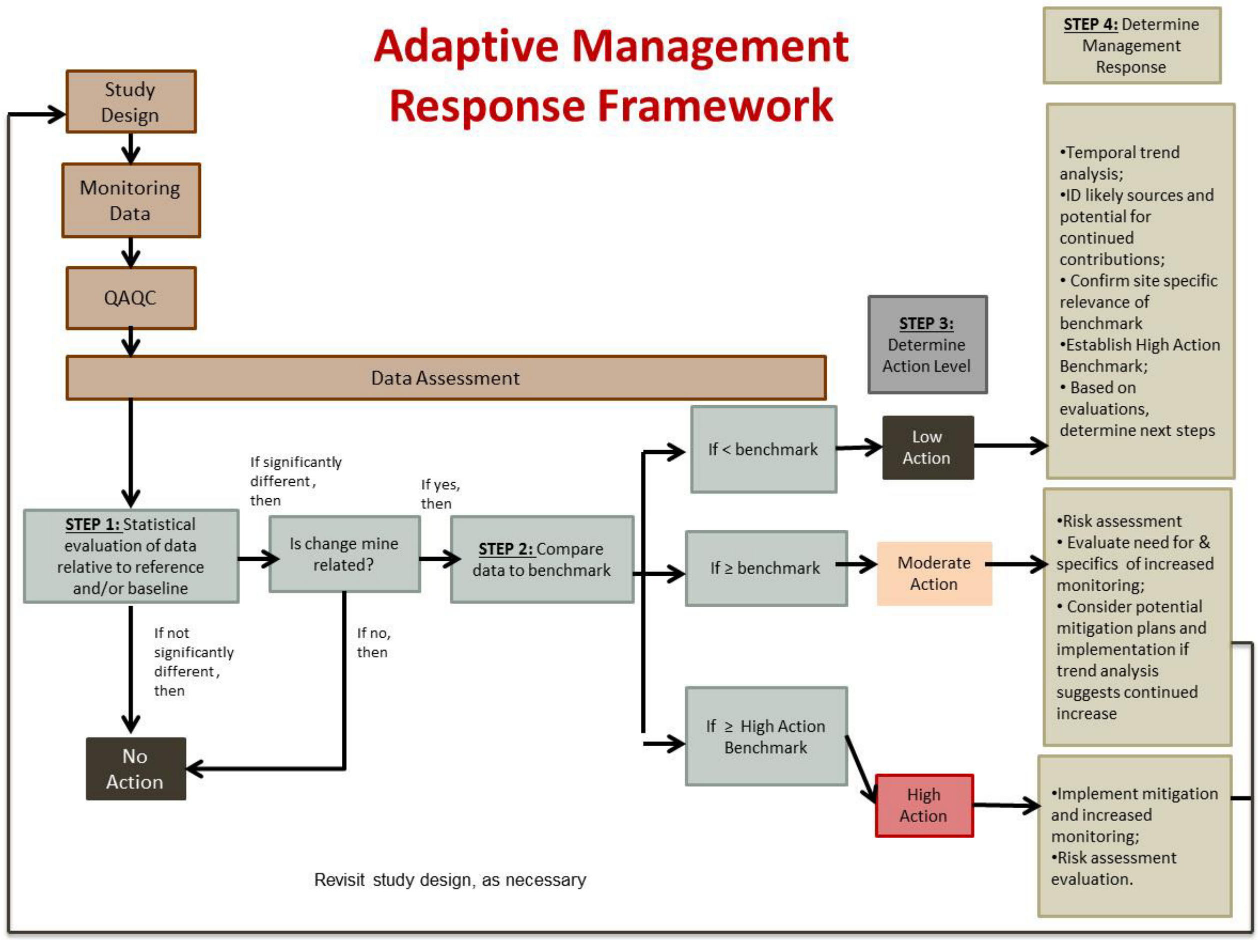

Figure 14.2-1. Adaptive Management Response Framework

There are also “feedback loops” built into the adaptive management approach, so that changes to the study design can be made, if there is a need to modify monitoring, based on what the data results. This approach is systematic and includes prescribed actions, which will assist in minimizing impacts to the environment.

As part of an adaptive management process, the EMS fully supports changes and updates by providing regular review of the adequacy of the environmental policy, environmental management programs and operational controls in light of concerns or other outcomes. EMS elements can then be updated as needed based on results and associated training programs can then be enhanced to improve the level of environmental protection. In this way, continual improvement of the Project EMS and mitigation programs will be assured.

Details of the proposed monitoring plans will be refined through discussions with regulatory authorities, communities and other stakeholders as review of the project proceeds.

2. Environmental Protection Plan

an ERM company

BACK RIVER PROJECT
Environmental Protection Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
ENVIRONMENTAL PROTECTION PLAN

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1. Environmental Protection Plan

It is Sabina's objective to apply appropriate and effective management practices to advance environmental management to all areas of operations related to the Back River Project. Sabina will prepare an Environmental Protection Plan (EPP) prior to commencement of construction for all project phases and it will be integrated into procedural documents. It will be written in accordance with the environmental management system and other chapters contained in this volume. The EPP will describe conceptual environmental protection measures to limit the disturbances to identified VECs and VSECs from Project's activities. It will provide activity specific, plainly written, environmental protection procedures to help ensure a high level of environmental protection throughout the life of the Project.

The EPP provides a practical way to facilitate field implementation of environmental regulations, practices, and procedures required to eliminate or reduce potential environmental effects. The EPP will be a "living document" and updated as the Project advances through its life cycle of Construction, Operation and Closure. The knowledge acquired during the early stages of the Project will thus be retained and passed on through the successive phases of the Project. Many additional procedures will be developed and added to the EPP at the onset of early construction activities.

Compliance will be confirmed by management, occupational health and safety, and environmental staff, as well as government departments and agencies tasked with regulatory compliance monitoring. This is largely accomplished by means of appropriate distribution and communication of the EPP on-site during work plan development and pre-activity reviews.

A proposed table of contents for the EPP is presented below in Table 1-1. The content will vary (expand or contract) depending on the phase of the development of the Project. Many of the specific EPP documents will be developed by contractors as construction commences on site.

Table 1-1. Outline of the Environmental Protection Plan (EPP)

Section 0	Introduction	Contents List and Revision Control, serving as the Table of Contents, listing the latest revisions for each Operational Standard.
Section 1	Purpose of the Plan	Outlines the purpose and organization of the EPP, Sabina's environmental commitment, corporate resources and regulatory requirements.
Section 2	Activity-Based Operational Standards	This provides Operational Standards for a variety of specific activities anticipated to occur in the Project. Each Operational Standard provides an overview, environmental concerns, and general environmental protection procedures associated with that activity to meet regulatory requirements, corporate commitments, and/or best practices. Within the Operational Standards, further reference will be provided, if warranted, to relevant operating procedures and work instructions that have been developed to address identified risks.
Section 3	Documentation	Provides the inspection and recordkeeping forms that will be used by Project personnel to verify adherence or audit compliance to the Operational Standards.
Section 4	Revisions	Includes a Request for Revision, which allows for users to recommend changes or additional Operational Standards to facilitate continuous improvement.
Attachments	Supporting material	Maps, drawings, forms, etc.

3. Risk Management and Emergency Response Plan

BACK RIVER PROJECT
Risk Management and Emergency Response Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
RISK MANAGEMENT AND EMERGENCY RESPONSE PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

DEIS	Draft Environmental Impact Statement
ERC	Emergency Response Coordinator
ERT	Emergency Response Team
FEIS	Final Environmental Impact Statement
HMMP	Hazardous Materials Management Plan
MLA	Marine Laydown Area
MSDS	Materials Safety Data Sheets
NIRB	Nunavut Impact Review Board
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
PPE	Personal Protective Equipment
the Project	Back River Project
RCMP	Royal Canadian Mounted Police
RMERP	Risk Management and Emergency Response Plan
Sabina	Sabina Gold & Silver Corp.
SCP	Spill Contingency Plan

1. Introduction

1.1 OVERVIEW

The purpose of this Risk Management and Emergency Response Plan (RMERP) is to outline Sabina Gold & Silver Corp.'s (Sabina) approach to risk management and to ensure that an adequate level of emergency preparedness is available for the construction and operation of the Back River Project (the Project). The scope of this plan includes the Marine Laydown Area (MLA) in southern Bathurst Inlet, and both the Goose and George Properties. It represents one plan in a series of Environmental Management Plans (EMPs) that have been prepared for the Project Draft Environmental Impact Statement (DEIS).

This RMERP has been prepared in accordance with Section 9.4.1 of the EIS Guidelines issued by the Nunavut Impact Review Board (NIRB) for the Back River Project (April 2013). This Plan was prepared in conformance with current Federal and Territorial statutory requirements.

This is a living document to be updated annually, based on management reviews, incident investigations, regulatory changes, or other Project-specific protocols.

The information presented herein is current as of December 2013. At this stage, certain aspects of the RMERP remain conceptual. The next update will likely accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study project designs. Following this, the Plan will be further updated based on detailed engineering design prior to the start of construction.

Sabina will maintain a distribution list providing contact details for all parties to receive the Plan including key personnel, contractors, organizations, and external agencies.

1.2 SCOPE AND OBJECTIVES

The scope of this Plan includes the MLA in southern Bathurst Inlet, the Goose and George Properties, connecting local all-weather roads, and the seasonal winter access road. Potential emergency situations associated with access to the Project by air are also included.

The RMERP is designed to provide an assessment of the potential risks associated with the Project and establish an organizational structure and procedures for effective response to emergencies.

The Plan addresses potential risks from natural hazards as well as accidents and malfunctions which could result in emergency situations (i.e., medical, spills, fire).

1.3 PLANNING AND IMPLEMENTATION

Planning for the RMERP started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies.

This Plan is currently conceptual in nature and strategies and procedures will be refined and implemented prior to the construction and operation of the Project.

Risk management and emergency preparedness and response will be tracked, reviewed, and updated through ongoing maintenance of the Plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

1.4 ENVIRONMENTAL POLICY

Sabina takes its responsibility to act as a steward of the environment seriously.

To fulfill this responsibility, Sabina strives to:

- Ensure that we design our activities and operate in compliance with all environmental regulations to minimize our impact on the environment.
- Promote responsibility and accountability of managers, employees and contractors to protect the environment and make environmental performance an essential part of the management/contractor review process.
- Provide resources, personnel and training to enable management, employees and contractors to implement programs and policies to protect the environment.
- Communicate openly with employees, contractors, local stakeholders and government on our environmental protection and sustainability programs and performance. We will also address any concerns pertaining to potential hazards and impacts.
- Promote the development and implementation of systems and technologies to reduce environmental risks.
- Establish and maintain appropriate emergency response plans for all activities and facilities.
- Maintain a self-monitoring program at each facility to ensure compliance and to proactively address plans to correct potential deficiencies.
- Work cooperatively with government agencies, local communities and contractors to develop and enhance systems and technologies to improve environmental and sustainability practices.
- Encourage all employees, contractors or stakeholders to report to management any known or suspected departures from this policy or its related procedures.

1.5 COMPLEMENTARY PLANS AND DOCUMENTS

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced where appropriate the following management plans:

- Fuel Management Plan (DEIS Volume 10, Chapter 4).
- Spill Contingency Plan (DEIS Volume 10, Chapter 5).
- Oil Pollution Emergency Plan (DEIS Volume 10, Chapter 6).
- Landfill and Waste Management Plan (DEIS Volume 10, Chapter 10).
- Incineration Management Plan (DEIS Volume 10, Chapter 11).
- Hazardous Materials Management Plan (DEIS Volume 10, Chapter 12).
- Explosives Management Plan (DEIS Volume 10, Chapter 13).
- Road Management Plan (DEIS Volume 10, Chapter 14).
- Shipping Management Plan (DEIS Volume 10, Chapter 15).
- Shipboard Oil Pollution Emergency Plan (to be provided in the future by Shipping Company).
- Occupational Health and Safety Plan.

1.6 APPLICABLE LEGISLATION

This RMERP has been developed to conform to Section 9.4.1 of the NIRB Environmental Impact Statement Guidelines for the Back River Project (April 2013).

Both federal and territorial legislation exist to address risk management and emergency response. Operational policies and procedures that fulfill conditions in applicable legislation will be further developed as the Project proceeds.

Table 1.6-1 summarizes the primary Federal and Territorial legislation applicable to emergency response in Nunavut.

Table 1.6-1. Legislation Applicable to the Risk Management and Emergency Response Plan

Act	Regulations	Guidelines
Federal		
Canadian Labour Code (R.S.C., 1985, C. l-2)	Canadian Occupational Health and Safety Regulations (SOR/86-304)	-
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	-	-
Canadian Environmental Protection Act (R.S.C. 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)	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 Petroleum Hydrocarbons (PHC) in Soil
Fisheries Act (1985, c. F-14)	Metal Mining Effluent Regulations (SOR/2002-2222	-
Explosives Act (1985, c. E-17)	Ammonium Nitrate and Fuel Oil Order (C.R.C., c.598)	-
	Explosives Regulations (C.R.C., c. 1516)	-
National Fire Code of Canada (2010)	-	-
Transportation of Dangerous Goods Act (1992, C. 34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	-
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., c. 1524)	-
Hazardous Products Act	*Controlled Products Regulations*	Workplace Hazardous Materials Information System (WHMIS)
Nunavut Act (1993 c.28)	-	-
Nunavut Land Claims Agreement Act (1993, c. 29)	-	-

(continued)

Table 1.6-1. Legislation Applicable to the Risk Management and Emergency Response Plan (completed)

Act	Regulations	Guidelines
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93)	Guideline for the General Management of Hazardous Waste in Nunavut
	Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)	Guideline for Industrial Waste Discharges in Nunavut
		Guideline for the Management of Waste Antifreeze
		Guideline for the Management of Waste Batteries
		Guideline for the Management of Waste Paint
		Guideline for the Management of Waste Solvent
Mine Health and Safety Act (SNWT (Nu) 1994, c. 25)	Mine Health and Safety Regulations (NWT Reg (Nu) 125-95)	-
Workers' Compensation Act (RSNWT, 1998, c. W-6)	Workers' Compensation General Regulations (Nu Reg 017-2010)	-
Explosives Use Act (RSNWT (Nu) 1988, c. E-10)	Explosives Regulations (RRNWT (Nu) 1990, c. E-27)	-
Fire Prevention Act (RSNWT (Nu) 1988, c. F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990, c. F-12)	-
Motor Vehicles Act (RSNWT (Nu) 1988, c. M-16)	Large Vehicle Control Regulations (RRNWT (Nu) 1990, c. M-30)	-
Public Health Act (RSNWT (Nu) 1988, c. P12)	Camp Sanitation Regulations (RRNWT (Nu) 1990, c. P-12)	-
	General Sanitation Regulations (RRNWT (Nu) 1990, c. P-16)	-
Safety Act (RSNWT 1988, c. S-1)	General Safety Regulations (RRNWT (Nu) 1990, c. P-16)	-
	Work Site Hazardous Materials Information System Regulations (RSNWT 1988, c. 81 (Supp))	-
Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c. 81 (Supp))	Transportation of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	-

1.7 SITE DESCRIPTION

The Back River Project is currently an advanced exploration gold project located in the West Kitikmeot region of Nunavut. The Project is located at approximately 65° to 66° north latitude, and 106° to 107° west longitude. Following future approval and implementation, the Project will include two primary mining areas (Goose Property and George Property), a Marine Laydown Area in southern Bathurst Inlet, and connecting local all-weather roads and a winter access road (Figure 1.7-1).

Sabina GOLD & SILVER CORP.

Back River Project Location

Figure 1.7-1

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2. Roles and Responsibilities

The initial stage of any emergency incident and resultant response is critical. An effective and timely response is essential to prevent an emergency situation from escalating to a higher level. Therefore, all relevant personnel must be fully aware of their individual duties and responsibilities as presented in this Plan.

Figure 2-1 summarizes Sabina's generalized emergency response organization chart. This structure will be refined in future iterations of this plan.

Specific responsibilities and duties inherent to personnel involved in emergency response are outlined below.

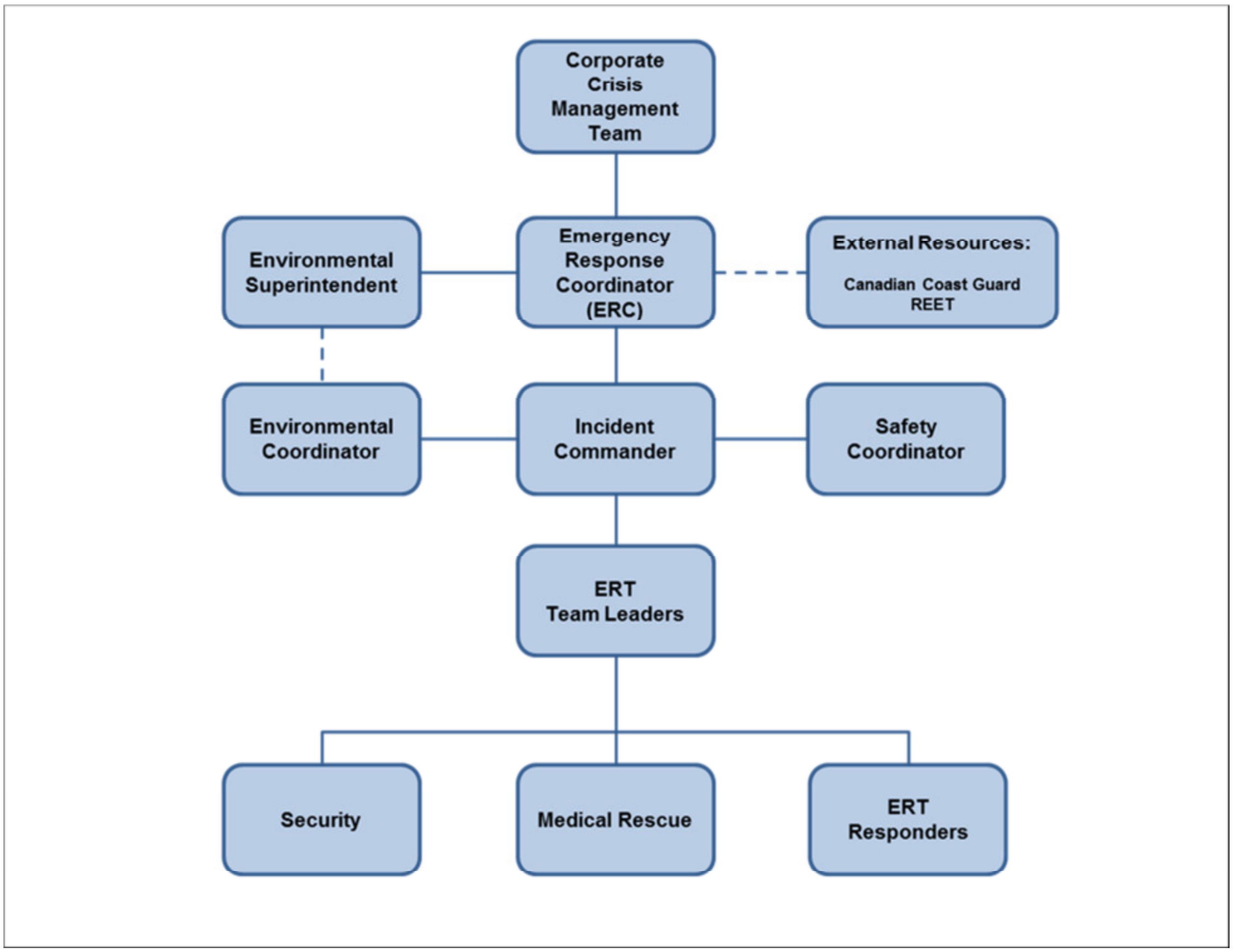

Figure 2-1. Sabina Emergency Response Organization Chart

2.1 EMERGENCY RESPONSE COORDINATOR

For the purpose of the RMERP, the Emergency Response Coordinator (ERC) is the General Manager or his designate. The ERC's duties during an emergency are:

- To ensure coordination of Emergency Response Team (ERT) support systems.

- Upon being notified of an emergency, initiate response activities and assess the situation based on current information from the Incident Commander.
- Activate the emergency response process and escalate according to severity of the incident.
- Coordinate all activities. In the event the ERC leaves his post, the ERC will designate an individual to coordinate in his absence.
- Ensure that the appropriate area manager/s has been notified.
- Provide internal notification as applicable based on the level of emergency.
- Provide instruction to ensure that appropriate external resources are notified.
- Receive information from the Incident Commander and ensure appropriate resources are made available.
- Provide support for the acquirement of additional supplies and resources as requested by the Incident Commander.
- Contact departmental resources via radio as required during the emergency response.
- Provide internal notification of the “all clear.”
- Ensure the coordination and establishment of an emergency debriefing session.
- Review incident log and post response incident report.
- Post incident debrief with Incident Commander.
- Provide necessary information to Public Relations for a media statement release if required.
- Complete a report on the events surrounding the incident.
- Coordinate collection of all incident notes, reports, statements and log of events.
- End the event in a project tracking system.

2.2 ENVIRONMENTAL SUPERINTENDENT

The duties of the Environment Superintendent during an emergency are:

- For major incidents contact the ERC and report to the Command Centre.
- Assist the ERC in evaluating the initial situation and assessing the magnitude of the emergency.
- Assist in developing an overall plan of action.
- For spills, report to NWT-NU 24-hour Spill Report Line at 867-920-8130.
- Report to the ERC and provide recommendations on resource requirements (additional manpower, equipment, material) to respond to the emergency.
- Provide liaison with management to keep them informed of response activities.
- Act as the spokesperson with government agencies as appropriate.
- Document all actions and decisions.
- Collect photographic records of the event and response efforts.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation process.

- Complete Government Agency notification processes.
- Document the cause of the emergency and effectiveness of the response effort, and recommend the appropriate measures to prevent a recurrence.
- Ensure that all involved departments complete reporting process.
- Prepare and submit follow-up documentation required by appropriate regulators.

2.3 INCIDENT COMMANDER

The Incident Commander is the site lead administrator for the ERT, responsible for ensuring the necessary emergency response equipment and adequate level of training for ERT members. The Incident Commander directs the ERT at the scene as ERT Leader. In the absence of the Incident Commander, a senior team member will be designated in his place.

The duties of the Incident Commander during an emergency are:

- Muster accordingly and brief team members.
- Report to the scene of the emergency.
- Take charge of the scene.
- Evaluate the details of the emergency as presented by those on scene. \Assess the immediate situation, confirm the level of emergency and notify the ERC.
- Maintain contact with the ERC and provide support in coordination of the response.
- Direct ERT members in their respective tasks as required.
- Contact departmental resources via radio as required during the emergency response.
- Request internal/external resources as required.
- Advise ERT on aspects of internal/external support as they are received.
- Develop a written log of events indicating instructions given, action taken and outcomes achieved.
- Announce the ‘all clear’ to the ERC when the emergency has ended.
- Lead the post-emergency debriefing session.
- Ensure that all ERT equipment is returned to original order and/or replaced to ensure future rapid response.
- Provide assistance with ongoing investigation.
- Prepare a written report on response activities.

2.4 EMERGENCY MEDICAL PERSONNEL

Duties of Emergency Response Personnel during an emergency are:

- Respond when required as directed by the Incident Commander.
- Responsible for all decisions of medical-related situations on site.
- Responsible for assessing, administering and delegating emergency medical care.
- Advise the Incident Commander of the number and condition of any ill/injured personnel.

- Advise the ERC of off-site resources required.
- Maintain a log of events, actions and outcomes.
- Participate in a post-emergency debriefing session.

2.5 EMERGENCY RESPONSE TEAM

Duties of the Emergency Response Team during an emergency are:

- Report to the scene of the incident.
- Work closely with the Incident Commander to determine appropriate response strategy for their respective work area.
- Contact departmental resources via radio as required during the emergency response.
- Direct ERT members in their respective tasks as required.
- Participate in a post-emergency debriefing session.

2.6 SECURITY

Security personnel or their designates are key in an emergency response in that they will receive an initial notification of an emergency and provide first communications to essential personnel and secure the area.

Their duties in an emergency are:

- Report muster and evacuation status to the Incident Commander and await further instruction.
- Provide traffic and personnel control at scene as directed by the Incident Commander.
- Assist in controlling access to the emergency area.
- Maintain open radio communication (via radio or telephone intercom system).
- Keep a written record of events throughout incident.
- Relay notification of 'all clear" order when directed by Incident Commander.
- Maintain Security of the scene as directed by the ERC or Incident Commander.
- Direct all off-site inquiries regarding the emergency to the ERC or designate.
- Participate in a debriefing session for the emergency response.

2.7 ENVIRONMENTAL COORDINATOR

The Environmental Coordinator will liaise with the Incident Commander to advise on the direction of environmental response efforts once the scene has been assessed by the Incident Commander and all medical and/or fire emergencies are under control.

In an emergency the Environmental Coordinator will:

- Directly proceed to the scene of the incident.
- Make recommendations for response methods and resources based on area sensitivities and incident severity through the Incident Commander as necessary.

- Make recommendations for additional resources through the Incident Commander as necessary.
- Participate in post-emergency debriefing.
- Maintain a log of events, actions, and outcomes.

2.8 SAFETY COORDINATOR

The duties of the Safety Coordinator during an emergency are:

- Contact the ERC.
- Respond to the scene and make direct contact with the Incident Commander.
- Establish perimeters around the area of the emergency and direct appropriate resource personnel responsible for traffic flow.
- Assist with identifying and assessment of potential hazards of the ERT response and notify the Incident Commander.
- Ensure appropriate personal protective equipment for involved ERT and non ERT personnel.
- Note pertinent information that may be relative to the investigation.
- Secure the area in coordination with site security.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation and complete report.

2.9 TRAINING

Sabina will ensure that personnel involved in emergency response have received prior training and the requisite skills to safely minimize risks and respond to emergencies.

The personnel directly linked to emergency response operations will receive training to familiarize themselves with the RMERP, Spill Contingency Plan (SCP), Oil Pollution Emergency Plan (OPEP), and Hazardous Materials Management Plan (HMMP) on a regular basis according to their duties and responsibilities. All completed training will be recorded in the training register and kept up to date in the OPEP binder.

The personnel directly linked to emergency response operations, contract employees and the other responders identified in this Plan should take part in the yearly training program. Training will be conducted to ensure adequate numbers of responders are available for all levels, times, and work shifts.

2.9.1 Site Orientation

On site orientation will be provided to all personnel to ensure employees are aware of:

- The RMERP, SCP, OPEP, Spill Action Plan and Fire Action Plan.
- Applicable legislation.
- Environmental receptors (i.e. surface water and sensitive areas).
- First Responders' duties in case of an emergency.
- Location of muster Points and First Aid Stations.
- The location of emergency response equipment, such as:

- Fire extinguishers and firefighting equipment.
- Materials Safety Data Sheets (MSDS) and Spill Report Forms.
- Spill Response Kits.

2.9.2 Role Specific

Specific training will be provided to all employees whose job function may have a higher probability of experiencing an emergency, to ensure understanding of:

- Workplace Hazardous Materials Information Systems and Transportation of Dangerous Goods Regulations.
- Risk management - identify and avoid conditions which may lead to an emergency situation.
- Hazards associated with sources of ignition (smoking, electrical sparks) near a fuel source.
- How to use emergency response equipment.

For employees involved in fuel handling, additional training would be provided regarding appropriate refueling techniques and drum handling procedures. Personnel not trained to handle chemical spills shall not attempt to clean up spill; they are to contact the ERT for clean-up assistance.

2.9.3 Emergency Response Team

Members of the ERT will be provided a higher level of training to allow for safe and adequate response. This includes:

- Information provided as part of the Role-Specific Training.
- First Aid training.
- Fire extinguishers and water pump locations and use.
- Details of the Spill Action Plan and the Fire Action Plan.
- Identify, evaluate and mitigate hazards by using appropriate personal protective equipment (PPE).

2.9.4 Emergency Response Exercises

Emergency response exercises will be conducted on occasion to validate on site capabilities, practice the internal and external notification processes and evaluate the management of the response through the decisions and actions of the ERT participating in the exercise(s).

The exercises will involve the application of realistic hands-on scenarios where the ERT will deploy the appropriate equipment to respond to the specific scenario developed for the exercise. The exercise may be broken down into two or more sessions to ensure adequate coverage.

Records of all emergency response exercises will be kept on file and posted to provide access for those who were unable to attend.

3. Emergency Contact Information

Contact information for all Sabina staff members involved in emergency response is presented in Table 2-1 and will be updated in future iterations of this Plan. External contacts that may provide additional assistance as necessary are presented in Table 2-2 and Table 2-3. Key government contacts are provided in Table 2-4.

These contacts are reviewed and updated with every review of the RMERP.

Table 2-1. Emergency Response Team

Title	Name	Telephone No.
Emergency Response Coordinator	-	-
Environmental Superintendent	-	-
Incident Commander	-	-
Environmental Coordinator	-	-
Safety Coordinator	-	-
Operations Superintendent	-	-
Manager Logistics and TS	-	-
Direction, Environment, Community Relations and Safety	-	-

Table 2-2. External Emergency Response Contacts

Emergency Situation	Agency Contact	Telephone No.
Medical emergency / medevac	Kitikmeot Regional Health Centre	867-983-4500
	Cambridge Bay Heath Centre	867-983-4500
	Stanton General Hospital	1-800-661-0867
	Air Tindi	867-669-8200
Poisonous substance ingestion	Poison Control Centre	1-800-268-9017
Search and Rescue	Cambridge Bay RCMP	867-983-0123
	Kitikmeot Search and Rescue	867-983-5100
Fatality	Cambridge Bay RCMP	867-983-0123
Workers' Safety and Compensation Commission	Incident and Injury Reporting	1-800-661-0792
Hazardous material spill	Emergency/ Spill Report Line	867-920-8130
Crime	Cambridge Bay RCMP	867-983-0123
Wildlife management	Department of Environment – Cambridge Bay	867-983-4164

Table 2-3. External Spill Response Contacts

Expediting Company	Contact Name	Telephone No.
Shell Canada, Mobile Environmental Response	Steve Bassett	867-874-2562
Kitnuna	Wilf Wilcox	867-983-2331
Nuna Logistics Ltd.	Court Smith	867-682-4667
Dupont (Fuel Dye)	-	905-821-5660
Frontier Mining (Sorbents)	-	867-920-7617
Acklands (Sorbents)	-	867-873-4100 867-920-5359

Table 2-4. Key Government Contacts

Agency/Organization	Contact	Telephone No.
Aboriginal Affairs and Northern Development Canada	Eva Paul, Water Resources Officer Baba Pederson, Resource Mgmt. Officer Andrew Keim, A/Manager of Field Ops	867-982-4308 867-975-4296 867-975-4295
Canadian Coast Guard	-	1-800-265-0237
Department of Fisheries and Oceans	Margaret Keast	867-979-8000
Environment Canada	Craig Broome, Manager of Enforcement Wade Romanko, Env. Emerg. Officer	867-669-4730 867-669-4736
Government of Nunavut Environmental Protection	Robert Eno, Director Environment	867-979-7800
Kitikmeot Inuit Association (KIA)	Geoff Clark, Manager Environment and Lands	867-982-3310
Nunavut Water Board	Damien A. Côté, Executive Director Phyllis Beaulieu, Manager of Licensing	867-360-6338
RCMP (Kugluktuk)	-	867-982-2111
RCMP (Yellowknife)	-	867-669-1111

4. Risk Assessment and Management

4.1 RISK ASSESSMENT METHODOLOGY

A comprehensive evaluation of the potential risks from natural hazards and accidents and malfunctions is essential in order to meet legislated regulations, as well as Sabina's health, safety, and environmental objectives. The process of identifying and managing risk, as well as the appropriate mitigation measures in the event of accident or malfunction, is ongoing and involves:

- Identification of hazards.
- Assessment of the risk.
- Evaluation of existing controls.
- Implementation of additional risk controls, if required.
- Monitoring and review.

Management of risks and contingency planning are integral to Sabina's approach to the Project. While there exists the possibility of natural hazards and accidents and malfunctions, Sabina's goal is to minimize risks and consequences that might affect people and the environment. Management systems, including adaptive management practices, will be designed to mitigate most risks and limit consequences. Personnel training, education, regular inspections, monitoring and maintenance of equipment are all utilized to further reduce risk.

Effective emergency response and contingency plans will be supported by effective implementation of Sabina's Environmental Management Plan along with its targeted component plans.

4.2 NATURAL HAZARDS

The environment has the potential to affect the design, operation, and closure of the Project. Extreme weather (storms, extreme rainfall or snowfall, extreme low temperatures) and geo-hazards (seismicity, ground and slope instabilities) have the potential to affect Project infrastructure and in turn represent concerns for human safety and the environment. An assessment of risk and identification of mitigation measures associated with effects of the environment on the Project can be found in Volume 9, Chapter 3 of the DEIS.

4.3 ACCIDENTS AND MALFUNCTIONS

Accidents and malfunctions may occur during any phase of the Project. Thus contingency planning and mitigation measures will be activated in any case where these have the potential to affect human health and the environment.

The primary environmental concern resulting from accidents and malfunctions is the possibility for spills, release of chemicals, reagents, petroleum products or process materials onto the land or water. For example, damage to, or malfunction of the wastewater system might result in the release of effluent. Fire presents another risk. This may result from vehicle accidents, damage to electrical systems or accidental explosions.

Shipping presents further risk potential. Ship damage through collision with other vessels or grounding may result in harm to marine life and the coastal environment through possible diesel spills along the shipping route.

Specific risk assessments, root cause, consequences, and mitigation processes are itemized in Volume 9 of the DEIS.

5. Emergency Response

5.1 EMERGENCY RESPONSE EQUIPMENT

Important information will be posted conspicuously throughout the Project area, including:

- Location of emergency response equipment (first aid kits, PPE, fire protection equipment, spill response kits) and details of proper use.
- Location of Muster Points and First Aid Stations.
- Lists of personnel trained in emergency response procedures (first aid, fire suppression, spill response).
- Outlines of Emergency Response Procedures.
- Emergency contact lists.

5.1.1 Fire Protection Equipment

All work areas will be equipped with proper fire protection equipment and signage will be posted where required. The inspection, and if necessary, testing and maintenance of all firefighting equipment are carried out by a qualified person at least once a month.

All precautions necessary will be taken to prevent fire hazards when working:

- Flammable substances will be managed in accordance with the Fuel Management Plan, Hazardous Materials Management Plan, and Explosives Management Plan (DEIS Volume 10).
- All areas will be kept clear of any accumulation of material to enhance safe access and egress in case of emergency.
- Scrap, paper, rags etc. will be disposed by placing them in proper containers with lids secured.
- Oil and grease spills will be cleaned up immediately.

Smoke and carbon monoxide detectors will be located throughout the camp area.

Air horns and/or sirens will be posted by all building exits for use in alerting others in camp of an emergency situation. Air horn signals will be:

- 1 long blast = fire.
- 2 short blasts = wildlife.
- 3 short blasts = medical emergency.

5.1.2 First Aid and Medical Equipment

First aid kits will be strategically located in vehicles and all Project sites. They will be stored in marked areas, readily accessible to responders.

Additional medical equipment will be located at the onsite Medical Clinic.

5.1.3 Spill Response Equipment

Available heavy equipment and aircraft will be used as appropriate for emergency use to respond to spill incidents.

Appropriately equipped spill response kits, additional on-site spill response equipment and MSDS sheets will be strategically located in vehicles and at all Project sites, especially the active mining areas. A location map will be provided in the SCP (DEIS Volume 10, Chapter 5).

A vehicle outfitted with a self-contained collection of spill response materials for rapid deployment to spill sites will be utilized.

Reserve spill response equipment such as booms, socks and pads will be available for response to larger spill incidents, or to replenish materials used in the smaller equipment spill kits. Spill kits will be inspected routinely and restocked after use.

Further information on spill response equipment is provided in the SCP (DEIS Volume 10, Chapter 5) and OPEP (DEIS Volume 10, Chapter 6).

5.2 COMMUNICATION SYSTEMS

The primary means of onsite communication will be the phone system, hand-held radios, and vehicle radios. The primary means of external communication will be the phone system. Cell phones may be used as additional means of communication.

Backup power sources and replacement batteries will be available to ensure continuous operation of communication systems.

In an emergency situation the “CAMP” radio channel will be used. Once an emergency call is given over the radio, all work must stop and radio silence is initiated. The CAMP channel will be used as the Emergency Channel.

Members of the ERT will be on-call for emergency situations 24 hours a day.

Emergency contact information is provided in Section 3.

5.3 MUSTER POINTS

In the event of an emergency, affected personnel must leave the emergency area and report to pre-determined Muster Points.

Muster Points will be designated based on Feasibility Study designs of the Project site and will be identified in updates on this Plan. A map of the Muster Points will be included in the Plan and will be posted around the Project site.

Emergency supplies (sleeping bags, stoves and food) will be kept at the Muster Points.

5.4 AVIATION AUDITS

Aircraft used to service the Project will be subject to audits as specified by Transport Canada and the internal procedures of the contractors supplying the aircraft.

5.5 EMERGENCY RESPONSE PROCEDURES

5.5.1 Medical Emergency

5.5.1.1 Onsite Medical Assistance

If the worker is injured but does not require immediate medical assistance or transportation:

- Provide immediate First Aid.
- Make arrangement with supervisor, or other personnel if needed, for transportation of the injured worker to the onsite Medical Clinic.
- Ensure worker’s supervisor is informed of the injury to the worker and that they are being transported to the Medical Clinic.
- Worker is to remain at the Medical Clinic until the supervisor arrives.
- The Principal Medical Aide Designee who treated the patient is responsible for filling out the appropriate forms and reports.

If a worker is injured and immediate medical assistance or medi-vac transportation is required:

- Provide immediate First Aid.
- Call, or send someone else to notify of need for medical assistance.
- Contact the Principal Medical Aide Designee via the hand held VHF radio on “CAMP” Channel.

- Call: Medic-Medic-Medic and provide the following information:
  - "My name is __________; I am located at _________. (State worker's name) has been injured and requires immediate medical assistance." Describe the nature of the injury. Await confirmation that the message was received.
- Once an emergency call is given over the radio, all work must stop and radio silence is initiated. The CAMP channel will be used as the Emergency Channel.
- Stay at the scene:
  - Maintain contact with the Principal Medical Aide Designee if possible.
  - Render First Aid.
  - Post a spotter for direction.
  - If needed, send an escort vehicle to meet the Principal Medical Aide Designee en-route.
- Hand over the care of the patient to the Principal Medical Aide Designee when they arrive and provide assistance.
- The Principal Medical Aide Designee to assume control over the injured worker and further medical response. The Principal Medical Aide Designee will decide on the need for mobilization and transport.
- Logistics and Camp Supervisor to be on standby for instructions regarding medevac, runway preparation, lighting, clearing, etc.

5.5.1.2 Medevac Procedure

If a medical emergency is declared by the Principal Medical Aide Designee, the following will be executed:

- Logistics will be contacted via radio on CAMP Channel, and will be provided the required medical information by the Principal Medical Aide Designee, or their designate.
- Logistics will contact Cambridge Bay Heath Centre (867-983-4500) and inform on-duty nurse of emergency.

  *Important: A doctor must be receiving to initiate the Medevac.

- If Cambridge Bay Health Centre is unavailable, Logistics will call Stanton Hospital in Yellowknife (1-800-661-0867) and inform on-duty nurse of emergency.
- Provide the following information to the on-duty nurse:

Company Project Camp No.	Sabina Gold & Silver Corp. Back River Project 778-372-2741
Patient Location	Latitude: 65° 32' 42"N Longitude: 106° 25' 43"W
Medicare/Health #	May need to be given at a later time.
# Of Injured Persons	
Patient Information	What happened?
Condition	Conscious or Unconscious?
History	Any other known medical conditions
Age of Patient	Time of Accident

- Doctor from Cambridge Bay Health Centre will contact a doctor in Yellowknife with the injury details and that they are initiating a Medevac.
- Await a call from Cambridge Bay doctor who will provide the name of the receiving doctor in Yellowknife.
- Call Air Tindi to request a Medevac Plane and provide them with the name of the receiving doctor and a brief incident description.
- Air Tindi Paramedics will call back to have complete incident details; request any medical equipment that is necessary.
- Principal Medical Aid Designee to continue to update Logistics with patient's status and vitals.
- If a medevac is initiated, Logistics to get direction from Air Tindi as to the estimated time of arrival (ETA).
- Logistics to notify the Principal Medical Aide Designee of ETA for the medevac.

<u>Secondary Contacts</u>

If Air Tindi cannot be reached, contact:

- Arctic Sunwest 867-669-9789.
- Northern Air Support 1-250-765-0100.

<u>Compromised Air Transportation</u>

Should air transport be unavailable due to weather or daylight hours, the patient will remain on site at the onsite medical clinic until air support can be provided.

<u>In Case of Death</u>

- Do not move the body unless it could be destroyed.
- Cover the body.
- Contact supervisor.
- Supervisor to call the RCMP, Company directors, Mines Inspectors.

5.5.2 Fire/Explosion

If a fire is discovered:

- Sound the alarm.
- Where it is safe to do so, onsite personnel will take immediate steps to extinguish small fires. All workers will be trained in use of fire extinguishers.
- If it is safe to do so, shut off equipment, warn others and use the planned escape route.
- In the event of a fire all workers must report to the primary muster point, if this is not possible report to the secondary muster point.

When approaching a fire:

- Always seek help before approaching.

- Before approaching, be sure to check the extinguisher is charged, and complete a visual inspection for any obvious signs of deterioration to the extinguisher or low pressure.
- Always ensure you keep the fire in front of you and that you have a means of escape. Stay upwind of the fire.
- Use the PASS method when operating a fire extinguisher:
  - Pull the pin at the top of the extinguisher. The pin releases a locking mechanism that will allow you to discharge the extinguisher.
  - Aim at the base of the fire, not the flames. This is important – in order to put out the fire, you must extinguish the fuel. Spraying the fire directly could cause it to spread.
  - Squeeze the lever/nozzle slowly. This will release the extinguishing agent in the extinguisher. If the handle is released, the discharge will stop.
  - Sweep from side to side. Using a sweeping motion, move the fire extinguisher back and forth until the fire is completely out, or until all expellant is used.
- Operate the extinguisher from a safe distance, several feet away and then move towards the fire once it starts to diminish.
- Never use a class A extinguisher on an electrical fire.
- Do not hesitate to leave the area if the fire continues to grow.
- Once the fire is out, don't walk away immediately. Watch the area for a few minutes in case it re-ignites.
- Replace the fire extinguisher with a recharged one.
- Bring the discharged fire extinguishers to the warehouse for recharging.

For emergencies associated with explosives, procedures outlined in the supplier's Explosives Management and Emergency Response plans will be initiated. This information will be available in later revisions of this Plan.

5.5.3 Air Emergency

As soon as an air emergency is identified the Project Air Traffic Controller or security personnel will notify the ERC who will assess the need for additional emergency response resources.

In the event of a helicopter or plane crash:

- The ERC will contact the RCMP who will establish access and traffic control.
- Medical response procedures will be initiated (Section 5.5.1).
- If required, fire response procedures will be initiated (Section 5.5.2).
- Emergency response personnel will not move debris associated with the wreckage, unless it inhibits passenger rescue.
- The RCMP/Coroner will be responsible for dealing with fatalities.
- Following the emergency response, the ERC will direct the ERT in the investigation and cleanup of the crash site.

5.5.4 Hazardous Material Spill

Spills may result from any of the following situations:

- Leaks or ruptures in tanks, drums or containers.
- Equipment failure including valves, hoses, piping or containment structures.
- Overfilling containers.
- Improper storage.
- Spills during transfer.
- Accidents during transportation.

Procedures will vary seasonally and be based on the nature of the hazardous material spilled. The applicable MSDS will be consulted to ensure that the materials are being handled safely and appropriately. Response procedures specific to land, water, snow and ice are presented in the Spill Contingency Plan (DEIS Volume 10, Chapter 5) and the Oil Pollution Emergency Plan (DEIS Volume 10, Chapter 6).

All site personnel will be briefed on the procedures to be followed to report a spill and initiate spill response. The following details the steps to be taken in the event of a spill. Steps are listed in order of importance; however, circumstances and conditions may alter the order of these steps to meet a specific situation.

Additional detail can be found in the Spill Contingency Plan and Oil Pollution Emergency Plan (DEIS Volume 10).

- Source Control:
  - Identify the product and determine the source.
  - Reduce or stop the flow of product without endangering anyone. This may involve very simple actions such as turning off a pump, closing a valve, sealing a puncture hole with almost anything handy (e.g., a rag, a piece of wood, tape, etc.), raising a leaky or discharging hose at a level higher than the product level inside the tank, or transferring fuel from leaking containers.
- Control of Free Product:
  - Prevent or limit the spread of the spilled material.
  - Accumulate/concentrate spilled product in an area to facilitate recovery.
  - Barriers positioned down-gradient of the spill will slow or stop the progression of the spill. Barriers can consist of absorbent booms, dykes, berms, or trenches (dug in the ground or in snow/ice).
- Protection:
  - Evaluate the potential dangers of the spill in order to protect sensitive ecosystems and natural resources.
  - Block or divert the spilled material away from sensitive receptors. This can also be achieved by using various types of barriers.
- Clean up the Spill:
  - Recover and contain as much free product as possible.
  - Recover and containerize/treat contaminated soil, water, and snow.
  - Pressure-wash contaminated bedrock surfaces, shorelines, ice and recover as much as possible oily water for containerization and/or treatment.

- Report the Spill:
  - Notification must be made as soon as reasonably practicable to the 24-hour Spill Report Line by calling **(867) 920-8130**. Use form NT-NU Interactive spill form. Contact information is also located on the top right corner of the form.
  - Provide basic information such as date and time of the spill, type and amount of product discharged, photographic records, location and approximate size of the spill, actions already taken to stop and contain the spill, meteorological conditions and any perceived threat to human health or the environment.

5.5.5 Evacuation

The need to evacuate part of or the entire Project site may result from:

- Extreme weather events.
- Seismic activity.
- Tundra fire.
- Toxic gas release.
- Hazardous material spill.

If an evacuation is required:

- All personnel will be under the direction of the ERC.
- All employees will report to the designated Muster Point.
- Supervisors will perform a count of personnel to ensure all are accounted for and call the ERT with the message "All persons account for."
- The ERT will coordinate airplane/helicopter support as required and handle telephone notifications and inquiries.
- The ERT will have the site helicopters stand-by and await instructions. If needed for fighting fires, the ERT will ask to have the Bambi basket ready.
- The situation will be accessed, and personnel will be given instructions for which areas have been cleared and can be used as shelter.
- If required, personnel will be evacuated to Cambridge Bay, Kugluktuk or Yellowknife, where accommodation and any further transport arrangements will be handled by the ERT.

5.5.6 Security

If security is required, contact Cambridge Bay RCMP: 867-983-0123.

5.6 FOLLOW-UP TO A SERIOUS INCIDENT

All emergency situations are to be reported to the ERC or designated representative. It is their responsibility to notify Sabina headquarters staff and external parties as outlined in the roles and responsibilities of this Plan (Section 2).

6. Plan Evaluation and Adaptation

The RMERP will be updated annually to incorporate lessons learned from any incidents that may have occurred, amendments to legislation, new characteristics of the sites, the equipment on site, new policies of the company, environmental issues and to provide updated information on new staff, external contact details and other changes.

Most important will be the review of aspects of the Plan affecting safety of employees of the facility, contractors, and the general public. Operational aspects of the Plan, as well as any paperwork that deals with the Plan, will be reviewed. All aspects of the Plan will be continuously audited for effectiveness.

The updated version of the Plan will be distributed to the distribution list. Formal evaluations of the RMERP will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

7. Record Keeping

An internal log of incidents resulting in a response from the ERT will be kept and maintained by the ERC. The Principal Medical Aide Designee will maintain records of all medical incidents. Each record will include date, location, nature of emergency situation, factors leading to emergency situation, details of response, any negative impact, status of cleanup, and corrective actions taken.

Training records for emergency response personnel and records of emergency response exercises will be kept by the ERT.

A record will document all significant changes that have been incorporated in the RMERP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Documentation will be maintained in accordance with Sabina’s standard operating procedures.

4. Fuel Management Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Fuel Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
FUEL MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

ANSI	American National Standards Institute
CCME	Canadian Council of Ministers of the Environment
EPS	Environmental Protection Service
ERP	Emergency Response Plan
ERT	Emergency Response Team
FMP	Fuel Management Plan
HAZCOM	Hazard Communication
HM	Hazardous Materials Storage Area
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
HW	Hazardous Waste Storage Area
ISO	International Organization for Standardization
MLA	Marine Laydown Area
MSDS	Materials Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
OHSA	Occupational Health and Safety Administration
OHSP	Occupational Health & Safety Plan
PPE	Personal Protective Equipment
SGSP	Sabina Gold and Silver Project
SCP	Spill Contingency Plan
TDG	Transportation of Dangerous Goods
TDGA	Transportation of Dangerous Goods Act
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

1. Introduction

This Fuel Management Plan (FMP) outlines Sabina Gold & Silver Corp. (Sabina) plan for managing hydrocarbon products to be stored and managed at the Back River Project (the Project). It represents one plan in a series of environmental management plans that have been prepared for the Project Draft Environmental Impact Statement (DEIS).

This management plan has been prepared in accordance with Section 9.4.2 of the EIS Guidelines issued to Sabina by the Nunavut Impact Review Board (NIRB) (NIRB 2013). The plan is written to be compliant with current statutory requirements of the:

- *Canadian Environmental Protection Act, 1999.*
- Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME 2003).
- Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, 2008.

The FMP is a living document which will be updated based on management reviews, incident investigations, regulatory changes, or other protocols. At this stage, certain aspects of the FMP remain conceptual and the information presented herein is current as of October 2013.

The next update will likely accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study project designs. Following this, the plan is anticipated to be further updated based on detailed engineering design prior to the start of construction, incorporating for construction engineering drawings of facilities and associated fuel management infrastructure.

2. Scope and Objectives

The scope of this plan focusses on the environmental protection measures required for fuel management. This entails the implementation of procedures for transportation, handling, inspection, storage, transfer, reporting and documentation for all fuel products throughout the mine life. These products include diesel, gasoline, lubricating oils, hydraulic fluids, propane, and varsol.

Sabina's intent is that through the diligent implementation of measures outlined in this plan the frequency of spill incidents will be minimized at the mine.

2.1 RELATED DOCUMENTS

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced where appropriate the following management plans:

- Site Water Monitoring and Management Plan.
- Landfill and Waste Management Plan.
- Hazardous Materials Management Plan.
- Spill Contingency Plan.

- Occupational Health and Safety Plan.
- Oil Pollution Emergency Plan (OPEP).

In the event of a spill at the **Marine Laydown Area** the **Oil Pollution Emergency Plan** will apply.

In the event of a spill at either the **Goose or George Properties**, the **Spill Contingency Plan** will apply.

3. Planning and Implementation

Planning for the Fuel Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during ongoing public consultations.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through contractor job-specific standard operating procedures (SOPs), work instructions, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

Federal and Territorial legislation that is applicable to fuel management in Nunavut is presented in Table 4-1.

Table 4-1. Applicable Legislation for Back River Project Fuel Management

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)	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 Petroleum Hydrocarbons (PHC) in Soil
Transportation of Dangerous Goods Act (1992, c. 34)		
Fisheries Act (1985, c. F-14)		
		National Fire Code of Canada (2010)
Territorial – Nunavut and Northwest Territories		
Nunavut Environmental Protection Act	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste
Northwest Territories Waters Act *Territorial Lands Act* *Mackenzie Valley Resource Management Act*		Guidelines for Spill Contingency Planning, Aboriginal Affairs and Northern Development Canada

Other applicable standards, systems and regulatory bodies include:

- Underwriters Laboratories of Canada (ULC) Standards.
- Canadian Standards Association (CSA) Standards.
- Workplace Hazardous Materials Information System (WHMIS).
- Worker's Compensation Board.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of this plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager is responsible for ensuring regular inspection of petroleum storage facilities at the Back River Project. The Mine Manager, or designate, will coordinate with the Safety and Environmental Superintendents with respect to their areas of responsibility. All employees, contractors, and contractor employees, are responsible for complying with the intent of this plan.

The Mine Manager will ensure that the following requirements are satisfactorily implemented before work starts on a storage facility:

1. Drawings and designs of temporary and permanent fuel storage and fuel transfer facilities will be provided by the Project engineer or fuel services provider.
2. A written commissioning plan will be provided to Sabina by the Project engineer or the responsible fuel services provider.
3. The commissioning plan will include the contractor's details for implementation of their contractual responsibilities which may include:
   - Detailed equipment commissioning procedures and schedules for testing all systems.
   - A fire and spill contingency plan integrated into the Project Emergency Response Plan.

All manifests, training and other tracking documentation will be maintained and kept readily available, as required, by the Mine Manager or designate.

The Emergency Response Coordinator (ERC) is responsible for coordinating and managing response in the event of a spill.

6. Facility Planning and Fuel Delivery

6.1 FACILITY SITING AND LOCATION

Land based fuel storage facilities will be constructed and utilized at the Marine Laydown Area (MLA), Goose Property and George Property, Figure 6.1-1 shows the location of these sites. The current conceptual fuel storage facility placements for each site are presented in Figures 6.1-2, 6.1-3 and 6.1-4.

Details on the fuel facilities and logistical considerations are provided in subsequent sections of this plan.

6.2 FUEL SUPPLY

Fuel supply during site preparation will be transported by air. During construction and operation, fuel will be delivered to the MLA by marine vessels before delivery to the Goose Site via winter road by trucks. Fuel transportation options to the MLA have been considered.

A trade-off study of transportation options indicated that the open water shipping season is too short to support fuel delivery by barges and the preferred option is delivery by tankers with transfer to fuel tanks at the MLA using a floating line. Based on this decision, the location and size of the storage tanks was refined to minimize the floating hose length, site facility on low topography and elevation, optimize tanker size and pumping capacity, and avoid environmental and culturally sensitive areas.

Fuel will be transported from the MLA to the Goose and George properties via winter road. The main fuel depot for the Back River Project mining area will be located at the Goose Property. A secondary depot will be located at the George Property.

Figure 6.1-1

Site Locations of the Back River Project

Rescan an ERM company

PROJECT #0194096-0001 GIS # BAC-15-128 December 23 2013

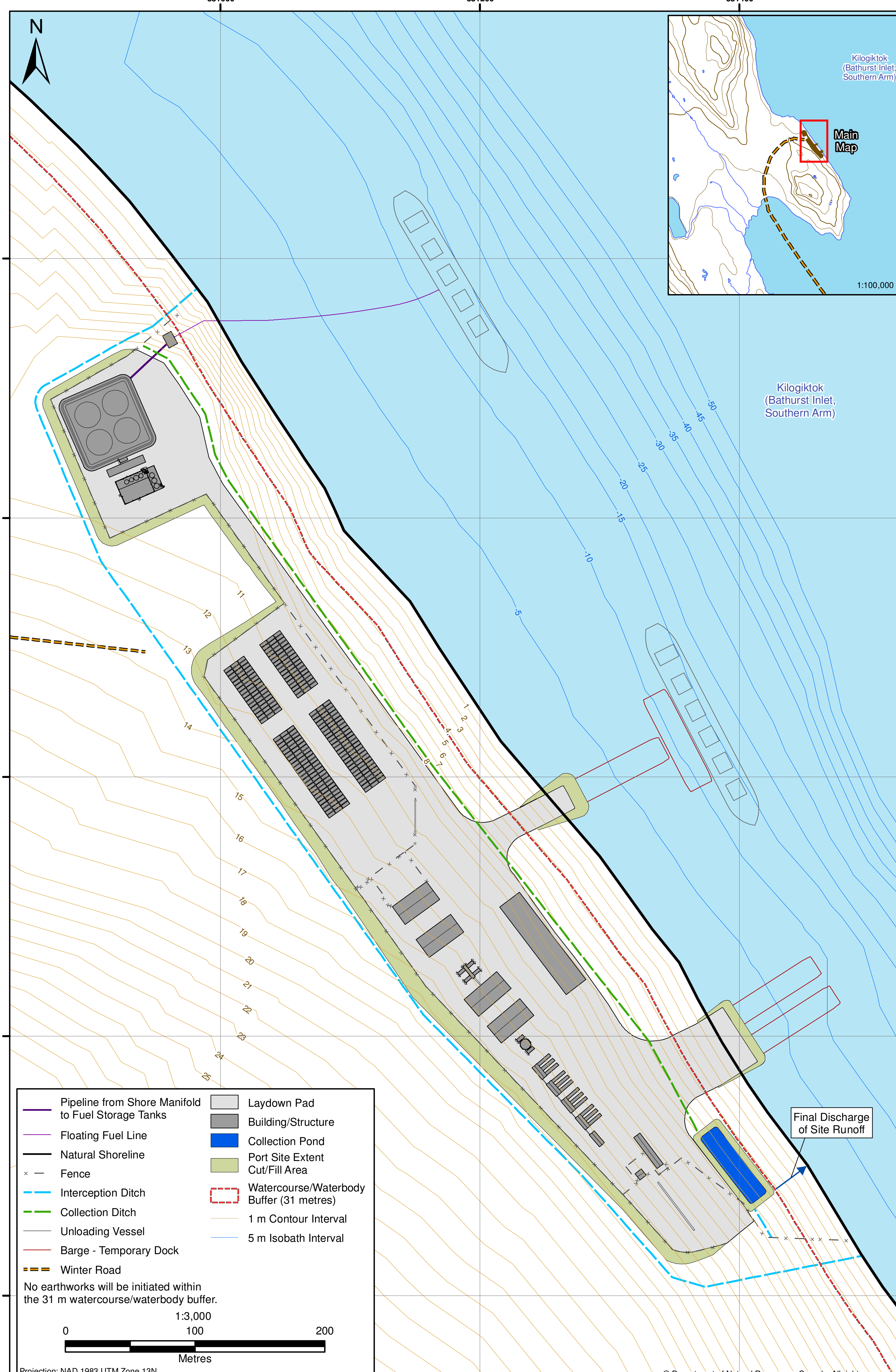
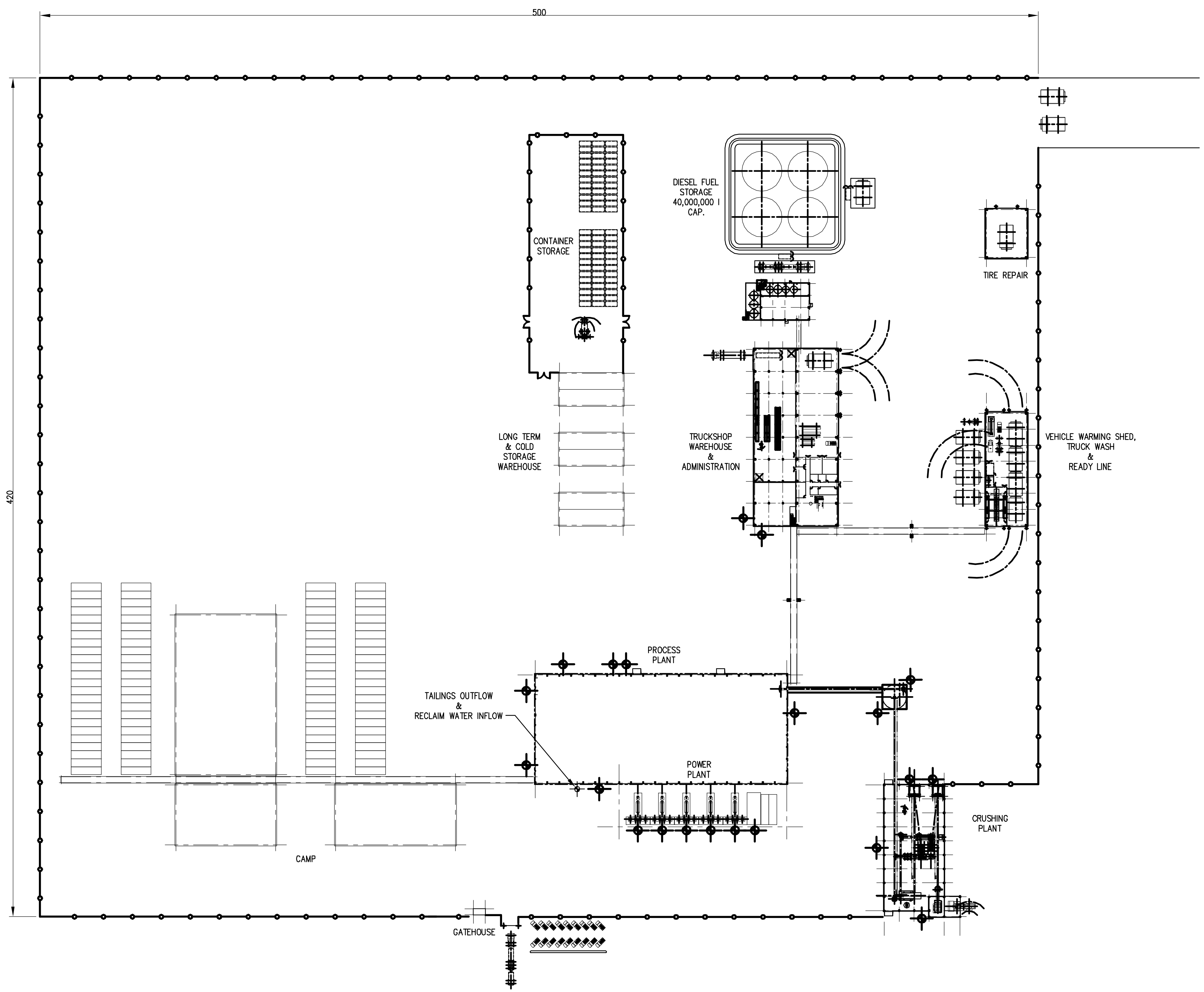


Figure 6.1-2

Sabina GOLD & SILVER CORP.

Port/Marine Laydown Area Site Layout

Rescan an ERM company



LEGEND

NOTES

Base data: Tetra Tech Drawing #100000-10-001, Rev. A

Sabina GOLD & SILVER CORP.

SABINA BACK RIVER PROJECT

Goose Property Site Layout

PROJECT NO.	DWN	CKD	APVD	REV
V15103033-01.002	MEZ	JB	JB	0

DATE October 22, 2013

Figure 6.1-3

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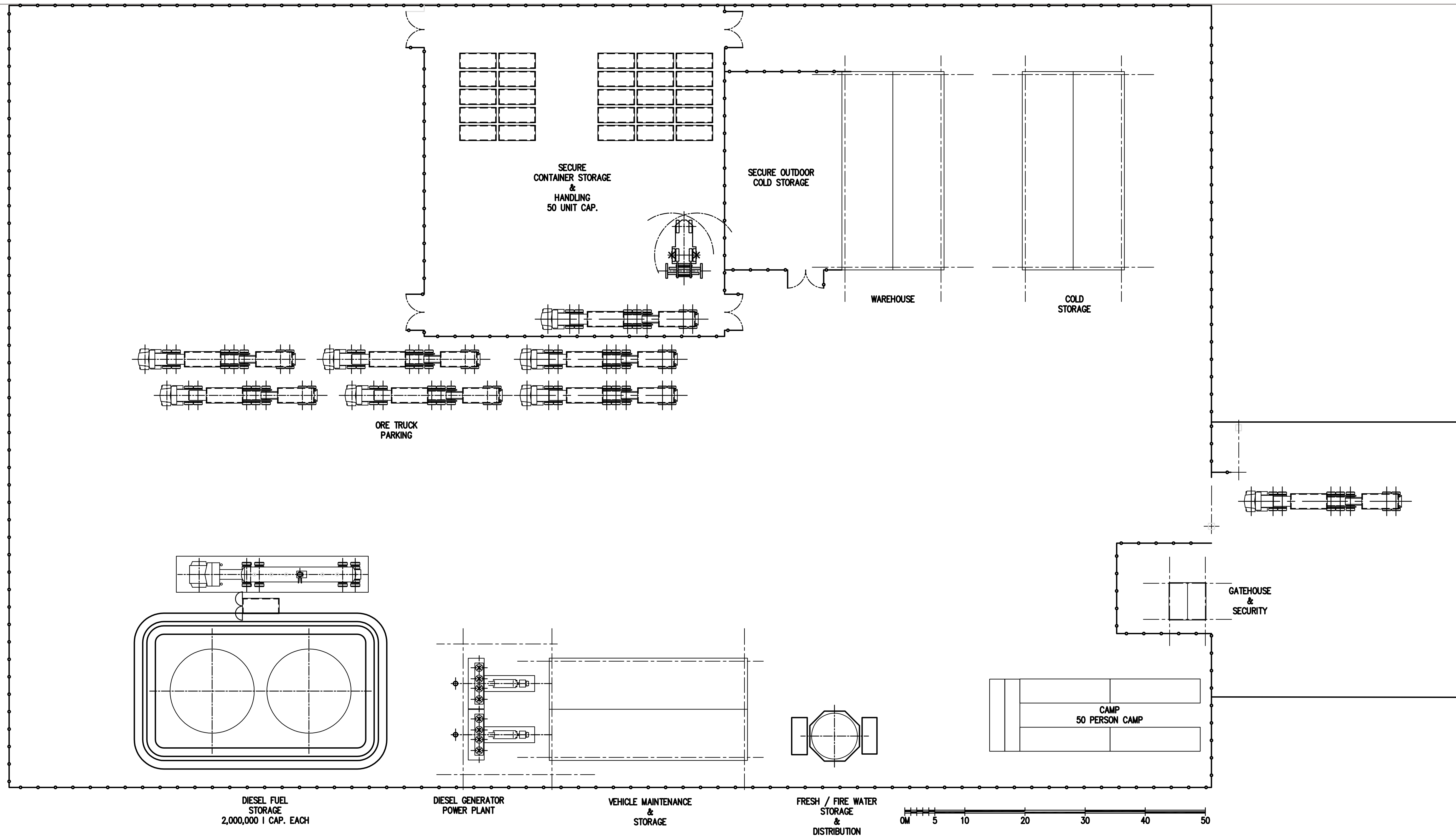

LEGEND

NOTES

Base data: Tetra Tech Drawing #100000-10-002, Rev. A

Sabina GOLD & SILVER CORP.

SABINA BACK RIVER PROJECT

George Property Site Layout

PROJECT NO.	DWN	CKD	APVD	REV	
V15103033-01.002	MEZ	JB	JB	0	**Figure 6.1-4**
	DATE October 22, 2013				

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6.3 MARINE LAYDOWN AREA

The Marine Laydown Area has been designed to be capable of offloading and storing 45 ML of diesel fuel in four 10 ML tanks and one 5 ML tank (Table 6.3-1). Three 10 ML fuel tanks and one 5 ML tank will be installed during the construction period, to accompany a 10 ML tank installed during site preparation.

Table 6.3-1. Fuel Storage

Site	Ultimate Storage Capacity	Site preparation (Year -4 and -3)	Construction Year - 2 and -1	Operation Year 1 to 10
Marine Laydown Area	4 steel tanks at 10 ML; 1 steel tank at 5 ML	Build and use 1 x 10 ML tank	Use 1 x 10 ML tank; build 2 x 10 ML and 1 x 5 ML tanks	Use 3 x 10 ML and 1 x 5 ML tanks; build and use 1 x 10 ML tank
Goose Property	4 steel tanks at 10 ML; 1 steel tank at 5 ML; Multiple isocontainers at 100,000L	Build and use 1 x 10 ML tanks	Use 1 x 10 ML tank; build 3 x 10 ML and 1 x 5 ML tanks	Use 3 x 10 ML and 1 x 5 ML tanks; build use 1 x 10 ML tank
George Property	3 steel tanks at 5 ML; Multiple isocontainers at 100,000L	Build and use 1 x 5 ML tank	Use 1 x 5 ML tank	Use 1 x 5 ML tank; build and use 2 x 5 ML tanks.

Construction of the Marine Laydown Area (MLA) will take place during the Construction phase. Initial fuel requirements will be delivered by sealift during the open water season with the vessels departing prior to winter ice formation in Bathurst Inlet.

In conformance with CCME's Environmental Code of Practice (CCME 2003) and the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (2008), all Project fuel storage facilities will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks or 110% volume of the largest tank, whichever is greater. The bermed lining will be impervious through the installation of a HDPE liner. The construction of this lining will be based on industry standards for installation and jointing of the membrane to ensure its integrity. Water management of the contact water from these berms will be incorporated into the water and waste management plans.

Water management of the contact water from the tank farm will be incorporated into the water and waste management plans.

Temporary storage of fuel during site preparation and construction may be required as permanent storage tanks are under construction and prepared for operation. In this case, temporary storage may utilize smaller portable double-walled fuel storage tanks.

6.4 GOOSE PROPERTY

Currently the Goose Property fuel farm is comprised of thirteen 75,000 L double walled enviro-type tanks. Fuel was either flown to site by aircraft or hauled to site by Cat train from a supply barge at the Bathurst Inlet.

Sabina plans to construct a 45 ML fuel storage facility at the Goose Property (Table 6.3-1), with capacity for a one year supply of diesel fuel. One 10 ML tank will be built for site preparation followed by installation of an additional three 10 ML tanks and one 5ML tank in the Construction Phase. The 45

ML storage capacity will be utilized for operations. Fuel for the Goose Property will be supplied from the Marine Laydown Area tank farm, and transported to the Goose Property via winter road.

The Goose Property tank farm will be constructed in line with CCME's Environmental Code of Practice (2003) and Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (2008). Water management of the contact water from the tank farm will be incorporated into the water and waste management plans.

Approximately 100,000 L of aircraft fuel will be stored in 205 L drums at the airstrip in case of emergencies. The drums will be stored in an area with secondary containment.

6.5 GEORGE PROPERTY

Sabina will construct a 15 ML fuel storage facility at the George Property comprised of three 5 ML tanks (Table 6.3-1). The George property tank farm will likely be constructed in Year 5 of the operations, ahead of anticipated mine production in years 6 through 8. As previously indicated, the George Property tank farm will be constructed in conformance with CCME's Environmental Code of Practice (2003) and Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (2008). Water management of the contact water from the tank farm will be incorporated into the water and waste management plans.

Fuel for the George Property will be supplied from the Marine Laydown Area, and transported to the George Property via winter road.

Approximately 100,000 L of aircraft fuel will be stored in 205 L drums at the airstrip in case of emergencies. The drums will be stored in an area with secondary containment.

6.6 FUEL CONSUMPTION AND DELIVERY

Arctic grade diesel fuel will predominantly be used by mining equipment, motor vehicles and power generation. Limited quantities of propane will be used in maintenance facilities for smaller motorized equipment and machinery, and in the accommodation complex for meal preparation.

The number and size of the storage tanks for site preparation, construction and operations activities is presented in Table 6.3-1.

The anticipated quantities and volumes of fuel will vary depending on the phase of the Project, as summarized in Table 6.6-1, deliveries will begin in Year -3 for site preparation.

Table 6.6-1. Estimated Fuel received at the Marine Laydown Area

Year	Y-3/Y-2	Y-2/Y-1	Y-1/Y1	Y1/Y2	Y2/Y3	Y4 onward
Fuel (tonnes)	4,500	10,500	22,000	29,000	31,000	31,000
Annual Number of Vessels	1	1	Up to 5	Up to 5	Up to 5	Up to 5

7. Environmental Protection Measures

Fuel will be delivered by fuel tankers during the open water season. The floating hose method will be used for the transfer of fuel to the on land storage tanks. An Oil Pollution Emergency Plan (OPEP) has been developed to address fuel spill incidents related to the MLA facility.

Refuelling stations will be equipped with a lined and bermed area to contain minor spills or leaks that may occur during refuelling. The liner (e.g., 40 mm hypolon liner or equivalent) will be protected by aggregate bedding. Vehicles and mobile equipment will drive onto this bedding for refuelling. Fuel transfer will be carried out with pumps.

Fuel storage areas and vehicles will be equipped with spill kits for emergency response. Sabina's Spill Contingency Plan identifies spill kit locations and appropriate response measures for spills. The spill kits will contain the appropriate type, size and quantity of equipment for the volume/type of product present in each of the three fuel storage facilities.

7.1 DESIGN REQUIREMENTS

The fuel storage facilities will be designed with features that protect the environment as per Table 7.1-1.

Table 7.1-1. Fuel Storage Facility Design Requirements

Topic / Activity	Environmental Protection Measures
Design Features	• The CCME Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products will be followed in design, construction, and operation of the fuel storage facilities. • All fixed location Above Ground Storage Tanks (AST) > 230L will be constructed and maintained in accordance with Underwriters Laboratories of Canada (ULC) tank specifications, and bear a current ULC certification plate or label. • All ASTs will be installed on firm foundations designed to minimize uneven settling and corrosion, and to prevent the design stress of the tank from being exceeded. • Fuel hose length will not exceed 4.5m, or 6m where a retracting system is used.
	• Tanks, lines, and fittings will be coated with durable paints for corrosion protection. • Fuel tanks will be locked (unless enclosed by a fence) when not being used for vehicle fuelling, or when not being filled by tanker trucks. • Fuel storage tanks must be vented to allow vapours to escape.
Moving Tanks	• Where a storage tank > 230L is removed (e.g., moved from one site to another) or abandoned, it is permitted to be reused for the storage of flammable liquids and combustible liquids only after having been refurbished and found to conform to acceptable standards. • A fuel storage tank > 230L requires spill control (or secondary containment) when it is removed from a mobile unit and installed in a fixed location. • Lighting will provide adequate illumination to ensure safe fuelling and allow users the ability to read safety placards and posted fuelling procedures, and to readily locate spill response equipment.
	• There must be no leaks from the valve or pipe system to the pump. Draw-off valves must be threaded at the discharge end or otherwise designed to provide a liquid tight connection to the delivery hose. • Collision protection may include concrete filled steel posts placed more than 1 m from the outer edge of the tank shell and spaced less than 1.5 m apart. Concrete barriers, if used, will have a minimum height of 750 mm and be spaced at least 500 mm from the tank shell. Posts and barriers will be painted yellow and equipped with reflective stripes.

7.2 SITING AND STORAGE

Table 7.2-1 summarizes the fuel storage facilities siting and storage requirements.

Table 7.2-1. Fuel Facility Siting and Storage

Topic / Activity	Environmental Protection Measures
Siting and Storage	• Design of fuel storage facilities will meet regulatory requirements for design and operation and will apply best management practices including: – fire prevention system design appropriate and adequate for the materials being stored – tanks will have a minimum 1m separation between them – siting away from ignition sources and environmentally sensitive areas – drums, containers, and storage areas properly labelled, marked, placarded and secured – containers or liner materials will be matched with the materials being stored • All tanks for fuelling operations will be placed aboveground, outside of buildings, and will be used for the storage of diesel fuel. • Tank siting will consider site drainage and surface flow routes for fluids if spilled during tank filling or product transfers. Grading and drainage will be designed to prevent liquids from reaching waterways, drain systems, and potable water sources. • Spill response and cleanup kits will be readily available in the refuelling area.
Secondary Containment & Collision Protection	• Fuel storage and dispensing systems will meet all applicable Nunavut regulations and all applicable Fire Code requirements. • Large or stationary equipment will be placed in secondary containment or will have a drip pan placed under vehicle/equipment prior to commencing any maintenance. • Precipitation accumulating within the containment area will be tested and treated if necessary prior to removal and disposal to the downstream receiving environment.
	• All water collection facilities surrounding the shops and fuel islands will be designed to convey the water to oil/water separators for hydrocarbon removal prior to release. • Secondary containment works will include spill control measures for preventing petroleum products from entering natural waterways.
	• Accidental damage to containment structures will be inspected immediately and appropriate repairs undertaken. The extent of damage, repairs and any follow up inspection will be reported in accordance with best practices.

7.3 FUELLING OPERATIONS AND TRAINING

Environmental Protection Measures for fuel management entail the implementation of proper transportation, inspection, storage, transfer and use of all petroleum products. Protection measures to ensure that fuel products are managed effectively are summarized in Table 7.3-1.

7.4 FUEL INVENTORY MANAGEMENT

All fuel products discussed in this plan will be transported to the mine site and will be safely stored in the designated fuel storage areas as previously discussed. Total amounts of the fuel products received will be reconciled against amounts ordered. Fuel volumes will be measured (metered or manual dipping) as they are distributed for use from the bulk tanks. Inventory records will be updated when fuel is used and added to each tank. An unexplained loss of fuel may indicate a leak and will be immediately investigated.

Fuel tanks and fuelling equipment will be kept in good operating condition and the potential for inadvertent releases of product will be achieved through procedures provided in Table 7.4-1.

Table 7.3-1. Fuelling Operations

Topic / Activity	Environmental Protection Measures
Transportation	• Drivers making deliveries on site will receive a site orientation that includes relevant sections of the *Transportation of Dangerous Goods Act* (1992, c. 34), Sabina safety requirements, and site traffic protocols. • Fuels will be trucked in sealed containers, be manifested, and equipment will be labelled and placarded in accordance with Transportation of Dangerous Goods Regulation standards. • Applicable WHMIS signage and TDG placards will be identifiable on all containers during transportation and storage. • Manifests will identify fuel type, quantity, and date of all deliveries to the mine site and will be retained on file at the contractor's head office for a period of two years. • Transportation vehicles will be equipped with spill kits of appropriate size and content. Vehicle operators will be trained in haul road safety and spill response.
	• Planning of delivery timing will consider weather conditions, road conditions and availability of appropriate transportation equipment and personnel.
Bulk Transfer and Refuelling	• Only persons trained to safely handle fuels and aware of WHMIS and TDG requirements will implement procedures to transfer fuel. • Qualified personnel will continuously supervise the refuelling operation to ensure against overflow or spillage. • Daily inspections will be performed by the personnel responsible for the refuelling facility. • Refuelling will occur at a refuelling point with drainage capture / collection installed, in the event that refuelling occurs elsewhere, drip trays will be used under vehicles and equipment. • Refuelling and maintenance activities will not occur within 30 m of a watercourse or water body except where required due to equipment breakdown or approved activities near water. • Refuelling equipment from a tank vehicle is permitted if the fuelling is conducted using approved hose-reel and automatic closing nozzles; and appropriate training and equipment are supplied to deal with any incidental spillage. • Before fuel transfer verify that a level shutoff device can be substituted for the person at the delivery tank, in which case operation of the shutoff should be verified each time it is used. • All connections will be bonded to prevent static discharge. • Any delivery hose that has the potential to cause a spill, if it were pulled from the delivery pump or valve, should be fitted with a breakaway valve. • Propane fuel delivery vehicle tanks will be manufactured and certified in accordance with applicable regulations and equipped to ensure the safe discharging of propane to a receiving tank. • Smoking is not permitted where dispensing is being carried out. • Spill control is required for small containers of flammable and combustible liquids that have the potential to spill. • When dispensing flammable liquids, ensure that static electrical charges are controlled by establishing an electrical connection between the tank or container and truck box fill stem, or by providing other appropriate measures as applicable. • Hose nozzle valves must conform to CAN/ULC-S620-M, "Hose Nozzle Valves for Flammable and Combustible Liquids" (FC 4.5.5.2.). • Valves at the storage tank must be constructed of steel according to the Fire Code. • An automatic shutoff nozzle must be used when using an integral hold-open device. • When a hose nozzle valve with a hold-open device is used, a break-away coupling conforming to CAN/ULC-S644-M, "Emergency Break-away Fittings for Flammable and Combustible Liquids" will be provided. • Do not use any object or device to maintain the flow of fuel that is not an integral part of the hose nozzle valve assembly. • Use only manufacturer's specified pressure relief security caps.

(continued)

Table 7.3-1. Fuelling Operations (completed)

Topic / Activity	Environmental Protection Measures
Bulk Transfer and Refuelling *(cont'd)*	• Use fuel dispensing pumps conforming to good engineering practice, and designed for flammable or combustible liquids. • Employees will remain at the dispensing nozzle whenever they are pumping fuel from any storage tank. • Tanks must not be filled beyond their safe filling level.
Training and Review	• Training for fuel dispensing attendants will include procedures for: • supervising the dispensing of flammable and combustible liquids; • taking appropriate measures to prevent sources of ignition from creating a hazard at the dispensers; • taking appropriate action in the event of a spill to reduce the risk of fire; and • shutting off the power to all dispensers in the event of a spill or fire. • Fuel management training for all employees and contractors will include: evacuation procedures and routes; alarm systems; when to attempt immediate response to an emergency and when to call for help; reporting procedures for personnel; shutdown procedures for equipment and electrical systems; types of potential emergencies; procedures for handling flammable liquids; importance of good housekeeping; importance of safe work habits; and procedures for control and cleanup of leaks and spills • Training will be provided by a combination of trained, qualified mine staff and outside training service organizations, as appropriate. Training manuals will be developed before the mine begins operation.

Table 7.4-1. Facility Monitoring and Preventative Maintenance

Topic / Activity	Environmental Protection Measures
Facility Monitoring and Preventative Maintenance	• Vehicles and equipment will be inspected prior to mobilization to site and malfunctions will be rectified. • Inspections will look for signs of deterioration, leaks, unsecured container lids or excess accumulation of materials in the containment areas. All visible leaks and releases will be documented and promptly corrected. • Equipment and light vehicle operators will conduct daily visual inspections at the start of their shifts to ensure equipment integrity, cleanliness and the adequacy of spill prevention material. • Fuel tanks will be visually monitored on a weekly basis for signs of leakage. This will include looking for signs of corrosion, staining on the ground, and cracks or breaks in hoses and other ancillary equipment during the visual inspection. Tanks will be repaired as soon as problems are noted. • Signs on tanks will be visible and legible. • Containment areas will be kept clear of debris, excess snow, ice or standing water. • If a sheen is visible on water within the secondary containment, it will be tested prior to treatment if necessary and disposal. • Emergency pumps and oily-water separators will be tested on a regular basis. • Inspection, monitoring, and record keeping for tanks will be in accordance with regulatory requirements for the Project. • Inspection findings will be reviewed with transporters to correct deficiencies, maintain awareness, and to recognize negative or positive performance.

8. Monitoring Program

Deliveries of fuel to site will be overseen by the Environmental Superintendent. On-site Environmental Monitors will be responsible for observing and documenting the bulk transfer of fuel.

Monitoring of fuel storage tanks on site will be conducted in accordance with the CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME 2003) and Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (2008).

Water pooling within the secondary containment of the fuel storage facilities will be treated as necessary prior to release to the receiving in conformance with discharge water quality criteria (Table 8.1-1).

Table 8.1-1. Proposed Bulk Fuel Storage Pooling Water Discharge Criteria (CCME 2003; 2013)

Parameter	Maximum Average Concentration (mg/L)
Benzene	0.370
Ethyl benzene	0.090
Toluene	0.002
Lead	0.01
Oil and Grease	15 and no visible sheen

Note:
The concentrations for Benzene, Ethyl benzene, Toluene and Lead are Freshwater CCME Guidelines for the Protection of Aquatic Life (CCME 2013).
The concentration for Oil and Grease is included in CCME (2003).

9. Mitigation and Adaptive Management

9.1 SPILL PREVENTION AND RESPONSE

Spill response procedures, equipment and organizations are based on a work and activity scope level assessment of potential spill risk. Sabina's comprehensive Spill Contingency Plan (SCP) and Oil Pollution Emergency Plan (OPEP) describe the components of spill prevention and response and provide equipment lists, response procedures and organization descriptions with associated roles and responsibilities.

In the event of a spill at the **Marine Laydown Area** the **Oil Pollution Emergency Plan** will apply.

In the event of a spill at either the **Goose or George Properties**, the **Spill Contingency Plan** will apply.

General spill prevention and response measures specific to fuel management are provided in Table 9.1-1.

Table 9.1-1. Spill Prevention and Response

Topic / Activity	Mitigation Measures
Spill Response Equipment (further detailed in Spill Contingency Plan	• Spill kits appropriate for the hydrocarbon products being handled or transported will be positioned at refuelling areas. At a minimum, each kit will contain: – Sufficient hydrophobic absorbent material (e.g., oil absorbent booms and sorbent pads) to contain and cleanup potential drips, leaks or spills. – Gloves and heavy plastic bags to contain oily absorbent materials and contaminated soils or wastes. • Spill kits will be inspected daily to ensure sufficient materials are available. • Absorbent materials in spill kits will not be used for normal cleaning activities usually done with rags, such as wiping parts or hands. • Containment booms, linkable oil absorbent booms and floating oil absorbent pads will be stored on-site to manage any releases to water. • Reserve spill response equipment such as booms, socks and pads will be available for response to larger spill incidents, or to replenish materials used in the smaller equipment spill kits. • Sabina will ensure that relevant personnel are responsible for maintaining or providing necessary spill response equipment in their area, if there is a potential for an environmental spill. • Sabina will ensure secondary spill response teams are in place and capable of effecting containment, remediation, communication, and reporting.
Spill Response (further detailed in Spill Contingency Plan)	• In the event a spill does occur, the following immediate actions will be taken by the responder (as is safe): – Identify source. – Stop release if safe to do so. – Contain spill to minimize impacts. – Notify the supervisor immediately. • Clean up in a manner appropriate to the spill, removing contaminated soil and snow. • Used spill kit materials will be disposed of in designated hazardous waste bins. • Spill kits will be restocked after use.
Spill Reporting	• All spills will be reported to appropriate personnel per the procedures defined in Sabina's Spill Contingency Plan.

10. Record Keeping

Records will be kept under the supervision of designated Sabina personnel at each Project site, for reconciled bulk fuel inventory, weekly use summaries, weekly reconciliation for each storage tank, overfill alarm tests, pressure tests (if applicable), inspections and maintenance checks, any alteration to the system, reports of leaks or losses, reports of spill responses; and records of training.

A record will document all significant changes that have been incorporated in the FMP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

11. Environmental Reporting

Spill reporting will be conducted in accordance with Sabina's comprehensive Spill Contingency Plan also included as a component of the Back River Project EMP. Reportable spills will be immediately and externally reported by the Operations Superintendent or designated alternate to the 24-hr NWT/Nunavut Spill Response Line (**867 920 8130**) as required.

12. Plan Effectiveness

Certain components of the Fuel Management Plan will need to be updated based on site experience. Therefore, it will be necessary to audit or review the plan on a regular basis to identify those components needing updating or upgrading. Most important will be the review of aspects of the plan affecting safety of employees of the facility, contractors, and the general public. Operational aspects of the plan, as well as any paperwork that deals with the plan, will be reviewed. All aspects of the plan will be continuously audited for effectiveness.

Formal evaluations of the Fuel Management Plan will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

References

Canadian Council of Ministers of the Environment. 2003. *Environmental Code of Practice for Above Ground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products*.

Canadian Council of Ministers of the Environment. 2013. Canadian Environmental Quality Guidelines Summary Table. Retrieved from: http://st-ts.ccme.ca/

5. Spill Contingency Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Spill Contingency Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
SPILL CONTINGENCY PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AANDC	Aboriginal Affairs and Northern Development Canada (formerly INAC, DIAND)
ANSI	American National Standards Institute
ATV	All-Terrain Vehicle
CCME	Canadian Council of Ministers of the Environment
DEIS	Draft Environmental Impact Statement
DFO	Department of Fisheries and Oceans
EC	Environment Canada
ERP	Emergency Response Plan
ERT	Emergency Response Team
FEIS	Final Environmental Impact Statement
HAZCOM	Hazard Communication
HM	Hazardous Materials Storage Area
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
HW	Hazardous Waste Storage Area
INAC	Indian and Northern Affairs Canada
ISO	International Organization for Standardization
KIA	Kitikmeot Inuit Association
MLA	Marine Laydown Area
MSDS	Materials Safety Data Sheets
NDOE	Nunavut Department of Environment
NIOSH	National Institute for Occupational Safety and Health
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
NU	Nunavut
NWT	Northwest Territories
OHF	Oil Handling Facility
OHSA	Occupational Health and Safety Administration

OHSP	Occupational Health & Safety Plan
OPEP	Oil Pollution Emergency Plan
PPE	Personal Protective Equipment
SGSP	Sabina Gold and Silver Project
SCP	Spill Contingency Plan
SOPEP	Shipboard Oil Pollution Emergency Plan
TC	Transport Canada
TDG	Transportation of Dangerous Goods
TDGA	Transportation of Dangerous Goods Act
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

1. Introduction

1.1 OVERVIEW

This Spill Contingency Plan (SCP) outlines Sabina Gold & Silver Corp.'s (Sabina) plan for responding to hydrocarbon or other contaminant spill incidents that may occur at the Back River Project (the Project). This includes provisions for the Marine Laydown Area in southern Bathurst Inlet, and both the Goose and George Properties (Figure 1.1-1). It represents one plan in a series of environmental management plans that have been prepared for the Project Draft Environmental Impact Statement (DEIS).

This SCP has been prepared in accordance with Section 9.4.3 of the EIS Guidelines issued by the Nunavut Impact Review Board (NIRB) to Sabina (NIRB 2013). This Plan was prepared in conformance with current Federal and Territorial statutory requirements

This is a living document to be updated annually, based on management reviews, incident investigations, regulatory changes, or other Project-specific protocols.

The information presented herein is current as of October 2013. At this stage, certain aspects of the SCP remain conceptual. The next update will likely accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study project designs. Following this, the Plan will be further updated based on detailed engineering design prior to the start of construction, incorporating for construction engineering drawings of facilities and associated fuel management infrastructure.

Sabina will maintain a distribution list providing contact details for all parties to receive the Plan including key personnel, contractors, organizations, and external agencies.

1.2 SCOPE AND OBJECTIVES

The scope of this Plan focusses on the spill response and environmental protection measures required in the event of a hydrocarbon or other contaminant spill at any of the Back River Project properties and associated infrastructure, including winter and all-weather access roads and airstrips. This entails the implementation of response procedures for Project-related spills, releases, or discharges to land, water, ice and snow of the following products:

- Hydrocarbon products including diesel fuel, gasoline, hydraulic oil.
- Soluble solids such as ammonium nitrate prill.
- Liquids such as glycols and paints.
- Corrosive liquids including Sulphuric Acid and Sodium Cyanide.
- Compressed (inert and flammable) gas.
- Other hazardous substances.

The SCP is designed to protect worker and public safety and minimize potential impacts to the environment in the event of a Project-related spill. This will be achieved through the application of best management practices implemented through predetermined lines of response and plans of action.

The Plan addresses land and freshwater based emergency response and spill scenarios, with marine response detailed in the Oil Pollution Emergency Plan.

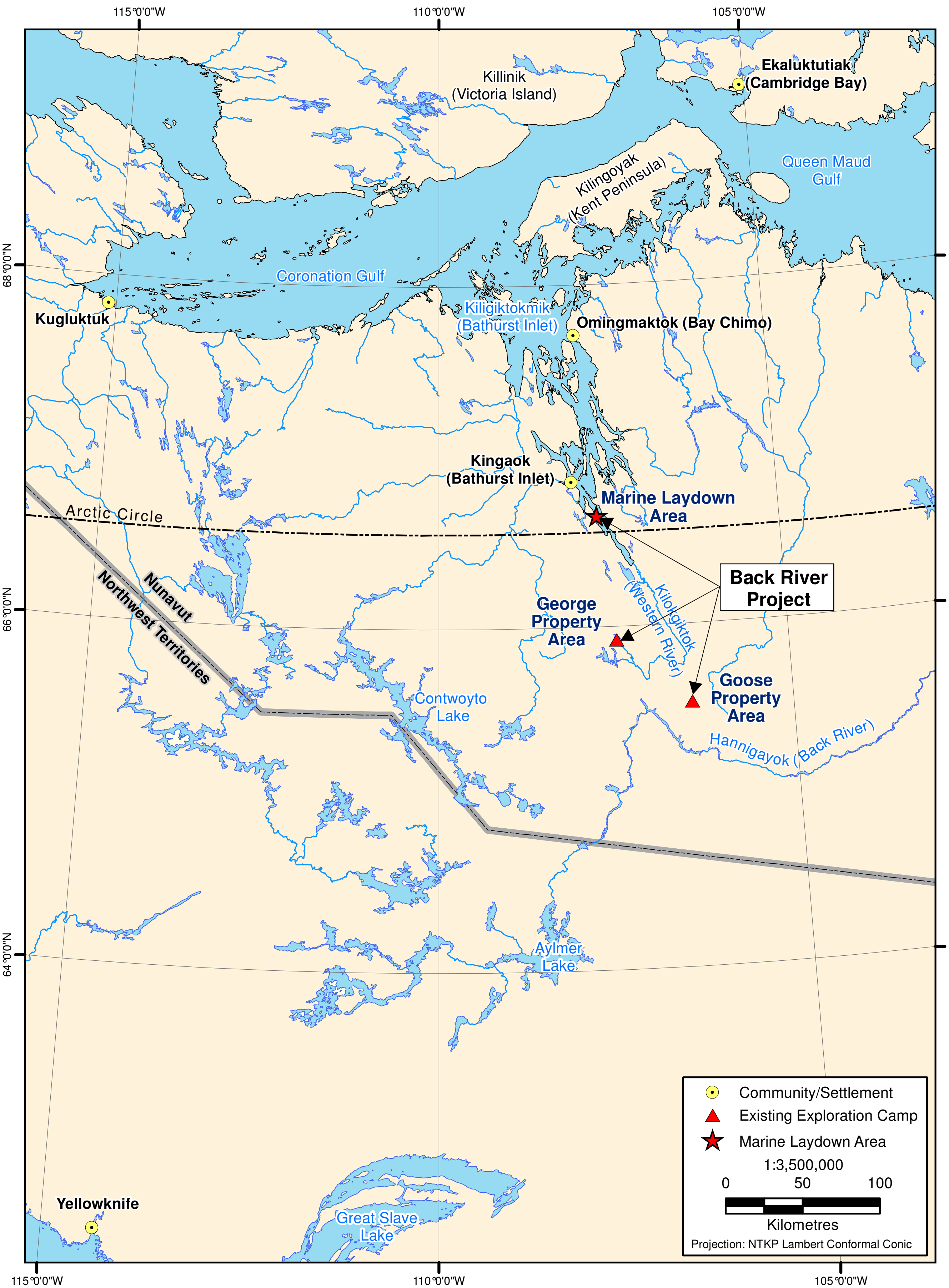


Figure 1.1-1

Sabina GOLD & SILVER CORP.

Project Location

Rescan an ERM company

1.3 PLANNING AND IMPLEMENTATION

Planning for the SCP started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management will be tracked, reviewed, and updated through ongoing maintenance of the Plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

1.4 COMPLEMENTARY PLANS AND DOCUMENTS

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced where appropriate the following management plans:

- Oil Pollution Emergency Plan.
- Shipping Management Plan.
- Shipboard Oil Pollution Emergency Plan (to be provided in the future by Shipping Company).
- Hazardous Materials Management Plan.
- Fuel Management Plan.
- Landfill and Waste Management Plan.
- Site Water Management Plan.
- Occupational Health and Safety Plan.

It must be noted that the Plan is intended to interface with the Oil Pollution Emergency Plan developed for the Marine Laydown Area Oil Handling Facility (OHF) and the Shipping Management Plan (SMP) developed for the shipping component of the Project.

1.5 LINKAGE WITH SABINA OIL POLLUTION - EMERGENCY PLAN (OPEP)

The Canada Shipping Act Response Organizations and Oil Handling Facilities Regulations stipulates that operators of designated Oil Handling Facilities must have an onsite Oil Pollution Emergency Plan (OPEP – standards, TP12402 applies).

The Marine Laydown Area Oil Handling Facility OPEP and ship specific Shipboard Oil Pollution Emergency Plans (SOPEPs) specifically address marine spill incidents that may be associated with the Project's marine operations. The Oil Handling Facility OPEP has been designed to complement this plan.

The OPEP does not supersede existing contingency plans. It serves to address the specifics of the Oil Handling Facility – the bulk fuel ship to shore transfer of fuel and spill scenarios directly relating to these operations as required by TP12402. The Emergency Response Team will be trained to adequately handle any emergencies that impact the ocean, land and freshwater.

1.6 APPLICABLE LEGISLATION

This SCP has been developed to conform to Section 9.4.3 of the Nunavut Impact Review Board Environmental Impact Statement Guidelines for the Back River Project (April 2013). Legislation specific to marine shipping can be found in the Shipping Management Plan

Both Federal and Territorial legislation exist to address spills of potentially harmful substances. Operational policies and procedures that fulfill conditions in applicable legislation, will be further developed as the project proceeds.

Table 1.6-1 summarizes the primary Federal and Territorial legislation applicable to spill contingency planning and response in Nunavut

Table 1.6-1. Legislation Applicable to the Spill Contingency Plan

Acts	Regulations	Guidelines
Federal		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c.A-12)		
Canadian Environmental Protection Act (R.S.C.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)	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 Petroleum Hydrocarbons (PHC) in Soil
Fisheries Act (1985, c.F-14)	Metal Mining Effluent Regulations (SOR/2002-2222)	
Explosives Act (1985, c.E-17)	Ammonium Nitrate and Fuel Oil Order (C.R.C., c.598) Explosives Regulations (C.R.C., c.1516)	
National Fire Code of Canada (2010)		
Transportation of Dangerous Goods Act (1992, C.34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	
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., c.1524)	
Hazardous Products Act	*Controlled Products Regulations*	*Workplace Hazardous Materials Information System (WHMIS)*
Nunavut Act (1993 c.28)		
Nunavut Land Claims 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) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste Antifreeze

(continued)

Table 1.6-1. Legislation Applicable to the Spill Contingency Plan (completed)

Acts	Regulations	Guidelines
Environmental Protection Act (RSNWT (Nu) 1988, c E-7) *(cont'd)*		Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvent
Mine Health and Safety Act (SNWT (Nu) 1994, c.25)	Mine Health and Safety Regulations (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1998, c.W-6)	Workers' Compensation General Regulations (Nu Reg 017-2010)	
Explosives Use Act (RSNWT (Nu) 1988, c.E-10)	Explosives Regulations (RRNWT (Nu) 1990, c.E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c.F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990, c.F-12)	
Motor Vehicles Act (RSNWT (Nu) 1988, c.M-16)	Large Vehicle Control Regulations (RRNWT (Nu) 1990, c.M-30)	
Public Health Act (RSNWT (Nu) 1988, c.P12)	Camp Sanitation Regulations (RRNWT (Nu) 1990, c.P-12) General Sanitation Regulations (RRNWT (Nu) 1990, c.P-16)	
Safety Act (RSNWT 1988, c.S-1)	General Safety Regulations (RRNWT (Nu) 1990, c.P-16)	
	Work Site Hazadous Materials Information System Regulations (RSNWT 1988, c.81 (Supp))	
Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c.81 (Supp))	Transportation of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	

1.7 SITE DESCRIPTION

The Back River Project is currently an advanced exploration gold project located in the West Kitikmeot region of Nunavut (Figure 1.1-1). The Project is located at approximately 65° to 66° north latitude, and 106° to 107° west longitude. Following future approval and implementation, the Project will include two primary mining areas (Goose Property and George Property), a Marine Laydown Area in southern Bathurst Inlet, and connecting local all-weather roads and a winter access road.

2. Definitions and Spill Quantities

For the purpose of this Plan, a **major spill** is defined as an accidental release of product into the environment that has the potential for significant adverse impact and is a reportable quantity.

A **minor spill** is defined as any hazardous chemical spill that does not involve highly toxic, highly reactive, or explosive chemicals, in a situation that is not life threatening, nor immediate risk to the receiving environment. Furthermore, this type of spill presents a manageable physical or health hazard to personnel who, when wearing proper personal protective equipment (PPE), will not be exposed to any chemical at a level that exceeds any recognized action levels or permissible exposure limits.

Minimum reportable thresholds are provided by Aboriginal Affairs and Northern Development Canada (AANDC) in:

- Guidelines for Spill Contingency Planning, Appendix B-3: Immediately Reportable Spill Quantities.

Information from the appendix table is reproduced below as Table 2-1.

Table 2-1. External Reporting Volumes (AANDC 2010)

TDGA Class	Description of Contaminant	Amount Spilled
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 litres
2.2	Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 litres
2.3	Compressed gas (toxic)	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid (hydrocarbon fuels)	100 litres
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solids	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 litres or 50 kg
5.2	Organic Peroxides	1 litre or 1 kg
6.1	Poisonous substances	5 litres or 5 kg
6.2	Infectious substances	Any amount
7	Radioactive	Any amount
8	Corrosive substances	5 litres or 5 kg
9.1 (in part)	Miscellaneous products or substances, excluding PCB mixtures	50 litres or 50 kg
9.2	Environmentally hazardous	1 litre or 1 kg
9.3	Dangerous wastes	5 litres or 5 kg
9.1 (in part)	PCB mixtures of 5 or more parts per million	0. 5 litres or 0. 5 kg
None	Other contaminants	100 litres or 100 kg

If a spill on site meets or exceeds the minimum reportable thresholds, or is thought to exceed the minimum reportable thresholds, the spill will be reported by the Environmental Superintendent (or designate) to the **NWT-NU 24-Hour Spill Report Line**. All spills of fuel or hazardous materials into a waterbody or ice will be reported to the Spill Report Line, to ensure compliance with the *Fisheries Act*.

NWT-NU 24-Hour Spill Report Line:

Phone: 867 920 8130
Fax: 867 873 6924
Email: spills@gov.nt.ca

Procedures will be developed and implemented to encourage all non-reportable spills to be communicated by staff and responded to as needed.

3. Hazardous Materials On-site

A number of hazardous materials are anticipated to be stored on site during all stages of construction and operations. The specific materials and quantities of hazardous materials being stored at one time will vary depending on the Project stage. A list of the main hazardous materials to be transported to and stored on site is provided in Appendix A of this Plan. As Project planning and design progresses, specific products and expected amounts will be included in this appendix.

4. Spill Prevention

Training and awareness are two major elements of spill prevention. All site staff and contractors will review the contents of the Spill Contingency Plan (SCP) during their on-site orientation and will be informed of where copies of the Plan are stored. The mandatory site orientation will provide hazard awareness training, identify the locations of spill kits and other response equipment, and discuss appropriate application.

A more detailed description of the training to be provided to site staff is provided in Section 6.0 of this Plan. Spill prevention in relation to the Marine Laydown Area Oil Handling Facility is discussed in detail in the OPEP.

In addition to training, all work sites and hazardous materials storage facilities will be routinely inspected. Good housekeeping practices will be adopted with emphasis on storage facilities and loading zones.

General practices, to be implemented by Sabina, that support spill prevention include:

- Assign spill response personnel and clearly publish their contact information.
- Provide easy access to current Material Safety Data Sheets (MSDS) for all hazardous materials on site.
- Maintain updated inventory of hazardous materials present at each site.
- Store materials in appropriate containers to the specified capacity, in areas adequately protected from weather and physical damage.
- Conduct regular inspections of storage facilities.
- Segregate incompatible materials.
- Provide training involving the SCP, Spill Kits and other response equipment.
- Stock adequate spill response materials and equipment, and have them readily available for transportation, transfer and storage of hazardous materials.
- Create an environment which promotes prompt communications of all spill incidents.

5. Roles and Responsibilities

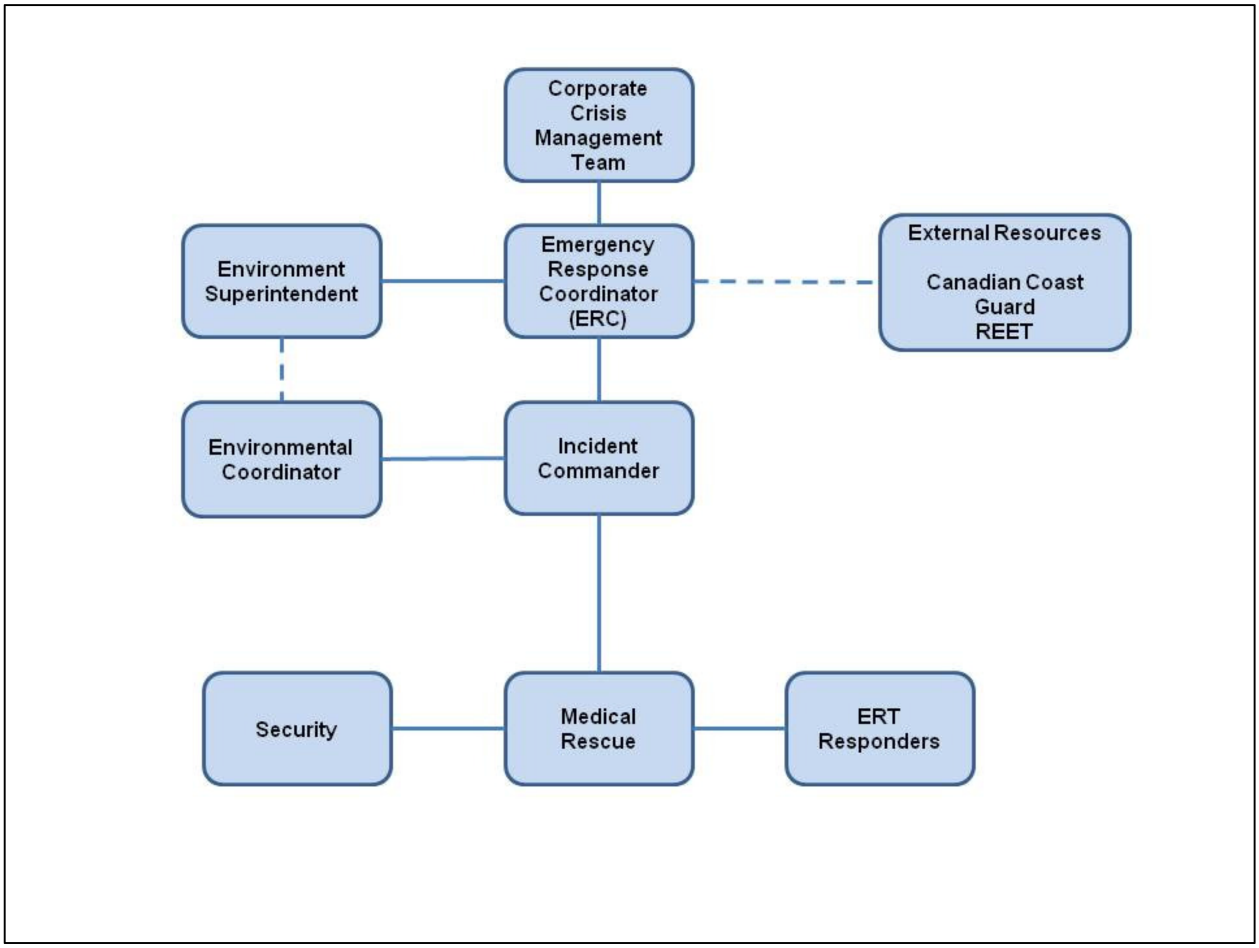
The initial stage of any emergency or spill incident and resultant response is critical. An effective and timely response is essential to prevent an emergency or spill situation from escalating to a higher level.

Therefore, all relevant personnel must be fully aware of their individual duties and responsibilities as presented in this Plan.

Figure 5-1 summarizes Sabina's generalized emergency and spill response organization chart. This structure will be refined in future iterations of this plan.

Specific responsibilities and duties inherent to personnel involved in emergency and spill response are outlined in Section 5.1.

Figure 5-1. Sabina Spill Response Organization Chart



5.1 EMERGENCY RESPONSE COORDINATOR

For the purpose of the SCP, the Emergency Response Coordinator (ERC) is the General Manager or his designate if absent. ERC duties during an emergency are detailed as follows:

- The Emergency Response Coordinator (ERC) will ensure coordination of ERT support systems.
- Upon being notified of an emergency, the ERC will initiate response activities and assess the situation based on current information from the Incident Commander.
- Activate the emergency response process and escalate according to severity of incident.

- The ERC will coordinate all activities. In the event the ERC leaves his post, the ERC will designate an individual to coordinate in his absence.
- Ensure that the appropriate area manager/s has been notified.
- Provide internal notification as applicable based on the level of emergency.
- Provide instruction to ensure that appropriate external resources are notified.
- Receive information from the Incident Commander and ensure appropriate resources are made available.
- Provide support for the acquirement of additional supplies and resources as requested by the Incident Commander.
- Contact departmental resources via radio as required during the emergency response.
- Provide internal notification of the “all clear”.
- Ensure the coordination and establishment of an emergency debriefing session.
- Review incident log and post response incident report.
- Post incident debrief with Incident Commander.
- Provide necessary information to Public Relations for a media statement release if required.
- Complete a report on the events surrounding the incident.
- Coordinate collection of all incident notes, reports, statements and log of events.
- End the event in a project tracking system.

5.2 ENVIRONMENT SUPERINTENDENT

The duties of the Environment Superintendent during an emergency are detailed as follows:

- For major spills contact the ERC and report to the command center.
- Report the spill to NWT-NU 24-hour Spill Report Line at (867) 920-8130.
- Document all actions and decisions.
- Assist the ERC in evaluating the initial situation and assessing the magnitude of the spill.
- Assist in developing an overall plan of action.
- Collect photographic records of the spill event and cleanup efforts.
- Report to the ERC and provide recommendations on resource requirements (additional manpower, equipment, material) to complete the cleanup effort.
- Provide liaison with management to keep them informed of cleanup activities.
- Act as the spokesperson with government agencies as appropriate.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation process.
- Complete Government Agency notification processes.
- Ensure that the spill is cleaned up and follow-up communication and reports are filed with the AANDC and KIA.

- Document the cause of the spill and effectiveness of the cleanup effort, and recommend the appropriate measures to prevent a recurrence of the spill.
- Ensure that all involved departments complete reporting process.
- Prepare and submit follow-up documentation required by appropriate regulators.
- Ensure that spill reports submitted to AANDC and KIA include photographic records and an updated map showing Universal Transverse Mercator (UTM) coordinates, date, and amount and nature of the spill.

For marine spills at the OHF, the Environment Superintendent will be available to the Canadian Coast Guard during the entire incident.

5.3 INCIDENT COMMANDER

The Incident Commander is the site lead administrator for the ERT, responsible for ensuring the necessary emergency response equipment and adequate level of training for ERT members. The Incident Commander directs the ERT at the scene as ERT Leader. In the absence of the Incident Commander, a senior team member will be designated in his place. The following duties during an emergency are performed by the Incident Commander:

- Muster accordingly and brief team members.
- Report to the scene of the emergency.
- Take charge of the scene.
- Evaluate the details of the emergency as presented by those on scene. Assess the immediate situation, confirm the level of emergency and notify the ERC.
- Maintain contact with the ERC and provide support in coordination of the response.
- Direct ERT members in their respective tasks as required.
- Contact departmental resources via radio as required during the emergency response.
- Request internal/external resources as required.
- Advise ERT on aspects of internal/external support as they are received.
- Develop a written log of events indicating instructions given, action taken and outcomes achieved.
- Announce the ‘all clear’ to the ERC when the emergency has ended.
- Lead the post-emergency debriefing session.
- Ensure that all ERT equipment is returned to original order and/or replaced to ensure future rapid response.
- Provide assistance with ongoing investigation.
- Prepare a written report on response activities.

5.4 ENVIRONMENTAL COORDINATOR

The Environmental Coordinator will liaise with the Incident Commander to advise on direction of environmental response efforts once the scene has been assessed by the Incident Commander and all medical and/or fire emergencies are under control.

The Environmental Coordinator will:

- Directly proceed to the scene of the incident.
- Make recommendations for response methods and resources based on area sensitivities and incident severity through the Incident Commander as necessary.
- Make recommendations for additional resources through the Incident Commander as necessary.
- Participate in post-emergency debriefing.
- Maintain a log of events, actions, and outcomes.

5.5 SAFETY COORDINATOR

The duties of the Safety Coordinator during an emergency are detailed as follows:

- Contact the ERC.
- Respond to the scene and make direct contact with the Incident Commander.
- Establish perimeters around the area of the emergency and direct appropriate resource personnel responsible for traffic flow.
- Assist with identifying and assessment of potential hazards of the ERT response and notify the Incident Commander.
- Ensure appropriate personal protective equipment for involved ERT and non ERT personnel.
- Note pertinent information that may be relative to the investigation.
- Secure the area in coordination with site security.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation and complete report.

5.6 EMERGENCY MEDICAL PERSONNEL

Duties during an emergency are as follows:

- Respond when required as directed by the Incident Commander.
- Responsible for all decisions of medical-related situations on site.
- Responsible for assessing, administering and delegating emergency medical care.
- Advise the Incident Commander of the number and condition of any ill/injured personnel.
- Advise the ER Coordinator of off-site resources required.
- Maintain a log of events, actions and outcomes.
- Participate in a post-emergency debriefing session.

5.7 TEAM LEADERS – (EMERGENCY RESPONSE TEAM)

- Report to the scene of the incident.
- Work closely with the Incident Commander to determine appropriate response strategy for their respective work area.
- Contact departmental resources via radio as required during the emergency response.

- Direct ERT members in their respective tasks as required.
- Participate in a post-emergency debriefing session.

5.8 EMERGENCY RESPONSE TEAM

All Emergency Response Team members shall receive training to ensure that they have the required skills to provide an appropriate, safe and adequate response minimizing the impact of a spill on the environment.

5.9 SECURITY

Security personnel or their designates are key in an emergency response in that they will receive an initial notification of an emergency and provide first communications to essential personnel and secure the area.

Duties during an emergency are as follows:

- Security will report muster and evacuation status to the Incident Commander and await further instruction.
- Provide traffic and personnel control at scene as directed by the Incident Commander.
- Assist in controlling access to the emergency area.
- Maintain open radio communication (via radio or telephone intercom system).
- Keep a written record of events throughout incident.
- Relay notification of ‘all clear” order when directed by Incident Commander.
- Maintain Security of the scene as directed by the ER Coordinator or Incident Commander.
- Direct all off-site inquiries regarding the emergency to the ER Coordinator or designate.
- Participate in a debriefing session for the emergency response.

5.10 EMERGENCY RESPONSE TEAM CONTACT INFORMATION

Contact information for all Sabina Staff members involved in spill response is presented in Table 5.10-1. Contact information for Project contractors is presented in Table 5.10-2. External contacts that may provide additional assistance as necessary are presented in Table 5.10-3. Key government contacts are provided in Table 5.10-4. These contacts are reviewed and updated with every review of the SCP.

Table 5.10-1. Emergency Response Management Team

Title	Contact Name	Telephone No.
Emergency Response Coordinator		
Environmental Superintendent		
Incident Commander		
Environmental Coordinator		
Safety Coordinator		
Operations Superintendent		
Manager Logistics and TS		
Direction, Environment, Community Relations and Safety		

Table 5.10-2. Contractor Contacts

Title	Telephone No.
TBD	TBD
TBD	TBD
TBD	TBD

Table 5.10-3. External Spill Response Contacts

Expediting Company	Contact Name	Telephone No.
Shell Canada, Mobile Environmental Response	Steve Bassett	(867) 874-2562
Kitnuna	Wilf Wilcox	(867) 983-2331
Nuna Logistics Ltd.	Court Smith	(867) 682-4667
Dupont (Fuel Dye)		(905) 821-5660
Frontier Mining (Sorbents)		(867) 920-7617
Acklands (Sorbents)		(867) 873-4100 (867) 920-5359

Table 5.10-4. Key Government Contacts

Agency/Organization	Contact Name	Telephone/Fax No.
NWT/NU 24hr Spill Report Line		Phone: (867) 920-8130 Fax: (867) 873-6924 Email: spills@gov.nt.ca
Aboriginal Affairs and Northern Development Canada	Eva Paul, Water Resources Officer Baba Pederson, Resource Mgmt. Officer Andrew Keim, A/Manager of Field Ops	Phone: (867) 982-4308 Phone: (867) 975-4296 Phone: (867) 975-4295
Canadian Coast Guard (in the event of a spill to the marine environment)		Phone: (800) 265-0237
Department of Fisheries and Oceans	Margaret Keast	Phone: (867) 979-8000
Environment Canada	Craig Broome, Manager of Enforcement Wade Romanko, Env. Emerg. Officer	Phone: (867) 669-4730 Phone: (867) 669-4736
Government of Nunavut Environmental Protection	Robert Eno, Director Environment	Phone: (867) 979-7800
Kitikmeot Inuit Association (KIA)		Phone: (867) 983-2458
Nunavut Water Board	N/A, Exec.Director Phyllis Beaulieu, Manager of Licensing	Phone: (867) 360-6338
RCMP (Kugluktuk)		Phone: (867) 982-2111
RCMP (Yellowknife)		Phone: (867) 669-1111
Workers Safety and Compensation Commission		Phone: (867) 979-8637 Fax: (867) 873-6924

6. Training and Emergency Response Exercises

6.1 GENERAL

Sabina will ensure that relevant personnel involved in a response have received prior training and the requisite skills to safely minimize the impact of a spill to the environment.

The personnel directly linked to spill response operations will receive training to familiarize themselves with the Spill Contingency Plan and the Environmental Emergency Plan on a regular basis according to their duties and responsibilities. All completed training will be recorded in the training register and kept up to date in the Oil Pollution Emergency Plan binder.

The personnel directly linked to spill response operations, contract employees and the other responders identified in the environmental emergency plan should take part in the yearly training program. Training will be conducted to ensure adequate numbers of responders are available for all levels, times, and work shifts.

6.2 SITE ORIENTATION

On site orientation will be provided to all personnel to ensure employees are aware of:

- Applicable Legislation.
- Environmental Receptors (i.e. surface water and sensitive areas).
- What First Responders are to do in case of a spill.
- The location of MSDS sheets and Spill Report Forms.
- The location of the Spill Response Kits.
- The general locations of fire extinguishers and firefighting equipment.
- The location of the Spill Action Plan and the Fire Action Plan.

6.3 ROLE SPECIFIC

Specific training will be provided to all employees whose job function may have a higher probability of experiencing a spill, such as those handling chemicals, to ensure understanding of:

- Workplace Hazardous Materials Information Systems (WHMIS) and Transportation of Dangerous Goods Regulations (TDGR).
- Identify and avoid the conditions which may lead to a spill.
- Develop an understanding of the potential environmental impacts of a spill.
- Recognize the hazards associated with sources of ignition (smoking, electrical sparks) near a fuel source.
- Spill kit contents and use of them.

For employees involved in fuel handling, additional training would be provided regarding appropriate refueling techniques and drum handling procedures. Personnel not trained to handle chemical spills shall not attempt to clean up spill; they are to contact emergency response personnel for clean-up assistance.

6.4 EMERGENCY RESPONSE TEAM

Members of the Emergency Response Team will be provided a higher level of training to allow for safe and adequate response. This includes:

- Information provided as part of the Role-Specific Training.
- Fire extinguishers and water pump locations and use.
- Details of the Spill Action Plan and the Fire Action Plan.
- Identify, evaluate and mitigate the hazards posed by any spilled product by using appropriate PPE (personal protective equipment).

6.5 SPILL RESPONSE EXERCISES

Spill response exercises will be conducted on occasion to validate on site capabilities, practice the internal and external notification processes and evaluate the management of the response through the decisions and actions of the spill management team participating in the exercise(s).

The exercises will involve the application of realistic hands-on scenarios where the Emergency Response Team will deploy the appropriate equipment to respond to the specific spill scenario developed for the exercise. The spill exercise may be broken down into two or more sessions to ensure adequate coverage. Records of all spill response exercises will be kept on file and posted to provide access for those who were unable to attend.

7. Spill Response Equipment

Available heavy equipment and aircraft will be used as appropriate for emergency use to respond to spill incidents. Appropriately sized spill kits and spill response equipment will be strategically located in vehicles and all Project sites, especially the active mining areas.

Each department will be responsible for providing all necessary MSDS sheets and sufficient spill response kits in their respective work areas. Spill Kits and MSDS sheets will be stored in marked areas, readily accessible to responders. A location map will be provided in future revisions of this plan.

Spill kits will be customized to account for specific hazards and conditions in each work site. Customized spill kits particular for the activity and area will be selected for use on the site as required. At a minimum, each kit will contain:

- Sufficient hydrophobic absorbent material (e.g., oil absorbent booms and absorbent socks) to contain and cleanup potential drips, leaks, or spills.
- Gloves and heavy plastic bags to contain oily absorbent materials and contaminated soils or wastes.
- Barrier tape to keep personnel out of contaminated areas.
- Sorbent granular materials to soak up free oil.
- Other appropriate PPE such as disposal coveralls, rubber gloves and safety goggles.

A vehicle outfitted with a self-contained collection of spill response materials for rapid deployment to spill sites will be utilized.

Reserve spill response equipment such as booms, socks and pads will be available for response to larger spill incidents, or to replenish materials used in the smaller equipment spill kits. Spill kits will be inspected routinely and restocked after use.

Table 7-1 provides a general list of mobile and stationary equipment likely available on site. This list will vary by project phase and response requirements.

Table 7-1. General Equipment for Emergency Spill Response

Mobile Equipment	
Grader	Winch Trucks
Cranes	Pickup Trucks
Snowmobiles	Generator Sets
Vacuum Truck	Fire Truck
Loaders	Aluminium Boats
Backhoes	Fuel Trucks
Bulldozers	Bobcats
Forklifts	Haul Trucks
Water Trucks	Snow Cats
Excavators	
Temporary Containment Systems	
Booms	Spill Kits
Drums	Spill Absorbent Material
Tanks	Silt Fencing
Tailings Impoundment Area	Lined Excavations
Emergency Transportation	
Aircraft (helicopter)	Snowmobiles
4-Wheel Drive Vehicles (ex. Pickup trucks)	Boats
ATVs	
Communication Equipment	
Radios	Fax
Telephone	Wireless Communication Systems

A mobile environmental emergency trailer will be located on site at each of the Back River Project properties; their typical contents are listed in Table 7-2.

Table 7-2. Environmental Emergency Trailer Equipment List

Equipment	
Pump/skimmer	White oil spill pads
Pump accessories	Universal booms
Vacuum ends	Cell U-Sorb
Tubing or pipes for vacuum or pumping	Sphagsorb
45 gallon top	Wedge wood
Diesel fuel jerry can	Plug patties

(continued)

Table 7-2. Environmental Emergency Trailer Equipment List (completed)

Equipment ***(cont'd)***	
Spill kit accessory	Quattrex bags
Drums opener	Hand shovel
Wescot (to open empty drum screw)	Ice breaker chisel
Empty drums	Sledge hammer
Drums berms	Rod bars
Tarps	

8. Spill Response Procedures

Spills may result from any of the following situations:

- Leaks or ruptures in tanks, drums or containers.
- Equipment failure including valves, hoses, piping or containment structures.
- Overfilling containers.
- Improper storage.
- Spills during transfer.
- Accidents during transportation.

Procedures will vary seasonally and based on the nature of the hazardous material spilled. The applicable MSDS will be consulted to ensure that the materials are being handled safely and appropriately. Response procedures specific to land, water, snow and ice are presented in this section.

8.1 GENERAL SPILL RESPONSE

All site personnel are briefed on the procedures to be followed to report a spill and initiate spill response. The following details the steps to be taken in the event of a spill. Steps are listed in order of importance; however, circumstances and conditions may alter the order of these steps to meet a specific situation. The Site Superintendent and Environmental Superintendent will be notified as soon as feasible for any spill.

8.1.1 Source Control

Identify the product and determine the source. Reduce or stop the flow of product without endangering anyone. This may involve very simple actions such as turning off a pump, closing a valve, sealing a puncture hole with almost anything handy (e. g. , a rag, a piece of wood, tape, etc.), raising a leaky or discharging hose at a level higher than the product level inside the tank, or transferring fuel from leaking containers.

8.1.2 Control of Free Product

Prevent or limit the spread of the spilled material. Accumulate/concentrate spilled product in an area to facilitate recovery. Barriers positioned down-gradient of the spill will slow or stop the progression of the spill. Barriers can consist of absorbent booms, dykes, berms, or trenches (dug in the ground or in snow/ice).

8.1.3 Protection

Evaluate the potential dangers of the spill in order to protect sensitive ecosystems and natural resources. Block or divert the spilled material away from sensitive receptors. This can also be achieved by using various types of barriers.

8.1.4 Clean Up the Spill

Recover and contain as much free product as possible. Recover and containerize/treat contaminated soil, water, and snow. Pressure-wash contaminated bedrock surfaces, shorelines, ice and recover as much as possible oily water for containerization and/or treatment.

8.1.5 Report the Spill

Provide basic information such as date and time of the spill, type and amount of product discharged, photographic records, location and approximate size of the spill, actions already taken to stop and contain the spill, meteorological conditions and any perceived threat to human health or the environment.

8.2 RESPONSE BY SPILL LOCATION

8.2.1 Spills on Land

Response to spills on land will include the general procedures previously detailed.

First use the equipment that is quickly available to build a berm to contain the spill and stop the material from entering any waterway. This can be built with soil, booms, lumber, snow, etc.

These barriers should be placed down gradient (down-slope) from the source of the spill, and as close as possible to the source. Barriers slow the progression of flow and also serve as containment to allow for recovery.

A plastic liner should be placed at the foot of and over the dykes to protect the underlying soil or other material and to facilitate recovery of the spill. Construct dykes in such a way as to accumulate a thick layer of free product in a single area (V shaped or U shaped).

Trenches are useful in the presence of permeable soil and when the spill is migrating below the ground surface. A plastic liner should be placed on the down-gradient edge of the trench to protect the underlying soil.

Large volumes of free-product should be recovered, as much as possible, by using vacuums and pumps, and containerized. Mixtures of water and fuel may be processed through an oil-water separator. Absorbent sheets should be used to soak up residual spill to water, on the ground (soil and rock), and in vegetation.

8.2.2 Spills on Water

Response to spills on water includes the general procedures previously detailed.

Various containment, diversion and recovery techniques are discussed in the following sections. The following elements must be taken into consideration when conducting response operations:

- Type of waterbody or watercourse (lake, ocean, stream, river).
- Water depth and surface area.

- Wind speed and direction.
- Resonance and range of tides.
- Type of shoreline.
- Seasonal considerations (open-water, freeze-up, break-up, frozen).

Containment of an oil slick on the ocean requires the deployment of mobile floating booms to intercept, control, contain and concentrate (i.e., increase thickness) the floating oil. One end of the boom is anchored to shore while the other is towed by a boat or other means and used to circle the oil slick and return it close to shore for recovery using a skimmer. Reducing the surface area of the slick increases its thickness and thereby improves recovery. Mechanical recovery equipment (i.e., skimmers and oil/water separators) will be mobilized, if required.

If oil is spilled in a lake it may not be possible to deploy booms using a boat. In this case, measures are taken to protect sensitive and accessible shoreline. The oil slick is monitored to determine the direction of migration. In the absence of strong winds the oil will likely flow towards the discharge of the lake. Measures are taken to block and concentrate the oil slick at the lake discharge using booms where it can subsequently be recovered using a portable skimmer, a vacuum, or sorbent materials.

In small slow-flowing rivers, streams, channels, inlets or ditches, inverted weirs (i.e., siphon dams) can be used to stop and concentrate moving oil for collection while allowing water to continue to flow unimpeded. In the case of floating oil in a stream or migration to a culvert (i.e., at a road crossing) a culvert block can be used to stop and concentrate moving oil for collection while allowing water to continue to flow unimpeded. In both cases oil will then be recovered using a portable skimmer or sorbent materials.

In the case of spills in larger rivers, with fast moving currents, diversion booming is used to direct the oil slick ashore for recovery. Single or multiple booms (i.e., cascading) may be used for diversion. Typically, the booms are anchored across the river at an angle. The angle will depend on the current velocity. Choosing a section of a river that is both wider and shallow will make boom deployment easier. Diversion booming may also be used to direct an oil slick away from a sensitive area to be protected.

8.2.3 Spills on Snow and Ice

In general, snow and ice will slow the movement of hydrocarbons. The presence of snow may also hide the oil slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material is to be limited as much as possible. Snow and frozen ground also prevent hydrocarbons from migrating down into soil or at least slow the migration process. Ice prevents seepage of fuel into the water.

Response to spills on snow and ice includes the general procedures previously detailed. Most response procedures for spills on land may be used for spills on snow and ice. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in snow or ice) slow the progression of the fuel and also serve as containment to allow recovery of the fuel. Free-product is recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice is scraped up manually or using heavy equipment depending on volumes.

The contaminated snow and ice is placed in containers or within plastic lined berms on land. For contingency purposes, a contaminated snow storage site will to be designated and located in close proximity to each of the main Project work sites to facilitate inspection and monitoring, in an area which will still be readily accessible once it is time to remove the snow (i.e., spring or summer), and at least 30 m away from any body of water or ditch. Once enough snow has melted, the oily water can be removed from the storage site and processed through an oil-water separator that would be mobilized to site. Hydrocarbons recovered will be burned in the camp incinerator or shipped off-site.

8.3 RESPONSE BY TYPE OF MATERIAL SPILLED

8.3.1 Fuel

Regular inspections will be conducted to ensure that there has not been a leak or that conditions within fuel storage areas could result in a leak. These inspections will include the fuel drums and storage containers, secondary containment sumps and associated spill containment devices, any pumps and product-handling equipment, and overfill protection devices. Inspections will be recorded to include who completed the inspections, areas included in the visual inspection and any deficiencies noted.

Fuel spills, leaks at fuel storage or transfer facilities or vehicle accidents will be handled by following these steps:

- Identify the source of the leak or spill.
- Contact the Environmental Superintendent/Site Superintendent.
- Stop leaks from tank or barrel by closing valves.
- Utilizing patching kits to seal leaks.
- Placing plastic sheeting at the foot of the tank or barrel to prevent seepage into the ground.
- Contain the spill and the source if possible.
- Take photographs of the spill site before and after the clean-up.

Small spills will be cleaned up by removing the contaminated soil and storing it in empty 205 L drums for backhaul and disposal at an approved hazardous waste disposal site. Should a large spill occur, cleanup and disposal efforts will be coordinated as necessary with the appropriate authorities and agencies.

8.3.2 Domestic Sewage, Solid Waste and Contact Water

Any problems with the sewage treatment system, incinerator or other waste disposal systems will be promptly reported to the Site Superintendent.

In the event of a power failure, the stand by generator will be put into operation as soon as possible. Similarly, in the case of a pump failure, the backup pump will be put on-line. As necessary appropriate safety equipment and personal protective clothing will be available to site personnel.

8.3.3 Chemical

Assess the hazard of the spilled material by referring to the relevant MSDS sheet. Each response will vary based on the specific material. If the chemical is hazardous, ensure personnel protective equipment is utilized (latex gloves, eye protection, etc.) before approaching the spill. As chemicals are only used in extremely small quantities on site use absorbent mats to soak up spilled liquids and place in appropriate container for treatment and/or disposal.

8.4 RESPONSE TO FIRE

Various products, including fuel, may be flammable under certain circumstances. It is important to ensure that the spill does not present a risk of fire prior to commencing the cleanup. If a fire does break out refer to relevant site firefighting procedures.

8.5 DISPOSAL

Appropriate disposal for any recovered product and contaminated soil, water or absorbent clean up material is regulated and must be authorized by the agency investigating the incident. Obtain approval from all appropriate government agencies before disposal

Fuel-contaminated soil can be remediated at camp through land-farming or incineration. Any non-reusable recovered product, contaminated soil and clean up material, which cannot be incinerated, will be stored in containers and returned to camp prior to eventual disposal in an approved disposal/treatment site.

8.6 POST-SPILL MONITORING AND REMEDIATION

Should there be any concern of contaminants remaining in area following clean-up, appropriate sampling and monitoring should be undertaken to determine residual contamination. Based on the results of the monitoring program the site should be remediated as necessary.

8.7 SPILL FOLLOW-UP INVESTIGATION

The root cause of all major spills will be investigated. An incident investigation will be performed by the Environmental Superintendent following every major spill. Minor spills as defined in Section 2.0, will be investigated by the appropriate supervisor. The likely cause of the spill will be determined, and remedial action will be taken to ensure that similar spills are prevented. Remedial action may involve:

- Additional training for personnel.
- Enhanced equipment maintenance or inspection program.
- Additional preventative infrastructure, such as containment berms, oil/water separators, etc.

The performance of the spill response procedures will also be reviewed, and updated as necessary.

9. Spill Reporting

9.1 ENVIRONMENTAL REPORTING

All spills are to be reported to the General Manager or designated representative. It is their responsibility to notify Sabina headquarters staff and external parties as outlined in the roles and responsibilities of this Plan.

Reportable spills, as identified in this Plan, are to be externally reported to the NWT-Nunavut 24-hr Spill Response Line. The Environmental Superintendent will ensure spills are reported externally as required. The Spill Response Form (Appendix B) is to be completed for all externally reported spills and forwarded to the NWT/Nunavut Spill Response Centre within the required 24 hour reporting period.

Any spill, or incident that may likely result in a spill, of an amount equal to or greater than the amount listed in Table 2-1 shall be promptly externally reported. Spills adjacent to or into a surface water or groundwater access shall be externally reported regardless of quantity.

Spills within secondary containment will be reported and included in an internal log. In the situation that the spill within the containment is above the thresholds noted in Table 2-1, an external report to the NWT-Nunavut 24-hr Spill Response Line will be submitted if the spill exceeds 40% capacity of the secondary containment.

Spills of a marine nature will be reported to the Canadian Coast Guard (Central and Arctic region):

- 1-800-265-0237 (24-hour).
- The fax number for transmission of the written report is (519) 337-2498.

Reporting of marine spills shall be conducted in accordance with Transport Canada Guideline TP-9834E, "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants".

The Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69) require that spills be reported to the nearest office of Transport Canada as follows:

Jaideep Johar
Manager, Technical Services
Transport Canada, Marine Safety
Tel: 204 984 8618
Cell: 204 880 0754
Email: joharj@tc.gc.ca

Craig D. Miller
Manager, Marine Safety (PNR)
Transport Canada
Tel: 204 984 0397
Fax: 204 984 8417
Email: craig.miller@tc.gc.ca

9.2 INTERNAL RECORD KEEPING

An internal log of spills, no matter how small, will be kept and maintained by the Environmental Department. Each record will include date, location, material spilled, volume, reason for release, any negative impact, status of cleanup, and corrective actions taken. Photo's (before, during and after cleanup) shall also be taken of all significant spills. To assist with internal tracking a Sabina Spill Form is included in Appendix C.

A record will document all significant changes that have been incorporated in the SCP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

10. Plan Evaluation and Adaptation

The SCP will be updated annually to incorporate lessons learned from any incidents that may have occurred, amendments to legislation, new characteristics of the sites, the equipment on site, new policies of the company, environmental issues and to provide updated information on new staff, external contact details and other changes.

Most important will be the review of aspects of the Plan affecting safety of employees of the facility, contractors, and the general public. Operational aspects of the Plan, as well as any paperwork that deals with the Plan, will be reviewed. All aspects of the Plan will be continuously audited for effectiveness.

The updated version of the Plan will be distributed to the distribution list. Formal evaluations of the SCP will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

References

Aboriginal Affairs and Northern Development Canada. 2010. Guidelines for Spill Contingency Planning. Retrieved from http://www. aadnc-aandc.gc.ca/eng/1100100024236/1100100024253

Indian and Northern Affairs Canada (INAC). 2007. Guidelines for Spill Contingency Planning.

Nunavut Impact Review Board (NIRB). 2013. Guidelines for the Preparation of an Environmental Impact Statement for Sabina Gold & Silver Corp.'s Back River Project (NIRB File No. 12MN036)

Appendix A

Expected Hazardous Materials Transported, Stored and Used On-site

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Fuels and Used Petroleum Products (oils / lubricants /greases)	Vehicles and equipment including generators and pumps	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake hydrocarbons in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Spill Response Procedures (safety procedures, initial assessment, spill report, containment, storage, and disposal) will be employed When possible. waste oil will be used in incinerators or designed used-oil heaters Waste oil may be collected and stored in empty bulk lubricant cubes to be stored in the designated hazardous waste section of the waste storage facility Contaminated snow/water will be stored in clearly-marked, sound, sealed containers in the laydown yard and may be shipped off-site to an appropriate facility Bioremediation may be considered for contaminated soil
Oil and Fuel Filters	Vehicles and equipment	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Waste oil and fuel filters will be drained in a heated and ventilated section of the maintenance shop. Filters will then be crushed to minimize volume and release any additional oil. This area of the maintenance shop will adhere to Sabina's Spill contingency plan and have a liner or tray to catch any spills or splashes The filters will be placed in sealed containers and labelled and stored at the waste management facility These containers may be shipped off-site to a registered hazardous waste receiver
Used Sorbents and Rags	Used in the maintenance of vehicles, equipment and spill control	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g.,	Where possible, used rags and sorbents will be incinerated on-site If incineration is not practical, used sorbents and rags will be stored in clearly-marked, sound, sealed containers in the laydown yard

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
				fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	and then shipped off-site to a registered hazardous waste receiver
Hydraulic Fluid	Used in vehicles and equipment (e.g., brakes, power steering, forklifts, underground hauling equipment)	Construction / Operations / Closure	Goose Property, George Property, and MLA	Hydraulic fluid may enter the environment from spills and leaks from equipment or from improper storage. Once in the environment some hydraulic fluids break down and have the potential to mix with water and, in high quantities, may harm fish	Equipment will be regularly maintained to prevent spills from ruptured hydraulic fluid lines Biodegradable, low toxicity hydraulic fluids will be used where practical Where possible, used hydraulic fluid will be incinerated on-site Used hydraulic fluid that cannot be incinerated will be stored in clearly marked, sound, sealed containers These containers may be shipped off-site to a registered hazardous waste receiver Unused hydraulic fuel in the original containers will be return to the manufacture for disposal or reuse at closure.
Empty Petroleum Hydrocarbon Containers and Drums	Packaging for oils, solvents and penetrating oils	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products may accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Sabina and its contractors will purchase these items in bulk to minimize the amount of packaging Backhauled to a recycling facility

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Glycol	Used as a coolant and antifreeze in equipment	Construction / Operations / Closure	Goose Property, George Property, and MLA	Glycol's odour is a known wildlife attractant Glycol can have toxic effects on aquatic organisms and wildlife	Environmental benign glycols will be used where practical Equipment will be regularly maintained to prevent spills from ruptured glycol lines Waste glycol will be stored in the waste storage facility in clearly marked, sound, sealed containers These containers may be shipped off-site to a registered hazardous waste receiver Unused glycol in the original containers may be returned to the manufacture for disposal or reuse at closure.
Reagents	Additives required for mine processing	Operations / Closure	Goose Property and MLA	Reagents (hydrated lime, sodium cyanide, activated carbon, sodium hydroxide, hydrochloric acid, sulphur, copper sulphate, MBS, flocculant, and antiscalant) may enter the environment from spills and leaks from containers, process equipment or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances (e.g. cyanide)	Spill prevention procedures will be developed Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal) Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure
Lab Reagents		Operations / Closure	Goose Property and MLA	Lab Reagents may enter the environment from spills and leaks from containers, or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances	Spill prevention procedures will be developed Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal)

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
					Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure
Solvents	Used to degrease machinery in the maintenance shop	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum fuels can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Low toxicity solvents and physical cleaning (e.g., steam jet) will be used where practical Petroleum-based solvents will not be allowed into the environment and will be subject to the spill response plan Waste or excess solvents will be stored in the waste storage facility in clearly marked, sound, sealed containers These containers may be shipped off-site to a registered hazardous waste receiver Unused solvents in the original containers may be returned to the manufacturer for disposal or reuse at closure
Paints		Construction / Operations / Closure	Goose Property, George Property, and MLA		When feasible, latex paints will be used on site. Latex paints should be collected in a covered area and opened to dry. Unused full containers of paint will be returned to the manufacture, if possible Paint containing hazardous materials, that cannot be used will be sealed and shipped off site to a registered hazardous waste receiver.

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Fluorescent Light Tubes	Indoor lighting	Construction / Operations / Closure	Goose Property, George Property, and MLA	Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium	Lights should be equipped with motion sensors to reduce usage where practical Discarded fluorescent lights will be consolidated together and stored indoors in the waste storage facility in their original packaging Fluorescent light tubes may be shipped off-site to a registered hazardous waste receiver
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	Construction / Operations / Closure	Goose Property, George Property, and MLA	Electrical waste and devices may or may not contain polluting substances (such as mercury, lead, arsenic, cadmium, and polyvinyl chloride (PVC) that could enter the ecosystem	Sabina's environment staff will determine the risk of electronic devices and classify them as hazardous or non-hazardous waste and determine the appropriate method of recycling/ disposal
Equipment Batteries	Equipment batteries	Construction/ Operations / Closure	Goose Property, George Property, and MLA	Lead batteries (i.e., vehicle batteries) contain sulphuric acid and lead harmful to environmental receptors Rechargeable batteries (i.e., industrial forklift, radio and transmitter batteries) usually contain either potassium hydroxide or nickel cadmium with toxic effects	Protect and service batteries to prevent damage and loss of charge Test batteries prior to disposal to confirm the battery is spent All batteries will be shipped off-site to a recycling facility or a registered hazardous waste receiver
Hazardous Medical Waste	Small amounts of medical waste from First Aid (e.g., syringes, used medical supplies)	Construction / Operations / Closure	Goose Property, George Property, and MLA	May be sharp or may contain bacteria and viruses which can be a risk to human or wildlife health	Medical waste will be labeled "Biohazard" and stored in a secure area of the First Aid Station Medical waste will remain under the care of medical personnel until backhauled to a registered hazardous biological waste receiver Medical waste will not be incinerated on-site as it poses a handling risk from sharps for the incinerator operator and workers collecting waste

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Aerosol Cans		Construction / Operations / Closure	Goose Property, George Property, and MLA		Pressurized aerosol cans will be punctured on site and landfilled.

Appendix B

NWT-NU Spill Report Form

Northwest Territories Nunavut Canada

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # ______ TO THE ORIGINAL SPILL REPORT		REPORT NUMBER ____-__________
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME			
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)			
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN			
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS			
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION			
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION			
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER		
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER		
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES		
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT		
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS				
L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Appendix C

Sabina Internal Report Form

SABINA INTERNAL SPILL REPORT FORM

This form is to be used for internal documentation of spills of any petroleum product, chemical, ethylene glycol (antifreeze), or other hazardous material. See recent Spill Contingency Plan for reporting thresholds and structure. Once complete file with the Operations Superintendent.

Report Date and Time:	***Spill Date and Time***: ☐ Spill occurred ☐ Spill observed
Spill Location: ☐ Goose ☐ Marine Laydown Area ☐ George ☐ Other (e.g. Drill, Boulder Pond)	***Describe Location***:
Coordinates (Lat/Long or UTM):	

Product(s) Spilled:	Jet fuel	Diesel (P50)	Gasoline	AvGas	Oil (type)	Antifreeze	Other (describe)
Quantity (L or kg):							

Personnel Involved:	☐ Sabina	☐ Contractor	☐ Visitor	☐ Other

Cause of Spill:
Containment/Cleanup Measures Taken:
Factors Affecting Spill or Recovery (weather, snow, ground conditions, etc.):
Additional Action Required:
Additional Comments:

	Name	***Employer***	***Signature***
Reported by:			
Reported to:			

6. Oil Pollution Emergency Plan

an ERM company

BACK RIVER PROJECT
Oil Pollution Emergency Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
OIL POLLUTION EMERGENCY PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

ASPPR	Arctic Shipping Pollution Prevention Regulations
AWPPA	Arctic Waters Pollution Prevention Act
AWPPR	Arctic Waters Pollution Prevention Regulations
BIPR	Bathurst Inlet Port and Road
CSA	Canada Shipping Act
CCME	Canadian Council of Ministers of the Environment
DEIS	Draft Environmental Impact Statement
DFO	Department of Fisheries and Oceans
ERC	Emergency Response Coordinator
ECC	Emergency Command Centre
EC	Environment Canada
GN-DOE	Government of Nunavut, Department of Environment
DIAND	Indian and Northern Affairs Canada
KIA	Kitikmeot Inuit Association
MLA	Marine Laydown Area
MSDS	Material Safety Data Sheet
NWT	Northwest Territories
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
OPPR	Oil Pollution Prevention Regulations
PPE	Personal Protective Equipment
PHA	Process Hazard Analysis
REET	Regional Environmental Emergencies Team
SOPEP	Shipboard Oil Pollution Emergency Plan
TC	Transport Canada
UTM	Universal Transverse Mercator
WHIMIS	Workplace Hazardous Materials Information System

Oil Handling Facility Declaration

Pursuant to paragraph 168(1) (b) of the *Canada Shipping Act, 2001*, Sabina Gold & Silver Corp. declares that:

(a) to comply with the regulations made under paragraph 182(a) of the *Canada Shipping Act, 2001*, on the detection of an oil pollution incident that arises out of the loading or unloading of oil to or from a ship, the measures as outlined in the Back River Project, Marine Laydown Area - Oil Handling Facility, Oil Pollution Emergency Plan shall be implemented.

(b) ~~in accordance with paragraph 168(1)(a) of the *Canada Shipping Act*, *2001*, I have an arrangement with the certified response organization known as *~~

~~(Name of response organization)~~

~~The arrangement is with respect to ________________ tonnes of oil~~
~~(Number of tonnes)~~

~~and in respect of ____~~
~~(Geographic location of the oil handling facility)~~

*** NOTE: In accordance with paragraph 168(2) of the *Canada Shipping Act*, *2001*, the requirements under paragraph 168(1)(a) and 168(1)(b)(ii) do not apply.**

(c) ~~the persons listed below are authorized to implement the arrangement described in paragraph (b):**~~

**** NOTE: In accordance with paragraph 168(2) of the *Canada Shipping Act*, *2001*, the requirements under paragraph 168(1)(b)(iii) do not apply in respect to the arrangement described in paragraph (b).**

(d) the persons listed below are authorized to implement the oil pollution emergency plan required by paragraph 168(1)(d) of the *Canada Shipping Act, 2001*:

Date: October 31, 2013

Sabina Gold & Silver Corp. ______________________ Matthew Pickard, Vice President, Environment & Sustainability

Preamble

This Oil Handling Facility, Oil Pollution Emergency Plan (OPEP) for the Back River Project Marine Laydown Area - Oil Handling Facility shall be in effect at the commencement of operations.

Formal distribution of the Plan shall be made to:

Transport Canada
Box 8550
344 Edmonton Street (RMW)
Winnipeg, Manitoba, R3C 0P6

Additional copies and updates of this Plan may be obtained from:

Sabina Gold & Silver Corp.
202 - 930 West First Street
North Vancouver, BC, V7P 3N4
Tel: 604-998-4186

Or:

Navenco Marine Inc.
Attn: Todd Mitchell
350 boul. Ford, Suite 130
Chateauguay, QC, J6J 4Z2
Tel: (450) 698-2810
info@navenco.com

Environmental Policy

Sabina Gold & Silver Corp. takes its responsibility to act as a steward of the environment seriously.

To fulfill this responsibility, Sabina strives to:

- Ensure that we design our activities and operate in compliance with all environmental regulations to minimize our impact on the environment.
- Promote responsibility and accountability of managers, employees and contractors to protect the environment and make environmental performance an essential part of the management/contractor review process.
- Provide resources, personnel and training to enable management, employees and contractors to implement programs and policies to protect the environment.
- Communicate openly with employees, contractors, local stakeholders and government on our environmental protection and sustainability programs and performance. We will also address any concerns pertaining to potential hazards and impacts.
- Promote the development and implementation of systems and technologies to reduce environmental risks.
- Establish and maintain appropriate emergency response plans for all activities and facilities.
- Maintain a self-monitoring program at each facility to ensure compliance and to proactively address plans to correct potential deficiencies.
- Work cooperatively with government agencies, local communities and contractors to develop and enhance systems and technologies to improve environmental and sustainability practices.
- Encourage all employees, contractors or stakeholders to report to management any known or suspected departures from this policy or its related procedures.

1. Introduction

The Back River Project, Marine Laydown Area, Oil Handling Facility (MLA-OHF), Oil Pollution Emergency Plan (OPEP) was developed to specifically assist in implementing measures to protect the marine environment and minimize impacts from potential spill events. The Plan outlines potential spill scenarios, and provides specific procedures for responding to spills while minimizing potential health and safety hazards and environmental damage. The OPEP provides instructions to guide all personnel in emergency spill response situations, defines the roles and responsibilities of management and responders and outlines the measures taken to prevent spills, the related exercise and evaluation programme, and the mechanism for regular updates to the plan.

It represents one plan in a series of environmental management plans that have been prepared for the Project Draft Environmental Impact Statement (DEIS).

The information presented herein is current as of October 2013. At this stage, certain aspects of the OPEP remain conceptual. The next update will likely accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study project designs. Following this, the Plan will be further updated based on detailed engineering design prior to the start of construction, incorporating construction engineering drawings of facilities and associated fuel management infrastructure.

Sabina Gold & Silver Corp. (Sabina) will maintain a distribution list for the OPEP providing contact details for all parties that receive the Plan including key personnel, organizations, and outside agencies.

1.1 LEGISLATIVE REQUIREMENT

The *Canada Shipping Act*, 2001, stipulates that operators of designated oil handling facilities must have an on-site oil pollution emergency plan.

The MLA-OHF, OPEP takes into account the requirements of the Canada Shipping Act, 2001, part 8, subsections 168. (1), 168. (2) and 168. (3). Although the subsection 168 (2) is applicable, as the MLA-OHF site is located North of 60', therefore the subsections 168. (1) (a), 168. (1) (b) (ii), and 168. (1) (b) (iii) do not apply.

The Canada Shipping Act Response Organizations and Oil Handling Facilities Regulations (SOR/95-405) applies.

The Oil Handling Facilities Standards, TP12402 applies.

Pollutant Discharge Reporting Regulations, 1995 (SOR/95-351).

Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69).

1.2 LINKS TO SABINA GOLD & SILVER CORP. SPILL CONTINGENCY PLAN

Spills of all types, both marine and land based are addressed in the Sabina Gold & Silver Corp. (Sabina), Back River Project, (The Project) "Spill Contingency Plan" (SCP) which is a separate document. The SCP addresses a wider scope of operations and includes storage areas other than the MLA-OHF. The SCP also addresses other materials including soluble solids such as ammonium nitrate prill, liquids such as glycols and paints, corrosive liquids including sulphuric acid and sodium cyanide, compressed (inert and flammable) gas and other hazardous substances.

The MLA-OHF OPEP has been designed specifically to compliment the Back River Project, SCP document. The plan is not to be construed as to supersede existing emergency response plans, rather it is conceived to address the specifics of the fuel storage facility, the bulk incoming transfer of fuel and spill scenarios directly relating to this operation.

2. Planning Standards

In the preparation of the MLA-OHF OPEP, the standards as outlined in the Oil Handling Facility standards, TP 12402 have been employed.

2.1 FACILITY CATEGORY

Based on the ship to shore maximum pumping rate of less than 149 m^3/hr, the MLA-OHF is classified as a level 1 facility. Spill scenarios have been developed and are outlined in section 8 of this plan. As a scenario addressing a possible 3.5 m^3 spill exists, the minimum size of an oil pollution incident for which a response is described in this OPEP is 3.5 m^3.

2.2 GENERAL PLANNING GUIDELINES

Beyond the requirements of the CSA and the Oil Handling Facilities Standards, Sabina recognizes the unique nature of the geographical location and the challenges inherent in mounting a response to a pollution incident.

All spill contingencies for Bathurst Inlet must take into consideration the diverse elements that might define, simplify or even reduce the possibility of taking action. The harsh climate, the remoteness, transportation difficulties (for personnel and goods), limited availability of manpower in case of oil spills and the lack of infrastructure in case of a fire are all elements that can limit the response to take in this type of situation. Air transportation is the only transportation on a regular basis but weather conditions may not be favorable, rendering a quick response difficult.

In the preparation of this plan, existing documents relating to the site specifications (physical, natural and social conditions) have been utilized. In the preparation of the final plan and related Back River SCP, extensive consultations with local authorities shall be undertaken, with the goal of a cooperative response as an important part of an incident.

To specifically address the CSA and Oil Handling Facilities Standards, spill scenarios have been developed, taking into consideration among various factors the following:

1. The nature of the oil product in respect of which the scenario is developed.
2. The types of ships that are unloaded at the facility.
3. The tides and currents that prevail at the facility.
4. The meteorological conditions that prevail at the facility.
5. The surrounding areas of environmental sensitivities that would likely be affected by an oil spill.

6. The measures that will be implemented to minimize an oil pollution incident.
7. The time within which an effective response to an oil pollution incident can be carried out.

Several priorities have also been identified among which include:

1. The safety of the facility's personnel.
2. The safety of the facility.
3. The safety of the communities living adjacent to the facility.
4. The prevention of fire and explosion.
5. The minimization of the oil pollution incident.
6. The notification and reporting of the oil pollution incident.
7. The environmental impact of the oil pollution incident.
8. The requirements for cleaning up the oil pollution incident.

2.2.1 Response Time Standards

The operations and response structure at the MLA-OHF have been designed so that a rapid response to a spill incident can be carried out. All equipment and resources are strategically placed near the beach front, directly at the port operation site. Responders, workboats and other support equipment are on standby during all facility operations. The deployment of equipment and resources required to contain and control the oil, or where the oil cannot be contained, to control the quantity of oil involved in the incident, up to the minimum spill size of 3.5 m^3 as determined in accordance with Section 2 of the Oil Handling Facilities Standards, shall be on site and deployed on scene within 1 hour after the discovery of the oil pollution incident, unless deployment would be unsafe.

The equipment and resources required to recover and clean up the oil involved in the incident, up to the minimum spill size of 3.5 m^3 as determined in accordance with Section 2 of the Oil Handling Facilities Standards shall be deployed on scene as soon as practical and effective, within 6 hours of the oil pollution incident.

2.2.2 On-water Recovery

On-water recovery of spilled product shall be initiated immediately upon containment of free floating product. The skimming capacity projected for the MLA-OHF is capable of recovery of several times the required spill volume within the time standards after derating formula are applied.

2.2.3 Dedicated Facility Spill Response Equipment

The MLA-OHF shall be equipped with appropriate spill response equipment which provides *resident capability* for the response to spills in accordance with the scenarios which have been developed under this OPEP. Containment and recovery equipment inventories exceed the facility category planning standards and are especially appropriate for the potential spill volumes as outlined in the scenarios contained in the OPEP. A list of the equipment can be found in Appendix 4.

3. Marine Laydown Area – Oil Handling Facility

3.1 GENERAL OVERVIEW AND SITE DESCRIPTION

The proposed MLA-OHF is situated on the western shore of southern Bathurst Inlet at approximately 66°38.59' N and 107°42.69' W. A site overview plan showing its location is presented in Appendix 1.

3.2 OIL HANDLING FACILITY AND INFRASTRUCTURE

Construction activities at the MLA will provide for a new steel construction bulk fuel storage facility consisting of 4 steel tanks of 10 ML and one of 5 ML. A preliminary site plan of the projected MLA-OHF configuration is provided in Appendix 2.

The bulk fuel storage facility located at the MLA shall be constructed in an impermeable secondary containment structure (lined and bermed containment area). The construction is in compliance with CCME's Environmental Code of Practice (CCME 2003; 2008), the fuel bulk fuel storage facility will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks OR 110 % volume of the largest tank, whichever is greater.

The above basis is consistent with the document entitled "Design Rationale for Fuel Storage and Distribution Facilities" published by the Department of Public Works of the Northwest Territories (refer to Section 4.6 of those guidelines). The lining within the bermed area is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., the membrane to ensure its integrity.

The bulk fuel storage facility is connected to a shore receiving manifold by a 6 inch diameter steel pipeline. The pipeline is of welded construction. The pipeline is supported on appropriate stands and blocking. The pipeline is fully pressure tested and inspected each year prior to annual bulk cargo transfer operations.

Lighting is provided at the shore receiving manifold meeting the regulatory requirements of the Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69). The bulk fuel storage facility is also equipped with lighting meeting the standards as set forth in the same regulation.

3.3 BATHURST INLET PHYSICAL ENVIRONMENT AND SENSITIVITIES

3.3.1 Inlet and Approaches

Bathurst Inlet is a deep fjord-type inlet along the northern coast of the Canadian mainland, within the territory of Nunavut. The entrance to the inlet is through Coronation Gulf between Cape Barrow (68°01' N, 110° 06' W) and Cape Flinders (68° 17' N, 108° 35' W), and the body extends over 200 km southwest into the mainland past the Arctic Circle. It has a large network of irregular shores, and is littered with numerous islands, islets and rocks, most of which are described in greater detail by the Canadian Hydrographic Service (1994). Melville Sound extends eastward from northern Bathurst Inlet into Elu Inlet.

The main channel of Bathurst Inlet is relatively narrow (~2 to 15 km) and deep, with depths generally between 100 and 200 m depth, and maximum depths over 300 m in the northern basin near Omingmaktok (Bay Chimo). The most characteristic oceanographic features of the channel are several sills spread along the inlet, which result in rapid shoaling of the bathymetry to depths shallower than 50 m. The largest sill is near Manning Point at the centre of Bathurst Inlet, and the shallow bathymetry is accompanied by a narrowing of the channel width to less than 1.5 km between Quadyuk Island and the Tinney Hills. This sill approximately divides Bathurst Inlet in two major basins: the outer inlet that comprises all regions north of Manning Channel and contains the deeper, more complex bathymetry; and the inner inlet that runs landward from near Kingaok and has few islands and relatively simple structure with shallower depths between 100 and 150 m.

3.3.2 MLA-OHF Area

The MLA-OHF is proposed for the western shore of southern Bathurst Inlet. The deeply indented rocky shorelines in the region lead to steep bathymetry with narrow near-shore areas, a consequence of the inlet cutting through the massive granite rocks that characterize the surrounding Bathurst Hills Ecoregion. Hence, the MLA site consists of a long cobble/sand beach with a steep shoreline consisting of limited shallow areas (i.e., < 10 m) and follows a general 120 - 125° WSW heading. The water shelf extends orthogonally from the shore at a steep slope of approximately 20% to depths below 50 m about 240 m offshore. Beyond this distance, the seabed slopes more gently to depths below 150 m in the main inlet channel.

3.3.3 Bathymetric and Marine Data

Limited bathymetric and marine data is available for the Bathurst Inlet site. Charts 7791, 7792 and 7793 cover most of the area; however data within the shallow beach areas is limited.

The measured tidal heights for the inlet are small, with a maximum tidal range for spring tides (new and full moon) of around 0.4 m, and between 0.1 and 0.3 m for neap tides (first and third quarter moons).

Bathurst Inlet water circulation during open-water season is influenced by winds rather than by tides, with tidal currents likely significantly weaker than the down-slope density flows originating from freshwater discharge at the inlet surface.

The marine environment at the proposed Bathurst Inlet Bulk Storage Facility is characterized as a sheltered waters environment. As has been noted at the site, the prevailing winds generally provide sea conditions of onshore waves, varying in height from flat calm to less than 0.65 metre in average winds of less than 30 km/hr. Bulk transfer procedures established jointly by the OHF and the charterer preclude the transfer of bulk product when conditions become excessive, i.e., wave heights greater than approximately 0.7 m. This enhances the possibility of deploying pollution gear should an incident occur.

3.3.4 Meteorological Data

The Back River Project Atmospheric Environment Study (DEIS Volume 4: Atmospheric Environment) baseline data has been used to help in project design, for assessing potential effects on air quality, and for understanding trends in climate change.

The climate in the project area is characterized by extremes and is primarily subject to cold, dry Arctic air masses and American continental air masses from the south.

Long-term meteorological data are collected at Environment Canada – Meteorological Service of Canada (EC-MSC) meteorological stations. The closest stations which are currently operating are Lupin CS and Kugluktuk A and CS meteorological stations. Climate normal data (arithmetic averages of climate elements over a prescribed 30-year interval) have been used from these EC-MSC stations. The most updated climate normals and extremes currently offered by EC are based on Canadian climate stations with at least 15 years of data between 1982 and 2010.

Project-specific meteorological baseline data collection commenced in August 2004 at the George and Goose meteorological stations which are located within the George and Goose properties, respectively.

These stations continue to be operational. Meteorological data are also available from the Bathurst Inlet Port and Road (BIPR) Project meteorological station, which has been located near the MLA in Bathurst Inlet since 2001.

The climate at the MLA consists of a winter period (October to May) of extremely cold mean monthly temperatures ranging from -33.0ºC to -1.3ºC and a cool spring, summer and fall period (June to September) with mean monthly temperatures ranging from -0.3ºC to 14.5ºC.

Precipitation climate normals in the regional area range from 249.4 to 299.2 mm per year. Project meteorological station precipitation was measured as rainfall during the summer period only (June, July, August, and September), when temperatures were above freezing. During the 2006 to 2011 monitoring period, summer monthly rainfall ranged from 0 mm (September 2006) to 102 mm (August 2008). The summer total rainfall between June and September ranged from 4 mm (2006) to 211 mm (2008).

Wind speed data was collected during the measurement period (2006 to September 2012) specifically at the BIPR meteorological station. For the open shipping season, during the summer season (June to September), winds predominantly came from the north and northwest, 17% and 15% of the time respectively, more than 5 m/s 45% of the time but less than 9 m/s approximately 86% of the time. On average, wind speeds during the summer were slightly slower than winter wind speeds.

3.3.5 Ice Conditions

Historically, consolidated first-year ice covers Bathurst Inlet from October to June. Ice break-up usually occurs in the first few weeks of July, after which open waters prevail until thin new ice forms around mid-October.

Environment Canada data documents the average sea ice freeze-up and break-up dates within the Canadian Arctic for the past 30 years. There has been significant temporal and spatial variation in the timing of break-up and freeze-up in southern Bathurst Inlet, as well as in the amount of ice present year-to-year. Environment Canada data is well documented for the area and includes the areas of Barrow Strait, Franklin Strait, and the area between Queen Maud and Coronation Gulfs. Ice data indicates an open shipping season of more than 60 days in the area of the MLA.

Observational evidence from the last few decades indicates that sea ice in the Arctic has been thinning and retreating earlier than historical reports (Stroeve et al. 2012). Most ice concentration records in the last 8 years have been lower than historical averages. The strongest changes occurred in the summer for the more northern straits, with several ice-free periods recently recorded where ice used to be present year-round. In 2012, Arctic sea ice was at the lowest recorded levels since ice monitoring by satellite began three decades ago (NSIDC 2012).

Ships sailing to Bathurst Inlet from eastern Canada must transit Transport Canada Zone 6 which has the most restricted entry season of any of the sixteen Arctic waters zones, except for the High Arctic. Bulk fuel deliveries therefore at the MLA-OHF shall be limited to the period of open water only, and by ships of appropriate ice class for the shipping zone.

3.3.6 Sensitivities

As noted in Section 3.3.2. above, the MLA site consists of a long cobble/sand beach with a steep shoreline consisting of limited shallow areas (i.e., < 10 m) and follows a general 120 - 125° WSW heading. The water shelf extends orthogonally from the shore at a steep slope of approximately 20% to depths below 50 m about 240 m offshore. Beyond this distance, the seabed slopes more gently to depths below 150 m in the main inlet channel.

The 2013 Bathurst Inlet Marine Diesel Fuel Spill Modeling (Rescan, 2013) study was completed to predict the fate of potential diesel fuel spills near the MLA in Bathurst Inlet during the open-water season (i.e., ~ July to October). The spills were assumed to originate near the MLA site. The fuel spill modeling undertaken also addresses the potential for environmental damage from diesel spills resulting from transportation and storage of fuel near the proposed Back River MLA.

In open-water diesel spills, a fraction of the diesel fuel becomes entrained into the upper water column immediately under slicks by direct solution or by entrainment of small oil droplets through current and wave action (Mackay et al. 1980; Kuiper and Van den Brink 1987; ITOPF 2011). Diesel fuel concentrations in this cloud of oil-contaminated water depend on the oil properties and the level of mixing energy (winds/waves). In theory, these concentrations may initially exceed the toxic thresholds of marine species present in the spill area. As the diesel fuel spreads under the influence of water currents, turbulent diffusion and weathering processes, the hydrocarbon concentrations within it are reduced. In time, these diesel fuel concentrations will fall below the threshold levels that cause toxicity to living organisms and ultimately decline to background levels.

The diesel volume scenarios presented in the study were modeled under hundreds of different wind conditions, from which spill probability distribution figures were drawn. Most of the diesel deposits were limited to the southern portion of the modeled inlet, and over two-thirds of the diesel quickly weathered out within the first 10 days of all simulations. In the detailed simulations prepared for the study, the diesel high probability distributions and spread resulting from a 20 kL diesel spill were only recorded directly near the MLA site; diesel very rarely spread in the areas outside of the MLA.

Marine birds are one of the more vulnerable and sensitive of marine organisms to all types of oil spills.

However, unlike cruder distillates, diesel spills (particularly small ones ≤ 20,000 L) usually have limited impacts on marine bird wildlife due to the oils high volatility (NOAA 2013). While diesel is highly toxic when in direct contact with marine birds, the number of birds affected is usually small due to the short residence times on surface waters.

Numerous marine bird species have been documented in southern Bathurst Inlet (Rescan 2012b, 2013b). Ordered from commonly (i.e., over >200 individuals counted) to rarely (i.e., less than 30 individuals) observed, these are: Canadian goose; red-breasted merganser; greater scaup; black, white-winged and surf scoters; herring and glaucous gulls; long-tailed duck; pacific, red-throated and yellow-billed loons; and the common eider. Amongst these populations, the glaucous gull, long-tailed duck and common eider are all listed as sensitive species in Nunavut (CESCC 2010).

Aside from the eider, all of these species have been recorded to forage and/or nest within a few kilometres of the MLA and in multiple areas around southern Bathurst Inlet. The observations occurred mainly in the late summer and fall when a number of birds were present in marine habitats for molting and staging purposes.

The approximate locality of each bird population within the study area has been included in the figures presented in Appendix 3 of this OPEP. The birds were grouped up in a few basic taxons to simplify the color scheme: duck (incl. mergansers, scaups, scoters and long-tailed duck), goose, gull and loon.

Any large groups of marine birds that were documented during baseline studies from 2010 to the present during any time of the year were thus mapped (Rescan 2012b, 2013b). Large groups are defined as any observation of a group of more than 10 individuals for any species of duck, loon, or gull, or any observation of a group of more than 25 individuals of a goose species.

In the assessments, the most apparent feature of Figure 5.3-1 contained in Appendix 3 is the lack of bird populations located near the MLA, which has by far the highest spill probabilities. Only a medium flock of geese and a brief observation of an unidentified fowl have been recorded within 4 km of the on land MLA infrastructure. Conversely, the highest proportion of bird observations in the inlet is located in the small cove just south the MLA, which is seasonally inhabited by large groups of ducks and geese. Diesel particles appear to reach the cove only in <10% of simulations, and the results of the simulations indicate it would take several hours before a spill would reach the area. It is logical that birds would favor the southern cove relative to the MLA shoreline for nesting grounds, as the cove is relatively sheltered from the main currents driving the circulation in the main Bathurst Inlet channel. The alongshore currents near the MLA will disperse spills northwards.

Two other bird areas could potentially interact with diesel fuel spills: the northern shores directly across the main channel from the MLA, and the shores surrounding the peninsula to the south of the MLA. The former is largely inhabited by duck populations that span over 10 km of the coast. The diesel residual probabilities there still remain relatively low with respect to the MLA coast, some small areas can have probabilities as high as 30%, but on average most of the coast probabilities are <10%. The peninsula to the south, on the other hand, is far enough south to receive little diesel fuel overall, with only a few patches of <5% probabilities present.

The spill modeling summarizes that the wind conditions, current regime and overall spill volume play a critical role in determining the fate of diesel spills within southern Bathurst Inlet. Regardless of diesel amounts, spills occurring in mild to moderate wind conditions generally did not progress past a few kilometres from the source location.

Preventive measures such as strict criteria for acceptable conditions for discharge are outlined in cargo transfer procedures and in section 9 of this plan. Preventive booming following any spill to protect sensitive areas of significant bird populations should be considered as outlined in the scenarios presented in Section 8 of this plan. The hazing techniques and wildlife protection procedures as outlined in Section 7.4 of this plan are of utmost importance.

4. Site Activities

4.1 BULK OIL TRANSFER, SHIP TO SHORE

Bulk fuel deliveries will take place during the open shipping season and volumes and frequency of deliveries will depend on a number of factors including but not limited to: size of ships, fuel consumption rates, operational constraints, etc. Multiple bulk fuel transfers therefore from ship to shore annually are anticipated.

It is anticipated that the total annual volume of the bulk fuel transfers shall be in the order of approximately 30-45 ML and will take place between the months of late August through early October. The fuel transfers shall take place by means of either a single or double 4-inch floating hose with an approximate length of approximately 1000 metres deployed between the vessel and the connecting flange on the shore. The products are then transferred through the pipeline to the above mentioned bulk storage facility. A steel pipeline of 6” diameter connects between the shore manifold and the tank farm.

The tides are not a major risk factor at this location. Wind force and direction are the dictating environmental factors during bulk transfer and criteria for acceptable conditions for discharge are outlined in cargo transfer procedures.

The ship to shore transfer operation at Bathurst Inlet is largely similar to other cargo discharge operations in the North and involves bulk transfer by floating hose of two types of fuel (Jet A and Ultra Low Sulphur Diesel – ULSD). It is expected that once cargo operations are underway, the ship will discharge at a rate of up to 149 m^3/hour depending on the number of hoses used and also final obtainable pumping rate.

The tanks shall take varying times to fill, depending on which tank is filled and also the final pumping rates obtained. Accurate reconciliation of discharge & fill volumes through regular communication between ship and shore personnel is required to ensure the safe transfer of fuel and prevent any overfilling that could result in a spill.

The bulk transfer procedures are fully detailed in the standard operating procedure in Appendix 5.

4.2 OTHER MLA-OHF OPERATIONS

Other than the planned bulk fuel and transfers, no other port operations involving fuel are anticipated at the MLA-OHF under normal operations.

Dry cargo sealift operations are anticipated to occur at the MLA, however these will be separate from the operations of the bulk fuel storage facility and are not considered in this Oil Pollution Emergency Plan.

5. General Response to Marine Spill Emergencies

In order to effectively manage emergency response, SABINA has implemented a detailed emergency response structure that is applicable to all emergencies.

5.1 LEVELS OF EMERGENCY

Escalating levels of emergency are described in the Sabina SCP which is a separate document. The SCP addresses a wider scope of operations and includes storage areas other than the MLA-OHF. The management of emergencies throughout the project requires varying degrees of response, effort and support. The impact on normal business operations will also differ as will the requirements for investigation and reporting.

Irrespective of reporting thresholds or usual escalating response levels to varying spill volumes dictated elsewhere in Sabina plans, all marine spills at the Bulk Fuel Storage Facility regardless of volumes shall be managed at the highest level of response as outlined in the Sabina emergency response system. The usual regulatory reporting requirements are to be strictly adhered to as outlined in Section 7 of this plan.

5.2 RESPONSE MANAGEMENT STRUCTURE

All spill procedures and response functions are to be implemented through the Emergency Response Management Team.

Table 5.2-1 presents the management team responsible for overseeing emergency spill response operations and their contact information.

Table 5.2-1. Sabina Gold & Silver Corp. Emergency Management Team Contacts

Role	Primary	Alternate
Emergency Response Coordinator Phone: Alternate Phone: Email:		
Incident Commander Phone: Alternate Phone: Email:		
Environmental Superintendent Phone: Alternate Phone: Email:		
Safety Superintendent Phone: Alternate Phone: Email:		

Note: At this stage, certain aspects of the OPEP remain conceptual. The Emergency Management Team Contacts table shall be populated at a later date prior to commencement of operations.

Once a spill event is reported, the Incident Commander establishes a specific strategy for containing and controlling the spill and to initiate the cleanup activities. Other site personnel may act as technical advisers before and during the intervention. The trained Emergency Response Team will conduct all emergency spill response operations under the direction of the Incident Commander. During the cleanup phase of the intervention other site personnel (e.g., heavy equipment operators, laborers) could be involved in the intervention.

The Emergency Response Organizational Chart is provided as Figure 5.2-1.

5.3 EMERGENCY RESPONSE TEAM

The Emergency Response Team will be structured from a worker volunteer base at site. With different work schedules, it will be necessary to have enough team members to maintain sufficient numbers of responders at site at all times.

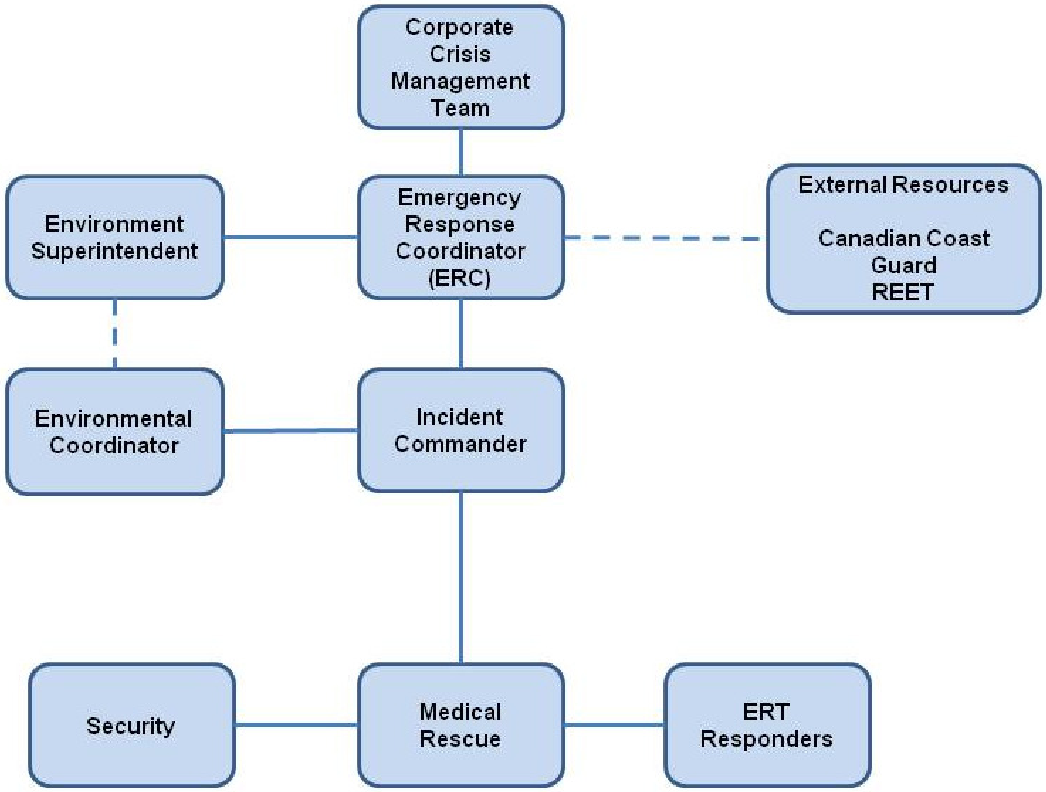

Figure 5.2-1. Marine Spill Response Organizational Chart

5.4 EQUIPMENT AND PERSONAL PROTECTION

In order to provide adequate response in case of spill events, Sabina maintains the appropriate type and quantity of response equipment and materials onsite.

Spill kits are strategically placed primarily in areas of fuel handling to facilitate immediate first response in the event of a hydrocarbon release to land. A complete list of spill response equipment is found in Appendix 4 of this plan.

In addition to the spill response material, a variety of mobile heavy equipment including excavators, front end loaders, bull-dozers, haul trucks, small workboat for in land water use, and marine support boat are available to aid in spill response and recovery efforts.

5.5 COMMUNICATION

Effective communication systems are critical to the success of emergency responses. Personnel involved, from first person on scene to the ER Coordinator rely on the ability to quickly relay accurate information.

Communications available at the project site during an emergency are listed below.

- Hand-held radio communication.

- Telephone.
- Satellite Phone.
- Internet.

5.5.1 Hand-held Radio Communication

During an emergency, the primary communications link between all emergency response personnel is through radio communication. Additionally, other individuals involved in emergency response will also carry hand-held radios as part of their regular work requirement.

During an emergency, radio communications should be kept to a minimum. If radio silence is requested, security personnel, upon receiving instruction by the ER Coordinator or Incident Commander, will announce this. This ensures open and free communications among personnel involved in the actual response.

5.5.2 Telephone Communication

During an emergency, telephone communications will be used to:

- Notify internal personnel and resources.
- Notify external personnel and resources.

To supplement radio communications, the site telephone system may be used to alert site personnel during an emergency response.

Communications links with Corporate Sabina office may also be required during some emergency situations. Constant communications links will be established by telephone where offsite assistance is required (from Sabina, or external resources such as medical practitioners or SAR/Coast Guards).

5.6 COMMUNICATION WITH THE PUBLIC

Only authorized Sabina Senior Management shall provide external communication to the public during emergencies.

Local residents, community leaders, other stakeholders, and non-governmental agencies will be contacted as appropriate. The designated officer(s) will coordinate dissemination of information to the media whenever necessary.

6. Roles and Responsibilities

The initial stage of any emergency is critical. An effective and timely response is essential to prevent an emergency situation from escalating to a higher level. Therefore, all personnel must be fully aware of their individual duties and responsibilities as they are presented in this plan.

Specific responsibilities and duties of the personnel involved in emergency response are outlined below.

6.1 EMERGENCY RESPONSE COORDINATOR – (ERC)

For the purpose of this response plan, the ERC will be the Operations Manager or his designate if absent. ERC duties during an emergency are detailed as follows:

- The Emergency Response Coordinator (ERC) will ensure coordination of ERT support systems.
- Upon being notified of an emergency, the ERC will initiate response activities and assess the situation based on current information from the Incident Commander.
- Activate the emergency response process and escalate according to severity of incident.
- The ERC will coordinate all activities. In the event the ERC leaves his post, the ERC will designate an individual to coordinate in his absence.
- Ensure that the appropriate area manager/s has been notified.
- Provide internal notification as applicable based on the level of emergency.
- Provide instruction to ensure that appropriate external resources are notified.
- Receive information from the Incident Commander and ensure appropriate resources are made available.
- Provide support for the acquirement of additional supplies and resources as requested by the Incident Commander.
- Contact departmental resources via radio as required during the emergency response.
- Provide internal notification of the “all clear.”
- Ensure the coordination and establishment of an emergency debriefing session.
- Review incident log and post response incident report.
- Post incident debrief with Incident Commander.
- Provide necessary information to Public Relations for a media statement release if required.
- Complete a report on the events surrounding the incident.
- Coordinate collection of all incident notes, reports, statements and log of events.
- End the event in ER System.

6.2 ENVIRONMENT SUPERINTENDENT

The duties of the Environment Superintendent during an emergency are detailed as follows:

- Contact the ER Coordinator and muster accordingly.
- At the order of the ER Coordinator, notify the required external regulatory agencies.
- Document all actions and decisions.
- Assist the Incident Commander in evaluating the initial situation and assessing the magnitude of the spill.
- Assist in developing an overall plan of action.
- Collect photographic records of the spill event and cleanup efforts.
- Prepare a root cause analysis and an incident investigation for major spills.

- Report to the ER Coordinator and provide recommendations on resource requirements (additional manpower, equipment, material) to complete the cleanup effort.
- In the event of a spill at the OHF, report the spill to the Canadian Coast Guard (Central and Arctic region) 1-800-265-0237 (24-hour). The fax number for transmission of the written report is (519) 337-2498. Reporting of marine spills shall be in accordance with Transport Canada Guideline TP-9834E, "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants." Detailed harmful substances report requirements are outlined in Appendix A-2 of the guideline.
- Report the spill to NWT 24-hour Spill Report Line at 867-920-8130, to the Kitikmeot Inuit Association (KIA) Lands Administrator at (867) 983-2458, and Aboriginal Affairs and Northern Development Canada (AANDC) Water Resources Officer at 867-982-4308.
- Provide liaison with management to keep them informed of cleanup activities.
- Obtain additional required resources not available onsite for spill response and cleanup.
- Act as the spokesperson with government agencies as appropriate.
- Document the cause of the spill and effectiveness of the cleanup effort, and recommend the appropriate measures to prevent a recurrence of the spill.
- Prepare and submit follow-up documentation required by appropriate regulators.
- Ensure that the spill is cleaned up and follow-up communication and reports are filed with the AANDC and Land Administrator. Ensure that the spill reports submitted to Land Administrator include photographic records and an updated map showing Universal Transverse Mercator (UTM) coordinates, date, and amount and nature of the spill.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation process.
- Complete Government Agencies notification process.
- Ensure that all involved departments complete reporting process.

For marine spills at the OHF, the SABINA Environment Superintendent will be accessible to the Canadian Coast Guard during the entire incident.

6.3 INCIDENT COMMANDER

The Incident Commander is the site lead administrator for the ERT, responsible for ensuring the necessary emergency response equipment and adequate level of training for ERT members. The Incident Commander directs the ERT at the scene as ERT Leader. In the absence of the Incident Commander, a senior team member will be designated in his place. The following duties during an emergency are performed by the Incident Commander:

- Muster accordingly and brief team members.
- Report to the scene of the emergency.
- Take charge of the scene.
- Evaluate the details of the emergency as presented by those on scene. Assess the immediate situation, confirm the level of emergency and notify the ERC.
- Maintain contact with the ERC and provide support in coordination of the response.

- Direct ERT members in their respective tasks as required
- Contact departmental resources via radio as required during the emergency response.
- Request internal/external resources as required.
- Advise ERT on aspects of internal/external support as they are received.
- Develop a written log of events indicating instructions given, action taken and outcomes achieved.
- Announce the 'all clear' to the ERC when the emergency has ended.
- Lead the emergency debriefing session.
- Ensure that all ERT equipment is returned to original order and/or replaced to ensure future rapid response.
- Provide assistance with ongoing investigation.
- Prepare a written report on response activities.

6.4 ENVIRONMENTAL COORDINATOR

The Environmental Coordinator shall liaise with Incident Commander to advise on direction of environmental response efforts once the scene has been assessed by the Incident Commander and any medical and/or fire emergencies are under control.

The Environmental Coordinator will:

- Immediately proceed to the scene of the incident.
- Make recommendations for response methods and resources based on area sensitivities and incident severity through the Incident Commander as necessary.
- Make recommendations for additional resources through the Incident Commander as necessary.
- Participate in post-emergency debriefing.
- Maintain a log of events, actions, and outcomes.

6.5 SAFETY COORDINATOR

The duties of the Safety Coordinator during an emergency are detailed as follows:

- Contact the ERC.
- Respond to the scene and make direct contact with the Incident Commander.
- Establish perimeters around the area of the emergency and direct appropriate resource personnel responsible for traffic flow.
- Assist with identifying and assessment of potential hazards of the ERT response and notify the Incident Commander.
- Ensure appropriate personal protective equipment for involved ERT and non ERT personnel.
- Note pertinent information that may be relative to the investigation.
- Secure the area in coordination with site security.
- Participate in post-emergency debriefing.

- Assist in the accident/incident investigation and complete report.

6.6 EMERGENCY MEDICAL PERSONNEL

Duties during an emergency are as follows:

- Respond when required as directed by the Incident Commander.
- Responsible for all decisions of medical-related situations on-site.
- Responsible for assessing, administering and delegating emergency medical care.
- Advise the Incident Commander of the number and condition of any ill/injured personnel.
- Advise the ER Coordinator of off-site resources required.
- Maintain a log of events, actions and outcomes.
- Participate in an emergency debriefing session.

6.7 EMERGENCY RESPONSE TEAM

All Emergency Response Team members shall receive training to ensure that they have the required skills to provide an appropriate, safe and adequate response minimizing the impact of a spill on the environment.

6.8 SECURITY

Security personnel or their designates are key in an emergency response in that they will receive an initial notification of an emergency and provide first communications to essential personnel and secure the area.

Duties during an emergency are as follows:

- Security will report muster and evacuation status to the Incident Commander and await further instruction.
- Provide traffic and personnel control at scene as directed by the Incident Commander.
- Assist in controlling access to the emergency area.
- Maintain open radio communication (via radio or telephone intercom system).
- Keep a written record of events throughout incident.
- Relay notification of ‘all clear” order when directed by Incident Commander.
- Maintain Security of the scene as directed by the ER Coordinator or Incident Commander.
- Direct all off-site inquiries regarding the emergency to the ER Coordinator or designate.
- Participate in a debriefing session for the emergency response.

7. General Spill Procedures

The response to spills begins immediately when the spill has been detected. In all cases immediately upon detection of a spill, all transfer operations are to be shut down and not restarted in any manner that would interfere with the immediate, effective and sustained response to the oil pollution incident.

This plan clearly outlines the notification procedure and the roles and responsibilities of the management and spill response team. All emergency telephone numbers are clearly listed and the persons are contacted as needed and according to the priority of the incident. The contact list is included in Table-5.2-1.

The response team, following a spill, must ensure that personnel safety is their first priority. First and foremost evaluate the risks as quickly as possible to guarantee that appropriate measures are taken to prevent or reduce the risk of injury to personnel, to avoid fire or explosion, to protect property and to minimize the damage to the environment. It is important to contain the spill or to start cleaning up as quickly as possible to stop the spill from contaminating a greater area.

Full details of the properties and hazards associated with potential spills of all products are found on the Material Safety Data Sheets (MSDS) in Appendix 8 of this plan.

When responding to spills, all procedures and safety methods in handling the products must be observed. The following specific measures must be followed with spills on water or on land:

- Take personal protective safety measures. Personal protective equipment must be worn at all times during response operations.
- Close all electrical sources.
- Take all appropriate measures to ensure personnel safety and the safety of the facility.
- Request help to control personnel access, vehicles and close the area. Never enter inside and/or within the radius of the contaminated area. Have a fire extinguisher close by. If a fire starts extinguish the fire only if it is safe for you and that you were trained to do so without exposing yourself to unnecessary risks.

Through the spill training initiative, all spill response personnel will be fully briefed on the procedures to be followed to report a spill and initiate spill response. The first person to notice a spill will take the following steps:

1. Immediately warn other personnel working near the spill area.
2. Evacuate the area if the health and safety of personnel is threatened.
3. Notify an appropriate supervisor, who will initiate the spill response operations.
4. In the absence of danger, and before the spill response team arrives at the scene, take any safe and reasonable measure to stop, contain and identify the nature of the spill.

All spill response actions carried out by the spill response team will follow these general procedures:

- **Cease Transfer Operations -** In all cases immediately upon detection of a spill, all transfer operations are to be shut down and not restarted in any manner that would interfere with the immediate, effective and sustained response to the oil pollution incident.

- **Source Control** - Reduce or stop the flow of product without endangering anyone. This may involve very simple actions such as closing shore valves, sealing a puncture hole with almost anything handy (e.g., a rag, a piece of wood, tape, etc.), raising a leaky or discharging hose at a level higher than the product level inside the tank.
- **Control of Free Product** - Prevent or limit the spread of the spilled material. Accumulate/concentrate spilled product in an area to facilitate recovery. Barriers positioned down-gradient of the spill will slow or stop the progression of the spill. Barriers can consist of absorbent booms, dykes, berms, or trenches (dug in the ground). Deployment of floating booms to contain a marine spill should be carried out by the spill response team as soon as safe and practical.
- **Protection** - Evaluate the potential dangers of the spill in order to protect sensitive ecosystems and natural resources. Block or divert the spilled material away from sensitive areas where possible.
- **Clean up the Spill** – Recover and containerize as much free product as possible. Recover contaminated soil, and water. Pressure-wash contaminated bedrock surfaces, shorelines, ice and recover as much as possible oily water for containerization and/or treatment.
- **Report the Spill** - Provide basic information such as date and time of the spill, type and amount of product discharged, location and approximate size of the spill, actions already taken to stop and contain the spill, meteorological conditions and any perceived threat to human health or the environment. Reporting requirements are presented in Section 7.3 of this plan.

7.1 HEALTH AND SAFETY

Sabina and its senior management are committed to ensuring the health, safety and welfare of its employees, contractors and visitors. As a consequence of this, Sabina requires all personnel to regard accident prevention and working safely as a collective individual responsibility.

Sabina conducts all site activities in accordance with all applicable Federal and Territorial health and safety regulations. The following applicable health and safety regulations apply to the activities described in this Oil Pollution Emergency Plan:

- *Northwest Territories, Nunavut Worker's Compensation Act* - Provides the territorial legislation covering the health and safety of workers in Nunavut.
- *Mine Health and Safety Act and Regulations (Nunavut)* - Provides specific health and safety guidelines for mines operating in Nunavut: Section 2(1) Duties and Responsibilities (the Owner).
- *Canada Labour Code Part II* – Provides federal regulations for the health and safety of workers involved in shipping and marine port operations.

Sabina requires and provides WHMIS training for all employees and contractors throughout the Back River Project: *Mine Health and Safety Act* and Regulations, Part VI Regs. Training 6.03.

It is also a requirement for supervisory personnel to hold level 1 or level 2 certification as required by the *Mine Health and Safety Act*: *Mine Health and Safety Act* and Regulations, Part V Regs. Supervision.

Comprehensive general training is provided to spill responders throughout the project in relation to inland spills. In addition, specific training with relation to safety during response to marine spills is provided to all responders through Sabina's marine spill training program. All responders who are involved in marine operations shall participate in the training as outlined in section 9 of this Oil Pollution Emergency Plan.

7.1.1 Personal Protective Equipment – Requirements

For all responders, personal protective equipment requirements (PPE) shall be as follows:

- MLA Site Services (non-water operations, no contact with spilled product):
  - Hard hat.
  - CSA-approved work boots.
  - Safety glasses.
  - Leather work gloves.
  - Orange/yellow retro reflective vests.
- MLA Site Services (non-water operations, possible contact with spilled product):
  - Hard hat.
  - CSA-approved work boots.
  - Safety glasses.
  - Orange/yellow retro reflective vests (if not wearing rain wear).
  - PVC rain suit.
  - Nitrile work gloves.
- Workboat and shoreline responders (beach or on-water operations, possible contact with spilled product):
  - Hard hat.
  - CSA-approved work boots.
  - Safety glasses.
  - PVC rain suit.
  - Nitrile work gloves.
  - Approved personal flotation device.

7.2 COORDINATION WITH CANADIAN COAST GUARD AND OTHER GOVERNMENTAL AGENCIES

7.2.1 Canadian Coast Guard

The response to spills at the MLA-OHF shall be managed in coordination with the Canadian Coast Guard whom are the lead response agency north of 60°.

The *Central & Arctic Regional Response Plan (2008)* and the *Kitikmeot Region, Nunavut Area Plan* outline the Canadian Coast Guard's response capability for the region. This plan is a component of the *Canadian Coast Guard National Response Plan* which is the responsibility of the Director of Safety and Environmental Response Systems, Ottawa. It establishes the framework and the procedures by which Central & Arctic Region will prepare for, assess, respond to and document actions taken in response to pollution incidents in this Region. This capability and the information contained in the Coast Guard plans are considered a valuable resource in the planning and response to spills at the MLA-OHF.

7.2.2 Regional Environmental Emergencies Team

The Environment Canada, Regional Environmental Emergencies Team (REET) is a multi-agency, multi-disciplinary group specializing in environmental emergencies. REET is designed to provide consolidated and coordinated environmental advice, information and assistance in the event of an environmental emergency. REET members represent several federal, provincial, territorial and municipal government departments, aboriginal communities, private sector agencies, and local individuals.

During emergency response situations a REET operates as a flexible and expandable multi-disciplinary and multi-agency team brought together to obtain and provide comprehensive and coordinated environmental advice, information and assistance to On Site Coordinator or Lead Government Agency.

7.2.3 Other Governmental Agencies

At all times, the response to spill incidents shall be coordinated with the various agencies as listed in Figure 5.2-1.

7.3 REPORTING REQUIREMENTS

Three individual reporting requirements are applicable in the case of all marine spills. Procedures for each are outlined herewith:

7.3.1 Canadian Coast Guard Reporting Requirements

All spills of a marine nature will be reported to the Canadian Coast Guard (Central and Arctic region) 1-800-265-0237 (24-hour). The fax number for transmission of the written report is (519) 337-2498.

Reporting of marine spills shall be in accordance with Transport Canada Guideline TP-9834E, “Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants.” Detailed harmful substances report requirements are outlined in Appendix A-2 of the guideline, a copy of which is included in Appendix 9 of this plan.

7.3.2 Reporting to Transport Canada

The Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69) require that any spills be reported to the nearest office of Transport Canada as follows:

Jaideep Johar
Manager, Technical services
Transport Canada, Marine Safety
Prairie and Northern Region
Tel: (204) 984-8618
Cell: (204) 880-0754
Email:joharj@tc.gc.ca

Craig D. Miller
Manager, Marine Safety (PNR)
Transport Canada
PO Box 8550, 344 Edmonton Street, Winnipeg, MB, R3C 0P6
Email: craig.miller@tc.gc.ca
Tel: (204) 984-0397
Fax: (204) 984-8417

Reporting of marine spills shall be in accordance with Transport Canada Guideline TP-9834E, "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants." Detailed harmful substances report requirements are outlined in Appendix A-2 of the guideline, a copy of which is included in Appendix 9 of this plan.

7.3.3 Government of Nunavut Reporting Requirements

Quantities of hazardous substances spilled that require reporting are listed in Schedule B of the Nunavut Spill Contingency and Reporting Regulation.

After the initial field emergency response to the spill event, spills are reported to the 24-hour Spill Report Line:

24-Hour Spill Report Line
spills@gov.nt.ca
Tel: (867) 920-8130
Fax: (867) 873 6924

Failure to report a spill can lead to fines. The Kitikmeot Inuit Association (KIA) Lands Administrator will also be promptly notified at (867) 983-2458 or via e-mail. Similarly, the AANDC Water Resources Officer will be promptly notified of the spill event at (867) 982-4308 or via e-mail. In the event of a spill on the ocean, the incident will be reported to the Canadian Coast Guard (Arctic region) 1-800-265-0237 (24-hour).

It is the responsibility of the Environmental Supervisor on behalf of the Operations Manager to prepare the proper reports and transmit them to regulatory authorities.

The spill event is reported in writing using the standard NWT-NU Spill Report Form.

In the event of a spill involving the marine carrier delivering bulk fuel, Sabina will ensure that the subcontractor reports any spill event under its responsibility.

7.4 WILDLIFE PROTECTION PROCEDURES

In response to a spill event, techniques used to prevent wildlife from becoming oiled or contaminated, by preventing animals from entering the contaminated area, will consist of hazing and other deterrents. This will be accomplished using a combination of both audible and visual devices, including but not limited to:

- Pyrotechnics, i.e., shell crackers, screamers, propane cannons for shore based spills.
- Visual scare tactics, i.e., helicopters, emergency response vessels or other water vessels.
- Broadcast sounds, i.e., Breco Bird Scarer designed to float with an oil spill.
- Exclusion, i.e., netting applied in smaller contaminated areas

These techniques need to be set in place immediately after a spill occurrence so as to minimize environmental impact.

The size of the spill and location in relation to sensitive wildlife areas must be assessed at the time of the event as to correctly apply the appropriate level of deterrence. Only workers trained in the safe and proper use of certain hazing equipment will be permitted to haze wildlife. Personal Protective Equipment will be worn by all personnel using equipment, as per manufactures instructions, and that the minimum will include the use of eye and ear protection. Other workers in the vicinity of such devices should also use ear protection or remain a safe distance away. Hazing through the use of pyrotechnics should not be used too close to dry vegetation or flammable spill materials due to fire hazard.

Hazing should be equal and continuous in all contaminated areas to prevent wildlife from being hazed into an area where they may be in danger. It is also important to ensure that hazing efforts do not cause already contaminated animals to scatter and techniques are applied as soon as possible to prevent wildlife from contacting spills off the surface of waters (if applicable).

All emergency response vessels shall be equipped with deterrent devices to ensure timely response in case of a spill occurrence off-shore. To prevent habituation, variation of hazing techniques will be used such as changing the location, appearance and types of hazing or using a combination of hazing techniques.

Efforts shall be made to collect alive or dead oiled wildlife. In the event of a spill occurring in or around a water body, shorelines and beaches shall be inspected for contaminated wildlife to be collected. Emergency Response vessels shall be equipped with dip-nets, large plastic collecting bags for dead wildlife, and cardboard boxes or cloth bags for live oiled wildlife. To ensure alive oiled wildlife be dealt with humanely, capture and handling of wildlife shall only be done by trained and permitted individuals. Gloves shall be worn when handling contaminated wildlife (leather gloves for raptors and mammals, latex/rubber gloves for ducks and small shorebirds). Wildlife will be kept individually within cloth bags or ventilated cardboard boxes and label the date and time animal was found, name of finder, location and name of species, if known. Wildlife treatment facilities will then be contacted for advisement on treatment. All contaminated wildlife will be held in a warm quiet place until treatment. The Canadian Wildlife Services (CWS) will be consulted to determine the most humane treatment strategy to be implemented for live oiled wildlife, whether rehabilitation or euthanization.

For wildlife mortalities each carcass shall be bagged and labeled individually. The date and time animal was found, name of finder, location and name of species, if known shall be documented. CWS shall be consulted and approval obtained prior to disposing of any dead wildlife. Contact information for experts in bird hazing and bird exclusion, oiled bird rehabilitation, and, permits needed to haze, salvage, hold and clean, or euthanize birds, are shown in Table 7.4-1.

Table 7.4-1. Emergency Contacts in Case of Spills Affecting Wildlife

Name	Location	Phone Number	Purpose
Canadian Wildlife Services (CWS)	TBA	TBA	Knowing and providing information on the migratory bird resource and species at risk (under CWS jurisdiction) in the area of a spill (this includes damage assessment and restoration planning after the event) Minimizing the damage to birds by deterring unoiled birds from becoming oiled Ensuring the humane treatment of captured migratory birds and species at risk by determining the appropriate response and treatment strategies which may include euthanization or cleaning and rehabilitation.
Cobequid Wildlife Rehabilitation Centre	Brookfield, NS	1-902-893-0253	Provide veterinary care and rehabilitation for wildlife
Nunavut Emergency Management	PO Box 1000, Station 700 Iqaluit, NU X0A 0H0	1-800-693-1666	Nunavut Emergency Management is responsible for developing the territorial emergency response plans, coordinating general emergency operations at the territorial and regional levels, and supporting community emergency response operations.
International Bird Rescue	International	1-888-447-7143	Wildlife rehabilitation specialists, can manage all aspects of wildlife response

7.5 TREATMENT AND DISPOSAL

Plastic sacks, steel drums, or other appropriate containers as approved by the Environmental Supervisor are used to contain and transport contaminated soil for treatment. Depending on the nature of the spilled contaminant, the soil may be treated for remediation on site, or shipped to a licensed facility for treatment and disposal. Contaminated soil resulting from the spill of hazardous chemicals will be treated as a hazardous waste and shipped to a licensed facility for treatment and disposal. Temporary storage of contaminated materials is within lined berms.

8. Spill Scenarios and Response Strategies

Sabina is committed to planning for spills at the MLA-OHF using an analysis of possible spill scenarios. The potential incident analysis is based on real projected operations, and potential quantities spilled are based on pumping rates and estimated times to halt pumping operations.

In the development of the scenarios the following constant factors have been applied:

- The type of ship that is employed for the bulk fuel delivery is a conventional double hulled, multi-compartment petroleum tanker, between 120 to 135 metres in length. The tanker is anchored at a safe distance from the MLA-OHF beach head and approximately 1,000 metres of floating hose is deployed between ship and shore.
- As outlined in Section 3.2 of this plan, two products are received at the facility. Both products, JET A1 and Ultra Low Sulphur Diesel (ULSD) are classified as non-persistent combustible hydrocarbons and will behave in a similar fashion if spilled. The response to a spill of either of these products shall be carried out in the same fashion. Full details of the properties and hazards associated with these products are found on the Material Safety Data Sheets (MSDS) in Appendix 8 at the end of this plan.
- Both products are of relative low viscosity, are clear to yellow in color and will float readily when spilled. It should be anticipated that any spillage will rapidly spread when spilled and a high rate of evaporation will occur. Wind will be the most important factor in promoting the spread of the product on the water surface.
- Where environmental sensitivities are mentioned in the scenarios, these relate to the area sensitivities as outlined in Appendix 3 of this plan.
- Local topography plays an important part in wind direction and force, but it is generally noted at the MLA site that the most common wind direction is from the north and northwest, 17% and 15% of the time respectively, more than 5 m/s 45% of the time but less than 9 m/s approximately 86% of the time. On average, wind speeds during the summer were slightly slower than winter wind speeds.
- As is indicated in the plan, upon discovery of spillage of any sort pumping operations are ceased.

General response time limits should be observed for each action as follows:

- Deployment of containment boom: 0-1 hr following the spillage event.
- Deployment of skimming equipment: 0-6 hours following the spillage event

During ship to shore discharge of the product, the floating hose is inspected on a regular basis by boat. Stoppers and absorbents are available in case they are needed. The ship has a Shipboard Oil Pollution Emergency Plan (SOPEP), appropriate response gear on board and the crew is fully trained in its use.

There is a person on watch at the shore manifold at all times during discharge and in direct radio communication with the vessel. Furthermore, there is a pressure alarm installed on the pipeline during discharge to validate the system. Any leak or malfunction and resulting drop in line pressure would trigger the alarm. In addition, a visual gauge is installed at the manifold and regular pressure monitoring is carried out by the manifold watchman. The pipeline is inspected visually and regularly by walking alongside of it. Once a year the pipeline is tested as part of annual maintenance (pressure test).

All spills within the bulk fuel storage facility zone would be retained within the bermed area. During the filling of the tanks (unloading of the vessel) continuous monitoring takes place. At all times there is a person on watch during discharge and in contact with the vessel.

In the presentation of the spill scenarios in this section, it is implied that the initial spill response actions outlined in section 7 above have first and foremost been addressed. The scenarios are designed moreover for the purpose of identifying the appropriate specific actions and therefore the related resources required for a given incident.

Detailed scenarios are as follows:

<u>During Ship to Shore Transfer</u>

Source of Discharge	Potential Loss*	Appropriate Actions	Resources Required
Coupling or hose break / malfunction at the ship's manifold	20 – 600 litres	1. Deploy containment boom as required to control migration of spill. Consideration of protection booming of beach front, or sensitive areas as defined in Appendix 3 of the OPEP depending on wind direction, tides and marine conditions present. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained. 5. Notifications of local authorities.	Boat – Sabina near shore workboat - 3 responders Boom – 100 metres and accessories, additional booms if necessary to provide shoreline protection Shore crew to deploy from container – 3 responders
Coupling leaking or hose rupture along length of hose between ship and shore manifold	20 – 3,500 litres	1. Deploy containment boom to control migration of spill. Consideration of protection booming of beach front, or sensitive areas as defined in Appendix 3 of the OPEP depending on wind direction, tides and marine conditions present. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained. 5. Notifications of local authorities.	Boat – Sabina near shore workboat - 3 responders Boom – 100 metres and accessories, additional booms if necessary to provide shoreline protection Shore crew to deploy from container – 3 responders

(continued)

During Ship to Shore Transfer *(continued)*

Source of Discharge	Potential Loss*	Appropriate Actions	Resources Required
Leak at shore manifold connection	20 - 600 litres	1. Deploy containment boom to control migration of spill. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained 5: Notifications of local authorities.	Same marine response, shore based response deploy berms and sorbents 3 additional shore responders MLA site services

Pipeline or along Shore-based Hose Length

Source of Discharge	Potential Loss*	Appropriate Actions	Resources Required
Failure of flange or coupling Vehicle Accident involving pipeline or shore based hose length	20-3,500 litres	Land spill only: 1. Immediately install portable berms under leaking or damaged line where possible. 2. If portable berms are not feasible, contain and recover oil spill using dykes or trenches. 3. Prevent the oil from reaching natural drainage paths leading to the ocean. 4. Collect free-product for temporary storage. Excavate contaminated soil, store and manage appropriately. Marine response if necessary: 1. Deploy containment boom to control migration of spill. Consideration of protection booming of beach front, or sensitive areas as defined in Appendix 3 of the OPEP depending on wind direction, tides and marine conditions present. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained. 5. Notifications of local authorities.	Land spill only: Response by MLA site services Recover free products with sorbents, pumps within temporary berms Earth moving equipment available for berming, etc. Boat – Sabina near shore workboat - 3 responders Boom – 100 metres and accessories, additional booms if necessary to provide shoreline protection Shore crew to deploy from container – 3 responders MLA site services

Bulk Fuel Storage Facility

The bulk fuel storage facility located at the MLA site shall be constructed in an impermeable secondary containment structure (lined and bermed containment area). The construction is in compliance with CCME's Environmental Code of Practice (CCME 2003; 2008), the fuel bulk fuel storage facility will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks OR 110 % volume of the largest tank, whichever is greater.

The above basis is consistent with the document entitled "Design Rationale for Fuel Storage and Distribution Facilities" published by the Department of Public Works of the North West Territories (refer to Section 4.6 of those guidelines). The lining within the bermed area is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., the membrane to ensure its integrity.

Source of Discharge	Potential Loss*	Appropriate Actions	Resources Required
Leaking Tank or piping/valves	20-500 litres	Isolate and patch accordingly, berm or portable berms	Patch kits/ portable berms Response by MLA site services Recover free products with sorbents Berm designed with fuel recovery to sump and engineered oil water separator

** Potential loss estimated based on pumping rate and anticipated response time to shut down pumping operations*

8.1 RESPONSE STRATEGIES – LARGE SPILLS

For the purposes of this plan, spills less than 3.5 m^3 are to be handled by MLA-OHF response operations. MLA personnel shall deploy the resident on-site equipment as outlined in the plan.

If the spill is larger than 3.5 m^3 and depending on the specific circumstances, the Emergency Response Coordinator shall determine if it is necessary to increase the response capability by requesting third party assistance.

Where this support is deemed necessary, the On Site Coordinator shall immediately request this assistance while ensuring ongoing mitigation of spill impact to the extent possible while awaiting additional resources and assistance from the third party responder.

The choice of third party responder and any contractual arrangements (if required) is a commercial element of the project and shall be determined at a future date prior to commencement of operations. The choice of a third party responder shall be commensurate with the required capabilities under the regulations.

9. Preventive Measures

It is Sabina policy to prevent any accidental spillage and all prior efforts shall be made to minimize the risk of incidents and impact to the environment. Sabina shall constantly update the facility, shall have adequate safety equipment at the site and provide comprehensive training to its employees, contractors and visitors with the goal of avoiding spills and to minimize their impact if they should occur.

Furthermore, Sabina has established standard operating procedure in relation to the bulk fuel transfer – (Appendix 5), that provides safeguards and immediate alarm in the event of failures during the operation.

9.1 TRAINING - GENERAL

Sabina ensures that personnel involved during a response receive training for their own safety, public safety, and that they have the required skills to minimize the impact of a spill on the environment.

The personnel directly linked to spill response operations will receive training to familiarize themselves with the environmental emergency plan. These personnel will also re-examine the manual of the OPEP on a yearly basis according to their duties and responsibilities. All training is recorded in the training register and kept up to date in the OPEP binder.

The personnel directly linked to spill response operations, contract employees and the other responders identified in the environmental emergency plan should take part in the yearly training program. It shall be ensured that training is carried out to ensure adequate numbers of responders at all levels are available on both work shifts.

All workboat operators and crews shall possess a Pleasure Craft Operator Competency Card.

9.1.1 Training Content

Spill training shall be provided on site prior to transfer operations for all personnel to be involved in the management and response to possible spills.

Sabina Emergency Response Coordinator shall possess spill management training to a level commensurate to the duties required of the position.

Responder training is to be of a combined theoretical presentation (classroom) and also of hands on nature (equipment deployment exercise).

The major components of this training program shall include:

- Classroom Training:
  - Introduction and overview of marine spill response.
  - Review of Sabina general spill response plan and integration of same to marine response.
  - Review of Marine Oil Pollution Emergency Plan elements.
  - Short review of oil spill behavior and operational parameters / limitations for marine spill response operations.
  - Spill assessment.
  - Basic safety for spill responders to marine oil spills, presentation of video – small craft safety practices.
  - Basic oil boom deployment, presentation of video and booming techniques / guidelines.
  - Marine and shoreline recovery operations.
- Hands-on Training and Deployments:
  - Hands on review with participants of Sabina inventory of spill equipment.
  - Hands on instruction - boom connections, tow bridles, rope handling, basic knots and attachment of deployment accessories.
  - Simulated deployment of booms and related gear on water using appropriate vessels.
  - Debriefing and lessons learned.

9.1.2 Short Notice Training

In the event of a large spill the personnel requirements may exceed those that have received the specific responder training as outlined in Section 9.1.1 above. Due to the remoteness of the site, volunteers are not anticipated. MLA site services personnel shall be employed as additional responders.

Although all site services personnel possess WHMIS training additional short notice training shall be carried out for these new responders on an as needed basis. Certain modules of the responder training shall be delivered on site to these personnel selected specifically from the training outlined in Section 9.1.1 above. The Incident Commander shall determine which modules are pertinent to each group of additional responders and shall be responsible for assuring adequate training for each group.

9.2 EXERCISES

Following the annual delivery of the spill training as outlined in Section 9.1 a comprehensive spill exercise shall be undertaken. The exercise is structured to test the readiness of management, responders and to practice and validate the logistics of the deployment of spill gear. The exercise content shall be different from year to year so that it can validate the various elements of the plan and the response over a three year period. Some of the factors that shall be evaluated include but are not limited to:

- Activation of the emergency plan.
- Management response.
- Internal and external notifications.
- Site safety.
- Communications.
- Equipment deployment to a specific scenario.
- Reporting and co-ordination with outside agencies.
- Exercise coordination with Canadian Coast Guard;.
- Exercise coordination with ship.

9.3 SPILL PREVENTION MEASURES

9.3.1 Bulk Fuel Storage Facility

Normal operation procedures of Sabina include many inspections which are performed regularly and kept on records. Any discrepancies noted are documented and investigated. Corrective measures are then applied.

9.3.2 Bulk Fuel Transfer

Several preventive measures are in place to minimize risk of spills during bulk fuel transfer including:

- The bulk fuel storage facility, pipeline and all related equipment and infrastructures are inspected prior to the bulk cargo transfer and the inspection methods are documented as a standard operating procedure.
- Complete bulk cargo transfer procedures have been established, a copy of which is found in Appendix 5 of this OPEP.
- As required by the applicable legislation the ship has a comprehensive Shipboard Oil Pollution Emergency Plan (SOPEP) and a copy of this plan has been reviewed by Sabina.
- In addition to the legislative requirements, the charterer has implemented a shipboard spill response training program and performs routine exercises in spill response operations.

- The ship carries a compliment of spill response equipment as listed in Appendix 6 of the OPEP and this equipment is ready at the ship's rail at all times for deployment during cargo operations.
- Sabina oil spill response equipment is on the beach, ready for immediate deployment at all times during cargo operations.
- The workboats and trained responders are available at all times during cargo operations for spill equipment deployment.
- Standard transfer procedures include hourly inspections by workboat of the floating hose for leaks or defects.
- During transfer operations the shore manifold is manned at all times.
- A low pressure alarm is installed at the shore manifold which is highly sensitive to differences in pressure during pumping. Any loss in the system will cause a drop in manifold pressure and results in an audible alarm which is immediately reported by the manifold personnel.
- The bulk fuel storage facility is monitored at all times by Sabina personnel during the transfer.
- The pipeline is inspected hourly on foot during the transfer operation.

9.4 RESPONSE EQUIPMENT AUDITING

As part of the annual exercise program, a scenario based deployment of spill gear is carried out. Prior to the exercise all gear is inspected, its condition is evaluated and any defects or missing equipment is replaced. The equipment audit is documented in the training register in Appendix 7.

9.5 OIL POLLUTION RESPONSE PLAN UPDATES

The Oil Pollution Emergency Plan (OPEP) will be scrutinized at least once a year to take into consideration any amendments of the legislation, new characteristics of the site, the equipment on site, new policies of the company, environmental issues and also new staff and particulars of team members. Furthermore following an exercise or an incident, the OPEP will be evaluated and modified accordingly.

Even if there is no change to be brought to the OPEP it will be updated at least once a year. The corrected version of the plan will then be sent to the responsible person on site to ensure that the team at the site always has an updated version of the plan in case their intervention is needed.

9.5.1 Update Registry

The Oil Pollution Emergency Plan (OPEP) shall be updated, reprinted and redistributed when changes are made as noted above. The plan carries the latest version identified by date as indicated in the footer of each page of the plan. If plan amendments result in a reprinting, all old versions of the plan shall be recalled and destroyed accordingly.

9.5.2 Plan Distribution

In addition to distribution within Sabina all modified versions of the plan shall be submitted to Transport Canada accordingly.

7. Site Water Monitoring and Management Plan

Rescan™
an ERM company

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Site Water Monitoring and Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
SITE WATER MONITORING AND MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AEMP	Aquatic Effects Monitoring Plan
ANFO	Ammonium Nitrate Fuel Oil
ARD	acid rock drainage
BIF	banded iron formation
CCME	Canadian Council of Ministers of the Environment
CPUE	Catch per Unit Effort
DEIS	Draft Environmental Impact Statement
DFO	Department of Fisheries and Oceans Canada
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EMP	environmental management plan
HADD	Harmful Alteration, Disruption and Destruction (of fish habitat)
HDPE	high-density polyethylene
MAC	Maximum Average Concentration
masl	metres above sea level
MCRP	Mine Closure and Reclamation Plan
mg/L	milligrams per litre
ML	metal leaching
MLA	Marine Laydown Area
MMER	Metal Mining Effluent Regulations
MSC	Meteorological Service of Canada
Mt	million tonnes
NH3	Ammonia
NIRB	Nunavut Impact Review Board
NP	neutralizing potential
nPAG	non potentially acid generating
NWB	Nunavut Water Board
PAG	potentially acid generating

PMP	Probable Maximum Precipitation
PPC&F	post pillar cut-and-fill
QA	quality assurance
QC	quality control
RBC	Rotating Biological Contractor
Sabina	Sabina Gold & Silver Corporation
SNP	Surveillance Network Program
TIA	tailings impoundment area
TSS	Total Suspended Solids
uPAG	uncertain acid generating potential
VEC	Valued Ecosystem Component
WQO	Water Quality Objective
WRSA	waste rock storage area
WSC	Water Survey of Canada

1. Introduction

The Site Water Monitoring and Management Plan (the Plan) outlines Sabina Gold & Silver Corp.'s (Sabina's) strategies for managing water at the Back River Project (the Project).

The Plan is a discipline-specific biophysical management plan that forms part of Sabina's overall Environmental Management Plan (EMP), developed for the Back River Project. This management plan has been prepared in accordance with Section 9.4.4 of the Environmental Impact Statement (EIS) Guidelines that the Nunavut Impact Review Board (NIRB) issued to Sabina (NIRB, 2013).

This plan should be read in conjunction with all the other EMPs. At a minimum, the following related plans should be resourced when reading this document:

- Ore Storage Management Plan.
- Mine Waste Rock and Tailings Management Plan.
- Fuel Management Plan.
- Spill Contingency Plan.
- Landfill and Waste Management Plan.
- Hazardous Waste Management Plan.
- Explosives Management Plan.
- Aquatic Effects Management Plan.

This plan is a living document to be updated throughout the Project life based on management reviews, incident investigations, regulatory changes, or other Project-related changes. It is expected that this plan will be a requirement of a future Type A Water Licence for the Project.

The current version of this plan is being submitted with the Draft EIS (DEIS). As such, the plan optimized the water management concepts assessed in the DEIS. The plan will continue to evolve and will be revised for the Final EIS (FEIS). Revisions are expected from the environmental review process by NIRB, the water licensing process, and/or the outcome of engineering feasibility studies and detailed design.

2. Scope and Objectives

The Site Water Monitoring and Management Plan describes the procedures necessary to document the quality and quantity of water that will interact with components of the Project over the life of the mine. The plan includes management practices that limit the potential for adverse impacts to receiving waters, to aquatic ecosystems, and to fish and fish habitat. The plan details:

- Regional climate and hydrology.
- Site water balances during mine operation.
- Water quantity thresholds and water quality discharge criteria.

- Water supply locations, volumes and facilities.
- Sewage treatment and disposal facilities.
- Water management strategies during in-water construction.
- Water management during mine operation.
- Water management during mine closure.
- Applicable legislation and guidelines.
- The roles and responsibilities of the environmental team.
- Environmental protection measures including general water management strategies.
- A preliminary monitoring program.
- Checking and corrective actions.
- Record keeping and environmental reporting.
- A framework for the evaluation of plan effectiveness.
- A Quality Assurance / Quality Control (QA/QC) program.

The plan including the mitigation measures identified herein apply to the construction, operation, closure and post-closure phases of the Project and includes the Goose and George Properties, the Marine Laydown Area (MLA), and the winter roads connecting the Project Properties.

The mitigation measures identified in this plan are intended to protect the following Valued Ecosystem Components (VECs):

- Surface Hydrology.
- Freshwater Water Quality.
- Freshwater Sediment Quality.
- Freshwater Fish/Aquatic Habitat.
- Freshwater Fish (Arctic Grayling and Lake Trout).

The plan is meant to ensure that the Project is conducted as proposed, predicted adverse environmental effects are promptly mitigated, the applied mitigation measures are successful, and the relevant laws and regulations are met. The plan outlines procedures for the reassessment, improvement, or reorientation of the plan if it is determined at any point in the Project's development that the plan no longer meets the initial purpose or objective.

Results of monitoring identified in this plan will be publicly reported, and may feed into other ongoing regional initiatives or programs with relevant government organizations, or regional authorities.

3. Planning and Implementation

3.1 REGIONAL CLIMATE AND HYDROLOGY

Meteorological and hydrological data are available for the Project from late 2006 and 2010, respectively. Meteorological and hydrological conditions at the Project are described by Knight Piésold (2013a).

Meteorological parameter estimates utilize the Goose Lake meteorological station that is located at elevation 277 m above sea level (masl). The data collected at this station were combined with historical data from the Meteorological Services of Canada (MSC) branch of Environment Canada and used in conjunction with research conducted by Waterloo University and Environment Canada to develop long-term meteorological estimates for the Project. Of the two MSC stations currently operating in the region, the Lupin station has a record of reasonable length.

Available site data were correlated to the concurrent monthly temperature data at the Lupin MSC station using a linear regression analysis. The resulting synthetic temperature record has a mean annual temperature of -11.3°C. The minimum and maximum mean monthly temperatures of -30.8°C and 11.4°C occur in January and July, respectively.

Regional wind speed data are not available near the project area, so mean monthly values were derived from the measured Goose Lake record. The mean annual wind speed on site is approximately 4.4 m/s, with the wind direction exhibiting strong seasonality. The maximum recorded wind gust during the monitoring period was measured at 30.7 m/s (111 km/h).

The mean annual precipitation at the site is estimated to be 395 mm, with approximately 55% falling as rain and 45% falling as snow. This estimate takes into consideration potential rainfall undercatch at the Goose Lake station and is calibrated to the long-term mean annual runoff derived for the Project area.

The annual long-term lake evaporation in the region is about 245 mm and the strongest control on evaporation is net radiation. Annual actual evapotranspiration from the tundra is estimated to be approximately 120 mm (50% of potential evapotranspiration) and annual sublimation is in the order of 35 mm.

Hydrometric data are currently being collected at 12 stations in the immediate Project area. Streamflow records were developed for 10 of the 12 Goose Property monitoring stations. Of these 10 records, four were used in the development of long-term synthetic flow series for the project area. The flow series were developed by correlating the measured streamflow records with the concurrent record collected at the Water Survey of Canada (WSC) Back River (10RA001) station. The resultant long-term mean annual unit runoff for the Project area is 5.9 $l/s/km^2$, which equates to a watershed averaged runoff depth of 185 mm.

Return period peak flow and seven-day low flow values were also developed for the Project area using a combination of Project and regional information. For example, the PL-H1 hydrometric monitoring station with a watershed area of 204 km^2, the 200-year peak flow value was estimated to be 250 m^3/s and the 10-year seven-day July-August low flow was estimated to be 0.13 m^3/s.

3.2 WATER SUPPLY LOCATIONS, VOLUMES AND FACILITIES

3.2.1 Water Quantity Thresholds

Water quantity thresholds will be established by the Nunavut Water Board (NWB) within Sabina's Type A Water Licence. Sabina has identified the following thresholds in its DEIS:

- Winter water use from lakes will not exceed 10% of the available water calculated with an appropriate ice thickness, as outlined in the Department of Fisheries and Oceans' (DFO's) winter water withdrawal protocol (DFO, 2010).
- Intakes in fish-bearing waters will be equipped with fish screens in accordance with DFO's water intake guideline (DFO, 1995).

Water meters will be installed to monitor water consumption and facilitate the development of detailed, site-specific management strategies to reduce water consumption.

3.2.2 Estimated Water Consumption

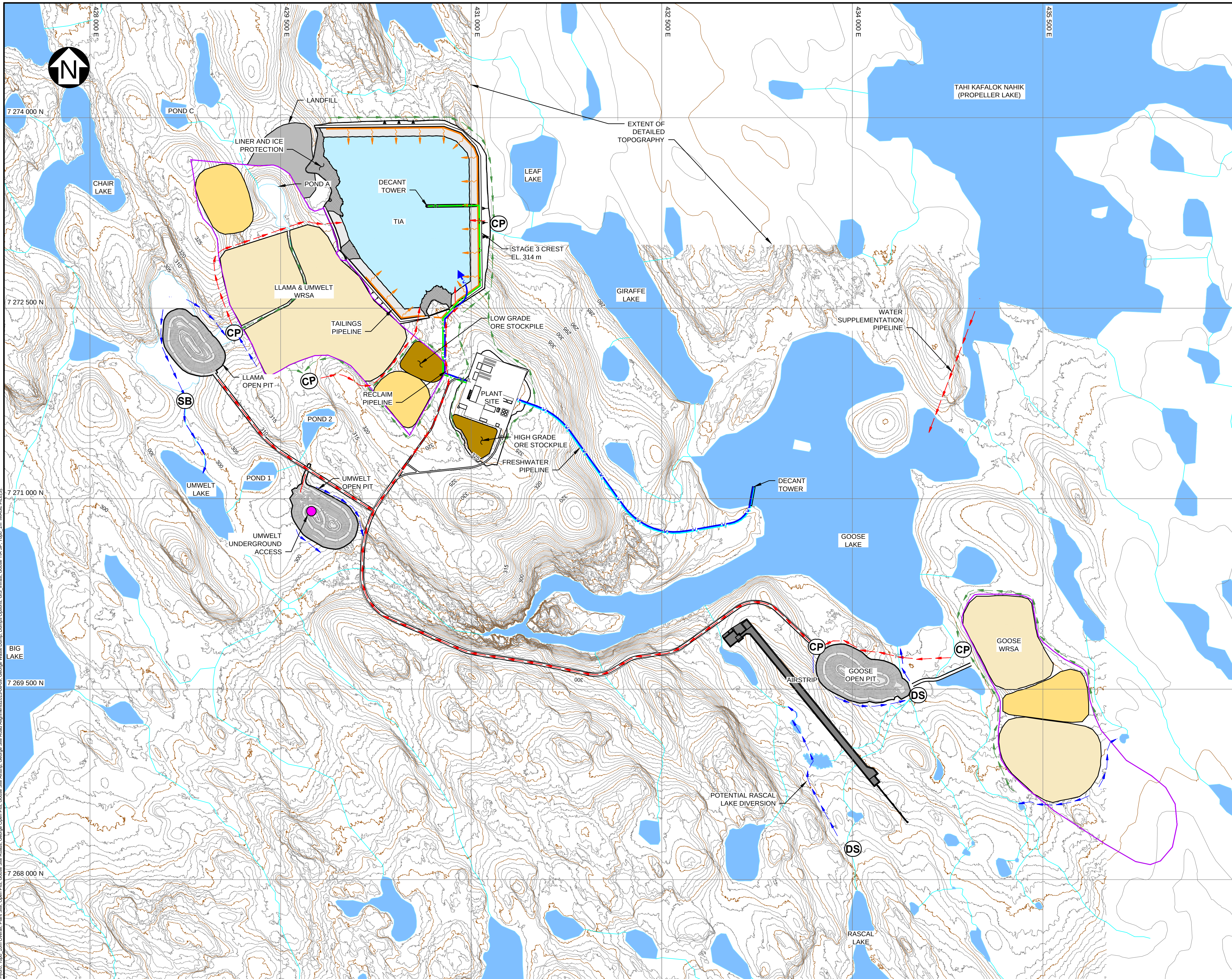
Water at the Goose Property will be drawn from Goose Lake. The intake location and consumption rates during the various Project phases are summarized in Table 3.2-1. The proposed water intake location on Goose Lake is shown on Figure 3.2-1.

Water at the George Property will be drawn from George Lake. The proposed water intake location on George Lake is shown on Figure 3.2-2. The intake location and consumption rates during the various Project phases are summarized in Table 3.2-1.

The MLA will be constructed on southern Bathurst Inlet. Construction of the MLA is expected to begin in Year -2 and will be completed for the beginning of the operation phase. Water at the MLA will be drawn from Bathurst Inlet and will be desalinated using a reverse osmosis plant. The brine from the desalinization process will be reconstituted when possible and discharged to the ocean. The location of the water intake, details on reconstitution, and location of the brine discharge outfall will be identified in a future update of this plan. Consumption rates at the MLA during the various Project phases are summarized in Table 3.2-1.

3.2.3 Winter Road

Overland access to the Project is possible between January and April each year. During site preparation and construction, equipment, material and supplies delivered by air or overland via the MLA winter road will be staged at the Goose Property. Equipment, material and supplies required for the development of the George Property will be transported during the winter months via the Goose-George winter road. Annually, in early December, preparation of the winter road linking the MLA to the Goose and George Properties will be undertaken. Once the winter road is ready for traffic, then the equipment, material, fuel and supplies staged at the MLA will be transported by trucks over the winter road to either the Goose or George Property. It is expected that the transfers will occur annually between January and April. Water will be drawn from various sources along the alignment of the winter road. Sabina will adhere to the DFO Operational Statements on Mineral Exploration, Culvert Maintenance, Ice Bridges and Snow Fills (DFO, 2009) as well as the DFO Under-Ice Water Withdrawal Protocol (DFO, 2010). Water supply locations for the winter roads and consumption rates will be included in a future version of the plan.



LEGEND:

- WATER
- nPAG STOCKPILE
- PAG STOCKPILE
- DEIS WRSA
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERMS
- SB SEDIMENT BASINS
- CP COLLECTION POND
- DS DIVERSION STRUCTURE

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 1 METRE.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. AIRSTRIP LAYOUT AND ROAD ALIGNMENTS PROVIDED BY EBA.
6. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

SCALE A 300 150 0 500 1000 1500 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GOOSE PROPERTY WATER MANAGEMENT OPERATION PHASE

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB101-517/2	6

FIGURE 3.2-1 — REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	20NOV'13	ISSUED WITH REPORT	RDW	AS	RAC	SRA

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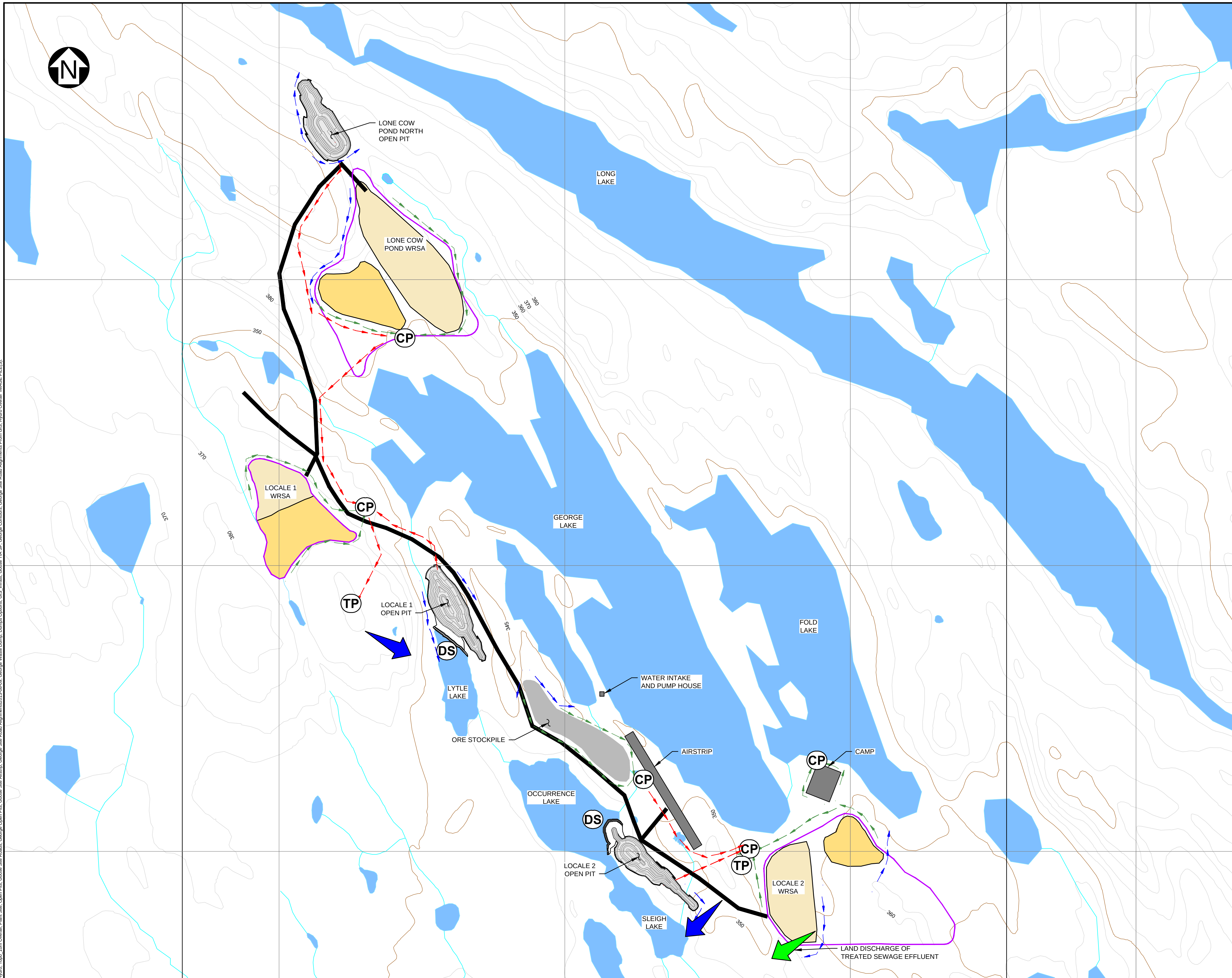

LEGEND:

- WATER
- nPAG STOCKPILE
- PAG STOCKPILE
- DEIS WRSA
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERMS
- CP COLLECTION POND
- DS DIVERSION STRUCTURE
- TP TREATMENT PLANT
- FINAL DISCHARGE OF MINE EFFLUENT
- FINAL DISCHARGE OF TREATED SEWAGE EFFLUENT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. AIRSTRIP LAYOUT AND ROAD ALIGNMENTS PROVIDED BY EBA.
6. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

SCALE A: 200 100 0 200 400 600 800 1000 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GEORGE PROPERTY
WATER MANAGEMENT
OPERATION PHASE

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB101-517/2	6

FIGURE 3.2-2 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	20NOV'13	ISSUED WITH REPORT	RDW	AS	RAC	SRA

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XREF FILE(S): Hydro; Topo_10m Overall; Plant Site; Open Pits; Goose Site Roads; George Open Pits; Goose Open Pits; Goose Site Airstrip; George Site Road Alignments2013-08-09; George Waste Dump; Dumps Options; GIS_Infrast; Goose TIA SF; George Contours; George Site Road Alignments From GIS; Hydro Overall IMAGE FILE(S):

Table 3.2-1. Water Supply Locations and Volumes by Project Phase

	Construction		Operation		Closure		
Project Area	**Daily (m^3/day)**	**Annual (m^3/year)**	**Daily (m^3/day)**	**Annual (m^3/year)**	**Daily (m^3/day)**	**Annual (m^3/year)**	**Sources**
Goose Property							Goose Lake Propeller Lake other local lakes
domestic water supply	210	76,650	210	76,650	15	1,800	
Miscellaneous industrial/camp use	70	25,550	70	25,550	70	8,400	
Freshwater makeup - year round	2,510	916,150	2,510	916,150	26,667	4,000,000	
Freshwater makeup - June only	4,510	135,300	4,510	135,300	n/a	n/a	
George Property							George Lake Lower Long Lake other local lakes
Domestic water supply	45	16,425	45	16,425	10	1,200	
Miscellaneous industrial/camp use	70	25,550	70	25,550	70	8,400	
Freshwater makeup - George Lake	n/a	n/a	n/a	n/a	3,333	500,000	
Freshwater makeup - Lower Long Lake	n/a	n/a	n/a	n/a	12,667	1,900,000	
Marine Laydown Area							Bathurst Inlet (marine)
Domestic water supply	30	10,950	30	10,950	n/a	n/a	
Miscellaneous industrial/camp use	20	7,300	20	7,300	n/a	n/a	

3.3 SEWAGE TREATMENT AND DISPOSAL

3.3.1 Sewage Discharge Criteria

Treated sewage effluent discharged by the Project will meet the discharge limits in Table 3.3-1. Separate criteria are identified for land discharges (ultimately reporting to freshwater), discharges to the Tailings Impoundment Area (TIA), and discharges to land ultimately reporting to the marine environment.

3.3.2 Goose Property Sewage Treatment and Disposal

Sewage at the Goose Property will be treated using a package Wastewater Treatment Facility (WWTF), such as a Rotating Biological Contractor (RBC) or similar. The WWTF will be located in the plant site area and treated sewage effluent will be discharged to the TIA during the construction and operation phases of the Project. The final configuration has not been determined, but it is likely that the treated sewage effluent will be discharged through the process plant and make-up water pipeline to the TIA. This will avoid the need for a dedicated sewage outfall pipeline to the TIA.

Early in the construction phase before the TIA has been constructed as well as during the active closure phase when the TIA is being decommissioned, treated sewage effluent will be land discharged. The selected discharge location is the sloping land west of the plant site area that runs into Pond 2, then Pond 1, Umwelt Lake and eventually fish habitat at Goose Lake. Later in the closure phase, the Goose Property camp will revert back to incinerating toilets.

Off-specification treated sewage during upset conditions will be discharged to a small pond constructed near the WWTF for this purpose. Sludge will be incinerated or landfilled.

Table 3.3-1. Treated Sewage Effluent Criteria

Parameter	Land Discharges - Freshwater Environment MAC[1] (mg/L)	Discharges to TIA MAC[1] (mg/L)	Land Discharges - Marine Environment MAC[1] (mg/L)
BOD_5	30	100	100
Total Suspended Solids (TSS)	35	120	120
Fecal Coliform (CFU/100 mL)	1,000	10,000	10,000
Ammonia (NH_3-N)	4 8[2]	Not applicable[3]	--
Phosphorus	4 8[2]		--
Oil and Grease	No visible sheen		No visible sheen
pH	between 6.0 - 9.5		between 6.0 - 9.5
Toxicity	Not acutely toxic		Not acutely toxic

Notes:
[1] MAC - Maximum Average Concentration.
[2] Maximum Grab Concentration.
[3] The TIA will operate as zero discharge during operations; at closure the TIA supernatant will need to meet Metal Mine Effluent Regulation (MMER) discharge limits.

3.3.3 George Property Sewage Treatment and Disposal

Sewage at the George Property will also be treated using a package WWTF such as an RBC or similar during the construction, operation and active closure phases. Treated sewage effluent will be land discharged at a location south of the Locale 2 Waste Rock Storage Area (WRSA) as shown on Figure 3.2-2. The effluent will ultimately report to the stream downstream of Sleigh Lake and upstream of Esker Pond.

Off-specification treated sewage during upset conditions will be discharged to the closest collection pond. Any discharges of sewage effluent from the collection pond will need to meet the applicable discharge criteria. In-pond treatment by coagulation can be applied if required as a contingency. Sludge will be incinerated or landfilled.

3.3.4 Marine Laydown Area (MLA) Sewage Treatment and Disposal

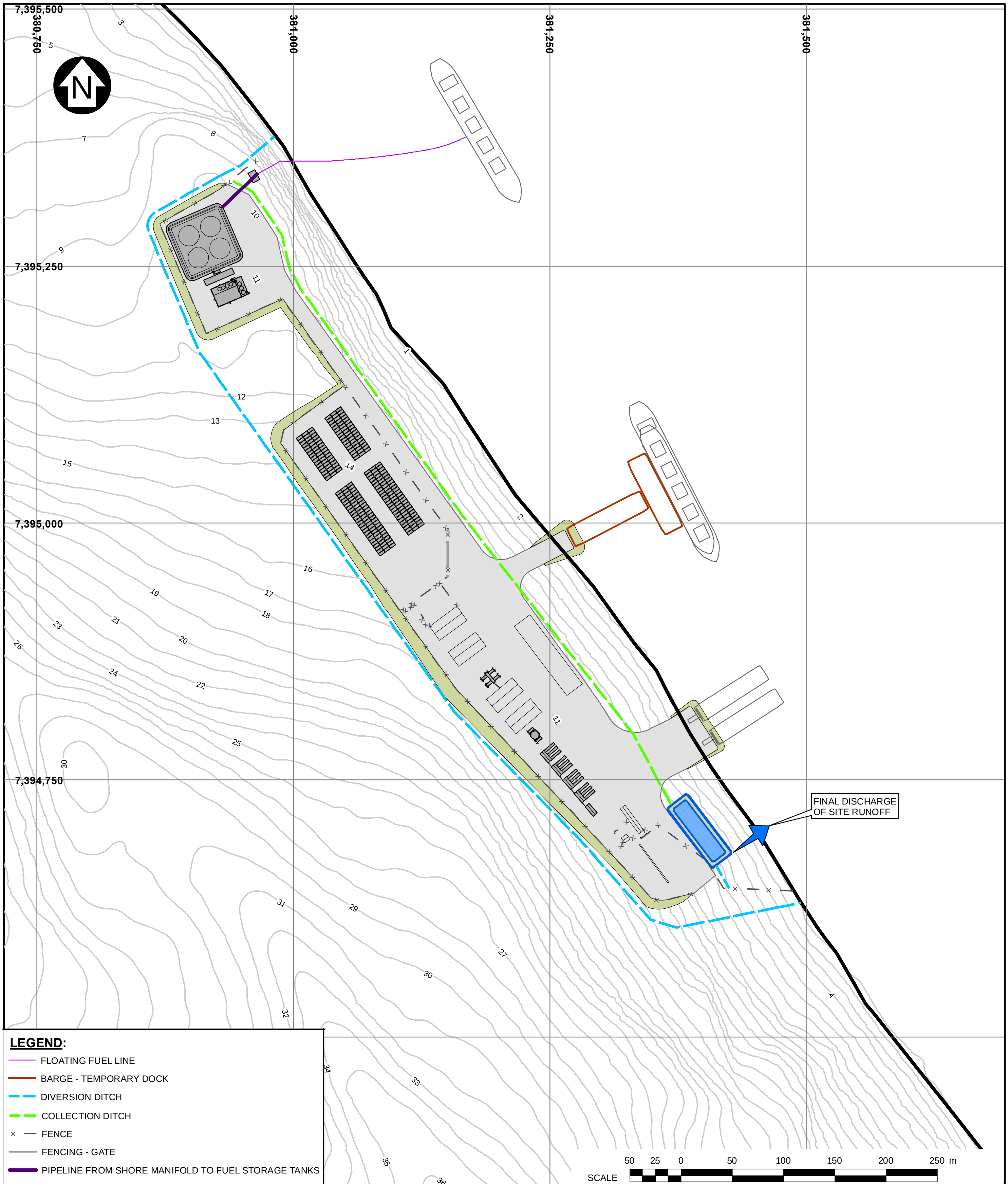
A package WWTF will be used to treat sewage at the MLA during the construction and operation phases. Treated sewage effluent will be discharged to land running off into Bathurst Inlet (Figure 3.3-1). Up to 50 m^3/d of sewage will be generated and treated during both the construction and operation phases. Treated sewage will meet the ocean disposal criteria identified in Table 3.3-1. Sludge will be incinerated or landfilled.

During the closure phase, the MLA camp will revert back to pacto or incinerating toilets.

3.4 WATER MANAGEMENT – GENERAL SITE RUNOFF

3.4.1 General Site Runoff

The general site runoff includes runoff that does not contact mine wastes. Site runoff may contain suspended solids due to erosion of ground surfaces, or oils and grease from heavy equipment. General site runoff will meet the discharge criteria presented in Table 3.4-1.



LEGEND:

- FLOATING FUEL LINE
- BARGE - TEMPORARY DOCK
- DIVERSION DITCH
- COLLECTION DITCH
- FENCE
- FENCING - GATE
- PIPELINE FROM SHORE MANIFOLD TO FUEL STORAGE TANKS
- COLLECTION POND
- BUILDING
- UNLOADING VESSEL
- NATURAL SHORELINE
- LAYDOWN PAD
- COLLECTION POND
- BUILDING/STRUCTURE
- PORT SITE EXTENT CUT/FILL AREA
- CONTOUR

NOTES:

1. PLAN BASED ON INFORMATION PROVIDED BY SABINA GOLD & SILVER CORP., (NOVEMBER, 2013).
2. COORDINATE GRID IS IN METRES. Coordinate System: NAD 1983 UTM Zone 13N.
3. CONTOUR INTERVAL IS 1 METRE.

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

MARINE LAYDOWN AREA WATER MANAGEMENT OPERATION PHASE

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB101-517/2	6

FIGURE 3.3-1 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
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Table 3.4.1. Site Runoff Discharge Criteria

Parameter	Maximum Average Concentration (mg/L)	Grab Sample Maximum Concentration (mg/L)
TSS (Construction)	50	100
TSS (Operations)	15	30
Oil and Grease	No visible sheen	No visible sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

Ditching, berms and sediment and erosion control measures such as sediment basins, rock flow check dams and rock armouring will be implemented (where appropriate) to manage the erosion of ground surfaces and reduce runoff of sediment into nearby waters. Environmental protection measures for site runoff are presented in Section 6.

Water management plans presented in Figures 3.2-1, 3.2-2, and 3.3-1 will be updated prior to construction.

3.4.2 Soil Landfarms

Soil that has been contaminated with hydrocarbons as a result of accidental releases of fuel will be placed in a lined containment area (landfarm) to be bio-remediated to site remediation guidelines for industrial land use as shown in Table 3.4-2.

Table 3.4-2. Soil Remediation Criteria

Soil Texture	Fraction 1 (C6-C10)	Fraction 2 (>C10-C16)	Fraction 3 (>C16-C34)	Fraction 4 (>C34)
Fine-grained	320 (170[2])	260 (230[2])	2,500	6,600
Coarse grained	320 (240[2])	260	1,700	3,300

Notes:
[1] *Source: Government of Nunavut (2009).*
[2] *Where applicable, for protection against contaminated groundwater discharge to an adjacent surface water body or for protection of potable groundwater.*

Soil that has been remediated to meet the above criteria will be used as either cover material at one of the landfills, or in the TIA or a WRSA.

Water pooling within the landfarm will be monitored for quality and will be sent to the TIA or released to designated terrestrial locations. The pooling water will be released to the receiving environment if it complies with discharge water criteria presented in Table 3.4-3. Otherwise, treatment will be provided.

3.4.3 Oily Water, Ice, and Snow

Oily water, ice and snow may be generated from the following activities:

- Snow clearing operations.
- Precipitation accumulating in lined soil remediation landfarms.
- Precipitation accumulating in lined bulk fuel storage facilities.
- Accidental releases of fuel or other substances.

Table 3.4-3. Proposed Landfarm Pooling Water Quality Discharge Criteria

Parameter	Grab Sample Maximum Concentration (mg/L)
pH	Between 6.0 and 9.5
Total Suspended Solids	15
Oil and Grease	15 no sheen
Total lead	0.01
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.09

Potentially contaminated water, ice and snow will be collected in a lined pond for treatment. Treated oily water will not be discharged directly to a waterbody. Treated oily water will be discharged to land in the summer at a minimum setback of 30 m from waterbodies provided that the water meets the criteria specified in Table 3.4-4.

Table 3.4-4. Oily Water Discharge Criteria

Parameter	Grab Sample Maximum Concentration (mg/L)
pH	Between 6.0 and 9.5
TSS	35
Oil and Grease	15 no sheen
Total lead	0.20
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.090
Ammonia	4
Arsenic	0.5
Copper	0.30
Nickel	0.50
Zinc	0.50

3.4.4 Quarries and Borrow Areas

Rock quarries and sand and gravel borrow areas will be developed at each of the Project sites to facilitate construction. A Borrow Pits and Quarry Management Plan has been developed to outline procedures for operating the quarries, as well as environmental protection measures and monitoring plans. Runoff from quarries and borrow area excavations will be managed in accordance with the environmental protection measures outlined in Section 6.6.

Runoff from the quarries and borrow pits can be elevated in suspended solids as well as possibly hydrocarbons from minor spills during refueling of equipment, and residual concentrations of ammonia from the use of Ammonia Nitrate Fuel Oil (ANFO) explosives. Runoff will be collected within the work area and will only be discharged to land if meeting the water quality criteria in Table 3.4-5.

Table 3.4-5. Quarry Runoff Criteria

Parameter	Grab Sample Maximum Concentration (mg/L)
Total Arsenic	0.50
Total Copper	0.30
Total Lead	0.20
Total Nickel	0.50
Total Zinc	0.50
Total Suspended Solids	50.0
Ammonia (NH3-N)	4.0
Oil and Grease	No visible sheen
pH	Between 6.0 and 9.5

3.4.5 Landfills

Landfills will be constructed and operated at each of the Project properties. The landfills will be used for the disposal of inert and non-combustible wastes as combustible non-hazardous wastes will be incinerated. As a consequence, the landfills are expected to generate minimal leachate. The landfill at the MLA will be subject to the landfill seepage criteria identified in Table 3.4-6.

Table 3.4-6. Landfill Seepage / Groundwater Quality Criteria

Parameter	Grab Sample Maximum Concentration (mg/L)
Total Arsenic	0.5
Total Copper	0.3
Total Lead	0.2
Total Nickel	0.5
Total Zinc	0.5
TSS	15
Oil and Grease	No visible sheen
pH	Between 6.0 and 9.5

The Goose Property landfill will be located between the Umwelt/Llama WRSA and the TIA as shown on Figure 3.2-1. The George Property landfill will be located to the east of the Locale 2 WRSA as shown on Figure 3.2-2. Seepage from both of these landfills will be collected with mine contact water and will therefore be subject to meeting the mine contact water quality requirements.

3.5 WATER MANAGEMENT – SPECIFIC CONSTRUCTION ACTIVITIES

3.5.1 Water Crossings

Two types of stream crossings are being considered for the site roads:

- Relatively small crossings assuming non fish-bearing water.
- Larger crossings assuming fish-bearing water.

The smaller crossings will use large diameter culverts, while the larger crossings will use a combination of single-lane modular free-span bridges or culverts. In the design, an allowance will also be included for regular drainage culverts and road signs. Water crossings may be the subject of a DFO authorization or Letter of Advice.

No infilling of lakes or stream crossings will be required.

3.5.2 Water Intakes

Water intake structures will be constructed in Goose Lake to supply both domestic, industrial and process make-up water, and in George Lake to supply domestic and industrial needs. The selected locations for the intakes are deep locations close to shore. The water intake structures are expected to consist of an insulated PVC pipe installed into the lake on a rockfill base to keep the pipe off the bottom of the lake. Armour rock will be placed over the pipeline to provide ice scour protection. A water treatment plant will house pumps and water treatment equipment. Insulated HDPE pipelines will convey the water from the intake to the pumphouse and on to the process plant and camps.

The construction of the intake will involve construction in and near water. To limit disruption to aquatic resources, the following practices will be implemented:

- Only clean armour rock (free of sediment) will be placed in the water during construction to minimize turbidity in the water during construction of the intake.
- In-water works will be isolated using silt curtains.
- Construction will be carried out during calm periods to minimize any turbidity effects due to the re-suspension of sediment.
- TSS and turbidity levels will be monitored during the construction.

No in-water blasting will be conducted during the construction of the water intake. Both water intakes will be equipped with screens to prevent the entrainment or impingement of fish in accordance with DFO (1995) requirements.

Additional design details will be provided in a future update to this plan.

3.5.3 Llama Lake Dewatering

Llama Lake will be dewatered to access the Llama open pit. In advance of the dewatering, a “fish-out program” will be completed. The fish-out program would follow the DFO’s *General Fish-Out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut* (Tyson *et al.*, 2011). In addition to following the DFO protocols for a fish-out, Sabina will collaborate with communities to involve interested parties in the program with the possibility to distribute fish for human or dog consumption (Rescan, 2013a). Lake dewatering can commence when the catch-per-unit-effort (CPUE)/recapture phase of the Fish-out Program, described in the Aquatic Effects Monitoring Plan, has been completed (typically between August and September).

At the time of the dewatering, the mining of the Umwelt open pit will be underway and the process plant and TIA will be operational. Approximately 900,000 m^3 of water will be transferred to the TIA from Llama Lake. This water transfer will contribute to the required water cover in the TIA early in operations.

Once the lake dewatering is complete, lake bottom sediments within the pit boundaries plus a buffer will be excavated and trucked to the TIA for disposal.

During lake dewatering, sediment basins will be established downstream of the lake as required and eventually within the drained basins around the pit. Perimeter diversion ditches/berms will be established around the future open pit to divert water away from the area, and collection ditches will direct runoff to a collection pond on the east side of the pit (Figure 3.2-1).

3.5.4 Potential Diversion of Rascal Lake Outlet

The existing outflow channel from Rascal Lake passes through the future airstrip extension and the proposed Goose Open Pit. To allow for construction of the airstrip and mining of the Goose open pit, a diversion of the outflow channel is proposed.

The Rascal Lake diversion will involve the construction of either one large or a series of smaller berms to divert flow from the eastern channel outflow. The water will be allowed to flow naturally from the western outlet of Rascal Lake to Goose Lake without excavating diversion channels. Construction will be completed during winter when the lake and outlets are completely frozen to eliminate the need for cofferdams. No in-water blasting will be conducted during the construction.

The diversion of the Rascal Lake outlet has been identified as a candidate for a fisheries offsetting project, and is described further in the Conceptual No Net Loss Plan (Fisheries Offsetting Plan) in this volume.

3.5.5 Water Supplementation Pipeline from Propeller to Goose Lake

The maximum water that can be withdrawn from Goose Lake without impacting fish and fish habitat (i.e., such that no HADD is incurred) is in the range of 1,000 m^3/day year-round and 2,000 m^3/day during the freshet period (June). The supplementary water usage has been estimated at a drawdown of no more than 6 cm during the winter months and 10 cm during ice-free periods from either Goose Lake or Propeller Lake.

The current operation phase water balance suggests that the make-up water demand from Goose Lake is within the ranges presented above; however, Sabina may elect to draw more than the maximum water use from Goose Lake during operations under unexpected circumstances. During the active closure phase when open pits are filled, it will be necessary to draw from both Goose and Propeller Lakes. As such, the Project includes the construction of a pump house and pipeline to potentially supplement the water demand of the milling operation from Propeller Lake, and to support active pit filling during closure. The intake and outfalls will likely be insulated reclaim barges to allow for year-round water withdrawals. Active pit filling, however, will only occur during the summer months (Section 3.7.1).

3.5.6 Dyke Construction at Occurrence Lake and Lytle Lake

At the George Property, the Locale 1 open pit will impinge on Lytle Lake and the Locale 2 open pit will impinge on Occurrence Lake. Impermeable retention dikes will be constructed to isolate the pits from these lakes. The dykes will be approximately 3 m in height from base to crest.

At the Locale 1 pit location, it will be necessary to excavate a diversion channel to allow the inlet of Lytle Lake (outlet of George Lake) to bypass the pit, and to construct a dyke to hold back the waters of Lytle Lake from the pit.

At the Locale 2 pit location, it will be necessary to divert local drainages around the pit perimeter, and to construct a similar dyke to hold back the waters of Occurrence Lake from the pit.

Ongoing feasibility studies will investigate these dykes and options will consider use of available mine waste material and various alternatives for seepage control such as glacial till, geosynthetic clay liners and slurry or sheet-pile cutoff walls or some combination of seepage control measures.

Both lakes are shallow and freeze to the bottom in winter. As such, the lakes may provide seasonal fish habitat during open water only. To limit downstream impacts due to the construction, the dykes will be constructed when the lakes are frozen to the bottom and fish are not present.

During the subsequent open water season, water will be pumped initially into the adjacent lake. The potential effect to the receiving environment resulting from lake dewatering is an increase in turbidity and total suspended solids (TSS) due to disturbance of lake sediments while water levels drop in the lake being dewatered. Clean lake water will be transferred and monitored for turbidity and total suspended solids (TSS), until the TSS threshold is reached. As dewatering advances and the potential for sediment increases, water from the dewatered pit side of the dyke will be directed to a local collection pond to settle out the solids and for monitoring prior to discharge. It is expected that the water in the collection ponds will not require treatment beyond the settling of solids, and therefore the ponds may be decanted to the adjacent tundra to further settle out the solids.

Excavated lake bottom sediment will be disposed of within the WRSAs. No in-water blasting will be conducted during the construction of the dykes.

The experience gained from the dewatering of Llama Lake will inform the strategy for the dewatering of these two lakes, as the development of these deposits currently follows the Llama deposit in the mine plan.

3.6 WATER MANAGEMENT – MINE OPERATION

3.6.1 Mine Contact Water Discharge Criteria

Mine contact water is water that has contacted ore and mine wastes. This includes discharges from the TIA (none are planned during operation), runoff from ore and waste rock stockpiles, and water that has been pumped from open pits during mine operations (or from pit lakes at post-closure).

Mine contact water discharged to freshwater receiving waters at the Goose and George Properties will be treated to the levels specified in the MMER at the final discharge point.

In addition to the MMER discharge criteria, Sabina will meet the Water Quality Objectives (WQOs) in the receiving waters. The WQOs are the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME, 2013) or site-specific WQOs developed under the Canadian Council of Ministers for the Environment (CCME; 2007) framework or other scientifically defensible means.

3.6.2 Site Water Balances

A monthly operational water balance was developed for the Project using the GoldSim© software package (Knight Piésold, 2013b). The intent of the modelling was to estimate the magnitude and extent of any water surplus and/or deficit conditions in the Goose Property TIA, and to determine potential volumes of WRSA runoff requiring water treatment at the George Property, based on a range of possible climatic conditions. The modelling timeline included one year of pre-production (Year -1) and 9.5 years of operations at a nominal milling rate of 5,000 tpd.

The potential variability of runoff conditions was accounted for in the analyses by using a stochastic version of the water balance model that incorporates Monte Carlo type simulation techniques. The difference between a stochastic and deterministic model is that the monthly runoff parameters in the stochastic model were modelled as probability distributions rather than simply as mean values. The year-to-year variability of monthly runoff was quantified using coefficient of variation (C_v) values that were derived from a long-term synthetic streamflow record.

High and low runoff scenarios were modeled for each property water balance. The high runoff scenario used an estimated runoff of 186 mm/year (Knight Piésold, 2013b). This was combined with runoff coefficients of 0.7 from the open pits and 0.6 from the WRSAs for the high runoff scenario. The runoff coefficients for the open pits and WRSAs used in the low runoff scenario were 0.5 and 0.3, respectively. The model is sensitive to input parameters, including the timing of mill start-up, runoff coefficients, and seasonal ice development.

Water balance schematics for the operation phases at the Goose Property (Year 2) and George Property (Year 7) are presented as Figure 3.6-1 and 3.6-2. These periods of time were selected because they represented the busiest periods of operation at each Property.

The following are the assumptions used in the model to develop the Goose Property water balance:

- The mill starts up in January of Year 1.
- The minimum TIA pond volume is assumed to be 100,000 m^3.
- The Llama Lake volume of 900,000 m^3 is pumped to the TIA once the stage 1 embankment is constructed. This volume of water is used for mill start-up.
- The catchments upslope of mine facilities (including the pits, waste rock stockpiles, and TIA) will be pumped to the TIA.
- The catchments upslope of the Llama and Umwelt open pits will be diverted to Umwelt Lake.

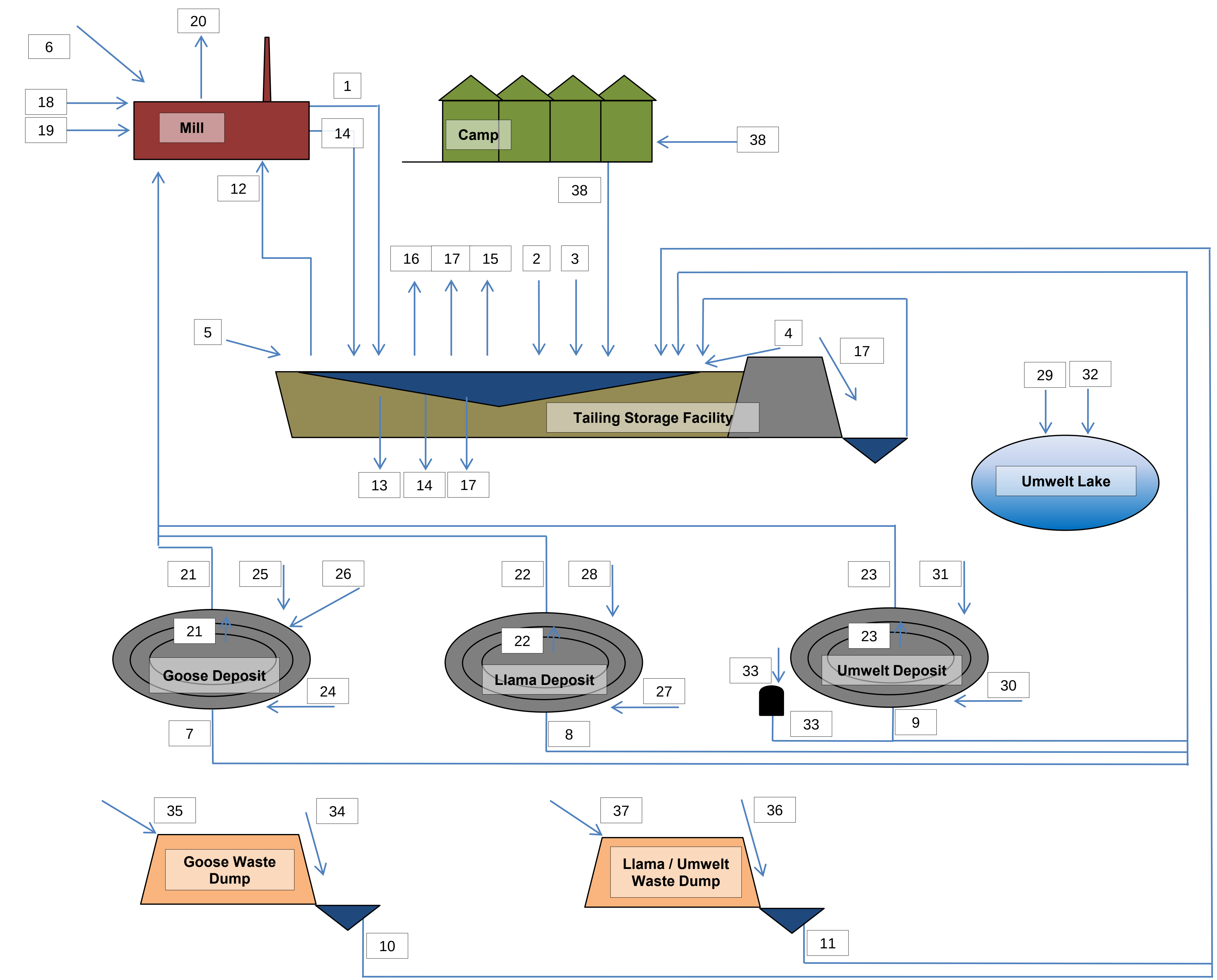
The open pits are dewatered to the TIA during their respective mining period (i.e., Umwelt open pit is dewatered to the TIA from Year 1.5 to Year 2.5).

The George Property was modeled as a separate entity and is comparatively simple since there is no TIA or process plant. Water management at the George Property is limited to camp water usage and sewage disposal, as well as the collection, treatment and discharge of runoff from mining areas.

Key questions for the site water balances included:

- Determining whether the TIA will be in a surplus or deficit and the resultant make-up water requirements for the mill at the Goose Property.
- Determining the volume of water reporting to collection ponds at the George Property requiring treatment.

The results for the 5th percentile, median (50th percentile) and 95th percentile climatic conditions were presented for each of the low and high runoff scenarios. The 95th percentile values correspond to abnormally wet conditions, and represent the values that are likely to be exceeded only 5% of the time. Conversely, the 5th percentile results correspond to abnormally dry conditions and represent the values that are likely to be exceeded 95% of the time. The median (50th percentile) presents the mid-point of climatic conditions.



Number	Description	Average Annual Volume (m^3/year)	
		High Runoff Scenario	Low Runoff Scenario
	Tailing Storage Facility		
	Inflows		
1	Tailings Slurry	1,880,000	1,880,000
2	Ice Melt (65% June and 35% July)	750,000	690,000
3	Supernatant Pond Precipitation	140,000	130,000
4	Tailings Beach Runoff	50,000	40,000
5	Catchment Runoff	240,000	210,000
6-11, 33, 38	Inputs from other areas	1,341,200	919,200
	Outflows		
12	Reclaim	1,620,000	1,620,000
13	Tailings Voids	820,000	820,000
14	Ice Entrainment (assumed 30% of water in tailings stream Oct. - May)	380,000	380,000
15	Supernatant Pond Ice Formation	1,030,000	920,000
16	Evaporation	90,000	80,000
17	Seepage	0	0
	Mill		
	Inflows		
12	Reclaim from TSF	1,620,000	1,533,000
18	Fresh Water (reagent mixing and gland seal)	237,000	237,000
19	Make-up Water from Goose Lake (as necessary)	0	87,000
6	Catchment Runoff	82,000	82,000
21, 22 & 23	Water In Ore	73,000	73,000
	Outflows		
1	Tailing Slurry	1,880,000	1,880,000
20	Lost to Cyanide Circuit	50,000	50,000
6	Catchment Runoff	82,000	82,000
	Deposit Areas		
	Goose Deposit		
	Inflows		
24	Groundwater to Open Pit	0	0
25	Open Pit Runoff	1,000	1,000
21	Water In Ore	1,000	1,000
26	Catchment Runoff	85,000	44,000
	Outflows		
7	Open Pit Dewatering	86,000	45,000
21	Water in Ore	1,000	1,000
	Llama Deposit		
	Inflows		
27	Groundwater to Open Pit	0	0
28	Open Pit Runoff	19,000	13,000
22	Water In Ore	30,000	30,000
29	Catchment Runoff	243,000	296,000
	Outflows		
8	Open Pit Dewatering	19,000	13,000
22	Water In Ore	30,000	30,000
	Umwelt Deposit		
	Inflows		
30	Groundwater to Open Pit	0	0
31	Open Pit Runoff	53,000	38,000
23	Water In Ore	42,000	42,000
32	Catchment Runoff	22,000	15,000
33	Groundwater to Underground	0	0
	Outflows		
9	Open Pit Dewatering	0	0
33	Underground Dewatering	0	0
23	Water In Ore	42,000	42,000
	Waste Rock Dumps		
	Goose Waste Dump		
	Inflows		
34	Waste Rock Runoff	250,000	125,000
35	Catchment Runoff	0	0
	Outflows		
10	Runoff Collection	250,000	125,000
	Llama / Umwelt Waste Dump		
	Inflows		
36	Waste Rock Runoff	361,000	180,000
37	Catchment Runoff	441,000	372,000
	Outflows		
11	Runoff Collection	802,000	552,000
	Camp		
	Inflows		
38	Domestic and Miscellaneous Industrial Uses	102,200	102,200
	Outflows		
38	Grey Water	102,200	102,200

NOTES:

1. RUNOFF = PRECIPITATION x RUNOFF COEFFICIENT; THE RUNOFF COEFFICIENT ACCOUNTS FOR INFILTRATION, EVAPORATION, EVAPOTRANSPIRATION, AND SUBLIMATION.
2. THE UMWELT PIT IS DECOMISSIONED IN JUNE OF YEAR 2. THE CATCHMENT RUNOFF RESULTING FROM SPRING MELT IS NOT PUMPED TO THE TSF AFTER DECOMISSIONING OF THE OPEN PIT.

0	20NOV'13	ISSUED WITH REPORT	RDW	RAC	RAM
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GOOSE MINE SITE
WATER BALANCE SCHEMATIC
YEAR 2

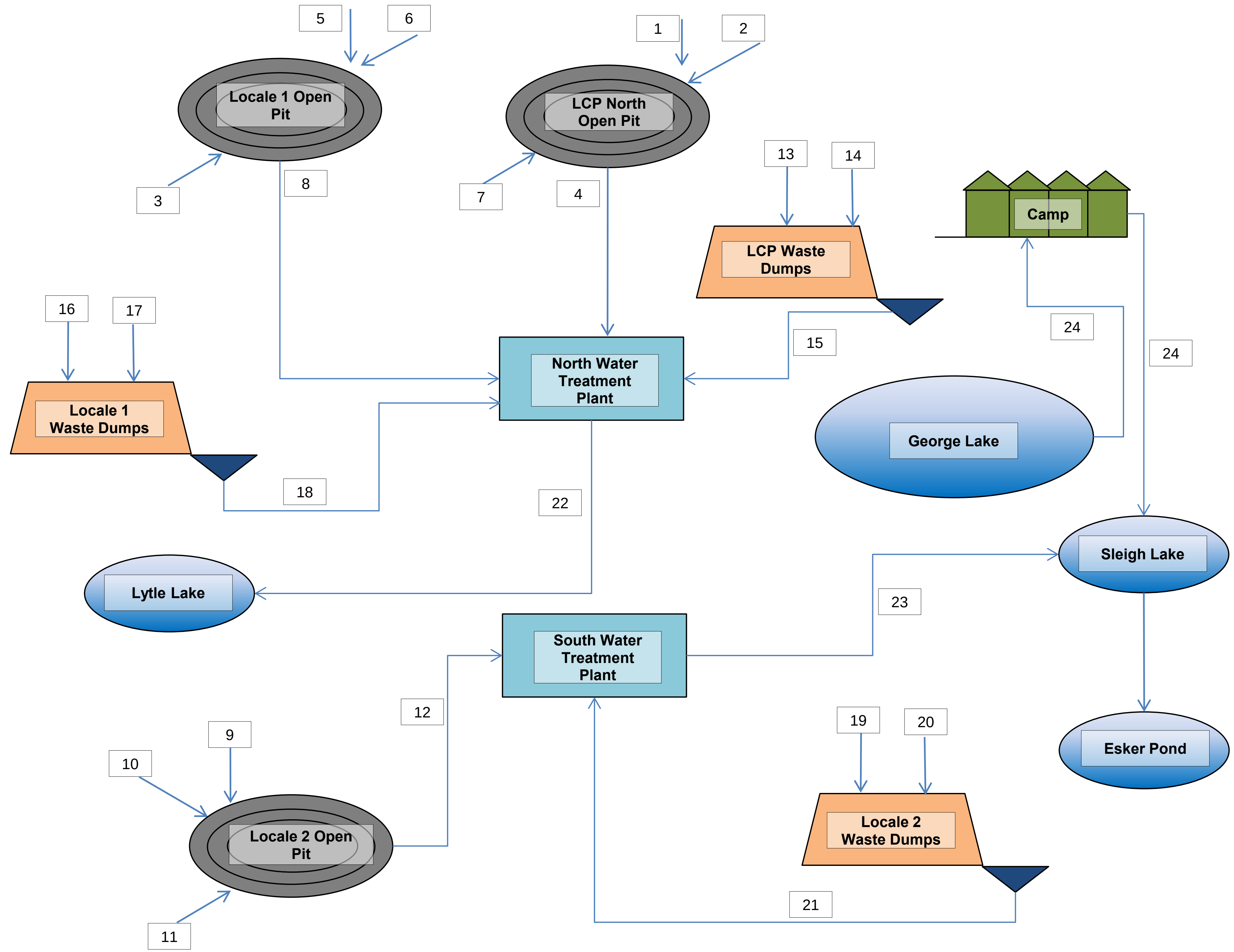
Knight Piésold CONSULTING

P/A NO. NB101-517/2

REF. NO. 6

FIGURE 3.6-1

REV 0



Number		Description	Average Annual Volume (m³/year) High Runoff Scenario	Low Runoff Scenario
		Deposit Areas		
		LCP North Open Pit		
		Inflows		
	1	Open Pit Runoff	5,000	4,000
	2	Catchment Runoff	27,000	18,000
	3	Groundwater to Open Pit	0	0
		Outflows		
	4	Open Pit Dewatering	32,000	22,000
		Locale 1 Open Pit		
		Inflows		
	5	Open Pit Runoff	5,000	4,000
	6	Catchment Runoff	38,000	25,000
	7	Groundwater to Open Pit	0	0
		Outflows		
	8	Open Pit Dewatering	43,000	29,000
		Locale 2 Open Pit		
		Inflows		
	9	Open Pit Runoff	4,000	3,000
	10	Catchment Runoff	12,000	8,000
	11	Groundwater to Open Pit	0	0
		Outflows		
	12	Open Pit Dewatering	16,000	11,000
		Waste Rock Dumps		
		LCP Waste Dumps		
		Inflows		
	13	Waste Rock Runoff	77,000	38,000
	14	Catchment Runoff	65,000	43,000
		Outflows		
	15	Runoff Collection	142,000	81,000
		Locale 1 Waste Dumps		
		Inflows		
	16	Waste Rock Runoff	27,000	14,000
	17	Catchment Runoff	56,000	37,000
		Outflows		
	18	Runoff Collection	83,000	51,000
		Locale 2 Waste Dumps		
		Inflows		
	19	Waste Rock Runoff	77,000	38,000
	20	Catchment Runoff	36,000	24,000
		Outflows		
	21	Runoff Collection	113,000	62,000
		North Water Treatment Plant		
		Inflows		
4	8	Open Pit Dewatering	75,000	51,000
15	18	Waste Rock Runoff	225,000	132,000
		Outflows		
	22	Treated Water	300,000	183,000
		South Water Treatment Plant		
		Inflows		
	12	Open Pit Dewatering	16,000	11,000
	21	Waste Rock Runoff	113,000	62,000
		Outflows		
	23	Treated Water	129,000	73,000
		Camp		
		Inflows		
	24	Domestic and Miscellaneous Industrial Uses	42,000	42,000
		Outflows		
	24	Grey Water	42,000	42,000

NOTE:
1. RUNOFF = PRECIPITATION x RUNOFF COEFFICIENT; THE RUNOFF COEFFICIENT ACCOUNTS FOR INFILTRATION, EVAPORATION, EVAPOTRANSPIRATION, AND SUBLIMATION.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	20NOV'13	ISSUED WITH REPORT	RDW	RAC	RAM

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GEORGE MINE SITE WATER BALANCE SCHEMATIC YEAR 7

Knight Piésold CONSULTING

P/A NO. NB101-517/2

REF. NO. 6

FIGURE 3.6.2

REV 0

Make-up Water Requirements at the Goose Property

As previously mentioned, a key line question with the water balance modelling was to determine what volume of supernatant in the TIA will be available to reclaim for processing and what volume of make-up water will be required from Goose Lake. This question was answered for the high and low runoff scenarios described above.

Under the high runoff scenario and median climatic conditions, the TIA will reach its maximum volume of 6.3 Mm^3 in Year 8, and the water accumulated in the TIA at closure will be approximately 6 Mm^3.

The TIA will require make-up water in Years 2 and 3 under the dry climatic conditions only.

No make-up water will be required under the median and 95th percentile wet conditions. Note that each instance of make-up water required is mutually exclusive; thereby the events do not influence one another. The model assumes that each individual monthly make-up water requirement is met, and does not influence the requirement in the next month.

Under the low runoff scenario and mean climatic conditions the TIA will reach its maximum volume of 3.7 Mm^3 in Year 8 and will contain approximately 3 Mm^3 of tailing supernatant at closure.

Under the low runoff scenario, the TIA will require make-up water most years under dry climatic conditions and in only one year under mean climatic conditions.

Volume of Mine Runoff Requiring Treatment at the George Property

The key question at the George Property was the volume of water that will be collected for treatment at the George Property from open pits and WRSAs. The average annual total volume of water requiring treatment at the George Property will range between 420,000 and 670,000 m^3/year under median climatic conditions. The contact water will be stored in collection ponds prior to treatment at the water treatment plants to regulate inflows. These volumes will support the sizing and design of the collection ponds, to be incorporated into a future update to this plan.

3.6.3 Open Pits

The open pits will accumulate water from direct precipitation. All open pits are contained within the continuous permafrost based on thermistor data (Knight Piésold, 2013b). As expected, hydrogeological data for the Project suggests that the rock is fairly impermeable with hydraulic conductivities in the order of 10^{-9} m/s. In areas of less competent rock (i.e., broken, shear and fault zones), hydraulic conductivities were observed to be between 10^{-9} to 10^{-6} m/s. As such, limited pit wall seepage is anticipated.

Accumulated precipitation in the pits at the Goose Property will be collected using in-pit sumps and pumped to the TIA (see Year 2 water balance for the Goose Property). Pit water at the George Property will be pumped to the same collection ponds that collect runoff from the WRSAs and ore stockpile.

Contingencies are available if inflows into the open pits are significantly larger than estimated. In the short-term this could be handled by temporarily removing workers and equipment from the pit until pumping facilities can catch up to the inflows. If higher inflows were sustained, larger pumping systems could be installed and the water balance for the TIA adjusted to reduce the volume of make-up water from Goose Lake to meet processing water requirements.

Runoff surrounding the Llama Pit will be collected in sediment basins around the pit perimeter to reduce the potential of the natural runoff from becoming contact water. These sediment basins will be pumped or gravity drained to Umwelt Lake. This arrangement will allow for a large portion of the catchment to continue to naturally feed the lake.

3.6.4 Umwelt Underground Mine

The mining method selected for the lower portion of the Umwelt deposit is post Pillar Cut-and-Fill (PPC&F). Mine development will start in Year 2 of the overall mine life, with ore production starting later that year and continuing to Year 8. Production will start at 500 t/d and increase to a peak of 1,500 t/d. Total production from the Umwelt underground mine will be 2.1 Mt.

PPC&F is a selective mining method where ore body extraction progresses up-dip in alternating cutting and filling cycles. The cutting takes the form of room and pillar mining on any given level. Once mining is completed on a level, the rooms are filled with waste rock and a new cut is started above the previous one. It is imperative that the pillars are vertically contiguous from the footwall to the hanging wall of the stope.

The Umwelt underground development is planned to a depth of approximately 660 m below ground surface (mbgs). At this depth, the planned workings will be approximately 260 m below the permafrost. As such, groundwater mine inflows are likely to be variable during development of the underground mine. Average groundwater inflows have been estimated at between 1 and 2 L/s (Knight Piésold, 2013b). Inflows of up to 10 L/s are considered possible for short periods of time.

Groundwater accumulating in the underground mine will be pumped to the TIA.

3.6.5 Waste Rock and Overburden Stockpiles

Waste rock and overburden will be co-disposed in WRSAs located near each of the open pits.

Runoff and seepage from the WRSAs will be collected in perimeter ditches directed towards collection ponds. Separate diversion ditches or berms will be used to direct surface waters away from the WRSA, to minimize the amount of contact water that needs to be managed.

During the operation phase, water accumulating in the collection ponds at the Goose Property will be pumped to the TIA (Figure 3.2-1). The WRSA runoff water accumulating in collection ponds at the George Property will be treated to meet the discharge limits prior to discharge. During the operation phase, treated mine contact water at the George Property will be discharged to land reporting to either Lytle Lake or Sleigh Lake (Figure 3.2-2).

Collection ponds will be sized with sufficient contingency to provide both operational flexibility and accommodate large flows based on appropriate return period storm events. This work will be completed during detailed engineering design and will be incorporated into an update to this management plan prior to construction.

3.6.6 Ore Crushing and Stockpiling Facilities

Runoff and seepage from the ore crushing and stockpiling facilities will be collected in perimeter ditches and directed towards collection ponds. The collected water will be managed with other mine contact water as described in Section 3.6.1.

3.6.7 Tailings Impoundment Area

The TIA will store both tailings solids and supernatant water. The TIA will be the used as the storage area for all Goose Property contact water from the open pits, underground workings, WRSAs and ore stockpiles. The TIA will also serve the main source of reclaim water for the mill, as described in the site water balance in Section 3.6.2. The TIA design is based on accommodating the 24-hour Probable Maximum Precipitation (PMP) event of 242 mm (Knight Piésold, 2013b).

By providing reclaim water to the mill process, the TIA will operate as a zero-discharge facility during the operation phase. No artesian inflow into the TIA is expected given the permafrost conditions at the site (the TIA is removed from lakes that may have taliks) and the incorporation of a liner in the design of the facility.

If processing were to halt for more than a single summer season under a scenario of temporary mine closure, the water level in the TIA would increase from precipitation inputs and runoff. The amount of available freeboard in the TIA will depend on when the last embankment raise occurred. If temporary mine closure persisted for more than a season, it may be necessary to treat and discharge tailings supernatant. Any treated tailings supernatant would be discharged to land upstream of Pond 2 once it means the mine contact water discharge criteria.

Minor seepage through the embankment of the TIA is expected due to defects in the liner. Perimeter ditching and/or berms will collect surface runoff and sub-surface seepage through the active layer to a collection pond and the water will be pumped back into the TIA.

3.6.8 Explosives Manufacture and Storage

Pre-packaged explosives delivered by air will be used early in construction until an ANFO-based emulsion plant is constructed at the Goose Property. Ammonium nitrate for ANFO production will be delivered to the mine site in shipping containers. The storage of pre-packaged explosives and ammonium nitrate is expected to represent a low potential to impact water resources.

An explosives truck wash facility will be constructed and operated at the ANFO emulsion plant. Wash water from this facility will be high in ammonia and possibly suspended solids or metals. This wash water will be transported and added to the sewage influent waste stream. Therefore, the explosives truck wash will be subject to the sewage effluent criteria identified in Table 3.3-1.

3.7 WATER MANAGEMENT – MINE CLOSURE

Water management plans for the properties are presented graphically on the following figures:

- Figure 3.7-1 - Goose Property Water Management – Active Closure Phase.
- Figure 3.7-2 – George Property Water Management – Active Closure Phase.
- Figure 3.7-3 – Goose Property Water Management – Post-Closure Phase.
- Figure 3.7-4 – George Property Water Management – Post-Closure Phase.

The total duration of the closure phase is 10 years, with the George Property closed out in the first four years. Additional detail is provided in Sabina's Preliminary Mine Closure and Reclamation Plan (Knight Piésold, 2013c).

Water management during this period relates to ongoing camp operation, active filling of open pits, and management of runoff from WRSAs. The plan will be in effect until the contact water meets discharge limits and receiving water quality objectives. At this point, passive discharge to the environment will be possible.

3.7.1 Open Pits

In terms of water management during closure, the open pits will be actively filled using fresh water from nearby lakes. This strategy will restrict the generation of acid and the subsequent leaching of metals. This is expected to ensure that the pit water will meet applicable discharge criteria so that the water can be passively discharged to nearby watercourses. Each pit will take between one and four years to fill.

The three pits at the Goose Property will be filled sequentially over a period of nine years by drawing water between June and October from Goose Lake. The amount of water available in nearby lakes for pit filling at the Goose Property that protects fish and fish habitat defines the schedule for active mine closure. The water from Goose Lake will be supplemented with water from Propeller Lake. Active pit filling will be sequenced according to the relative Acid Rock Drainage (ARD) potential. The Llama pit will be first followed by the Umwelt pit and Goose pit. Runoff from the Llama/Umwelt WRSA will be directed to the Llama pit to supplement pit filling. Treated tailings supernatant water will also be discharged to the Llama open pit.

The three open pits at the George Property can be filled over a period of two to four years by drawing water concurrently from Lower Long Lake and George Lake, allowing the George Property to be closed out in year four of closure.

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

- An annual water usage of 4 Mm^3 from Goose Lake, Propeller Lake and possibly other lakes at the Goose Property, as required.
- An annual water usage of 950,000 to 1.9 Mm^3 from Long Lake and 250,000 to 500,000 m^3 from George Lake.
- The quality of water discharged from the open pits, once filled, will be suitable for discharge without treatment. This strategy will be evaluated with water quality modelling in the FEIS.
- Overburden slopes around pit perimeters will be developed for long-term stability during pit development. This strategy will help ensure that additional reclamation work will not be required at closure.
- Diverted waterways around the Goose pit will not be re-established to their original flow paths.

Monitoring of the water quality in the pit lakes will be important prior to the end of the pit filling period in order to establish that the water to be passively discharged from the filled pits will meet discharge criteria. In the unlikely event that the water in any of the pit lakes is not suitable for discharge, the pit lake could be batch treated to address any remaining water quality impairments.

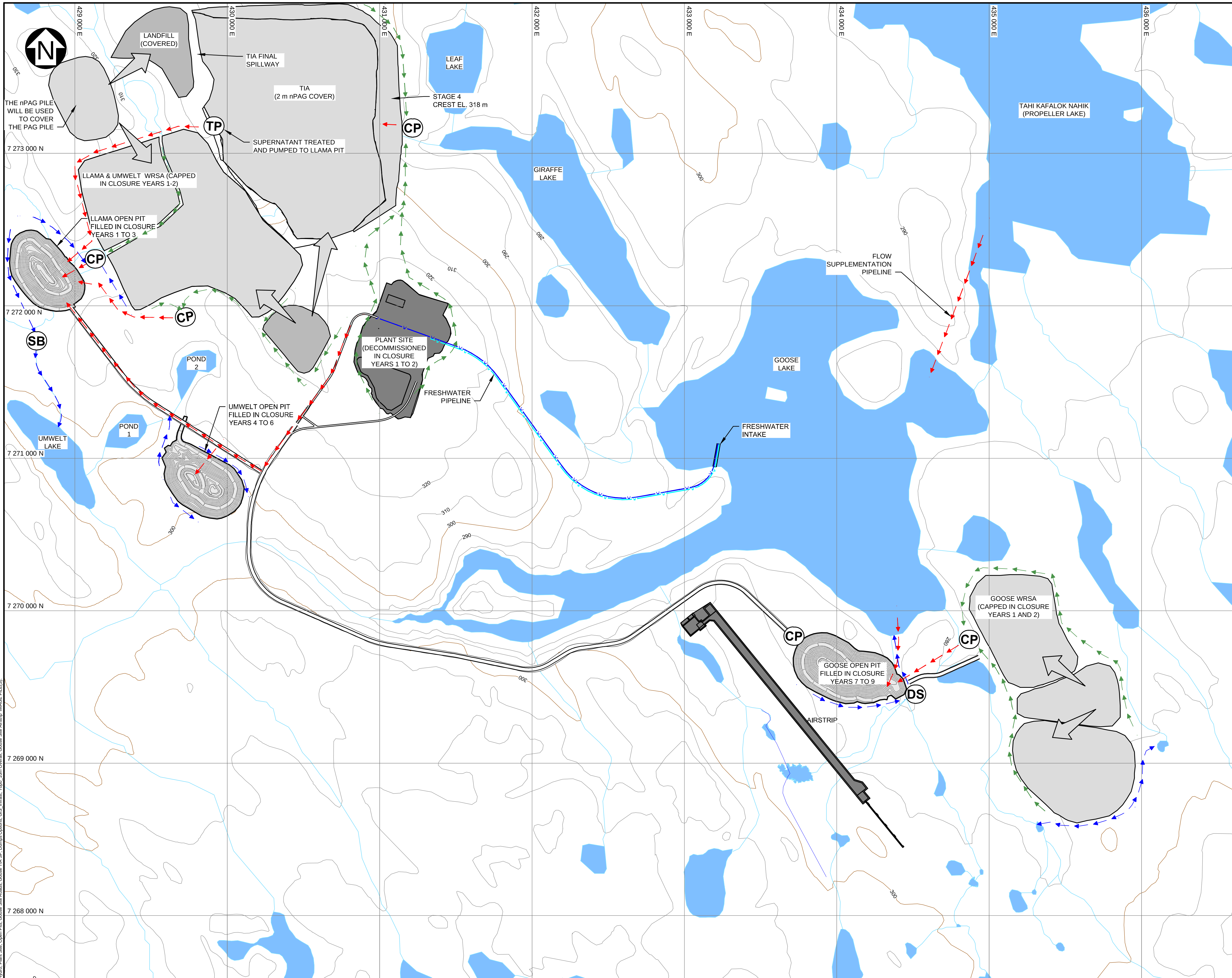
3.7.2 Umwelt Underground Mine

During mine operations, saline groundwater entering the underground workings will be pumped to the TIA along with water collecting in the pit. At closure, the underground portal will be sealed with a concrete plug to restrict saline groundwater from entering the pit. As described above, the Umwelt pit and other pits will be actively filled with freshwater.

3.7.3 Waste Rock Stockpiles

At closure, Potentially Acid Generating (PAG) waste rock stockpiles will be covered with a 4 m cap of not PAG (nPAG) waste rock to promote the aggregation of permafrost in the piles so that the PAG rock remains permanently frozen. This is expected to improve water quality of the runoff as water quality from nPAG rock is assumed to be non-metal leaching.

At the Goose Property, runoff from the WRSAs will be collected in the operation phase. The collection ponds will be monitored and eventually pumped to adjacent open pits as the TIA will be drained and the permanent cover constructed. Once the runoff consistently meets the mine contact water discharge criteria the collection ponds will be breached and removed and the final post-closure discharge will be established.



REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	20NOV'13	ISSUED WITH REPORT	RAC	AS	RAC	SRA

LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERMS
- SB SEDIMENT BASINS
- CP COLLECTION POND
- DS DIVERSION STRUCTURE
- PLACEMENT OF nPAG WASTE ROCK AS FINAL COVER ON PAG STOCKPILES

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. AIRSTRIP LAYOUT AND ROAD ALIGNMENTS PROVIDED BY EBA.
6. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

SCALE A 250 125 0 250 500 750 1000 1250 m

SABINA GOLD & SILVER CORP.

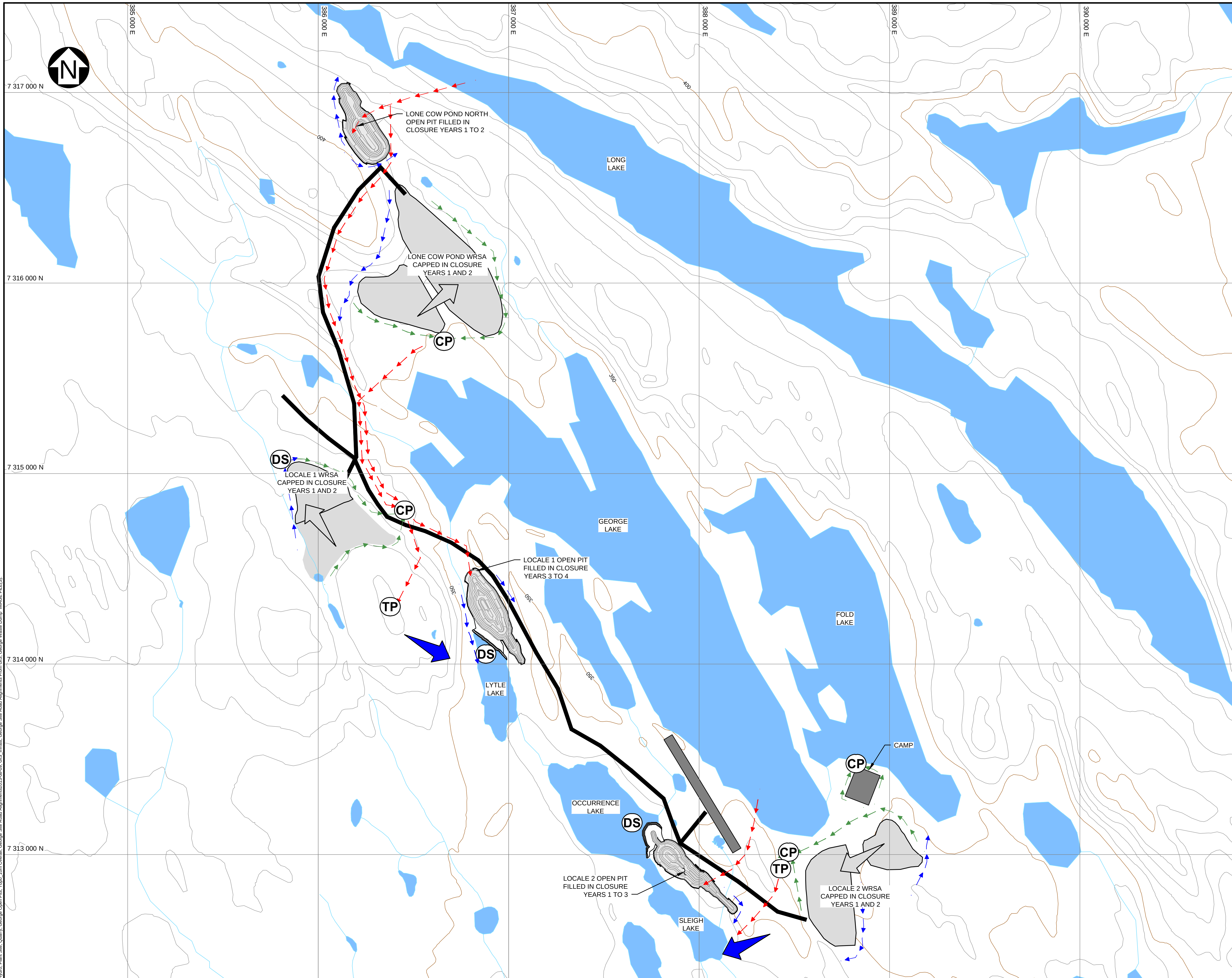
BACK RIVER PROJECT

GOOSE PROPERTY WATER MANAGEMENT ACTIVE CLOSURE

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-517/2	6

FIGURE 3.7-1 REV 0



LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERM
- CP COLLECTION POND
- DS DIVERSION STRUCTURE
- TP TREATMENT PLANT
- FINAL DISCHARGE OF MINE EFFLUENT
- PLACEMENT OF nPAG WASTE ROCK AS FINAL COVER ON PAG STOCKPILES

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. LIDAR / TOPOGRAPHY BASED ON INFORMATION PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL OPEN PIT OUTLINES ARE ULTIMATE OPEN PITS.
5. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
6. ROAD ALIGNMENTS PROVIDED BY EBA.

SCALE A 200 100 0 200 400 600 800 1000 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GEORGE PROPERTY
WATER MANAGEMENT
ACTIVE CLOSURE

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-517/2	6

FIGURE 3.7-2 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	20NOV'13	ISSUED WITH REPORT	RAC	AS	RAC	SRA

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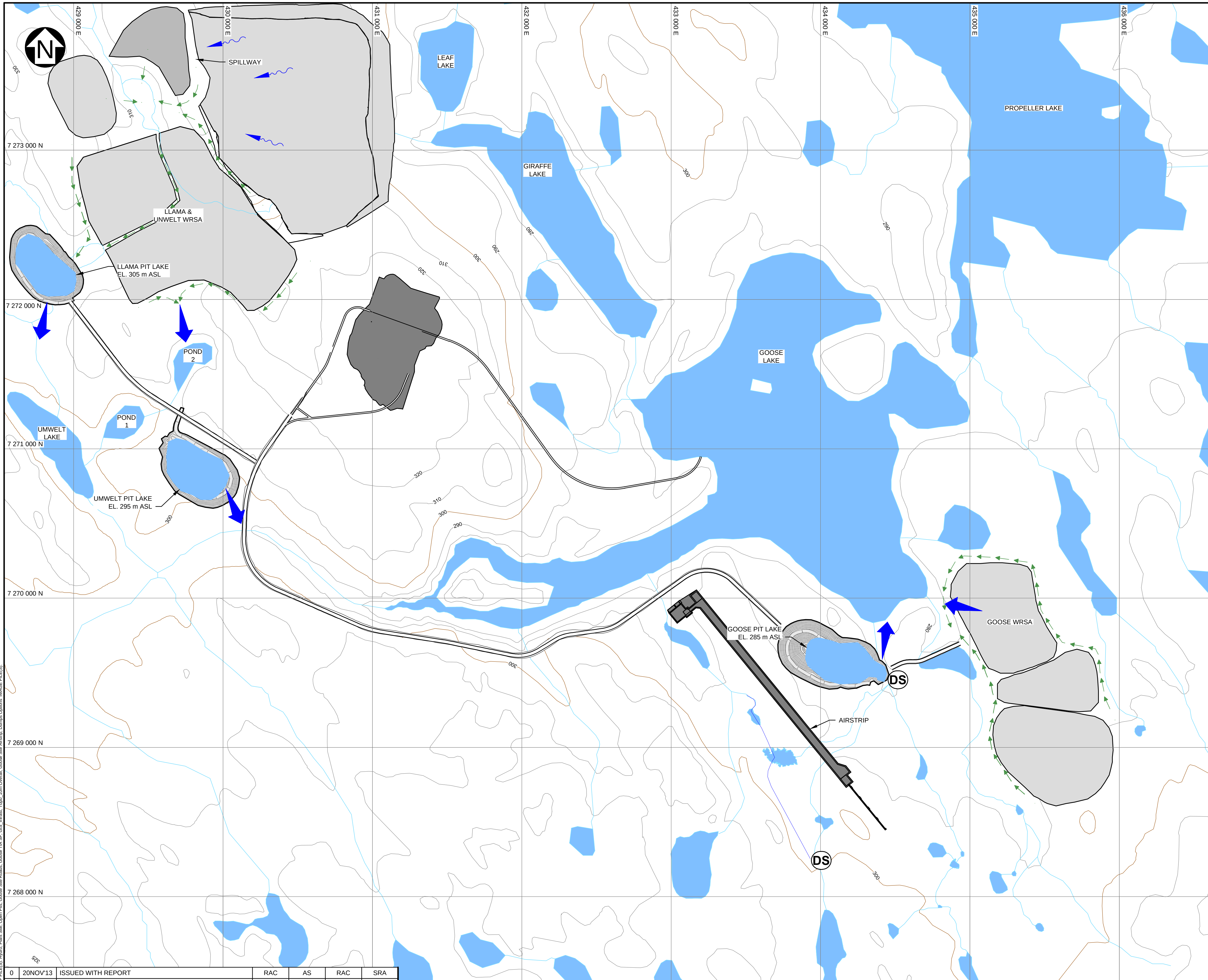
XREF FILE(S): Hydro; Plant Site; Quarry; George Open Pits; Topo_10m Overall; George Site Road Alignments2013-08-09; GIS_Infrast; George Site Road Alignments From GIS; George Waste Dump IMAGE FILE(S):



LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERMS
- DS DIVERSION STRUCTURE
- FINAL DISCHARGE OF MINE EFFLUENT
- WATER MOVEMENT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. AIRSTRIP LAYOUT AND ROAD ALIGNMENTS PROVIDED BY EBA.
6. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

SCALE A 250 125 0 250 500 750 1000 1250 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GOOSE PROPERTY WATER MANAGEMENT POST-CLOSURE

Knight Piésold CONSULTING

P/A NO. VA101-517/2 REF NO. 6

FIGURE 3.7-3 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
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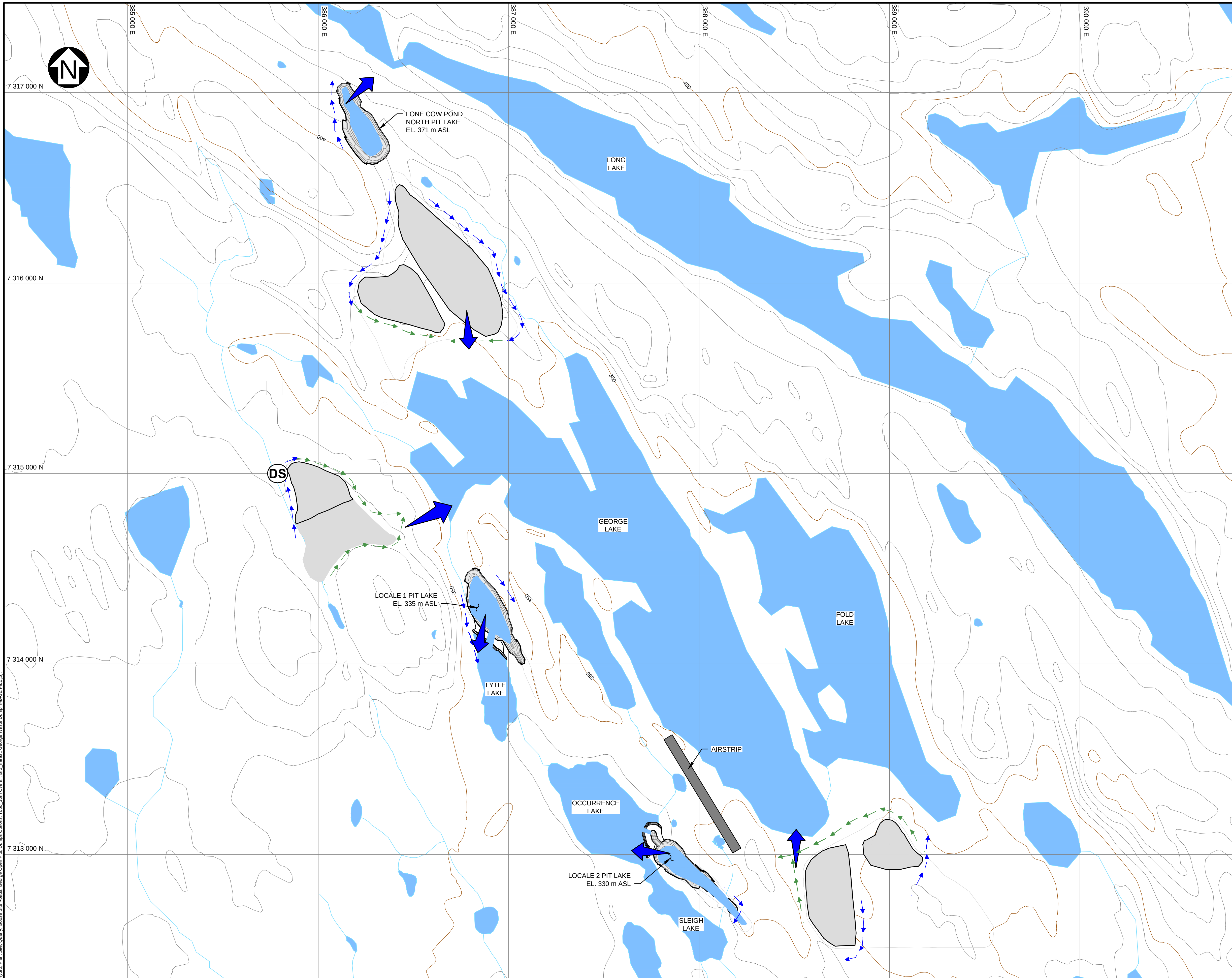

LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE

WATER MANAGEMENT FACILITY COMPONENTS

- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERM
- DS DIVERSION STRUCTURE
- FINAL DISCHARGE OF MINE EFFLUENT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. LIDAR / TOPOGRAPHY BASED ON INFORMATION PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL OPEN PIT OUTLINES ARE ULTIMATE OPEN PITS.
5. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
6. ROAD ALIGNMENTS PROVIDED BY EBA.

SCALE A 200 100 0 200 400 600 800 1000 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

**GEORGE PROPERTY
WATER MANAGEMENT
POST-CLOSURE**

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-517/2	6

FIGURE 3.7-4 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	20NOV'13	ISSUED WITH REPORT	RAC	AS	RAC	SRA

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At the George Property, closure of the waste rock stockpiles will involve covering the PAG waste rock stockpiles with a 4 m thick cap of nPAG. 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 encapsulated in permafrost, water quality is expected to improve to limits acceptable for discharge. A disposal plan has been developed that maximizes the placement of nPAG waste rock over final PAG lifts during mine operations (i.e., by using nPAG waste rock coming directly from the pits). This approach will minimize the amount of dedicated capping that will be required during operations (as progressive reclamation) and at closure (as a final closure measure). Overburden will have been co-disposed in the nPAG stockpiles and will also be used for capping the PAG waste rock.

It is expected that WRSA runoff, once capped, will be suitable for discharge without treatment. This assumption will be validated by water quality modeling. On this basis, active management of runoff is planned for the first two years of active closure. At the Goose Property, runoff from the Umwelt/Llama WRSA will be directed to the Llama open pit without treatment and runoff from the Goose WRSA will be discharged to the Goose pit without treatment.

At the George Property, treatment systems established during operations will continue to operate and treat WRSA runoff for two years (or until the runoff meets discharge criteria).

3.7.4 Tailings Impoundment Area (TIA)

The TIA will be closed out by draining off and treating the tailings supernatant water, constructing a closure spillway and capping the TIA with a 2 m cover of nPAG waste rock. Specific activities include:

- Operating the tailings beach in later years so that the tailings will slope to a future closure spillway along the west embankment.
- Treating approximately 3.7 to 6 Mm^3 of tailings supernatant water to meet MMER requirements and pumping the treated supernatant to the Llama open pit.
- Covering the tailings beach and embankments with a 2 m thick cap of nPAG waste rock.
- Constructing a closure spillway along the west embankment so runoff from the TIA will report to the perimeter ditching through the Llama/Umwelt WRSA and eventually report to the Llama open pit.

3.7.5 Dykes in Lytle and Occurrence Lakes

Once each of the lakes is nearly filled, the dykes will be breached. This work will be carried out during the winter months and suitable armouring will be placed within the connecting channel.

3.7.6 Camp Facilities

Over the course of the closure phase, the camps at each Project Property (Goose, George and the MLA) will be reduced to temporary camps equipped with modest camp water supply and incinerating toilets. This will allow the main camps to be decommissioned as part of closure.

4. Applicable Legislation and Guidelines

The Site Water Monitoring and Management Plan is a requirement of the EIS Guidelines issued to Sabina by NIRB and it forms part of the DEIS.

The Site Water Monitoring and Management Plan has been designed to comply with the following regulations:

- *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (Canada, 2002).
- Northwest Territories Waters Regulations, under the *Northwest Territories Waters Act (SOR/93-303)* (expected to be replaced in the near future by a Nunavut Waters Act and regulations).
- *Fisheries Act* (1985b), including the MMER (SOR/2002-22).
- Nunavut Environmental Protection Act (Nunavut, 1988).
- Nunavut Land Claim Agreement Act (Canada, 1993).

Water use and waste disposal in Nunavut is regulated by the NWB through the water licensing process. The Project will be subject to a Type A Water Licence. The on-site work is currently regulated by three Type B Water Licences (2BE-GOO1015, 2BE-GEO1015 and 2BE-MLL1217).

5. Roles and Responsibilities

The Environmental Superintendent along with his/her direct reports is responsible for the implementation of this plan including:

- Overall management of plan.
- Monitoring.
- Internal reporting.
- External reporting.
- Ensuring compliance and adaptive management.

6. Environmental Protection Measures

6.1 GENERAL OBJECTIVES

The purpose of environmental protection measures for site water management is to eliminate or reduce the Project effects on water quality.

The main objectives of Sabina's water management strategies are to:

- Minimize the amount of water that contacts mine ore and wastes, which ultimately reduces the volume of water requiring management.
- Appropriately manage all contact water and discharges to protect local aquatic resources.
- Implement water conservation and recycling to maximize water reuse and minimize the use of natural waters.

Protection measures may include the planning and design of engineered structures; the application of control technologies; the implementation of best management practices; and specific requirements from regulatory authorizations. Monitoring of the protection measures and adaptive management are also an integral part of effective environmental protection measures.

6.2 WATER USAGE AND CONSERVATION MEASURES

6.2.1 General Measures

The following protection measures will be applied to water usage:

- Freshwater intakes will be designed to limit erosion and sedimentation, protect against freezing, and accommodate peak flows.
- Controlled construction of the engineered intakes will ensure minimal to no PAD.
- All material used in construction will be clean, free of sediment and non-reactive.
- All intakes will be screened in accordance with the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO, 1995). The water withdrawal rate will be controlled such that fish do not become impinged on the screen.

Wherever possible, water will be recycled to the maximum extent possible. The most significant water recycling activities will be within the TIA. The TIA will store both tailings solids and supernatant water. The supernatant water will include contact water from the open pits, underground mine workings and WRSAs. The water will be recycled and make up the main source of reclaim water for the mill.

6.2.2 Water Use Conservation Measures

Long-term water usage has been closely evaluated as part of the DEIS. The focus has been on identifying maximum water use, while protecting fish and fish habitat.

Short-term water taking activities will be required for various Project activities (i.e., winter road construction, dust suppression, etc.). Potential short-term water sources will be evaluated in advance to determine if they will be adequate for the activity in accordance with the DFO (2010) winter water withdrawal guidelines:

- Total water withdrawal from a single waterbody will not exceed 10% of the available water volume assuming a maximum ice thickness of 2 m.
- Potential waterbodies will only be considered if their maximum depths are at least 3.5 m (i.e., there is at least 1.5 m of free water beneath the ice).

6.3 SEDIMENT AND EROSION CONTROL MEASURES

Surface water will be managed within the Project footprint such that sediment-laden runoff is minimized, intercepted, and/or treated prior to entering downstream receiving waters or mine process facilities. Effective sediment control depends on the isolation of easily-eroded, disturbed ground surfaces.

Measures will be implemented to reduce the quantity of runoff where the mobilization of sediments cannot be eliminated. Sediment-laden water will be captured and routed to sediment basins.

Sediment and erosion management and control during initial and ongoing construction will involve establishing contact water collection ditches, constructing sediment ponds, limiting land disturbance to a practical minimum, reducing water velocities across the ground through surface texturing and re-contouring, progressively rehabilitating and stabilizing disturbed land surfaces to minimize erosion, and re-establishing temporary vegetation covers.

Exposed landscape surfaces will be protected, where possible, by the installation of covering material such as riprap, aggregate, or rolled erosion control products. Runoff flow may be controlled by a combination of measures, including:

- Texturing/grading of slopes to slow runoff and reduce effective slope lengths.
- Synthetic permeable barriers and/or fibre rolls to reduce runoff velocities and retain sediments.
- Check dams, gabions, and energy dissipation structures to reduce flow velocities in channels.

Sediment levels in runoff will be minimized by intercepting sediment before it reaches the freshwater environment. In addition to measures aimed at controlling runoff flow, the quantity of transported material in runoff may be controlled by measures including:

- Preserving riparian zones which trap sediment and to reduce flow velocities.
- Installing synthetic permeable barriers, fibre rolls, and/or silt fences as required.
- Installing check dams, gabions, and sediment basins to reduce flow velocities and encourage sediment deposition.
- Locating stockpiles well away from watercourses.
- Maintaining and repairing any machinery prior to use that has the potential to result in a fluid release or leak.
- Locating fuel transfer and maintenance activities greater than 30 m from a watercourse or waterbody, except for approved activities near water.

6.4 MINE WATER RUNOFF MANAGEMENT

A number of environmental protection measures will be implemented to manage mine water runoff, including:

- Collection of all mine water runoff through use of diversions, collection ditches/berms and pipelines.
- Recycling of mine contact water to the extent possible at the Goose Property (Section 6.2).
- Treatment of a mine contact water prior to discharge to the environment during the construction, operation and closure phases.
- Land discharge of mine contact water where possible, rather than direct discharge to surface waters.
- Passive discharge of mine contact water during the post-closure phase provided MMER discharge criteria and receiving water quality objectives will be met.

At the Goose Property, these measures will be achieved by collecting all mine contact water from pits, ore stockpiles and WRSAs in the TIA. Water will be recycled from the TIA for use in the milling process and the TIA will operate as a zero-discharge facility. At closure, the tailings supernatant water in the TIA will be treated to meet the discharge criteria prior to being discharged to the Llama pit. Since the TIA will no longer be available at closure to store mine contact water, this water will be directed to open pits which will also be actively filled with fresh lake water (Section 3.7.1). As previously mentioned, passive discharge of untreated mine contact water will occur during post-closure only if discharge criteria and receiving water quality objectives are met. In the unlikely event that mine water runoff from pit lakes and WRSAs do not meet discharge criteria, water treatment will be provided.

At the George Property, the above environmental protection measures will be achieved through the collection of all mine contact water (runoff from WRSAs and pit inflows) in collection pond for treatment prior to discharge to land. Mine contact water will continue to be treated until discharge criteria are met, and in the unlikely event that mine water runoff from pit lakes and WRSAs do not meet discharge criteria, water treatment will be provided.

Diversion structures will be required around the Goose, Locale 1 and Locale 2 open pits 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 DEIS. The management strategies will continue to evolve and will be finalized for the FEIS.

6.5 GENERAL SITE RUNOFF

Collected water or runoff that meets the criteria specified in Table 3.3-1 will be discharged to land, and where possible at a minimum setback of 30 m from a waterbody, provided the water meets the criteria.

To protect the freshwater environment during site preparation, construction and decommissioning activities, the Project will minimize runoff and the transport of material into freshwater by the following planning and design measures:

- WRSAs will be confined to the local watersheds where the deposits are located to limit potential effects on water quality in local drainage areas.
- Infrastructure will be located, whenever feasible, on competent bedrock or appropriate base material that will limit permeability and the transport of potentially lower quality water into the active layer and ultimately to the freshwater environment.
- Footprint areas of Project components will be minimized, such as locating infrastructure nearer to the central location of Project sites around the deposits.
- The landscape will be restored as soon as possible to minimize erosion potential.

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.

6.6 BORROW AREA AND QUARRY DEVELOPMENT

Plans to develop aggregate sources as well as the identified environmental protection measures and monitoring plans are described in the Borrow Pits and Quarry Management Plan. The following summarizes the environmental protection measures identified to minimize impacts to water during borrow area and quarry planning and development:

- Conduct adequate geochemical testing for ARD / Metal Leaching (ML) at candidate quarry locations and borrow areas and apply screening criteria to avoid development of quarries with meaningful ARD/ML potential.
- Maintain a setback distance of 30 m from creeks and streams.
- Preserve vegetative buffers to limit impacts on water quality.
- Use berms and ditching to direct runoff away from the excavation.
- Slope rock quarry floors so that water is diverted to a sump within the quarry or adjacent to the quarry boundaries where it can be monitored prior to release.
- Sample accumulated water within water collection areas for TSS, oil and grease, and ammonia-nitrogen.
- Slope borrow areas at the natural angle of repose.
- Apply sediment and erosion control measures such as those described in Section 6.3.
- Use dust skirts on conveyors and apply dust suppression measures as identified in the Air Quality Management Plan.
- Monitor for ground ice during excavation of borrow areas.
- Monitor and address any subsequent settlement to maintain positive drainage and avoid the ponding of water (which can further exacerbate thawing of ground ice).
- Routinely inspect the effectiveness of water management structures.

These environmental protection measures are described further in the Borrow Areas and Quarry Management Plan. Individual quarry development plans and standard operating procedures will be prepared by the contractor before extraction activities commence.

6.7 DUST CONTROL

Dust from stockpiles is not expected to be substantial; however, dust will be monitored and managed to the extent reasonable. Crushing and screening operations will be conducted in fully-enclosed units to prevent ore dust dispersion. In the unlikely event that an unacceptable amount of dust is generated from end-dumping or front-loading during stockpiling and transferring operations, additional dust mitigation measures will be applied as identified in the Air Quality Management Plan.

6.8 ONGOING ACID ROCK DRAINAGE / METAL LEACHING (ARD/ML) TESTING

A preliminary geochemical characterization of the waste rock was completed by Rescan Environmental Services Ltd. (Rescan) and results were presented in an ARD/ML baseline report (Rescan, 2013). Static geochemical tests were completed on samples of drill core selected to represent the major and minor waste rock and tailings lithologies from the Project. The three major lithologies include greywacke, banded iron formation (BIF), and mudstone. Other minor units within the waste rock include dykes and other intrusives.

This plan will be periodically updated as new geochemical information if available. Continued kinetic test results will be used to develop a site-specific ARD criterion. The Mine Waste Rock and Tailings

Management Plan will be updated in the future to incorporate criteria and procedures for the segregation of PAG and nPAG waste rock.

<u>Goose Property Waste Rock</u>

Goose Property mine workings and waste rock represent a moderate ARD/ML potential. Low to moderate bulk Neutralizing Potential (NP) contents could result in acidic drainage after a lag time. Interaction with the deposit material and air/water could result in result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MMER limits. The two lithologies that will comprise the majority of the mine workings and waste rock are greywacke and BIF. Approximately 30% of greywacke and BIF samples are currently classified with uncertain acid generating potential (uPAG). For mine planning purposes, Sabina has used the precautionary approach and assumed that all uPAG waste rock is PAG waste rock.

<u>George Property Waste Rock</u>

George Property mine workings and waste rock represent a moderate to high ARD/ML potential. Low to moderate bulk NP contents combined with low to moderate sulphur contents could result in acidic drainage after a lag time. Interaction with the deposit material and air/water could result in result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MMER limits. As with the Goose Property, sizing of the separate PAG and nPAG piles at the George Property are based on the assumption that uPAG waste rock is PAG waste rock.

<u>Tailings Geochemistry</u>

The bulk tailings that will be stored in the TIA will have a high ARD/ML potential. Some parameters in the supernatant aging tests were above MMER limits and all samples were classified as PAG. During operations, if tailings material that forms the TIA beaches is not buried under fresh material before the lag time is exceeded then ARD will develop.

6.9 CONSIDERATION OF CLIMATE CHANGE

Water management strategy designs have considered climate change, including the establishment of the PMP for the TIA. A future update of this plan will include the sizing of other water management structures (collection ponds) considering a return period that accounts for climate change effects.

7. Monitoring Program

7.1 CONSTRUCTION PHASE

The following monitoring is proposed during the construction phase:

- Visual inspections to confirm that the mitigation measures identified in this plan in the other construction-related management plans (i.e., the Environmental Protection Plan, Borrow Pits and Quarry Management Plan) are implemented satisfactorily.
- Visual inspections to monitor the effectiveness of sediment and erosion control and runoff collection measures on a regular basis (daily or weekly as appropriate).
- Monitor treated sewage effluent discharges on a weekly basis for key indicators (i.e., TSS and ammonia) and monthly using laboratory analysis for the parameters listed in Table 3.3-1.

- Periodically sample runoff at active construction fronts for the parameters listed in Table 3.4-1.
- Monitoring of runoff from quarries and borrow pits in relation to the quarry runoff criteria identified in Table 3.4-4.
- Recording daily and monthly water consumption.
- Monitoring of waste and water management aspects including remediated soil, oily water and landfill seepage as outlined in the Surveillance Network Program (SNP) outlined in the Type A Water Licence.
- Monitoring of water quantity and quality will occur during all dewatering activities.
- Volume of water transferred will be measured on a continuous basis using appropriate flow meters.
- Field turbidity and TSS will be monitored daily. As data becomes available, a TSS and turbidity curve will be generated to manage dewatering activities. Water transferred during dewatering activities will meet a TSS or turbidity threshold equivalent to the MMER limit for TSS (15 mg/L). The trigger level to suspend dewatering activities will be 90% of the MMER limit (13.5 mg/L) to avoid releasing water above the threshold. Clean lake water will be transferred and monitored until the trigger level is reached. When the TSS trigger level is reached, lake water will be retained or transferred to an appropriate water management facility, such as the TIA.
- If released volumes of water change stream base flows or water levels by greater than 10% of baseline, then water transfer rates will be adjusted as required.
- Clean lake water will be transferred and monitored until a trigger level of 13.5 mg/L TSS (or equivalent turbidity as determined by a TSS and turbidity curve) is reached. When the TSS trigger level is reached, lake water will be retained until TSS concentrations decrease or transferred to an appropriate water management facility, such as the TIA.

In addition to the above, downstream monitoring of aquatic effects will be conducted as outlined in a future Aquatic Effects Monitoring Plan (AEMP).

During construction, the emphasis of monitoring will be on the implementation and success of mitigation at construction areas. Toward the end of construction, operation phase monitoring activities will be implemented and monitoring will shift to include the relevant aspects of operation phase monitoring (Section 7.2). Operation phase activities beginning before the end of the construction phase will include the installation of operation phase water management facilities, construction of the TIA, pre-stripping of open pits and the development of waste rock stockpiles.

7.2 OPERATIONS PHASE

In addition to the above monitoring during construction (Section 7.1), the following monitoring is proposed during the operation phase:

- Recording daily and monthly water consumption.
- Regular visual monitoring of operation phase water management facilities.
- Visual inspections and monitoring of construction areas (i.e., George Property) as described in Section 7.1.
- Daily monitoring of the tailings discharge and the supernatant water level within the decant tower.

- Monitoring of effluents prior to discharge in relation to the criteria identified for various effluents within the tables of Section 3.
- Monitoring of mine contact water discharges as prescribed by a study design developed under the MMER.
- Implementation of the future AEMP to monitor effects to downstream aquatic environments.

During the operation phase, the emphasis will be preserved on inspecting and monitoring construction fronts as aspects of construction will be ongoing throughout the mine life (i.e., construction of the George Property facilities). The operation phase monitoring program will also incorporate the monitoring of mining activities and water management systems associated with the TIA, pits and WRSA collection ponds.

7.3 ACTIVE CLOSURE

The following monitoring is proposed during the active closure phase:

- Regular inspections to confirm that closure activities are being undertaken as identified in the final approved Mine Closure and Reclamation Plan.
- Construction-type monitoring is undertaken during decommissioning activities as described in Section 7.1.
- Water quality being discharged from pits, the TIA and the WRSAs all meet water quality objectives.

Due to the relatively long closure phase, there will be sufficient opportunities to conduct post-closure monitoring of the closed-out project features. The George Property and the TIA, WRSAs and Llama pit at the Goose Property will be closed out by Closure Year 4, allowing for a number of years of post-closure monitoring during the active closure phase. Closure phase monitoring at receiving waters will be measured against water quality objectives.

7.4 POST-CLOSURE

Post-closure monitoring is expected to be required for five years after completion of active closure activities. This is in line with mine reclamation at other northern sites and is believed to be a reasonable monitoring period given the amount of post-closure verification monitoring that can be carried out during the closure phase. Post-closure monitoring is expected to include:

- Water quality sampling at mine contact water discharge locations in accordance with water quality objectives.
- Final Environmental Effects Monitoring (EEM) studies in accordance with the water quality objectives needed to obtain status as a recognized closed mine from Environment Canada.

8. Mitigation and Adaptive Management

A key element of monitoring as outlined in Section 7 is to verify that mitigation measures are being implemented and are achieving the intended outcome. Adaptive management will be employed where mitigation is not achieving the intended result. Alternative mitigation measures will be identified and implemented, and will be reflected in updates to this plan and related management plans.

9. Checking and Corrective Action

9.1 GENERAL APPROACH

Internal reporting structures will be developed so that monitoring results are reviewed to identify instances of non-compliance with this plan so that feedback is provided to the contractor or within Sabina and corrective action is undertaken in a timely manner.

Items of non-compliance with applicable permits, licences and authorizations will be reported to the respective agency as outlined in those authorizations.

Specific construction activities will require rapid checking of monitoring results and the implementation of corrective action. This includes the monitoring of TSS and turbidity data during in-water works. Field measurements of TSS and turbidity may be undertaken daily or hourly and corrective action such as work stoppage will be undertaken immediately, if appropriate.

9.2 CHECKING AND CORRECTIVE ACTION SPECIFIC TO DEWATERING ACTIVITIES

Checking and corrective action will occur through during dewatering behind the dykes at Lytle and Occurrence Lakes through the evaluation of continuous flow data and daily TSS and turbidity data. Results of the monitoring program will be reviewed by the Environmental Specialist and water quantity and quality trends will be updated on a time scale relevant to the dewatering activity. If the dewatering activity will take two weeks or less, then data will be updated daily. If dewatering will take longer, then a more appropriate time scale may be used (e.g. every 3 days or weekly). This program will allow early detection of changes in water quality and implementation of corrective actions, if required. If trigger levels or thresholds are approached or exceeded, dewatering activities will be suspended.

10. Environmental Reporting

External reporting of Sabina's of monitoring results and performance against this management plan will be in accordance with the following permits, licences, approvals and authorizations (Table 10-1).

11. Plan Effectiveness

It is expected that this plan will require updating with the FEIS submission, and upon issuance of the Type A Water Licence for the Project.

This plan will be reviewed on an annual basis at minimum and will be updated as required to reflect adaptive management (changes to the mitigation measures identified) or if Project changes necessitate changes to the monitoring program.

Table 10-1. Reporting Requirements

Regulatory Instrument	Responsible Agency	Information to be Reported	Frequency	Compliance Inspections
Project Certificate	NIRB	Terms and conditions relevant to water management	Annually	A NIRB Monitoring Officer will inspect the site against the Project Certificate annually
Type A Water Licence	NWB	Water licence reporting requirements, including those identified in this plan	Monthly (SNP only); Annually	A waters inspector will inspect the site
Authorization for HADD of fish habitat under the *Fisheries Act*	DFO	Specified in the authorization – focused on protection of fish habitat	Annually	A fisheries officer may inspect the site periodically to determine compliance with the
MMER	Environment Canada	Effluent quality and toxicology; sediment, benthics, fish population data	Monthly reporting of effluent quality and receiving water quality; annual reporting	
AEMP	NWB	To be determined – possibly inclusive of water and sediment quality and freshwater biota	As prescribed in the AEMP – likely annually	The AEMP will be submitted to the NWB and reviewed by other relevant agencies including DFO and Environment Canada

12. Quality Assurance / Quality Control (QA/QC)

QA/QC principles will be applied throughout the field sample collection and laboratory analysis phases.

The following procedure will be used when water quality sampling:

- All water quality samples will be collected by qualified personnel using suitable sampling equipment.
- Samples will be preserved (where applicable) in appropriate containers, and transported and stored following accepted procedures.
- Chain-of-Custody forms will be used to track the samples.
- Replicate samples will be collected from a subset (10 to 20%) of all samples collected to quantify environmental variability and analytical consistency.
- Travel, equipment, and field blanks will be collected to detect potential sources of contamination.

Qualified laboratories with the appropriate accreditation will be used for all laboratory analyses.

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8. Ore Storage Management Plan

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BACK RIVER PROJECT
Ore Storage Management Plan

December 2013

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BACK RIVER PROJECT
ORE STORAGE MANAGEMENT PLAN

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Appendix A. Project Site Layouts

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

TSS	Total Suspended Solids
VEC	Valued Ecosystem Component
CPUE	Catch per Unit Effort
TIA	Tailings Impoundment Area
MMER	Metal Mining Effluent Regulations
QA	Quality Assurance
QC	Quality Control

1. Introduction

The Ore Storage Management Plan outlines the Sabina Gold & Silver Corp. (Sabina) plan for managing stockpiled ore at the Back River Project (the Project). The scope of the plan covers operational procedures, the implementation of environmental protection measures, and monitoring the effectiveness of any mitigation strategies. The plan applies to the construction and operation phases of the Project during which ore will be produced and stored prior to processing. It is expected that all ore will have been processed by the end of the operation phase.

The Ore Storage Management Plan includes the following:

- Applicable legislation and guidelines.
- The roles and responsibilities of the environmental team.
- Environmental protection measures.
- A monitoring program regarding the management of ore, with reference to other biophysical management plans for monitoring of potentially affected environmental media.
- Mitigation strategies recommended to avoid or minimize the potential adverse effects on air and water quality.
- Checking and corrective actions.
- Record keeping and environmental reporting.
- A framework for the evaluation of plan effectiveness.
- A quality assurance/quality control (QA/QC) program.

The Ore Storage Management Plan is a “living document”. It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes. The next update will likely accompany the Final Environmental Impact Statement (EIS) based on Feasibility Study Project designs. Following this, the plan can be further updated based on engineering completed prior to the start of construction and will incorporate for-construction engineering drawings of stockpiles and associated water management infrastructure.

2. Scope and Objectives

The Ore Storage Management Plan is a discipline-specific biophysical management plan that forms part of Sabina’s overall Environmental Management Plan (EMP) developed for the Back River Project. This management plan has been prepared in accordance with Section 9.4.5 of the EIS Guidelines that the Nunavut Impact Review Board (NIRB) issued to Sabina (NIRB, 2013).

The scope of this plan focused on the management (i.e., handling and storage) of ore. The main environmental concerns related to ore storage are associated with the effects of runoff on local water quality and the potential for dust to spread ore fines on the surrounding land and water. As such, the Valued Ecosystem Components (VECs) that will be monitored include air quality and water quality. To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced the Project-wide monitoring plans for air and water (as appropriate) in the Site Water and Air Quality management plans.

3. Planning and Implementation

3.1 PHYSICAL CHARACTERISTICS

The main lithologies at the Project include greywackes, banded iron formation (BIF), mudstones and other minor units (i.e., dykes and other intrusions). The majority of the gold mineralization within the various pits is hosted within the BIF unit. Within the Goose deposit, the mineralization is also hosted within greywackes and mudstones. As such, it is expected that the ore will exhibit characteristics similar to the BIF. The bulk density of the ore will likely be about 3 t/m^3. The blasted ore material could be up to 2 m in diameter depending on the equipment used.

3.2 GEOCHEMICAL CHARACTERISTICS

Rescan Environmental Services Ltd. (Rescan) completed geochemical evaluations on the Project between 2007 and 2013 (Rescan 2013).

The ore is mainly hosted within the BIF. Test results are summarized below.

- Paste pH results were above 6.0 for both the ore and low grade material. This result suggests that there was no stored acidity.
- Total sulphur contents varied, but were usually greater than 1% indicating a moderate to high potential for acidic drainage.
- Sulphate sulphur values were low, indicating that most of the sulphur is in sulphide mineral phases.
- The bulk neutralization potentials were low to high. An unavailable neutralization potential (NP) of 4 kg $CaCO_3$/t was applied to Goose Property ore and low grade ore samples.
- Most ore and low grade ore samples were classified as PAG.

During operations ore and low grade ore material will be processed prior to the onset of ARD. Leachate running off the stockpiles will also be collected and diverted to an appropriate facility.

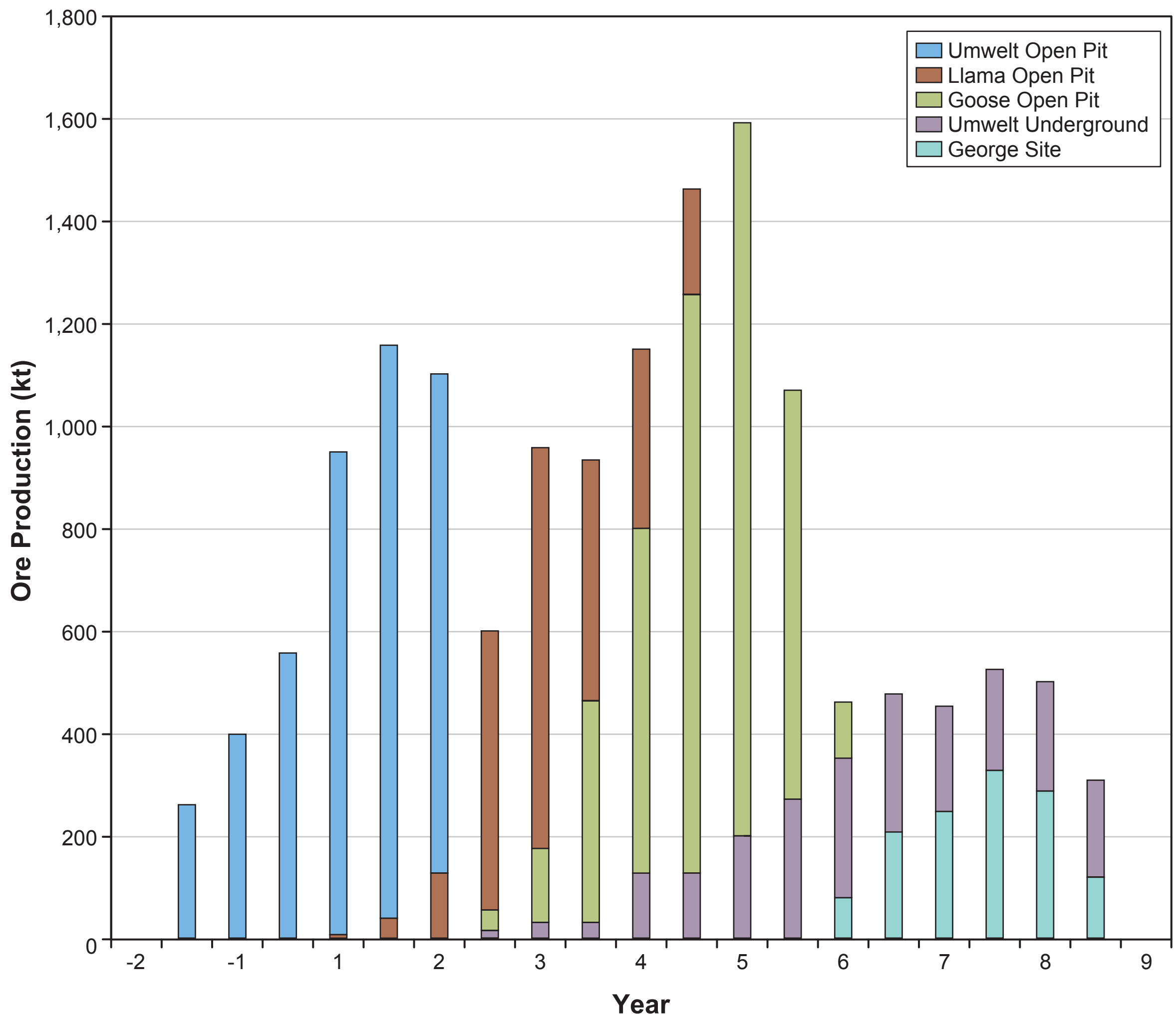
In terms of metal leaching potential, one ore sample from the Llama Deposit iron formation has undergone Shake Flask Extraction (SFE) tests. Selenium concentrations in the leachate were above CCME guidelines (CCME 2013) and below a draft Metal Mine Effluent Regulation (MMER) limit.

A future iteration of this plan will incorporate additional results of ongoing geochemical studies.

3.3 PRODUCTION OVERVIEW

An ore production schedule is provided in Figure 3.3-1 and summarized in Table 3.3-1. The schedule includes both low and high grade ore.

There will be two ore stockpiles at the Goose Site, one for low grade ore and one for high grade ore. The high grade stockpile will be located to the southwest of the plant site and the low grade pile will be located to the west of the plant site (see the site layout for the Goose site in Appendix A). All ore will be fed from these stockpiles to the mill. Mining will start at the Goose Site, where the majority of the ore stockpiling will take place.



Source: Tetratech, 2013.

Figure 3.3-1

Ore Production Schedule

Table 3.3-1. Ore Production Schedule

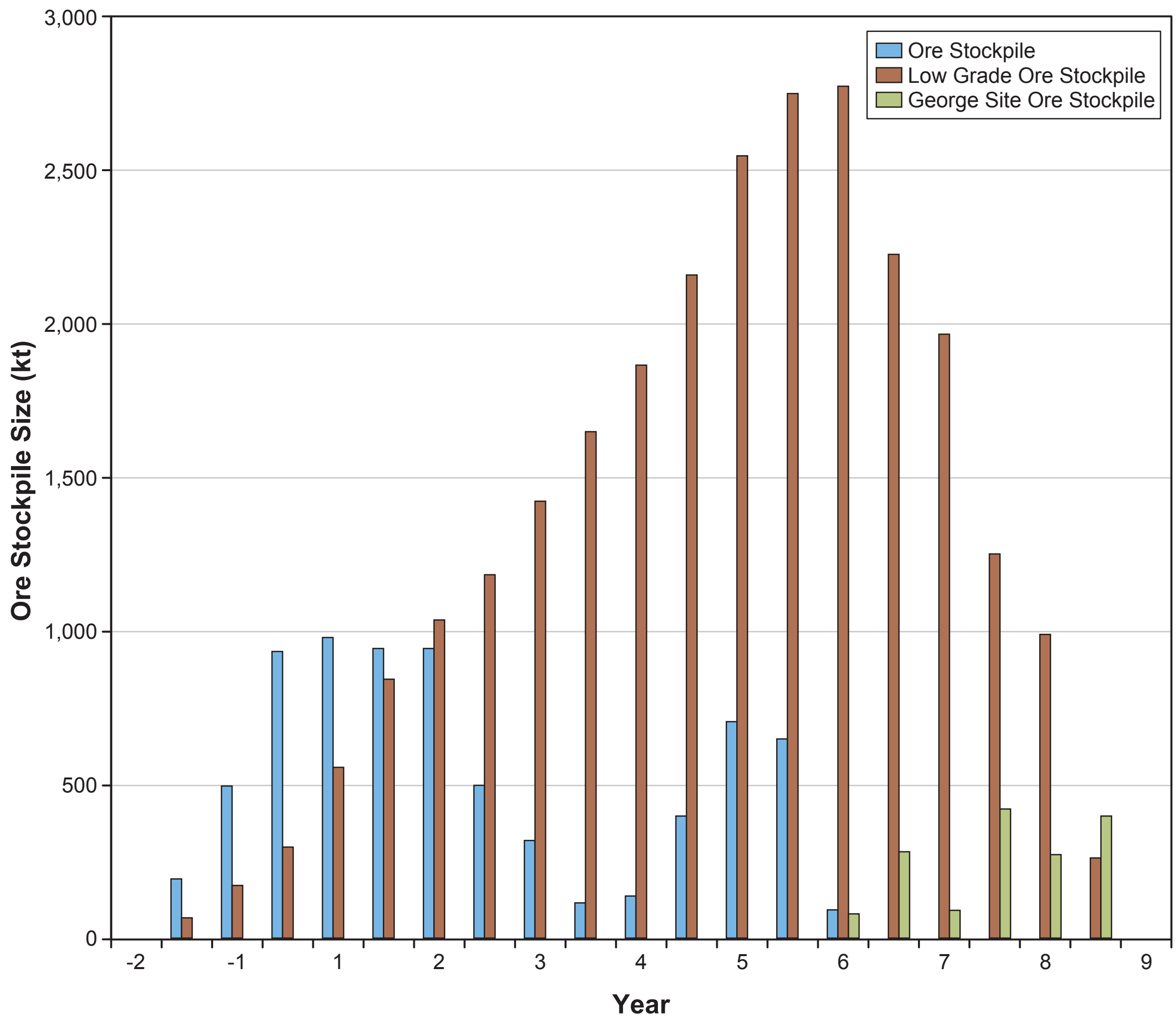
Year	Ore Production (kt)				
	Umwelt Open Pit	Llama Open Pit	Goose Open Pit	Umwelt Underground	George Site
-2	0	0	0	0	0
-1.5	262	0	0	0	0
-1	403	0	0	0	0
-0.5	564	0	0	0	0
1	940	10	0	0	0
1.5	1,122	42	0	0	0
2	973	133	0	0	0
2.5	0	558	36	18	0
3	0	784	142	36	0
3.5	0	472	432	36	0
4	0	355	673	126	0
4.5	0	211	1,129	126	0
5	0	0	1,392	198	0
5.5	0	0	803	270	0
6	0	0	115	270	81
6.5	0	0	0	270	209
7	0	0	0	208	246
7.5	0	0	0	198	331
8	0	0	0	216	287
8.5	0	0	0	192	120
9	0	0	0	0	0
9.5	0	0	0	0	0

Source: Tetratech (2013).

There will be one ore stockpile at the George Site, between the Locale 1 and Locale 2 open pits (see the site layout for the George site in Appendix A). The stockpile will be developed over a 9 to 10 month period when the George site is not connected by a winter road to the processing facilities at the Goose site. During the winter road season, all the stockpiled ore will be reclaimed and transported to the Goose site for processing and/or stockpiling.

The Umwelt Open Pit will be mined first under the current mine plan commencing in Year -1.5 (i.e., Year 0.5 of the construction schedule). The Llama Open Pit will come online in Year 1 before mining the Umwelt Open Pit is completed (in Year 2) and preparations are made for the Umwelt Underground. The Goose Open Pit and Umwelt Underground will commence in Year 2.5, while the Llama Open Pit continues mining until Year 4.5. The Goose Open Pit finishes mining in Year 6 when mining at the George Site begins. Mining at Umwelt Underground and George Site will continue until the end of operations in Year 8.5.

The size of the ore stockpiles over the mine life is shown on Figure 3.3-2 and in Table 3.3-2. The three George Site stockpiles are shown together.



Source: Tetratech, 2013.

Figure 3.3-2

Ore Stockpile Sizes

Table 3.3-2. Ore Stockpile Sizes over the Life of Mine

	Ore Stockpile Size (kt)			
Year	Ore Stockpile	Low Grade Ore Stockpile	George Site Ore Stockpiles	Totals
-2	0	0	0	0
-1.5	195	67	0	262
-1	491	174	0	665
-0.5	927	302	0	1,229
1	979	561	0	1,540
1.5	948	842	0	1,790
2	947	1,037	0	1,984
2.5	504	1,180	0	1,683
3	316	1,417	0	1,733
3.5	119	1,640	0	1,760
4	138	1,864	0	2,002
4.5	398	2,158	0	2,556
5	700	2,533	0	3,234
5.5	648	2,746	0	3,394
6	98	2,769	81	2,948
6.5	0	2,224	290	2,514
7	0	1,959	97	2,056
7.5	0	1,245	428	1,673
8	0	987	276	1,263
8.5	0	267	396	663
9	0	0	0	0
9.5	0	0	0	0

Source: Tetratech (2013).

The size of the high grade ore stockpile next to the process plant at the Goose mine site will peak at approximately 950 kt in the final four years of mining from the Umwelt Open Pit (i.e., Years -1.5 to 2). The stockpile size will spike again, briefly in Year 5, when mining from the Umwelt Underground is in full production.

The size of the low grade ore stockpile will steadily increase in size by an average of 210 kt/yr and peak at approximately 2,750 kt in Year 5.5. From Year 5.5 onward, the low grade ore is processed and the stockpile is consumed.

The size of the stockpile at the George Site will vary between 80 and 430 kt.

The ore stockpile footprints have been designed with a contingency of approximately 1.5 times the expected ore generation. This is to account for the unlikely situation where the designed facilities are not adequate to accommodate the actual ore production.

3.4 GOOSE SITE ORE STOCKPILE METHODS AND PROCEDURES

The current mine production schedule indicates that 13,715 kt of ore will be produced from the Goose Site. Ore generated from mining activities at the site will be end-dumped in surficial stockpiles and deposited in a similar manner as the waste rock. The stockpile storage design requirements are approximately 4,000 kt (3,000 kt of low grade ore and 1,000 kt of high grade ore).

The acid-generating potential of the ore is not expected to adversely impact surface water and soil quality as the stockpiles are temporary and will be consumed during processing. In the unlikely event that ore stockpiles are present at closure, the piles will be relocated to Potentially Acid-Generating (PAG) Waste Rock Storage Areas (WRSAs) and closed out with the PAG.

The ore at the Goose Site will be stockpiled with maximum side slopes of 2H:1V. Further design details (stockpile design, foundation requirements and runoff management etc.) will be provided in a future update of the plan following detailed engineering design.

The stockpiled ore will eventually be loaded and dumped into the hopper at the primary crusher.

3.5 GEORGE SITE ORE STOCKPILE METHODS AND PROCEDURES

The current mine production schedule schedule indicates that approximately 1,275 kt of ore will be produced from the George Site. Ore generated from mining activities at the site will be end-dumped in surficial stockpiles close to the open pits. Ore generated from the George pits will be stockpiled up to nine months a year (since the ore will be hauled to the Goose site for processing over a winter road). The storage design requirement for the pit is approximately 500 kt.

The ore at the George Site will be stockpiled with maximum side slopes of 2H:1V. Further design details (stockpile design, foundation requirements and runoff management etc.) will be provided in a future update of the plan following detailed engineering design.

Further design details, including stockpile design, foundation requirements and runoff management, will be provided in a future update to the plan following detailed engineering design and prior to construction.

During the winter road period, ore will be reclaimed from the ore stockpile using front-end loaders. The loaders will fill 40 t end-dump haul trucks. Once it has been trucked to the Goose site, the George site ore will either be delivered to the crusher or to the high grade ore stockpile.

3.6 ORE MANAGEMENT ALTERNATIVES

The proposed layout for the stockpiles was selected based on proximity to facilities (i.e., high and low grade stockpiles will be located near the plant site). The George Site stockpile will be located between active pit(s) before the ore is hauled over the winter road to the Goose Site.

An alternative ore stockpile arrangement would be to construct an all-season road from the George Site to the Goose Site. This strategy may eliminate the temporary ore stockpile at the George Site. An all-season road would, however, negatively impact the Project economics without a clear environmental benefit.

Another potential alternative would be to process low-grade ore as it is generated, rather than stockpiling the ore until Year 5.5. This alternative would also negatively impact the Project's economics without a clear environmental benefit.

4. Applicable Legislation and Guidelines

The Ore Storage Management Plan has been designed to comply with existing regulations and follow the available guidelines provided by the federal government and the government of Nunavut. The applicable regulations include:

- *Fisheries Act* (1985b), including the *Metal Mining Effluent Regulations* (SOR/2002-22).
- *Nunavut Environmental Protection Act* (1988).
- *Nunavut Land Claims Agreement Act* (1993).
- *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (2002).
- Northwest Territories Waters Regulations (SOR/93-303), under the *Northwest Territories Waters Act* (1992; expected to be replaced in the near future by a "*Nunavut Waters Act* and regulations").

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager along with his/her direct reports are responsible for the implementation of this plan including

- Overall management of plan.
- Monitoring.
- Operational aspects.
- Internal reporting.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including

- External reporting.
- Ensuring compliance and adaptive management.

6. Environmental Protection Measures

6.1 RUNOFF MANAGEMENT

Runoff from the ore stockpiles will be collected in perimeter ditches and directed to a central collection pond. The water quality of the runoff is expected to be similar to that for the waste rock (see Section 2.2). The runoff will be designated as "contact water" and treated similarly to runoff from the WRSAs.

At the Goose site, dedicated collection ponds will collect the runoff from the low grade and high grade ore stockpiles. The contact water in the collection ponds will be pumped or trucked to the Tailings Storage Facility (TSF).

At the George site, runoff from the ore stockpile will be collected and pumped or trucked to the collection ponds for the WSRAs for treatment together with runoff from the WSRAs and pits.

The collection ponds constructed for the ore stockpiles will apply the same design criteria as has been developed for the WSRAs, in terms of managing extreme flows. Additional detail on the waste rock is provided in the Waste Rock and Tailings Management Plan and water management is addressed in the Site Water Management Plan.

Since the ore storage stockpiles are temporary and the life of the mine is relatively short, the identification of measures to protect the ore storage infrastructure from the effects of climate change was not deemed necessary.

6.2 DUST CONTROL

Dust from the ore stockpiles is not expected to be meaningful given the large size of the ore coming from the pit. Crushing and screening operations will be conducted in fully enclosed units to prevent ore dust dispersion. Dust will be monitored at the site as described in the Air Quality Management Plan, and in the unlikely event that an unacceptable amount of dust is generated from end-dumping or front-loading during stockpiling and transferring operations, additional dust mitigation measures will be applied as identified in the Air Quality Management Plan.

7. Monitoring Program

Routine ore stockpile inspections will be conducted monthly by the General Manager or designate at both the Goose and George Sites. These inspections will include:

- Measurement, recording and reporting of the number of truckloads and tonnage of ore hauled and stockpiled.
- Monitoring stockpile construction and operation visually to ensure compliance with permits, authorizations and commitments of monitoring plans.
- Evaluating the effectiveness of runoff collection measures.
- Surveying the extents of stockpiles to ensure the piles are within the areas set out in the permits and authorizations.
- Photographing the site conditions and observations.

The final inspection report should be delivered to the General Manager no more than one (1) week after the inspection. The report should be brief, minutes-style, and include observations made during the current inspection. These observations would include a photographic record and a complete list of all corrective actions taken (i.e., actions agreed upon during the inspection, actions taken since the last inspection and all other active actions)

Air and water quality monitoring and reporting will be conducted as described in the Air Quality and Site Water Management Plans, respectively.

8. Mitigation and Adaptive Management

The Ore Storage Management Plan may be updated if monitoring under the Air Quality and Site Water Management Plans identify the need for corrective action.

9. Checking and Corrective Action

The General Manager (or designate) will conduct weekly checks of the monitoring activities and any trends in the data collected. Corrective action will be taken if ore storage is not being conducted in accordance with this plan or any Standard Operating Procedures (SOPs) developed for ore management.

10. Record Keeping

Record keeping will be conducted by the Environmental Superintendent or designate. Field and laboratory data will be entered into suitable electronic databases.

11. Environmental Reporting

Environmental reporting will be conducted as identified in future permits, approvals and authorizations relevant to ore storage and management.

12. Plan Effectiveness

The Environmental Superintendent or designate will conduct a weekly evaluation of the monitoring activities. This plan may be updated if additional methods for monitoring are found to be more appropriate.

13. Quality Assurance / Quality Control

The QA/QC for the ore monitoring program will include the preparation of a SOP for each of the activities within the program (i.e., stockpiling and transporting of ore, etc.) and auditing operations against this plan and any relevant SOPs.

References

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1992. *Northwest Territories Waters Act*, SC. C. 39.

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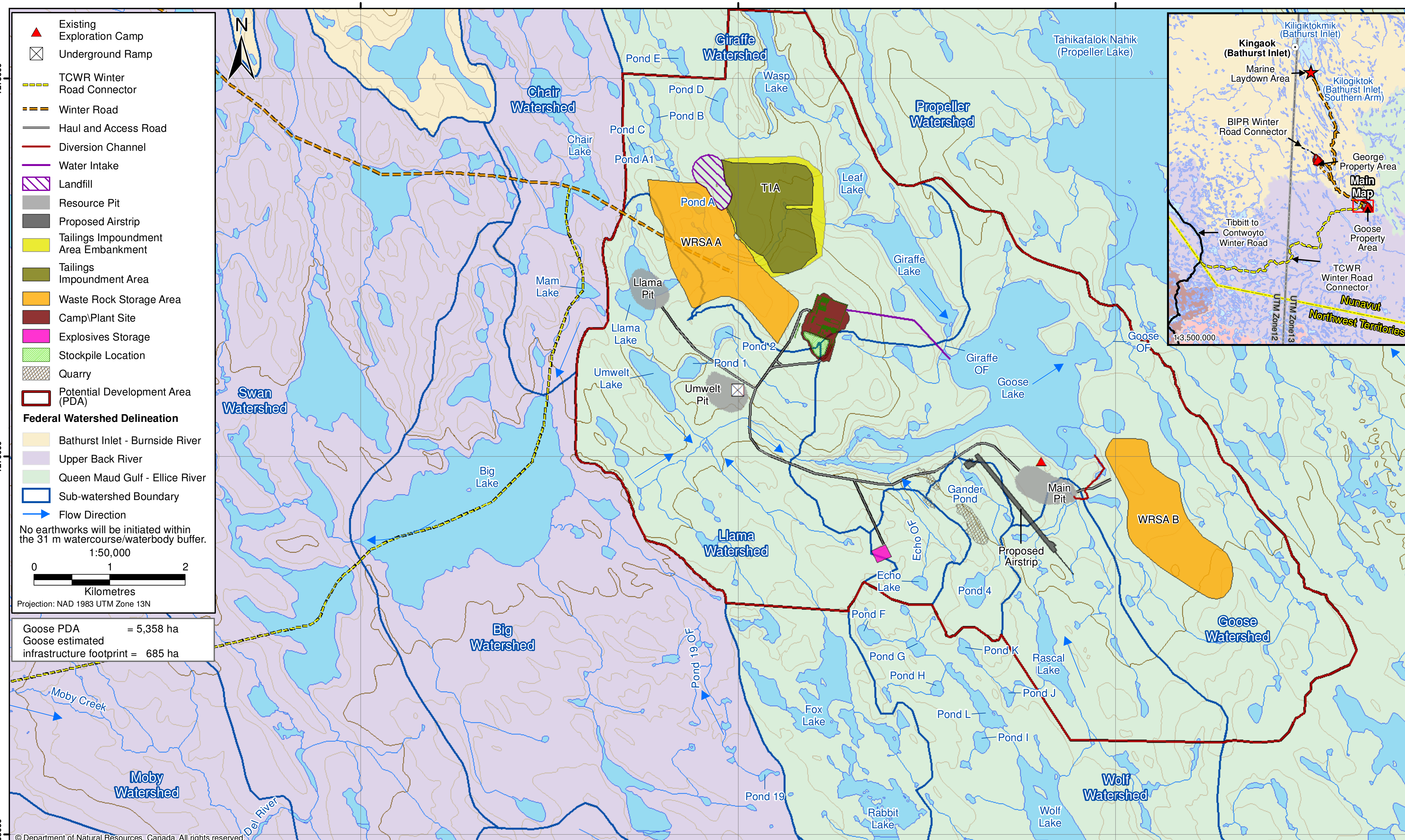
Appendix A
Project Site Layouts



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Rescan an ERM company

Figure A1

Project Site Layout for 2013 DEIS - Goose Property Area

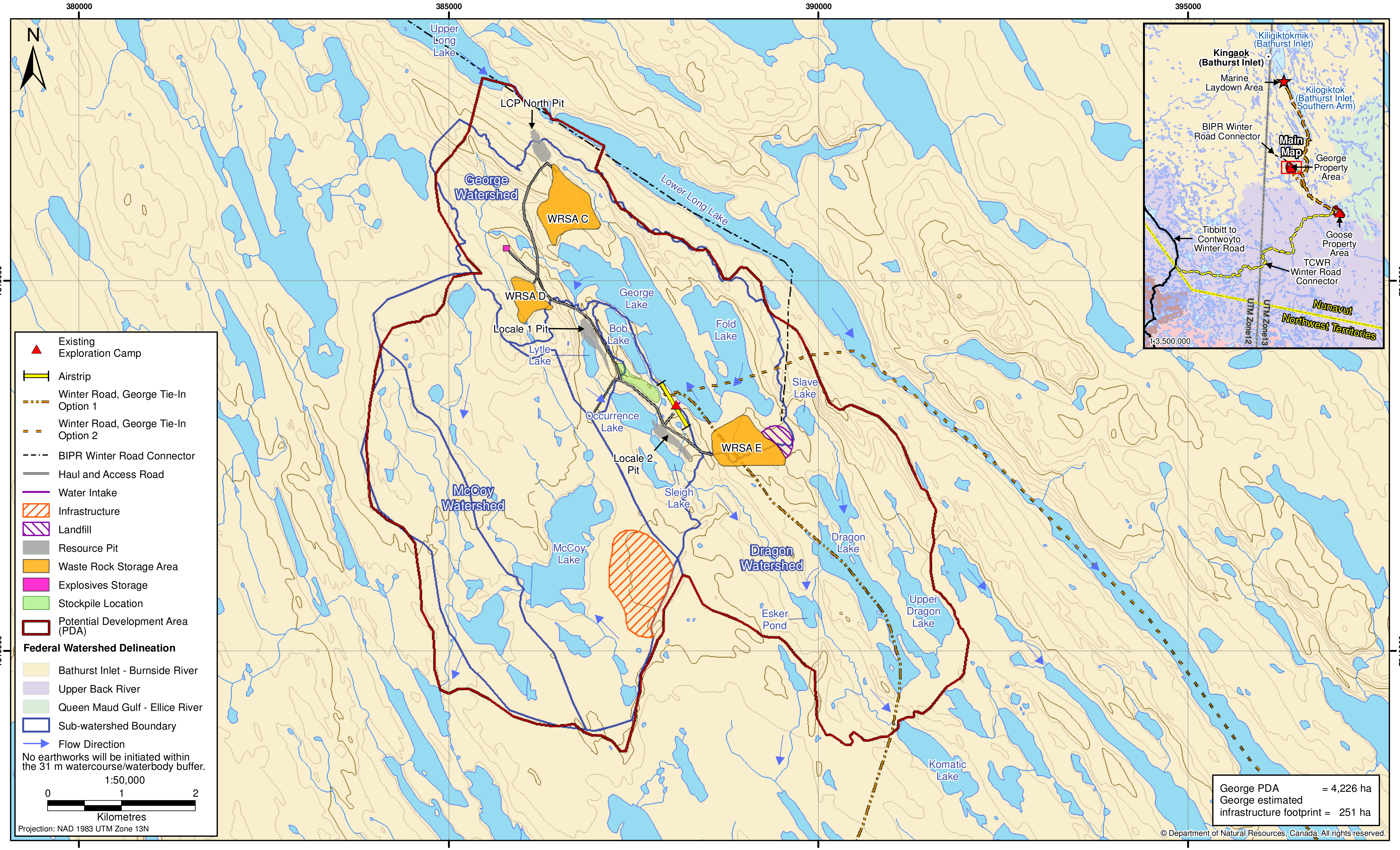

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Figure A2

Project Site Layout for 2013 DEIS - George Property Area

9. Mine Waste Rock and Tailings Management Plan

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BACK RIVER PROJECT
Mine Waste Rock and Tailings Management Plan

December 2013

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BACK RIVER PROJECT

MINE WASTE ROCK AND TAILINGS MANAGEMENT PLAN

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Appendix A. Tailings Impoundment Area Drawings

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AEP	annual exceedance probability
ARD	acid rock drainage
BIF	banded iron formation
CCME	Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
EDGM	earthquake design ground motion
EIS	Environmental Impact Statement
EMP	environmental management plan
FLB	field leach barrel
HDPE	high-density polyethylene
IDF	inflow design flood
LCP	Lone Cow Pond
MAC	Mining Association of Canada
MCRP	Mine Closure and Reclamation Plan
MDE	maximum design earthquake
ML	metal leaching
MMER	Metal Mining Effluent Regulations
Mt	million tonnes
NIRB	Nunavut Impact Review Board
NP	neutralizing potential
nPAG	non potentially acid generating
NWB	Nunavut Water Board
OBE	operating basis earthquake
OMS	operation, maintenance and surveillance
PAG	potentially acid generating
PGA	peak ground accelerations
QA	quality assurance
QC	quality control
Sabina	Sabina Gold & Silver Corporation

SFE	shake flask extraction
SOP	standard operating procedure
TIA	tailings impoundment area
TSM	Towards Sustainable Mining
uPAG	uncertain acid generating potential
VEC	valued ecosystem component
WRSA	waste rock storage area

1. Introduction

The Mine Waste Rock and Tailings Management Plan outlines the Sabina Gold & Silver Corp. (Sabina) plan for managing waste rock and tailings produced by the Back River Project (the Project).

The Mine Waste Rock and Tailings Management Plan includes the following:

- Applicable legislation and guidelines.
- The roles and responsibilities of the environmental team.
- Environmental protection measures.
- A monitoring program regarding the management of ore, with reference to other biophysical management plans for monitoring of potentially affected environmental media.
- Mitigation to avoid or minimize potential adverse effects on air and water quality.
- Checking and corrective actions.
- Record keeping and environmental reporting.
- A framework for the evaluation of plan effectiveness.
- A quality assurance/quality control program to be applied to the monitoring program.

The Mine Waste Rock and Tailings Management Plan is a "living document". It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes. The next update will likely accompany the Final EIS based on Project Feasibility Study designs. Following this, the plan can be further updated based on detailed engineering design prior to the start of construction, incorporating for construction engineering drawings of stockpiles, embankments and associated water management infrastructure.

2. Scope and Objectives

The scope of the plan covers operational procedures, the implementation of environmental protection measures, and monitoring the effectiveness of mitigation. The plan applies to the construction and operation phases of the Project during which time both waste rock and tailings will be produced, as well as the closure/post-closure phases of the Project as both waste rock and tailings will be permanently stored at the site. The plan is meant to ensure that the Project is conducted as proposed, predicted adverse environmental effects are promptly mitigated, mitigation measures are successful, and relevant laws and regulations are met. Closure and reclamation of waste rock storage areas (WRSAs) and the tailings impoundment area (TIA) are addressed in greater detail in the Preliminary Mine Closure and Reclamation Plan (MCRP).

The Mine Waste Rock and Tailings Management Plan is a discipline-specific management plan that forms part of Sabina's overall Environmental Management Plan (EMP) developed for the Project. This management plan has been prepared in accordance with Section 9.4.6 of the Environmental Impact Statement (EIS) Guidelines that the Nunavut Impact Review Board (NIRB) issued to Sabina (NIRB, 2013).

The main environmental concerns related to waste rock and tailings storage are the potential for dust to spread to the surrounding land and water as well as runoff and seepage effects on local water quality. Progressive reclamation is also considered as it presents an important opportunity to reduce environmental liabilities associated with mine closure while the mine is in operation.

The measures identified in this plan are intended to protect the following Valued Ecosystem Components (VECs):

- Air quality.
- Surface hydrology.
- Water quality.
- Sediment quality.
- Fish and aquatic habitat.
- Fish (Arctic Grayling and Lake Trout).

As a member of the Mining Association of Canada (MAC), Sabina will develop a future Operation, Maintenance and Surveillance (OMS) Manual consistent with MAC's Towards Sustainable Mining (TSM) Initiative requirements. More detail on this is provided in Section 4.

3. Planning and Implementation

3.1 WASTE ROCK PRODUCTION AND STORAGE

Waste rock will be produced during mining and will be stored in engineered stockpiles located proximate to each of the open pits. A total of 124.7 Mt of waste rock will be generated consisting of the following:

- Overburden = 5.4 Mt.
- Non-potentially acid generating (nPAG) waste rock = 62.5 Mt (~55%).
- Potentially acid generating (PAG) waste rock = 56.8 Mt (~45%).

Overburden will be co-disposed with nPAG waste rock.

3.1.1 Waste Rock Physical Characteristics

The waste rock could be up to 2 m in diameter depending on the equipment and blasting techniques used for the mining operation. It is expected to exhibit characteristics of a typical poorly-graded, low-density rockfill (Leps, 1970). These characteristics include a bulk unit weight of 20 kN/m^3 and a friction angle of between 35 and 55° (Knight Piésold, 2013a).

3.1.2 Waste Rock Geochemical Characteristics

The three (3) major lithologies that make up the waste rock at the Project include greywacke, banded iron formation (BIF), and mudstone. Other minor units within the waste rock include dykes and other intrusives.

A preliminary geochemical characterization of the waste rock was completed by Rescan and results were presented in an Acid Rock Drainage (ARD) / Metal Leaching (ML) baseline report (Rescan, 2013). Static geochemical tests were completed on samples of drill core selected to represent the major and minor waste rock lithologies from the Project. Table 3.1-1 provides the ML and ARD potential and proportion of PAG/uPAG/nPAG waste rock by lithology and deposit for the deposits at the Goose site. Table 3.1-2 provides equivalent information for the deposits at the George site.

Goose Site Waste Rock

Goose Property mine workings and waste rock represent a moderate ML/ARD potential. Low to moderate bulk neutralizing potential (NP) contents could result in acidic drainage after a lag time. Interaction with the deposit material and air/water could result in result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MMER limits. The two lithologies that will comprise the majority of the mine workings and waste rock are greywacke and iron formation. Approximately 30% of greywacke and iron formation samples are currently classified as uncertain acid generating potential (uPAG). For mine planning purposes, Sabina has used the precautionary approach and assumed that all uPAG is PAG with runoff reporting to the TIA.

George Site Waste Rock

George Property mine workings and waste rock represent a moderate to high ML/ARD potential. Low to moderate bulk NP contents combined with low to moderate sulphur contents could result in acidic drainage after a lag time. Interaction with the deposit material and air/water could result in result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MMER limits. As with the Goose site, sizing of the separate PAG and nPAG piles at the George site are based on the assumption that waste rock with uncertain acid generating potential (uPAG) is PAG.

Development of Segregation Criteria for Mine Operation

Continued kinetic test results will be used to develop a site-specific ARD criterion. Management plans will incorporate testing that will allow segregation of mine workings and waste rock. In the current mine design, sizing of the separate PAG and nPAG piles are based on the assumption that waste rock with uPAG is PAG.

3.1.3 Waste Rock Stockpile Areas

Waste rock generated by the Project will be contained in Waste Rock Stockpile Areas (WRSAs) located near to the open pits (Figure 3.1-1). The WRSAs will consist of separate but adjacent engineered stockpiles of PAG and nPAG waste rock.

There will be two (2) WRSAs at the Goose Site as follows:

- **Llama/Umwelt WRSA:** Located to the east and north of the proposed Llama open pit and Umwelt open pit and underground mines.
- **Goose WRSA:** Located to the east of the proposed Goose open pit.

There will be three (3) WRSAs at the George Site as follows:

- **Lone Cow Pond (LCP) North WRSA:** Located southeast of the proposed LCP North open pit.
- **Locale 1 WRSA:** Located northwest of the proposed Locale 1 open pit.
- **Locale 2 WRSA:** Located east of the proposed Locale 2 open pit.

Each of the WRSAs has separate PAG and nPAG piles that will share a common water management system.

Table 3.1-1. Goose Site Waste Rock – ML Potential and Proportion of PAG/uPAG/nPAG by Deposit and Lithology (October, 2013)

	Goose Main				Llama				Umwelt			
Lithology	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG
Greywacke	Al, As, Cu, Se	5.4%	32.4%	62.2%	Al, As, Se	17.6%	37.1%	45.2%	Al, As, Cd, Se	17.9%	30.8%	51.3%
Iron Formation	Al, As, Cd, Se	5.6%	16.7%	77.8%	Al, As, Cd, Cu, Fe, Se	33%	34.9%	32.1%	Al, As, Cd, Se	14.3%	42.9%	42.9%
Mudstone	Al, As, Cd, Cu, Se	5.3%	26.3%	68.4%	Al, Se	38.9%	13.9%	47.2%	Al, As, Se	25%	6.3%	68.8%
Felsic Dykes	Al	0%	0%	100%	Al, As, Se	14.3%	32.1%	53.6%	Al, As[3], Cd, Se	28.6%	0%	71.4%
Vein	As	0%	0%	100%	As, Cu, Pb	100%	0%	0%	n/a	0%	100%	0%
Gabbro	Al, As, Cu, Se	0%	12.5%	87.5%	Al, Cu, Fe, Se	2%	20.4%	77.6%	Al, As, Cu, Fe, Se	0%	6.3%	93.8%

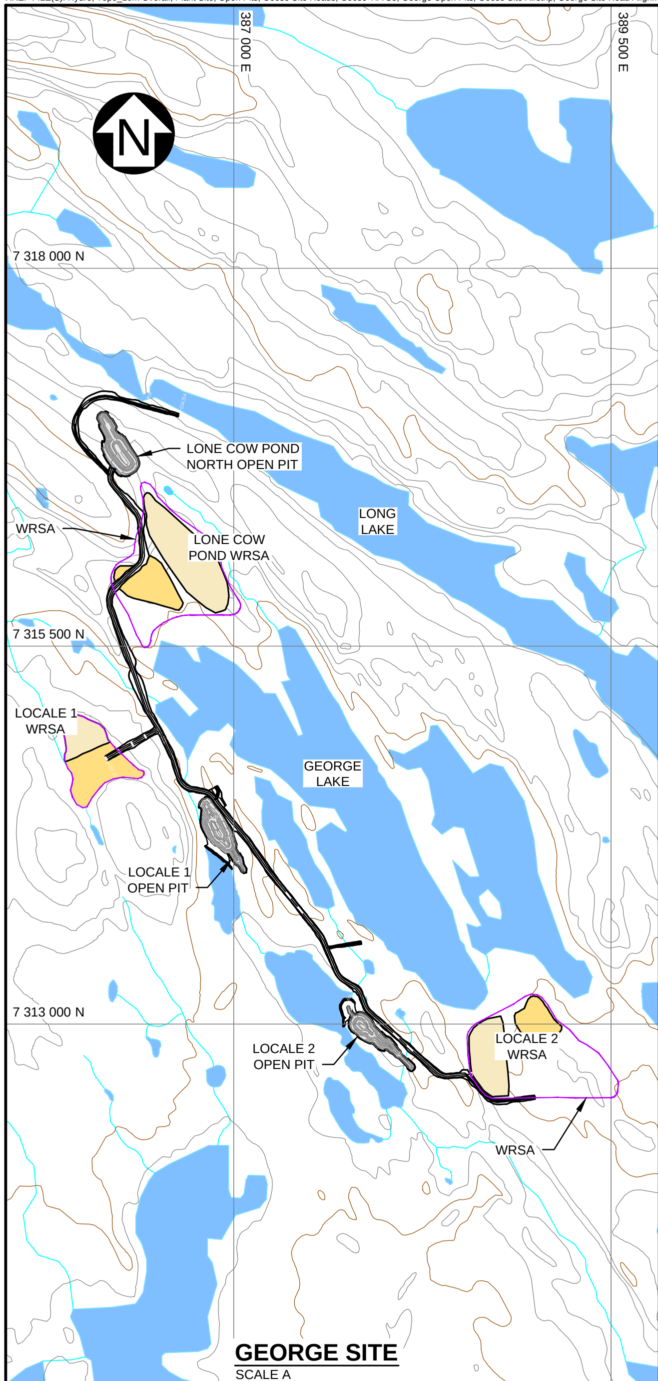
Notes:
[1]Source: Rescan, 2013.
[2]ML Potential - Metal Leaching Potential, as indicated by either shake flask extraction (SFE) or field leach barrel (FLB) testing, and in comparison to CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME, 2013). Typically the SFE testing identified metal leaching potential that was not indicated by the FLB testing. See Rescan (2013).
[3]SFE and/or FLB testing indicated metal leaching potential above MMER Schedule 4 discharge limits.

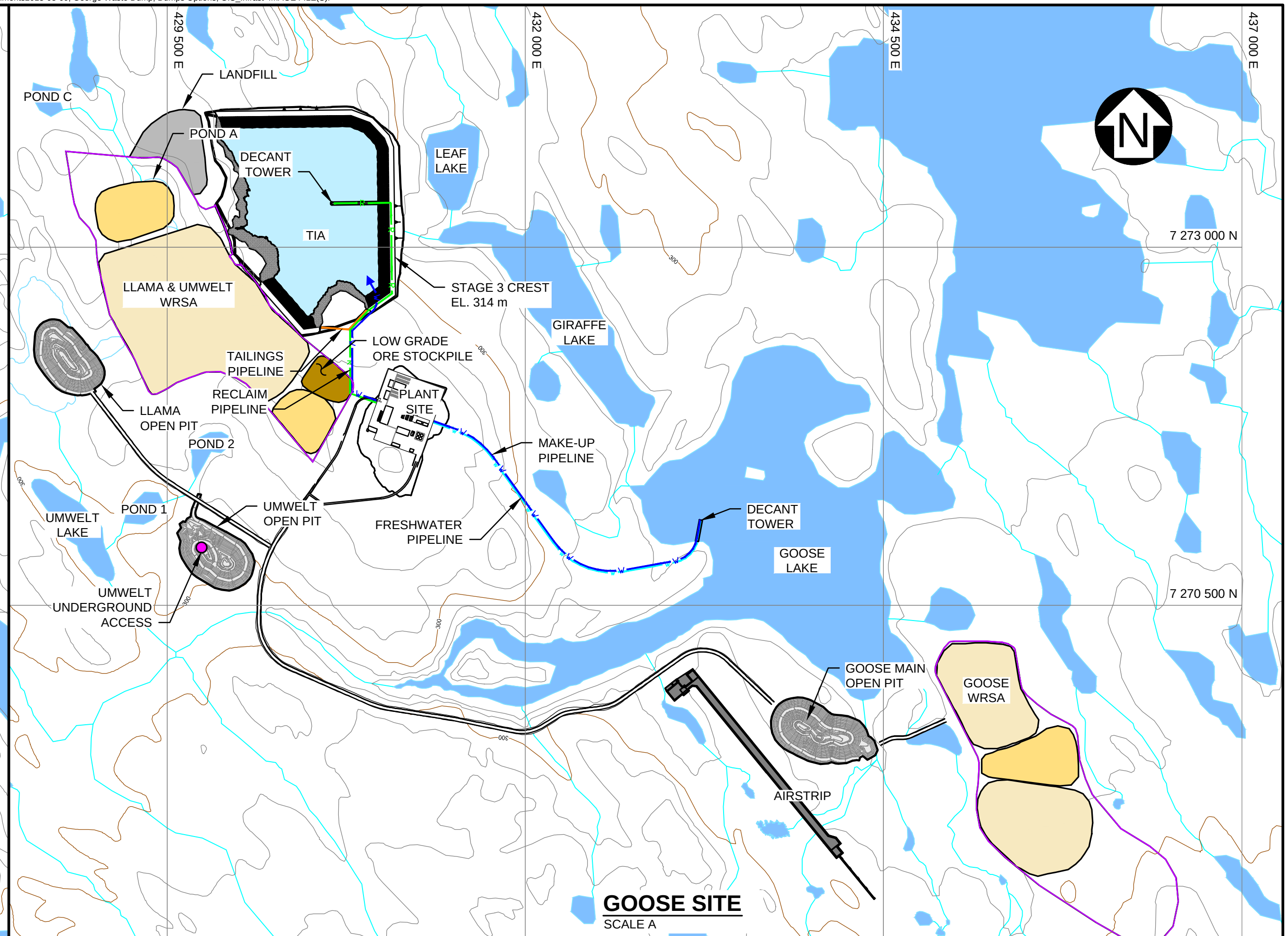
Table 3.1-2. George Site Waste Rock – ML Potential and Proportion of PAG/uPAG/nPAG by Deposit and Lithology (October, 2013)

	LCP North				Locale 1				Locale 2			
Lithology	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG
Greywacke	n/a	61.5%	15.4%	23.1%	n/a	54.5%	27.3%	18.2%	As, Cd, Cu	38.9%	44.4%	16.7%
Iron Formation	n/a	100%	0%	0%	n/a	7.1%	21.4%	71.4%	As, Cd, Cu, Ag	10%	30%	60%
Mudstone	n/a	100%	0%	0%	n/a	33.3%	33.3%	33.3%	n/a	42.9%	14.3%	42.9%
Felsic Dykes	n/a	0%	100%	0%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vein	n/a	50%	0%	50%	n/a	50%	0%	50%	n/a	n/a	n/a	n/a
Gabbro	n/a	0%	0%	100%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Notes:
[1]Source: Rescan, 2013.
[2]ML Potential - Metal Leaching Potential, as indicated by field leach barrel (FLB) testing, and in comparison to CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME, 2013). See Rescan (2013).

SAVED: I:\1\01\00517\02\A\Acad\FIGS\A05_r0 , 10/29/2013 8:22:24 AM , ASIMPSON PRINTED: 10/29/2013 8:23:31 AM, Layout1, ASIMPSON
XREF FILE(S): Hydro; Topo_10m Overall; Plant Site; Open Pits; Goose Site Roads; Goose TIA S3; George Open Pits; Goose Site Airstrip; George Site Road Alignments2013-08-09; George Waste Dump; Dumps Options; GIS_Infrast IMAGE FILE(S):





LEGEND:

- nPAG STOCKPILE
- PAG STOCKPILE
- DEIS WRSA

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. LIDAR/TOPOGRAPHY BASED ON INFORMATION PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL OPEN PIT LAYOUTS ARE ULTIMATE OPEN PITS.
5. WASTE DUMP AND OPEN PIT LAYOUTS PROVIDED BY AMC.
6. PLANT SITE LAYOUT PROVIDED BY TETRATECH.
7. ROAD ALIGNMENTS AND AIRSTRIP LAYOUT PROVIDED BY EBA.

500 250 0 500 1000 1500 2000 2500 m
SCALE A

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GENERAL ARRANGEMENT PLAN

Knight Piésold CONSULTING

P/A NO.	REF NO.	
VA101-517/2	7	
FIGURE 3.1-1		REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	25OCT'13	ISSUED WITH REPORT	RDW	AS	RAC	KEH

3.1.4 Waste Rock Stockpile Design

The mine production schedule expects to generate approximately 56.8 Mt of PAG and 62.8 Mt of nPAG waste rock over the life of the mine. Waste rock generated from mining activities at the site will be end-dumped in surficial stockpiles and deposited in a similar manner as the ore. PAG and nPAG waste rock will be identified by the Mine Manager and Head Geologist applying a screening methodology to be developed prior to construction (Section 3.1.2).

PAG waste rock will be stockpiled in 3 m lifts to promote freezing of the waste rock following lift placement. The PAG stockpiles are designed to incorporate the waste rock into the permafrost using convective cooling techniques to aggregate the permafrost into the stockpiles. This will improve the water quality of the runoff from the stockpiles. The nPAG will be stockpiled with a maximum lift thickness of 10 m. All stockpiles will be constructed with maximum side slopes of 2H:1V. The final stockpile heights will range from 15 to 35 m above ground surface. The final WRSA footprints will range from 11 ha (Locale 2) to 120.5 ha (Llama/Umwelt).

Throughout the mine life, the nPAG waste rock will be used for various construction activities and to progressive apply a final nPAG cap over the PAG stockpiles. At closure, the remaining nPAG thermal cover will be applied over the PAG stockpiles to prevent seasonal thawing of the PAG. Disturbed areas of the nPAG stockpiles where nPAG was extracted for cover material will be re-graded to maximum 2H:1V side slopes (Knight Piésold, 2013b).

Further design details including stockpile design and foundation requirements will be provided in a future update to the plan following detailed engineering design and prior to construction. The Site Water Management Plan presents preliminary plans for runoff management.

3.1.5 Waste Rock Production Schedule

A waste rock production schedule is provided in Table 3.1-3. The schedule includes details on progressive reclamation of the PAG stockpiles to be completed during operations. This will involve covering final lifts of PAG waste rock with nPAG directly from the active mining operation.

The following is a description of the production schedule progressive reclamation and final capping, including the quantity of nPAG waste rock derived from adjacent active mining operations and nearby stockpiles:

<u>Umwelt/Llama WRSA</u>

- During years 4 and 5, approximately 2.6 Mm^3 of nPAG waste rock will be transported from the active Goose pit operation to the Umwelt/Llama WRSA.
- Final capping of the Umwelt/Llama WRSA will be completed with approximately 2.4 Mm^3 of stockpiled nPAG waste rock.

<u>Goose WRSA</u>

- Most of the nPAG cover will be derived from the Goose pit operation.
- Final capping of the Goose WRSA will be completed with approximately 2.4 Mm^3 of stockpiled nPAG waste rock.

Table 3.1-3. Waste Rock Disposal Schedule

Site	Storage Area	Mine	Waste	Year of Operation										
				-2	-1	1	2	3	4	5	6	7	8	9
Goose	WRSA 1 (Umwelt/Llama)	Umwelt Open Pit	Overburden (m^3)	887,605	0	0	0	0	0	0	0	0	0	0
			NAG (m^3)	1,362,174	3,102,992	2,785,264	519,394	0	0	0	0	0	0	0
			PAG (m^3)	1,541,630	3,655,638	3,479,231	654,465	0	0	0	0	0	0	0
		Umwelt Underground	NAG (m^3)	0	0	0	38,186	39,377	36,635	3,184	0	0	0	0
			PAG (m^3)	0	0	0	32,529	33,543	31,208	2,712	0	0	0	0
		Llama Open Pit	Overburden (m^3)	0	0	747,376	1,257	0	0	0	0	0	0	0
			NAG (m^3)	0	0	1,328,358	3,522,447	1,837,694	452,787	0	0	0	0	0
			PAG (m^3)	0	0	1,908,716	5,727,784	3,065,993	731,962	0	0	0	0	0
		NAG from WRSA 2 (m^3)		0	0	0	0	0	528,138	2,094,412	0	0	0	0
		NAG + Overburden (m^3)		2,249,779	3,102,992	4,860,999	4,081,284	1,191,447	0	0	**-1,017,560**	0	0	0
		PAG (m^3)		1,541,630	3,655,638	5,387,946	6,414,779	3,099,537	763,170	2,712	0	0	0	0
		PAG Area to Cover (m^2)		513,877	1,204,585	1,204,585	1,204,585	1,033,179	778,789	254,390	0	0	0	0
	WRSA 2 (Goose)	Goose Open Pit	Overburden (m^3)	0	0	0	1,091,504	1,520,085	0	0	0	0	0	0
			NAG (m^3)	0	0	0	84,959	3,181,692	6,568,740	3,157,555	78,129	0	0	0
			PAG (m^3)	0	0	0	470,253	2,037,189	2,622,348	1,217,562	31,794	0	0	0
		NAG to WRSA 1 (m^3)		0	0	0	0	0	528,138	2,094,412	0	0	0	0
		NAG + Overburden (m^3)		0	0	0	1,176,464	4,701,777	5,823,031	626,763	**-770,187**	**-1,623,416**	0	0
		PAG Area to Cover (m^2)		0	0	0	156,751	781,421	727,028	617,933	405,854	0	0	0
George	WRSA 3 (Lone Cow Pond)	LCP N Open Pit	NAG (m^3)	0	0	0	0	0	0	0	373,632	865,921	162,022	0
			PAG (m^3)	0	0	0	0	0	0	0	388,882	901,265	168,636	0
		NAG to Locale 1 (m^3)		0	0	0	0	0	0	0	0	174,039	0	0
		NAG from Locale 2 (m^3)		0	0	0	0	0	0	0	0	0	220,870	0
		NAG (m^3)		0	0	0	0	0	0	0	373,632	691,882	0	**-398,184**
		PAG Area to Cover (m^2)		0	0	0	0	0	0	0	129,627	195,269	99,546	0
	WRSA 4 (Locale1)	Locale 1 Open Pit	NAG (m^3)	0	0	0	0	0	0	0	938,308	398,191	0	0
			PAG (m^3)	0	0	0	0	0	0	0	976,606	414,444	0	0
		NAG from LCP N (m^3)		0	0	0	0	0	0	0	0	174,039	0	0
		NAG from Locale 2 (m^3)		0	0	0	0	0	0	0	0	0	139,288	0
		NAG (m^3)		0	0	0	0	0	0	0	938,308	0	**-97,470**	0
		PAG Area to Cover (m^2)		0	0	0	0	0	0	0	202,247	59,189	0	0
	WRSA 5 (Locale 2)	Locale 2 Open Pit	NAG (m^3)	0	0	0	0	0	0	0	0	346,416	401,803	0
			PAG (m^3)	0	0	0	0	0	0	0	0	360,556	418,203	0
		NAG to LCP N (m^3)		0	0	0	0	0	0	0	0	0	220,870	0
		NAG to Locale 1 (m^3)		0	0	0	0	0	0	0	0	0	139,288	0
		NAG (m^3)		0	0	0	0	0	0	0	0	346,416	0	**-397,451**
		PAG Area to Cover (m^2)		0	0	0	0	0	0	0	0	109,774	99,363	0

Notes:

[1] *Source: Knight Piésold (2013).*

[2] *Calculations assume the following approximate densities:*

Overburden =	*1.5*	*t/m^3*
Waste rock =	*2*	*t/m^3*

[3] *WRSA footprints are as follows:*

WRSA 1 (Umwelt AND Llama) =	*1,204,585*	*m^2*
WRSA 2 (Goose) =	*781,421*	*m^2*
Lone Cow Pond North =	*195,269*	*m^2*
Locale 1 =	*202,247*	*m^2*
Locale 2 =	*109,774*	*m^2*

[4] *PAG is placed in 3 m lifts; NAG is placed in 4 m lifts over final PAG waste rock.*

[5] *Bolded numbers are the quantities of NAG waste rock to be extracted from NAG stockpile to provide final cap to PAG waste rock.*

LCP North WRSA

- A portion of the nPAG cover will be derived from the LCP North pit operation.
- During year 8, approximately 221,000 m^3 of nPAG waste rock will be transported from the active Locale 2 pit operation to the LCP WRSA.
- Final capping of the LCP North WRSA will be competed using approximately 400,000 m^3 of stockpiled nPAG waste rock.

Locale 1 WRSA

- A portion of the nPAG cover will be derived from the Locale 1 pit operation.
- During year 7, approximately 175,000 m^3 of nPAG waste rock will be transported from the active LCP pit operation to the Locale 1 WRSA.
- Final capping of the Locale 1 WRSA will be completed using approximately 100,000 m^3 of stockpiled nPAG waste rock.

Locale 2 WRSA

- A portion of the nPAG cover will be derived from the Locale 2 pit operation.
- Final capping of the Locale 2 WRSA will be completed using approximately 400,000 m^3 of stockpiled nPAG waste rock.

Contingencies

Development of the WRSAs is based on the mine production schedule. It is considered unlikely that the total volume of waste rock generated by the Project would be greater than the design capacity of the facilities. Should the volume of PAG (including uPAG) be less than expected, then there are several options available to accommodate a larger proportion of nPAG, including:

- Stockpiling the nPAG in an enlarged pile within the same WRSAs.
- Co-dispose the nPAG with PAG as previously planned.

Given the conservatism built into the geochemical evaluation (assuming uPAG is PAG) it is unlikely that more PAG waste rock will be generated than predicted under the current mine plan.

3.1.6 Waste Rock Stockpile Stability Analysis

Stability Analyses were conducted on cross-sections from all nPAG and PAG stockpiles (excluding the nPAG stockpiles from the Llama & Umwelt WSRA). Cross-sections for creating the models were developed from 3D models of the waste rock stockpiles. The waste rock was modelled as a rockfill material using a low density, poor grading and weak particles based on investigations by Leps (1970).

From the stability analysis results it was observed that all analyses satisfy the minimum factor of safety for long-term static conditions (1.5). Stability models analyzed with an appropriate seismic load applied show that no deformation of the waste dumps is expected during a seismic event.

The potential for rock heave phenomena to occur and affect ground stability will be assessed in the next phase of study.

3.1.7 Waste Rock Stockpile Thermal Modelling

The strategy of incorporating the PAG waste into the permafrost was developed based on computed depths of freeze and thaw. Average freeze/thaw depths were calculated using a number of simplified closed-form mathematical solutions including the Neumann and the Modified Berggren equations (Knight Piésold, 2013b). Based on these computations, the freezing depth over an average winter is estimated to be approximately 6 m and the thawing depth over an average summer is estimated to be approximately 3 m. The calculations supported the recommendation to apply PAG waste rock in 3 m thick lifts and apply a final cover of nPAG waste rock of 4 m thickness (Knight Piésold, 2013b).

These estimates are preliminary and are subject to further refinement using thermal modelling as data becomes available.

3.1.8 Waste Rock Management Alternatives

The proposed locations of the WRSAs were selected based on proximity to open pits and other facilities, and ground conditions, as well as the ease with which runoff from the piles can be collected to a single runoff collection pond.

One alternative would be to co-dispose PAG and nPAG waste rock together in a single pile. This would not allow for the PAG waste rock to be capped at closure with nPAG waste rock. This alternative was not considered because the resultant long-term runoff from the piles would likely be potentially acid-generating and metal leaching.

Alternatively, the waste rock could be segregated into separate PAG and nPAG piles throughout the mine life. This would result in higher closure costs as all capping of PAG waste rock with nPAG waste rock would need to be carried out during mine closure rather than during operations. This option was deemed unacceptable due to higher Project costs.

A potential alternative identified by Sabina for further study is to dispose of waste rock into one or more of the open pits when mining at a pit has ceased. This option will likely have higher operating costs but lower final closure costs, and would result in waste rock placed under a cover of water in one or more pit lakes. This option could limit any further open pit or underground mining within the pit. This option will be considered further in the feasibility study.

3.2 TAILINGS PRODUCTION AND STORAGE

Tailings will be generated by the process plant at a daily production rate of 5,400 t/d, for a total tonnage of 16.3 Mt over the life of the Project. A TIA located adjacent to the process plant at the Goose site will securely and permanently store tailings solids, process water, and contact runoff from the Goose Site.

3.2.1 Tailings Physical Characteristics

Physical properties of the tailings include the following:

- Slurry Percent Solids: 49%.
- Slurry Density: 1.51 t/m^3.
- Grain Size: 53 μm on average with a coarse fraction (defined as particles >44 μm) of 95 μm.
- Solids Density: 3.17 t/m^3.
- Settled Dry Density: 1.3 to 1.4 t/m^3.

3.2.2 Tailings Geochemical Characteristics

The bulk tailings that will be stored in the TIA will have a high ML/ARD potential. Some parameters in the supernatant ageing tests were above MMER limits and all samples were classified as PAG. During operations if tailings material that forms the TIA beaches is not buried under fresh material before the lag time is exceeded then ARD will develop. The TIA will be constructed to be a zero discharge facility during operation. At closure, nPAG waste rock will be used to cover tailings material to minimize infiltration and development of ML/ARD.

3.2.3 TIA Design Basis

The design of the TIA has incorporated the following requirements:

- Permanent, secure and total confinement of tailings solids within an engineered disposal facility.
- Control, collection and recovery of tailings pore water and runoff water from within the tailings impoundment for recycling to the mill operations as process water.
- Minimizing seepage losses from the facility and providing seepage collection systems below the impoundment structures to minimize adverse downstream water quality impacts.
- Integration of the tailings impoundment into the overall mine site water management requirements.
- Designing for closure.
- The inclusion of freeboard allowances for ice entrainment, storm water management, wave run-up, and other contingencies which include sloping beaches, ice expansion of supernatant pond, and potential embankment settlement following a seismic event.
- The inclusion of monitoring features for all aspects of the facility.

The design basis is summarized in Table 3.2-1.

Table 3.2-1. Design Basis Summary – Tailings Impoundment Area

Item	Design Criteria
Mine Production	Total ore milled = 16.3 Mt Throughput = 5,000 tpd 8 to 10 years
Tailings Properties	% solids of tailings from mill process = 49% Average in-situ dry density of 1.3 t/m^3 from start-up to the end of Year 1, 1.4 t/m^3 from start of Year 2 to EOM Ice entrainment allowance of 10% tailings volume
Tailings Impoundment Area	Geomembrane faced rockfill embankment constructed with run of mine nPAG waste rock Starter embankment (Stage 1) constructed for 12 months of tailings production plus IDF, freeboard, and process water Embankments raised via downstream construction to store additional tailings production plus IDF, freeboard, and process water HDPE lined basin and embankments with 100 mil HDPE geomembrane. Minimum 150 mm of bedding material (sand) Minimum 1,000 mm of liner protection material (sand) on TIA basin, minimum 3,000 mm of liner protection material (sand) at a 3H:1V side slope on the TIA upstream embankment faces Storm storage (IDF) of 290,000 m^3 Wave run-up and additional contingencies of 3 m Minimum static factors of safety: 1.3 – Short Term Conditions; 1.5 – Long Term Conditions (Steady state seepage, normal reservoir level)

Should additional mineral resources be identified for mining and processing, additional raises to the TIA embankment will be necessary and should be possible.

3.2.4 Dam Hazard Classification

Assessment of the dam hazard classification was carried out to determine the appropriate design earthquake and flood events for the TIA. Selection of the design earthquake and flood events is based on the classification criteria provided by the CDA Dam Safety Guidelines (CDA, 2007). The CDA classification guidelines and suggested design earthquakes and flood events are summarized in Tables 3.2-2 and 3.2-3, respectively.

Table 3.2-2. Dam Classification

		Incremental Losses		
Dam Class[2]	**Population at Risk**	**Loss of Life[3]**	**Environmental and Cultural Values**	**Infrastructure and Economics**
Low	None	0	Minimal short-term loss. No long-term loss.	Low economic losses; area contains limited infrastructure or services.
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat. Loss of marginal habitat only. Restoration in kind highly possible.	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes.
High	Permanent	10 or fewer	Significant loss or deterioration of *important* fish or wildlife habitat. Restoration or compensation in kind highly possible.	High economic losses affecting infrastructure, public transportation, and commercial facilities.
Very High	Permanent	100 or fewer	Significant loss or deterioration of *critical* fish or wildlife habitat. Restoration or compensation is possible but impractical.	Very high economic losses affecting infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances).
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat. Restoration or compensation impossible.	Extreme losses affecting critical infrastructure or services (e.g. hospital, major industrial complex, major storage facilities for dangerous substances).

Notes:
[1]Reproduced from Table 2-1 of the Canadian Dam Association's Dam Safety Guidelines (CDA, 2007).
[2]Definitions for Population at Risk:
***None** - There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.*
***Temporary** – People are only temporarily in the Dam-Breach Inundation Zone (e.g., seasonal cottage use, passing though on transportation routes, participating in recreational activities).*
***Permanent** – The population at risk is ordinarily located in the Dam-Breach Inundation Zone (e.g., as permanent residents); three consequence classes (High, Very High and Extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).*
[3]Implications for Loss of Life:
***Unspecified** - The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the temporary requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.*

Table 3.2-3. Suggested Design Flood and Earthquake Levels[1]

Dam Class[2]	Annual Exceedance Probability (AEP)	
	IDF[3]	EDGM[4]
Low	1/100	1/500
Significant	Between 1/100 and 1/1,000[5]	1/1,000
High	1/3 between 1/1,000 and PMF[6]	1/2,500[7]
Very High	2/3 between 1/1,000 and PMF[6]	1/5,000[7]
Extreme	PMF[6]	1/10,000

Notes:
[1]Reproduced from Table 6-1 of the Canadian Dam Association's Dam Safety Guidelines (CDA, 2007).
[2]As defined in Table 3.2-2 above.
[3]Extrapolation of flood statistics beyond 1/1,000 YEAR FLOOD (10^{-3} AEP) is discouraged.
[4]AEP levels for EDGM are to be used for the mean rather than the median estimates of the hazard.
[5]Selected on the basis of incremental flood analysis, exposure and consequences of failure.
[6]PMF has no associated AEP. The flood defined as "1/3 between 1/1000 year and PMF" or "2/3 between 1/1000 year and PMF" has no associated AEP.
[7]The EDGM value must be justified to demonstrate conformance to societal norms of acceptable risk. Justification can be provided with the help of failure mode analysis focused on the particular modes that can contribute to failure initiated by a seismic event. If the justification cannot be provided, the EDGM should be 1/10,000.

The TIA dam classification is carried out by considering the potential incremental consequences of an embankment failure. The incremental consequences of failure are defined as the total damage from an event with dam failure minus the damage that would have resulted from the same event had the dam not failed. Three categories of losses are considered; loss of life, environmental and cultural values, and infrastructure and economics, as shown on Table 3.2-2.

The project is located in an extremely remote area with no major development other than those associated with the project itself. The potential for loss of life due to a dam failure is therefore very low. A Dam Classification of "High" has been selected for the TIA based on the impact to environmental and cultural values, i.e., expected significant loss or deterioration of important fish or wildlife habitat with restoration or compensation in kind highly possible.

The selection of an Inflow Design Flood (IDF) and an Earthquake Design Ground Motion (EDGM) is governed by the dam classification. The criteria for selection of the aforementioned flood event and design earthquake are outlined in Table 3.2-3.

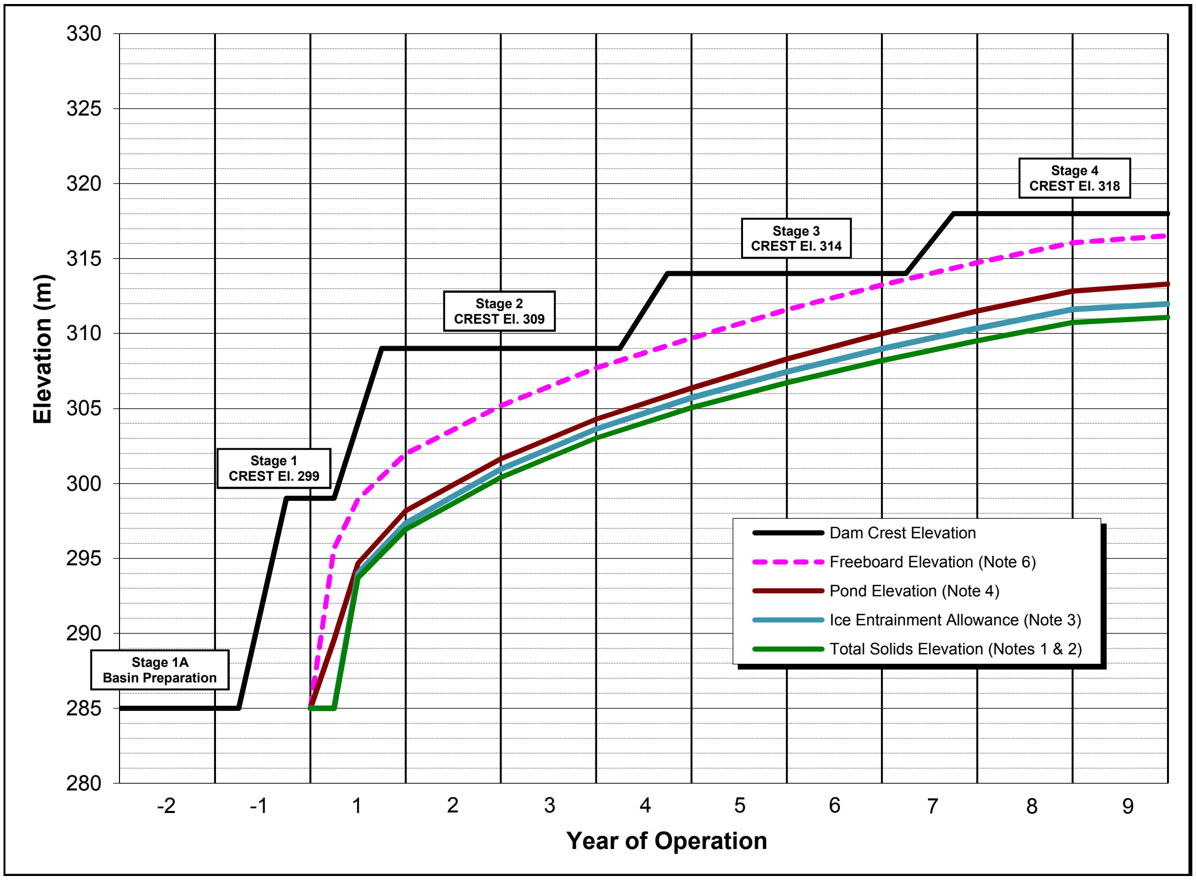
The design criteria for a dam with a "High" classification will include:

- An IDF of 1/3 between the probable maximum flood and the 1-in-1,000-year, 24-hour storm event (approximately 209 mm).
- An earthquake design ground motion (EDGM) corresponding to the 1-in-2,500-year seismic event (approximately 0.05g).
- An Operating Basis Earthquake (OBE) of the 1-in-2,500-year seismic event and Maximum Design Earthquake of the 1-in-10,000-year seismic event have been selected for this project. These correspond to PGAs of 0.05g and 0.14g respectively.

3.2.5 TIA Embankment Construction

The TIA will be constructed in four stages over the life of the mine. The construction filling schedule for the TIA is shown on Figure 3.2-1. The general arrangement of the ultimate TIA in Year 7 is shown on Drawing C0006 in Appendix A.

Figure 3.2-1. Tailings Impoundment Area Filling Schedule



Note:
SOURCE: Knight Piésold, 2013a.

Tailings and runoff water from within the TIA will be recycled back to the mill operations as process water, with no planned discharge from the TIA during operations. Seepage collection systems below the TIA structure will minimize seepage losses and adverse water quality impacts downstream. Perimeter ditches or berms will collect seepage that may occur through the embankment and any collected seepage will be pumped back into the TIA. The design of the TIA has incorporated a freeboard allowance for ice entrainment, storm water and wave action; and other contingencies such as sloping tailings beaches.

Site and Foundation Preparation

Prior to construction of the TIA, some preparation work is necessary, specifically in the TIA Basin and the foundations of the TIA embankments. TIA basin preparation will require the stripping of topsoil and organic materials to stockpile, the recontouring of the basin area, the process and installation of a minimum 150 mm thick bedding layer, the installation of a HDPE Geomembrane liner with a non-woven geotextile underlay and overlay, and the processing and installation of a minimum 1,000 mm thick ice protection layer on top of the liner system.

TIA foundation preparation will require establishing sediment and erosion control best management practices throughout the construction area and the stripping of topsoil and overburden materials to stockpile.

Other site preparation work to be carried out includes the excavation of runoff collection and diversion ditches, seepage collection & recycle measures and embankment perimeter roads.

Embankment Components

A typical section showing the development of the TIA during mine operations is provided on Drawing C0005 in Appendix A.

The main components of the TIA embankments are as follows:

- Embankment Shell Zone – Zone C:
  - The embankment shell zone will be constructed using nPAG waste rock sourced from the development of the pits, with a maximum particle size of 900 mm.
- HDPE Liner System:
  - The upstream embankment face and TIA basin will be lined with a 100 mil HDPE liner. 16 oz. non-woven geotextile will be placed below and above the HDPE liner to help protect the liner from damage during the construction program.
- Bedding Layer:
  - The liner will be installed on a bedding layer, which is to be placed and suitably compacted on the embankment face and TIA basin to provide a smooth contact surface for liner installation. The bedding layer consists of processed sand material from screened/crushed nPAG waste rock.
- Ice Protection Layer:
  - A sand and gravel layer will be installed on top of the liner to protect it against damage from ice in areas exposed to water. The ice protection layer will be screened/crushed material from nPAG waste rock with a maximum particle size of 50 mm.

Instrumentation

Geotechnical instrumentation will be installed in the TIA embankment and foundation during construction and over the life of the project. The instrumentation will be monitored to assess embankment performance and to identify any conditions different to those assumed during design and analysis. Amendments to the ongoing designs and/or remediation work can be implemented to respond to the changed conditions, should the need arise.

3.2.6 Seepage Analysis

Seepage through the embankments will be limited by the installation of a high-density polyethylene (HDPE) liner system throughout the facility. The upstream embankment face, and TIA basin, will be lined with a HDPE liner system comprised of a 100 mil textured (for the embankments) or smooth (for the basin) HDPE geomembrane with a 16 oz. nonwoven geotextile overlay and underlay to provide protective layers.

Lining of the facility will limit the majority of seepage from the facility to flow through defects in the liner. Leakage through the liner system was modelled using both a SEEP/W finite element seepage model and empirical leakage rate equations (Knight Piésold, 2013a). This assessment was carried out to determine potential leakage flow rates through the lined facility during operations of the TIA. Potential leakage flow rates through the liner system prior to tailings deposition were estimated using both the empirical and finite element methods of analysis, and a correction factor was developed to correct SEEP/W results to correlate with results from Giroud and Bonaparte's empirical results, as the Giroud and Bonaparte method is considered conservative given that it assumes that only a hydraulic head is acting on the defect and do not account for any materials above the liner, such as the ice protection cover and deposited tailings.

The estimated seepage rate from the TIA is in the order of 10^{-5} m^3/s at the end of production. This will decrease post-closure as the tailings consolidate, the supernatant pond is removed and a surface cover is constructed.

3.2.7 Stability Analyses

A simplified model of the TIA was created to run Slope/W stability analyses for static and seismic loading conditions. Stability conditions modelled included the following:

- Stability of upstream TIA starter embankment (prior to mill start-up) – static and seismic.
- Stability of downstream TIA starter embankment (prior to mill start-up) – static and seismic.
- Stability of TIA Stage 1 embankment (post tailings deposition) – static and seismic.
- Stability of TIA Ultimate embankment – static and seismic.
- Stability of TIA Ultimate embankment for post liquefaction conditions) static stability.

Peak Ground Accelerations (PGA) of 0.05g (1/2,500 seismic event) and 0.14g (1/10,000 seismic event) were adopted as the Operating Basis Earthquake (OBE) and Maximum Design Earthquake (MDE) seismic load factors respectively for the model.

Factors of Safety calculated in the models above satisfy the minimum required Factor of Safety of 1.5 for Long Term Static as specified in the Canadian Dam Association (CDA) Dam Safety Guidelines (CDA, 2007). Stability models with a seismic load of the MDE show that no deformation of the embankment is expected for such a seismic event.

3.2.8 TIA Operation

Tailings water from within the TIA will be recycled back to the mill operations as process water, with no planned discharge from the TIA during operations. Seepage collection systems below the TIA structure will minimize seepage losses and adverse water quality impacts downstream. Perimeter ditches will collect seepage through the embankment and the seepage will be pumped back into the TIA. The design of the TIA has incorporated a freeboard allowance for ice entrainment, storm water and wave action; and other contingencies such as sloping tailings beaches.

The tailings distribution system will extend from the mill to the TIA and consist of one (1) main 305 mm (12"), over-land pipeline that branches off with 150 mm (6") discharge spigots located around the perimeter of the facility. Discharge spigots will be spaced 50 to 100 m apart with 100 m extensions to allow for subaqueous discharge below the ice cover during the winter months.

The tailings distribution system is designed for a daily production rate of 5,400 t/d at a slurry flow rate of 305 m^3/h. Water will be reclaimed from the TIA through a decant structure and 250 mm (10”) pipeline designed for a flow rate of 233 m^3/h.

Water will be reclaimed from the TIA decant structure located mid-way up the east side of Main Embankment (Drawing C0006 in Appendix A). The water will consist of supernatant from the settled tailings and runoff from precipitation and snowmelt from the mine site. A dedicated HDPE pipeline will convey the reclaimed water to the storage tank located at the mill. The reclaim system is designed for a flow rate of 233 m^3/h and consists of an intake decant structure and an overland 10” HDPE DR21 (254 mm) pipeline that will be 2” (50 mm) UIP insulated and heat traced. The 1,200 mm diameter decant tower (shown on Drawings C0010 and C0011 in Appendix A) will be founded on a reinforced concrete footing and placed into a second larger diameter (2,000 mm) perforated pipe and surrounded by clean, coarse drainage rock. The decant structure will be fitted with one installed and one standby submersible pump, and all necessary control, check, drainage and isolation valves. A small, insulated utility shed will be installed over the decant tower to house the electrical boxes and valve control works. An access berm will be constructed from the Main Embankment to the tower.

The TIA pond has an integral role in recycling water from tailings back into the process plant. The water balance is presented in the Site Water Management Plan.

3.2.9 Tailings Management Alternatives

The proposed layout for the TIA was selected based on proximity to the plant site and local topography and foundation conditions.

A potential alternative for tailings disposal is to deposit the tailings into one (1) or more of the open pits when mining at a pit has ceased. This could potentially offset the construction of the final lift of the TIA embankment, and/or reduce the TIA footprint and therefore final closure costs; however, the TIA plays an important role in recycling water for processing and the currently proposed location is ideal for this purpose. This alternative for tailings disposal will be considered in the feasibility study.

4. Applicable Legislation and Guidelines

The Mine Waste Rock and Tailings Management Plan has been prepared to comply with existing regulations and follow the available guidelines provided by the federal government and the government of Nunavut. The applicable regulations include:

- *Fisheries Act* (1985b), including the *Metal Mining Effluent Regulations* (SOR/2002-22).
- *Nunavut Environmental Protection Act* (1988).
- *Nunavut Land Claim Agreement Act* (1993).
- Nunavut Waters and Nunavut Surface Rights Tribunal Act, S.C. 2002, c 10 (Canada, 2002).
- Northwest Territories Waters Regulations (Canada, 1993a), under the Northwest Territories Waters Act (SOR/93-303; Canada, 1992; expected to be replaced in the near future by a “Nunavut Waters Act and regulations”).

Water use and waste disposal in Nunavut is regulated by the Nunavut Water Board (NWB) through the water licensing process. The Project will be subject to a Type ‘A’ Water Licence. The on-site work is currently regulated by three Type ‘B’ Water Licences (2BE-GOO1015, 2BE-GEO1015 and 2BE-MLL1217).

In addition, through Sabina’s membership in the Mining Association of Canada, the company commits to meeting the requirements of the Towards Sustainable Mining (TSM) Initiative. A component of the TSM Initiative is adherence to the TSM Tailings Management Protocol, which includes the following elements:

- Development of a tailings management policy and commitment (either as a stand-alone policy or as part of an overall environmental policy).
- Development of a tailings management system.
- Assignment of accountability and responsibility for tailings management.
- Conducting an annual tailings management inspection.
- Preparation of an Operation, Maintenance and Surveillance (OMS) Manual.

The following are TSM Guidance Documents that Sabina will refer to as the project moves through the design and permitting phase and into construction:

- Tailings Management Protocol (MAC, 2011a).
- A Guide to the Management of Tailings Facilities (MAC, 2011b).
- A Guide to Audit and Assessment of Tailings Facility Management (MAC, 2011c).
- Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities (MAC, 2011d).

It should be noted that the scope of this management plan prescribed by the Nunavut Impact Review Board overlaps with the scope and content of a future OMS Manual that Sabina will develop as a member of the Mining Association of Canada. It is Sabina`s preference to replace this plan with a future OMS Manual that is compliant with MAC requirements.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager along with his/her direct reports are responsible for the implementation of this plan including:

- Overall management of plan.
- Operational aspects.
- Internal reporting.

The Environmental Superintendent along with their direct reports are responsible for the implementation of this plan including:

- Monitoring.
- External reporting.
- Ensuring compliance and adaptive management.

Future revisions to this plan will further define the site management structure, organizational chart and a listing of designated personnel responsible for aspects of this plan or a replacement OMS Manual in compliance with MAC requirements (see Section 4), as the organizational structure is developed.

6. Environmental Protection Measures

6.1 MANAGEMENT OF RUNOFF FROM WASTE ROCK STOCKPILES

Runoff from the WRSAs will be collected in perimeter ditches and directed to the collection ponds. During operations, runoff from the WRSAs at the Goose site will be pumped back to the TIA and runoff from the WRSAs at the George site will be collected in ponds and treated prior to discharge. Runoff and seepage management from the WRSAs is detailed further in the Site Water Management Plan.

Collection ponds will continue to operate and collect runoff from the WRSAs into the closure phase, until the collected runoff meet discharge criteria and are expected to meet applicable receiving waters criteria. During the active closure phase and while the collection ponds remain operational, collected runoff at the Goose site will be discharged to nearby open pits. At the George sites, the treatment plants will continue to operate. Once runoff can be demonstrated to meet applicable limits, the ponds will be decommissioned in accordance with the Mine Closure and Reclamation Plan (MCRP).

The collection ponds constructed for the WRSAs will apply the same design criteria as these for the TIA, in terms of managing extreme flows. Additional detail on water management is addressed in the Site Water Management Plan.

6.2 MANAGEMENT OF SEEPAGE FROM THE TIA

A small amount of seepage is expected to bypass the liner in the TIA, and this seepage will be collected in perimeter ditches/berms and will be pumped back onto the TIA. This will continue into the closure phase but will be reduced to negligible seepage over time with the stoppage of tailings deposition, removal of the supernatant pond, and the placement of the final cover.

6.3 DUST CONTROL

Dust from the WRSAs and TIA is not expected to make a significant impact; however, dust will be monitored and management to the best extent possible. Because of the size of the waste rock generated from the pit, the waste rock stockpiles are not expected to generate a meaningful amount of dust. The TIA will be operated with a water cover during operations to supply the process, and therefore limited tailings beach will be exposed that can generate wind-blown tailings. In the unlikely event that an unacceptable amount of dust is generated from end-dumping or front-loading during stockpiling operations or a lack of ice and water cover on the tailings, additional dust mitigation measures will be applied as identified in the Air Quality Management Plan.

6.4 AVOIDANCE OF NAVIGABLE WATERS

The siting of WRSAs and the TIA are not located in waterways and therefore do not have the potential to affect navigation.

7. Monitoring Program

Routine inspections will be conducted at WRSAs and will include:

- Measurement, recording and reporting of the number of truckloads and tonnage of waste rock hauled and stockpiled in accordance with the waste rock disposal schedule (Table 3.1-3), including confirmation that PAG and nPAG waste rock are being disposed of in the appropriate stockpiles.
- Monitoring stockpile construction and operation visually to ensure compliance with design, this management plan, permits, authorizations and commitments.
- Installing ground temperature monitoring instrumentation (thermistors) to ensure that PAG waste rock is encapsulated in permafrost.
- Evaluating the effectiveness of runoff collection measures.

Routine inspections will be conducted at the TIA and will include:

- Daily monitoring of the tailings discharge and tailings beach formation.
- Daily monitoring of the tailings supernatant water level within the decant tower.
- Weekly visual inspections of the tailings embankment and, during period of flow, seepage in perimeter ditches, etc.
- Monitoring geotechnical instrumentation installed in the tailings embankment and foundation over the life of the project. The instrumentation will be monitored to assess embankment performance and to identify any conditions different to those assumed during design and analysis. Amendments to the on-going designs and/or remediation work can be implemented to respond to the changed conditions, should the need arise.

Runoff water quality monitoring will be conducted as described in the Site Water Management Plan and prescribed in the Type A Water Licence.

8. Mitigation and Adaptive Management

Additional mitigation or adaptive management may be required as an outcome of monitoring activities described in Section 7. This may include changes to TIA operation or WRSA development as a result of operational, engineering and environmental monitoring.

9. Checking and Corrective Action

The General Manager or designate will conduct weekly checks of the monitoring activities and any trends in the data collected. Corrective action will be undertaken if mine waste management is not being conducted in accordance with this plan or any SOPs developed for stockpiling of waste rock and tailings management.

10. Record Keeping

Record keeping will be conducted by the site environmental compliance supervisor. Field and laboratory data will be entered into suitable electronic databases and checked for quality control.

11. Environmental Reporting

Environmental reporting will be conducted as identified in future permits, approvals and authorizations relevant to mine waste management. The Type A Water Licence is expected to be the primary regulatory instrument governing mine waste management for the Project.

12. Plan Effectiveness

The General Manager and Environmental Specialist will conduct an evaluation of the plan and its effectiveness on an annual basis. This plan may be updated as required if additional methods for construction, operation, maintenance and monitoring are found to be more appropriate.

13. Quality Assurance / Quality Control

Quality Assurance / Quality Control (QA/QC) for the waste rock and tailings monitoring program will include the preparation of Standard Operating Procedures (SOPs) developed for mine waste management operations, and auditing operations against this plan and any relevant SOPs.

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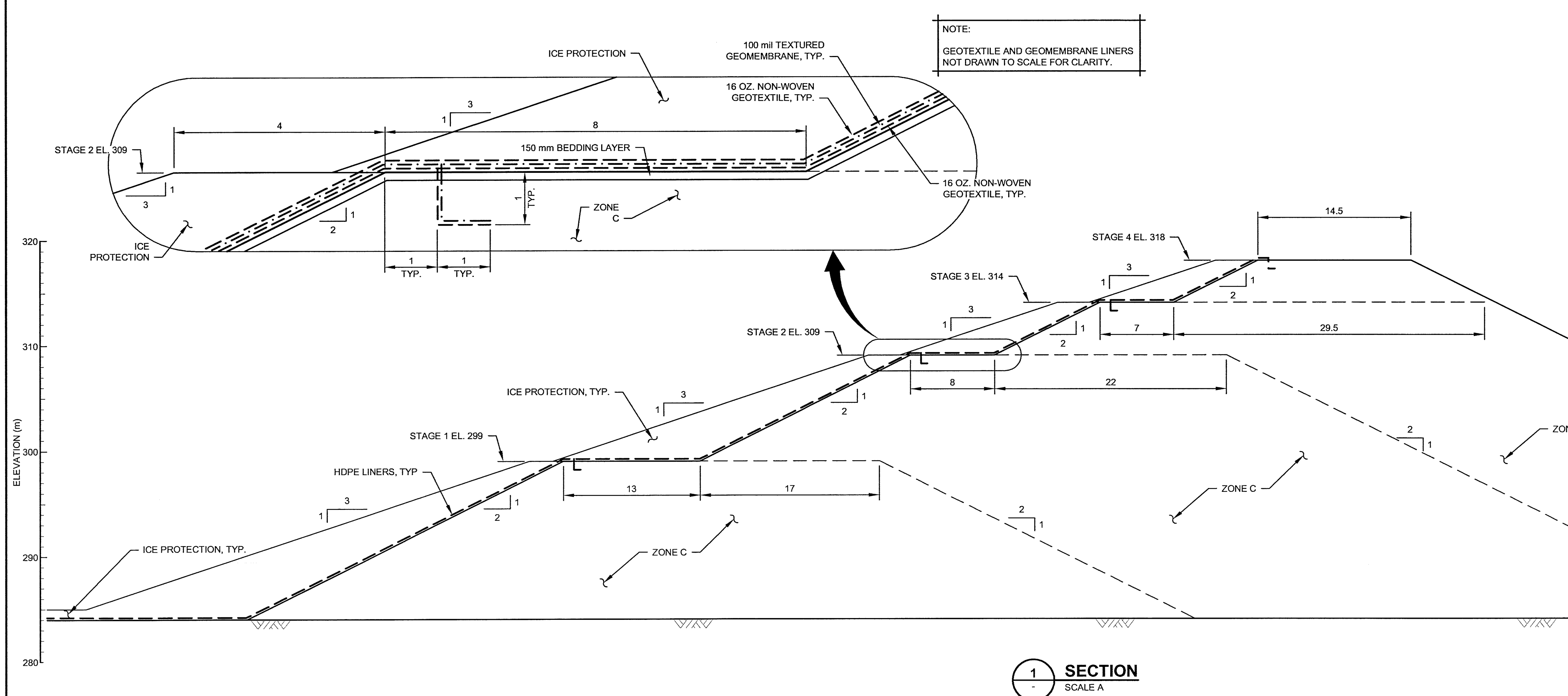
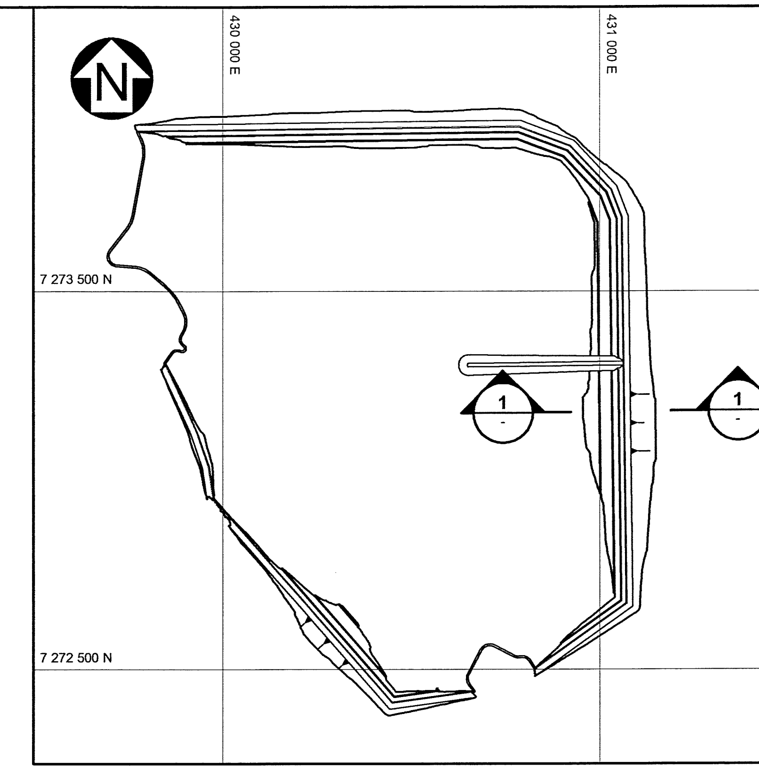
Appendix A

Tailings Impoundment Area Drawings



1 SECTION
SCALE A



KEY PLAN
NTS

NOTES:

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

NOT FOR CONSTRUCTION

SCALE A 5 2.5 0 5 10 15 20 25 m

MATERIAL SPECIFICATIONS		
ZONE	PLACEMENT AND COMPACTION	MATERIAL DESCRIPTION
C	MAX. 1 m LIFTS. COMPACTION VIA TRAFFICKING OF MINE EQUIPMENT	NPAG WASTE ROCK (RUN OF MINE)
BEDDING LAYER	MAX. 0.3 m LIFTS. COMPACTION AS REQUIRED BY ENGINEER.	SAND (PROCESSED)
ICE PROTECTION	MAX. 0.3 m LIFTS	SAND/SANDY GRAVEL (PROCESSED NPAG WASTE ROCK)

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA L.J. GALBRAITH 25493
Oct. 25/13

Knight Piésold CONSULTING

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

TSF EMBANKMENT SECTION AND DETAILS

P/A NO.	DRAWING NO.	REVISION
VA101-517/2	C0005	0

DRG. NO.	DESCRIPTION
-	-

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D

REVISIONS

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D
0	25OCT'13	ISSUED FOR INFORMATION	JEF	NSD		

REVISIONS

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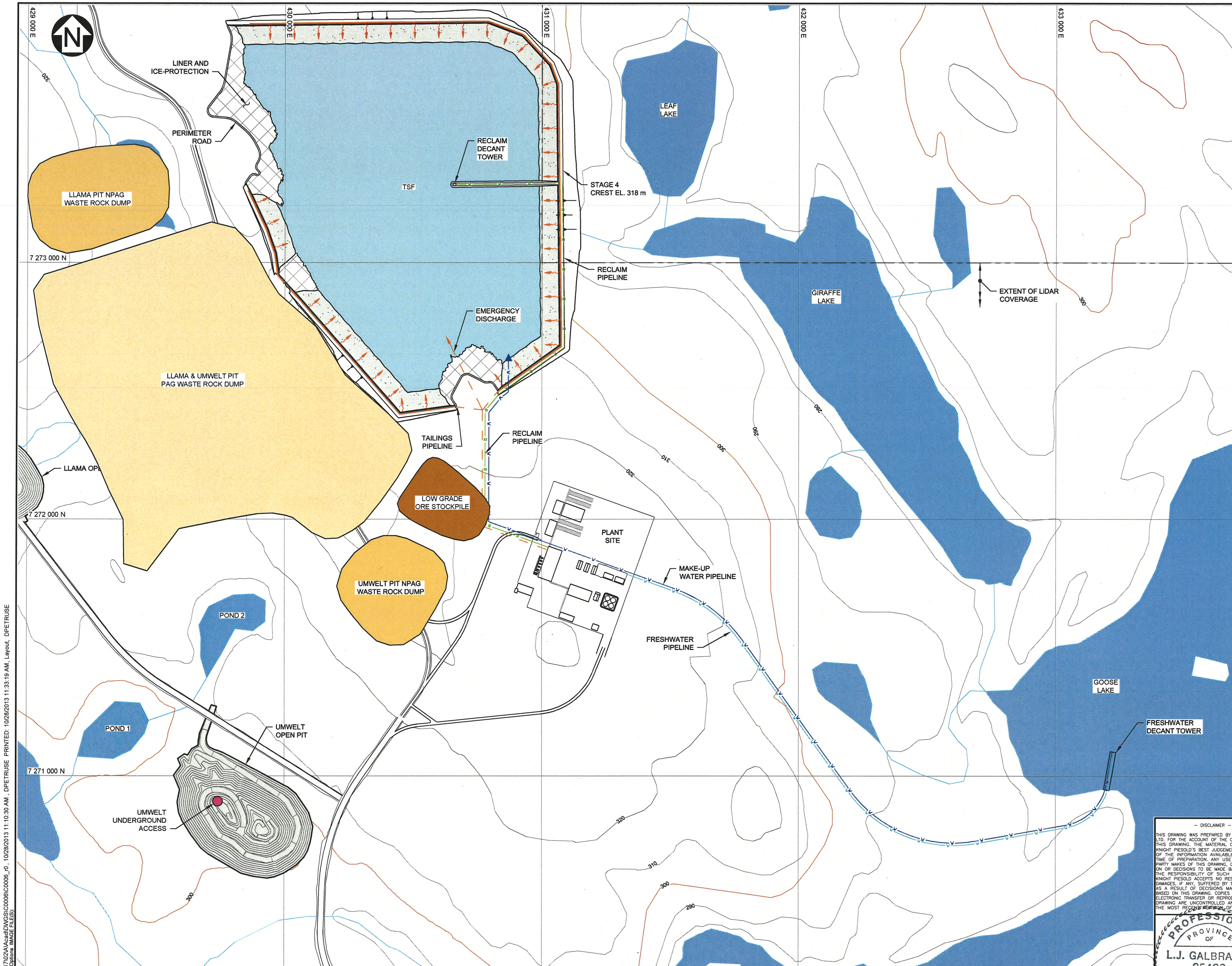

LEGEND:

- RECLAIM PIPELINE
- TAILINGS PIPELINE
- MAKEUP WATER PIPELINE
- FRESHWATER PIPELINE

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. ROAD ALIGNMENTS PROVIDED BY EBA.
6. OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

NOT FOR CONSTRUCTION

150 75 0 250 500 750 m
SCALE A

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BACK RIVER PROJECT

FINAL PIPELINE LAYOUTS
TAILINGS, RECLAIM, MAKEUP AND FRESHWATER

P/A NO.	DRAWING NO.	REVISION
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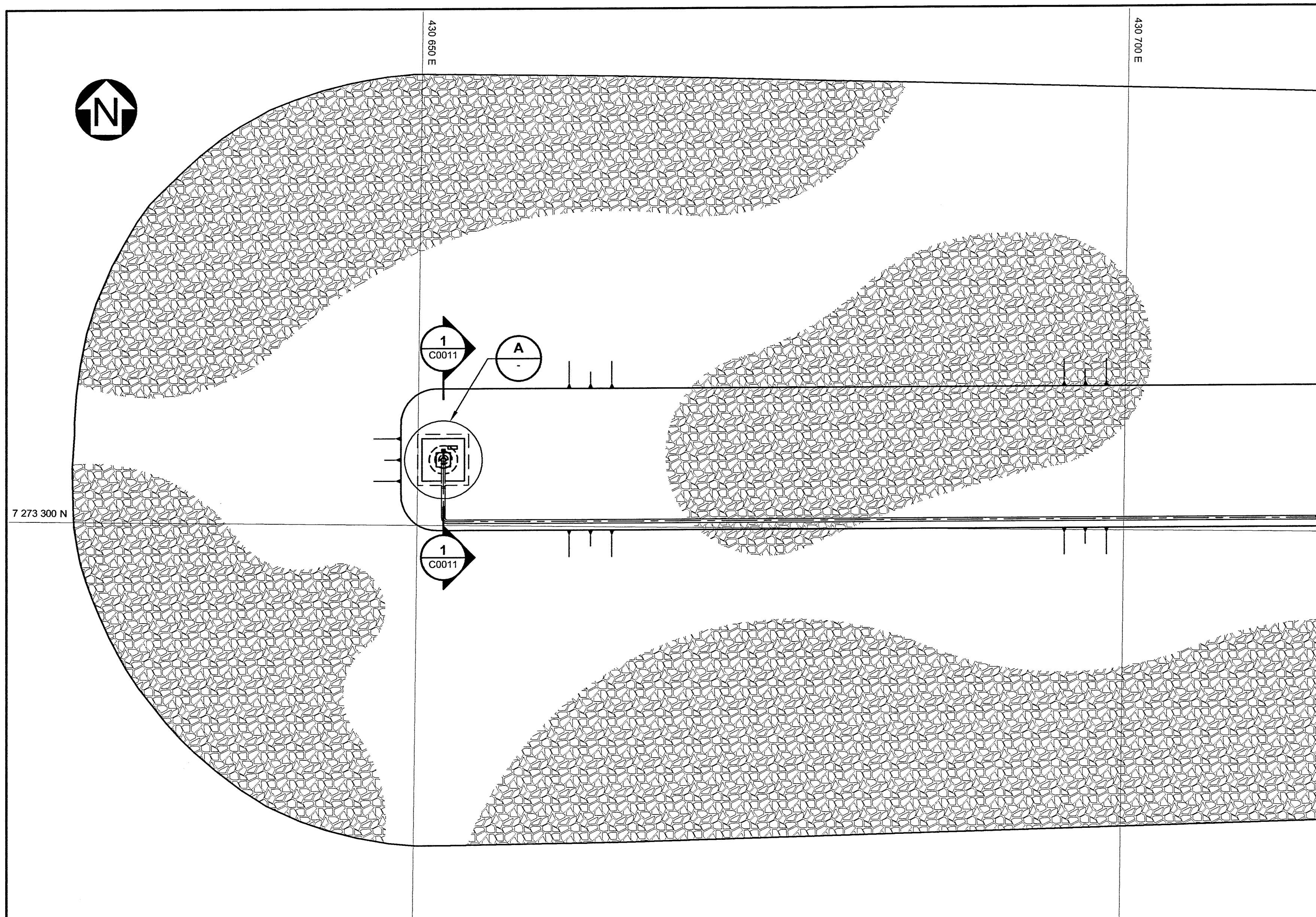

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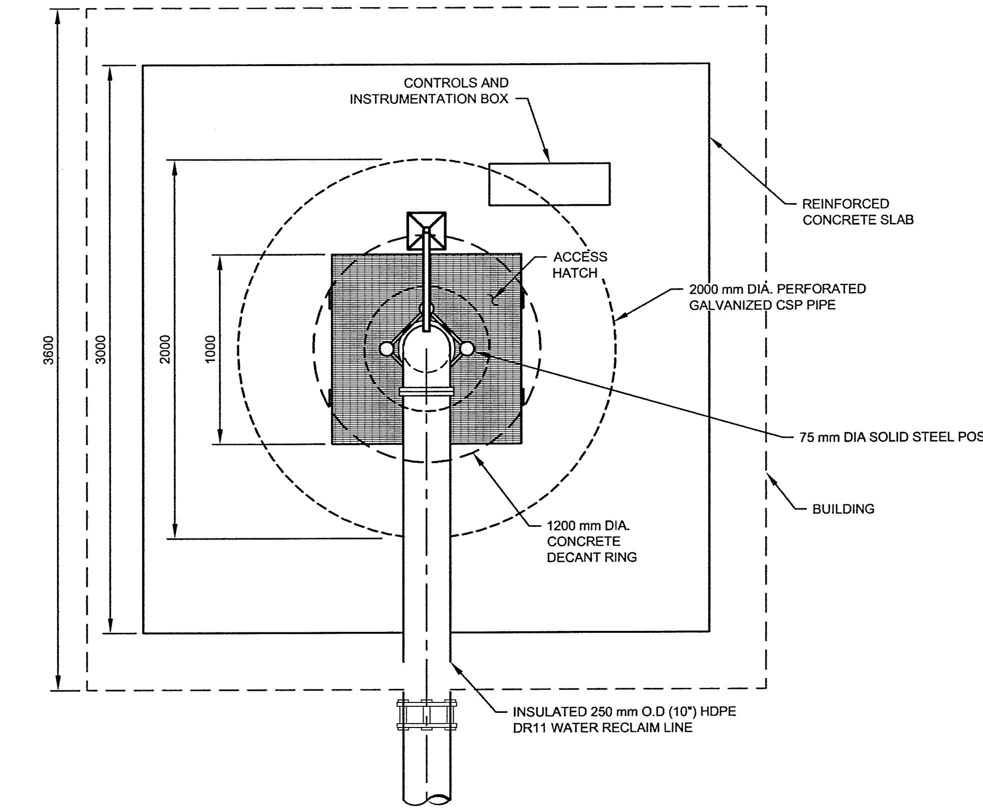

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NOTES:

1. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. LOCATIONS FOR CONSTRUCTION ITEMS ARE PROPOSED AND MAY BE MODIFIED BASED ON ACTUAL SITE CONDITIONS.

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PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA
D. V. MARTIN
29814
2013/10/25

Knight Piésold
CONSULTING

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

DECANT TOWER PLAN

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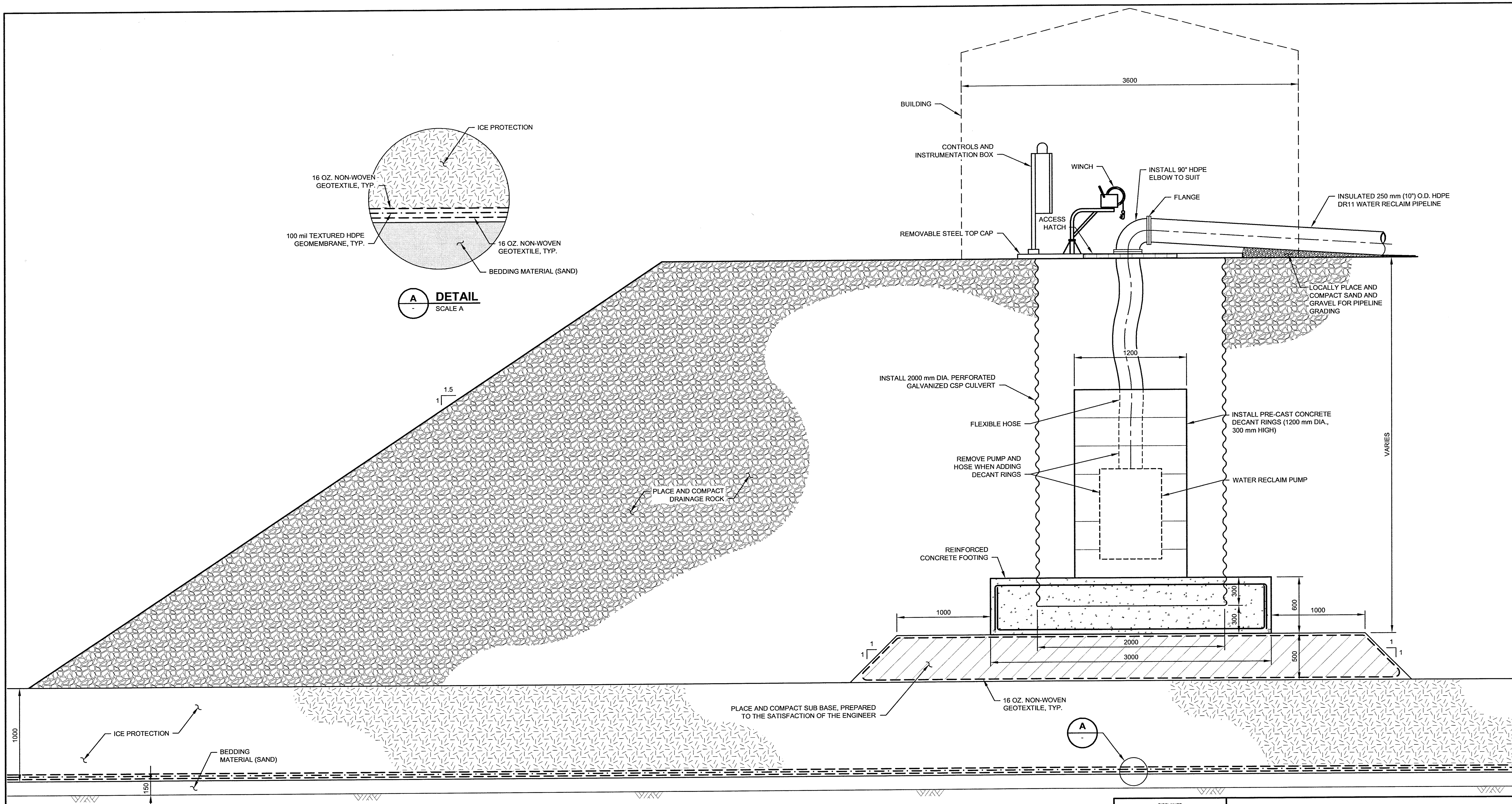

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NOTES:

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2. LOCATIONS FOR CONSTRUCTION ITEMS ARE PROPOSED AND MAY BE MODIFIED BASED ON ACTUAL SITE CONDITIONS.

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NOT FOR CONSTRUCTION

PROVINCE OF BRITISH COLUMBIA
N.W. MARTIN
29814
ENGINEER
2013/10/25

Knight Piésold
CONSULTING

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

DECANT TOWER SECTION

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10. Landfill and Waste Management Plan

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BACK RIVER PROJECT
Landfill and Waste Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
LANDFILL AND WASTE MANAGEMENT PLAN

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Appendix A. Waste Types, Sources, and Management Structure

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AANDC	Aboriginal Affairs and Northern Development Canada
CCME	Canadian Council of Ministers of the Environment
CEPA	*Canadian Environmental Protection Act*
DEIS	Draft Environmental Impact Statement
EC	Environment Canada
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
HMMP	Hazardous Materials Management Plan
HR	Human Resources
IMP	Incinerator Management Plan
KIA	Kitikmeot Inuit Association
kg	Kilogram
L	Litre
LWMP	Landfill and Waste Management Plan
MLA	Marine Laydown Area
NIRB	Nunavut Impact Review Board
NT/NWT	Northwest Territories
RBC	Rotating Biological Contactor
SOP	Standard Operating Procedures
SWMP	Surface Water Management Plan
TDG	Transportation of Dangerous Goods
QA	Quality Assurance
QC	Quality Control
WHMIS	Workplace Hazardous Materials Information System
WRSA	Waste Rock Storage Area

1. Introduction

This Landfill and Waste Management Plan (LWMP) outlines Sabina Gold & Silver Corp.'s (Sabina's) plan for managing non-hazardous wastes, recyclables and treated sewage at the Back River Project (the Project). It represents one plan in a series of environmental management plans that have been prepared for the Project Draft Environmental Impact Statement (DEIS). This management plan has been prepared in accordance with Section 9.4.7 of the EIS Guidelines issued by the Nunavut Impact Review Board (NIRB) to Sabina (NIRB 2013).

The LWMP is a living document which will be updated based on management reviews, incident investigations, regulatory, or Project-specific protocol changes. At this stage, certain aspects of the LWMP remain conceptual and the information presented herein is current as of October 2013.

The next update will likely accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study Project designs. Following this, the plan is anticipated to be further updated based on detailed engineering design prior to the start of construction, incorporating for construction engineering drawings of facilities and associated waste management infrastructure.

1.1 SITE NAMES AND LOCATIONS

The Back River Project is an advanced exploration gold project located in the West Kitikmeot region of Nunavut (Figure 1.1-1). The Project is located at approximately 65° to 66° north latitude, and 106° to 107° west longitude. The Project includes the Goose Property, the George Property, and Marine Laydown Area (MLA) in southern Bathurst Inlet, and connecting winter roads.

1.2 SABINA'S ENVIRONMENTAL POLICY

Sabina's Environmental Policy relates specifically to waste management by:

- Recognizing that environmental quality is vital to the Corporation's existence, progress and continued development.
- Committing to high environmental standards, conserving natural resources, and minimizing the impact of its activities through the diligent application of appropriate technology and responsible conduct.
- Providing a framework to measure performance.
- Ensuring compliance with applicable legislation, regulations and guidelines.

2. Scope and Objectives

The objectives of Sabina's LWMP are to minimize potential effects from the Project on the environment, to develop a system for the proper handling and disposal of wastes, and to comply with all applicable legislation, regulations, authorizations, permits and licences for the duration of the Project.

Figure 1.1-1

Location Map of the Back River Project Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

Objectives of the plan will be achieved by using proven strategies and applying the latest technological developments to ensure that materials are used efficiently when brought to the Project sites and then disposed of in an environmentally acceptable manner. General strategies to be used to achieve the objectives will include:

- **Proactive Procurement Policy**: Any tender documents will notify prospective bidders of the environmental sensitivity of the applicable Project site and solicit the use of the most environmentally suitable materials, equipment and products.
- **Pollution Prevention**: Pollution prevention methods to eliminate the generation of wastes will continuously be evaluated and where feasible, appropriate improved methods will be implemented. This will be achieved by applying the reduction, substitution, segregation, reuse, recycling and recovery approaches discussed as follows.
- **Strategic Material Substitution**: At the purchasing stage, the possibility of material substitution with less polluting products will be assessed - in particular for materials that are hazardous to handle, generate hazardous wastes or create environmental problems.
- **Strategic Chemical Substitution**: A policy of using chemicals that are cost effective, and accomplish the same results as the original chemicals employed, without or with less hazardous wastes generation in the process, will be adopted.
- **Waste Segregation**: Segregation of all waste streams by type or category will avoid potentially undesirable combined effects and will facilitate the reuse, recycling, recovery and/or disposal of the various wastes. All waste categories will be evaluated and the principals of the following four R's applied:
  - **Reduction Initiatives**: Reducing the raw material consumption is the first step to reduce waste generation. To practice this principle all processes and material used will be evaluated on the basis of possible reduction in raw material usage.
  - **Reuse Initiatives**: Reuse of the material in other applications and /or by other parties is routinely examined by using the waste materials exchange.
  - **Recycling Initiatives**: Recycling is the next option considered for the successful management of the waste streams.
  - **Recovery Initiatives**: Recovery of usable material or energy as a by-product is a part of the four R's of the waste minimization process. For example, redistributing waste heat from generators to heat buildings is a process of recovery of energy from waste.
- **Disposal**: Disposal is the final option when the four R's are no longer applicable or practical.

The scope of the LWMP includes non-hazardous waste, recyclables, and treated sewage, at each of the MLA, Goose and George sites. Separate waste management strategies will be prepared for the various mineral wastes (waste rock and tailings) and hazardous waste products to be produced by all components of the Project.

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced, where appropriate, the following management plans:

- Risk Management and Emergency Response Plan.
- Environmental Management and Protection Plan.
- Incinerator Management Plan.
- Hazardous Materials Management Plan.

- Fuel Management Plan.
- Occupational Health and Safety Plan.

3. Planning and Implementation

Planning for the LWMP started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

Waste management in Nunavut is regulated under Nunavut's *Public Health Act* (1988), the Nunavut *Environmental Protection Act* (1988), the federal *Canadian Environmental Protection Act* (1999) and the federal *Transportation of Dangerous Goods Act, 1992* (TDG; 1992). Sabina will also be bound by the terms and conditions of its land use permits to be issued by Aboriginal Affairs and Northern Development Canada (AANDC) for Crown Lands and the Kitikmeot Inuit Association (KIA) for Inuit Owned Land, and its Type A Water Licence to be issued by the Nunavut Water Board (NWB).

In addition to the mandatory requirements, a number of waste management guidelines are commonly used in the Northwest Territories and Nunavut. The Mine Site Reclamation Guidelines for the Northwest Territories (INAC 2007) were followed regarding specific landfill design and mitigation for potential impacts pertaining to waste.

Specific legislation, regulations and guidelines related to waste management in Canada, and specifically within Nunavut, are summarized in Table 4-1.

Table 4-1. Applicable Legislation to Project Wastes and Landfill Management

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (CEPA; 1999)	Schedule 1: List of Toxic Substances Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301)	Environment Canada (EC) Technical Document for Batch Waste Incineration (EC 2010) Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CCME 2001).
Transportation of Dangerous Goods Act, 1992 (1992) and Regulations	Regulations Amending the Transportation of Dangerous Goods Regulation (SOR/2012-245)	
Territorial Lands Act (1985)	Territorial Land Use Regulations (CRC, c.1524) Northwest Territories and Nunavut Mining Regulations (CRC, c.1516)	Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure (BGC 2003)
Hazardous Products Act (1985)	Controlled Products Regulations	Workplace Hazardous Materials Information System (WHMIS)
Territorial - Nunavut		
Nunavut *Environmental Protection Act* (1988)		Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN 2011a) Environmental Guidelines for the Burning and Incineration of Solid Waste (GN 2012) Environmental Guidelines for Waste Asbestos (GN 2011b), Ozone Depleting Substances (GN 2011c)
Nunavut *Public Health Act* (1988)		
Territorial - Northwest Territories		
Northwest Territories *Environmental Protection Act* (1988)	Used Oil and Waste Fuel Management Regulations (NWT Reg. 064-2003).	Mine Site Reclamation Guidelines for the Northwest Territories (INAC 2007)

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of this plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager along with his/her direct reports are responsible for the implementation of this plan including overall management of the plan and internal reporting.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including ensuring compliance and adaptive management.

All other Project personnel involved with waste management activities will be responsible for the effective implementation of this plan including: completion of required training, and maintaining compliance with training requirements as set out by this plan or by Sabina's Standard Operating Procedures (SOPs) and best management practices. All employees are to work in compliance with Health and Safety Laws and Regulations.

6. Waste Types and Waste Management Approach

6.1 WASTE TYPES

A material is considered to be a waste when it can no longer be used for its original intended purpose. The types of waste anticipated to be generated by the main components of the Project can be classified into the following general categories:

- Combustible non-hazardous waste.
- Non-combustible non-hazardous waste.
- Recyclable waste.
- Treated sewage.
- Hazardous waste.
- Other waste.

Specific waste management plans will be prepared for mineral wastes (including waste rock and tailings) and will be provided to NIRB and the NWB in conjunction with permitting for the main components of the Project.

6.1.1 Combustible, Non-hazardous Waste

Typical combustible non-hazardous wastes include discarded materials in a solid, liquid, or semi-solid form that can be safely incinerated. Such wastes do not pose a risk to human or environmental health. The types of waste generated within this category include:

- Domestic food wastes.
- Cardboard and paper.
- Lumber scraps.
- Domestic refuse.
- Damaged bulk containers.

Appendix A identifies the typical combustible non-hazardous waste types, sources, potential effects, management hierarchy, and management strategies.

6.1.2 Non-combustible, Non-hazardous Waste

Typical non-combustible non-hazardous wastes include discarded materials in a solid, liquid, or semi-solid form that cannot be burned or recycled. Such wastes do not pose a risk to human or environmental health. The types of waste generated within this category include waste concrete and other construction wastes such as steel, wire, roofing and asphalt.

6.1.3 Recyclable Waste

Recyclable materials comprise discarded items that can be made into new products. The typical types of waste generated within this category include:

- Beverage containers (plastic, aluminum, glass, tetra packs).
- Tires.
- Electronics and electrical wastes.
- Dry cell batteries for domestic use (e.g., AAA to D cells, 6 and 9 volt batteries).

Appendix A - Waste Management Tables, identifies the recyclable waste types, sources, potential effects, management hierarchy, and management strategies.

6.1.4 Treated Sewage Waste

Domestic sewage and greywater will be produced by toilets, showers, laundry facilities, janitorial services and vehicle washing bays. The volume of wastewater generated will be approximately 260 L of wastewater per person, based on experience with other northern mining projects.

Appendix A identifies the sewage and grey water waste types, sources, potential effects, management hierarchy, and management strategies.

6.1.5 Hazardous Waste

Hazardous materials are covered by the *Transportation of Dangerous Goods Act* (1992) under Classes 2 through 6, and 8 through 9, that are no longer used for its original purpose and are intended for storage, treatment, recycling, or disposal. Hazardous material waste management is discussed in detail in Sabina's Hazardous Materials Management Plan (HMMP).

Lead acid batteries greater than 1 kg and rechargeable batteries are considered a contaminant as per the Environmental Guideline for Waste Batteries under the *Environmental Protection Act* (1988) of Nunavut. Waste batteries will be safely stored until they can be transported to a commercial recycler or registered hazardous waste receiver.

6.1.6 Other Wastes

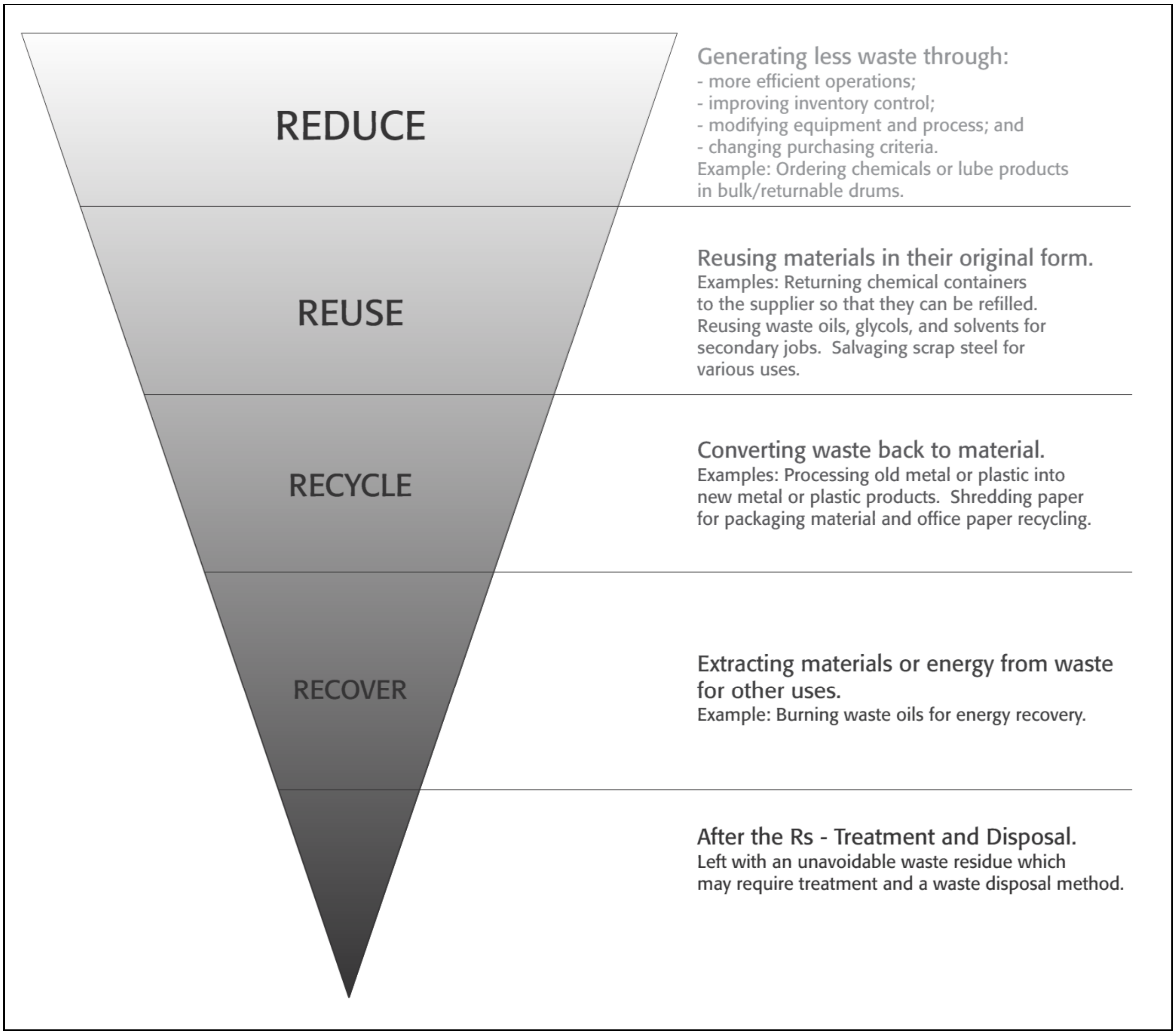
In addition to the wastes identified in the preceding sections, Sabina has identified additional waste products to be managed. The other waste categories include:

- Medical waste: Waste generated in the first aid or health room will require special handling. Waste products will be put in single use medical waste containers. Both the containers and medical wastes will be incinerated.
- Used oil and waste fuels: Used oil and waste fuels will be directed to waste oil burners as appropriate.
- Incinerator ash: Ash removed from the incinerator will be landfilled, as per Sabina's Incinerator Management Plan.

6.2 REDUCTION, RE-USE, RECYCLING, AND RECOVERY INITIATIVES

Responsible waste management begins by keeping all waste materials that can be economically recycled out of the waste stream destined for landfill or incineration. Sabina is committed to undertaking waste collection, storage, transportation and disposal in a safe, efficient and environmentally compliant manner, by actively encouraging and implementing the four R's of waste management, namely: waste reduction, re-use, recycling, and recovery, as illustrated in Figure 6.2-1.

Figure 6.2-1. Basic Principles of Waste Management



To support Sabina's waste management initiatives, operating procedures at the mine will be developed to maximize the volume of materials that can be recycled or reused. The basic implementation of this strategy includes eliminating the use of disposable material in everyday use, encouraging the use of personal drink containers, stainless steel cutlery and re-useable lunch boxes.

Sabina embraces source reduction as a means of minimizing the quantities of wastes to be generated. Reducing the amount of waste produced is a sound environmentally responsible business principle. Team Leaders will be empowered to ensure that each area of operations uses materials in an efficient manner and to take the necessary steps to address these waste management principles.

6.3 TRAINING

As part of their orientation, all on-site personnel, including Sabina Personnel and contractors, will receive basic environmental and waste management training, including:

- Reducing water use.
- Managing food wastes to minimize animal attraction.
- Reducing waste.
- Separating waste (recyclables, dry-cell batteries, food waste, and hazardous waste).

The Sabina Environmental Policy will be communicated to all on site personnel during the orientation and it will be emphasized that it is everyone's responsibility to properly dispose of waste, including the sorting waste that can be reused and recycled.

Project personnel responsible for the handling of wastes will be fully trained in safe work and sorting procedures, and the identification of misdirected waste. Personnel working with waste materials will undertake formal training to ensure compliance with applicable legislation and Sabina's SOPs.

All personnel involved in the handling of hazardous wastes will receive Workplace Hazardous Materials Information System (WHMIS), Personal Safety and Protection and Emergency Response training. Where applicable, personnel will receive Transportation of Dangerous Goods (TDG) training.

Site specific training will be provided by Sabina and renewed as required according to SOPs and legislative requirements. Contractors may be requested to provide copies of safety certificates, including First Aid, WHIMS, and TDG.

Sabina will manage and update training logs to ensure that all on site staff are in compliance, and have been suitably trained for their respective tasks.

6.4 TOTAL VOLUME OF WASTE

The total volume of waste generated at a given time during the life of the Project will be dependent on the activities and number of personnel at that time. The specific volume of material directed to the landfill, incinerator and recycling/reuse waste stream will be controlled through SOPs for waste management. For the purpose of this LWMP, the life of the mine is divided into three phases: construction, operations and closure. Table 6.4-1 provides a summary of the maximum number of personnel expected during each phase of the mine life.

Table 6.4-1. Maximum Number of Personnel on Site

Project Phase	Marine Laydown Area	George	Goose
Construction	100	300	700
Operations	100	150	350
Two years of active Closure	10	25	50

It is anticipated that the greatest volume of waste production will occur during the construction phase due to the greater number of on-site personnel and the additional construction waste material produced. During this period, waste directed to the landfill will be predominantly composed of construction waste, including concrete steel, wire, roofing and asphalt.

Based on estimates from other northern mining projects, it has been assumed that each person will produce approximately 1 tonne of waste material per year.

7. Waste Management Infrastructure

The waste management infrastructure for the Project will be established at the onset of the site preparation activities.

The waste management infrastructure at the MLA will include:

- A sewage treatment plant.
- A portable incinerator for the disposal of acceptable combustible wastes.
- A landfarm for the treatment of contaminated soils and snow located.
- A waste sorting facility.
- A landfill for disposal of non-hazardous solid wastes.
- A hazardous waste storage area.

The waste management infrastructure at the George property will include:

- A sewage treatment plant.
- A portable incinerator for the disposal of acceptable combustible wastes.
- A landfarm for the treatment of contaminated soils and snow.
- A waste sorting facility.
- A landfill for disposal of non-hazardous solid wastes.
- Multiple waste laydown/temporary storage area.
- A hazardous waste storage area.

The waste management infrastructure at the Goose Property will include:

- A sewage treatment plant.
- An incinerator for the disposal of acceptable combustible wastes.
- A landfarm for the treatment of contaminated soils and snow located.
- A waste sorting facility.
- A landfill for disposal of non-hazardous solid wastes.
- A hazardous waste storage area.

The Project will not use any municipal facilities or services for waste management, with the exception of hazardous waste material as outlined below, and detailed in the HMMP.

7.1 INCINERATORS

Incinerators (portable and stationary) selected for the Project will incorporate state-of-the-art technologies capable of satisfying the criteria set forth in *Environment Canada's Technical Document for Batch Waste Incineration* (EC 2010). Details of incinerator operation, maintenance, and agency requirements associated with incinerator emissions are outlined in the Incinerator Management Plan (IMP). The IMP was developed in conjunction with the LWMP and discusses environmental protection and monitoring programs developed in consideration of the overall waste segregation program.

7.2 LANDFILL

Several landfill sites will be required for the disposal of non-salvageable, non-hazardous, solid industrial wastes that cannot be incinerated during construction, operations and closure of the Project. It is anticipated that landfill sites will be developed at both the Goose and George sites. Material from the Marine Laydown Area will primarily be transported to the landfill at the George Property. The landfills will be operated as industrial dry waste landfills and not as municipal solid waste landfills.

Inert waste material intended for disposal in the landfills includes plastics, wood, fiberglass insulation, roofing, asphalt, concrete, ceramics, small rubber items, clothing, glass, small appliances (batteries removed), ash, bricks, and waste asbestos (according to GN guidelines), and vehicles (liquids, grease and electronics removed).

7.2.1 Landfill Locations

The proposed landfills will be strategically located within existing Waste Rock Storage Areas (WRSA), which will be located in close proximity to the major waste sorting facilities. The landfill sites will be selected to ensure accessibility by existing roads. Situating the landfills within the existing WRSAs will minimize the overall environmental footprint of the Project and facilitate landfill closure. The landfills will be designed so that runoff water does not pool. Drainage pathways from the landfills will be sampled and monitored in conformance with Water Licence requirements.

7.2.2 Landfill Design Considerations

The landfill designs have not yet been finalized but will be progressed for the FEIS. Design criteria will be based on the approach successfully used at Ekati Diamond Mine, NWT, where permafrost has been used to minimize water leaching into the subsoil. The site is located in a region of continuous permafrost. As such, permafrost is expected to develop through the waste. Unfrozen waste will be present during operation in the summer months.

It is anticipated that the landfill sites will be developed using the area fill method as detailed in Kent et al. (2003). The area fill method is the preferred design method where permafrost and geological rock conditions inhibit the development of trenches. The design employed at EKATI allows for the landfill to become fully aggraded into the permafrost over time.

Each of the Project landfill sites will be capped and progressively closed as final elevations are achieved. Final elevations will be field fit so that the stability of the landfilled wastes will be maintained. Rounded tops will be established on completed portions of the landfills to minimize water accumulation and percolation through the landfilled wastes.

The quality of leachate from the landfill sites will be controlled by the rigorous controls placed on the materials to be landfilled. Leachate will be sampled and monitored in conformance with Water Licence requirements.

The total waste volume generated over the life of the mine will dictate the ultimate dimensions of each landfill. Designs will allow flexibility to accommodate layout extension or contraction within the confines of each respective WRSA.

7.3 TEMPORARY WASTE STORAGE FACILITIES

7.3.1 Non-hazardous Waste Storage

Combustible wastes will be temporarily stored in dedicated bins within the waste incineration building or in proximity to the portable incinerators until they are ready to be incinerated.

Recyclable non-hazardous, non-combustible waste will be stored in dedicated waste storage facilities located at each of the three project sites. Specific waste storage locations have not been identified at this time. Material will be safely stored until it is transported to an appropriate recycling or disposal facility. All three sites will have both indoor and outdoor storage, and waste will be segregated according to its susceptibility to exposure to the elements.

Recyclable beverage containers will be stored inside to avoid attracting animals. Hazardous waste will be stored inside to minimize potential leaching to the environment. The majority of other items will be stored in the laydown yard outdoors, and in shipping containers where appropriate. This includes recyclables such as tires, electronics and electrical materials, and scrap metal.

7.3.2 Hazardous Waste Storage

Hazardous waste will be temporarily stored on site in designated storage areas, likely placed in modified seacans. These materials will not be placed in the landfill sites. All hazardous materials will be packaged for shipment to certified southern waste management facilities located in a provincial jurisdiction for subsequent treatment, recycling and/or disposal. The management and handling of hazardous waste is further detailed in the HWMP.

7.4 LANDFARMS

Hydrocarbon contaminated soil, snow, and ice may be treated within dedicated landfarms to be located at each of the Goose Property, George Property, and Marine Laydown Area. At the Goose and George properties, the landfarms will be co-located within the WRSAs.

7.5 SEWAGE TREATMENT AND SLUDGE DISPOSAL FACILITIES

Wastewater will be treated at the MLA, George and Goose properties by rotating biological contactor (RBC) units. A vacuum truck will collect and transport sewage wastes from the various buildings on-site to the respective RBC unit. The Project sewage treatment plants will be designed to accommodate the maximum number of personnel on site during peak periods.

Based on a 700-person camp at the Goose Property during construction, the sewage treatment plant would have a capacity of 210 m^3/day (700 people at 300 L/day). Based on a 350 person camp at the George Property during construction, the sewage treatment plant would have a capacity of 90 m^3/day (300 people at 300 L/day). Based on a 100 person camp at the MLA during construction, the sewage treatment plan would have a capacity of 30 m^3/day (100 people at 300 L/day).

Sewage sludge generated by each of the Project sewage treatment plants will be directed to the respective landfill sites.

8. Record Keeping

Waste material logs will be completed to track the volume, material type and material source for all materials that are passed through the waste segregation and waste management process. The segregation of waste and transportation to each of the waste management facilities on site will be tracked and recorded. Material tracking logs will be stored digitally and available for review by on-site personnel and regulatory agencies on an as-needed basis.

Details of record keeping for the incinerator, including the updating of a maintenance log and collection of incinerator operational data is provided in detail in the IMP.

9. Environmental Protection Measures and Monitoring Program

Sabina has an ongoing commitment to implementing environmental protection measures for all components of its operations. As previously indicated in Section 6.2, Sabina is committed to undertaking waste collection, storage, transportation and disposal in a safe, efficient and environmentally compliant manner, by actively encouraging and implementing the four R's of waste management, namely: waste reduction, re-use, recycling and recovery. In addition, Sabina is also committed to implementing appropriate waste and runoff monitoring programs to satisfy regulatory requirements and achieve environmental protection.

10. Environmental Reporting

To demonstrate conformity with performance limits, an annual waste management report will be prepared and submitted as part of annual reporting to authorizing agencies. The waste management reporting will also be integrated into the annual environmental monitoring report which Sabina is committed to developing every year, and aligned with the annual incinerator reporting.

The following information will be included for waste management and landfill reporting:

- The quantity and type of materials directed to each of the waste management facilities discussed in Section 7.0.
- Record of landfill disposal, including weight of waste disposed, location of disposal, and the transportation/load details.
- Results from runoff and leachate monitoring around each of the landfill sites.
- Details of personnel roles, responsibilities, and training credentials.

The annual reporting will also identify any major changes to the operation and efficiency of the overall Project waste management program, namely the effectiveness of the waste reduction and segregation strategies. Staff changes or amendments to training requirements will be noted.

11. Plan Review and Effectiveness

The LWMP will be updated in the FEIS and tailored for AANDC and KIA land use permit applications, the NWB Type A Water Licence application, and then on a regular basis to reflect ongoing operating conditions at the Back River Project during each phase of the mine life.

The LWMP will be reviewed in conjunction with the preparation of the annual report to incorporate any lessons learned, major changes to facility operation or maintenance, and environmental monitoring results. The review will be completed in consultation with the NWB inspector. An updated version of the LWMP will be produced every two (2) years of operation.

All employees will be informed of relevant updates and the updated LWMP will be located in a designated area at each site.

Sabina will retain all raw data records and annual reporting for at least two (2) years in digital format. The updated LWMP, raw data and annual reporting will be made available by Sabina at all times for review by the Government of Nunavut, Nunavut Impact Review Board, and Environment Canada.

12. Closure Plan

Each of the landfill sites will be designed to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is consistent with past traditional pursuits and wildlife habitat.

Final closure of the landfill sites will be undertaken once they are no longer needed, which is dictated by site conditions (not anticipated) or when the mine closes as part of mine closure activities. Final closure will consist of covering the landfill sites with adjacent waste rock (i.e. not anticipated to generate acid rock drainage or metal leaching) over the landfill to a minimum depth of 2 metres to facilitate aggradation and encapsulation in permafrost.

Estimates of total waste volumes and tonnage at closure, as well as the life of the two planned landfill sites are not currently available and will be refined and updated in this management plan as the project moves into operation. Details pertaining to mine closure, including closing of the landfill sites, are provided in Sabina's Mine Closure and Reclamation Plan.

13. QA / QC

Sabina will implement a series of Quality Assurance (QA) and Quality Control (QC) plans and programs at all levels of the waste management and landfill operation. QC procedures implemented as part of the LWMP will be variable and program-specific. QA/QC procedures will be implemented immediately and updated as necessary based on findings of the year-end reporting.

Internal audits and inspections will be conducted as required by permit and other regulatory requirements on all components related to the LWMP. Qualified personnel will perform regular inspections of the storage areas, landfarms and landfills to ensure that waste segregation and inventory are being documented correctly.

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Appendix A

Waste Types, Sources, and Management Structure

Table A1. Waste Types, Sources, and Management Structure

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Combustible Non-hazardous Waste				
Kitchen and Food Waste	Food scraps Kitchen grease Wrappings contaminated with food Bagged lunches	Improper storage, handling and disposal can lead to the attraction and subsequent habituation of carnivores and scavengers Potential for litter	Train kitchen staff on waste reduction Use bulk food containers whenever possible	Designated wildlife-proof food waste containers will be located at all remote sites and underground lunchrooms Collected daily Stored inside the waste storage facility prior to incineration / landfilling Regular incineration
Corrugated Cardboard	Packaging of supplies/ materials	Potential for litter	Order products in bulk to minimize packaging Monitor and reduce, where possible, the amount of packaging shipped to the sites Reuse corrugated cardboard on-site to package materials being sent off-site	Stored inside the storage facility prior to incineration Regular collection and incineration
Domestic Refuse	Refuse from offices and camp rooms (e.g., paper, plastic wrapping, fabrics, etc.)	Improper storage, handling and disposal can lead to the attraction and subsequent habituation of carnivores and scavengers Potential for litter	Domestic waste will be reduced through employee education programs, including proper separation of waste Double-sided printing and photocopying will be encouraged	Educate employees about separating recycling and hazardous items from personal waste items Use clear garbage bags so that cleaning staff can monitor waste sorting habits Periodically assess domestic refuse to ensure that waste streams are being separated Regular collection and incineration / landfilling
Damaged Sacks (Super Sacks)	Used for the transportation of bulk materials and explosives	Potential for litter	Sacks will be used to ship explosives from the manufacturer to site, and undamaged sacks will be returned to the manufacturer for reuse. Only damaged sacks will be disposed.	Damaged sacks will be incinerated.

Table A1. Waste Types, Sources, and Management Structure

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Combustible Non-hazardous Waste (*cont'd*)				
Sewage Sludge	Periodically sludge needs to be removed from the Biodisk system.	This nutrient-rich product can act as a fertilizer if exposed to land or water May cause odours that can attract wildlife	No opportunity to limit the input of sewage waste on-site. Encourage staff to reduce greywater through education programs Water-efficient appliances will be used Use low phosphorus detergents The Biodisk system reuses sludge to reduce the output of sludge	Waste transported directly from the Biodisk system to the incineration building for same-day incineration, or Waste transported directly to landfill site for disposal
Recyclable Wastes				
Beverage Containers (plastic, aluminum, glass, tetra packs)	Camp staff drinking bottled beverages	Improper storage, handling and disposal can lead to the attraction and subsequent habituation of carnivores and scavengers Potential for litter	The camp will not provide individually packaged beverages (e.g., cans of pop or juice, bottled water, etc.), rather the camp will promote the use of bulk beverages, available from a beverage dispenser	Basic waste management training, including recycling training, and waste reduction for all personnel on-site Designated recycling bins for beverage containers Used beverage containers will be stored in wildlife-proof containers Stored in the waste storage facility prior to shipping off-site
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	May contain mercury, lead, arsenic, cadmium, brominated flame retardants (BFRs), and polyvinyl chloride (PVC) that could enter ecosystem	Electrical devices will be repaired when possible	Sabina's environment staff will determine the risk of electronic devices and classify them as recyclables, hazardous or non-hazardous waste and investigate the possibility of recycling the electronics and/or appropriate methods for waste disposal
Dry cell batteries (AAA to D cell, 6 and 9 volt, and watch batteries)	Personal electronics (e.g., flashlights)	New domestic dry cell batteries do not contain mercury. Older batteries may contain small amounts of lead, cadmium, and mercury. Other battery compounds like silver, zinc, and nickel may also be present.		There will be designated collection bins for dry cell batteries in the employee facilities at each of the three project sites Dry cell batteries will be shipped off-site for recycling / disposal as appropriate.

Table A1. Waste Types, Sources, and Management Structure

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Sewage and Greywater				
Greywater	Janitorial services Vehicle washing bay Kitchen sinks and dishwashers Showers Laundry	Increased concentration of nutrients and toxic contaminants Aquatic oxygen depletion and reduced water clarity Risks to human health from consumption of contaminated water Taste and odour problems in water Reduced aesthetic of water and shores and impaired recreational use Increase in ambient water temperature Changes in ecosystem species composition, abundance, and diversity Increased submerged weed growth Sedimentation (Environment Canada, as cited in CCME 2006).	Sabina and its contractors will reduce the amount of greywater produced by using water-efficient fixtures and appliances Sabina will educate employees and contractors about the importance of water conservation The Biodisk system recycles sludge as part of its system which reduces the amount of sludge created	Greywater and Sewage Effluent will be treated by the modular (RBC) Sewage Treatment Plants resulting in the generation of sewage sludge. sewage sludge will be transported directly from the Biodisk system to the respective incinerator for regular incineration, or transported directly to landfill site for disposal
Sewage Effluent	Human waste	Same as above		Sewage sludge will be transported directly from the Biodisk system to the respective incinerator for regular incineration, or transported directly to landfill site for disposal

11. Incineration Management Plan

BACK RIVER PROJECT
Incineration Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
INCINERATION MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in the document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

CCME	Canadian Council of Ministers of the Environment
CEPA	*Canadian Environmental Protection Act*
CWS	Canada-Wide Standards
DEIS	Draft Environmental Impact Statement
EC	Environment Canada
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
IMP	Incineration Management Plan
NIRB	Nunavut Impact Review Board
NWT	Northwest Territories
NWB	Nunavut Water Board
PCDD	PolyChlorinated Dibenzo-p-Dioxins
PCDF	PolyChlorinated DibenzoFurans
SOP	Standard Operating Procedures
TSF	Tailings Storage Facility
QA	Quality Assurance
QC	Quality Control

1. Introduction

This Incineration Management Plan (IMP) outlines the Sabina Gold & Silver Corp. (Sabina) plan for managing incinerator operation at the Back River Project (the Project). It represents one plan in a series of environmental management plans that have been prepared for the Project Draft Environmental Impact Statement (DEIS). This management plan has been prepared in accordance with Section 9.4.2 of the EIS Guidelines that the Nunavut Impact Review Board (NIRB) issued to Sabina (NIRB, 2013).

This plan was prepared in accordance with best management practices and Environment Canada's (EC) *Technical Document for Batch Waste Incineration* (EC, 2010).

The IMP is a living document which will be updated based on management review, incident investigations, regulatory changes, or other Project-specific protocols. At this stage, certain aspects of the IMP are conceptual and the information presented herein is current as of October 2013.

The next update will likely accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study project designs. Following this, the plan can be further updated based on detailed engineering design prior to the start of construction, incorporating for construction engineering drawings of facilities and associated waste management incinerator infrastructure.

2. Scope and Objectives

Incineration is an essential part of waste management at the Back River site. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunch rooms, shops, warehouses and offices will divert waste from directly reporting to the on-site landfill. Incineration has the advantage of eliminating waste that could potentially attract wildlife to the landfill, thereby reducing possible interactions between humans and wildlife.

Waste products will be safely managed from the time they are produced to their final disposal. Reduce, reuse, and recycle initiatives as well as a waste segregation program will be implemented at the Project to minimize the quantity of waste incinerated or directed to the landfill. Waste that is deemed unsuitable for incineration, including hazardous waste, will be handled appropriately. It may be packaged for shipment to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

By using state of the art incinerator technologies and developing a deliberate and conscientious waste management program Sabina can ensure that each incinerator achieves full compliance with air quality requirements for the protection of the environment and human health.

The objectives of incineration management through all phases of the Back River Project are to:

1. Characterize the quantity and composition of the waste products to be generated at the Back River site, and effectively separate wastes acceptable for incineration from waste that is not.

2. Select appropriate batch waste incinerators based on the characteristics and quantity of waste, and to locate them at appropriate sites setback an appropriate distance from other site infrastructure.
3. Operate incinerators to achieve optimal combustion and avoid the formation of dioxins, furans and mercury in the combustion process.
4. Implement incinerator operational practices and to document frequency and incinerator operating parameters, including the safe handling and disposal of incinerator residues.
5. Demonstrate compliance with applicable Federal and Territorial regulations for environmental protection.

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced where appropriate the following management plans:

- Environmental Management Plan.
- Landfill and Waste Management Plan.
- Hazardous Materials Management Plan.
- Fuel Management Plan.
- Occupational Health and Safety Plan.

3. Planning and Implementation

Planning for the IMP started with the development of the draft environmental impact statement (DEIS), which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs), work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act* and the federal *Environmental Protection Act*. Various regulations and guidelines under these Acts as well as guidelines developed by the Canada Council of Ministers of the Environment (CCME) were reviewed in preparing this document (Table 4-1).

Provincial and/or territorial regulations that pertain to emissions from incinerators are not available for Nunavut or the Northwest Territories. Therefore, performance limits for Project incinerators will be in accordance with the emission guidelines set out by the CCME: Canada-Wide Standard for Dioxins and Furans (CCME 2001a), and Canada-Wide Standards for Mercury Emissions (CCME 2000).

The management of used oil is regulated in the Northwest Territories (NWT) through the *Used Oil and Waste Fuel Management Regulations* (NWT. Reg. 064-2003). In the absence of Nunavut guidance/regulations pertaining to used oil and waste fuel, the NWT regulations will be followed for the Project.

Ash produced from the incineration process will be disposed of in accordance with the Nunavut Environmental Guideline for Industrial Waste Discharges (GN 2011b).

Table 4-1. Applicable Legislation to the Incineration Management Plan

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (CEPA 1999 c.33)	Schedule 1: List of Toxic Substances Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301)	Environment Canada (EC) Technical Document for Batch Waste Incineration (EC, 2010) Canada-Wide Standards for Dioxins and Furans (CCME, 2001a) Canada-Wide Standards for Mercury (CCME, 2000)
Hazardous Products Act	Controlled Products Regulations	Workplace Hazardous Materials Information System (WHMIS
Territorial – Nunavut		
Nunavut Environmental Protection Act		Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN, 2011b) Environmental Guidelines for the Burning and Incineration of Solid Waste (GN, 2012) Environmental Guidelines for Ambient Air Quality (GN, 2011a) Environmental Guideline for Mercury-Containing Products and Waste Mercury (GN, 2010)
Nunavut Public Health Act		
Territorial – Northwest Territories		
Northwest Territories Environmental Protection Act	Used Oil and Waste Fuel Management Regulations (NWT Reg. 064-2003).	

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of this plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager along with his/her direct reports is responsible for the implementation of this plan including overall management of the plan and internal reporting.

The Environmental Superintendent along with his/her direct reports is responsible for the implementation of this plan including ensuring compliance and adaptive management.

Other relevant personnel are responsible for the plans effectiveness by completing required training, maintaining compliance with training requirements as set out by this plan and best management practices. All employees are to work in compliance with Health and Safety Laws and Regulations.

6. Procedures and Operation for Waste Incineration

The Project will select and operate incinerators based on EC *Technical Document for Batch Waste Incineration* (EC, 2010).

6.1 EQUIPMENT AND INSTALLATION

The Project will utilize state-of the art incinerators capable of satisfying all criteria set forth in EC *Technical Document for Batch Waste Incineration* (EC, 2010).

A scale will be used to measure the weight of all material that will be directed to each incinerator. Weights and waste types will be recorded and mixed appropriately to maximize combustion efficiency. Incinerators will be equipped with internal computerized process control and data acquisition systems to monitor the operating parameters each unit.

6.2 INCINERATOR LOCATIONS

The incinerator at the Goose Property will be housed inside a separate building away from the process plant and accommodations building. The final location will be situated down-wind from the main camp buildings. The building will have sufficient floor space and capacity to receive and sort all waste material generated on site for a period of three weeks.

The mobile incinerator at the George Property will also be located away from the main accommodation complex and will be situated downwind from the most prevalent prevailing winds.

It is anticipated that a mobile incinerator will be set-up at the MLA.

6.3 CONTINGENCY

In the event of an incinerator breakdown, alternative disposal methods shall be implemented until the incinerator is repaired. The presence of putrescibles in the domestic waste makes long term storage impractical due to the potential of attracting wildlife. The following alternative disposal methods for this waste have been identified:

- Short-term shutdown of incinerator (up to 3 weeks) will be mitigated through temporary storage in sealed, wildlife-proof containers.
- Long-term shutdown of incinerator (more than 3 weeks) will require off-site disposal by a waste services provider to a nearby regional landfill.

6.4 TRAINING

Incinerator operators will complete a training program prior to commencement of operation. This training will be include recommendations presented in Environment Canada's *Technical Document for Batch Waste Incineration* (EC, 2010) and developed in conjunction with the training manual provided by the incinerator supplier.

At a minimum, the training program will educate operators in the following areas:

- Hazard recognition and safety protocols.
- Identification of waste types and understanding of how waste composition affects operation.
- Incinerator start-up and operating procedures, including identification of adjustments to increase operating efficiency.
- Incinerator clean-out and maintenance procedures.
- Record keeping and reporting requirements.

Operator training will be provided by a qualified technician appointed by the incinerator vendor.

6.4.1 Staffing and Staff Safety

The incineration process is automated and requires minimal attendance during operation. A computerized incinerator will typically require one operator to interact with the equipment for approximately 1 to 1.5 hours per day, largely for ash removal, loading and start-up. Each incinerator will be designed, installed and operated so that the operators are not exposed to high temperatures during loading or ash removal due to complete cool down after the burn cycle.

6.5 INCINERATOR OPERATION

A full set of incinerator operating procedures will be developed in consultation with the supplier/manufacturer prior to use. Operation will be conducted in accordance with the EC *Technical Document for Batch Waste Incineration* (EC 2010) and shall include the following general procedures:

- Waste sorting on the basis of origin and heating value. Food waste and waste that has been in contact with food will have priority for incineration.
- Waste mixing to ensure a calorific value within incinerator specifications and to achieve good combustion inside the primary chamber.
- The operator will observe the start of the burn cycle for at least 15 minutes to ensure incinerators are operating correctly, and the primary and secondary chambers operate in the temperature ranges specified by the manufacturer.
- Sizable front doors will be utilized for easy access to manually load-feed waste with a front-end loader.
- Incinerator doors will only be opened after the burn cycle is complete and the unit cooled.

Incinerator ash will be handled and disposed of appropriately, following these steps:

- Ash will be removed from each incinerator before it is charged with the next load of waste to be incinerated.
- Ash will be placed in drums or bags before disposal.
- Ash will be disposed in the nearest landfill; if the concentration of trace metals exceeds the Government of Nunavut's *Environmental Guidelines for Industrial Waste Discharges* (GN 2011b), ash will be either packaged and sent to an approved disposal facility or buried within the TSF.

To facilitate the initial sorting of material, waste will be collected in transparent bags so that the contents are readily visible. Verification of correct sorting and mixing procedures will be ensured by periodic spot checks and QA/QC management by a trained staff member.

6.5.1 Incinerator Waste Stream

Food, food covered packaging, and other combustible (non-recyclable) office wastes will be collected and stored in sealed wildlife-resistant containers. As soon as practical, these waste products will be relocated from the source site for incineration.

Authorized incinerator waste includes domestic food waste, paper, cardboard, lumber scraps, and plastic food wrap or other food encrusted packaging which cannot be reasonably washed of food. Bag lunches and kitchen food waste and packaging will be stored in plastic bags, collected and incinerated to minimize potential wildlife attractants associated with domestic waste at the site. Oil and grease collected from the kitchen is to remain stored in the kitchen until transferred to the incinerator for immediate disposal.

Other combustible waste such as used oil and filters, rags and sorbent pads, laboratory chemical wastes (spent acids, caustics, solvents, washings and solutions), corrugated cardboard, paper, waste lumber and other clean, untreated wood waste will also segregated in the waste stream for incineration.

6.5.2 Waste Volumes

The number of individuals working on-site and the current nature of activities shall determine the volume of waste destined for landfills, incinerators, and the amount removed from waste streams for reuse and recycling. An estimate of these volumes will be provided as engineering progresses.

6.5.3 Waste Incineration Rate

Wastes will be batch-incinerated on an as-required basis.

6.5.4 Odour and Dust Control

Current state of the art incinerators are designed with a non-turbulent atmosphere in the primary burn chamber which reduces the formation of particulate matter. It is not anticipated that additional dust or odour control methods will be needed. Ash residues generated in the primary chamber will be manually removed on a daily basis and loaded into a labelled bin.

7. Environmental Protection Measures

Sabina has an ongoing commitment to implementing environmental protection measures in all aspects of its operations and is committed to reducing incinerator emissions through the use of technologically advanced, best available and economically feasible procedures.

Sabina is committed to reducing waste volumes to be incinerated, while managing and minimizing dioxin, furan and mercury emissions. In addition, Sabina will implement appropriate material handling procedures for the disposal of ash material generated by incineration.

A summary of the Canada-Wide Standards, as prepared by CCME, for dioxins, furans and mercury emission limits is presented in Table 7-1.

Table 7-1. Canada-Wide Standards for Waste Incineration Emissions

Waste Incineration Compound	Sector	Emission Limit (Max)
Dioxins and Furans[(1)]	Municipal Solid Waste[(3)] Sewage Sludge Incineration	80 picograms of International Toxic Equivalents (I-TEQ) per cubic metre (pg/m^3)
Mercury[(2)]	Municipal Solid Waste	20 micrograms per cubic metre (µg/m^3)
	Sewage Sludge Incineration	70 micrograms per cubic metre (µg/m^3)

[1] *CCME, 2001a,*
[2] *CCME, 2000*
[3] *According to the Canada-Wide Standards (CWS) , "municipal solid waste" includes any waste that might be disposed of in a non-secure landfill site if not incinerated (i.e. non-hazardous wastes regardless of origin), but does not include "clean" wood waste.*

The emission limits apply to waste incineration at new facilities across Canada. Compliance with these standards will be achieved through the use of state of the art technologies and a detailed and conscientious waste management program. The incinerator at the Project is expected to achieve full compliance immediately upon attaining normal full scale operation.

7.1 WASTE REDUCTION AND MITIGATION STRATEGIES

Waste reduction, reuse, and recycling initiatives as well as a waste segregation program will be developed at the Project as per the Landfill and Waste Management Plan to minimize the quantity of waste to be incinerated or directed to the landfill.

A waste audit will be completed prior to operation of the incinerator to identify waste stream volumes that can be minimized prior to incineration. The waste audit will inform the development of waste segregation procedures and policies. It is anticipated that sewage-sludge will be directed to the landfill, rather than being incinerated.

Sabina will develop a comprehensive list of acceptable and unacceptable waste for incineration based on the waste audit and at the time that all on site waste materials have been identified. The identification of unacceptable waste for incineration will be based on the EC *Technical Document for Batch Waste Incineration* (EC 2010) and the regulations discussed in Section 4.0

7.2 DIOXINS AND FURANS

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, are toxic chemicals, which are persistent and subject to bio-accumulation. Their presence in the environment results predominantly from human activity, most notably the large-scale incineration of municipal and medical wastes. Sabina recognizes the importance of reducing the presence of dioxins and furans in emissions.

7.3 MERCURY

Mercury is a naturally occurring substance, which can be transformed through biological processes to methyl mercury, a persistent substance which bio-accumulates in the food chain and is particularly toxic to humans and wildlife. Sabina understands the importance of reducing the concentrations of mercury in emissions.

7.4 USED OIL AND WASTE FUEL

The incinerator will be capable of efficiently and safely burning oil and waste fuel. Sabina will manage used oil and waste fuel according to the Used Oil and Waste Fuel Management Regulations (NWT 2003). The regulations stipulate the maximum level of contaminants in used oil that is allowed for incineration. Specifics of the used oil and waste fuel regulations are referenced in the Fuel Management Plan.

7.5 INCINERATOR ASH

The incinerator ash produced will be non-hazardous provided that the incinerated material excludes all hazardous waste. In order to confirm the ash concentration, an ash testing protocol developed by the Government of Nunavut will be implemented to ensure that the ash is suitable for landfill disposal. If the concentration of trace metals exceeds the Government of Nunavut's *Environmental Guideline for Industrial Waste Discharges* (GN 2011b), ash will be either packaged and sent to an approved disposal facility or buried within the waste rock storage area.

8. Monitoring Program

Sabina will implement a testing and monitoring program to ensure that criteria for applicable air quality standards and guidelines and ash disposal are being met. The monitoring program is outlined in the following sections.

8.1 INCINERATOR EMISSIONS TESTING

The incinerator stack design will incorporate appropriate sampling ports, with caps where necessary, at appropriate locations to allow for stack testing to be undertaken during incineration. The frequency of incinerator emissions testing is governed by the CCME Canada-Wide Standards for dioxins and furans (CCME, 2001a) and mercury (CCME, 2000). The frequency of incinerator emissions testing at Sabina will be determined based on discussions with the appropriate regulatory authorities

8.2 ASH TESTING

In order to confirm the quality of the ash, the ash testing protocol developed by the Government of Nunavut will be implemented to ensure that the ash is suitable for landfill disposal. Elemental concentrations identified in the ash will be compared against guidelines presented in the Government of Nunavut's *Environmental Guideline for Industrial Waste Discharges* (GN 2011b).

9. Record Keeping

A maintenance log is required to be kept for regulatory review. The maintenance log will be used to record routine maintenance activities, the date completed, personnel responsible and observations during maintenance activities. The maintenance log will also note any problems encountered. The maintenance log will include a description of any maintenance or operational changes, the date the work was completed, and who performed the work. As part of the maintenance, operators/maintenance personnel should determine the cause of any failure to help avoid or reduce similar failures.

Operational data will be collected by a data logger and stored continuously, even when the incinerator is not operating. The data will be used to monitor operating conditions to ensure that normal operating parameters are not exceeded. In the event that normal operating conditions are not met, the data will be used to identify causes of failure and to optimize the system.

Prior to incineration, the type of waste in each bag will be determined, weighed and the source noted. The total weight of each type of waste will be recorded before the burn cycle is started. After the cool-down period, the ash will be removed and weighed before it is sent for disposal. This information will be stored electronically with the operational data from the incinerator. This data will assist Sabina in determining incinerator waste generation rates at the facility, and in turn, provide data on the effectiveness of waste diversion, reduction and recycling programs.

10. Environmental Reporting

To demonstrate conformity with performance limits, an annual incineration management report will be prepared and submitted as part of annual reporting to authorizing agencies. The incinerator reporting will also be integrated into the annual air quality monitoring report which Sabina is committed to developing every year.

At the minimum, the following information will be included for incinerator reporting:

- The quantity and type of materials incinerated on-site during operations.
- Results from the stack emissions and ash monitoring.
- Record of ash disposal, including weight of ash disposed, location of disposal, and the transportation/load details.
- Record of any use of auxiliary fuel, referenced to the fuel management plan for fuel log, shipment and handling).
- Summary of operational data that is recorded continuously throughout the year. This includes, but not limited to, temperature, carbon monoxide and oxygen levels, auxiliary burner operating times, and differential pressures.
- Details of operating personnel and summary of their training.

The annual reporting will also identify any major changes to the operation and efficiency of the incinerator. Staff changes or amendments to training requirements will be noted.

11. Plan Review and Effectiveness

The IMP will be updated for the Type A Water Licence application, and regularly thereafter to reflect the operating conditions at the Project during construction, operation and closure. The IMP will be reviewed annually by the Project management team and an updated version will be produced every two (2) years of operation. The IMP will be reviewed in conjunction with the preparation of the annual report to incorporate any lessons learned, major changes to the incinerator operation or maintenance, and environmental monitoring results.

All employees will be informed of relevant updates and the updated IMP will be stored appropriately on site.

Sabina will retain all raw data records and annual reporting for at least two (2) years in digital format. The updated IMP, raw data and annual reporting will be made available by Sabina at all times for review by the Government of Nunavut, Nunavut Impact Review Board, and Environment Canada.

12. QA/QC

Sabina will implement a series of Quality Assurance (QA) and Quality Control (QC) plans and programs at all levels of the incinerator operation and management. This includes emissions and ash testing procedures. QC procedures implemented as part of the IMP are variable and program-specific. QA/QC procedures will be implemented immediately and updated as necessary based on findings of the year-end reporting.

The following QA/QC procedures for incineration will be implemented:

- Incinerator operational data including temperature, differential pressure in the primary chamber, auxiliary burner operation, fan amperage will be recorded continuously, consistent with detailed written operating instructions from qualified personnel.
- Detailed training programs will be implemented to ensure that all staff working with the incinerator are competent and qualified for their respective task.
- Analysis of sampled emissions during monitoring will be completed by an accredited laboratory.
- Stack testing samples of emissions and ash samples will be collected and handled according to operating instructions prepared by qualified personnel.
- Qualified personnel will calculate emission concentrations for monitored air quality parameters based on laboratory results and compare against the applicable guidelines.

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12. Hazardous Materials Management Plan

an ERM company

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Hazardous Materials Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
HAZARDOUS MATERIALS MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AANDC	Aboriginal Affairs and Northern Development Canada
AN	Ammonium Nitrate
ANFO	Ammonium Nitrate / Fuel Oil
ANSI	American National Standards Institute
C	Celsius
CCME	Canadian Council of Ministers of the Environment
CEPA	Canada Environmental Protection Act
DEIS	Draft Environmental Impact Statement
DFO	Fisheries and Oceans Canada
DOE	Department of Environment
EIS	Environmental Impact Statement
EPS	Environmental Protection Service
ERP	Emergency Response Plan
ERT	Emergency Response Team
FO	Fuel Oil
FS	Fuel Storage Area
HAZCOM	Hazard Communication
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
HW	Hazardous Waste Storage Area
IPC	Instantaneous Pressure Change
ISO	International Organization for Standardization
KIA	Kitikmeot Inuit Association
L	litre
MBS	Sodium metabisulphate
MSDS	Materials Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
NRC	Natural Resources Canada

OPEP	Oil Pollution Emergency Plan
OHSA	Occupational Health and Safety Administration
OHSP	Occupational Health & Safety Plan
PPE	Personal Protective Equipment
SD	Support Document
SCP	Spill Contingency Plan
SOP	Standard Operating Procedures
TDG	Transportation of Dangerous Goods
TDGA	Transportation of Dangerous Goods Act
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

1. Introduction

This Hazardous Materials Management Plan (HMMP) outlines Sabina Gold & Silver Corp.'s (Sabina) plan for managing hazardous materials at the Back River Project (the Project) including safe handling, storage, transport and disposal. This HMMP was prepared in accordance with best management practices and Applicable legislation (Section 4.0). It represents one management plan in a series of environmental management plans (EMP) that have been prepared for the Project Draft Environmental Impact Statement (DEIS). This plan was developed with support from, and in conjunction with the other environmental management plans. This management plan has been prepared in accordance with Section 9.4.8 of the EIS Guidelines issued by the Nunavut Impact Review Board (NIRB) to Sabina (NIRB, 2013).

The HMMP is a living document which will be updated as required based on management reviews, incident investigations, and regulatory changes prior to mine construction / operation and periodically thereafter as needed to reflect changes to Project-specific requirements. At this stage, certain aspects of the HMMP remain conceptual and the information presented herein is current as of October 2013.

1.1 SITE NAMES AND LOCATIONS

The Back River Project is located at approximately 65° to 66° north latitude, and 106° to 107° west longitude (Figure 1.1-1). The Project includes the Goose Property and the George Property, a Port and Marine Laydown Area (MLA) in southern Bathurst Inlet, and connecting all-weather and/or winter roads.

1.2 SABINA'S ENVIRONMENTAL POLICY

Sabina's Safety and Environmental Policy relates specifically to waste management by:

- Recognizing that environmental quality is vital to the Corporation's existence, progress and continued development.
- Committing to high environmental standards, conserving natural resources, and minimizing the impact of its activities through the diligent application of appropriate technology and responsible conduct.
- Providing a framework to measure performance.
- Ensuring compliance with applicable legislation, regulations and guidelines.

2. Scope and Objectives

This EMP provides information on hazardous material management including the environmental hazards; safe handling requirements; transportation, storage, and disposal at the Project and conforms to Section 9.4.8 of the NIRB EIS Guidelines for the Back River Project April 2013 (NIRB File No. 12MN036). Sabina intends to use, generate and dispose of hazardous materials as part of the development, operation and closure phases of the Project.

Location Map of the Back River Project Area

Figure 1.1-1

This Plan has been aligned to conform to the general strategies to be used to achieve the waste management objectives, as presented in Sabina's Landfill and Waste Management Plan. These strategies will include:

- Proactive Procurement Policy: Any tender documents will notify prospective bidders of the environmental sensitivity of the applicable Project site and solicit the use of the most environmentally suitable materials, equipment and products.
- Pollution Prevention: Pollution prevention methods to eliminate the generation of wastes will continuously be evaluated and where feasible, appropriate improved methods will be implemented. This will be achieved by applying the reduction, substitution, segregation, reuse, recycling and recovery approaches discussed as follows.
- Strategic Material Substitution: At the purchasing stage, the possibility of material substitution with less polluting products will be assessed - in particular for materials that are hazardous to handle, generate hazardous wastes or create environmental problems.
- Strategic Chemical Substitution: A policy of using chemicals that are cost effective, and accomplish the same results as the original chemicals employed, without or with less hazardous wastes generation in the process, will be adopted.
- Waste Segregation: Segregation of all waste streams by type or category will avoid potentially undesirable combined effects and will facilitate the reuse, recycling, recovery and/or disposal of the various wastes. All waste categories will be evaluated and the principals of the following four R's applied:
  - Reduction Initiatives: Reducing the raw material consumption is the first step to reduce waste generation. To practice this principle all processes and material used will be evaluated on the basis of possible reduction in raw material usage.
  - Reuse Initiatives: Reuse of the material in other applications and /or by other parties is routinely examined by using the waste materials exchange.
  - Recycling Initiatives: Recycling is the next option considered for the successful management of the waste streams.
  - Recovery Initiatives: Recovery of usable material or energy as a by-product is a part of the four R's of the waste minimization process. For example, redistributing waste heat from generators to heat buildings is a process of recovery of energy from waste.
- Disposal: Disposal is the final option when the four R's are no longer applicable or practical. Hazardous wastes will be stored temporarily on-site and ultimately transported to a licensed, approved hazardous waste handling facility for possible recovery, treatment and/or disposal.

The main objectives of Sabina's HMMP are summarized as follows:

1. Identification of hazardous materials types potentially generated during the construction, operations, and reclamation and closure phases.
2. Characterization of the potential environmental hazards associated with the proposed materials.
3. Assignment of responsibilities for the management of hazardous materials.
4. Identification of practices for handling, storing, and disposal of hazardous materials at the Back River mine site that are safe, secure, and environmentally sound.
5. Identification of required training for all staff related to hazardous materials.

6. Implementation of waste monitoring and mitigation measures.
7. Confirmation of conformance with applicable Federal and Territorial regulations.
8. Conformance with Section 9.4.8 of the NIRB EIS Guidelines for the Back River Project, April 2013 (NIRB File No. 12MN036).

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced where appropriate the following management plans:

- Landfill and Waste Management Plan.
- Fuel Management Plan.
- Spill Contingency Plan.
- Oil Pollution Emergency Plan.
- Risk Management and Emergency Response Plan.
- Occupational Health and Safety Plan.
- Shipping Management Plan.

This Plan is at a conceptual stage as the mine has not yet been permitted. Suppliers have not been identified. From development to closure, transport of hazardous material from site and disposal will be contracted to licensed contractor(s) who will have adequate certification for the transportation, handling, and disposal of hazardous materials.

3. Planning and Implementation

Planning for the Hazardous Material Management Plan (HMMP) started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

The generation, storage, transport and disposal of hazardous materials within Canada and the Territorial area are covered by existing federal and territorial Acts and Regulations. Sabina will also be bound by the terms and conditions of its land use permits to be issued by Aboriginal Affairs and Northern Development Canada (AANDC) for Crown Lands and the Kitikmeot Inuit Association (KIA) for Inuit Owned Land, and its Type A Water Licence to be issued by the Nunavut Water Board (NWB).

The Project will put into place operational policies and procedures (ex. SOPs) which meet or exceed the requirements of the applicable legislation and authorizations. Applicable Acts, Regulations and Guidelines related to hazardous material management are summarized in Table 4-1. Additional documentation which also will be followed includes guidelines and operational policies and procedures developed by suppliers.

5. Roles and Responsibilities

The Sabina General Manager in charge of the Back River Project will be ultimately responsible for the success of this plan and will approve all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager, Plant Manager and Safety Superintendent, along with their direct reports will be responsible for the implementation of this plan including overall management of the plan and internal reporting. All other Project personnel involved with hazardous waste management activities will be responsible for the effective implementation of this plan including: completion of required training, maintain compliance with training requirements as set out by this Plan or by Sabina's Standard Operating Procedures (SOPs), and Best Management Practices. All employees are to work in compliance with Health and Safety Laws and Regulations.

6. Hazardous Materials and Management Approach

For the purpose of Sabina's HMMP, hazardous materials are defined as materials that are covered by the *Transportation of Dangerous Goods Act* under Classes 2 through 6, and 8 through 9, that are no longer used for its original purpose and are intended for storage, treatment, recycling, or disposal.

The classifications under the *Transportation of Dangerous Goods Act* which are included are as follows:

- Class 2 – Gases.
- Class 3 – Flammable liquids.
- Class 4 – Flammable solids.
- Class 5 – Oxidizing substances and organic products.
- Class 6 – Poisonous (toxic) and infectious substances.
- Class 8 – Corrosives.
- Class 9 – Miscellaneous products or substances.

Table 4-1. Applicable Legislation to the Hazardous Material Management Plan

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (CEPA)	Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations	Canadian Council of the Ministers of Environment (CCME) - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil CCME Environmental Quality Guidelines Canada – Wide Standards for Dioxins and Furans
National Fire Code of Canada (2010)		
Transport of Dangerous Goods Act (TDGA)	Transportation of Dangerous Goods Regulations	
Fisheries Act (1985, c. F-14)	Metal Mining Effluent Regulations (SOR/2002-2222)	
Hazardous Products Act	Controlled Products Regulations	Workplace Hazardous Materials Information System (WHMIS)
Territorial – Nunavut		
Environmental Protection Act	Spill Contingency Planning and Reporting Regulations Used Oil and Waste Fuel Management Regulations The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment (DOE) as a waste generator as well as carrier (if applicable) prior to transport	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste Hazardous Waste Disposal Manual Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Disposal Guidelines for Fluorescent Lamp Tubes Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Mine Health And Safety Act	Mine Health And Safety Regulations	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	Explosives Regulations (RRNWT (Nu) 1990 c E-27)	
Fire Prevention Act	Fire Prevention Regulations	
Safety Act	General Safety Regulations Work Site Hazardous Materials Information System Regulations	
Transportation Of Dangerous Goods Act	Transportation Of Dangerous Goods Regulations	

A hazardous waste does not include materials that are:

- Household in origin.
- Included in class 1 - Explosives or class 7 - Radioactive materials.
- An empty container.
- Intended for disposal in a sewage system or by landfilling.

6.1 PRODUCTS

The typical types of hazardous materials that will be generated at the Project include:

- Used petroleum products or new fuel/lubricants/oils/greases.
- Contaminated snow/water/soil (oil/fuel).
- Oil and fuel filters.
- Used sorbents and rags.
- Hydraulic fluid.
- Empty petroleum hydrocarbon containers and drums.
- Glycol.
- Process reagents.
- Laboratory reagents.
- Solvents.
- Paints.
- Fluorescent light tubes.
- Electronics and electrical waste.
- Waste equipment batteries.
- Hazardous medical waste.

6.1.1 Petroleum Products (Fuel/Lubricants/Oils/Greases)

Regular preventive maintenance of Project vehicles and machinery will require the periodic replacement of products such as fuel, lubricants, oils and greases at the Port/MLA, Goose Property and George Property. Such wastes pose a risk to human or environmental health if not managed and disposed of properly. The types of waste generated within this category may include:

- Fuel for machinery.
- Lubricants.
- Waste oil from vehicles/equipment.
- Waste oil from oily water separators.

6.1.2 Contaminated Snow/Water/Soil (Oil/Fuel)

All spills will be contained and cleaned in accordance with the SCP and OPEP. The materials that are contaminated and the materials that are used for the clean-up will require disposal under this HMMP.

6.1.3 Oil and Fuel Filters

Regular preventive maintenance of vehicles and machinery will require the periodic replacement of oil and fuel filters in the maintenance facilities at the MLA, Goose Property and George Property. The used material poses a risk to human or environmental health if not managed and disposed of properly.

6.1.4 Used Sorbents and Rags

Used sorbents and rags may be generated from regular maintenance and occasional spill response activities. All spill materials will be contained and cleaned up in accordance with the SCP and OPEP. Hydrocarbon-contaminated materials, including the materials used for the clean-up will require disposal under this HMMP.

6.1.5 Hydraulic Fluid

Regular preventive maintenance of Project vehicles and machinery will require the periodic replacement hydraulic fluid in the maintenance facilities at the MLA, Goose Property and George Property. These used fluids pose a risk to human or environmental health if not managed and disposed of properly. All spills will be contained and cleaned in accordance with the SCP and OPEP.

6.1.6 Glycol

As a result of the regular use of glycol in Project operations, used glycol will be generated. All glycol spills will be contained and cleaned up in accordance with the SCP. Spent or contaminated glycols will require disposal under this HMMP. The types of waste generated within this category will include (Government of Nunavut 2011a):

- Glycol solutions from heat recovery and building HVAC.
- Waste antifreeze from vehicles.
- Waste antifreeze from equipment.
- Airport de-icing solutions.
- Used glycol products.

6.1.7 Empty Petroleum Hydrocarbon Containers and Drums

Empty petroleum hydrocarbon containers and drums will be stored and returned for recycling and disposal. When possible, Sabina will bring supplies in bulk to limit the number of empty containers generated. Empty containers will also be used for the containment of spent or used products such as oil, glycol and hydraulic fluid.

6.1.8 Process Reagents

Process reagents to be stored onsite include hydrated lime, sodium cyanide, activated carbon, sodium hydroxide, hydrochloric acid, sulphur, copper sulphate, sodium metabisulphate (MBS), flocculant, and anti-scalant. Best practices will be in place to reduce or eliminate the generation of hazardous waste from the mill process. Process reagents identified as hazardous waste will require disposal under this HMMP. All reagent spills will be contained and cleaned in accordance with the SCP.

6.1.9 Laboratory Reagents

Laboratory reagents will be stored onsite for use during operations. Best practices will be in place to reduce or eliminate the generation of hazardous waste from laboratory processes. Laboratory reagents identified as hazardous waste will require disposal under this HMMP. All reagent spills will be contained and cleaned in accordance with the SCP.

6.1.10 Solvents

Used solvents may be generated as a result of maintenance and operations. All solvent spills will be contained and cleaned in accordance with the SCP. Spent / contaminated solvents will require disposal under this HMMP. The types of waste generated within this category may include (Government of Nunavut 2011b):

- Cleaning agents (degreasers).
- Oil-based paints.
- Paint thinner.
- Industrial glues.
- Other solvents.

6.1.11 Paints

Used paints may be generated by the Project. All paint spills will be contained and cleaned in accordance with the SCP. The materials that are spent / contaminated will require disposal under this HMMP. When feasible, water-based paints will be used on site. Waste water-based paints under 5 litres should be collected in a covered area and opened to dry. After they have been dried, the paint and cans can be landfilled (Government of Nunavut 2010a).

Unused full containers of paint will be returned to the manufacturer when possible. Paint containing hazardous materials over 5 litres, that cannot be used, will be sealed and shipped off-site to a registered hazardous waste receiver.

6.1.12 Fluorescent Light Tubes

Used florescent light tubes are expected to be generated by the Project. Used tubes will be collected in the original boxes and stored for disposal. If the fluorescent tubes are not broken and are packaged in their original shipping box, no special requirements are needed for transport purposes and transport, as a hazardous waste is not necessary. If tubes are broken, compliance with the hazardous waste regulations will be required (Government of Nunavut 2003).

6.1.13 Waste Equipment Batteries

Waste batteries will be generated by the Project. All batteries will be collected and shipped off-site to a recycling facility or a registered hazardous waste receiver. Types of batteries that might be used during operation and recommended disposal methods are summarized in Table 6.1-1 (Government of Nunavut 2011c).

6.1.14 Electronics and Electrical Materials

Electrical devices from the Project that cannot be repaired or recycled will be collected for disposal. Sabina's environment staff will determine the risk of electronic devices and classify them as hazardous or non-hazardous waste and determine the appropriate method of recycling/disposal.

Table 6.1-1. Battery Type and Recommended Disposal Methods

Battery Type	Sites Available	Disposal Method
Alkaline	AAA, AA, C, D, 6V and 9V	Dispose along with household garbage
Carbon-Zinc	AAA, AA, C, D, 6V and 9V	Dispose along with household garbage
Button Cell – Silver Oxide, Lithium, Alkaline, Zinc-Air	Various sizes	Alkaline – dispose along with household garbage. All other types – return to a licensed recycler.
Vehicle Lead-Acid	6V and 12V	Return to a licensed recycler
Sealed Lead-Acid	2V, 6V and 12V	Return to a licensed recycler
Nickel-Cadmium (NiCd)	AAA, AA, C, D, 6V and 9V	Return to a licensed recycler
Nickel-Metal-Hydride (NiMH)	AAA, AA, C, D, 6V and 9V	Return to a licensed recycler
Lithium-Ion	Various sizes	Return to a licensed recycler

Source: Government of Nunavut 2011c

6.1.15 Hazardous Medical Waste / Biomedical Waste

Hazardous medical waste/biomedical waste originates from human health care and personal health requirements on site, such as First Aid rooms. A portion of that waste stream may be infectious or potentially infectious and presents a potential hazard to the public health and the environment.

All hazardous medical waste/biomedical waste will be handled, transported and disposed of according to the Guidelines for the Management of Biomedical Waste in Canada, Environment Canada (1992) (CCME-EPC-WM-42E). Additional guidelines pertaining to northern environmental conditions have been integrated into the Guideline for the Management of Biomedical Waste in the Northwest Territories. These guidelines should also be incorporated into the management of hazardous medical waste.

6.2 SAFETY REQUIREMENTS

Each chemical component will be handled and disposed of in accordance with information found within its respective material safety data sheet (MSDS). A MSDS is a source of health and safety information for workers and emergency personnel. Information found within the MSDS includes the following:

- Identification of the material.
- Hazard Information.
- Composition / Ingredients.
- First Aid Measures.
- Fire Fighting Measures.
- Accidental Release Measures.
- Handling and Storage.
- Exposure Controls / PPE.
- Physical and Chemical Properties.
- Stability and Reactivity.
- Toxicological Information.
- Ecological Information.

- Disposal Considerations.
- Transport Information.
- Regulatory Information.
- Other Information.

Material Safety Data Sheets (MSDS) will be available for hazardous material products to be stored on site (Appendix A). This information will be available at various designated Project locations such as the maintenance areas and hazardous material generation and storage areas.

6.3 TRAINING AND CERTIFICATION REQUIRMENTS

All personnel working on the Back River Project will undertake formal training, to ensure compliance with legislation and Sabina’s Standard Operating Procedures (SOPs). The training requirement for all staff may include:

- Site Specific Orientation.
- Workplace Hazardous Materials Information System (WHMIS).
- Emergency and Spill Response Training.
- Additional site specific procedures (such as SOPs).

Only trained personnel will be assigned to work with and around hazardous materials. Personnel working with hazardous materials will undertake formal training, including on-the-job training to ensure compliance with legislation and SOPs. The additional training requirements for staff handling hazardous materials or fuel may include:

- First Aid.
- Transportation of Dangerous Goods (TDG).
- Emergency and Spill Response Team Training.
- Additional site-specific procedures (such as SOPs pertaining to fuel handling, waste oil incineration, oily liquid treatment plant, reagent loading and transfer, and job specific training).

The training requirements for contractors and other visiting personnel will be the same as for Sabina employees. It is expected that contractors will have been provided adequate training from their employer. Contractors may be requested to provide copies of any current certificates of requested individuals, such as, First Aid, WHIMS, and TDG. Site specific training will be provided by Sabina and renewed as required according to SOPs and legislative requirements.

Records for training will maintained for employees and contractors.

7. Procedures and Operations

7.1 SET-UP AND USE PROCEDURES

Sabina has implemented general strategies for the management of waste in an effort to reduce impacts to the environment. The strategies outlined in Section 2 of the Landfill and Waste Management Plan and the HMMP outline the policies and controls used to reduce impacts to the environment and reduce quantities required for use.

7.2 STORAGE LOCATIONS

The main hazardous waste storage facility will be located at the Marine Laydown Area (MLA). Temporary hazardous waste storage areas will be developed at each of the Goose and George properties. Hazardous waste that is generated onboard cargo ships will remain on board the ship, stored and labelled in accordance with carrier / ship specific plans.

7.2.1 Port Facility/MLA

A 2 ha dedicated lined storage pad will be constructed at the Port facility in the MLA to receive and temporarily store hazardous wastes until the sealift can transport it from the site. The hazardous waste storage pad at the MLA will be constructed to prevent pooling of water. The pad will be fenced and appropriate signage will be posted. The storage facility will be proximal to the fuel storage facilities (Figure 7.2-1).

At this stage of the Project, a contaminated soil /material remediation area (land farm) will be constructed at the MLA to treat contaminated soil or snow.

7.2.2 George and Goose Property

Hazardous wastes originating from the Goose and George properties will be temporarily stored on site until it can be packaged in appropriate containers for transportation to the main hazardous waste storage area at the MLA. Storage at the Goose and George properties will be predominantly outdoors, and where appropriate sea can containers will be used. Collection sites within the building will be identified and labelled. Materials and containers will be inspected for proper storage prior to storage (Figures 7.2-2 and 7.2-3). At the Goose Property, a secure area for hazardous materials will be identified for items such as mill reagents.

7.3 HANDLING REQUIREMENTS

All waste material will be handled in accordance with the Canadian and Territorial waste regulations, including the Environmental Protection Act, Fire Prevention Act, Safety Act, Public Health Act and all other applicable statutes, regulations, standards, guidelines and local by-laws. At minimum, all handling methods will comply with the Nunavut Department of Environment (DOE): Environmental Guideline for the General Management of Hazardous Waste (Government of Nunavut 2010b). Hazardous materials will be handled in accordance with the MSDSs and safe handling requirements. When possible, materials will reused.

All waste manifests will be completed according to applicable legislation and retained for the required time periods.

General requirements are included in Sections 7.3.1 through 7.3.5

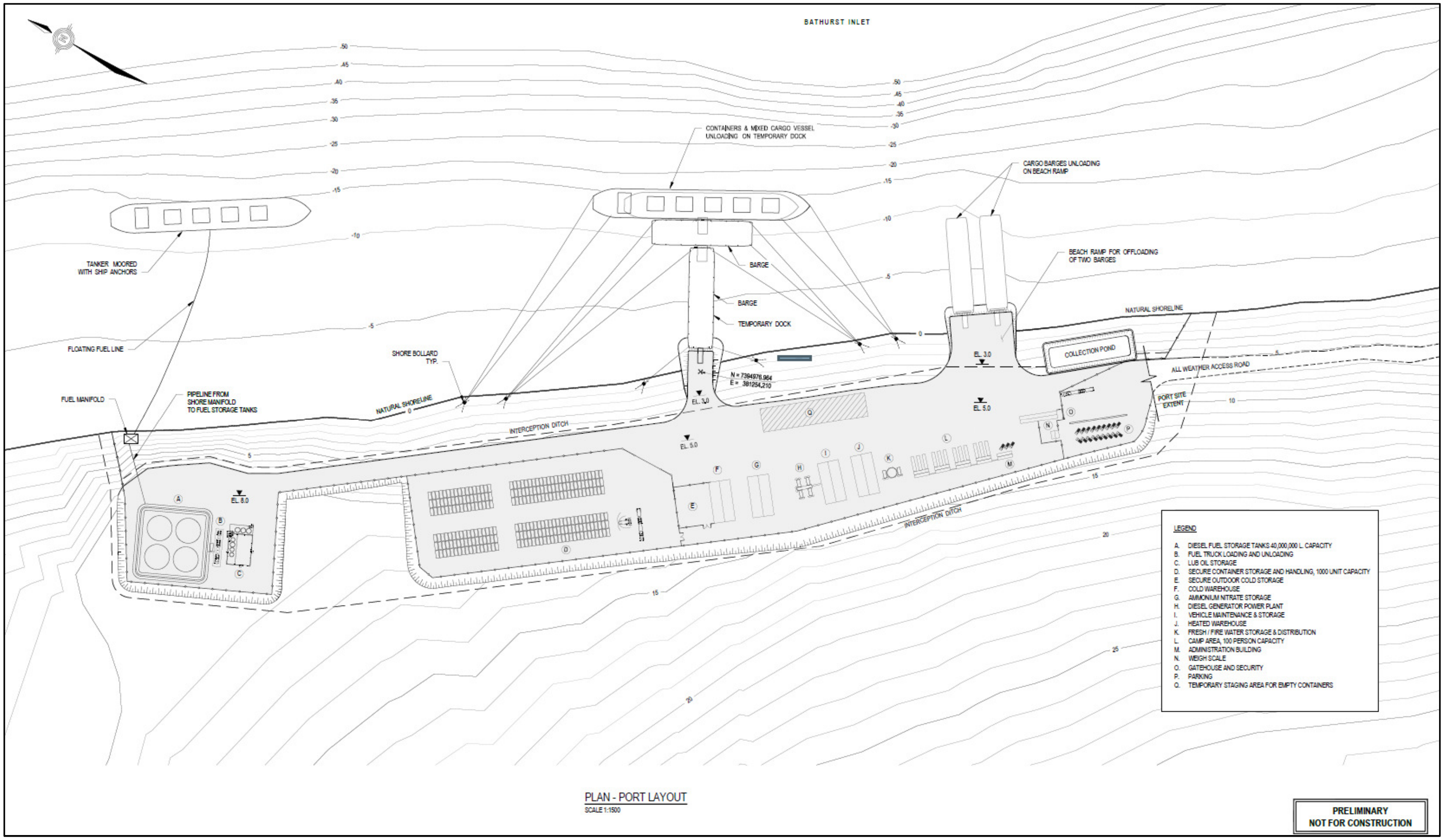

Figure 7.2-1. Port Site General Arrangement

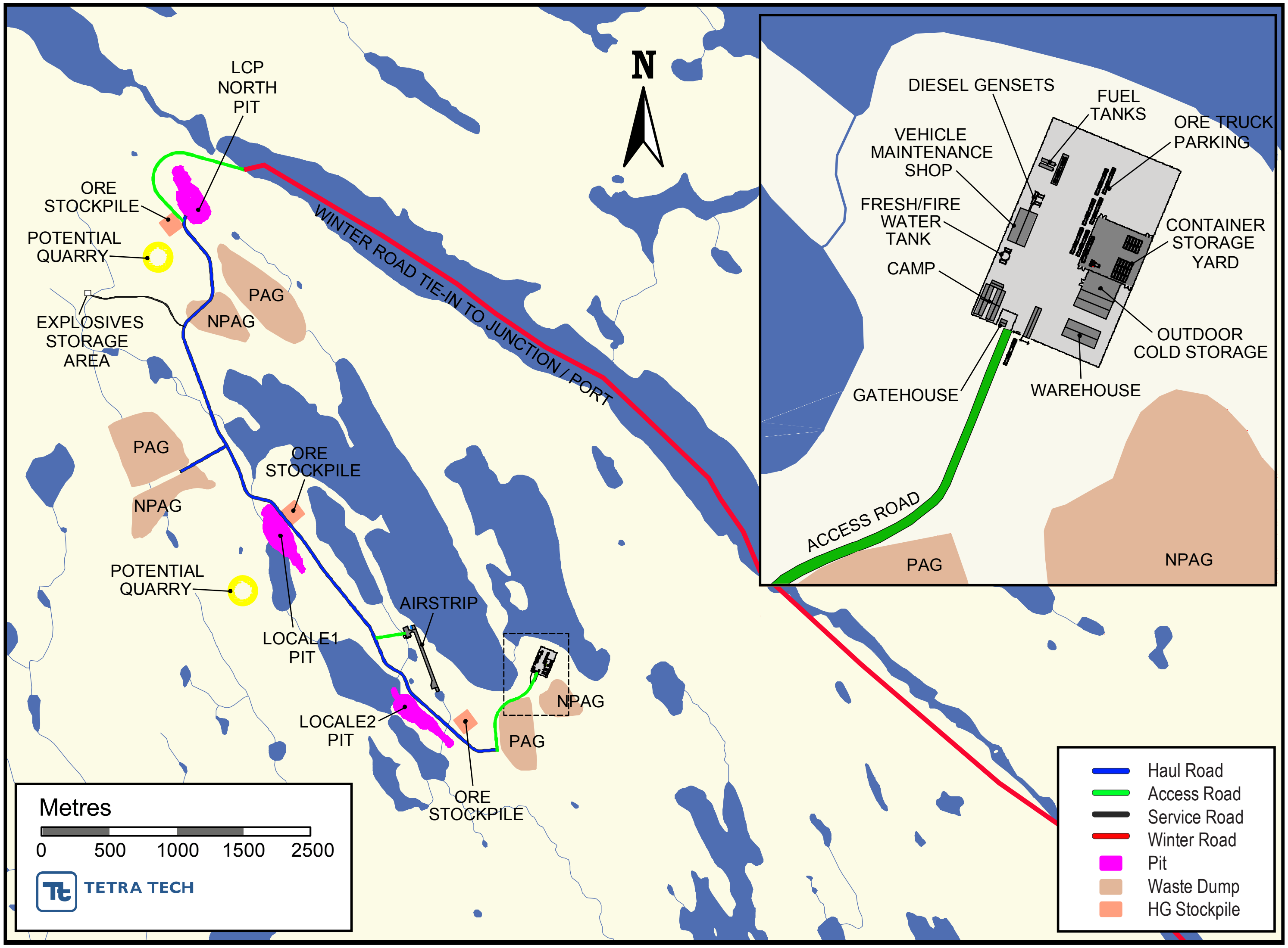

Figure 7.2-2. George Property General Arrangement

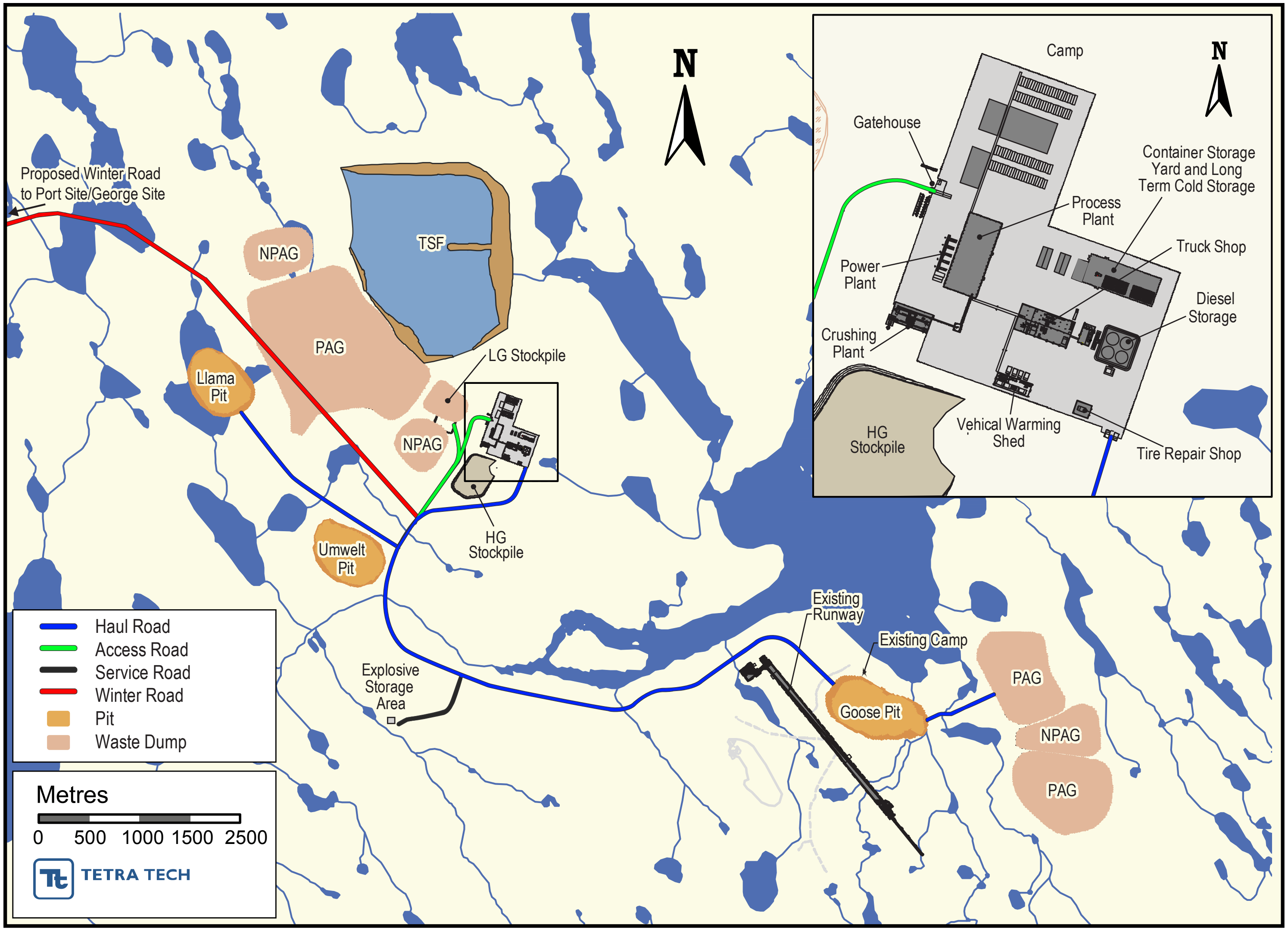

Figure 7.2-3. Goose Property General Arrangement

7.3.1 Hazardous Substance Inventory at Back River Project

An accurate and detailed inventory of hazardous materials and dangerous goods is required to implement best materials management practices at the site. A hazardous substances inventory will list all chemicals on the site, and include additional information on the products applicable for use by mine personnel including specific spill response considerations and procedures.

An example table listing hazardous substances to be utilized at the mine site is provided in Table 7.3-1. The inventory will be populated in the next revision of this plan and will be applicable to each mine phase.

Table 7.3-1. Hazardous Substances

Substance (by area)	Use	Delivered Form, Typical Volume in Site Storage	Storage vessels
Goose Camp Chlorine	Potable water treatment	200 cylinders, via MLA	Potable water storage tank
Goose Mill Area	TBD	TBD	TBD

The anticipated consumptions of selected hazardous substances are provided in tabular form in example Table 7.3-2 which will be populated in subsequent revisions of this plan.

Table 7.3-2. Anticipated Consumption of Hazardous Substances

Material	Area of Use	Consumption Estimate
ANFO	Umwelt Pit Mining Activities	20 tonnes / Week
XYZ	TBD	TBD

7.3.2 Containment and Labelling

All hazardous materials will be contained in designated containers appropriate for their WHMIS hazard classification, and in accordance with any other information contained in their respective MSDS sheet to prevent chemical reactions or corrosion that could result in spills or emergency situations (i.e., fire and explosions).

When possible, original containers will be used for storage (e.g., fuel drums, and reagent containers). All containers should be sealable and in good condition, void of cracks or potential for leaks. Containers will be kept closed except when adding or removing product. Each container of hazardous waste material will be clearly labelled with the contents being stored, in accordance with the requirements of WHMIS and the applicable MSDS sheet MSDS where available.

7.3.3 Collection and Onsite Transport

Collection sites within the buildings and around the Project will be identified and labelled. Hazardous materials and containers will be inspected to ensure appropriate storage /transport containers and methods prior to transport

Hazardous materials will be collected from these areas at regular intervals and transported to the temporary storage areas. During winter road access, such materials will be transported to the main storage facility at the MLA. All transportation of goods will be in accordance with on-site best management practices (i.e., speed limits and shipping hours), SOPs (i.e., truck spill kit requirements, and communication procedures) and required laws and regulations.

7.3.4 Storage

Hazardous materials may be stored on site for greater than 180 days; therefore, Sabina will be registered with Nunavut's DOE as a Hazardous Waste Management Facility. Hazardous materials will be stored in accordance with applicable laws and regulations. To assist in the safe and secure storage of fuels, hazardous materials and hazardous wastes, the following general guidelines for storage areas/facilities will be applied:

- All hazardous material storage areas will be adequately signed indicating that hazardous materials/wastes are stored therein.
- All hazardous material storage areas will be clearly defined and designed to protect containers from physical damage, such as barriers or fencing.
- Storage areas will be designed to comply with the National Fire Code, where appropriate.
- Hazardous materials will be segregated by chemical compatibility within the storage area to prevent contact of incompatible materials in the event of a release.
- Storage areas will be maintained in an organized fashion to make them accessible for firefighting and other emergency procedures.
- Adequate ventilation will be provided to prevent the build-up of noxious or toxic vapours.
- Secondary containment will be installed to allow for the containment of at least 110% of the volume of the largest tank within the contained area.
- Drums containing hazardous materials or wastes will be placed on pallets or on a well-drained storage area to prevent rusting.
- All containers containing product shall be stored in the upright position to prevent leaking.
- Containers shall be arranged within the storage area in a manner as to prevent damage from falling or dislodging.
- Containers shall be arranged to allow for easy access and inspections.
- All wastes should be stored in conditions recommended by the MSDS, such as temperature requirements.

7.3.4.1 Hazardous Medical Waste / Biomedical Waste

To the extent possible, Sabina will follow the NT DOE guidelines for the management of biomedical waste which recommends that all biomedical waste must be refrigerated at 4°C or lower if stored for more than four days. Facilities refrigerating or freezing stored waste should use a lockable, closed cold storage facility or a lockable, domestic type freezer unit only to be used for storing biomedical waste. The refrigerating or freezing unit must visibly display the biohazard symbol, and be identified as containing biomedical waste (Government of Northwest Territories, 2005). When possible, biomedical waste will be incinerated. If the facility will only generate waste sharps, waste storage areas need not be refrigerated.

7.3.5 Transport

All hazardous materials will be transported to and from site by commercial carriers in accordance with the applicable transport authority. All carriers will be registered with Nunavut DOE as a hazardous waste carrier. Requirements for each transport authority vary and may include different legislation (Table 7.3-3).

Table 7.3-3. Transport Requirements (Government of Nunavut 2010b)

Method of Travel	Legislation
Marine	International Maritime Dangerous Goods Code (IMDG) Interprovincial Movement of Hazardous Waste Regulations (CEPA)
Road and Rail	TDGA and Regulations, Interprovincial Movement of Hazardous Waste Regulations (CEPA) and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (CEPA)
Air	International Air Transport Association (IATA) Dangerous Goods Regulations International Civil Aviation Organization (ICAO) Technical Instructions, Interprovincial Movement of Hazardous Waste Regulations (CEPA)

Carriers will be licensed and inspected as required by the Department of Transportation. All required permits, licences, and certificates of compliance will be the responsibility of the carrier.

To assist in the safe and secure transport of hazardous materials and hazardous wastes, the following general guidelines for carrier storage areas/facilities will include:

- The hazardous materials will be shipped in approved containers housed in a sea can.
- All shipments will be properly identified and labelled, such as placarding and labeling all transport vehicles and containers in accordance with the appropriate legalisation.
- Shipping papers and waste manifests will be filled in completely and accessible during transport.
- Each transportation company will have a spill prevention, control, and counter measures plan to address the materials they are importing / exporting. In the event of a release during transport, the commercial transportation company is responsible for first response and cleanup. Sabina will periodically review this plan for Sabina requirements.
- Hazardous waste will only be transported to a registered receiver or hazardous waste management facility.
- Sabina will periodically verify waste shippers training records to ensure staff are trained and qualified to safely transport hazardous waste.

7.3.6 Disposal

Sabina will ensure that all hazardous materials will be shipped to approved hazardous waste disposal facilities. The hazardous waste receiver accepting hazardous waste will be registered with the DOE as a hazardous waste receiver. The facility will also be registered as a hazardous waste management facility where it is used for commercial purposes and is used to store hazardous waste for a period of 180 days or more.

Basic responsibilities of the receiver will include.

- Sabina will periodically verify waste receivers qualifications and registrations to ensure the facility is within compliance of applicable legislation and guidelines.
- Sabina may tour the disposal facility to verify compliance with Sabina's environmental policy.
- Relevant personnel will be trained and qualified to safely handle and dispose of hazardous waste.

- Have an approved SCP which covers the waste disposed of by Sabina.
- Report all spill according to applicable legislation and guidelines. Report all spill of Sabina's former products to Sabina.
- Maintain required records in compliance with applicable legislations, such as waste manifests.
- Receiver is to accept hazardous material only from registered generators and carriers.
- All handling of the hazardous waste must be completed in a proper and safe manner, such as reusing, recycling, treating or disposing.

7.3.6.1 Waste Oil

Waste water containing waste oil from light vehicles and mine maintenance shops will be treated and recycled within the shop. Waste oil will be collected and either burned in an approved waste-heat generator or drummed and removed from site as hazardous waste.

7.3.6.2 Aerosol Cans

Waste aerosol cans will be consolidated on-site. Pressurized cans will be punctured on-site and landfilled.

7.4 SPILLS

Adequate emergency and spill response equipment will be located at all hazardous materials storage areas. All spills will be contained and cleaned up according to the SCP. All spills of hazardous waste over the reporting requirements will be reported immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130 as per the SCP.

7.5 SECURITY

Security measures for the management of hazardous materials include design and procedural measures. All hazardous material storage areas will have controlled access and only authorized personnel will have access/permission to enter hazardous materials management areas.

8. Environmental Protection Measures

Sabina has an ongoing commitment to implementing environmental protection measures in all aspects of its operations. Sabina is committed to undertaking waste collection, storage, transportation and disposal in a safe, efficient and environmentally compliant manner, by actively encouraging and implementing the four R's of waste management, namely: waste reduction, reuse, recycling and recovery. Sabina will implement monitoring programs to satisfy regulatory requirements and achieve environmental protection from hazardous waste contamination.

Temporary and long term hazardous waste management storage areas will be lined to prevent possible spills or leaching of hazardous waste products into the environment. Where appropriate, hazardous waste material will be stored in a covered building to prevent exposure to the influences of weather.

Environment Protection measures will be implemented in all aspects of the hazardous waste management program, from waste segregation and waste handling to ultimate storage and disposal. The Environmental Protection measures will be implemented from project design and construction through operations and into the closure phase (Table 8-1).

Table 8-1. Hazardous Waste Types, Source, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Fuels and Used Petroleum Products (oils / lubricants / greases)	Vehicles and equipment including generators and pumps	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake hydrocarbons in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Spill Response Procedures (safety procedures, initial assessment, spill report, containment, storage, and disposal) will be employed. When possible. waste oil will be used in incinerators or designed used-oil heaters. Waste oil may be collected and stored in empty bulk lubricant cubes to be stored in the designated hazardous waste section of the waste storage facility. Contaminated snow/water will be stored in clearly-marked, sound, sealed containers in the laydown yard and may be shipped off-site to an appropriate facility. Bioremediation may be considered for contaminated soil.
Oil and Fuel Filters	Vehicles and equipment	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Waste oil and fuel filters will be drained in a heated and ventilated section of the maintenance shop. Filters will then be crushed to minimize volume and release any additional oil. This area of the maintenance shop will adhere to Sabina's Spill contingency plan and have a liner or tray to catch any spills or splashes. The filters will be placed in sealed containers and labelled and stored at the waste management facility. These containers may be shipped off-site to a registered hazardous waste receiver.

(continued)

Table 8-1. Hazardous Waste Types, Source, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (continued)

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Used Sorbents and Rags	Used in the maintenance of vehicles, equipment and spill control	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Where possible, used rags and sorbents will be incinerated on-site. If incineration is not practical, used sorbents and rags will be stored in clearly-marked, sound, sealed containers in the laydown yard and then shipped off-site to a registered hazardous waste receiver.
Hydraulic Fluid	Used in vehicles and equipment (e.g., brakes, power steering, forklifts, underground hauling equipment)	Construction / Operations / Closure	Goose Property, George Property, and MLA	Hydraulic fluid may enter the environment from spills and leaks from equipment or from improper storage. Once in the environment some hydraulic fluids break down and have the potential to mix with water and, in high quantities, may harm fish.	Equipment will be regularly maintained to prevent spills from ruptured hydraulic fluid lines. Biodegradable, low toxicity hydraulic fluids will be used where practical. Where possible, used hydraulic fluid will be incinerated on-site. Used hydraulic fluid that cannot be incinerated will be stored in clearly marked, sound, sealed containers. These containers may be shipped off-site to a registered hazardous waste receiver. Unused hydraulic fuel in the original containers will be return to the manufacture for disposal or reuse at closure.

(continued)

Table 8-1. Hazardous Waste Types, Source, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (continued)

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Empty Petroleum Hydrocarbon Containers and Drums	Packaging for oils, solvents and penetrating oils	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products may accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Sabina and its contractors will purchase these items in bulk to minimize the amount of packaging. Backhauled to a recycling facility.
Glycol	Used as a coolant and antifreeze in equipment	Construction / Operations / Closure	Goose Property, George Property, and MLA	Glycol’s odour is a known wildlife attractant. Glycol can have toxic effects on aquatic organisms and wildlife.	Environmental benign glycols will be used where practical. Equipment will be regularly maintained to prevent spills from ruptured glycol lines. Waste glycol will be stored in the waste storage facility in clearly marked, sound, sealed containers. These containers may be shipped off-site to a registered hazardous waste receiver. Unused glycol in the original containers may be returned to the manufacture for disposal or reuse at closure.

(continued)

Table 8-1. Hazardous Waste Types, Source, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (continued)

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Reagents	Additives required for mine processing	Operations /Closure	Goose Property and MLA	Reagents (hydrated lime, sodium cyanide, activated carbon, sodium hydroxide, hydrochloric acid, sulphur, copper sulphate, MBS, flocculant, and antiscalant) may enter the environment from spills and leaks from containers, process equipment or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances (e.g., cyanide).	Spill prevention procedures will be developed. Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal). Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility. Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure.
Lab Reagents		Operations /Closure	Goose Property and MLA	Lab Reagents may enter the environment from spills and leaks from containers, or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances.	Spill prevention procedures will be developed. Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal). Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility. Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure.

(continued)

Table 8-1. Hazardous Waste Types, Source, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (continued)

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Solvents	Used to degrease machinery in the maintenance shop	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum fuels can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Low toxicity solvents and physical cleaning (e.g., steam jet) will be used where practical. Petroleum-based solvents will not be allowed into the environment and will be subject to the spill response plan. Waste or excess solvents will be stored in the waste storage facility in clearly marked, sound, sealed containers. These containers may be shipped off-site to a registered hazardous waste receiver. Unused solvents in the original containers may be returned to the manufacturer for disposal or reuse at closure.
Paints		Construction /Operations /Closure	Goose Property, George Property, and MLA		When feasible, latex paints will be used on site. Latex paints should be collected in a covered area and opened to dry. Unused full containers of paint will be returned to the manufacture, if possible. Paint containing hazardous materials, that cannot be used will be sealed and shipped off site to a registered hazardous waste receiver.
Fluorescent Light Tubes	Indoor lighting	Construction / Operations /Closure	Goose Property, George Property, and MLA	Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium.	Lights should be equipped with motion sensors to reduce usage where practical. Discarded fluorescent lights will be consolidated together and stored indoors in the waste storage facility in their original packaging. Fluorescent light tubes may be shipped off-site to a registered hazardous waste receiver.

(continued)

Table 8-1. Hazardous Waste Types, Source, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (completed)

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	Construction /Operations /Closure	Goose Property, George Property, and MLA	Electrical waste and devices may or may not contain polluting substances (such as mercury, lead, arsenic, cadmium, and polyvinyl chloride (PVC) that could enter the ecosystem.	Sabina's environment staff will determine the risk of electronic devices and classify them as hazardous or non-hazardous waste and determine the appropriate method of recycling/ disposal.
Equipment Batteries	Equipment batteries	Construction/ Operations /Closure	Goose Property, George Property, and MLA	Lead batteries (i.e., vehicle batteries) contain sulphuric acid and lead harmful to environmental receptors. Rechargeable batteries (i.e., industrial forklift, radio and transmitter batteries) usually contain either potassium hydroxide or nickel cadmium with toxic effects.	Protect and service batteries to prevent damage and loss of charge. Test batteries prior to disposal to confirm the battery is spent. All batteries will be shipped off-site to a recycling facility or a registered hazardous waste receiver.
Hazardous Medical Waste	Small amounts of medical waste from First Aid (e.g., syringes, used medical supplies)	Construction /Operations /Closure	Goose Property, George Property, and MLA	May be sharp or may contain bacteria and viruses which can be a risk to human or wildlife health.	Medical waste will be labeled "Biohazard" and stored in a secure area of the First Aid Station. Medical waste will remain under the care of medical personnel until backhauled to a registered hazardous biological waste receiver. Medical waste will not be incinerated on-site as it poses a handling risk from sharps for the incinerator operator and workers collecting waste.
Aerosol Cans		Construction /Operations /Closure	Goose Property, George Property, and MLA		Pressurized aerosol cans will be punctured on site and landfilled.

Notes: Goose = Goose Property, George = George Property, MLA= Marine Laydown Area

9. Monitoring Program

Monitoring programs for the HMMP will include inventory checking. Any materials that are reported as excess will be reported to purchasing in an effort to adaptively manage future hazardous waste generation. All fuel and waste fuel will be monitored according to the Fuel Management Plan (FMP). Records will be available for review.

10. Checking and Corrective Action

Sabina will implement a series of checking and corrective action measures to ensure the effectiveness of this plan. Best management practices will be implemented to check the function and may include:

- Hazardous material inventory accounting.
- Internal inspections and audits.
- External inspection and audits.

10.1 INVENTORY ACCOUNTING

Hazardous material inventory accounting will be verified against purchasing requirements and waste manifests to identify waste generation amounts and ensure all materials are removed from site.

10.2 INTERNAL INSPECTIONS AND AUDITS

Internal audits and inspections will be conducted on a regular basis and adapted to each phase of the mine life. Inspections will be completed by qualified personnel on a regular basis for physical condition and serviceability, and the results recorded according to quality and safety standard operating procedures. In addition, qualified personnel will perform inspections to ensure that each inventory is documented.

Inspections will be required and reported for:

- Waste manifests;.
- Inspection of all hazardous waste collection areas.
- Storage areas.
- Storage containers.
- Transportation containers.
- Fuel management areas.
- Waste oil collection systems.

10.3 EXTERNAL INSPECTIONS AND AUDITS

On occasion external inspections and audits may be required by regulatory authorities. All recommendations and orders made by regulatory authorities, Fire Marshals and Insurance Inspectors will be responded to and acted upon accordingly.

11. Record Keeping

Hazardous material inventories, waste manifest libraries, spill reports (as per the SCP) will be completed to track the volume, hazardous material type and hazardous material source for all hazardous materials that are generated. The transportation of hazardous waste to the on-site hazardous material management facilities will be tracked and recorded. Records will be stored digitally and available for review by on-site personnel and regulatory agencies on an as-needed basis as part of the annual review process.

All internal and external inspections and audits will be documented and stored digitally and available for review by on-site personnel and regulatory agencies as part of the annual review process.

Staff training records will be filed per Safety SOPs and made available for review with this plan.

12. Environmental Reporting

Any spills or releases of hazardous materials will be reported as part of this plan and will follow the incident response procedures identified in Sabina's SCP, OPEP and FMP. All information about the spill or release will be documented according to the requirements of the SCP, OPEP and FMP.

13. Plan Effectiveness

The HMMP will be reviewed and updated annually to incorporate any lessons learned, and records outlined in Section 11.

All employees will be informed of relevant updates and the updated HMMP will be stored at designated Project sites. A record will document all significant changes that have been incorporated in the HMMP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Sabina will retain all raw data records and annual reporting for at least two (2) years. The updated HMMP, raw data and annual reporting will be made available by Sabina at all times for review by the regulatory inspectors.

14. Quality Assurance/Quality Control

Sabina will implement a series of Quality Assurance (QA) and Quality Control (QC) plans and programs at all levels of the hazardous waste management process. QA/QC procedures will be incorporated as this plan becomes operationalized. Results will be tabulated and included in annual reports. Any required improvements will be incorporated as necessary, based on relevant findings.

Internal audits and inspections will be conducted as required on all clauses related to the HMMP. Qualified personnel will perform regular inspections of the hazardous waste storage areas to ensure that waste segregation and inventory are being documented correctly, and that there are no concerns for the leaching of deleterious substances.

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Government of Nunavut. 2011d. Department of Environment: Environmental Guideline for Waste Lead and Lead Paint. March 2011. Available: http://env.gov.nu.ca/sites/default/files/waste_antifreeze_2011.pdf. Accessed: October 28, 2013.

Government of Nunavut. 2003. Disposal Guideline for Fluorescent Lamp Tubes. Available: http://env.gov.nu.ca/sites/default/files/Fluorescent%20Lamp%20Tubes.pdf. Accessed: October 28, 2013

Transportation of Dangerous Goods (TDG)

Workplace Hazardous Materials Information System (WHMIS)

Appendix A

Expected Hazardous Materials Transported, Stored and Used On-site

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Fuels and Used Petroleum Products (oils / lubricants /greases)	Vehicles and equipment including generators and pumps	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake hydrocarbons in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Spill Response Procedures (safety procedures, initial assessment, spill report, containment, storage, and disposal) will be employed When possible. waste oil will be used in incinerators or designed used-oil heaters Waste oil may be collected and stored in empty bulk lubricant cubes to be stored in the designated hazardous waste section of the waste storage facility Contaminated snow/water will be stored in clearly-marked, sound, sealed containers in the laydown yard and may be shipped off-site to an appropriate facility Bioremediation may be considered for contaminated soil
Oil and Fuel Filters	Vehicles and equipment	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Waste oil and fuel filters will be drained in a heated and ventilated section of the maintenance shop. Filters will then be crushed to minimize volume and release any additional oil. This area of the maintenance shop will adhere to Sabina's Spill contingency plan and have a liner or tray to catch any spills or splashes The filters will be placed in sealed containers and labelled and stored at the waste management facility These containers may be shipped off-site to a registered hazardous waste receiver
Used Sorbents and Rags	Used in the maintenance of vehicles, equipment and spill control	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g.,	Where possible, used rags and sorbents will be incinerated on-site If incineration is not practical, used sorbents and rags will be stored in clearly-marked, sound, sealed containers in the laydown yard

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
				fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	and then shipped off-site to a registered hazardous waste receiver
Hydraulic Fluid	Used in vehicles and equipment (e.g., brakes, power steering, forklifts, underground hauling equipment)	Construction / Operations / Closure	Goose Property, George Property, and MLA	Hydraulic fluid may enter the environment from spills and leaks from equipment or from improper storage. Once in the environment some hydraulic fluids break down and have the potential to mix with water and, in high quantities, may harm fish	Equipment will be regularly maintained to prevent spills from ruptured hydraulic fluid lines Biodegradable, low toxicity hydraulic fluids will be used where practical Where possible, used hydraulic fluid will be incinerated on-site Used hydraulic fluid that cannot be incinerated will be stored in clearly marked, sound, sealed containers These containers may be shipped off-site to a registered hazardous waste receiver Unused hydraulic fuel in the original containers will be return to the manufacture for disposal or reuse at closure.
Empty Petroleum Hydrocarbon Containers and Drums	Packaging for oils, solvents and penetrating oils	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum products may accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Sabina and its contractors will purchase these items in bulk to minimize the amount of packaging Backhauled to a recycling facility

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Glycol	Used as a coolant and antifreeze in equipment	Construction / Operations / Closure	Goose Property, George Property, and MLA	Glycol's odour is a known wildlife attractant Glycol can have toxic effects on aquatic organisms and wildlife	Environmental benign glycols will be used where practical Equipment will be regularly maintained to prevent spills from ruptured glycol lines Waste glycol will be stored in the waste storage facility in clearly marked, sound, sealed containers These containers may be shipped off-site to a registered hazardous waste receiver Unused glycol in the original containers may be returned to the manufacture for disposal or reuse at closure.
Reagents	Additives required for mine processing	Operations / Closure	Goose Property and MLA	Reagents (hydrated lime, sodium cyanide, activated carbon, sodium hydroxide, hydrochloric acid, sulphur, copper sulphate, MBS, flocculant, and antiscalant) may enter the environment from spills and leaks from containers, process equipment or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances (e.g. cyanide)	Spill prevention procedures will be developed Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal) Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure
Lab Reagents		Operations / Closure	Goose Property and MLA	Lab Reagents may enter the environment from spills and leaks from containers, or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances	Spill prevention procedures will be developed Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal)

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
					Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure
Solvents	Used to degrease machinery in the maintenance shop	Construction / Operations / Closure	Goose Property, George Property, and MLA	Petroleum fuels can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition Petroleum products can damage the respiratory system if aspirated and be toxic if ingested	Low toxicity solvents and physical cleaning (e.g., steam jet) will be used where practical Petroleum-based solvents will not be allowed into the environment and will be subject to the spill response plan Waste or excess solvents will be stored in the waste storage facility in clearly marked, sound, sealed containers These containers may be shipped off-site to a registered hazardous waste receiver Unused solvents in the original containers may be returned to the manufacturer for disposal or reuse at closure
Paints		Construction / Operations / Closure	Goose Property, George Property, and MLA		When feasible, latex paints will be used on site. Latex paints should be collected in a covered area and opened to dry. Unused full containers of paint will be returned to the manufacture, if possible Paint containing hazardous materials, that cannot be used will be sealed and shipped off site to a registered hazardous waste receiver.

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Fluorescent Light Tubes	Indoor lighting	Construction / Operations / Closure	Goose Property, George Property, and MLA	Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium	Lights should be equipped with motion sensors to reduce usage where practical Discarded fluorescent lights will be consolidated together and stored indoors in the waste storage facility in their original packaging Fluorescent light tubes may be shipped off-site to a registered hazardous waste receiver
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	Construction / Operations / Closure	Goose Property, George Property, and MLA	Electrical waste and devices may or may not contain polluting substances (such as mercury, lead, arsenic, cadmium, and polyvinyl chloride (PVC) that could enter the ecosystem	Sabina's environment staff will determine the risk of electronic devices and classify them as hazardous or non-hazardous waste and determine the appropriate method of recycling/ disposal
Equipment Batteries	Equipment batteries	Construction/ Operations / Closure	Goose Property, George Property, and MLA	Lead batteries (i.e., vehicle batteries) contain sulphuric acid and lead harmful to environmental receptors Rechargeable batteries (i.e., industrial forklift, radio and transmitter batteries) usually contain either potassium hydroxide or nickel cadmium with toxic effects	Protect and service batteries to prevent damage and loss of charge Test batteries prior to disposal to confirm the battery is spent All batteries will be shipped off-site to a recycling facility or a registered hazardous waste receiver
Hazardous Medical Waste	Small amounts of medical waste from First Aid (e.g., syringes, used medical supplies)	Construction / Operations / Closure	Goose Property, George Property, and MLA	May be sharp or may contain bacteria and viruses which can be a risk to human or wildlife health	Medical waste will be labeled "Biohazard" and stored in a secure area of the First Aid Station Medical waste will remain under the care of medical personnel until backhauled to a registered hazardous biological waste receiver Medical waste will not be incinerated on-site as it poses a handling risk from sharps for the incinerator operator and workers collecting waste

Appendix A. Hazardous Materials Transported, Stored and Used On-Site

Type	Source	Project Phase Generated	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Aerosol Cans		Construction / Operations / Closure	Goose Property, George Property, and MLA		Pressurized aerosol cans will be punctured on site and landfilled.

Appendix B
NWT-NU Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # ______ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-__________
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS		
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION		
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS			

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Appendix C
Sabina Internal Report Form

SABINA INTERNAL SPILL REPORT FORM

This form is to be used for internal documentation of spills of any petroleum product, chemical, ethylene glycol (antifreeze), or other hazardous material. See recent Spill Contingency Plan for reporting thresholds and structure. Once complete file with the Operations Superintendent.

Report Date and Time:	***Spill Date and Time***: ☐ Spill occurred ☐ Spill observed
Spill Location: ☐ Goose ☐ Marine Laydown Area ☐ George ☐ Other (e.g. Drill, Boulder Pond)	***Describe Location***:
Coordinates (Lat/Long or UTM):	

Product(s) Spilled:	Jet fuel	Diesel (P50)	Gasoline	AvGas	Oil (type)	Antifreeze	Other (describe)
Quantity (L or kg):							

Personnel Involved:	☐ Sabina	☐ Contractor	☐ Visitor	☐ Other

Cause of Spill:
Containment/Cleanup Measures Taken:
Factors Affecting Spill or Recovery (weather, snow, ground conditions, etc.):
Additional Action Required:
Additional Comments:

	Name	***Employer***	***Signature***
Reported by:			
Reported to:			

13. Explosives Management Plan

an ERM company

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Explosives Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
EXPLOSIVES MANAGEMENT PLAN

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Appendix A. Material Safety Data Sheets (MSDS)

Glossary and Abbreviations

Terminology used in the document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AN	Ammonium Nitrate
ANFO	Ammonium Nitrate / Fuel Oil
ANSI	American National Standards Institute
CCME	Canadian Council of Ministers of the Environment
DFO	Fisheries and Oceans Canada
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPS	Environmental Protection Service
ERP	Emergency Response Plan
ERT	Emergency Response Team
ExMP	Explosives Management Plan
FO	Fuel Oil
FS	Fuel Storage Area
HAZCOM	Hazard Communication
HM	Hazardous Materials Storage Area
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
HW	Hazardous Waste Storage Area
IPC	Instantaneous Pressure Change
ISO	International Organization for Standardization
MSDS	Materials Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
NRC	Natural Resources Canada
OHSA	Occupational Health and Safety Administration
OHSP	Occupational Health & Safety Plan
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PVS	Peak Vector Sum

SD	Support Document
SGSP	Sabina Gold and Silver Project
SCP	Spill Contingency Plan
TDG	Transportation of Dangerous Goods
TDGA	*Transportation of Dangerous Goods Act*
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

1. Introduction

This Explosives Management Plan (ExMP) outlines the Sabina Gold & Silver Corp. (Sabina) plan for managing explosives products at the Back River Project (the Project). It represents one plan in a series of environmental management plans that have been prepared for the Project Draft Environmental Impact Statement (DEIS). This management plan has been prepared in accordance with Section 9.4.13 of the EIS Guidelines that the Nunavut Impact Review Board (NIRB) issued to Sabina (NIRB, 2013). The plan was prepared in accordance with best management practices and applicable legislation (Section 4.0).

The Project is an advanced exploration gold project located in the West Kitikmeot region of Nunavut (Figure 1-1); it is located at approximately 65° to 66° north latitude, and 106° to 107° west longitude. The Project includes the two mining areas (Goose Property and George Property), a Marine Laydown Area (MLA) in southern Bathurst Inlet, and a connecting winter road (Figure 1-2).

The ExMP is a living document which will be updated based on management reviews, incident investigations, regulatory changes, or other Project-specific protocols. At this stage, certain aspects of the ExMP are conceptual and the information presented herein is current as of October 2013.

The next update will accompany the Final Environmental Impact Statement (FEIS) based on Feasibility Study project designs. Following this, the plan can be progressed further based on detailed engineering design prior to the start of construction, incorporating for construction engineering drawings of facilities and associated fuel management infrastructure.

2. Scope and Objectives

This plan provides information on explosives manufacture, transport, storage, handling and use at the Back River Project. Sabina intends to use explosives for controlled blasting of overburden rock, waste rock, ore, construction rock and granular material on surface and underground during the development and operation phases of the Back River Project.

Sabina will require the use of ammonium nitrate and fuel oil (ANFO) at the Back River Mine site to conduct blasting during construction and operations. Water-resistant explosives are not currently anticipated to be used at the Project.

This plan is at a conceptual stage as the mine has not yet been permitted. Suppliers have not been identified.

Figure 1-1

Location Map of the Back River Project Area

Sabina GOLD & SILVER CORP.

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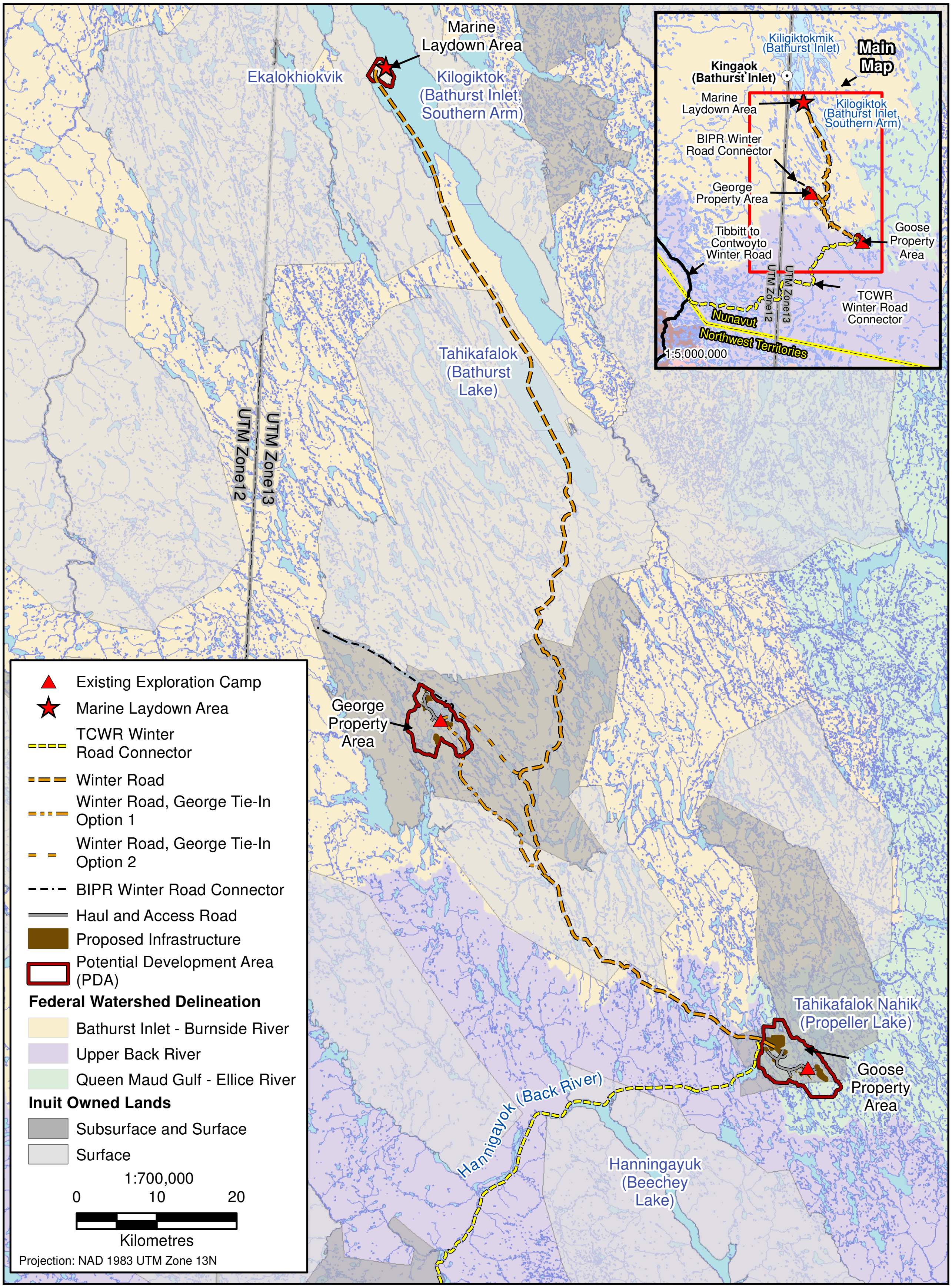

Figure 1-2

Site Locations of the Back River Project

Sabina GOLD & SILVER CORP.

Rescan an ERM company

To avoid overlap and inconsistencies with other biophysical management plans, Sabina has referenced where appropriate the following management plans:

- Risk Management and Emergency Response Plan.
- Spill Contingency Plans.
- Landfill and Waste Management Plan.
- Borrow pits and Quarries Management Plan.
- Environmental Management and Protection Plan.
- Hazardous Materials Management Plan.
- Surface Water Management Plan.
- Occupational Health and Safety Plan.
- Shipping Management Plan.

2.1 OBJECTIVES

The objectives of this ExMP are summarized as follows:

1. Identify practices for handling, storing, and using explosives at the Back River mine site that are safe, secure, and environmentally sound.
2. To demonstrate compliance with applicable Federal and Territorial regulations.
3. Conform to Section 9.4.13 of the "NIRB EIS Guidelines for the Back River Project" April 2013 (NIRB File No. 12MN036).

3. Planning and Implementation

Planning for the Explosives Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

The control and use of explosives within Canada and Nunavut are covered by existing federal and territorial Acts and Regulations. The Back River Project will implement operational policies and procedures (ex. SOPs) which meet or exceed the applicable legislation. Applicable Acts, Regulations and Guidelines related to explosives management are listed in Table 4-1. Additional documentation which also will be followed includes guidelines and operational policies and procedures developed by suppliers.

Table 4-1. Applicable Legislation to the Explosives Management Plan

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)	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 Petroleum Hydrocarbons (PHC) in Soil
Explosives Act (1985 c.E-17)	Explosives Regulations (C.R.C., c. 599) Ammonium Nitrate and Fuel Oil Order (C.R.C., c. 598)	
Fisheries Act (R.S.C. c. F-14)	Metal Mining Effluent Regulations (SOR/ 2002-2222)	
National Fire Code of Canada (2010)		
Transport of Dangerous Goods Act (1992, c.34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	
Hazardous Products Act	Controlled Products Regulations	Workplace Hazardous Materials Information System (WHMIS)
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	Mine Health And Safety Regulations (NWT Reg (Nu) 125-95)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	Explosives Regulations (RRNWT (Nu) 1990 c E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990 c F-12)	

(continued)

Table 4-1. Applicable Legislation to the Explosives Management Plan (completed)

Acts	Regulations	Guidelines
Safety Act (RSNWT 1988, c.S-1)	General Safety Regulations (RRNWT (Nu) 1990 c S-1) Work Site Hazardous Materials Information System Regulations (RSNWT 1988, C 81 (Supp))	
Transportation Of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	Transportation Of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	

5. Roles and Responsibilities

The Sabina General Manager in charge of the Back River Project will ultimately be responsible for the success of this plan and will approve all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager, Plant Manager and Safety Superintendent, along with their direct reports will be responsible for the implementation of this plan including overall management of the plan and internal reporting.

6. Safe Handling Procedures

6.1 PRODUCTS

The following chemical products will be required for the mixing of explosives at the Back River Project:

- Ammonium nitrate (AN).
- Fuel Oil (FO).

6.1.1 Ammonium Nitrate

Ammonium nitrate (AN) is the oxidiser component of the Ammonium Nitrate and Fuel Oil (ANFO) explosive. It is a stable, inorganic, solid compound. It must be kept dry to remain effective if it is to be used in blasting. AN is completely soluble in water and also readily absorbs water from air. AN products vary in composition, blend, and surface treatment. AN prills (pellets) produced for use in ANFO explosives are intentionally porous to permit the fuel oil (FO) to be absorbed. Prills are generally white or off-white, and their shelf life in a tightly closed container is unlimited.

AN is not an explosive, but rather it is an oxidiser which can explode or decompose under specific conditions, such as:

- High temperature (between 160 degrees Celsius (°C) and 200°C).
- Bulk storage in a confined space.
- Contamination with organic substances such as oils or waxes.

- Contamination with inorganic materials such as chlorides and metals (e.g., chromium, copper, cobalt and nickel).
- Exposure to strong shock waves from other explosions.

AN is not combustible; however, as an oxidizing agent it increases fire hazard when in contact with other combustible materials, even in the absence of air. AN must be stored in a dry, well-ventilated area away from all possible sources of heat, fire, or explosion.

6.1.2 Ammonium Nitrate and Fuel Oil

Ammonium Nitrate and Fuel Oil (ANFO) is a mixture of ammonium nitrate (AN) and fuel oil (FO) and is the main explosive to be used for mining at the Back River Project. ANFO is formulated of approximately 94% AN and 5% FO by weight. ANFO requires a booster of primary and / or secondary explosives to ensure reliable detonation. ANFO is then placed in boreholes for efficient detonation and brisance.

The mixture of AN and FO when active using a detonator reacts to form nitrogen (N_2), carbon dioxide (CO_2) and Water (H_2O) when complete, and some carbon monoxide (CO) and nitrogen oxides (NO_x) during incomplete combustion. Water can interfere with the explosive function and reaction of ANFO. Straight ANFO will be used for blasting at George and Goose. A water-resistant ANFO / emulsion blend is currently not anticipated to be used for blasting at the Back River Project.

6.1.3 Other Supplies

The following other explosives products will be required to achieve blasting activities:

- Prepackaged explosives.
- Caps.
- Boosters.
- Detonating cord.

6.2 STORAGE LOCATIONS AND QUANTITIES

The explosive products outlined in Section 6.1 will be stored in three locations:

- Marine Laydown Area.
- George Property.
- Goose Property.

6.2.1 Marine Laydown Area

At this facility, there will be a laydown storage area for up to 6,000 tonnes of inert AN. A separate explosives storage area for 500 tonnes of packaged explosives and blasting accessories will be located outside the secured laydown storage area (Figure 6-1) at a site to be determined according to the Quantity/Distance regulations.

6.2.2 George Property

At the George site, there will be a laydown and storage area for up to 100 tonnes of inert AN, as well as an explosives storage area, explosive mixing plant, and two magazines for 10 tonnes of packaged explosives and blasting accessories, as per regulatory requirements (Figure 6-2). Explosives magazines for short-term use may be placed in proximity to the pits, subject to quantity/distance regulations, re-supplied from the explosives storage area.

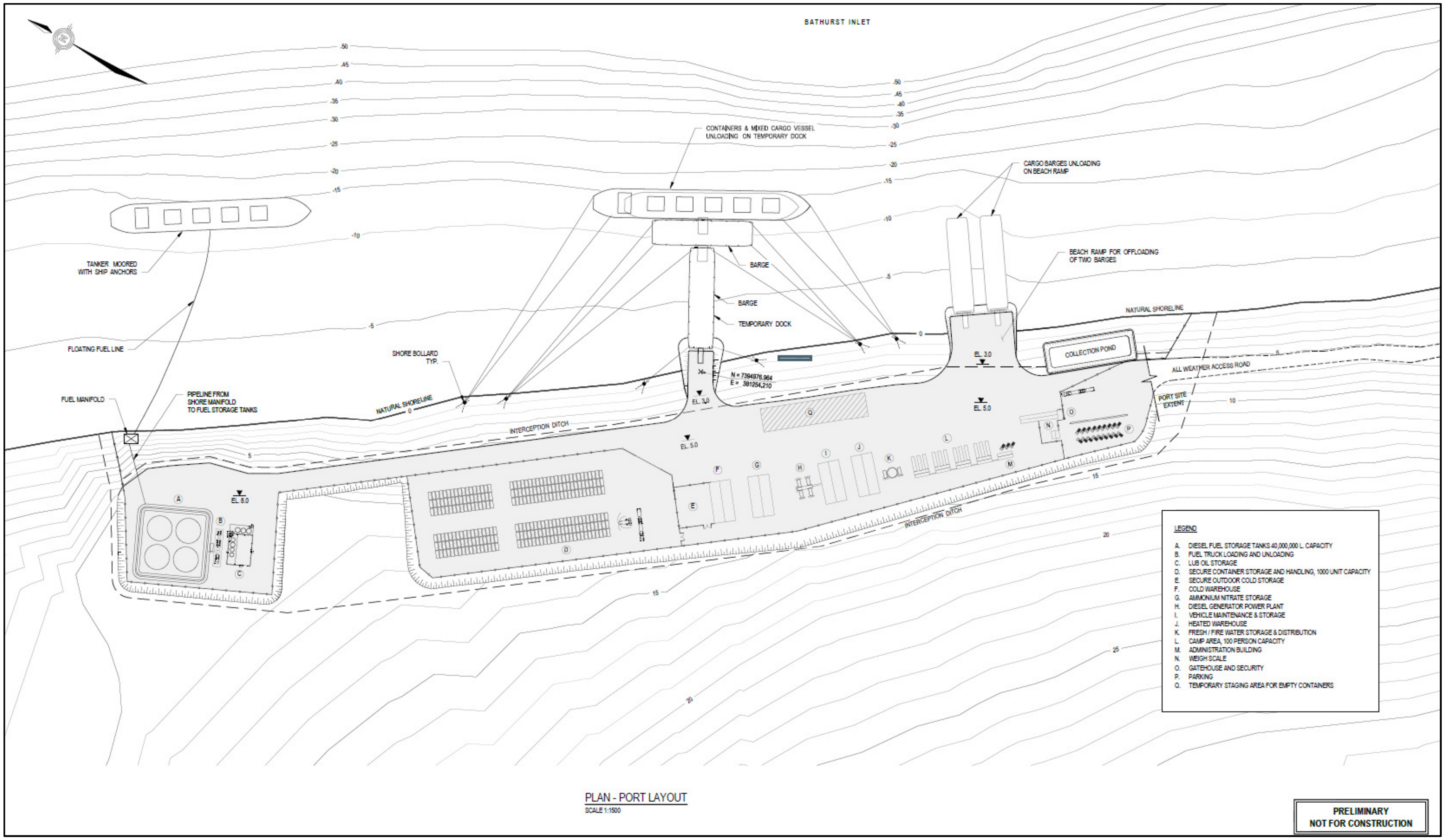

Figure 6-1. Port Site General Arrangement

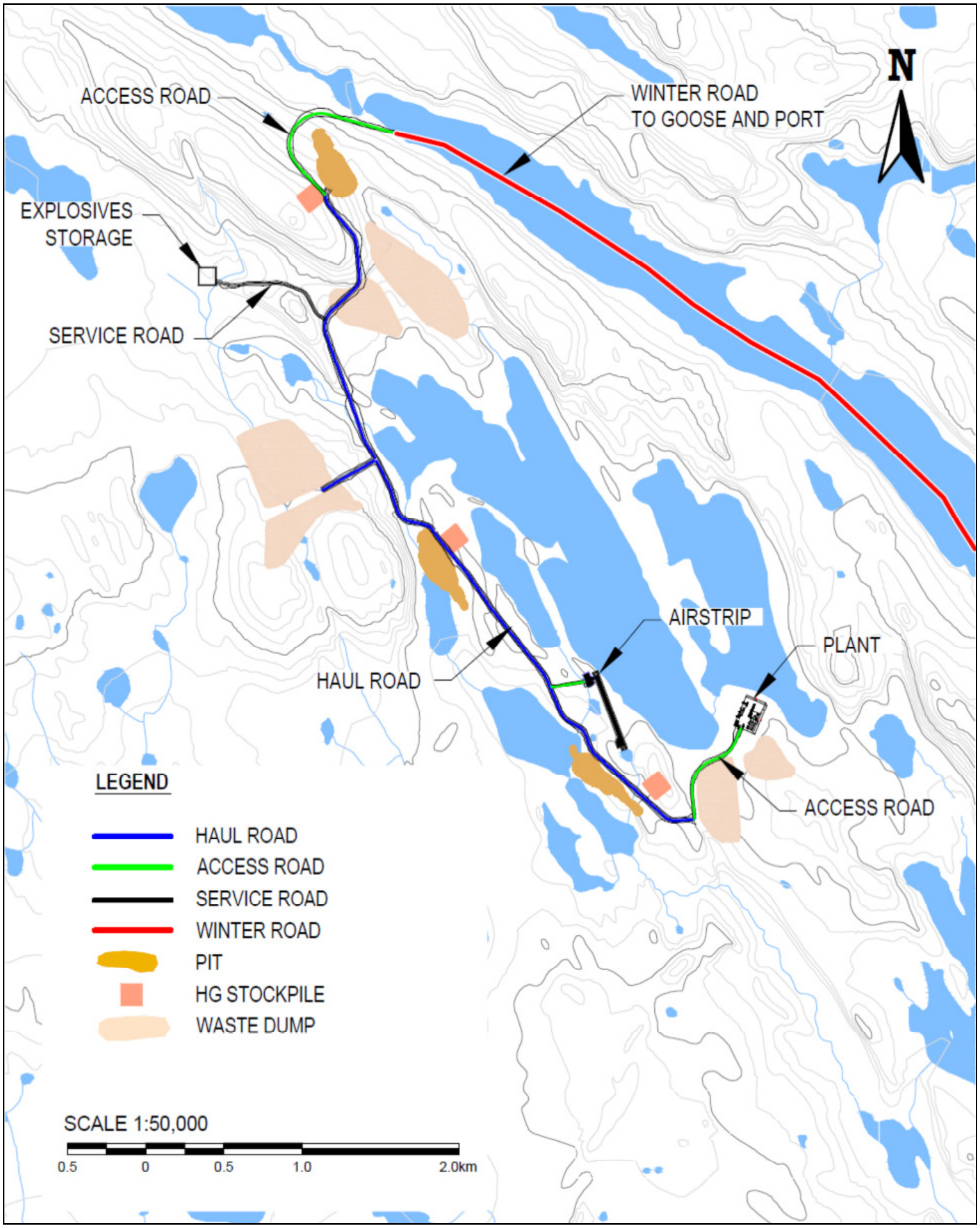

Figure 6-2. George Property General Arrangement

6.2.3 Goose Property

At the Goose site, there will be a laydown and storage area for up to 6,000 tonnes of inert AN, as well as an explosives storage area, explosive mixing plant and 50 magazines for 10 tonnes of packaged explosives and detonators, as per regulatory requirements (Figure 6-3). Explosives magazines for short-term use may be placed in proximity to the pits, subject to quantity/distance regulations, re-supplied from the explosives storage area.

In the underground operation, two underground bays are planned for the storage of explosive products. One bay will be designated for the storage of explosives; while the other bay will be designated for the storage of detonators.

6.3 SAFETY REQUIREMENTS

Each chemical component will be handled and used in accordance with information found within its respective material safety data sheet (MSDS). A MSDS is a source of health and safety information for workers and emergency personnel. Information found within the MSDS includes the following;

- Identification of the material.
- Hazard Information.
- Composition / Ingredients.
- First Aid Measures.
- Fire Fighting Measures.
- Accidental Release Measures.
- Handling and Storage.
- Exposure Controls / PPE.
- Physical and Chemical Properties.
- Stability and Reactivity.
- Toxicological Information.
- Ecological Information.
- Disposal Considerations.
- Transport Information.
- Regulatory Information.
- Other Information.

Material Safety Data Sheets (MSDS) will be available for all explosive products that are stored on site (Appendix A). This information will be available at various locations on the site such as the explosive storage areas and magazines. As an example, a summary of the minimum product safe handling measures is listed in Table 6-1. It must be emphasized that these are protection measures against the materials themselves. They are not a substitute for the safe handling and use of explosives.

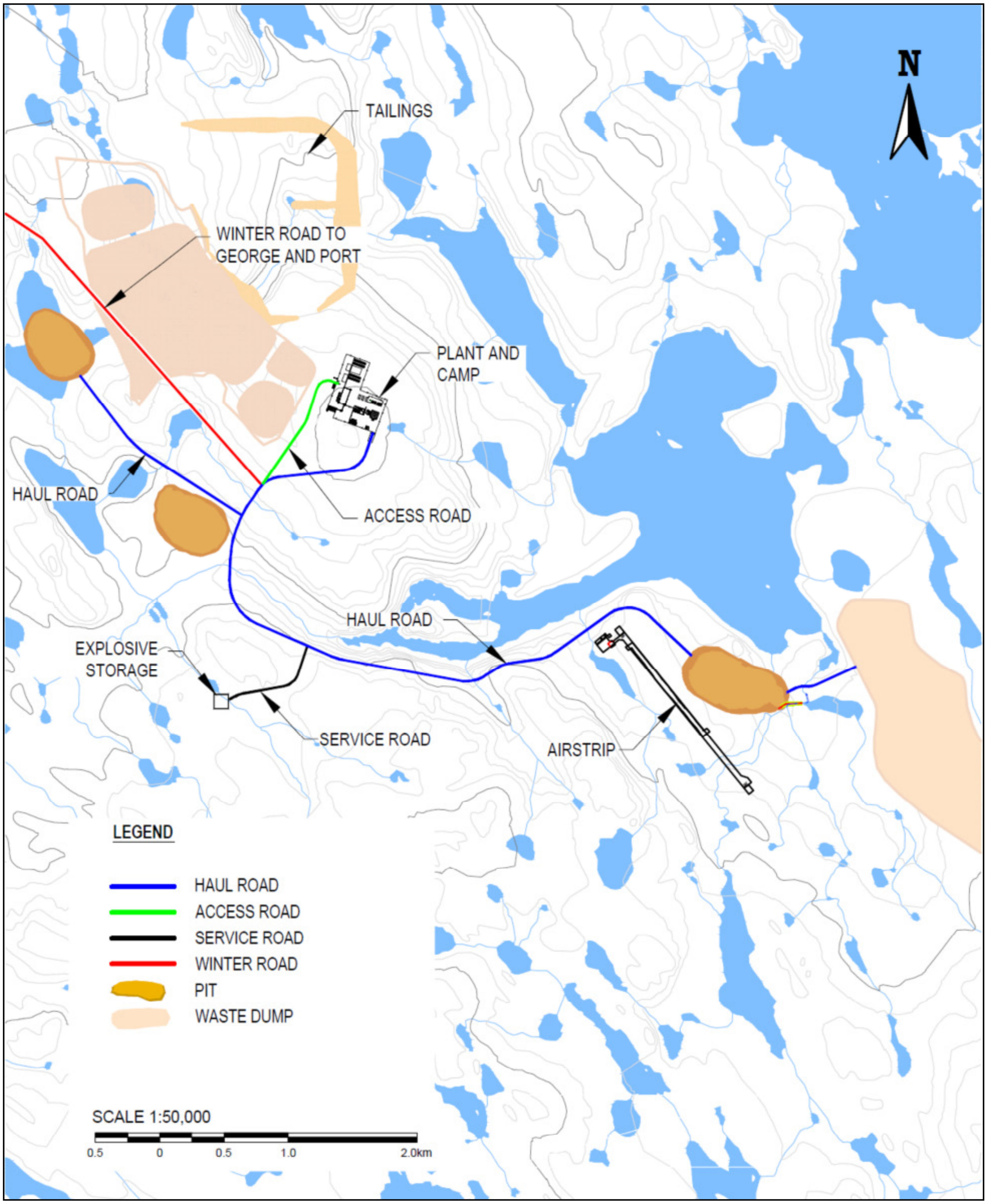

Figure 6-3. Goose Property General Arrangement

Table 6-1. Summary of Safe Handling Procedures for Ammonium Nitrate and Fuel Oil

Product	Handling Procedures
Ammonium Nitrate	• Protective clothing and impervious gloves must be worn during handling. • Do not ingest. • Do not smoke while handling. • Keep away from combustible or reducing agents. • Prevent dispersion of dust.
Fuel Oil	• Avoid contact with eyes, on skin or clothing. • Avoid breathing vapours, mist, fumes. • Do not ingest. • Wear protective equipment and/or garments if exposure conditions warrant. • Wash thoroughly after handling. • Launder contaminated clothing before reuse. • Use in areas with adequate ventilation. • Keep away from heat, sparks, and flames. • Store in a closed container in a well-ventilated area. • Bond and ground during transfer.

6.4 TRAINING AND CERTIFICATION REQUIREMENTS

Only trained and certified personnel will be assigned to work with and around explosives. All personnel working with explosives will undertake formal training, including on-the-job training to ensure compliance with legislation, or will show evidence of having done so. The training requirements may include but are not limited to:

- Specific fire procedures as per the federal *Explosives Act*.
- First Aid.
- Transportation of Dangerous Goods (TDG).
- Blasting Certificate.
- Workplace Hazardous Materials Information System (WHMIS).
- Additional site-specific procedures.

6.5 SET-UP AND USE REQUIREMENTS

Sabina, the explosives supplier and the shipping contractors will have or will develop detailed manuals for the transportation, storage, handling and use of explosives and will be responsible for explosives management including employee training, hazardous operations analysis, and quality control.

In addition to the annual resupply of bulk inert ANFO components, explosives may be delivered onsite by plane in addition to three annual resupply barges. Upon arrival of the explosives products onsite, the authorized mine blasting personnel will sign off to confirm their delivery. It is then the responsibility of the authorized mine blasting personnel to transport the explosives to the designated magazines immediately.

Prior to construction, Sabina will complete the following forms and submit them to the relevant authorities:

- Natural Resources Canada (NRC) Form 10 Magazine License Application (if it not a mine site, this federal form needs to be filled out).
- NRC Form 1 Application for Explosives Manufacture.
- NRC Form 4 Plant, Buildings and Equipment.
- NRC Form 5 Authorized Explosives Manufacture and Storage.
- NRC Form 6 Authorized Operations and Processes.
- NRC Form 7 Distances To Be Maintained Between the Buildings and Process Units of the Site(s) and Other Buildings and Works Outside the Site or Operations.

6.6 HANDLING REQUIREMENTS

The handling of explosives on site will be carried out by certified Sabina employees.

All explosives shall be handled according to the manufacturer's specifications. In addition to the manufacturer's specifications, all applicable WSCC regulations will be complied with.

6.6.1 Transport

During the construction and operation phase of the Project, explosives and inert materials (AN and FO) will be received in sea can containers during the annual sealift. During the operations period (Year 1 to Year 10) approximately 5,900 tonnes of ammonium nitrate will be received by the annual sealift.

The total consumption of ANFO at the Back River Project is estimated to be 34,989 tonnes (Table 6-2). Approximately 4,958 tonnes will be used during the construction phase and the remainder will be used during operations.

Table 6-2. ANFO Consumption Rates or Transfer Rates at the Back River Project

	Units	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Total
Goose Site	t	1,681	3,277	5,097	5,853	5,709	5,566	2,845	533	320	324	31,205
George Site	t	-	-	-	-	-	-	-	1,269	1,724	791	3,784
Storage/ Transfer	t	1,681	3,277	5,097	5,853	5,709	5,566	2,845	1,802	2,045	1,115	34,989

6.6.2 Storage

Inert ammonium nitrate will be stored separately from explosives. Explosives will be stored separately from detonators. Explosives and detonators will be stored in magazines of approved construction located with respect to Quantity/Distance regulations.

6.6.3 Blasting

Blasting will be required in the open pits and underground operations. Only trained and certified personnel will be assigned to work with and around explosives. Blasting, including preparation of blast sites before blasting and securing of blast sites after blasting, will be carried out in strict compliance with the applicable WSCC regulations.

6.6.4 Disposal

In the event that explosives become unusable or are surplus to requirements, they will be detonated in a safe location by certified blasting personnel.

Inert ammonium nitrate becoming unusable or surplus to requirements will be disposed of as hazardous waste.

6.7 SUPPLIER ERP

An Emergency Response Plan (ERP) will be prepared by the explosives supplier. The supplier ERP will should include but will not limited to potential incidents involving manufacturing, transport, handling and storage of explosives and related products. At minimum, it will outline actions that supplier's and Sabina's employees must take to ensure employee and public safety in the event of an emergency.

The following worse case scenarios should be addressed relative to explosives in this ERP:

- Fire/explosion.
- Spills from product transport trucks.
- Spills from raw material from delivery.
- Shut down due to weather, floods, lightning, fires, explosions and other threats to the security and operation of supplier's facilities, equipment and material.
- Bomb threats.
- Quantities of spills and reportable to the supplier and authorities.

The supplier's ERP will be provided in an appendix in future versions of this ExMP.

6.8 SPILLS

All spills will be reported and recorded as described in Sabina's Spill Contingency Plan. Further information regarding hazardous materials and spill management are provided in Sabina's Hazardous Materials Management Plan and Spill Contingency Plan.

6.9 SECURITY

Explosives on site are at risk of theft, unexplained loss, possible sabotage, and unauthorized access. To reduce these risks, Sabina will have procedures in place to control access and document the movement of explosives.

During construction, all storage containers will be locked, and a secondary lock will be used for entrances to explosive storage areas and magazines.

Warning signs such as 'Authorized Access Only' will be posted around these areas and security precautions such as alarms, patrols, and extra lighting will be used. Access keys will only be given to designated responsible employees; Sabina will keep a list of employees who have a key. Documentation will reconcile incoming and outgoing quantities of explosives. In underground magazines, access to the bays will be controlled with a bulkhead and man-door. The documentation will also track the authority of employees to remove and receive explosives. Further details on these procedures will be included in subsequent updates of the Explosives Management Plan.

Security incidents will be reported to the Safety Superintendent. If the incident cannot be resolved internally, the Safety Superintendent will report any unexplained loss, theft, attempted theft, or any other security incident to the authorities.

7. Environmental Protection Measures

Environmental protection measures include the applicable water and air quality guidelines (e.g., MMER and CCME) and guidelines such as DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (DFO 1998). Monitoring Program

Blast areas must be cleared of smoke, dust and gases before anyone is permitted to re-enter them. A designated employee will be assigned to monitor the air quality, at each working location, to ensure appropriate air quality is met. This information will be collected for each shift, on a daily basis, as per Health and Safety Regulations. The records of daily monitoring will be submitted to the site Safety Supervisor.

8. Mitigation and Adaptive Management

Mitigation measures for Project activities will be applied to all phase of the project (Table 8-1).

Table 8-1. Mitigation and Adaptive Management Measures

Topic / Activity	Phase	Mitigation Measures
Transport	Construction Operation Closure	• The supplier will provide AN, explosives magazines, mixing equipment and delivery trucks; the mine operator shall provide FO. • Certified and authorized Sabina employees will l mix AN with FO at the on-site explosives plant. • All explosives will be transported to site in dedicated containers. • Explosives shall not be allowed to be stored in vehicles. • Only qualified personnel holding valid blasting certificates shall handle these materials. • At mine closure, all unused explosives will be removed from site or safely burned or detonated if the quantities are small. • Spills will be contained and placed in suitable containers for use or disposal. All spills will be reported to the spill response coordinator.
Storage	Construction Operation Closure	• All explosives will be deployed only at safe distances from facilities or personnel. • Explosives will be stored in a designated location within the explosives storage area and away from the explosive caps / detonator storage magazines. • The magazines will be dedicated to storing high energy explosives and blasting caps. • Explosives will be handled and managed only by suitably qualified employees trained in safe handling procedures and applicable legislation and regulations. • Mine personnel involved in explosives spill response will have explosives training.

(continued)

Table 8-1. Mitigation and Adaptive Management Measures (completed)

Topic / Activity	Phase	Mitigation Measures
Storage *(cont'd)*	Construction Operation Closure *(cont'd)*	• Only qualified personnel holding valid blasting certificates will handle these materials. • Inventory will be used on a first-in, first-out basis to ensure quality control and prevent degradation due to cold weather storage. • Explosives stored in magazines will be clearly labelled. • Spills shall be contained and placed in suitable containers for use or disposal. All spills will be reported to a spill response coordinator. • Perimeter fences and security lights will surround the explosives plant. • Access to the explosives plant is restricted to authorized personnel and log books shall be kept in each magazine for tracking purposes.
Blasting	Construction Operation	• Only certified and authorized mine employees will charge the holes, place the detonators and boosters, and tie-in the patterns. • All Blasting will follow applicable legislation such as DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (DFO 1998). • The Air Quality Monitoring and Management Plan will be followed to reduce or eliminate impacts from air. • Spills shall be contained and placed in suitable containers for use or disposal. All spills will be reported to a spill response coordinator. • The mine shall record daily use of explosives. Records will be checked and reconciled on a regular basis. • Explosives identified as deteriorated or damaged will be destroyed; the supplier shall be consulted on the appropriate handling and disposal. • All mine water will be treated prior to release into the environment.
Disposal	Construction Operation Closure	• All explosives will be removed from site at closure or temporary closure. • All explosives will be disposed of according to the MSDS or manufacture. • Spills will be contained and placed in suitable containers for use or disposal. All spills will be reported to the spill response coordinator.

9. Checking and Corrective Action

9.1 INTERNAL INSPECTIONS AND AUDITS

Internal audits and inspections will be conducted as required by the regulations on all components related to the ExMP. Inspections will be completed by qualified personnel on a regular basis for physical condition and serviceability, and the results recorded according to quality and safety standard operating procedures. In addition, qualified personnel will perform regular inspections of the storage area, such as sea cans, storage of the boosters, caps and explosives to ensure that inventory is documented.

Inspections will be required for and reported for:

- Inspection of all magazines.
- Transportation containers.
- Equipment.
- Broken or contaminated bags.

9.2 EXTERNAL INSPECTIONS AND AUDITS

On occasion external inspections and audits may be required by regulatory authorities. All recommendations and orders made by Natural Resources Canada (NRC) Explosives Branch Inspectors, Fire Marshals and Insurance Inspectors will be responded to and acted upon accordingly.

10. Record Keeping

Record keeping and inspections is an import way to document the effectiveness of this ExMP, as well as being mandatory by Sabina. Four forms of record keeping for include: explosives use tracking; monitoring records; inspections and audits; and incident reporting.

10.1 EXPLOSIVE USE TRACKING

Documentation will reconcile incoming and outgoing quantities of explosives. The documentation will also track the authority of employees to remove and receive explosives. Further details on these procedures will be included in subsequent updates of the Explosives Management Plan.

10.2 MONITORING RECORDS

Records of the air quality at each of the blasting working location, during each shift, will be submitted to the Safety Supervisor on a daily basis.

10.3 INSPECTIONS AND AUDITS

Copies of all internal and external inspections and audits will be stored on site for review during annual EMP reviews.

10.4 EXPLOSIVE INCIDENTS

All explosives-related incidents will be reported to the Safety Superintendent. If the incident cannot be resolved internally, the Safety Superintendent will report any unexplained loss, theft, attempted theft, or any other security incident to authorities.

If an explosives incident were to occur, an explosive incident report will be completed as required. Form 34 Federal Explosives Incident Report can be found at: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca.minerals-metals/files/pdf/mms-smm/expl-expl/pdf/fm34-eng.pdf.

11. Environmental Reporting

Any spills or releases of explosives material or diesel fuel will be reported as part of this plan and will follow the incident response procedures of Sabina’s Spill Contingency Plan and the Fuel Management Plan. All information about the spill or release will be documented according to the requirements of Spill Contingency Plan and the Fuel Management Plan.

12. Plan Effectiveness

The ExMP will be reviewed and updated at least annually. As part of the review, associated documents reporting use logs, and spill records will be incorporated into the annual review. Completion of the annual review of the ExMP will be documented through signatures of the personnel responsible for reviewing, updating and approving the ExMP.

A record will document all significant changes that have been incorporated in the ExMP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

References

Explosives Act (Canada)

Explosive Regulations and the Industry: Tables of Quantity Distances (QD) http://www.nrcan.gc.ca/minerals-metals/explosives/3045

Fisheries and Oceans Canada (DFO). 1998. Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters.

NWT Mine Health and Safety Act and Regulations (NWT MHSAR), specifically Part XIV http://www.canlii.org/en/nt/laws/regu/nwt-reg-125-95/latest/nwt-reg-125-95.html

Transportation of Dangerous Goods (TDG)

Workplace Hazardous Materials Information System (WHMIS)

Appendix A
Material Safety Data Sheets (MSDS)

MSDS sheets will be provided in future iterations of the Plan

14. Road Management Plan

BACK RIVER PROJECT
Road Management Plan

December 2013

REVISION E.1

Preface

General Information

Sabina Gold & Silver Corp. (Sabina) is actively exploring the Back River property mineral rights (encompassing the primary exploration camp at Goose Lake, as well as a satellite camp at George Lake and unoccupied claim groups at Boot Lake, Boulder Pond, Wishbone and Del Lake.

The Road Management Plan will be executed within the scope of normal operations.

Annual Review

The Road Management Plan will be reviewed and updated at least annually. Completion of the annual review of the Road Management Plan will be documented through signatures of the personnel responsible for reviewing, updating and approving the Road Management Plan.

Record of Changes and Revisions to Plan

A record will document all significant changes that have been incorporated in the Road Management Plan subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Distribution List

Sabina will maintain a distribution list for the Road Management Plan providing information about all parties that receive the plan including personnel, departments, and outside agencies.

BACK RIVER PROJECT
ROAD MANAGEMENT PLAN

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Appendix A. Applicable Legislation

1. Introduction

Winter roads, all-weather service and haul roads are needed in the operation of the Back River Project. All Project roads will be private for the exclusive use of Sabina's operations. The road network required by the Project is presented on the following Figures:

- Figure 1-1: Back River Project Road Network.
- Figure 1-2: Site Layout for Marine Laydown Area.
- Figure 1-3: Site Layout – Goose Property.
- Figure 1-4: Site Layout – George Property.

1.1 ALL-WEATHER ROADS

The two main sites of the Back River Project will contain all-weather services roads. The Goose site will have 8 km of haul roads and 2 km of service/access roads. The George site will have 6 km of haul roads and 3 km of service/access roads.

1.2 WINTER ROADS

Two winter roads will be constructed for the Back River Project. The winter road between the port and the Goose site will be approximately 160 km long, travelling over 50% land and 50% water. The George site will connect to this road by a winter spur road approximately 20 km in length.

1.2.1 Public Use of Winter Road Corridors

Sabina acknowledges that once the winter roads are constructed, local hunters may use these roads for ease of access to hunting grounds inland. While Sabina's community communication effort will emphasize the safety aspects of using these winter roads, the Company cannot prevent local inhabitants from using the corridor. Non-Project individuals will use the winter roads at their own risks.

1.2.2 Expected Traffic on Winter Roads

These winter roads will be used for the duration of the Project Life. It is expected that vehicle traffic will begin in January to end of April annually. The expected number of vehicles on each road is presented in Table 1.2-1.

Table 1.2-1. Expected Annual Vehicle* Traffic on Winter Roads

	Construction	Operation	
	Cargo/Freight/Fuel	Cargo/Freight/Fuel	Ore Trucks
Goose-George Winter Road	Not applicable	Included below	40 to 50 trucks making two return trips per day (up to 15000 transits)
Goose/George to MLA	40 to 50 trucks making two return trips per day (up to 15000 transits**)	40 to 50 trucks making two return trips per day (up to 15000 transits)	Not applicable

**includes trips by 80 to 95 t trucks moving cargo, freight and fuel over a 75 day trucking window; this does not include any personnel movement, equipment movement or public use of the winter road*
***a transit is an individual truck passing if you were to stand at one point*

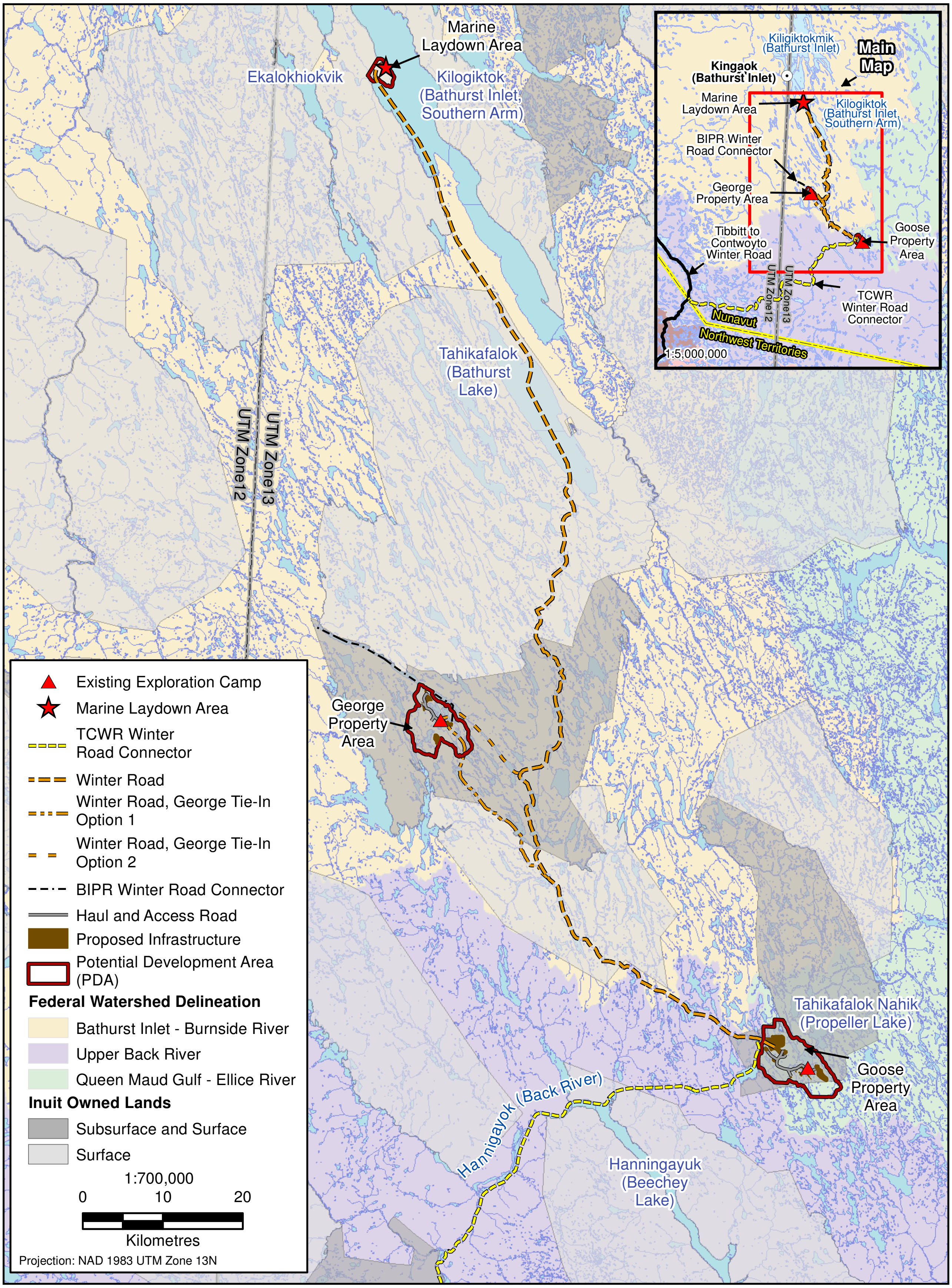


Figure 1-1

Back River Project Road Network

Sabina GOLD & SILVER CORP.

Rescan an ERM company

PROJECT # 0194096-0001 GIS # BAC-15-084b VERSION # T2.1 November 01 2013

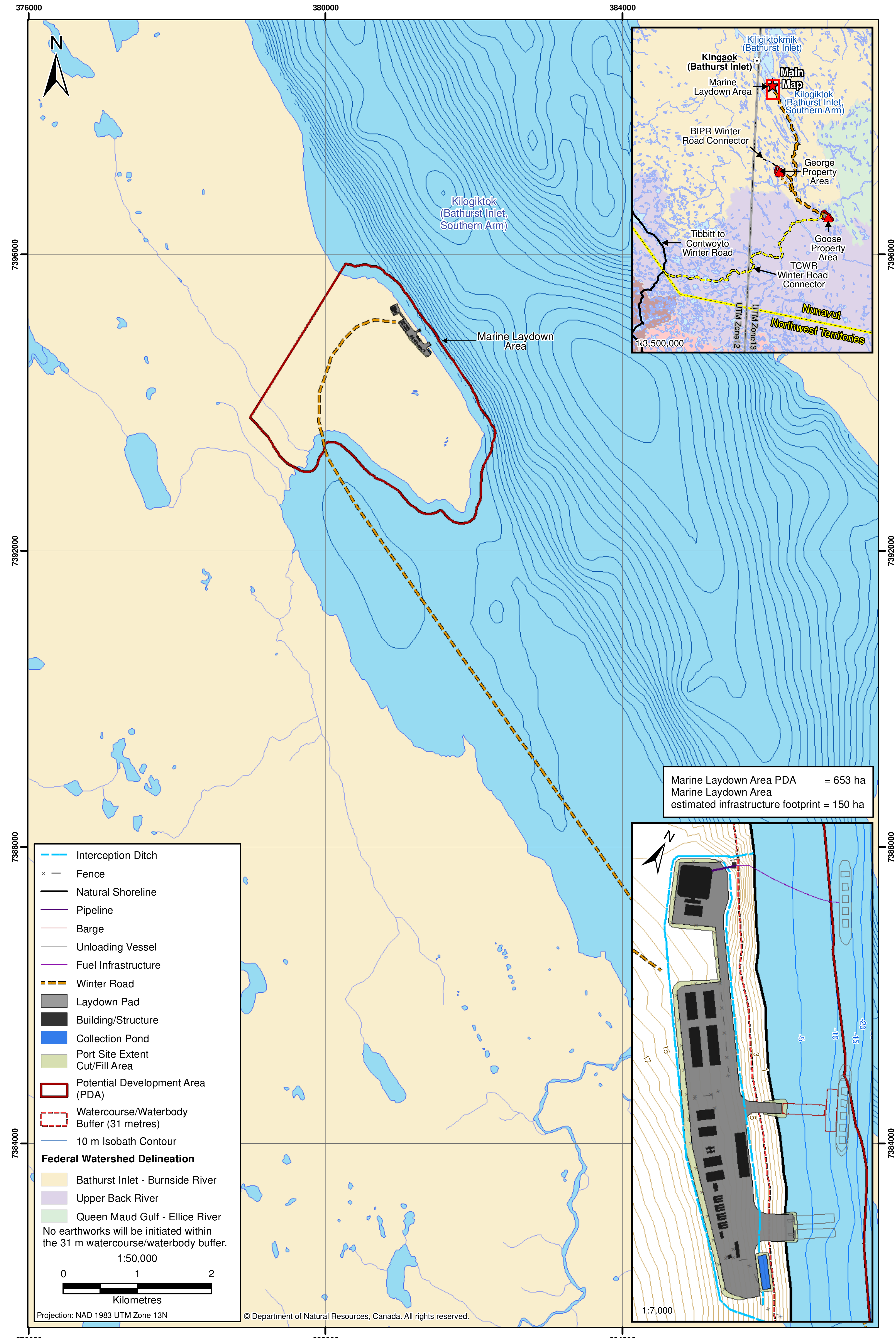
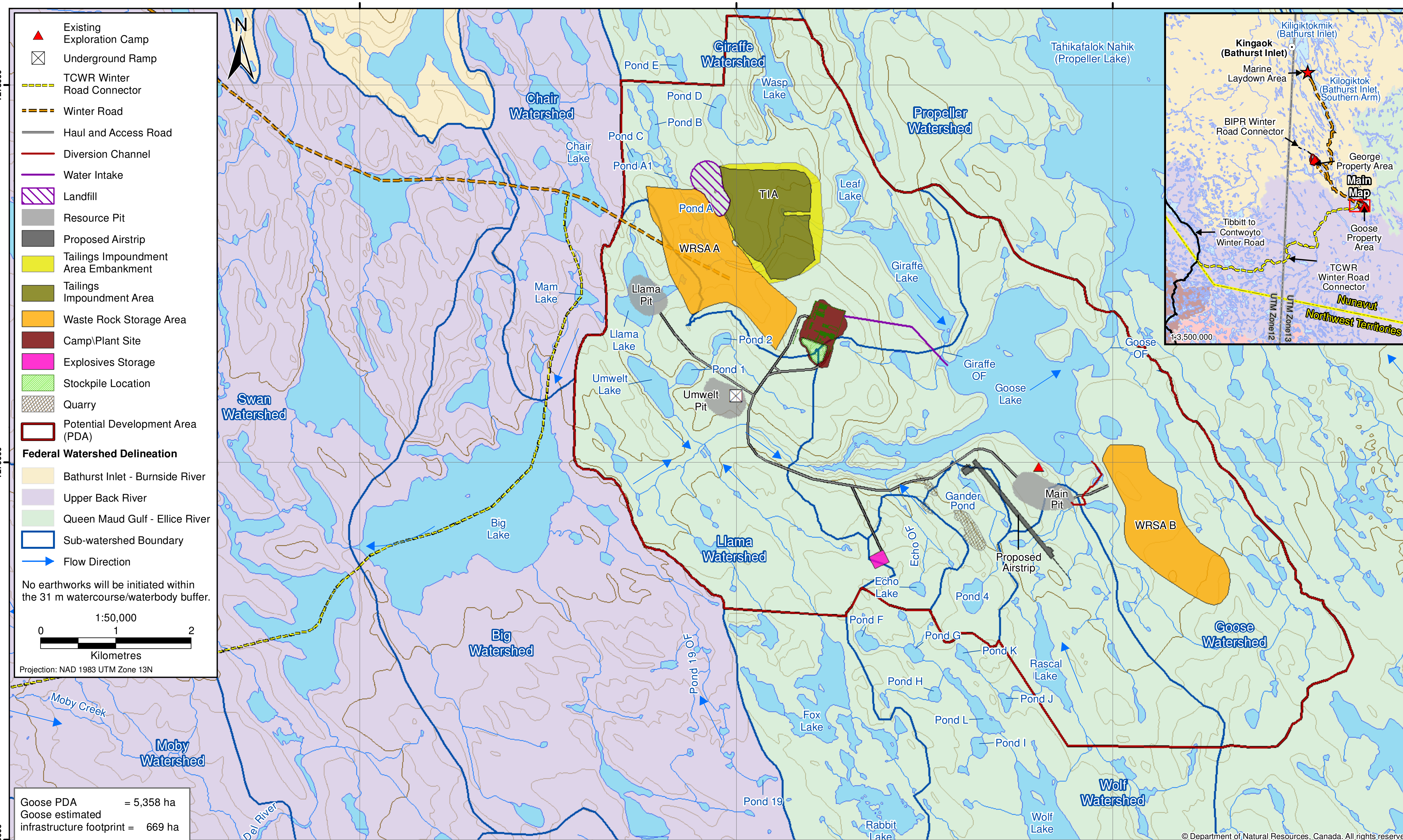


Figure 1-2

Sabina GOLD & SILVER CORP.

Project Development Area and Infrastructure Areas - Marine Laydown Area

Rescan an ERM company



Sabina GOLD & SILVER CORP.
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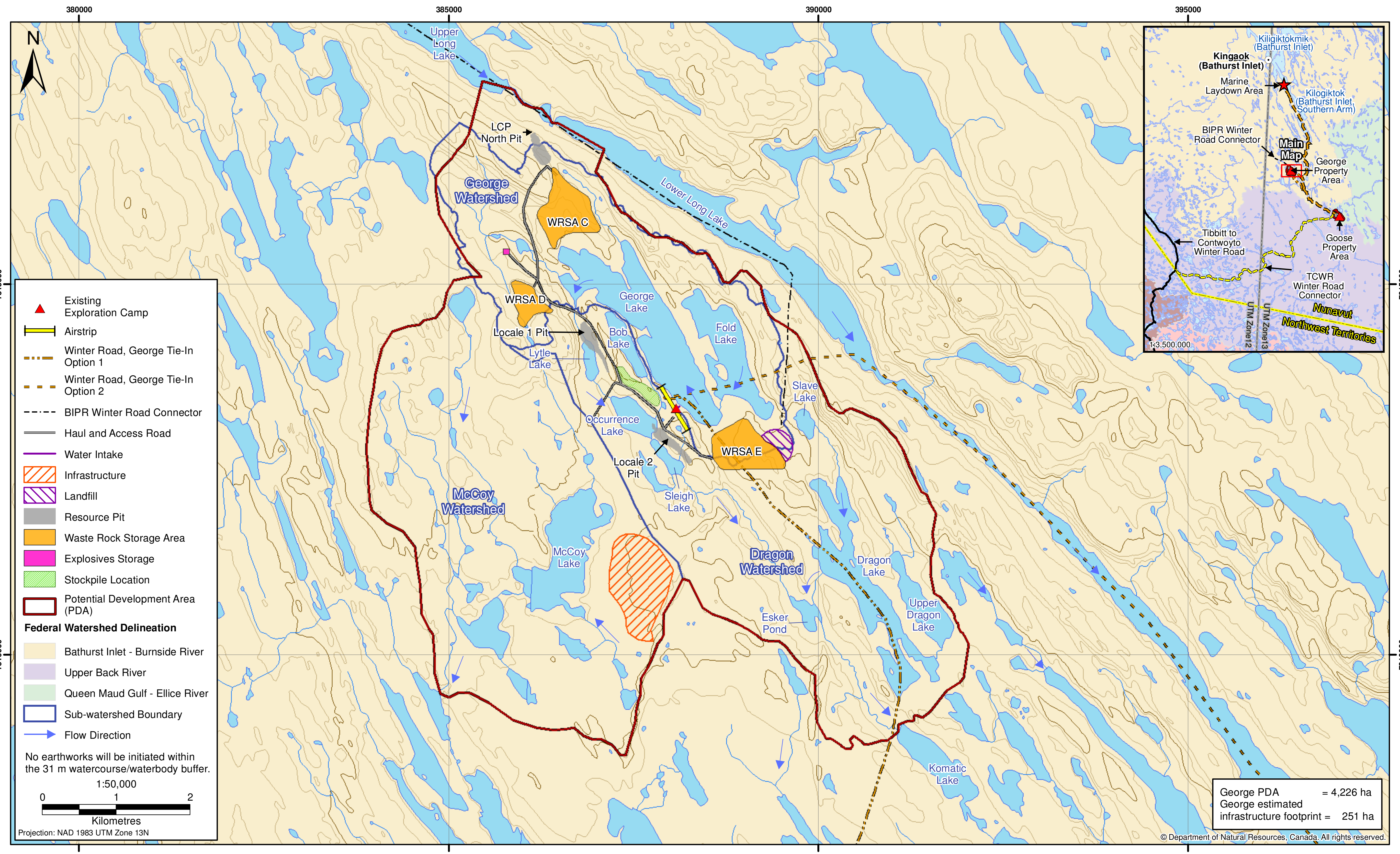
Figure 1-3

Project Development Area and Infrastructure Areas - Goose Property



Sabina Gold & Silver Corp.
Rescan an ERM company

Figure 1-4

Project Development Area and Infrastructure Areas - George Property

1.3 RELATED MANAGEMENT PLANS

The construction, upgrade, and maintenance of roads can affect site water quality and fish habitat. Therefore, this plan must be viewed in concert with:

- Environmental Protection Plan.
- Site Water Management and Monitoring Plan.
- Borrow Pit and Quarry Management Plan.
- Mine Closure and Reclamation Plan.
- Aquatic Effects Monitoring Plan.
- Emergency Response Plan.
- Spill Contingency Plan.
- Air Quality Management Plan.
- Wildlife Management Plan.

2. Targeted VECs and VSECs

The targeted valued ecosystem components (VECs) and valued socio-economic components (VSECs) are:

- Water quality.
- Fish habitat.
- Terrestrial wildlife.
- Health and safety of employees.
- Cultural resources and heritage.

In addition to the VECs and VSECs, this plan considers occasional use of the roads by residents of the neighbouring communities.

3. Scope and Objectives

This Road Management Plan has been written to meet requirements under the NWB Review Process and applies to all Sabina projects in the Kitikmeot region. Subject to annual internal review and revision, it will remain applicable throughout the duration of the Project.

This Road Management Plan outlines construction, operation and management of access and transportation for the Back River Project including construction, operation and closure of an all-weather airstrip, connecting winter roads and associated rock quarries.

This Plan provides construction and operating maintenance methods and best management practices that will be used for the Back River Project. The purpose of this Plan is to ensure sound management of water and waste deposited to water to minimize the impacts to the local environment during construction, operation and closure of the transportation corridors.

Implementing best management practices and working responsibly will ensure the protection of the environment and personnel safety. The goal of any management plan is to reduce and prevent impacts to the environment while ensuring personnel safety and appropriate fiscal considerations during mineral exploration activities.

4. Planning and Implementation

4.1 WINTER ROAD INFRASTRUCTURE

Environmental conditions determine the route selected for winter road corridors including:

- Ice of a sufficient thickness to support equipment so that pumping and using water to build up ice will be unnecessary.
- Snow/ice thickness will be a minimum of 15 cm on land to prevent damage to soil and vegetation.
- Weather conditions permit safe transport of equipment and materials.

The “Field Guide for Ice Road Construction Safety” published by the Department of Transportation of the Northwest Territories (2007) will guide the planning and construction of the winter roads.

The winter road will be constructed yearly in December and January. The road will be open to traffic from late January to the end of April. The roads will be designed to be capable of carrying legal highway loads.

The winter road between the Goose and George sites will also be used to convey ore in B-trains from the George site to the plant at the Goose site. All-season roads will be constructed at the Goose and George sites. The all-season roads will consist of haul roads, and service and access roads. The all-season roads will allow the Goose and George sites to operate year-round. The roads will be designed to protect the permafrost regime.

The effective use and duration of a winter road depends on a number of variables, the most important of which are the climatic conditions (air temperatures and snowfall), surface conditions, and the amount and type of traffic that will be using it.

The winter roads will be constructed over land and over ice. Overland crossings rely on a frozen subgrade to support the vehicle loads and a prepared surface layer to provide a level driving surface. Surface layers usually consist of compacted snow and/or ice where available. Ice-capped snow roads will be constructed for highway legal loads (B-trains and Super B-trains). A discontinuous pad of granular fill may be required over rough terrain or where there is insufficient snow cover to create a smooth surface. If this is insufficient to provide an acceptable surface and gradient, additional grading effort may be required to create a road that meets the design criteria.

Roads that will be built over floating ice covers on lakes and rivers for B-trains and Super-B trains need to be built to a minimum 30 m cleared width. This width is necessary to provide a 5 m buffer along the edges to separate the vehicle traffic from the thinner ice found under snow banks. It also provides additional lane width when roads are blown with drifted snow. Snow banks need to be managed carefully as they are an additional load on the ice, and the thinner ice underneath is prone to cracking and flooding.

In high wind locations, it is often desirable to initially open the road to widths greater than the normal 30 m, which will provide space for the operational width to narrow throughout the season to a minimum width of 30 m. The final cleared width will be determined during the next stages of the Project.

4.1.1 Design Criteria for Winter Roads

The following design criteria were used for the winter roads:

1. Road width.
   - Land – 10 m.
   - Water – as required, typically 30 m depending on ice quality, length of season, amount of snow drifting, etc..
2. Maximum grade: 5%.
3. Design vehicle: Super B-train – legal highway load capacity.
4. Operating speeds on water.
   - Maximum vehicle speed for vehicles hauling at 100% of the load limit for the ice crossings: 25 km/h (e.g. a 100% loaded Super B-train on 1.05 m of ice).
   - Maximum vehicle speed for vehicles at 50% of the maximum load limit of the ice crossings: 35 km/h.
   - Maximum vehicle speed for hauling vehicles that meet another hauling vehicle going in opposite direction: 10 km/h.
   - Operating speeds on land: 25 to 55 km/h (depending on loaded/unloaded conditions and horizontal/vertical geometry.

4.1.2 Winter Road Construction

The winter road is anticipated to be constructed in early December when the subgrade is frozen to a sufficient depth and the ice can support light tracked vehicles. Construction of the winter road will take approximately two months utilizing two work fronts from the Goose camp and Bathurst Inlet.

Maintenance will be required over the operating season from late January to the end of April, with crews accommodated at the Bathurst and Goose camps.

The “Field Guide for Ice Road Construction Safety” published by the Department of Transportation of the Northwest Territories (2007) will guide the construction and maintenance requirements of the winter roads.

4.2 ALL-WEATHER ROAD INFRASTRUCTURE

The Goose and George sites will require all-season roads in order to operate year-round. The roads will be constructed in a permafrost environment. In non-permafrost areas, it is common for road designs to incorporate both cuts and fills to establish the final grade along the alignment. However, in permafrost areas, disturbing sensitive overburden soils and surface vegetation can result in thaw degradation and the creation of unstable ground. Consequently, the design for the Project calls for embankment construction only, wherever the road passes over overburden soils. The embankment material will come from rock quarry sources near to the existing road alignment.

The roads will cross a number of ephemeral streams. While the streams will be dry most of the year, there will be considerable flow during freshet. All culverts and bridges will be designed to handle a 1-in-50-year event. Surface gravel will be used on all service and access roads. Where there is combined haul and service traffic on a road, surfacing gravel will be used.

Due to site constraints, a portion of the haul roads at the Goose and George sites will share the road with service vehicles. These portions of the road will require strict traffic controls to ensure safe operating conditions.

4.2.1 Design Criteria for Haul Roads

The design criteria have been determined using the *Mine Health and Safety Act* (Northwest Territories and Nunavut), and the appropriate Transportation Association of Canada Geometric Guidelines. The following design criteria were used for the haul roads:

- Design speed: 50 km/h.
- Design vehicle: Cat 785D or equivalent.
- Minimum width of travelling surface: 21 m.
- Maximum super-elevation: 4%.
- Side slopes: 3:1.
- Maximum grade: 10% for short lengths, 6% normal.
- Minimum horizontal curve radius: 100 m.
- Safety berms for fills: greater than 3 m in height.
- Drainage: major culverts and bridges to be designed to a 1-in-50-year return period.

4.2.2 Design Criteria for Service Roads

Service roads are used for smaller vehicles (i.e. light trucks) to access ancillary infrastructure such as water supply sources, the air terminal building (ATB), airstrip, and explosives supply sites. The following design criteria were used for the service roads:

- Design speed: 50 km/h.
- Design vehicle: light/medium truck.
- Minimum width of travelling surface: 6 m.
- Side slopes: 3:1.
- Maximum super-elevation: 4%.
- Maximum grade: 10% for short lengths, 6% normal.
- Minimum horizontal curve radius: 100 m.
- Safety berms: where required.
- Drainage: major culvert/bridges to be designed to a 1-in-50-year return period.

4.2.3 Design Criteria for Access Roads

Access roads are used to accommodate off-site traffic supplying the site with materials and supplies. In this case, there is very limited all-season access, as most of the access road from the port is a winter road, and only the immediate portion of the road around the Goose plant site is all-season. The following design criteria were used for the access roads:

- Design speed: 50 km/h.
- Fesign vehicle: B-train.
- Minimum width of travelling surface: 10 m.
- Maximum super-elevation: 4%.
- Side slopes: 3:1.
- Maximum grade: 10% for short lengths, 6% normal.
- Minimum horizontal curve radius: 100 m.
- Safety berms: where required.
- Drainage: major culvert/bridges to be designed to a 1-in-50-year return period.

4.2.4 Construction of All-weather Roads

Disposal of excavated material will be in a location above the high water mark to ensure that this material does not enter the watercourse. Efforts shall be made to minimize the duration of any instream works and minimize disturbance at stream crossings. This will enable crews to prevent the release of sediment or sediment laden water into water frequented by fish. Exposed landscape surfaces will be protected, where possible, by the installation of covering material like riprap, aggregate, or rolled erosion control products.

Sediment loading in runoff will be minimized by the application of measures to intercept TSS before it reaches the freshwater environment. Sediment control measures will include:

- Buffer zones to trap sediment and to reduce flow velocities.
- Installation of synthetic permeable barriers, fibre rolls, and/or silt fences as required.
- Installation of check dams, gabions, and sediment basins to reduce flow velocities and encourage sediment deposition.
- Stockpiles will be located well away from watercourses.

4.3 AIRSTRIP

The proposed all-weather airstrip and connecting road will be privately-owned infrastructure, built entirely on Inuit-Owned Lands currently permitted by Sabina from the Kitikmeot Inuit Association (KIA). The airstrip and road will be constructed, inspected, and maintained by Sabina to support activity at the Back River Project.

The design of the airstrip is in accordance with Transport Canada's Aerodrome Standards and Recommended Practices (Transport Canada, 2005). The construction of the road follows generally accepted good engineering practices for building roads in permafrost areas of the Northwest Territories and Nunavut.

Environmental considerations are incorporated into design and routing. Wind direction and speeds, in addition to existing terrain and ground conditions, determine the optimal airstrip orientation. Road alignment, connecting the airstrip to the camp and airstrip to the quarries, considered the existing terrain and topography to determine the optimal route for equipment movement. The design aimed to minimize the project footprint. Additional fieldwork determined that the airstrip and road alignments did not include any archaeological sites or vegetation/wildlife species under the “Species at Risk” Act.

Establishing fish and fish habitat included water quality and quantity, fish population and fish habitat studies. These data have been incorporated to determine the optimal alignment for the airstrip and road and the associated water crossings.

5. Applicable Legislation and Guidelines

5.1 LAND TENURE

The larger part of all proposed access, service and haul roads are to be located on Inuit Owned Lands (IOL) administered by the Kitikmeot Inuit Association (KIA). The surface ownership of the land encompassing the roads right-of-ways was transferred to the KIA when the Nunavut Land Claims Agreement (NLCA) came into effect. Land and environmental management in this area are generally governed by the provisions of the NLCA.

5.2 PERMITTING REGIME

Federal, territorial and municipal laws and regulations that apply to the construction, operation and closure of all access, service and haul roads are itemized in Appendix A.

Table 5.2-1 outlines the current licences and permits held by Sabina in relation to the Exploration Phase of the Project.

Table 5.2-1. Current Authorizations and Permits (as of July 31, 2013)

Permit No.	Permit Name	Type	Expiry	Agency	Description
N33221	Prospector permit		2014-03-31	AANDC	
N2011F0029	Winter road Beechy Area	Class A	2013-12-13	AANDC	
N2010F0017	Winter road Bathurst Inlet to Back River	Class A	2013-09-16	AANDC	Winter Road
N2009F0015	Winter road Hackett to George	Class A	2014-02-28	AANDC	winter road connecting Hackett and George Camps
KTL304F049 – Amended	Winter road Bathurst Inlet to Goose Lake and George Lake	Level 3	2013-12-13	KIA	Winter Road
KTL304F012	Winter road Hackett to George	Level 3	2013-12-13	KIA	winter road connecting Hackett and George Camps
N2010C0016	Back River Mineral Exploration	Class A	2013-10-31	AANDC	

(continued)

Table 5.2-1. Current Authorizations and Permits (as of July 31, 2013; completed)

Permit No.	Permit Name	Type	Expiry	Agency	Description
KTL304C017 – Amended	Goose Camp	Level 3	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road, allweather airstrip and connecting road
KTL204C012 – Amended	Boulder	Level 2	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), geophysical survey, gridding and drilling
KTL304C018 – Amended	George Camp	Level 3	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road
KTL204C020 – Amended	Boot	Level 2	2013-12-13	KIA	Exploration (air/ground geophysics), staking, prospecting, fly/survival camp and drilling
2BE-GEO1015	George Water	Type B	2015-06-15	NWB	Water use and waste disposal for exploration and clean-up activities
2BE-GOO1015	Goose Water	Type B	2015-03-31	NWB	Industrial water use and waste disposal, bulk sample and exploration
N2012C0003	Wishbone - Malley exploration activities on crown land	Class A	2014-02-06	AAND	Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road
KTL312C004	Wishbone - Malley exploration activities on IOL	Level 3	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road
2BEMLL1217	Wishbone-Malley water	Type B	2017-03-26	NWB	Water use and waste disposal for exploration and clean-up activities

6. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager along with his/her direct reports is responsible for the implementation of this plan including safety, traffic management and maintenance

The Environmental Superintendent along with his/her direct reports are responsible for monitoring the effective implementation of this plan.

7. Inspection and Maintenance of Roads

Sabina has sole responsibility for the ongoing inspection and maintenance of all of the components of the airstrip and road, including the road bed, the airstrip foundation, the culverts, clear span bridges, and quarry sites. Sabina will have the Site Supervisor, or their designate, responsible for ongoing inspection and maintenance. The following is a summary of the procedures that will be applied.

7.1 ALL-WEATHER ROADS INSPECTION AND MAINTENANCE

Sabina recognizes that a good inspection program will lead to the early identification of areas of the airstrip and road where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the infrastructure.

The all-weather roads and its shoulders will be inspected regularly during the summer period for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment. Such movements are expected and may lead to longitudinal cracking and thaw settlement especially for portions of the road founded on thaw-susceptible (ice-rich) soil. When such areas are discovered, the affected area will be repaired using granular material and/or crushed rock. Sabina will maintain stockpiles of such material in the quarry area.

The roads and airstrip will be inspected for signs of accumulation of ponded water, either on the surface or along the sides. Where noticed, the Site Supervisor will evaluate and monitor the accumulation to determine why water is accumulating in these areas. Based on these evaluations, the site supervisor will take remedial action where and when necessary to correct the cause of such ponding, such as grading of the surface to remove areas of ponding or installation of additional culverts if the road is causing excessive water ponding.

These periodic inspections will include an inspection of the water crossings and a visual observation of the road surface to assess the status of the road foundation.

The all-weather road surfaces will be maintained with gravel being spread as required and regular grading of the road. Granular surfacing required for yearly maintenance of the all-weather roads will be sourced and stockpiled from local quarries. Refer to the Quarry Management Plan, as it develops, for each quarry site.

In fall, winter and spring, maintenance will be adjusted according to the weather conditions. Snow clearing along the roads will be done to ensure that the roads can be operated safely. The manner in which the snow is cleared will also take into account the road configuration to ensure that snow accumulation will not cause any problems during the freshet.

Inspection frequency will be increased during the following critical time periods:

- Just prior to spring freshet to ensure that the culverts and stream crossings are in good state to accommodate the rapid spring thaw.
- During the spring freshet to ensure that the culverts and stream crossings are not impeding spring freshet and to initiate action when and where required to prevent wash outs.
- Just after heavy rainfall events to monitor water accumulation, to ensure that culverts and diversion/collection channels and ponds are passing precipitation as planned and to initiate action when and where required to prevent erosion and wash outs.

7.1.1 Dust Suppression

The amount of dust generated along the road and airstrip is dependent on the dryness of the surface, the number of vehicles, weight and speed, and maintenance of the driving surface. Regular grading of the road and airstrip combined with the addition of granular material to the surface will be needed. This will improve road safety and also reduce dust. In areas or times identified by the site supervisor as being prone to high dust levels or areas where safe road visibility is impaired or in areas where dust deposition is impacting fish habitat and/or water quality, the site supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, placement of new coarser topping, and/or watering of the road surface. Use of chemical dust suppressants will be only used as a last resort and only in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment (January 2002), available online at the following web site: http://env.gov.nu.ca/sites/default/files/Guideline%20Dust%20Suppression.pdf.

All Sabina employees and contractors are instructed to report any road and airstrip maintenance problem or hazardous condition to Project Management. Regular scheduled safety meetings will incorporate discussion and reminders related to all-weather airstrip and road use, operation and maintenance.

7.1.2 Watercourse Crossings Inspection and Maintenance

The watercourse crossing inspection and maintenance program has these main components:

- A regular inspection program to identify issues relating to watercourse crossings such a structural integrity and hydraulic function.
- All necessary repairs and adjustments will be conducted in a timely manner.
- An event inspection program to track the impacts of large storm events on watercourse crossings, such as structural integrity and hydraulic function.
- A culvert location inspection program to ensure that culverts have been installed in the right location with respect to the watercourse and that culvert capacity is adequate to ensure that the culvert(s) pass the water under all hydraulic conditions.

In most cases there will be multiple culverts installed at different elevations at each stream crossing to ensure that these culverts can adequately pass both normal summer flows as well as spring freshet and heavy rainfall flows.

Visual monitoring will be conducted by the site foreman or environmental personnel on a regular basis to ensure drainage and erosion controls are effective per the following guidelines:

- Culvert maintenance will be conducted following the DFO Nunavut Operational Statement for Culvert Maintenance (Fisheries and Oceans Canada 2009).
- Instream work will be conducted during approved timing windows presented in the DFO Nunavut Operational Statement for Timing Windows (Fisheries and Oceans Canada 2009).

Winter road construction will follow the DFO Nunavut Operational Statement for Ice Bridges and Snow Fills (Fisheries and Oceans Canada 2009). Water withdrawal will follow DFO's Protocol for Winter Water Withdrawal from Ice covered Waterbodies in the Northwest Territories and Nunavut and DFO's Operational Statement on Mineral Exploration Activities (Fisheries and Oceans Canada 2009).

7.1.3 Regular Crossing Inspection and Maintenance

During the freshet period, crossings inspections will be performed (mid-May through June) during the remainder of the ice-free period prior to fall freeze-up (July through October). These activities for each watercourse crossing will consist of visual inspection to:

- Its infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts.
- Identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damage as soon as possible.
- Identify bed erosion or scour around the watercourse crossing of the upstream and downstream channel.

Particular attention will also be paid to potential sources of sediment transport at the crossing. Inspection results will be recorded to help track change in conditions over time. Maintenance operations will consist of undertaking remediation of any detected problems and repairing damage as soon as possible.

7.2 SNOW CLEARING

The Project is expected to experience snow drifts because of strong winds over winter. Routine spring snow management will include the removal of any snow that accumulates at culverts so that water at freshet can move freely through the culverts and waterway. In the case of culverts, snow is removed from both ends but not from the inside.

7.3 WINTER ROADS INSPECTION AND MAINTENANCE

The winter roads will be inspected and maintained in accordance with the Field Guide for Ice Construction Safety (Depart. Of Transportation, NWT(1), refer to section 3 of the field guide, “Ice Capacity and Testing”).

8. Traffic Management and Road Safety

Sabina’s traffic management and road safety regulations will be inspired from the Tibbit Contwoyto Winter Road Joint Venture, Winter Road Regulations and Rules of the Roads(2). This comprehensive document on winter road regulation will be developed once the Project is approved. This document will address:

- General Regulations for Use of the Winter Roads:
  - General regulations.
  - Enforcement.
  - Signage.
  - Dispatching.
- Rules of the Road:
  - Speed restrictions.
  - Truck and Convoy Spacing.

- Right of way.
- Portage traffic.
- Dangerous Driving and Unsafe practices.
- Interference with Security.
- Drug, Alcohol and Firearms.
- Littering and Refuse Disposal.
- Safety Restrictions and Equipment.
- Hours of Works / Log Book.
- Designated Refuge and rest Areas.
- Dispatching.
- Communications.
- Spills and Dangerous/Emergency Situations.
- Stopping on Lakes/Water Crossings.
- Wildlife.
- Reporting Wildlife.

Key concepts of the traffic and road safety plan are discussed below.

8.1 ROAD SAFETY AND COMMUNICATION

Sabina security personnel along with Sabina's road supervisor will monitor activity on all roads through radio contact with both staff and drivers on the roads, and through periodic patrols of the roads. All Sabina's vehicles that routinely travel on the roads will be equipped with a radio set to the requisite road frequency. Similarly contractor's vehicles that routinely travel on the roads will be equipped with a radio set to the requisite road frequency. Consequently, Sabina's traffic on the roads will always have radio contact.

This system will be used to report any unusual conditions along the roads such as:

- Location of other Sabina vehicles.
- Presence of wildlife on the roadway.
- Presence of non-Sabina traffic such as ATVs, snowmobiles or other vehicles.
- Non-Sabina vehicles broken down on the roads.
- Unsafe practices noticed.
- Special road conditions.
- Special weather conditions; etc.

Although the Project roads are private roads, preventing non Sabina personnel from using the winter roads will be challenging and Sabina expects that local hunters may occasionally use the winter roads. Sabina will work to develop partnerships with local communities, community organizations, and government departments in educating the non-Project related users on road safety, shaping good driving practices, and influencing people's behaviour on the roads. Emphasis will be directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc.

The safety rules that will apply to all users of the roads, including Sabina's employees, Sabina's contractor employees, and public users of the roads are as follows:

- Maximum speed limits.
- Use of seat belts by all drivers and passengers is mandatory.
- Driving under the influence of alcohol or intoxicating drugs is prohibited.
- Wildlife has right-of-way on the roads, and no harassment of wildlife is allowed.
- Hunting by non-Project personnel is not allowed within 1 km of mining areas and the Back River Project sites.
- No public traffic is allowed within mining areas; these are industrial work sites and, thus, non-Project related vehicles will be stopped and escorted to the camp. Signs will be posted.

Sabina will hold public information sessions in local communities prior to the roads opening and on a regular basis thereafter. A copy of the road safety rules will presented at these sessions.

Sabina will also use other communication tools to get the road access procedures and road safety rules out to the public. These will include community radio, community TV, and postings in local communities. Communications will be in both English and Inuktitut.

Sabina may place an emergency refuge station approximately every 50 km along the MLA –Goose winter road. The refuge will have the necessary safety supplies to allow stranded travelers to wait out an event such as a prolonged blizzard.

8.2 ROAD SIGNAGE

Sabina will post appropriate road signs along the roads in both English and Inuktitut. Typically, signs will advise drivers of the posted speed limit, of approaching bridges, of approaching curves, and/or areas of lower visibility (blind hills or obstructed curves).

Speed limit signs will be posted at intervals of approximately every 5 km along the roads. Reflective flags will be installed along one side of the roads to help drivers identify the road shoulder during blizzard, white out conditions or dense fog. Typically, these flags will be black in colour to help them stand out in white-out conditions, and are nominally set at intervals of 100 to 200 m apart. Kilometre markers will be posted at intervals of at least 1 km along the roads.

8.3 POLICING

Responsibility for all operating and maintenance activity on roads will rest solely with Sabina. Sabina will concentrate on raising public awareness and commitment to road safety, and improving communication, cooperation and collaboration among all stakeholders on the safe use of the roads. Sabina employees and its contractors who will use the roads will be required to take road safety training before being allowed to venture on the roads.

Sabina will use its road supervisor and site security to monitor what is occurring on the roads. They will monitor activity on the roads through radio contact with the staff at the gatehouse, through periodic patrols of the roads, and in conversation with drivers on the roads at the time. Sabina will monitor speed limit infractions by direct observation of drivers seen to be driving too fast. Sabina will also rely on radio contact with its employees and contractor vehicles on the roads to monitor unsafe conditions or activity.

The Company has no special policing powers. Sabina staff cannot issue tickets or use other methods to address unsafe operation. For non-Project personnel using the roads, Sabina can record unsafe practices, warn the person causing the infraction, and in severe or repeated cases of violation, request assistance from the RCMP in preventing access to the roads by an offending driver. It is worth noting that the Criminal Code of Canada applies to private roads. If an accident were to occur on a road and alcohol was involved, that person could be charged.

8.3.1 Emergency Response

As a private road the responsibility for response to any emergency or accident lies solely with Sabina. It will be Sabina personnel that respond and deal with any emergencies that occur on the road and airstrip. Sabina has people on site trained in emergency response (firefighting, first aid, spill response). Sabina does not anticipate that emergency response will result in any demand on local public service providers in Cambridge Bay (fire, police, ambulance, medical, maintenance).

In most circumstances the emergency response will be met by Sabina personnel. Sabina's emphasis will be on prevention with on-going awareness, training and on-going safety measures while at the same time keeping resources close at hand to respond to emergencies at the Project in a timely manner.

8.4 ACCIDENTS AND MALFUNCTIONS

Sabina's emphasis will be on prevention, while at the same time keeping resources close at hand to respond to emergencies on the roads in a timely manner.

Three possible causes of road emergencies are the road, vehicle, and people. It is the interplay of these three elements that lead to either safe use of the roads or emergency response. Sabina is fully responsible for the design, construction, and maintenance of the roads for project related use, and public use of the access roads. This will include regular inspection and maintenance of transportation infrastructure, including access roads, service roads, haul roads, road crossings, water crossings, signage and the refuge station located along the winter roads.

Sabina will ensure its vehicles are in good working order before they venture out on the roads. As well, Sabina will train its employees on road safety and emergency response (first aid, firefighting, spill response, etc.). By educating and protecting its workers, they will lead by example in road safety. However, Sabina can only influence the non-Project users in their choice of vehicle and behaviour on the access roads through education.

Some accidents and malfunctions may have an indirect effect on local fauna. For example, fish spawning success appears to be strongly affected by stream blockages. Thus, improper decommissioning of ice bridges and snow fills may cause stream channels to become blocked to fish during the spring migration, which could in turn lead to fish failing to spawn.

A Sabina trained emergency response and spill clean-up team will be available on site with appropriate equipment to respond to all spills and road accidents. The Emergency Response Team will be trained in emergency response (firefighting, first aid, mine rescue, spill response, vehicle accidents, etc.). In addition, emergency response equipment is to be carried in all Sabina vehicles. This equipment includes survival gear, emergency first aid equipment, and initial spill response equipment. Spill response will be implemented by environmental staff who will advise, document, and report on initial response and clean-up actions. The Spill Contingency Plan will be activated in responding to a spill.

8.4.1 Incident Response

Despite the preventative and mitigation measures taken, should any incident arise as a result of human error or unforeseen circumstances, the response procedures outlined in the *Spill Contingency Plan* will be implemented. The types of accidents and malfunctions that may occur are as follows:

- Vehicle collisions that may result in personal injury and spillage of potential harmful materials such as fuel, lubricating fluids, antifreeze, etc..
- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury and spillage of potentially harmful materials.
- Single vehicle accidents that may result in personal injury and spillage of potentially harmful materials.
- Risk of people getting stuck on the roads in bad weather such as in blizzard, white out or dense fog conditions, or due to mechanical breakdown.
- Risk of accident due to an intoxicated or impaired driver on the roads.
- Spills of harmful materials onto the land or into water through a vehicle rollover or tipping during bad weather.

Sabina will report all reportable scale incidents to the appropriate Government authority (e.g., Mines Inspector, RCMP, Nunavut Water Board (NWB), NU Spill Line, Environment Canada, GN Department of Environment, Fisheries and Oceans Canada (DFO), KIA and Hamlet of Cambridge Bay).

The following actions are to be taken in the event of an accident on the roads involving other vehicles (including ATVs), or in the event of an accident involving contact with wildlife such as caribou, muskox, bear, wolf, etc.:

- Check the condition of people involved in the accident and provide immediate first aid if appropriate.
- Call the Sabina road dispatch by radio and report the location and nature of the accident and indicate the type of assistance required (medical help, environmental cleanup, fire and/or mechanical help).
- Secure the accident site so that the vehicles do not continue to present a hazard to others. This may involve moving the vehicles to the nearest pull off in the event of a minor accident, or blocking off the road in both directions in the event of a more serious accident.
- If safe to do so, secure the site to prevent continued spill or leakage of contaminants into the surrounding environment.

Upon receiving the accident call, the road dispatch will initiate the emergency response procedure passing along the information to the emergency response coordinator. The emergency response coordinator will then call out the required emergency response personnel to assist at the accident site.

Once the accident site is secured and all people requiring assistance have been removed to medical care, the emergency coordinator will turn the scene over to the mine’s safety personnel so that an appropriate accident investigation can be initiated.

In the event of an incident involving contact with wildlife, the road dispatch will notify the site security personnel and the environmental representatives. Security and the site environmental team will then initiate an appropriate accident investigation. The Environmental Department will ensure that appropriate reporting of such incidents is made on a timely basis to the KIA, the HTO, and the GN Conservation Officer.

In the event of a serious accident, the RCMP will be contacted and advised of the incident. The RCMP will then decide on whether they will become involved or take the lead on any subsequent accident investigation.

9. Wildlife Protection Measures

Wildlife may occasionally be observed on or immediately along the side of the all-weather airstrip and connecting road. Caribou and other wildlife will have the right-of-way at all times. In case of problems (e.g. groups of caribou), the project management and environmental personnel on site will be manage the situation. The project personnel will be notified by radio if any wildlife is observed on the road according to current communication procedures.

The following protocol will be implemented on the road and airstrip for the protection of wildlife:

- Vehicular traffic speeds on the access road will be limited to 50 km/hr.
- It will be strictly forbidden for any individual to feed wildlife wile operating or travelling on the roads.
- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife. If possible, the wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and that they are not to land until it has been completed. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to the George airstrip or to return to Yellowknife at the pilot's discretion.
- Where small to moderate aggregations of caribou (i.e., 1-50 animals) are observed within 100 m of the road, travel speeds will be reduced to 30 km/hr.
- Where large aggregations of caribou (i.e., 50 or more) are observed within 100 m of the road, at the discretion of the site supervisor, vehicle movements may be suspended until the animals have moved away from the road.
- Caribou and all wildlife will be given right-of-way on the road. Vehicles must stop until the animals are off the road.
- Locations of large aggregations of animals must be reported to the site supervisor who will inform all potentially affected employees and the environmental representative.
- All incidents between vehicles and wildlife must be reported to the Project Management/Environmental Department whether they are:
  - Near-miss.
  - Collision with injury to the wildlife.
  - Accidental death.
- Each incident will be investigated by the site supervisor and environment personnel with measures taken to avoid reoccurrence. Disciplinary measures will be taken against any employee if the investigation concludes that the accident is the result of negligence.

- Road embankments are designed at a 3:1 gradient that will facilitate ungulate passage.
- In the case of the accidental death of an animal, environment personnel will contact the GN Conservation Officer, KIA Senior Lands Manager and the HTO office in Kugluktuk and Cambridge Bay. The carcass will be removed from the road and incinerated to avoid attracting scavengers such as Arctic Fox, Wolves, Grizzly Bear, and/or Wolverine.

10. Monitoring Program

10.1 WILDLIFE

Wildlife monitoring will be incorporated into current wildlife tracking according to the terms and conditions of current land use permits. This includes a log of sightings that detail wildlife observed, estimate of numbers and nearest kilometre marking along the road. The data will be aggregated and made available on-site during inspections.

11. Adaptive Management

The road management activities will be reviewed internally on an annual basis relative to the long-term exploration strategy for the Project and operational needs.

12. Reclamation

Reclamation of the access, service and haul roads will follow the completion of mining. Progressive reclamation will, in some instances, lead to roads being reclaimed after they are no longer needed. As described in the Mine Closure and Reclamation Plan, the access roads should be the last mining component to be reclaimed.

Decommissioning of the roads will be accomplished by removing all culverts, bridges, and other potential obstructions to drainages paths.

The road deactivation works will be carried out as necessary to stabilize any slopes where potential for slope erosion may exist. Stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened out slopes using non-acid generating material.

References

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Sabina, Draft Environmental Impact Statement for the Back River Project, January 10, 2014

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BIMC, Mary River Project Road Management Plan, May 2013

AEM, Meliadine Gold Project Road Management Plan (SD 2-9), March 2013

Appendix A
Applicable Legislation

Appendix A. Applicable Legislation

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)	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 Petroleum Hydrocarbons (PHC) in Soil
Canada Water Act (1985 c.11)		
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		(Eskimo Curlew – endangered)
Migratory Birds Convention Act (1994 c.22)	*Migratory Birds Regulations* (C.R.C., c. 1035)	
Fisheries Act (1985, c. F-14)	*Metal Mining Effluent Regulations* (SOR/2002-2222)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure - Clear Span Bridges
Explosives Act (1985 c.E-17)	*Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598) *Explosives Regulations* (C.R.C., c. 599)	
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232)	
Transport of Dangerous Goods Act (1992, c. 34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Territorial Lands Act (R.S. *1985, c. T-7)*	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c.10)		

Acts	Regulations	Guidelines
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c.29)		
Territorial		
Environmental Protection Act (RSNWT (nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's land Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Historical Resources Act RSNWT (Nu) 1988, c. H-3)		
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licences And Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground Caribou Areas Regulations* (NWT Reg (Nu) 099-98) *Wildlife Management Grizzly Bear Areas Regulations* (NWT Reg (Nu) 155-96) *Wildlife Management Zones Regulations* (RRNWT (Nu) 1990 c W-17) *Wildlife Regions Regulations* (NWT Reg (Nu) 108-98)	
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Scientists Act (RSNWT (Nu) 1988 c S-4)	*Scientists Act Administration Regulations* (NWT Reg (Nu) 174-96)	

Acts	Regulations	Guidelines
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Airport Lands Regulations* (NWT Reg (Nu) 067-97) *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)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	*Workers' Compensation General Regulations* (Nu Reg 017-2010)	
All-Terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	*All-Terrain Vehicles Regulations* (RRNWT (Nu) 1990 c A-1)	
Apprenticeship, Trade And Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	*Apprenticeship, Trade And Occupations Certification Regulations* (RRNWT (Nu) 1990 c A-8)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	*Electrical Protection Regulations* (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance And Health And Social Services Administration Act (RSNWT 1988, c T-3)	*Territorial Hospital Insurance Services Regulations* (RRNWT (Nu) 1990 c T-12)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	*Various*	
Motor Vehicles Act (RSNWT (Nu) 1988, c M-16)	*Large Vehicle Control Regulations* (RRNWT (Nu) 1990 c M-30) *Motor Vehicle Registration And Licence Plate Regulations* (RWT Reg (Nu) 054-94)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	*Petroleum Products Tax Regulations* (RRNWT (Nu) 1990 c P-3)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	*Camp Sanitation Regulations* (RRNWT (Nu) 1990 c P-12) *General Sanitation Regulations* (RRNWT (Nu) 1990 c P-16)	
Public Highways Act (RSNWT (Nu) 1988, c P-13)	*Highway Designation And Classification Regulations* NWT Reg (Nu) 047-92)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1)	
Transportation Of Dangerous Goods Act (1990. RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

Applicable Legislation and Guidelines for the Back River Project

15. Shipping Management Plan

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Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Shipping Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
SHIPPING MANAGEMENT PLAN

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Appendix A. Shipping Regulatory Framework

Preface

GENERAL INFORMATION

Sabina Gold & Silver Corp. (Sabina) is actively exploring the Back River property mineral rights encompassing the primary exploration camp at Goose Lake, as well as a satellite camp at George Lake and unoccupied claim groups at Boot Lake, Boulder Pond, Wishbone and Del Lake.

The Shipping Management Plan will be executed within the scope of normal operations.

ANNUAL REVIEW

The Shipping Management Plan will be reviewed and updated at least annually. Completion of the annual review of the Shipping Management Plan will be documented through signatures of the personnel responsible for reviewing, updating and approving the Shipping Management Plan.

RECORD OF CHANGES AND REVISIONS TO PLAN

A record will document all significant changes that have been incorporated in the Shipping Management Plan subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

DISTRIBUTION LIST

Sabina will maintain a distribution list for the Shipping Management Plan providing information about all parties that receive the plan including personnel, departments, and outside agencies.

Preamble

All shipping companies operating in Canadian territorial waters must abide by the Canadian regulatory framework. The Shipping Management Plan was developed in accordance with federal legislation with shipping in Canada being regulated by the following:

- *Canada Shipping Act, 2001* (http://www.tc.gc.ca/eng/acts-regulations/acts-2001c26.htm).
- *Arctic Waters Pollution Prevention Act* (http://www.tc.gc.ca/eng/acts-regulations/acts-1985ca-12.htm).
- *Marine Liability Act* (http://www.tc.gc.ca/eng/acts-regulations/acts-2001c6.htm).
- *Coasting Trade Act* (http://laws-lois.justice.gc.ca/eng/acts/C-33.3/).
- *Navigable Waters Protection Act* (http://laws-lois.justice.gc.ca/eng/acts/N-22/).
- *Marine Transportation Security Act* (http://www.tc.gc.ca/eng/acts-regulations/acts-1994c40.htm).

In the Arctic, three of these Acts combine to provide Canada's operational regulatory regime governing marine safety and environmental protection issues: the *Canada Shipping Act*, 2001, the *Marine Liability Act*, and the *Arctic Waters Pollution Prevention Act* (AWPPA).

These federal laws and regulations aim to promote marine safety, prevent pollution, provide a framework to respond to incidents, and address related liabilities and compensation issues. Transport Canada is the federal lead on regulating shipping. Other federal agencies and departments, such as Fisheries and Oceans Canada, the Canadian Coast Guard and Environment Canada, have distinct but interrelated responsibilities for the management of marine transportation safety and environmental protection in the Arctic. Transport Canada works with these federal agencies and departments to establish the regulatory framework and mechanisms that provide a coherent and consistent approach to aspects of marine transportation safety and environmental protection.

The *Canada Shipping Act* provides an overall mechanism to protect safety and the environment for vessels operating in Canadian jurisdiction – waters out to the 200 nautical mile limit. Its regulations include requirements for a vessel's construction, how it manages ballast water, its pollution control equipment, arrangements for emergency response, and its crew qualifications. The AWPPA provides enhanced protection for vessels operating in Canadian jurisdiction north of 60°North latitude. It provides specific construction standards for vessels engaged in Arctic shipping, a system of shipping safety control zones, a ban on discharges of oil, hazardous chemicals, and garbage, and requirements for vessels to carry insurance to cover damages from any of these discharges. The *Marine Liability Act* sets out a regime that requires vessels operating in Canadian jurisdiction to carry insurance to pay for damages from oil spills. In the event of a conflict between the AWPPA and the *Marine Liability Act*, the latter applies. All three of these Acts are implemented based on the "polluter pays" principle. An overview of the shipping regulatory framework, shipping provider's obligations, and Transport Canada's role in enforcement these regulations is presented in Appendix A.

Sabina Gold & Silver Corp. is not a shipping company and does not own any vessels. Sabina intends to contract all its shipping and resupply requirements to a Canadian shipping provider. Sabina does not possess the expertise to impose navigational requirements in terms of safety at sea, emergency responses on ships, crew qualifications, or other specialized requirements on shipping providers. This expertise lies with Transport Canada and the Canadian Coast Guards.

1. Introduction

The Project includes a Marine Laydown Area (MLA) located at Bathurst Inlet, approximately 130 km north-northwest of the Goose site. The MLA will be connected via winter roads to both the Goose and George Properties. It will be used to receive fuel, cargo, and consumables through all phases of the Project.

Fuel and cargo will be received and staged at the port site during the ice-free period, typically from August to September, and will be transported to the Project by freight truck via the winter road from January to March. Outside of the aforementioned periods, port activities will be limited to on-site storage and monitoring for loss prevention.

During periods of port activity, crew transport to the MLA will be facilitated by an ice airstrip in the winter months (January to March) and by float planes in the summer months (August to September). Between operational seasons, occasional personnel transport will be supported by helicopter service.

1.1 PORT FUNCTIONAL AND DESIGN CRITERIA

The MLA has been designed to be capable of off-loading and storing 45 ML of diesel fuel and 17,000 t of consumables during operations and off-loading and storing 10 ML of diesel fuel and 45,000 t of materials during construction. A laydown area is required for 900 containers (20 ft long, 1 Twenty-foot Equivalent Unit (TEU)), as well as a fuel farm with four 10 ML tanks. Three of these fuel tanks will be installed during the construction period, with an additional 10 ML tank installed in Year 1 to accommodate the incremental increase in diesel usage starting in Year 2.

The port comprises the marine infrastructure, the laydown area, and the upland infrastructure. Upland infrastructure includes:

- Four 10 ML diesel fuel storage tanks with a fuel truck loading/unloading facility.
- Lubricant oil storage.
- Secure container storage for 900 containers (20 ft, 1 TEU).
- Secure outdoor cold storage.
- A warehouse.
- Diesel generator sets.
- A vehicle maintenance and storage building.
- A heated warehouse.
- Fresh/fire water storage and distribution.
- A 50-person camp with offices.
- A temporary staging area for containers.

The port marine infrastructure comprises a beach ramp that is wide enough to allow simultaneous off-loading of two barges. A temporary floating dock is also included in the marine infrastructure, and is comprised of two barges that link the ships, moored at a water depth of approximately 12 m, to a foreshore ramp with access to the laydown area. The barges will be secured in place by mooring them to onshore bollards. Rubber airbags will protect the barges where they make contact with each other, or the foreshore ramp; rubber fenders will provide a cushion between the barges and the ship at the dock. The barges will be removed before winter and brought back for the next year's sealift.

Other components of the port include:

- An onshore fuel manifold for offloading fuel from tankers.
- Shore bollards for securing the temporary floating dock and mooring the ships.

An interception ditch will diver catchment water uphill of the laydown area and convey it into the sea. Another interception ditch will collect and direct contact water from the laydown area to a collection pond. The port layout is shown in Figure 1.1-1.

1.2 SHIPPING ROUTES

The MLA is located in a peninsula approximately 30 km south of the settlement of Kingaok (Bathurst Inlet) with the following NAD 83 UTM coordinates: 13.7394976.381254. This site allows the port to be constructed on relatively flat terrain while providing sufficient water depth for ships at a reasonable distance from the shore. The bathymetric information for the port was obtained from Canadian Hydrographic Services Chart No. 7793 (2003).

Fuel and cargo will be shipped to Bathurst Inlet from the Port of Belledune, located in New Brunswick on Canada's East Coast, with access to Arctic waters via Davis Strait. Vessels entering Canadian Arctic waters must follow Transport Canada's regulations that are administered through the *Arctic Waters Pollution Prevention Act* (AWPPA). The AWPPA includes the Arctic Shipping Pollution Prevention Regulations (ASPPR), which is a Zone/Date Shipping Safety Control scheme that stipulates what type of vessel is allowed in each Arctic zone at a given time of the year. According to the ASPPR, the Canadian Arctic waters are divided into 16 zones. When approaching Bathurst Inlet from the east, the most critical sections of the route are Larsen Sound and Victoria Strait, with regard to navigating ice-infested waters, and are identified in the ASPPR as Zone 6. All vessels will be equipped with appropriate navigation aids pertinent to Transport Canada's laws and regulations.

The ships transporting cargo and fuel to Bathurst Inlet will be Arctic Class 1A. According to ASPPR, these vessels are allowed to navigate through Zone 6 for a period of approximately nine weeks from August 25 to October 31. Transport Canada's more recent Arctic Ice Regime Shipping System (AIRSS) may allow for a longer operating window; however, this depends on the actual ice conditions, which may vary from year to year. The shipping route is presented in Figure 1.2-1.

1.3 SHIPPING MANAGEMENT

The aspects of shipping which are under Sabina's control include:

- Shipping schedule for freight and fuel deliveries.
- Ship to shore transfer of freight and fuel.
- Oil handling facility at the Marine Laydown Area.
- Security at the Marine Laydown Area.

The Shipping Management Plan addresses shipping activities on which Sabina can exert influence or control through contractual agreements with shipping providers or direct management of the Marine Laydown Area sealift activities.

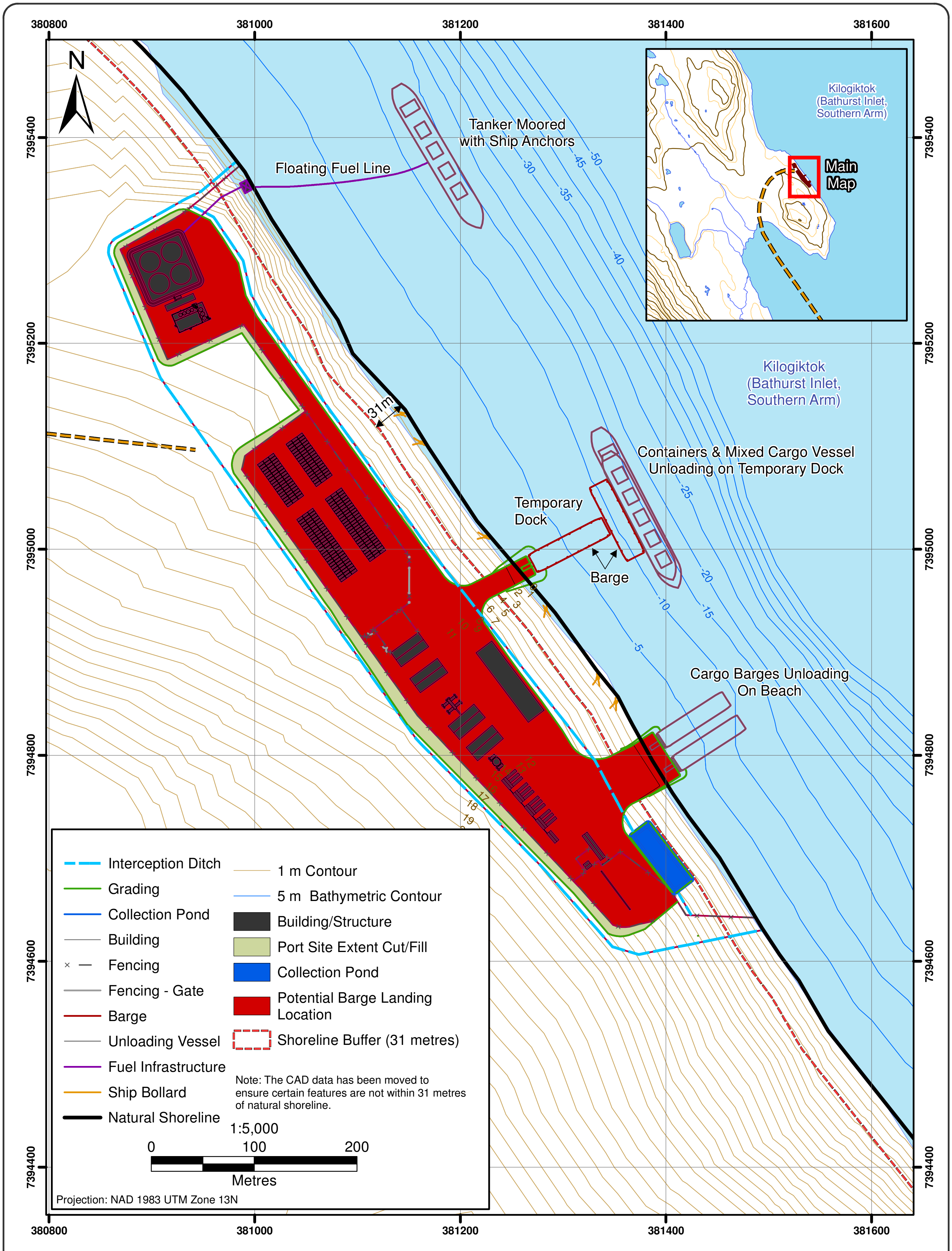

Figure 1.1-1

Marine Laydown Area Site Layout

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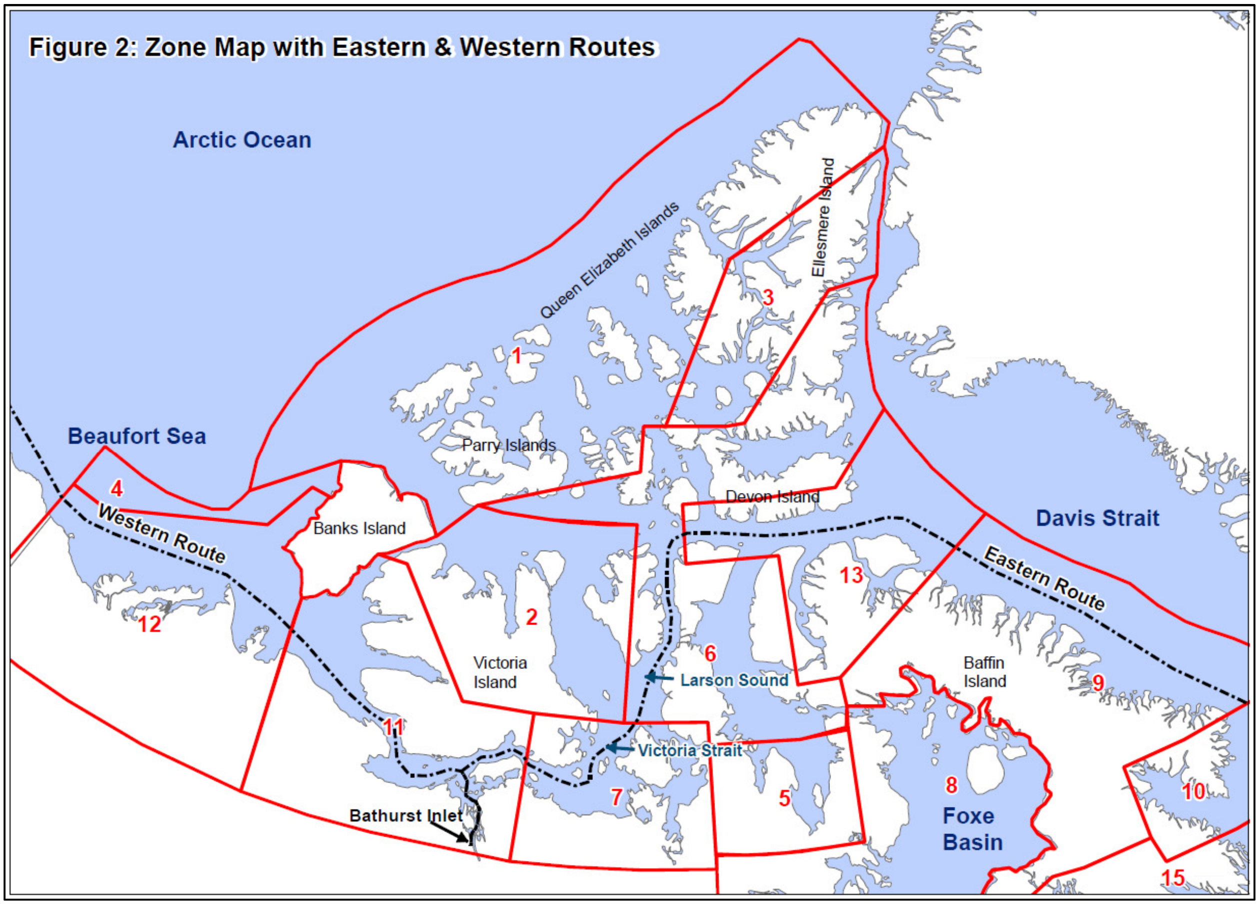
Rescan Engineers & Scientists

Figure 1.2-1. Shipping Route



2. Related Management Plans

The Shipping Management Plan must be viewed in concert with:

- Shipboard Oil Pollution Emergency Plan (shipping companies).
- Emergency Response and Spill Contingency Plan.
- Oil pollution Emergency Plan.
- Occupational Health and Safety Plan.

2.1 SHIPBOARD OIL POLLUTION EMERGENCY PLAN

Section 27 of the Vessel Pollution and Dangerous Chemicals Regulations requires the owner of every Canadian oil tanker of 150 tons gross tonnage or more, and every other Canadian ship of 400 tons gross tonnage or more that carries oil as fuel or cargo, to submit four copies of the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) to Transport Canada. All Plans must be ship-specific. Transport Canada pollution prevention officers who have also been appointed as marine vessel safety inspectors will examine SOPEPs for Canadian vessels.

A SOPEP must also provide guidance to help the master meet the demands of a catastrophic discharge, should one occur.

2.2 OIL POLLUTION EMERGENCY PLAN (OPEP)

As the owner and operator of an Oil Handling Facility (OHF), the CSA 2001 and its regulations and standards require Sabina to maintain a minimum level of preparedness at all times. Prescribed OHFs must each have onsite emergency and prevention plans, equipment, personnel, and training that allow them to deploy an immediate response in the event of an oil spill. Transport Canada's regional Pollution Prevention Officers enforce the OHF regulations by reviewing their plans, inspecting the facilities and response resources to ensure compliance with the CSA, 2001.

Sabina's conceptual Oil Pollution Emergency Plan (OPEP) is presented in Volume 10, Chapter 6 of the DEIS.

3. Targeted VECs and VSECs

The targeted valued ecosystem components (VECs) and valued socio-economic components (VSECs) are:

- Marine water quality.
- Marine mammals.

4. Shipping Schedule

All shipping activities will take place during the open water season, from August to October.

Dry cargo will be loaded on ocean-going barges and container ships in eastern ports (St. Lawrence River) and delivered directly to the Marine Laydown Area on Bathurst Inlet. It is expected that the first vessels of the year will arrive in Bathurst Inlet in August. This first ship will include two (2) loaded barges having dry cargo, and two (2) tugs. Once the barges and tugs arrive in Bathurst Inlet, they will remain until the last of the annual dry cargo has been received and lightered from the ships.

During the two years of construction, up to ten (10) freighters will arrive throughout the open water shipping season delivering dry cargo. All ships will comply with the requirements of the *Canada Shipping Act 2001* (refer to Appendix A).

The port of departure for transporting fuel will also be from an eastern Canadian refinery. The fuel tankers will follow the same shipping route as the ships carrying dry goods. The first shipment of fuel will be received once the land based tank farm is constructed, expected in Year -2 of construction. During operation, up to three shipments of fuel will be received annually.

4.1 GOODS AND MATERIALS RECEIVED

The quantities and volumes of goods and material received will vary depending on the phase of the Project. Deliveries will begin during the construction phase as shown in Table 4.1-1.

Table 4.1-1. Estimated Goods and Material Received at the Marine Laydown Area

Year	Y-3/Y-2	Y-2/Y-1	Y-1/Y1	Y1/Y2	Y2/Y3	Y4 onward
Construction freight (tonnes)	20,000	49,000				
General freight (tonnes)	2100	4000	15,000	17,000	17,000	15,000
Number of vessels	5 to 10	5 to 10	3 to 5	3 to 5	3 to 5	3 to 5
Fuel (tonnes)	4,500	10,500	22,000	29,000	31,000	31,000
Number of tankers	1	1	Up to 3	Up to 3	Up to 3	Up to 3

4.2 LIGHTERING PROCEDURES

4.2.1 Dry Cargo

During the construction phase, supplies and equipment will be off-loaded by landing barges on beach ramps and then off-loading the cargo using mobile equipment, such as a front end loader. A barge camp will be used for the crew during early stages of construction.

Cargo will be transported to the port by barges and ships. The design cargo barge has a Dead Weight Tonnage (DWT) of 5,500 t with maximum draft of 5 m. The design cargo ships have a DWT of 12,600 to 17,900 t with draft of 8 to 10 m. The ships and barges will be self-sufficient for offloading cargo by using their own equipment.

Sea cans, large equipment, machinery and vehicles will be lightered onto the barges that arrived earlier for transport through the access passage using tugs before docked alongside the spud barge located at the MLA. During lightering onto the barges, attention will be directed to ensuring the barges are secured alongside or anchored, with due consideration being given to the prevailing wind, weather, and tide conditions.

Most dry cargo will be transported in marine shipping containers (Twenty-foot Equivalent Units) stacked on the deck of general cargo vessels fitted with cranes. Materials will arrive in sea cans that will be stacked in the MLA laydown yard prior to transport to the Goose and George properties over the winter road. The use of sea containers serves to provide secondary protection against spills and facilitates rapid transfer from ship to shore.

The tug-barge used to ferry the dry cargo to shore will be highly manoeuvrable. Navigation will be during daylight hours and will proceed at a slow speed in periods of low visibility. Traffic through the access passage will be coordinated through communication between the tugs to avoid shipping conflicts and to ensure safety.

Masters of tugs, large and small tankers, and dry cargo ships will be responsible for their vessels at all times and for the safe navigation of their vessels from the port of departure to Bathurst Inlet. For tugs this also includes responsibility for the barge they are towing or pushing. When a barge is laid alongside a dry cargo vessel for lightering containers or equipment from the cargo ship to the barge, a loading supervisor on the ship will take charge of the barge. When a cargo barge is secured to the spud barge, a shore supervisor will take charge of the cargo barge.

The port marine infrastructure will comprise a beach ramp wide enough to allow simultaneous off-loading of two barges. A temporary floating dock will also be included in the marine infrastructure, and will comprise two barges that link the ships, moored at a water depth of approximately 12 m, to a foreshore ramp with access to the laydown area. The barges will be secured in place by mooring them to onshore bollards. Rubber airbags will protect the barges where they make contact with each other, or the foreshore ramp; rubber fenders will provide a cushion between the barges and the ship at the dock. The barges will be removed before winter and brought back for the next year's sealift.

At the end of the shipping season or when all the dry cargo has been received by Sabina for the year, outgoing cargo will be loaded on the barges for the return trip to southern ports. Outgoing cargo could include construction equipment being demobilized following the completion of construction and/or hazardous or other waste being sent to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction. No barges, fuel vessels or tugs will remain at Bathurst Inlet over the winter; all will return to established ports.

4.2.2 Diesel Fuel

Fuel will be transported to the port using tankers with the following specifications:

- Fuel capacity of 7,300 to 19,300 m^3.
- Dead weight tonnage (DWT) of 9,000 to 18,000 t.
- Draft of 7.8 to 10 m.

The tankers will use anchors to secure the ship offshore and will off-load fuel by connecting a floating fuel line from the ship to a shore manifold that is linked to the port's fuel storage tanks. The tankers will be self-sufficient for offshore mooring and the deployment of a floating hose. Tankers will follow Transport Canada's Arctic Water Oil Transfer Guidelines.

It is expected that the tankers delivering diesel fuel will anchor in the same general location as the dry cargo vessels. Ship-to-shore transfer of fuel will occur at this location from the tanker to the land based tank farm.

As Sabina will be the owner and operator of the MLA tank farm, the Company will be subject to the CSA 2001 for this oil handling facility. The CSA 2001 and its regulations and standards require potential polluters to maintain a minimum level of preparedness at all times. Prescribed OHFs must each have onsite emergency and prevention plans, equipment, personnel, and training that allow them to deploy an immediate response in the event of an oil spill. Transport Canada's regional Pollution Prevention Officers enforce the OHF regulations by reviewing their plans, inspecting the facilities and response resources to ensure compliance with the CSA, 2001. Contingency measures related to the transfer of fuel are described in Sabina's OPEP.

4.2.3 Explosives and Hazardous Materials

Part of the dry cargo received each year will be ammonium nitrate, which will be used on site to manufacture explosives. Bulk ammonium nitrate will be shipped as prill, which is inert and will not require special handling during transit. The ammonium nitrate will remain in sea containers at the MLA until it can be transported to the mine sites over the winter road. Other needed raw materials and blasting related products will arrive in sea cans and will be stored in secure locations at the MLA until transferred to the mine sites.

All handling, transport, storage, manufacture and use of explosives will be subject to federal approval under the *Explosives Act*, and the *Nunavut Mine Health and Safety Act*.

Hazardous waste and contaminated soil will be stored at the MLA until it can be shipped off site. Hazardous waste will be appropriately packaged for transport in sea cans and sent via a dry cargo vessel to a certified hazardous waste management facility for treatment, recycling and/or disposal in another jurisdiction.

5. Applicable Legislation and Guidelines

Refer to Appendix A for an overview of Canadian shipping regulations.

6. Roles and Responsibilities

Roles and responsibilities of Sabina personnel involved with the shipping operation are described in the OPEP.

7. Pollution Prevention

7.1 PREVENTING POLLUTION AND REGULATING VESSEL DISCHARGES

Transport Canada regulates vessels to prevent pollution as set out in international standards of the International Convention for the Prevention of Pollution from Ships, known as MARPOL. This convention sets out detailed technical standards for:

- Carrying and handling oil.
- Carrying and handling noxious liquid substances in bulk.
- Carrying packaged dangerous goods.
- Managing vessel sewage discharges.
- Managing vessel garbage.
- Managing vessel air emissions.

Transport Canada also prohibits the use of hull coatings containing tributyl tin, which has been found harmful to marine life, under International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001.

Transport Canada applies these standards through the Vessel Pollution and Dangerous Chemical Regulations under the CSA 2001. These standards are continuously subject to review. Under the Regulations, vessels operating in Canadian waters are subject to the following requirements.

7.2 PREVENTING OIL POLLUTION

Division 1 of Part 2 of the Regulations set out requirements to prevent oil pollution and implement Annex I of MARPOL. Oil tankers (vessels carrying oil in bulk) must:

- Have their plans and specifications approved by their Administration—in the case of a Canadian tanker, by Transport Canada—and by 2015 be double-hulled.

- Have contained areas where fuel or product is pumped on or off the vessel and tanks for oily residue and sludge oil.
- Use standardized connections and piping systems and use equipment for cleaning holds that meet international standards.

Transport Canada requires any tanker built after 1993 to be double-hulled to operate in Canadian waters. Tankers that are not double hulled are being gradually phased out by 2015, depending on their age, size, construction, and cargoes. These regulations align with United States and amended international regulations. This means that all tankers calling on the Project will be required to be double-hulled as of January 2015. The Proponent has stated that they intend to only use double-hulled tankers as part of the proposed Project.

The IMO phase-in period for double-hulled tankers worldwide will be complete in 2015. An accelerated phase-out program was adopted following the MV Erika incident off France in 1999. The new stricter timetable has different schedules for different classes of vessels:

- For large crude-oil tankers, the phase-out date for single hulled vessels was brought forward from 2015 to 2010.
- For smaller tankers, the phase-in period for double hulled vessels ranges up to the end of 2014, depending on the size and age of the vessel.

During the phase-in period, all single-hull tankers are subject to an enhanced inspection program using IMO guidelines.

All ships of 400 tons gross tonnage or more and oil tankers of 150 tons gross tonnage or more, must:

- Meet cargo standards for oil even if they carry oil with other cargo.
- Be able to remotely stop discharge pumps.
- Have oil filtering equipment to remove oil from discharges down to 15 parts per million (note, in Canadian jurisdiction, north of 60°N, the AWPPA zero discharge regime applies).
- Have alarms that both alert crew when the filtered product exceeds the standard and automatically shut discharge.
- Be inspected regularly, with simple inspections carried out annually, more detailed inspections about every three years, and a comprehensive inspection every five years.
- Carry on board:
  - An onboard Emergency Plan that includes contacts for response organizations.
  - Certificates, namely the International Oil Pollution Prevention Certificate, attesting that the inspections were carried out and that the vessel meets standards.
  - An oil record book that is kept up to date (this includes a record of all discharges of waste oil or of unloading waste oil in port to a reception facility).
  - Procedures and arrangement manual that sets out operating instructions for all equipment used onboard the oil tanker.

The regulations also set out requirements for transfer operations, the loading or unloading of oil or oil products either between an oil tanker and shore facility or between two oil tankers at sea:

- The operations must be supervised by a person certified to do so and clear communications between all personnel involved must be arranged.
- The supervisor is responsible for ensuring:
  - Personnel understand all signals, controlling flow rates during the transfer.
  - No hazardous conditions place the transfer operation at risk.
  - Response preparations are in place.
  - Valves and equipment are secure once operations are complete.
- Only fittings and conduits that meet performance standards for pressure resistance may be used.
- The facility and vessel are equipped with proper lighting.

7.3 PREVENTING POLLUTION FROM CHEMICALS CARRIED IN BULK

Division 2 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations set out requirements to prevent pollution from chemicals known as noxious liquid substances when carried in bulk and implement Annex II of MARPOL.

The regulations also set out requirements for transfer operations: the loading or unloading of chemical products either between a chemical tanker and shore facility or between two such tankers at sea. These requirements are similar to requirements for oil noted above. Discharge requirements of this Division do not apply in Arctic waters, as the AWPPA applies and prohibits these discharges.

7.4 CARRYING PACKAGED DANGEROUS GOODS

Division 3 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations prohibits the discharge of any substance that is listed as a marine pollutant.

International standards under Annex III of MARPOL set out requirements for vessels carrying packaged dangerous goods, which are set out in detail under the International Maritime Dangerous Goods Code.

In Canada, carrying packaged dangerous goods is subject to a separate comprehensive control regime of the TDGA 1992, which applies to all modes of transportation and is also administered by Transport Canada. The regime includes standards for classifying different types of dangerous goods to ensure proper containment, packaging, handling, control documents, operator training, and emergency response.

7.5 MANAGING VESSEL SEWAGE DISCHARGES

Division 4 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations sets out requirements that all ships of 400 tons gross tonnage or more must follow to manage sewage generated on board and implement Annex IV of MARPOL. The provisions setting limits on the discharge of sewage do not apply in Arctic waters as the AWPPA allows for the discharge of untreated sewage.

7.5.1 On-vessel Sewage Treatment

Vessels are to have an approved sewage treatment plant meeting Canadian standards. Holding tanks with the capacity for all grey and treated sewage while in port are expected to be part of the ship's infrastructure. Sewage sludge from the sewage treatment plant can be incinerated in the on-board incinerator.

7.6 MANAGING VESSEL GARBAGE

Division 5 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations sets out requirements for vessels to manage the garbage generated on board and implements Annex V of MARPOL. Garbage can include:

Waste from the vessel's crew;

- Operational waste such as galley or maintenance shop waste.
- Cargo associated waste such as dunnage or packing material or residues of dry cargoes carried in bulk (such as ore or grain).

The provisions setting limits on the discharge of garbage do not apply in Arctic waters as the AWPPA prohibits the discharge of garbage.

7.6.1 On-vessel Solid waste

Solid waste materials are to be incinerated, not disposed of in the marine environment. Modern incinerators operating at very high combustion temperatures are expected on all vessels. These will be capable of incinerating food and other domestic waste, residual oil separated from bilge water, waste oil and, in most cases, sewage. Ash from incineration will remain on board and be taken south for treatment, recycling and/or disposal in a certified waste management facility.

The design and operation of shipboard incinerators in Canada are specified under the International

Marine Organization, Marine Environmental Pollution Committee 76 (40), Annex V. Standard specification for shipboard incinerators allow for the incineration of solid wastes approximating in composition to household waste and liquid wastes arising from the operation of the ship, e.g., domestic waste, cargo-associated waste, maintenance waste, operational waste, cargo residues, and fishing gear. Ash from the incinerator is stored on-board. The ash is transported south to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

Sabina will require all of its shipping providers to disposed of waste at the port of origin. No solid or liquid waste will be accepted for treatment at the Marine Laydown Area.

7.7 MANAGING VESSEL AIR EMISSIONS

Division 6 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations sets out requirements for vessels to manage air emissions and implements Annex VI of MARPOL. The requirements:

- Prohibit emissions of ozone depleting substances.
- Set controls for emissions of nitrogen oxides (combustion products from nitrogen in the air), sulphur oxides (combustion products from sulphur in the fuel), and volatile organic compounds.
- Set performance standards for incinerators.

For example, the regulations set a maximum limit for the sulphur content of any fuel oil used on a vessel to 4.5%. In addition, tankers using a vapour collection system for volatile organic compounds are required to meet international standards for the collection system. These criteria will become even more stringent once the new air emissions requirements come into force.

7.8 ANTIFOULING SYSTEMS

Division 7 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations requires vessels not to have any tributyl tin compounds present in hull coatings. This applies a global ban on such compounds under the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001.

7.9 REPORTING POLLUTION

In the event of an incident involving harmful substances, responsibilities are set out in the AWPPA, Part 3 of the Vessel Pollution and Dangerous Chemicals Regulations and the Release and Environmental Emergency Notification Regulations. These instruments outline when and how a vessel's master or an owner or operator of an oil handling facility must report any discharge of a pollutant that occurs or the probability that such a discharge will occur. Reports are to be made according to either the:

- Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants, TP 9834 (http://www.tc.gc.ca/eng/marinesafety/tp-tp9834-menu-1684.htm).
- General Principles for Ships Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants, IMO Resolution A.851(20).

Vessels are also required to report the presence of any pollutant in the water under the CSA 2001's Vessel Traffic Services Zones Regulations.

Vessels in Arctic waters are subject to the AWPPA. The Arctic Shipping Pollution Prevention Regulations, which set requirements for how vessels operating in Arctic waters must be built and details conditions on the no-discharge regime, and the Arctic Waters Pollution Prevention Regulations, which include a civil liability regime for vessels to ensure there is insurance to cover damages should deposits of wastes occur, both regulate pollution.

8. Ballast Water Management

Discharge of ballast water will not be an issue since all ships will arrive to Bathurst Inlet fully loaded. The vessel will take ballast water on board when departing Bathurst Inlet. Canadian regulatory requirements on management of ballast water are described in Appendix A.

9. Accidents and Malfunctions

9.1 FUEL SPILLS ALONG THE SHIPPING ROUTE

The navigation route from the Eastern seaboard of Canada to Cambridge Bay is well known and has been in use for several decades. In addition, Canadian regulations required that fuel tankers navigating in Arctic waters be double-hull vessels.

The following spill prevention measures are essential and must be respected by all shipping providers:

- The Ship Master's responsibility is to navigate with caution. He is ultimately responsible for the safety of his crew and of the ship.
- All fuel tankers built after 1993 to be double-hulled to operate in Canadian waters.
- Vessels have anti-collision devices with alarms and radar to ensure that collisions are avoided.
- Vessels are equipped with several dual/redundant back-up systems such as twin engines, radar, and have redundancy for navigational systems and communication systems.
- Shipping route bathymetry is known.

Furthermore, the "rules of the road" for shipping are:

1. Shipping operators must abide by the established regulatory framework.
2. Ships must sail within the established shipping corridor.
3. Ships must have a Shipboard Oil Emergency Response Plan (SOPEP).

The likely scenarios considered that could lead to a spill event are:

1. Ship engine failure at sea (possible; moderate risk) – many ships have dual engines.
2. Ship grounding (unlikely, low risk) – bathymetry along shipping corridor is known.
3. Collision with other vessels (rare, low risk) – radar very low incidence of collision.

Because of the tanker ship double-hull design, systems redundancy on vessels, and, the focus placed on prevention of accidents and malfunctions the recorded frequency of such accidents and malfunctions is very low.

In support of this statement, Sabina points to the millions of tonnes of fuel cargo transiting in the St Lawrence River annually, as well as the large tanker traffic off the coast of Norway where no major fuel spills have occurred during shipping.

9.2 FUEL SPILLS DURING SHIP-TO-SHORE TRANSFER OF FUEL AT THE MLA

The worldwide Oil Tanker Spills Statistics for 2011, prepared by the International Tankers Owners Pollution Federation Limited (ITOFP) confirms that the vast majority of spills occurred at dock while loading or unloading fuel and that the vast majority of fuel spills are generally less than 7 tonnes in size.

Sabina's emphasis will be on prevention, while at the same time keeping resources close at hand to respond to emergencies on the roads in a timely manner. The OPEP details the emergency response procedures to deal with small fuel spill during the ship-to-shore fuel transfer operation.

9.3 ACCIDENTS AND MALFUNCTIONS INVOLVING FREIGHT

At the anchor point, cargo will be lightered from the ships onto barges and be delivered to the spud barge via the access passage. The tugs-barges will be highly manoeuvrable. Navigation will be during daylight hours and will proceed at a slow speed in periods of low visibility. Shipping traffic will be coordinated to avoid shipping conflicts and to ensure safety.

Accidents and malfunctions could increase the level of hazard and necessitate associated mitigation measures:

- Mechanical failure occurring on the ship or tug thereby placing it in jeopardy in the shipping route.
- Tug-barge or ship running aground due to a navigational error or mechanical failure.
- Loss or damage to sea cans in heavy seas.
- Barge tow line breaking in heavy seas.
- Collision of tug-barge or ship carrying dry cargo and fuel.
- Tug-barge or ship sinking upon hitting ice.
- Tug-barge or ship colliding with a small boat.

Mitigation reduces the probability of occurrence and increases safety. The following mitigation/safety measures are proposed:

- Where available, electronic navigation aids be used in all instances.
- Ship speeds in open water remain less than 14 knots.
- Shipping is only carried out during the ice free season. Should ice be encountered, the vessel will either sail around it at a reduced speed or proceed slowly through the ice.
- Tug-barge or ship will remain within defined sea route.
- Tug-barge operations will proceed when there is good visibility from the anchor point of the ships to the spud barge and/or adjust their speed according to the conditions.
- Traffic at the MLA will be coordinated to avoid conflicts and ensure safety.
- Communication between tugs will coordinate movement at the MLA.
- Sabina will provide emergency response equipment and materials as outlined in the OPEP for use by the tug or ship in dealing with spills.
- Crews will follow standard operating procedures and adherence to these will be monitored.
- Tug-barge or ship crews will be trained for responses to hazards that can normally be expected in northern waters.

10. Safety of Persons Using Small Boats

The most likely areas where interactions may occur between small boats and barges-tugs and/or ships/vessels are in Bathurst Inlet, in proximity of the MLA.

Mitigation measures to safeguard the safety of those in small boats will include the following:

- Sabina will inform communities on the shipping activities that can be expected over the ice free shipping season and consults with organizations/individuals mooring or beaching their boats in proximity of the MLA.
- Protocols will be developed to minimize the interaction between barge-tug or ship and small boats.

- Barge-tug or ship will travel at a slow speed when transiting near shore to reduce the wake and not compromise the safety of people travelling in small boats along the shipping route. The slower speed will reduce the wake of the ship while also providing an opportunity for the small boats to move to the side.
- Barge-tug or ship would only travel through the near shore islands and reefs when there is good visibility or adjust their speed according to the conditions. This would allow the ship and the small boats to see one another.
- Barge-tug or ship will restrict themselves to the shipping route thereby not surprising any small boat travelling outside the shipping route.
- The ship will sound its horn if a small boat seems unaware of its presence.
- Sabina, through the Community Liaison Committee, will recommend that all those in small boats wear personal floatation devices.

11. Wildlife Protection Measures

The reaction of marine wildlife to vessel traffic is predicted to not be significant and, providing mitigation measures are employed, should not lead to any residual effects (refer to Volume 7, Marine Environment and Impact Assessment).

11.1 INTERACTIONS AND POTENTIAL EFFECTS

Possible interactions between shipping and marine wildlife can have the following potential effects:

- Marine mammals may retreat to the water should a vessel pass too close to an island or reef where they have pulled themselves out of the water.
- The foraging of marine birds and mammals may be interrupted when vessels approach and pass them in the shipping lanes.
- Mammal mortalities may result from collisions with the ship.
- Fuel and/or oil spills could result in mortalities and, for marine birds, could lead to the loss of foraging and brood rearing habitat.

11.2 MITIGATION MEASURES

As part of shipping companies' standard operating procedures, ship crew will monitor the shipping route for marine mammals from the Davis Strait to Bathurst Inlet. The ship's Master will be notified if there is a concern of the ship striking a marine mammal. The Ship Master will make a decision if actions are required to avoid a possible collision. This may include, if safe to do so, slowing the ship until the animal has travelled clear of the ship's course. As safe navigation allows, ships shall take every precaution to avoid harassment of marine mammals.

11.3 MONITORING AND REPORTING

Sabina will discuss with contracted vessel operators the monitoring of marine wildlife. Shipping providers will be encouraged to collect incidental monitoring data during their voyage and to report it to Sabina.

12. Marine Liability Insurance

Sabina's shipping contractors will carry third party liability insurance as required by Canadian regulations and outlined in Appendix A.

Identifiable third party liabilities related to shipping include:

- The Hamlets of Cambridge Bay and Kugluktuk in the event of spill in Bathurst Inlet that adversely impact the marine environment.
- The Hunters and trappers should a ship or tanker run aground and adversely impact the marine environment in spilling fuel or other chemicals into the marine environment.
- Small boat owners should a ship or tanker collide with a small boat along the shipping route.
- Hunters and trappers should a vessel collide with a large marine mammal such as a whale along a shipping route.

13. Marine Security

13.1 MARINE SECURITY PLAN

Sabina will develop a Marine Security Plan in the FEIS as per the requirements of the *Marine Transportation Security Act*. Refer to Appendix A, Section 2.2.1 for the requirements of this Plan.

13.2 SMUGGLING PREVENTION AND POLICING

Smuggling, particularly alcohol and prohibited substances, could have negative socio-economic effects on the community. Measures to prevent smuggling will include:

- The crew of the ship will not be allowed to take any tobacco or alcohol ashore.
- Any crew member under the influence of alcohol, or attempting to take alcohol ashore will be disciplined by the ship's Master.
- Sabina MLA security will send any crew member having alcohol back to the ship for disciplinary action, or refer the matter to the Royal Canadian Mounted Police (RCMP) if prohibited substances are involved.

While it is anticipated that the RCMP will not be involved in security matters, all criminal activities or matters of a grave nature will be referred to the RCMP in Cambridge Bay.

14. Adaptive Management

The Shipping Management Plans will be reviewed on an annual basis and revised/updated as required.

References

Sabina, Draft Environmental Impact Statement for the Back River Project, January 10, 2014

Transport Canada, Transport Canada's Written Submission to The Nunavut Impact Review Board Respecting: Baffinland Iron Mines Corporation's Mary River Project, Final Environmental Impact Statement, NIRB File #08MN053, June 11, 2012

AEM, Meliadine Gold Project, Shipping Management Plan (SD 8-1), March 2013

Appendix A
Shipping Regulatory Framework

Appendix A. Shipping Regulatory Framework

The following Appendix presents selected extracts from Transport Canada's presentation at the Nunavut Impact Review Board (NIRB) Final Hearing for Baffinland Iron Mines Corporation's Mary River Project.

This presentation provides an overview of the regulatory framework with respect to shipping activities in Canada, the responsibilities of the shipping companies and the role of Transport Canada as the lead agency for enforcement of the regulatory regime.

The original document can be consulted in its entirety on the NIRB's public registry.

Transport Canada's written submission to the Nunavut Impact Review Board respecting:

Baffinland Iron Mines Corporation's Mary River Project
Final Environmental Impact Statement
NIRB File #08MN053
June 11, 2012

EXECUTIVE SUMMARY

This submission summarizes Transport Canada's mandate, roles and responsibilities, including those defined by relevant conventions, legislation, regulations and policies. Specific detail is provided related to marine transportation safety and security, rail transportation safety, transportation of dangerous goods and aviation safety. Although the transportation safety regime described is broader than the scope of the Final Environmental Impact Statement, this information provides important context for the consideration of the potential environmental impacts of the proposed project.

Transport Canada's submission responds to the Nunavut Impact Review Board (NIRB) letter of May 10, 2012 requesting information with respect to areas falling within Transport Canada's mandate, notably relating to the regulatory and enforcement regime for marine shipping, ballast water management and the overwintering of fuel barges/vessels. The Department will be providing its discussion paper on the practice of overwintering of fuel barges/vessels in Arctic waters to the NIRB in an addendum to this submission by the end of June 2012.

2.1 MARINE TRANSPORTATION SAFETY

The *Constitution Act,* 1867 grants the federal government exclusive legislative jurisdiction over navigation and shipping, coastal fisheries, and aids to navigation such as beacons, buoys, and lighthouses.

The following is an overview of the laws that govern marine shipping activities in Canada and Transport Canada's responsibilities, highlighting those laws that govern marine safety and environmental protection in the North.

These federal laws and regulations aim to promote marine safety, prevent pollution, provide a framework to respond to incidents, and address related liabilities and compensation issues. Transport Canada has the federal lead in regulating shipping. However it recognizes that other federal agencies and departments, such as Fisheries and Oceans Canada, the Canadian Coast Guard and Environment Canada, have distinct but interrelated responsibilities for the management of marine transportation safety and environmental protection in the Arctic. Transport Canada works with these federal agencies and department to establish the regulatory framework and mechanisms which provide a coherent and consistent approach to aspects of marine transportation safety and environmental protection.

The list below names the principal statutes, relevant to the Project, which Transport Canada enforces to help ensure that marine transportation is safe, secure and environmentally responsible. They will be discussed further in this section to provide context for later sections of this submission.

- *Canada Shipping Act, 2001* (http://www.tc.gc.ca/eng/acts-regulations/acts-2001c26.htm).
- *Arctic Waters Pollution Prevention Act* (http://www.tc.gc.ca/eng/acts-regulations/acts-1985ca-12.htm).
- *Marine Liability Act* (http://www.tc.gc.ca/eng/acts-regulations/acts-2001c6.htm).
- *Coasting Trade Act* (http://laws-lois.justice.gc.ca/eng/acts/C-33.3/).
- *Navigable Waters Protection Act* (http://laws-lois.justice.gc.ca/eng/acts/N-22/).
- *Marine Transportation Security Act* (http://www.tc.gc.ca/eng/acts-regulations/acts-1994c40.htm).

In the Arctic, three of these Acts combine to provide Canada's operational regulatory regime governing marine safety and environmental protection issues: the Canada Shipping Act, 2001, the *Marine Liability Act*, and the *Arctic Waters Pollution Prevention Act*.

The CSA 2001 provides an overall regime to protect safety and the environment for vessels operating in Canadian jurisdiction – waters out to the 200 nautical mile limit. Its regulations include requirements for a vessel's construction, how it manages ballast water, its pollution control equipment, arrangements for emergency response, and its crew qualifications. The AWPPA provides enhanced protection for vessels operating in Canadian jurisdiction north of 60°north latitude. It provides specific construction standards for vessels engaged in Arctic shipping, a system of shipping safety control zones, a ban on discharges of oil, hazardous chemicals, and garbage, and requirements for vessels to carry insurance to cover damages from any these discharges. The *Marine Liability Act* sets out a regime that requires vessels operating in Canadian jurisdiction to carry insurance to pay for damages from oil spills. In the event of a conflict between the AWPPA and the *Marine Liability Act*, the latter applies. All three of these Acts are implemented based on the —polluter pay principle.

The *Coasting Trade Act* (CTA) supports domestic marine interests by reserving the coasting trade of Canada to Canadian registered ships, with limited exemptions. The *Navigable Waters Protection Act* sets out a regime to approve works built in, on, over, under, through or across navigable water in Canada.

The *Marine Transportation Security Act* sets out a regime to protect and preserve the efficiency of Canada's marine transportation system against unlawful interference, terrorist attacks or use as a means to attack our allies.

2.1.1 *Canada Shipping Act, 2001*

The CSA 2001 is the principal statute that governs safety in marine transportation and protects the marine environment. The CSA 2001 seeks to balance shipping safety and marine environment protection while encouraging maritime commerce. The CSA 2001 applies to all vessels operating in

Canadian waters and Canadian vessels worldwide. No special permission or authority is required for transporting goods by vessels that comply with the CSA 2001.

The objectives of the CSA 2001 are to:

- Protect the health and well-being of people, including crews of vessels who participate in marine transportation and commerce.
- Promote safety in marine transportation and recreational boating.
- Protect the marine environment from damage caused by navigation and shipping activities.
- Develop regulations that encourage viable, effective and economical marine transportation and commerce.
- Promote an efficient marine transportation system.
- Develop regulations that encourage the viable, effective and economical use of Canadian waters by recreational boaters.
- Ensure that Canada can meet its international obligations under bilateral and multilateral agreements related to navigation and shipping.
- Encourage harmonized marine practices.
- Establish an effective inspection and enforcement program.
- Establish and maintain an oil spill preparedness and response regime.

In addition to national requirements, the CSA 2001 and its regulations implement in whole or in parts many international conventions enforced on Canadian vessels trading internationally and on foreign vessels in Canadian waters.

Shipping is an international activity. At any given time, many vessels in Canadian waters are foreign-flagged. That is why we have tools for regulating foreign vessels to protect our marine environment and to ensure the safe and efficient operation of our ports and waterways. International organizations such as the International Maritime Organization (IMO) and the International Labour Organization (ILO) play a central role in setting the highest maritime standards possible for shipping safety and security as well as protecting the environment and seafarers. Canada works closely with these organizations so we can adopt these international standards into our marine safety regulations.

The IMO is a specialized agency of the United Nations that focuses on improving safety and security at sea and preventing pollution from vessels. The IMO also deals with international aspects of liability and compensation and promotes maritime commerce. To achieve these objectives, the 169 IMO Member States develop and promote the adoption of conventions, protocols, codes and recommendations concerned with these issues. Canada has ratified or agreed to IMO conventions on safety, collision prevention, pollution prevention, crewing and oil spill response, and is enforcing them through safety and environmental standards set out in the CSA 2001.

Canada also contributed to the safety of seafarers by ratifying the ILO's Maritime Labour Convention, 2006. The Convention sets out seafarers' rights to decent work conditions and helps to create conditions of fair competition for shipowners. Marine safety and pollution prevention measures set out in the CSA 2001 and its regulations include:

- Establishing vessel traffic services (VTS) zones.

- Reporting vessel movements.
- Establishing vessel routing measures where warranted.
- Setting vessel design and construction requirements, including double-hull requirements for tankers.
- Setting crew qualifications and training requirements.
- Adopting the International Safety Management Code.
- Setting controls to prevent pollution and manage ballast water.

The Canadian Coast Guard's Marine Communications and Traffic Services (MCTS) monitor coastal vessel traffic. The Canadian Coast Guard works with Transport Canada on notification. The Northern Canada Vessel Traffic Services Zones Regulation (NORDREG) is one reporting system for vessels in the Arctic. All vessels of 300 tons gross tonnage or more, vessels towing or pushing with combined gross tonnage of 500 tons or more, and all vessels carrying pollutants or dangerous goods as cargo, or towing or pushing a vessel carrying pollutants or dangerous goods must report their identity, destination, route, information on pollutants on board, and any defects 24 hours before entering the VTS zone that extends along Canada's coastal waters. This information helps promote safe and efficient navigation and environmental protection and allows any safety or environmental concerns to be addressed before the vessel enters Canadian waters.

Transport Canada is the lead federal regulatory agency responsible for the National Marine Oil Spill Preparedness and Response Regime. Part 8 of the CSA 2001 and its regulations and standards govern the regime, which is built upon the polluter-pay principle that makes the polluter liable for reasonable response costs associated with an oil spill. Canada, as an active member of the IMO, has acceded to a number of international conventions that support the regime, such as the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC Convention) – the regime reflects this convention. Transport Canada sets the guidelines and regulatory structure for the preparedness and response to marine oil spills incidents.

Part 8 of the CSA 2001 sets out the preparedness and response regime. Part 8 and its regulations require oil handling facilities (OHFs), such as the Proponent's proposed port facilities for the Project, to have emergency plans and prevention plans. OHFs south of 60° are required to have arrangements with a Transport Canada certified oil spill response organization prior to commencement of operations. Currently, there is no response organization present in the Arctic. Response services north of 60° north are the responsibility vessel and OHF owners and operators and fall under the mandate of the Canadian Coast Guard.

Transport Canada works with stakeholders through a network of six Regional Advisory Councils (RACs) to monitor and continually improve the administration of Part 8 of the CSA 2001. The RAC for the Prairie and Northern Region is the Arctic Regional Advisory Council. Each council has seven members, who provide a cross-representation of people, groups and companies whose interests could be affected by spills. The role of each RAC is to address areas of mutual concern and to advise the Minister of Transport on issues related to the Regime in Part 8.

There is a designated lead agency for every type of environmental emergency. The Canadian Coast Guard is the lead agency for the Government of Canada response to ship-source and mystery marine spills; and other federal agencies assist. For example, Environment Canada will provide the Canadian Coast Guard with expert environmental advice to ensure an appropriate response to the incident. When the polluter is unknown, unwilling or unable to respond, the Canadian Coast Guard will manage the response.

When the polluter is known, willing and able to respond, the Canadian Coast Guard will advise the polluter of the latter's responsibilities. Once satisfied with the polluter's intentions and plans, the Canadian Coast Guard will monitor the polluter's response and provide advice and guidance as required.

Part 9 of the CSA 2001 sets controls to prevent pollution and to manage ballast water. Under this Part, the Vessel Pollution and Dangerous Chemicals Regulations set standards for vessel construction and onboard management to prevent pollution from oil, hazardous chemicals, sewage, garbage, and air emissions. For details see http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-69/index.html

These Regulations also require pollution incidents, or threats that pollution may be released, to be reported when observed by vessels or oil handling facilities. The provisions of these Regulations related to discharges of oil, chemicals, sewage and garbage do not apply in Arctic waters, as they are governed by the AWPPA.

As well, the Ballast Water Control and Management Regulations apply to all vessels entering Canadian waters, including the Arctic. These Regulations require vessels to manage their ballast water by either:

- Exchange at sea 200 nautical miles off shore in waters at least 2,000 m deep.
- Treatment on board to standards specified in the Regulations.
- Offloading ballast water to port for treatment.
- Retention on board and not discharging ballast water in Canada.

These Regulations also require ships to report on the ballast water management in advance of entering Canadian waters and keep a ballast water management plan and record book. For details see http://laws-lois.justice.gc.ca/eng/regulations/SOR-2011-237/index.html.

Monitoring Compliance under the CSA 2001

Transport Canada monitors compliance with the CSA 2001 and enforces its requirements. Transport Canada has three main programs for monitoring compliance: Flag State Control (FSC), Port State Control (PSC), and the National Aerial Surveillance Program (NASP).

Flag State Control ensures that Canadian-flagged vessels are inspected to Canadian regulations and, for vessels on international voyages, the appropriate international memoranda, conventions and protocols that are integrated into Canadian regulations. It is also responsible for taking all other steps necessary to fully enforce these regulations and ensure that a Canadian vessel is fit for its intended service.

Port State Control is a vessel inspection program whereby foreign vessels entering a sovereign state's waters are boarded and inspected to ensure compliance with various major international maritime conventions. The IMO and the ILO provide the regulatory framework for the PSC program.

Canada works with the global PSC community to verify that foreign vessels entering their waters comply with strict international safety, security and anti-pollution standards. Vessels that are found to be in serious violation of standards are detained in port until their deficiencies are addressed. The objective of PSC is to detect and inspect sub-standard vessels and help eliminate the threat that they pose to life, property and the marine environment.

Transport Canada monitors vessels transiting waters under Canadian jurisdiction through its National Aerial Surveillance Program. NASP regular aerial surveillance has greatly reduced oil discharges nationally because potential polluters are aware that:

- Canada has increased its surveillance over all waters under Canadian jurisdiction.
- The NASP gathers evidence that can be used to help prosecute marine polluters.

<u>Enforcement under the CSA 2001</u>

Transport Canada has a compliance and enforcement program that works to achieve CSA 2001's objectives. Marine Safety Inspectors conduct both random and targeted inspections of Canadian and foreign vessels in Canadian waters on a risk-management basis to ensure they comply with the CSA 2001 and its regulations. When they detect a problem, Transport Canada can use a number of enforcement tools ranging from warnings, to Administrative Monetary Penalties, to prosecutions. The choice of enforcement tool depends on:

- How severe the violation is.
- If the violation was deliberate.
- If the alleged violator was a previous offender.

Transport Canada maintains a Policy on Compliance and Enforcement of the *Canada Shipping Act*, 2001 (TP 13585) that can be accessed at: http://www.tc.gc.ca/eng/marinesafety/tp-tp13585-policy-ce-csa2001-1356.htm

2.1.2 *Arctic Waters Pollution Prevention Act*

While the provisions of the CSA 2001 and its associated regulations apply in all Canadian waters, vessels in Arctic waters north of 60° north and out to the 200 nautical mile limit of Canada's Exclusive Economic Zone, are also subject to the provisions of the AWPPA. There is one notable exception to provisions in the Arctic compared to elsewhere in Canada: discharge limits. The AWPPA prohibits discharges of oil, chemicals, garbage and other wastes generated onboard vessels, except untreated sewage which may be discharged. The AWPPA is based on the polluter pays principle. The following key regulations support the AWPPA:

- The Arctic Shipping Pollution Prevention Regulations which set requirements for how vessels operating in Arctic waters must be built and details conditions of the no-discharge regime. These regulations also establish vessel control systems for preventing a vessel from operating in ice conditions which exceed its capability.
- The Arctic Waters Pollution Prevention Regulations which include a civil liability regime for vessels to ensure there is insurance to cover damages should deposits of wastes occur.

<u>Vessel Control Systems</u>

Two vessel control systems are established under the Arctic Shipping Pollution Prevention Regulations – the Zone/Date System and the Arctic Ice Regime Shipping System – provide for operational safety by taking into account the vessel's capability to operate safely in ice by virtue of ice strengthening, and the ice conditions it will encounter.

Zone/Date System

Under the Zone/Date System, Canadian Arctic waters are divided into 16 shipping safety control zones. A vessel is allowed to operate in a particular zone between the dates that correspond to its ice class. Zone boundaries were established using analysis by the National Research Council of ice conditions over many years. Zone numbering indicates the relative severity of ice conditions from Zone 1, the most severe, to Zone 16.

Arctic Ice Regime Shipping System (AIRSS)

The AIRSS System was developed as an alternative to the Zone/Date System and provides a more flexible framework for decision-making based on actual ice conditions. Vessels using AIRSS are required to have an experienced ice navigator on board. The ice navigator uses currently available ice information to plan a preliminary route. While underway, decisions on whether to proceed are made based on a calculation that takes into account both the vessel's ice strengthening and observations from the bridge of actual ice conditions.

A pictorial guide that explains AIRSS and its application in greater detail is available at http://www.tc.gc.ca/media/documents/marinesafety/tp14044e_airss_guide.pdf.

For details on the AWPPA and its regulations, see http://laws-lois.justice.gc.ca/eng/acts/A-12/.

For details on Marine Safety programs for the Arctic, see http://www.tc.gc.ca/eng/marinesafety/debs-arctic-menu-303.htm.

<u>Enforcement</u>

Pollution Prevention Officers (PPOs) designated under the AWPPA conduct risk-based inspections of Canadian and foreign vessels in Canadian waters as a means to monitor compliance with the Act and its regulations. When a designated PPO suspects that a vessel fails to comply with a standard prescribed by the regulations or that a vessel is about to or has entered a zone in contravention of the regulations, the Officer may direct the vessel to proceed outside of a zone, remain outside of a zone or proceed to anchor as justified in the interests of safety. In more serious situations, a PPO may, with the consent of the Governor in Council, seize the vessel, or may consider charging the vessel with an offence under the Act.

2.1.3 *Marine Liability Act*

The *Marine Liability Act* was adopted in 2001 and later amended in 2009. It is the principal legislation dealing with the liability of shipowners and vessel operators in relation to passengers, cargo, pollution and property damage. It establishes uniform rules on liability and compensation by balancing the interests of shipowners and other parties involved in maritime accidents.

Under the *Marine Liability Act*, all vessels over 1000 gross tonnage must have adequate insurance to pay for damages that would result from a bunker oil spill. This requirement stems from the IMO's International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001 (Bunker Convention), which deals with bunker oil spills from vessels carrying oil as fuel for their propulsion or operation. In addition, ships that can carry more than 2000 tonnes of oil as cargo must also have adequate insurance under the IMO's International Convention on Civil Liability for Oil Pollution Damage, 1992 (Civil Liability Convention or CLC), which deals with oil spills from ships (i.e., tankers) carrying oil as cargo. A vessel over 1,000 gross tonnage and a tanker carrying more than 2,000 tons of oil must have its insurance coverage certified in order to operate in Canada.

For Canadian vessels, or vessels registered in countries that are not party to one of the two liability conventions, Transport Canada can issue certificates. Foreign vessels registered in countries that are party to these conventions would be certified by those countries. For details, see http://www.tc.gc.ca/eng/marinesafety/oep-environment-liability-menu-365.htm

2.1.4 *Coasting Trade Act*

The coasting trade refers to Canada's domestic marine trade. It includes the carriage of goods and passengers between Canadian points and other marine activities of a commercial nature. The CTA supports domestic marine interests by reserving the coasting trade of Canada to Canadian registered ships, with limited exemptions. The legislation provides an administrative process to temporarily import a foreign vessel under a coasting trade license when a suitable Canadian registered vessel is not available.

The Proponent's submission indicates that the ore vessels will be foreign flagged, however, since these vessels will not be carrying passengers or cargo between ports in Canada they will not be engaged in the coasting trade. Conversely other vessels providing marine services to the mine will be subject to the CTA when carrying goods or passengers from places in Canada to the mine or when engaged in other marine activities of a commercial nature in Canadian waters.

2.1.5 *Navigable Waters Protection Act*

Transport Canada's Navigable Waters Protection Program (NWPP) administers the NWPA, the federal law designed to protect the 'public right to navigate'. The NWPA applies to all navigable waterways in Canada, both inland and coastal, extending out 12 nautical miles offshore.

The NWPP regulates works to ensure a balance between the public's right to navigate and the need to build works. Specifically, the NWPP:

- Regulates certain works built or placed in, on, over, under, through or across any navigable water in Canada.
- Removes obstructions to navigation, such as wrecks or sunken vessels, as well as unauthorized works.
- Imposes appropriate terms and conditions required for safe navigation during and/or on completion of the construction of works.

The NWPA defines a work as any man-made structure, device or thing, whether temporary or permanent, that may interfere with navigation and any dumping of fill in any navigable water, or any excavation of materials from the bed of any navigable water, that may interfere with navigation.

As a result, section 5 of the NWPA applies to all works that are proposed to be built or placed in, on, over, under, through, or across any navigable water. New works may require an approval under Section 5 of the NWPA before they can be built or placed.

Approvals issued under subsection 5(2) are for works that substantially interfere with navigation. Subsection 5(2) of the NWPA states,

> *"If the Minister considers that the work would substantially interfere with navigation, the Minister may impose any terms and conditions on the approval that the Minister considers appropriate, including requiring that construction of the work be started within six months and finished within three years of the day on which approval is granted or within any other period that the Minister may fix."*

Approvals issued under subsection 5(3) are for works that interfere with navigation other than substantially. Subsection 5(3) of the NWPA states,

> *"If the Minister considers that the work would interfere, other than substantially, with navigation, the Minister may impose any terms and conditions on the approval that the Minister considers appropriate, including requiring that construction of the work be started and finished within the period fixed by the Minister."*

Substantial interference means that the proposed work will significantly alter the way that vessels pass down a navigable waterway or may make passage dangerous to the public. As indicated above, Transport Canada can apply appropriate terms and conditions to both subsection 5(2) and subsection 5(3) approvals to protect and maintain the public's right to navigate.

The regulatory process for subsections 5(2) and 5(3) approvals differ. Before issuing a subsection 5(2) approval, the NWPP will direct the local authority, company or individual to provide notice of the proposed construction and the deposit of the plans by advertising in the Canada Gazette and in one or more newspapers published in or near the place where the work is to be constructed. This allows the public and stakeholders to provide input on the potential navigational concerns related to a proposed work. The NWPP will consider all navigational comments received when determining the appropriate terms and conditions to protect navigation.

For more information about Transport Canada's NWPP, and a link to the electronic application form, see http://www.tc.gc.ca/eng/marinesafety/oep-nwpp-menu-1978.htm.

2.1.6 Relevant Transport Canada Marine Transportation Programs and Proponent Obligations

The following section describes Transport Canada's marine transportation regulatory programs that are relevant and the Proponent's responsibilities to meet these regulatory requirements. These include programs related to vessel safety, security, pollution prevention, pollution response, marine liability and compensation, and navigable waters. This section also outlines the steps the Proponent will be required to take under Transport Canada's legislation prior to commencing operation if the project is approved.

Observations are provided where appropriate, based on the information made available to Transport Canada through the NIRB Review Process. It is understood that more detailed information will be brought forward by the Proponent as it develops its detailed project design.

<u>Port State Control Program</u>

According to the Proponent, some vessels calling on the Project will be foreign-flagged (e.g., any large equipment shipments will most likely come from Europe so they will be foreign flagged), and therefore will be subject to oversight by the PSC Program. For PSC inspections, Transport Canada applies a risk based inspection program when determining which vessels will require inspection services.

Additionally, all foreign tankers chartered by the Proponent will be subject to PSC inspections under the following terms:

- Vessels are targeted for inspections based on risks they may pose and intelligence received on deficiencies.
- Vessels more than 12 years old calling on the Project will undergo expanded inspections.

Foreign vessels that do not meet safety standards may be detained until their deficiencies have been rectified.

Transport Canada maintains an inspections database and a list of detained ships, which in turn feed into the two international databases. This will allow Transport Canada to apprise the Proponent of any substandard vessels, if they may be considering chartering or utilizing such vessels in support of this Project. See http://www.tc.gc.ca/eng/marinesafety/oep-inspection-psc-menu-1120.htm.

Flag State Control Program

Canadian flagged vessels will be inspected and certified under the FSC Program. For details see, http://www.tc.gc.ca/eng/marinesafety/dvro-fsc-menu-1741.htm.

Safety Management Systems

The Safety Management Regulations of the CSA 2001 provide the legal basis for Safety Management Systems (SMS). The Regulations incorporate the requirements of the International Safety Management Code, which provides an international standard for safely managing and operating vessels and for preventing pollution.

SMS are formal management systems that strengthen safety awareness and pollution prevention practices. SMS integrates formal rules and processes to enhance safety into daily operations and seeks to identify and manage any risks before they turn into accidents. In short, SMS allows vessel owners and operators to have a safety system that prepares them for the realities of day-to-day work and that meets safety management regulatory requirements.

SMS is an independent safety requirement. It does not replace safety requirements under other regulations. It also does not remove the requirement for a vessel to be inspected and carry Canadian Maritime Documents (CMDs).

Five Responsible Organizations authorized by the Minister of Transport perform the SMS certification of Canadian vessels and the companies that operate them, as the companies are legally required to comply with the regulations. Transport Canada monitors and oversees the audit and certification process for the International Safety Management Code as part of its responsibilities under international shipping treaties.

The Safety Management Regulations apply to Canadian convention vessels. A convention vessel is one to which international conventions apply. Transport Canada oversees and enforces compliance with these regulatory requirements.

Canadian convention vessels involved in the Project must comply with the Safety Management Regulations. For details on SMS, see: http://www.tc.gc.ca/eng/marinesafety/dvro-4067.htm.

Navigation Safety

There are several regulations under the CSA 2001 that help to ensure vessels can navigate safely in Canadian waters. Vessels must have the appropriate navigation equipment, follow navigational rules and procedures, and have effective means of communications for safety. For example, vessels must follow international regulations for preventing collisions at sea, which include a requirement to proceed at a safe speed at all times. Vessels must also have up-to-date nautical charts and, for each voyage, a passage plan that takes into account relevant information for safe navigation and protection of the environment and that will ensure the progress of the vessel can be closely monitored. There are vessel reporting requirements and vessel routing measures that also help ensure safe navigation.

Specific challenges regarding the Canadian Arctic include navigation in ice infested waters, limited charting information, and limited marine infrastructure.

Navigation and Radio Communications Equipment

Foreign cargo vessels in Canadian waters must be equipped with navigation and radio communications equipment as set out in international requirements. Each item of equipment must also meet detailed international standards. To ensure compliance, vessels are subject to regular inspections and must have valid inspection certificates that show the vessel's navigation equipment (Cargo Ship Safety Equipment Certificate) and radio equipment (Cargo Ship Safety Radio Certificate) meet all requirements. For more details, see http://www.tc.gc.ca/eng/marinesafety/oep-navigation-safety-menu-724.htm.

Places of Refuge

Canada has a National and Regional Places of Refuge Contingency Plan (PORCP) that applies to all situations where a vessel needs assistance and requests a place of refuge within waters under Canadian jurisdiction. This includes Canada's internal waters, territorial sea and the Exclusive Economic Zone. Note that this is for when a vessel reports a malfunction or other defect. When life is at risk, established search and rescue procedures are followed. The PORCP is based on the IMO's Guidelines on Places of Refuge for Ships in Need of Assistance.

The PORCP involves cooperation between Transport Canada, which is the lead agency, and the Canadian Coast Guard, which is responsible to ensure an appropriate response to ship-source pollution spills. In cases where vessel damage has resulted in the discharge of a pollutant or there is an imminent threat of a discharge of a pollutant, the PORCP would be followed, along with current response procedures and contingency plans. In urgent situations, the PORCP is followed to the extent possible given the time available for making decisions.

Transport Canada's Prairie and Northern Region has developed a draft Place of Refuge Plan, and will be implementing it in the near future.

In the event of an incident, when a vessel requests assistance through the MCTS, regional officers would invoke the plan and work with all appropriate partners to resolve the issue as quickly and effectively as possible.

The vessels involved in the Project will be required to meet all appropriate navigational equipment, routing, collision and reporting regulatory requirements. Compliance will be monitored and enforced through existing compliance and enforcement programs.

<u>Seafarers Certification/Crewing</u>

To achieve the desired level of marine safety, it is essential that properly trained, qualified and competent ship officers and crew operate Canadian vessels. This requirement is addressed under both the CSA 2001 and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

Transport Canada is responsible for developing and updating regulations, examinations, and training standards for the certification of seafarers, including medical fitness. Transport Canada also issues Certificates of Competency to seafarers after they have successfully completed a certificate's prerequisites and examinations. Transport Canada keeps complete records on all seafarers who are candidates or recipients of these certificates.

All vessels involved in the Project, if under the Canadian flag, must comply with the Marine Personnel Regulations Part 1 Certification and Part 2 Crewing.

Canadian seafarers must follow an approved training course or an approved training program, or enroll in an approved cadet training program in either navigation or marine engineering depending on the certificate sought.

Transport Canada Publication TP 2293 ―Examination and Certification of Seafarers‖ provides details relevant to each certificate a Canadian seafarer must complete (http://www.tc.gc.ca/eng/marinesafety/tp-tp2293-menu-2254.htm). These training courses and programs are approved by Transport Canada.

Foreign vessels are required to meet the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers and the requirements specified in Part 2 of the Marine Personnel Regulations for foreign vessels.

National Marine Oil Spill Preparedness and Response Regime

As noted, Transport Canada is the lead federal regulatory agency responsible for the National Marine Oil Spill Preparedness and Response Regime. As such, Transport Canada:

- Provides regime management and oversight.
- Develops regulations and standards relative to Part 8 of the CSA 2001.
- Applies and enforces regulations relating to response organizations.
- Applies and enforces regulations relating to OHFs.
- Oversees an appropriate level of national preparedness.
- Monitors marine activity levels, and makes adjustments to the Regime, as required.
- Monitors and prevents marine oil spills through the NASP.
- Sets up the Regional and National Advisory Councils.
- Provides post-mortem reporting for oil spill response exercises and incidents, both nationally and internationally. This helps improve the Regime by ensuring that the recommendations and/or lessons learned are considered and adopted as appropriate.

Transport Canada has created a National Review Board made up of regional Transport Canada representatives to ensure that Part 8 of the CSA 2001 is adopted and applied consistently across Canada as well as to ensure all regions have appropriate response capability. A representative from Transport Canada's Prairie and Northern Region is part of the National Review Board and continually monitors the region's response capability.

Transport Canada has an Environmental Prevention and National Response Preparedness Plan that lays out the overall framework for the nation's preparedness capacity to combat marine oil pollution incidents in Canada. Similarly, the Canadian Coast Guard has a National Response Plan that identifies how it will manage the response to a marine oil spill, including deploying personnel and response resources.

Spill Response Procedures

Canada's Marine Oil Spill Preparedness and Response Regime and the AWPPA are based on the polluter-pays principle. The polluter is responsible for appointing an On-Scene Commander and managing the response to a spill. The Canadian Coast Guard monitors the overall response to ensure that it is effective, timely, and appropriate to the incident. The Regional Environmental Emergencies Team, chaired by Environment Canada, provides the On-Scene Commander with technical advice about environmental priorities and scientific or other regional concerns related to the incident. The Canadian Coast Guard becomes the On-Scene Commander during an incident if the polluter is unable to respond, unwilling to take action, or unknown.

For this Project, the Proponent will be required to ensure it adheres to all requirements under CSA 2001, AWPPA, and the Vessel Pollution and Dangerous Chemicals Regulations.

Oil Handling Facility Regulatory Inspection and Compliance

The CSA 2001 and its regulations and standards require potential polluters to maintain a minimum level of preparedness at all times. Prescribed OHFs must each have onsite emergency and prevention plans, equipment, personnel, and training that allow them to deploy an immediate response in the event of an oil spill. Transport Canada's regional Pollution Prevention Officers enforce the OHF regulations by reviewing their plans, inspecting the facilities and response resources to ensure compliance with the CSA, 2001.

Pollution Liability and Compensation

The AWPPA and its associated regulations establish liability limits and insurance requirements to cover damages caused by the deposits of waste in Arctic waters. However, in the event of any inconsistency between the AWPPA and the *Marine Liability Act*, the provisions of the *Marine Liability Act* prevail over provisions of the AWPPA, as detailed in section 2.1 of the AWPPA.

The *Marine Liability Act* is based on the polluter-pays principle. There are various regimes available to pay for cleanup and compensation costs, such as shipowners' insurance and domestic and international funds. A single oil pollution incident may draw compensation from multiple regimes. Table A-1 below describes the liability and compensation framework for ship-sourced oil spills in Canada.

Table A-1. Liability and Compensation for Ship-Sourced Oil Spills in Canada

Persistent Oil Spill (crude oil, fuel oil, etc. carried in tankers)	**Bunker Oil Spill (used to propel/operate non-tankers)**	**Spill of Other Pollutants (i.e., refined oil, etc.)**
Shipowner strictly liable under the 1992 *Civil Liability Convention* Compulsory insurance certified by states Separate and higher limits of liability	Shipowner strictly liable under the 2001 *Bunkers Convention* Compulsory insurance certified by states General limits of liability	Shipowner only liable under *Marine Liability Act* No compulsory insurance General limits of liability
Access to international compensation funds: • 1992 Fund • Supplementary Fund Access to domestic compensation fund: Ship-Source Oil Pollution Fund	Access to domestic compensation fund: Ship-Source Oil Pollution Fund	Access to domestic compensation fund only if the substance is oil: Ship-Source Oil Pollution Fund
Total amount of compensation available: **approx. $1.35 billion**	Total amount of compensation available: **approx. $250 million**	Total amount of compensation available for largest ships: **approx. $100 million**

For the Project, bunker oil would be used as fuel by the vessels carrying the ore to markets or bringing supplies to the mine. Persistent oil would include heavy fuel oil or heavy diesel oil. Should the diesel used as fuel for the operation of the mine be considered a non-persistent oil (i.e., a lighter fuel that distills like gasoline), the CLC would not apply to spills from tankers supplying the Project.

The Proponent's shipping service provider will be required to ensure compliance with the *Marine Liability Act* and all requirements pertaining to insurance and liability coverage for their vessels operating in support of this project.

Marine Liability Act

As indicated in Section 2.1.3 above, the *Marine Liability Act* is the principal act that governs all matters of civil liability for maritime claims and sets out the various regimes that provide compensation for pollution damage from ships. These are included in Parts 6 and 7 of the *Marine Liability Act*, which determine to what extent shipowners are liable for pollution damage and what other forms of compensation are available to claimants.

The *Marine Liability Act* incorporates both international and domestic law and provides for various levels of liability depending on the substance causing the pollution damage and the type of ship involved in an incident.

Shipowners' Liability

The liability of ships carrying persistent oils in bulk (such as tankers) is governed by the IMO's Civil Liability Convention. Canada ratified and adopted it in Part 6 of the *Marine Liability Act*. The CLC covers any persistent hydrocarbon mineral oil such as crude oil, fuel oil, heavy diesel oil and lubricating oil, whether it is carried onboard a ship as cargo or as bunker oil.

The CLC imposes strict liability on the shipowner for oil pollution from his ship, subject to a limited number of defenses. In exchange, shipowners are entitled to limit their liability to a maximum amount linked to the tonnage of the vessel. To ensure that victims are protected, the CLC requires that shipowners carry insurance to cover the full amount of their liability. This insurance provides for direct action by claimants against the insurer and is certified by state parties to the CLC, such as Canada. The insurance is usually provided by Protection and Indemnity Association (P&I Clubs), which are mutual associations of shipowners insuring third party risks. Transport Canada issues certificates of financial responsibility or insurance once it receives evidence of adequate insurance from the shipowner. These certificates are issued to Canadian-registered tankers and to those registered in a state not party to the CLC and must be carried onboard the tanker. The maximum liability for shipowners under the CLC for the largest tankers is 89.770 million Special Drawing Right (SDR)2 or approximately $145 million per incident.

Spills of bunker oil from ships other than tankers are covered by the Bunkers Convention. This is another IMO instrument that Canada has ratified and implemented in the *Marine Liability Act*. Bunker oil is used for propelling and operating most seagoing ships, such as bulk carriers, general cargo ships, container ships, barges, passenger ships, and tugs. The Bunkers Convention is similar to the CLC in that it imposes strict liability for shipowners up to a limit linked to the vessel's tonnage. Under the Bunkers Convention, all ships over 1,000 gross tonnage must have the appropriate insurance coverage and similarly to the CLC above, this is certified by state parties to the Bunkers Convention. Upon receipt of proof of adequate insurance, Transport Canada issues certificates of financial responsibility to Canadian-registered ships that carry bunker fuel, which must be carried onboard the ship in order for it to sail or operate legally. Transport Canada can also issue certificates to ships registered in states that not party to the Bunkers Convention. The limits of liability are set out in another international convention (the 1996 Protocol to the International Convention on the Limitation of Liability for Maritime Claims, 1976) that Canada ratified and adopted in Part 3 of the *Marine Liability Act*. The maximum liability for shipowners under the Bunkers Convention for the largest ships of all classes other than tankers is 55 million SDRs or approximately $88 million per incident.

Spills of other types of oils and other pollutants not covered by these two international conventions are governed by Division 2 of Part 6 of the *Marine Liability Act*. This includes non-persistent oils such as refined oil, gasoline, jet fuel, kerosene, etc. While section 77 of the *Marine Liability Act* makes the shipowner strictly liable for the pollution damages from such a spill, there are currently no compulsory insurance requirements. The shipowners' liability would also be limited in accordance with the limits set out in Part 3 of the *Marine Liability Act*.

Please note that the IMO adopted the Protocol of 2010 to the International Convention on Liability and Compensation for Damage in connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996 (2010 HNS Protocol) in April 2010. This protocol would put in place a liability and compensation regime for spills of HNS, including non-persistent oils currently covered by Division 2 of Part 6 of the *Marine Liability Act*. This includes strict liability for the shipowner, compulsory insurance, higher limits of liability and access to a new international compensation fund. Canada was a leader in developing the 2010 HNS Protocol at the IMO and showed its support for its eventual coming into force when it signed the Protocol, which was ratified on October 25, 2011.

International Oil Pollution Compensation Funds

The International Oil Pollution Compensation Funds (IOPC Funds) is an international organization of which Canada has been a member since 1989. This organization manages two compensation funds created through two IMO conventions that Canada ratified and adopted through Part 6 of the *Marine Liability Act*. The compensation available under the IOPC Funds supplements the shipowner's liability under the CLC (i.e., tanker spills).

The IOPC Funds covers a range of loss and damage, including reasonable costs for preventive measures (to minimize or prevent a spill), clean-up, property damage, environmental damage (reinstatement measures), quantifiable economic losses (such as in the fisheries or tourism sectors) and post-spill monitoring and studies. It covers actual losses and reasonable expenses that can be directly linked to the pollution incident.

Ship-Source Oil Pollution Fund

In addition to the international funds, Canada has a domestic fund, the Ship-Source Oil Pollution Fund (SOPF), which is set out in Part 7 of the *Marine Liability Act* and which can provide an additional tier of compensation to victims of oil spills. The SOPF was created from levies paid by receivers and importers of oil in Canada. The balance of the fund has grown with interest paid to it to approximately $392 million. The SOPF has also paid the contributions to the IOPC Funds on behalf of Canadian receivers of oil since Canada joined them in 1989.

There is no international compensation fund to cover damage from bunker oil spills; however, Canadian victims may be able to claim additional compensation from the SOPF.

The SOPF covers pollution damages from any type of oil and any type of ship, including mystery spills if it can be proven that the spill originated from a ship. The current maximum liability for the SOPF is approximately $159 million for a single incident. This amount is adjusted annually with the Consumer Price Index. With the SOPF and the CLC/IOPC Funds regime, the total amount of compensation for a tanker spill of persistent oil would be approximately $1.3 billion. This is one of the largest amounts of compensation available in the world.

2.2 MARINE TRANSPORTATION SECURITY

Transport Canada is responsible for increasing the level of protection of Canada's marine transportation system against unlawful interference, terrorism attack, and terrorist exploitation of it as a conduit to attack our allies. The Department helps industry achieve compliance with marine security legislation and regulations through awareness, certification, inspection, and enforcement, and helps ports, marine facilities and vessels implement the International Ship and Port Facility Security (ISPS) Code through the Marine Transportation Security Regulations (MTSRs). As a partner in the Government of Canada's interdepartmental Marine Security Operations Centres, Transport Canada works to detect, assess, prevent, and respond to direct or indirect marine security threats.

2.2.1 *Marine Transportation Security Act*

The MTSA came into force in 1994 as the legislative framework for securing the Canadian marine transportation system. The MTSA applies to vessels and marine facilities in Canada, Canadian ships outside Canada and marine installations and structures. It does not apply to vessels and marine facilities under the authority of the Minister of National Defense or military vessels of a foreign country.

The MTSA provides the Minister of Transport with the authority to secure the marine transportation system by preventing unlawful interference with it and ensuring appropriate action is taken where that interference occurs.

The MTSA gives the Minister of Transport the authority to:

- Make regulations respecting the security of the marine transportation system.
- Direct a vessel to a certain place, to proceed out of Canadian waters (12 nautical miles from the coast), or to remain outside of Canadian waters when there are reasonable grounds to believe the vessel is a threat to the security of any person or thing.
- Formulate security measures for any vessel or port or facility where the security of persons or goods is not adequately protected. A measure may apply instead of, or in addition to, any provision of a regulation.
- Exempt any person, vessel or marine facility from any regulations, security measure or rule when the exemption is in the public interest and is not likely to affect marine security.
- Designate security inspectors who enforce compliance with the regulations.
- Issue administrative monetary penalties and other enforcement tools as required.

As a signatory to the International Convention for the Safety of Life at Sea (SOLAS3 Convention), Canada is party to this international treaty on safe commercial shipping. The SOLAS Convention, however, also sets out special measures for commercial shipping security, and as such, is the source of most, if not all, the rules and regulations that govern the security of the world's marine transportation system.

In 2002, the ISPS Code was adopted by the IMO. It sets out a detailed framework that further explains and builds on the security measures already in the SOLAS Convention to prevent acts of terrorism involving vessels, ports and marine facilities involved in international trade. In other words, the ISPS Code forms the internationally agreed upon legal framework for deterring, preventing and detecting acts that threaten marine transportation security.

All signatories to the SOLAS Convention were required to have the necessary national regulations in place to apply the ISPS Code by July 1, 2004. The MTSA authorized the Government to make the Marine Transportation Security Regulations (MTSR) in order to implement the ISPS Code in Canada starting July 1, 2004.

The MTSRs were designed to set out a risk-based approach to achieving Canada's international obligations. While the ISPS Code applies to vessels of 500 gross tonnage and upwards, in developing the MTSRs Canada decided to harmonize its requirements with that of the United States who extended their marine security regime beyond the ISPS Code requirements. As a result, the MTSRs applies to SOLAS vessels, defined as travelling from a port in one country to a port in another country that are

500 GRT or carrying more than 12 passengers; and vessels (other than SOLAS) travelling from a port in one country to a port in another country that: are more than 100 GRT (other than a towing vessel), or carrying more than 12 passengers, or are towing vessels engaged in towing a barge astern or alongside or pushing ahead, if the barge is carrying certain dangerous cargoes (as defined in section 1 of the MTSRs). The MTSRs also apply to those Canadian ports and facilities that serve all such vessels.

The marine facilities of the Mary River Project and the vessels that interface with these facilities will be subject to these legislative requirements. The MTSRs do not apply to pleasure craft, fishing vessels, government vessels or vessels without a crew that are in dry-dock, dismantled or laid-up. In general, the MTSRs set out a clear accountability structure for operators of those vessels, ports and marine facilities who are required to adopt marine security requirements.

SOLAS: ‘Safety of Life at Sea’ and is an International agreement for all vessels (cargo, tanker, passenger etc.) that sets standards for safety, emergency procedures and other such protocols.

A detailed summary of the main safety regulatory framework that applies is provided in Section 2.1, including the enforcement regimes detailed in Sections 2.1.1 (CSA 2001) and 2.1.2 (AWPPA). The following lists the key regulatory obligations relative to the proposed Project pursuant to this framework:

- Report their arrival to Canada under the Northern Canada Vessel Traffic Services Zone Regulations.
- Report on their ballast water management under the Ballast Water Control and Management Regulations.
- Manage ballast water before entering Canada’s waters, under the Ballast Water Control and Management Regulations.
- Retain all oil, noxious liquids, and garbage onboard while in Arctic waters (north of 60°N) or offload to ports, under the *Arctic Waters Pollution Prevention Act*.
- Discharge only sewage that has no chemical residues, under the *Arctic Waters Pollution Prevention Act*.
- Carry shipboard oil pollution emergency plans or shipboard marine pollution emergency plans, under the Vessel Pollution and Dangerous Chemicals Regulations.
- Attain certifications required by international standards and under the Vessel Pollution and Dangerous Chemicals Regulations and other regulations under the *Canada Shipping Act*, 2001.
- Adhere to standards for vessel construction and equipment, under the Vessel Pollution and Dangerous Chemicals Regulations and other regulations under the *Canada Shipping Act*, 2001.
- Adhere to special standards for vessel construction and equipment for ships navigating in the Arctic, set out in the Arctic Shipping Pollution Prevention Regulations under the *Arctic Waters Pollution Prevention Act*. The construction and operational standards established under both the Vessel Pollution and Dangerous Chemicals Regulations and Arctic Shipping Pollution Prevention Regulations are based upon the principle that not carrying pollutants next to the hull provides a measure of pollution prevention in the event of damage to the vessel due to striking ice, a collision, or a grounding.
- Adhere to global standards for sulphur oxides and nitrogen oxides, under the Vessel Pollution and Dangerous Chemicals Regulations.

- Not use any organotin compounds for antifouling coatings on their hulls, as these substances are banned internationally, under the Vessel Pollution and Dangerous Chemicals Regulations.
- Report any release of pollution or pending release of pollution to the Canadian Coast Guard, under the Vessel Pollution and Dangerous Chemicals Regulations.
- Carry insurance to cover fuel spills, oil spills if carrying oil as cargo, under the *Marine Liability Act*.
- Carry insurance to cover deposits of wastes, under the *Arctic Waters Pollution Prevention Act*.

The AWPPA, the CSA 2001 and their associated regulations set out comprehensive regimes for the regulation of marine shipping in Canada, including the enforcement regime. Transport Canada enforces the above requirements through a risk-based inspection regime and takes action in accordance with Marine Safety's Compliance and Enforcement Policy.

The broader regulatory regimes are constantly monitored and updated in response to international and domestic developments. Section 3.3 outlines some forthcoming pan-Canadian regulatory initiatives that could be relevant to NIRB's assessment of the shipping aspects of the Mary River project. At this point, Transport Canada does not anticipate implementing any regulatory changes (including relating to enforcement) in direct response to the Mary River project to address issues that are specific to that project.

3.2 BALLAST WATER MANAGEMENT AND POLLUTION PREVENTION

The NIRB requested the following of Transport Canada (NIRB request i):

> *A summary of the existing regulatory requirements associated with ballast water management, including ballast water exchange, pollution prevention, preventing the release of potentially invasive species, and the related jurisdiction of the agencies responsible for this type of regulation.*

As noted in Section 2.1, the *Canada Shipping Act*, 2001 is the primary act that sets out operational requirements for shipping. The *Arctic Waters Pollution Prevention Act* provides a special regime to control discharges of wastes in the Arctic.

Ballast water is brought on board a vessel to increase the draft and change the trim so as to regulate the stability or maintain stress loads within acceptable limits. Under the CSA 2001, Transport Canada administers and enforces the Ballast Water Control and Management Regulations to address the growing problem of aquatic species that may be carried in vessels' ballast water. These include bacteria and other microbes, micro-algae, and various life stages of aquatic plant and animal species. Vessels travelling in Canadian waters carry thousands of tonnes of ballast water annually, making Canada vulnerable to new species entering our waters from discharged ballast water.

Canada's regulations apply, as much as possible, to the IMO's International Convention for the Control and Management of Ships' Ballast Water and Sediments. Canada ratified this convention on April 8, 2010, which should come into force internationally between 2013 and 2014. As well, Canada's ballast water requirements are harmonized, as much as possible, with US Coast Guard requirements.

Under the regulations, all vessel operators need a ballast water management plan for each vessel that complies with the regulations. This plan must outline the operator's measures and procedures that ensure ballast water is being managed safely and effectively.

The vessels involved in the Project will be required to meet international standards and Canadian regulations that control how they manage pollutants such as sewage, garbage, anti-fouling coatings, ballast water, onboard chemicals, and air emissions, and how they report any pollutant discharges. Compliance will be monitored and enforced through existing compliance and enforcement programs.

A summary of the existing regulatory requirements associated with ballast water management, pollution prevention, and the responsible agencies is set out below. Additional requirements related to safety and security, such as the Northern Canada Vessel Traffic Services Zone Regulations under the CSA 2001, also support pollution prevention goals.

3.2.1 Ballast Water & Preventing Release of Potentially Invasive Species

As detailed in section 2.1.1 above, vessels entering Canadian waters, including the Arctic, are subject to the Ballast Water Control and Management Regulations made under the CSA 2001. Vessels are required to manage their ballast water by:

- Exchange at sea 200 nautical miles off shore in waters at least 2000 m deep.
- Treatment on board to standards specified in the Regulations.
- Offloading ballast water to port for treatment.
- Retention on board and not discharging ballast water in Canada.

The existing Regulations also require that ships report on their ballast water management in advance of entering Canadian waters and keep a ballast water management plan and record book.

For details on the Ballast Water Control and Management Regulations, see http://laws-lois.justice.gc.ca/eng/regulations/SOR-2011-237/index.html.

3.2.2 Pollution Prevention

Preventing Pollution and Regulating Vessel Discharges

Transport Canada regulates vessels to prevent pollution as set out in international standards of the International Convention for the Prevention of Pollution from Ships, known as MARPOL. This convention sets out detailed technical standards for:

- Carrying and handling oil.
- Carrying and handling noxious liquid substances in bulk.
- Carrying packaged dangerous goods.
- Managing vessel sewage discharges.
- Managing vessel garbage.
- Managing vessel air emissions.

Transport Canada also prohibits the use of hull coatings containing tributyl tin, which has been found harmful to marine life, under International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001.

Transport Canada applies these standards through the Vessel Pollution and Dangerous Chemical Regulations under the CSA 2001. These standards are continuously subject to review. Under the Regulations, vessels operating in Canadian waters are subject to the following requirements.

Preventing Oil Pollution

Division 1 of Part 2 of the Regulations set out requirements to prevent oil pollution and implement Annex I of MARPOL. Oil tankers (vessels carrying oil in bulk) must:

- Have their plans and specifications approved by their Administration—in the case of a Canadian tanker, by Transport Canada—and by 2015 be double-hulled.
- Have contained areas where fuel or product is pumped on or off the vessel and tanks for oily residue and sludge oil.
- Use standardized connections and piping systems and use equipment for cleaning holds that meet international standards.

Transport Canada requires any tanker built after 1993 to be double-hulled to operate in Canadian waters. Tankers that are not double hulled are being gradually phased out by 2015, depending on their age, size, construction, and cargoes. These regulations align with U.S. and amended international regulations. This means that all tankers calling on the Project will be required to be double-hulled as of January 2015. The Proponent has stated that they intend to only use double-hulled tankers as part of the proposed Project.

The IMO phase-in period for double-hulled tankers worldwide will be complete in 2015. An accelerated phase-out program was adopted following the MV Erika incident off France in 1999. The new stricter timetable has different schedules for different classes of vessels:

- For large crude-oil tankers, the phase-out date for single hulled vessels was brought forward from 2015 to 2010.
- For smaller tankers, the phase-in period for double hulled vessels ranges up to the end of 2014, depending on the size and age of the vessel.

During the phase-in period, all single-hull tankers are subject to an enhanced inspection program using IMO guidelines.

All ships of 400 tons gross tonnage or more and oil tankers of 150 tons gross tonnage or more, must:

- Meet cargo standards for oil even if they carry oil with other cargo.
- Be able to remotely stop discharge pumps.
- Have oil filtering equipment to remove oil from discharges down to 15 parts per million (note, in Canadian jurisdiction, north of 60°N, the AWPPA zero discharge regime applies).
- Have alarms that both alert crew when the filtered product exceeds the standard and automatically shut discharge.
- Be inspected regularly, with simple inspections carried out annually, more detailed inspections about every three years, and a comprehensive inspection every five years.
- Carry on board:
    - An onboard Emergency Plan that includes contacts for response organizations.

- Certificates, namely the International Oil Pollution Prevention Certificate, attesting that the inspections were carried out and that the vessel meets standards.
- An oil record book that is kept up to date (this includes a record of all discharges of waste oil or of unloading waste oil in port to a reception facility).
- A procedures and arrangement manual that sets out operating instructions for all equipment used onboard the oil tanker.

The regulations also set out requirements for transfer operations, the loading or unloading of oil or oil products either between an oil tanker and shore facility or between two oil tankers at sea:

- The operations must be supervised by a person certified to do so and clear communications between all personnel involved must be arranged.
- The supervisor is responsible for ensuring:
  - Personnel understand all signals, controlling flow rates during the transfer.
  - No hazardous conditions place the transfer operation at risk.
  - Response preparations are in place.
  - Valves and equipment are secure once operations are complete.
- Only fittings and conduits that meet performance standards for pressure resistance may be used.
- The facility and vessel are equipped with proper lighting.

<u>Shipboard Oil Pollution Emergency Plans</u>

Section 27 of the Vessel Pollution and Dangerous Chemicals Regulations requires the owner of every Canadian oil tanker of 150 tons gross tonnage or more, and every other Canadian ship of 400 tons gross tonnage or more that carries oil as fuel or cargo, to submit four copies of the vessel's Shipboard Oil Pollution Emergency Plan (OPEP) to Transport Canada. All Plans must be ship-specific. Transport Canada pollution prevention officers who have also been appointed as marine vessel safety inspectors will examine Shipboard OPEPs for Canadian vessels.

Plans for foreign vessels will be approved by their flag State or an organization recognized by them. These Plans help shipboard personnel deal with an unexpected discharge of oil. Their main purpose is to set in motion the necessary actions to stop or minimize the discharge and to reduce its effects. Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

Plans must go beyond providing for operational spills. They must include guidance to help the master meet the demands of a catastrophic discharge, should one occur.

<u>Preventing Pollution from Chemicals Carried in Bulk</u>

Division 2 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations set out requirements to prevent pollution from chemicals known as noxious liquid substances when carried in bulk and implement Annex II of MARPOL.

The regulations also set out requirements for transfer operations: the loading or unloading of chemical products either between a chemical tanker and shore facility or between two such tankers at sea. These requirements are similar to requirements for oil noted above. Discharge requirements of this Division do not apply in Arctic waters, as the AWPPA applies and prohibits these discharges.

Carrying Packaged Dangerous Goods

Division 3 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations prohibits the discharge of any substance that is listed as a marine pollutant.

International standards under Annex III of MARPOL set out requirements for vessels carrying packaged dangerous goods, which are set out in detail under the International Maritime Dangerous Goods Code.

In Canada, carrying packaged dangerous goods is subject to a separate comprehensive control regime of the TDGA 1992, which applies to all modes of transportation and is also administered by Transport Canada. The regime includes standards for classifying different types of dangerous goods to ensure proper containment, packaging, handling, control documents, operator training, and emergency response.

Managing Vessel Sewage Discharges

Division 4 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations sets out requirements that all ships of 400 tons gross tonnage or more must follow to manage sewage generated on board and implement Annex IV of MARPOL. The provisions setting limits on the discharge of sewage do not apply in Arctic waters as the AWPPA allows for the discharge of untreated sewage.

Managing Vessel Garbage

Division 5 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations sets out requirements for vessels to manage the garbage generated on board and implements Annex V of MARPOL. Garbage can include:

- Waste from the vessel’s crew.
- Operational waste such as galley or maintenance shop waste.
- Cargo associated waste such as dunnage or packing material or residues of dry cargoes carried in bulk (such as ore or grain).

The provisions setting limits on the discharge of garbage do not apply in Arctic waters as the AWPPA prohibits the discharge of garbage.

Managing Vessel Air Emissions

Division 6 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations sets out requirements for vessels to manage air emissions and implements Annex VI of MARPOL. The requirements:

- Prohibit emissions of ozone depleting substances.
- Set controls for emissions of nitrogen oxides (combustion products from nitrogen in the air), sulphur oxides (combustion products from sulphur in the fuel), and volatile organic compounds.
- Set performance standards for incinerators.

For example, the regulations set a maximum limit for the sulphur content of any fuel oil used on a vessel to 4.5%. In addition, tankers using a vapour collection system for volatile organic compounds are required to meet international standards for the collection system. These criteria will become even more stringent once the new air emissions requirements come into force.

Antifouling Systems

Division 7 of Part 2 of the Vessel Pollution and Dangerous Chemicals Regulations requires vessels not to have any tributyl tin compounds present in hull coatings. This applies a global ban on such compounds under the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001.

Reporting Pollution

In the event of an incident involving harmful substances, responsibilities are set out in the AWPPA, Part 3 of the Vessel Pollution and Dangerous Chemicals Regulations and the Release and Environmental Emergency Notification Regulations. These instruments outline when and how a vessel's master or an owner or operator of an oil handling facility must report any discharge of a pollutant that occurs or the probability that such a discharge will occur. Reports are to be made according to either the:

- Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants, TP 9834 (http://www.tc.gc.ca/eng/marinesafety/tp-tp9834-menu-1684.htm).
- General Principles for Ships Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants, IMO Resolution A.851(20).

Vessels are also required to report the presence of any pollutant in the water under the CSA 2001's Vessel Traffic Services Zones Regulations.

As noted in section 2.1.2 above, vessels in Arctic waters are subject to the AWPPA. The Arctic Shipping Pollution Prevention Regulations, which set requirements for how vessels operating in Arctic waters must be built and details conditions on the no-discharge regime, and the Arctic Waters Pollution Prevention Regulations, which include a civil liability regime for vessels to ensure there is insurance to cover damages should deposits of wastes occur, both regulate pollution.

3.2.3 Agencies Responsible for Various Marine Components of this Project

All standards set out in Canadian Regulations implement the standards recognized worldwide and negotiated at the IMO, the United Nations specialized agency governing safety and environmental protection in shipping. Canada is key member of IMO. By implementing IMO standards in Canadian regulations, Canada ensures foreign vessels calling in Canadian ports will understand and comply with standards. For details on the IMO, see http://www.imo.org.

Transport Canada is Canada's primary regulator for shipping and implements a comprehensive system to implement standards under the CSA 2001 and the AWPPA. Transport Canada inspectors perform inspections to verify vessels are in compliance with these Acts. As well, Transport Canada has agreements with five Recognized Organizations to perform detailed surveys of vessels as they are built and later maintained, repaired and upgraded through their operational lives. The Recognized Organizations that conduct ships' surveys on behalf of Transport Canada are the American Bureau of Shipping, Bureau Veritas, Det Norske Veritas, Germanisher Lloyd, and Lloyd's Register. For details on Transport Canada's Marine Safety and Security Directorate, see: http://www.tc.gc.ca/eng/marinesafety/menu.htm.

16. Borrow Pits and Quarry Management Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Borrow Pits and Quarry Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
BORROW PITS AND QUARRY MANAGEMENT PLAN

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1. Introduction

Sabina Gold & Silver Corp. (Sabina) is actively working in the Back River area under valid land use, mineral tenure and water permits (Table 1-1).

Table 1-1. List of Licenses and Permits Applicable to the Back River Project

Permit No.	Permit Name	Type	Expiry	Agency
N2011F0029	winter road Beechy Area	Class A	2013-12-13	AANDC
N2010F0017	Winter road Bathurst Inlet to Back River	Class A	2013-09-16	AANDC
N2009F0015	winter road Hackett to George	Class A	2013-02-28	AANDC
KTL304F049 - Amended	Winter road Bathurst Inlet to Goose Lake and George Lake	Level 3	2013-12-13	KIA
KTL304F012	winter road Hackett to George	Level 3	2013-12-13	KIA
N2010C0016	Back River Mineral Exploration	Class A	2013-10-31	AANDC
KTL304C017 -Amended	Goose Camp	Level 3	2013-12-13	KIA
KTL204C012 - Amended	Boulder	Level 2	2013-12-13	KIA
KTL304C018 - Amended	George Camp	Level 3	2013-12-13	KIA
KTL204C020 - Amended	Boot	Level 2	2013-12-13	KIA
KTP11Q001	**Goose rock quarry agreement**		**2013-12-13**	**KIA**
KTP12Q001	**Goose aggregate/borrow quarry agreement**		**2013-12-13**	**KIA**
KTP12Q002	**George aggregate/borrow quarry agreement**		**2013-12-13**	**KIA**
2BE-GEO1015	George Water	Type B	2015-06-15	NWB
2BE-GOO1015	Goose Water	Type B	2015-03-31	NWB

The Borrow Pits and Quarry Management Plan outlines development, operation and closure of approved borrow and rock quarry areas within the Back River Project include the Goose and George Properties and the Marine Laydown Area. It represents one plan in a series of environmental management plans that have been prepared for the Draft Environmental Impact Statement (DEIS).

The purpose is to ensure sound management of borrow and quarry material, explosives and water in order to minimize the impacts to the local environment during the life of a quarry. Implementing best management practices and working responsibly will ensure the protection of the environment and personnel safety.

The Borrow Pits and Quarry Management Plan (the Plan) is designed to minimize adverse effects to downstream water quality and quantity due to quarry operations. The potential effects to the receiving environment are a potential increase in turbidity and total suspended solids (TSS) due to contact surface impact. Management of quarry operations is intended to protect the following valued ecosystem components (VECs):

- Surface Hydrology.
- Freshwater Water Quality.
- Freshwater Sediment Quality.

- Freshwater Fish/Aquatic Habitat.
- Freshwater Fish (Arctic Grayling and Lake Trout).

Quarry operations currently are permitted at the Back River Project under the appropriate land and water use authorizations. These operations will continue to support ongoing exploration camp and associated activities in the area.

The Plan addresses the following topics:

- Applicable legislation and guidelines.
- Roles and responsibilities.
- Environmental protection measures and proposed thresholds.
- A monitoring program to collect water quality and quantity data during quarry operations.
- Mitigation to avoid or minimize potential adverse effects on water quality and quantity during quarry operations identified through the monitoring program.
- Checking and corrective actions.
- Record keeping and environmental reporting.
- A framework for the evaluation of plan effectiveness.
- A quality assurance/quality control program to be applied to the monitoring program.

The Borrow Pits and Quarry Management Plan is a “living document”. It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other related changes.

Sabina will implement this Plan upon approval, and will continue to look for opportunities to minimize or eliminate negative impacts to the environment as a result of its activities, products and services.

2. Scope and Objectives

This Plan has been prepared to meet NIRB EIS Guidelines for the Back River Project, requirements under the NWB license and the KIA land use licenses, and applies to all quarry activities at the Goose Property, George Property and the Marine Laydown Area in the Kitikmeot Region. Subject to annual internal review and revision, it will remain applicable throughout the duration of the water and land licenses and agreements, or until a material change in the scope of the Project occurs.

Related documents presented in the DEIS include:

- Air Quality Monitoring Plan.
- Explosives Management Plan.
- Occupational Health and Safety Plan.
- Mine Closure Plan.
- Road Management Plan.
- Site Water Management Plan.

The goal of any management plan is to reduce and prevent impacts to the environment while ensuring personnel safety and appropriate fiscal considerations during mineral exploration activities and project development.

3. Planning and Implementation

3.1 EXISTING BORROW AND ROCK QUARRY FACILITIES

The primary purpose of the borrow and rock quarries is to support development and operation of the all-weather airstrips, access roads and camp operations/enhancements at the Goose and George Properties. These current quarry agreement locations are on Inuit Owned Lands as authorized by the Kitikmeot Inuit Association (KIA) with associated water management authorized by the Nunavut Water Board. The quarry areas will be developed, inspected, maintained and closed by Sabina or contractors working under the direction of Sabina.

During the 2013 season (March 1 to May 15, 2013) approximately 74m^3 of borrow material was quarried from one area at the northern end of George camp. The material was trucked over the airstrip from the quarry to camp and used to build a greywater berm and transported to three drill sites for use in progressive reclamation.

During the 2013 season (March 1 to May 15, 2013) approximately 40,000 m^3 of rock material was quarried from a site approximately 750 m west of Goose camp. The run-of-quarry (ROQ) material was trucked over a winter road corridor from the quarry to crushing equipment located at the all-weather airstrip. The material was crushed to 4 inch and ¾ inch aggregate. This material was used to build a pad and containment for bulk fuel tanks in Goose camp and to surface the all-weather airstrip and connecting road between the airstrip and Goose camp. Estimates indicate that there is approximately 100,000 m^3 of available material remaining within this quarry area.

3.2 PROPOSED BACK RIVER GOLD PROJECT

The proposed Back River Gold Project includes the Goose Property and the George Property, a Marine Laydown Area situated in the southern portion of Bathurst Inlet, along with connecting winter roads. The mine plan for the Project calls for an approximate 10 year operating mine life, with a total ore feed to a single mill at the Goose Property of 12.5 million tonnes.

Ore will be mined and trucked using conventional open pit and underground methods and processed using standard gravity and leach recovery processes at a mill located at the Goose Property. Ore from these properties will be processed at the Goose mill, while waste rock will be stored in designated storage areas on surface or backfilled in mine workings at both properties. Tailings from the mill will be stored in a single Tailings Impoundment Area (TIA) in the area of the mill. Depending on the results of ongoing exploration, the mine and mineral processing plant may operate for more than 10 years.

Infrastructure requiring borrow and quarry material include:

- Haul roads connecting mine workings.
- Pads for infrastructure and laydown.
- Tailings Impoundment Area.
- Fuel and other containment areas.

- Laydown and storage pads.
- Fill for marine in-water infrastructure.

3.3 PROPOSED BORROW AND ROCK QUARRY FACILITIES

The proposed borrow and rock quarry locations will be located on Inuit Owned Lands, as authorized by the Kitikmeot Inuit Association (KIA) or on Crown Land, as authorized by Aboriginal Affairs and Northern Development (AANDC).

Borrow pit and quarry locations are assessed by the geomechnical properties of the material, the geochemistry and ARD/ML potential, available volume of material, proximity to infrastructure and avoidance of environmentally sensitive (e.g. fish and fish habitat) and culturally sensitive (e.g. archaeological) areas.

Current and proposed borrow and quarry locations at Goose and George Properties are illustrated on Figures 1 and 2 below. Coordinates for these areas are presented in Table 3.3-1. During the life of project there may potentially be numerous borrow and rock quarry activities. These will be determined and approved as needed but all will meet the requirements of this Plan.

Table 3.3-1. Proposed Quarry Agreement Area Coordinates

Property	Easting	Northing
Goose	**TBD***	**TBD***
George -1	**TBD***	**TBD***
George – 2	**TBD***	**TBD***
MLA	**TBD***	**TBD***

TBD: to be entered once proposed boundaries confirmed*

Quarry operations at the Marine Laydown Area include cutting bedrock material to create a suitable area for the camp infrastructure and using the extracted material to build wetted works (for example docks). This cut/fill material may also be used to build the laydown, storage pads, containment areas, site roads and other mitigation measures at the Marine Laydown Area. This will minimize the footprint of the Marine Laydown Area by maximizing use of stripped material.

3.4 EXTRACTION METHODS

Quarry operations will use explosives and the design, shape and size of the blasts shall be planned with safety being the most important consideration. A predetermined pattern of drillholes will be drilled to a depth, not exceeding the overall depth of the quarry, and filled with explosives. Prior to the blast, all personnel and equipment are moved to a safe distance. The blasted rock and fragments will be loaded into haul trucks using either a loader or a hydraulic shovel. The ROQ material is then hauled to the construction area, dumped and placed using a dozer. This sequence is called a “drill, blast, load, haul, dump” sequence.

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. The shielding is best managed by placing the crusher within the quarry behind a high wall to reduce the quantity of wind-blown dust and enabling dust to fall within the quarry boundaries.

Borrow pit operations will use ripping methods using a dozer. This loosens the material and allows it to be picked up using a loader or a hydraulic shovel. Standard drill and blast methods similar to quarry operations are used in instances where ripping is not possible.

3.5 DEVELOPMENT, OPERATION AND CLOSURE

The proposed areas will be developed, inspected, maintained and closed by Sabina or contractors charged with this responsibility under the direction Sabina. The projected volumes of material required are outlined in Table 3.5-1. Some of this material will be obtained from within existing quarry boundaries; however additional sources will be necessary to satisfy construction and operational requirements. Infrastructure will be constructed as much as possible using waste rock and overburden from stripping the open pits.

Table 3.5-1. Quarry Material Required for Site Preparation and Construction (as of Sept 2013)

Location	Total (m^3)
Goose Property	
Stripped Bedrock and Overburden	390,830
Embankment ROQ	915,946
Safety Berm ROQ	65,971
Structural Fill	216,260
Surfacing Gravel	123,665
Total:	1,712,672
George Property	
Stripped Bedrock and Overburden	5,000
Embankment ROQ	755,414
Safety Berm ROQ	50,600
Structural Fill	52,415
Surfacing Gravel	53,080
Total:	916,479
Marine Laydown Area	
Stripped Bedrock and Overburden	
Embankment ROQ	TBD – pending further geotechnical investigations
Safety Berm ROQ	
Structural Fill	
Surfacing Gravel	
Total:	TBD

Proposed quarry locations at Goose and George Properties are presented in Figure 3.5-1 and 3.5-2 with the meters and bounds of the existing quarry locations. Proposed quarry location at the Marine Laydown Area is presented in Figure 3.5-3.

Figure 3.5-1. Location of Current and Proposed Quarry Agreement Areas at Goose Property (as of Sept 30, 2013)

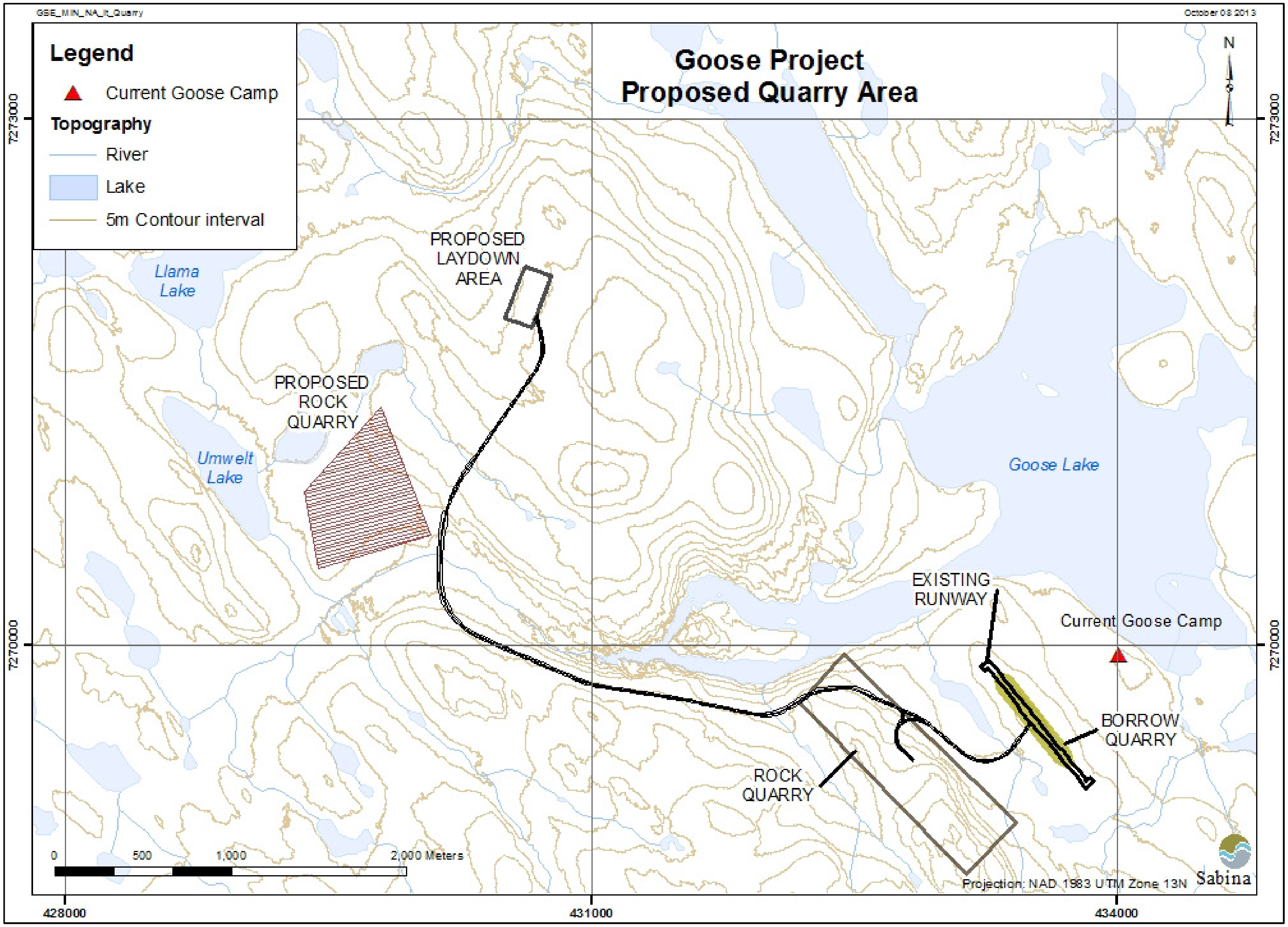


Figure 3.5-2. Location of Current and Proposed Quarry Agreement Areas at George Property (as of Sept 30, 2013)

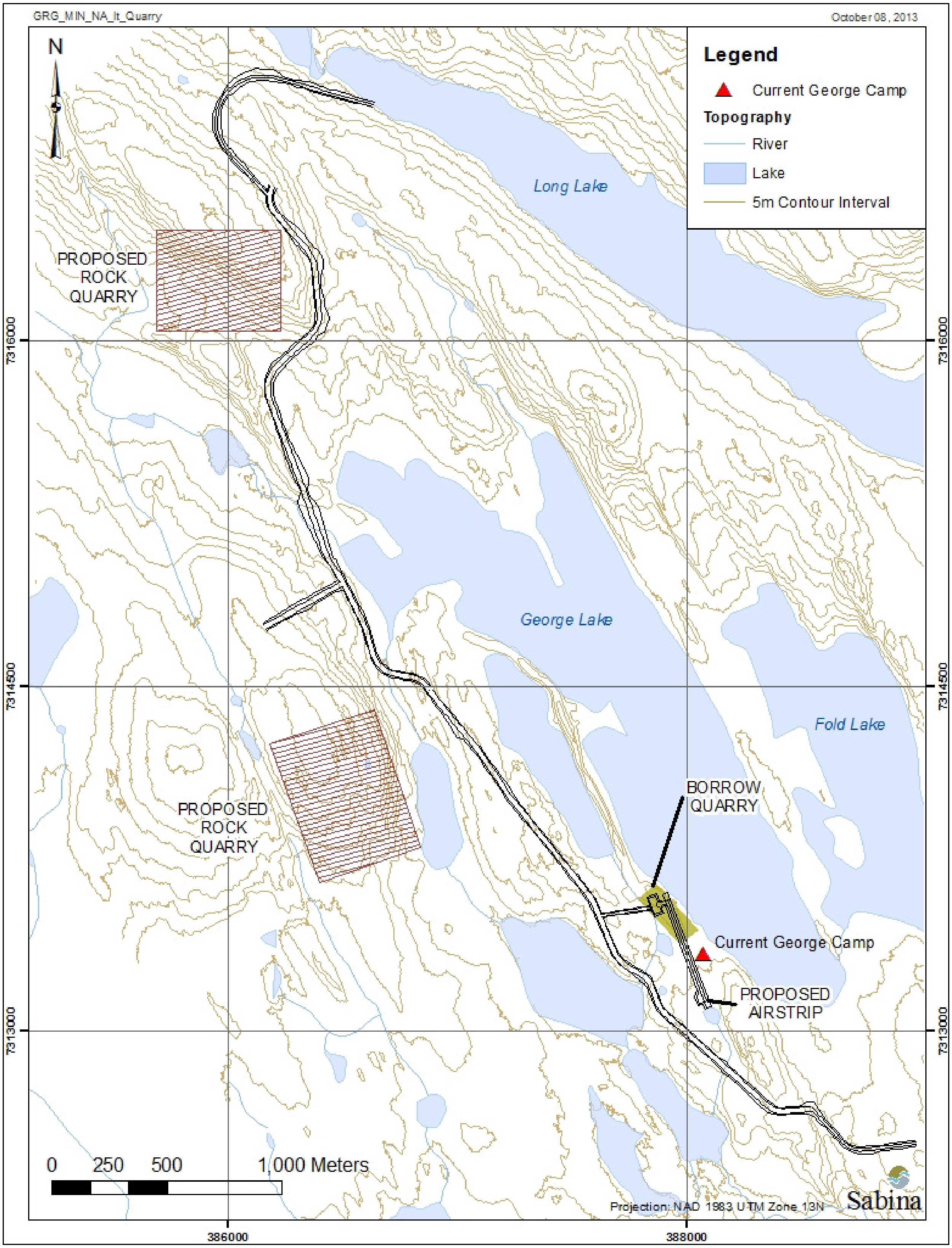
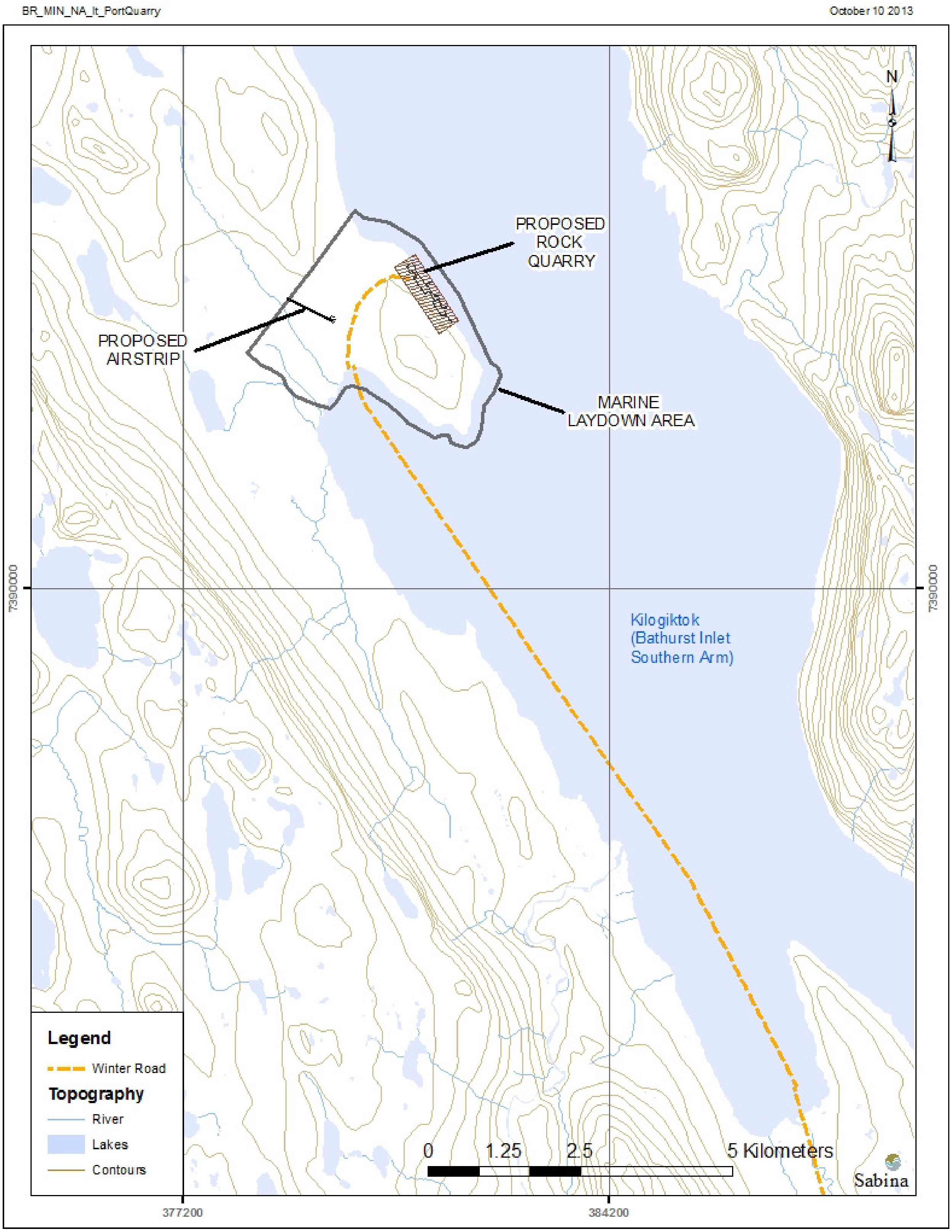


Figure 3.5-3. Location of Current and Proposed Quarry Agreement Areas at Marine Laydown Area (as of Sept 30, 2013)



3.5.1 Development Plans – Rock Quarries

A detailed procedure will be prepared before the start of development for each rock quarry. Site development plans will augment this management plan with specific details. These development plans will include:

- Site layout and setup with the following provisions:
  - Minimum setback of 31 m from environmentally sensitive areas.
  - Adequate room for all activities.
  - Estimates of the resources to be extracted.
  - Refueling station with appropriate containment (if required).
  - Confirmation of low ARD/ML potential.
  - Confirmation of archeology, vegetation and wildlife status.
  - Expected permafrost conditions.
  - Stockpiling location (if required).
  - Equipment lists.
  - Explosive magazine locations.
  - Dust and noise management.
  - Waste management facilities.
  - Water management facilities.
- Related documents:
  - Explosives Management Plan.
  - Spill Contingency Plan.
  - Landfill and Waste Management Plan.
  - Site Water Management Plan.
  - Site specific operating procedures.
- Monitoring:
  - Water management and quality.
  - Pit wall stability;.
  - Extent of permafrost or ground-ice.
  - Wildlife interactions or sightings.

3.6 QUARRY AND BORROW PIT CLOSURE

When operations are complete, the overall reclamation objective for the quarry/borrow pit areas is to return the site to a natural condition that blends in with the existing topography and surrounding landscape. Ongoing operations and closure of quarry areas will focus on progressive reclamation measures to ensure the site:

- Is secure to protect employees, the public and wildlife.
- Has drainage and erosion control measures to minimize runoff to local waterways.
- Is cleared of all material, equipment, debris, and hazardous/contaminated materials.

Sabina will continue a program of progressive reclamation per the Mine Closure and Reclamation Plan, Volume 10, Chapter 29.

Both temporary and final closure of the quarry areas will include:

- Removal of all garbage and debris.
- Removal of all temporary storages/structures/equipment.
- Reclamation of access/winter road to ensure free flow of water during melt.
- Block access (if required) and flag boundaries.
- Water quality monitoring.
- Monitoring pit wall stability.
- Measuring extent of permafrost or ground-ice.

These procedures will be built into future workplans and conducted in accordance with the measures detailed in Volume 10, Chapter 29, the Mine Closure and Reclamation Plan.

4. Applicable Legislation and Guidelines

Borrow pits and rock quarries within IOL require a land use license or commercial lease and quarry permit issued by the KIA. Quarry permits from the KIA include terms and conditions specifying how operations are to be conducted. The use of explosives will comply with the "Explosives Use and Regulations" and the "Mine Health and Safety Act and Regulations". A Type B water license will be needed to operate borrow pits and quarries, and the federal "Fisheries Act" may apply if runoff water containing deleterious substances flow from the quarries/borrow pits into fish bearing water. Other applicable legislation from the Government of Nunavut includes the permitting of archaeological surveys completed in advance of operations and compliance with the Nunavut "Wildlife Act" with respect to impacts to raptors and terrestrial animals.

5. Roles and Responsibilities

The Sabina General Manager in charge of the Back River Project will be ultimately responsible for the success of the Plan and will approve all relevant policies and documents, auditing, action planning and the verification process.

The Mine Manager, Plant Manager and Safety Superintendent, along with their direct reports will be responsible for the implementation of this plan including overall management of the plan and internal reporting.

6. Environmental Protection Measures

The proper implementation of best management practices will ensure sound management of borrow and rock quarry material, explosives, and freshwater which will help to minimize potential impacts to the environment during the life of a quarry.

The following measures will be considered for each rock quarry concurrent with the development of site specific Standard Operating Procedures (SOP; Table 6-1).

Table 6-1. Mitigation Measures to be Considered for Borrow Pit and Quarry Locations

Development Phase	Activities	Environmental Concerns	Mitigation techniques
Site design and development	• vegetation clearing. • Overburden removal.	• Habitat loss. • Soil erosion. • Sediment deposition.	• Minimize project footprint. • Identify and avoid environmentally sensitive areas. • Locate the development in a well- drained area. • Maintain natural drainage patterns. • Retain vegetation buffer zones to maintain slope stability and protect waterbodies. • Construct ditches to direct runoff away from the site. • Salvage and properly store organics, topsoil and overburden for use during reclamation.
Operations and monitoring	• Blasting. • Excavating. • Crushing. • Piling material. • Access road maintenance.	• Soil erosion. • Sediment deposition.	• Limit sediment movement using erosion controls (e.g. silt fence). • Use rip-rap to reinforce drainage channel corners and water discharge points. • Use settling ponds before discharging water. • Revegetate and /or use riprap where required to stabilize slopes.
		• Fuel spills. • Blasting residue.	• Use proper fuel containment and explosives- handling techniques.
		• Permafrost degradation.	• Limit pit or quarry depth to the active layer. • Minimize in-pit water by directing surface water away from the site. • Thaw ice-rich material at a location where meltwater will not re-enter the pit.
		• Dust generation.	• Use water and dust skirts on conveyors to minimize dust.

(Source: AANDC 2010)

6.1 GEOCHEMICAL CHARACTERIZATION

Geochemical and physical characterization of the quarry locations will be conducted as part of the ML/ARD Management Plan at the Back River Project. Static test methods are used to assess the chemical composition of the potential construction material, its potential to generate acid rock drainage (ARD) and its potential to leach metals into the receiving environment with exposure to local environmental conditions.

For initial assessment, acid base accounting (ABA) analysis will be completed and material with a Net Potential Ratio of 3 or more will be labeled as not Potentially Acid Generating (nPAG) and ratios less than 3 will be considered Potentially Acid Generating (PAG). The results of the ML/ARD characterization program to date indicate that the Goose Property gabbro material is predominately nPAG and can be used as construction material. Other units (e.g. greywacke) will contain areas that will be screened as nPAG and also available for construction. Some potential quarries/borrow areas have already been rejected due to the current understanding of ARD potential. Avoiding the use of undesirable or uncertain construction material is the ideal mitigation measure.

Ongoing sampling and testing prior to building a quarry or borrow pit, along with assessment of applied screening criteria, will significantly reduce the risk of ARD/ML generation.

6.2 SURFACE DRAINAGE AND WATER MANAGEMENT FROM QUARRIES AND BORROW PITS

Water quality monitoring of contact water from the borrow pits and quarries, serves to provide information on possible effects to the receiving environment. Surface drainage and water management procedures will be implemented at quarry/borrow locations. A setback of at least 31m is established from the quarry operations and associated workings to any local waterbody. These buffers will be delineated prior to the commencement of work.

All grubbing and disposal of debris near watercourses will comply with regulatory approvals. The following measures minimize effects on aquatic habitat and resources:

- Grubbing of the organic vegetation mat and/or the upper soil horizons will be minimized, and left in place where possible due to the sensitivity of arctic soils.
- Topsoil may be stockpiled separately from the overburden and the location of the stockpiles will be recorded and accessible for future rehabilitation purposes.
- Care will be taken to ensure that the material will not be pushed into sensitive areas which are to be left undisturbed.
- Overburden stripped from the quarries will be placed in a stable area to mitigate erosion into a waterbody during spring thaw.
- Any evidence of erosion due to surface water flow from the quarries and borrow pits will be repaired by placing riprap over the affected area.

The quarry configuration will consist of a relatively flat surface graded such that water slopes to an area within, or adjacent to, the quarry boundaries. Any water accumulating more than 15cm (6 inches) will be sampled as part of ongoing monitoring and allowed to discharge to the environment if it meets water license criteria. A notification of this discharge will be submitted to appropriate regulatory parties under the land and water authorizations and also reported within annual reports.

Storm and snow melts will be diverted away from the quarry by small 0.5m berms on the upslope edges of any excavation. Measures will be taken to reduce the velocity of the water (i.e. silt curtains and small dikes) and promote suspended sediments to settle out.

6.3 DUST MANAGEMENT

Crushers may be located near high obstacles to facilitate shielding from the prevailing winds and thereby reduce and restrict the quantity of dust to the quarry boundary. ROQ will be transported from the quarries and borrow pits within speed restrictions to help reduce dust along the road corridors. Dust monitoring for the quarry and borrow pit operations will be considered for inclusion with dust monitoring programs.

6.4 GROUND ICE AND PERMAFROST PROTECTION

Quarry sites are expected to be free of ground ice and will not extend below the bottom limits of the continuous permafrost. There will be some localized impacts to the surrounding active zone of the quarry locations and any water seeps originating in the quarries as a result of permafrost melting, or precipitation events, will be monitored as part of the surface water management.

Borrow pits are formed from glaciofluvial deposits and weathered bedrock located in well-drained, higher relative topography areas. These types of granular deposits are selected as they can be relatively free of ground ice. Minimal ground ice, reduces the potential for thaw settlement, erosion causing melt water, and external slumping. In the event that ground ice is prevalent, the area will be monitored and may be stabilized by covering the affected land with granular material. This would allow the permafrost aggrade into the covering material and restrict the remaining ground ice from melting.

7. Monitoring

7.1 WATER QUALITY

During high runoff periods, water may drain from borrow and rock quarry areas. Should noticeable flows occur, the water will be tested to ensure it meets permitted criteria. Regular water samples will be collected during the open water period (late June to September). Parameters will be defined by the water licence and may include field analysis of the following:

- Physical parameters – field pH, water temperature, conductivity, major anions and cations, turbidity, TSS.
- Total and Dissolved metals.

The results will be tracked on site, available during inspection, and included in annual reports.

7.2 PIT WALL STABILITY (ROCK QUARRIES)

Regular visual monitoring of pit wall stability within active rock quarry areas will be completed and recorded. Inactive, open areas will be visually monitored (typically monthly) between July and September and this monitoring will be recorded. Closed areas will be visually monitored annually (during the July to September period) and these observations will be recorded.

7.3 PERMAFROST AND GROUND ICE

Daily visual monitoring of permafrost and ground ice within active borrow and rock quarry areas will be completed and recorded. Inactive, but still open, areas will be visually monitored at least monthly between July and September and this monitoring will be recorded. Closed areas will be visually monitored once the year following closure (during the July to September period) and this monitoring will be recorded. Closed areas may require additional monitoring.

7.4 WILDLIFE

Wildlife monitoring will include maintaining a written log of species, number and frequency of sightings near the workings. Data will be maintained by the Environmental Department and presented during inspections and in accordance with permit conditions.

8. Adaptive Management

Checking and corrective action will occur through evaluation of monitoring data including continuous flow data and daily TSS and turbidity data. Results of the monitoring will be reviewed by a environmental specialist. Water quality and quantity trends will be updated on a time scale relevant to the dewatering activity. If the dewatering activity will take two weeks or less, then data will be updated daily. If dewatering takes longer, then an appropriate time scale may be used (e.g. every 3 days or weekly). This will allow early detection of changes in water quality and implementation of corrective actions, if required. If trigger levels or thresholds are approached or exceeded, dewatering activities will be suspended.

9. Record Keeping and Environmental Reporting

Record keeping will be conducted by the site environmental compliance supervisor. Field and laboratory data will be entered into suitable electronic databases and checked for quality control.

All formalized documents and reports will follow a version control procedure to ensure they are approved before use and the internal and external users are accessing the most current information. Reporting of environmental monitoring data will be conducted in accordance with all licenses and approvals. Regulatory requirements are anticipated to include formal annual reports, including disclosure of issues of non-conformance with laboratory analyses.

9.1 ANNUAL SUMMARY REPORT

An annual summary report including results of the geochemical inventory and monitoring programs will be prepared during construction and operations. For year prior to closure, the annual report will include an assessment for additional monitoring and reporting through the closure phase. The report will include documentation of data collection methodology, data management and will detail observed trends.

The annual monitoring report will include the following:

- A description of Project activities during the monitoring interval.
- Monitoring data obtained during the most recent reporting period.
- Description of the methods used for sample and data collection.
- Results and conclusions from updated predictive modelling.
- Evaluation of mitigation measures.
- Discussion of the need for any additional corrective actions or control measures.

Standardized formats will be used for the annual reports, and reports will be kept on file and made available on request.

9.2 INTERIM SUMMARY REPORT

An interim summary report will be generated for the Environmental Superintendent annually. The interim report will provide a summary of the trends in the geochemical inventory and identify any additional mitigation measures that are appropriate as part of the adaptive management approach.

10. Plan Effectiveness

The activities will be reviewed internally on an annual basis relative to the long-term exploration and development strategy for the Project and operational needs.

11. QA/QC

Quality control and quality assurance programs will be part of water quality and geochemical characterization programs based on current best current approach to include appropriate duplicate and blank samples in the analysis. These sampling programs will be revised as site activities, analytical methods and/or regulatory requirements change and adjusted appropriately in the Quarry Development and Management Plan.

17. Air Quality Monitoring and Management Plan

an ERM company

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Air Quality Monitoring and Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT

AIR QUALITY MONITORING AND MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Air Quality Standards	Objectives for maximum concentrations air contaminants in the atmosphere developed to ensure long-tern protection of public health and the environment.
Ambient Air Quality	The outdoor air quality at a particular site.
ASTM	American Society for Testing and Materials.
CACs	Criteria air contaminants
CALA	Canadian Association for Laboratory Accreditation
Dioxins	Polychlorinated dibenzodioxins (PCDDs), or simply dioxins, are a group of polyhalogenated compounds that can act as environmental pollutants. They are commonly referred to as dioxins for simplicity in scientific publications because every PCDD molecule contains a dioxin skeletal structure. Members of the PCDD family have been shown to bioaccumulate in humans and wildlife due to their lipophilic properties, and are known teratogens, mutagens, and suspected human carcinogens. They are organic compounds.
EC	Environment Canada
Fugitive Dust	Particulate matter, often sand or mineral dust, released to the atmosphere by mechanical disruption of soil or by wind scouring.
Furans	Polychlorinated dibenzofurans (PCDFs), or simply furans, are a group of halogenated organic compounds which are toxic environmental pollutants. They are known teratogens, mutagens, and suspected human carcinogens. PCDFs tend to co-occur with polychlorinated dibenzodioxins (PCDDs). PCDFs can be formed by pyrolysis or incineration at temperatures below 1,200°C of chlorine containing products, such as PVC, PCBs, and other organochlorides, or of non-chlorine containing products in the presence of chlorine donors.
GN-DOE	Government of Nunavut – Department of Environment
Mercury	Mercury is a natural and persistent bioaccumulative element which can be transported many kilometers in the atmosphere. Mercury can be deposited to waterbodies from anthropogenic emissions and poses a threat to human and ecosystem health. Mercury also enters the environment through the disposal (e.g., land filling, incineration) of certain products. Products containing mercury include: auto parts, batteries, fluorescent bulbs, medical products, thermometers, and thermostats.
NAAQO	National Ambient Air Quality Objectives
NAPS	National Air Pollution Surveillance
NIRB	Nunavut Impact Review Board

Oxides of Nitrogen (NO_x)	NO_x gas primarily consists of nitrogen oxide (NO) and nitrogen dioxide (NO_2). The gases are emitted with exhaust from combustion engines and are products of blasting operations. NO_x can be converted to nitric acid in the atmosphere and thus contribute to acid deposition.
PM_{10}	Inhalable particulate matter. PM_{10} particles are airborne particles that have a diameter of 10 µm or less and are thus a subset of total suspended particulate. The majority of PM_{10} particles are from fugitive dust sources. PM_{10} can enter the respiratory system and has been linked to respiratory problems.
$PM_{2.5}$	Respirable particulate matter ($PM_{2.5}$) particles are a subset of PM_{10} and are defined as particles with a diameter less than 2.5 µm. These particles are small enough to enter deep into the respiratory system. The majority of particulate matter emitted in diesel engine exhaust is $PM_{2.5}$.
Sulphur Dioxide (SO_2)	Fossil fuel contains a small amount of sulphur-containing organic compounds. During fuel combustion, the sulphur is oxidized and emitted as SO_2 gas with the engine exhaust. In the atmosphere, SO_2 can further oxidize to sulphate, which contributes to acid deposition.
Total suspended particulates (TSP)	Total suspended particulates (TSP) are solid matter or liquid droplets having aerodynamic particle sizes from 0.01 to 100 µm in diameter and are found in smoke, dust, fuel ash, or condensing vapours that can be suspended in the air.
US EPA	United States Environmental Protection Agency. The US EPA has promulgated a variety of guidelines, objectives, emission factors, air dispersion modelling procedures and statutes for the protection of ambient air quality.

1. Introduction

The Back River Project (hereafter "the Project") has been designed to minimise, mitigate and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects. As part of the requirements of the final Environmental Impact Statement (EIS) guidelines issued by the Nunavut Impact Review Board (NIRB), this document presents the Air Quality Monitoring and Management Plan that Sabina Gold & Silver Corp. (hereafter "Sabina") will follow concurrent with the development of the Project.

This plan is dynamic and it will be updated based on management reviews and associated costing of the mitigation and monitoring activities relative to the long-term strategy for the Project, regulatory requirements, consultation and project operational needs.

2. Scope and Objectives

The intent of this plan is to outline the requirements for air quality monitoring, control and mitigation. The Air Quality Monitoring and Management Plan includes the following:

- Applicable legislation and guidelines.
- Control measures that are already in place or that will be established to avoid, control, and mitigate potential adverse effects on air quality and greenhouse gas (GHG) emissions associated with all phases of the Project, including an Emissions Reduction Strategy Plan, a Dust Reduction Plan, and an Incineration Management Plan.
- A monitoring plan to collect on-site air quality, GHG and meteorological data to allow for an adaptive approach to air quality and GHG management.

The Plan includes the following pollutants:

- Nitrogen dioxide (NO_2).
- Sulphur dioxide (SO_2).
- Total suspended particulates (TSP) matter.
- Particulate matter (PM_{10}).
- Respirable particulate matter ($PM_{2.5}$).
- Dust deposition.
- Acid deposition.
- GHG.

The Project is not a significant source of pollutants such as carbon monoxide and ozone and they are therefore not considered in the management plan. The monitoring program will not include hourly and daily NO_2 or PM_{10} monitoring, as there are no objectives or guidelines for PM_{10} and concentrations of hourly and daily NO_2 are not expected to be significant.

Air quality effects from the project also interact with Country Foods (Volume 8, Chapter 5), Vegetation (Volume 5, Chapter 5), Freshwater Water Quality (Volume 6, Chapter 4), and the Human Health and Environmental Risk Assessments (Volume 8, Chapter 6) through a variety of pathways. The Project has been designed to minimize or eliminate potential adverse effects on other VECs.

3. Planning and Implementation

Planning for the Air Quality Monitoring and Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Air quality management will be tracked, reviewed, and updated through ongoing maintenance of the plan. Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

4.1 AIR QUALITY

Air quality standards and objectives are generally intended to protect all members of the general public, including sensitive individuals such as the elderly, infants, and persons with compromised health. Therefore, standards are applicable in areas that are accessible to the general public. Air quality modelling predictions are typically compared to standards and objectives at the fence-line of the industrial property where emissions occur. A fence-line is defined as the limit beyond which public access is restricted.

Air quality standards or criteria for industrial settings are defined by occupational health and safety codes. Air quality guidelines are different for ambient and workplace environments. Occupational health air quality standards and criteria allow for higher concentrations of air contaminants because working individuals are assumed to be of reasonably good health and therefore have higher tolerance than sensitive receptors, and exposure is limited to the time spent at the workplace. Due to the fact that workers will be housed on-site, more emphasis is placed on the evaluation of air quality standards and objectives in the area containing the accommodation buildings. Indoor air quality control measures will be established during the construction and operations phases of the project.

Canada's national, provincial, and territorial governments have established ambient air quality thresholds for criteria air contaminants (CACs) that are intended to ensure long-term protection of public health and the environment. The Government of Nunavut has established standards for maximum concentrations of ambient SO_2, NO_2, TSP and $PM_{2.5}$. The Canadian Council of Ministers of the Environment (CCME) have also produced Canadian Ambient Air Quality Standards for 2015 and 2020 for $PM_{2.5}$ (CCME 2012). The Back River Project is expected to be operational in 2020 and therefore, as a conservative approach, the 2020 values have been used in this assessment. There are no territorial or national objectives for PM_{10}, therefore the British Columbia (BC) objective has been used (BC MOE 2009).

There are no air quality standards for dustfall in Nunavut; however there are objectives and guidelines for dustfall in other jurisdictions. The most stringent dustfall criterion is the acceptable limit in BC which ranges from 1.7 to 2.9 mg/dm^2/day (BC MOE 1979).

There are also no air quality standards for acid deposition in Nunavut; however critical loads of acid deposition proposed by the WHO (2000) range from less than 250 eq/ha/year to more than 1500 eq/ha/year, dependant on soil type. The Goose and George properties are dominated by shallow, acidic morainal and glaciofluvial deposits, characterized by variable but predominantly coarse to medium textures (Volume 5). Since coarse deposits are more susceptible to acidification, a more conservative critical load value associated with this texture was chosen for the assessment of the effects of acidic deposition on local soils. The critical load guideline for acidic deposition recommended by the WHO for acidic, coarse parent materials is below 250 eq/ha/year (WHO 2000).

Table 4.1-1 summarizes the ambient air quality standards applicable to the Project. The federal National Ambient Air Quality Objectives (NAAQOs) defined under the Environmental Protection Act, are also included for comparison.

Table 4.1-1. Federal, Provincial, and Territorial Ambient Air Quality Standards and Objectives

Contaminant	Averaging Period	Nunavut Ambient Air Quality Standards[a]	Dust and Acid Deposition Provincial Guideline Values	Canadian Ambient Air Quality Standards (2020)	National Ambient Air Quality Objectives[b]	
					Maximum Desirable	Maximum Acceptable
Sulphur dioxide (SO_2) (µg/m^3)	1-hour	450	-		450	900
	24-hour	150	-		150	300
	annual	30	-		30	60
Nitrogen dioxide (NO_2) (µg/m^3)	Annual	60	-		60	100
Total suspended particulate (TSP) (µg/m^3)	24-hour	120	-		-	120
	Annual[c]	60	-		60	70
PM_{10} (µg/m^3)	24-hour		50[d]			
$PM_{2.5}$ (µg/m^3)	24-hour	30	-	27[e]	-	-
	Annual			8.8		
$PM_{2.5}$ (µg/m^3)	24-hour	30	-		-	-
Dust deposition (mg/dm^2/day)	30-day	-	1.7[f]		-	-
Acid deposition (eq/ha/yr)	annual	-	250[g]		-	-

Notes:
[a] *Government of Nunavut (2011)*
[b] *CCME (1999)*
[c] *Geometric mean: the average of the logarithmic values of a data set converted back to a base 10 number*
[d] *BC MOE (2009)*
[e] *The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.*
[f] *Most stringent provincial guideline (British Columbia 1979).*
[g] *The critical load guideline recommended for acidic, coarse parent materials (WHO 2000).*

4.2 GREENHOUSE GASSES

Since 2010, facilities emitting over 50,000 metric tonnes (t) of carbon dioxide equivalent (CO_2e) have been required to report to Environment Canada for the Greenhouse Gas Emissions Reporting Program (GHGRP), under the jurisdiction of the Canadian Environmental Protection Act, 1999 (Environment Canada 2013).

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Safety Superintendent along with his/her direct reports are responsible for the implementation of safety aspects of this plan.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including:

- Overall management of plan.
- Monitoring.
- Operational aspects.
- Internal reporting.
- External reporting.
- Ensuring compliance and adaptive management.

6. Environmental Protection Measures

6.1 EMISSIONS MANAGEMENT

In order to eliminate or reduce the potential for adverse effects on air quality during all phases of the Project, an Emissions Reduction Strategy Plan, a Dust Reduction Plan and an Incineration Management Plan have been developed and are described below.

6.1.1 Emissions Reduction Strategy Plan

An Emissions Reduction Strategy Plan will be in place during all phases of the Project to reduce criteria air contaminant and GHG emissions. The following sources of emissions have been identified:

- Stack emissions, such as generators and incinerators.
- Equipment exhaust emissions from vehicles such as dozers, haul trucks, forklift, graders, and fuel trucks.
- Aircraft emissions.

The plan will include the following:

- Selecting equipment with low emissions that meet latest applicable Canada emissions standards and guidelines.
- Implementation of energy efficiency and heat recovery measures.
- Procurement policies to identify fuel and equipment specifications.
- Ensuring proper equipment maintenance.
- Minimization of vehicle and equipment idling, when not in use, taking account of differing operational requirements in summer and winter.
- Use of large haul trucks for ore and waste transport to minimize the number of trips required between the source and the destination.
- Ensuring vehicles are driven at designated speeds on site roads.
- Installation of a waste oil burner unit equipped with a settling tank and filter system for particulate removal from the waste oil.
- Use of emission control systems (e.g., wet scrubbers, baghouses, and filters) on stacks and on relevant ventilation systems.
- Regular servicing of all mobile and stationary equipment to maintain efficiency.
- Necessary training and instruction for all on-site staff with duties related to the operation of equipment that emit air pollutants or controls air emissions (e.g., the required measures to be implemented during start-up, shut down, and emergency conditions):
  - The site operator will maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an effect on the environment.
  - These documents will be made available to the regulator on request.
- Adherence to all permits, authorizations and approvals.

6.1.2 Dust Reduction Plan

A Dust Reduction Plan will be in place during all phases of the Project in order to minimize fugitive dust emissions. The following sources of emissions have been identified:

- Dust from baghouses and dust collectors.
- Fugitive dust on unpaved roads from vehicles travelling on onsite roads.
- Fugitive dust emissions from mining activities such as bulldozing, grading, drilling and blasting and CAC emissions from explosives used in blasting.

The Plan will include the following:

- Ensuring all-weather roads (local site roads) are regularly compacted and kept in good repair.
- Ensuring vehicles will be driven at designated speeds on site roads.
- Use of large haul trucks for ore and waste transport to minimize the number of trips required between the source and destination.

- Application of water or other dust suppressant (non-wildlife attracting) to roadways to minimise dust from ore and waste rock haulage and grading, when ambient air temperatures permit.
- Regular wheel-cleaning of vehicles travelling around and leaving the site.
- Use of water sprays or dust suppression fluids compatible with the ambient air temperatures to suppress dust generation from equipment in the crushing facility. Dust suppression methods should be approved by the Government of Nunavut as outlined in the Nunavut Environmental Guideline for Dust Suppression (GN 2002a) and should be suitable for use at below freezing temperatures.
- Regular removal of dust deposits on external parts of the plant in order to minimise the potential for wind entrainment.
- Minimize the discharge heights from the crushers onto conveyers, and conveyors onto stockpiles. In addition, the discharge from crushers onto conveyors or into other equipment should be enclosed as far as is practicable (e.g., free fall of materials from conveyors carrying material should be fitted with a full hood such as a plastic chute).
- Conditioning materials which are likely to generate dust with water prior to transfer when temperatures allow.
- Enclose or cover loads carried by vehicles when possible.
- Storage areas should be kept in a condition that does not give rise to visible dust emissions.
- Erection of windbreaks or fences around known problem areas or stockpiles to limit the dispersion of dust emissions from equipment and stockpiles, or activities likely to generate dust.
- Necessary training and instruction for all on-site staff with duties related to activities that may cause fugitive dust:
  - The site operator will maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an effect on the environment.
  - These documents will be made available to the regulator on request.
- Adherence to all permits, authorizations and approvals.

6.1.3 Incineration Management Plan

An Incineration Management Plan will be in place during all phases of the Project in order to minimize emissions from incineration activities. The Plan will include the following:

- Installation of an incinerator that complies with Nunavut standards (GN 2002b), Canada-Wide Standards for Dioxins and Furans (CCME 2000a) and Canada-Wide Standards for Mercury emissions (CCME 2000b). Operation of the incinerators will include the following measures:
  - A waste segregation program will be implemented (i.e., materials that are unsuitable for incineration, such as chlorinated plastics, will be diverted to alternate waste disposal facilities).
  - Personnel will be properly trained in incinerator operations.
  - Stack testing will be undertaken to ensure compliance with standards.
- Recycling program and waste segregation to ensure incinerator stream is free of plastics.

6.2 SUMMARY

A summary of the various Project phases and relevant emissions management plan is shown in Table 6.2-1

Table 6.2-1. Mitigation Schedule

	Baseline and Pre-construction	Site Preparation and Construction	Operation	Temporary Closure	Care and Maintenance	Reclamation and Closure	Post-closure
Emissions Reduction Strategy Plan	Not considered necessary	Required	Required	Required	Required	Required	Not considered necessary [a]
Dust Reduction Plan	Not considered necessary	Required	Required	Required	Required	Required	Not considered necessary [a]
Incineration Management Plan	Not required	Required once incinerator installed	Required once incinerator installed	Required if incinerator is in use	Required if incinerator is in use	Required if incinerator is in use	Not required

[a] *The plan will be re-evaluated as required.*

7. Monitoring Program

The Back River Air Quality Monitoring Program consists of the following components:

- Passive air quality monitoring of NO_2 and SO_2 (baseline collection began in May 2011).
- Dustfall monitoring of particulates, anions, cations and total metals (baseline collection began in May 2011).
- Particulate monitoring of TSP, PM_{10} and $PM_{2.5}$ (baseline collection began in Summer 2013).
- Meteorological monitoring, which has been ongoing since 2004.
- Incinerator stack emissions testing.
- Construction monitoring.
- GHG emission monitoring (e.g., fuel use for power, mobile and stationary equipment operation) to determine whether reporting is required.

The design, installation, operation and certification of ambient air quality monitoring systems and programs will comply with the principles contained in the National Air Pollution Surveillance Network Quality Assurance and Quality Control Guidelines (Environment Canada, 2004). The following sections provide further details of these monitoring components.

7.1 PASSIVE AIR QUALITY MONITORING (NO_2 AND SO_2)

Emissions of NO_2 and SO_2 are expected as a result of fuel combustion associated with the Project.

7.1.1 Sample Locations

Baseline air quality data collection has taken place since 2011. In 2011 a Passive Air Sampling System (PASS) was located within the Goose Property Area and in 2012/2013 three PASSs were installed, one located within the Goose Property Area, one within the George Property Area and one at the Marine laydown Area. The stations operate from approximately June until September. The stations were all co-located with dustfall monitoring stations.

Upon Project approval, monitoring would to be carried out at three locations during the construction and operation of the Project. In each case the PASS would be sited approximately 100 m downwind of the location with the most activity, for the George and Goose Properties the locations would change depending on which pit is operational. An example of the monitoring locations is shown in Figure 7.1-1. The monitoring locations are based on the assumption that the Locale 2 Pit and the Main Pit are operational. The exact locations of the sites will be determined based on the final project specifications.

There will also be one additional monitoring site located between the Goose and George Project Areas, away from the project activities, in order to measure background concentrations (Figure 7.1-1).

7.1.2 Sampling Methods

A PASS is currently being used to monitor NO_2 and SO_2 and will continue to be used should the Project proceed to construction and operation. The PASS monitors gas or vapour pollutants from the air through the process of diffusion through a static air layer or permeation through a membrane (Maxxam Analytics Inc. 2011), and has low detection limit capabilities. The sample media are installed in the field and exposed in protective shelters that are mounted to a support pole for a period of 30 days. Following the set exposure period the samples are retrieved, replaced and sent to the laboratory for analysis along with meteorological data including air temperature, wind speed and relative humidity, to allow the ambient air concentration of the compound over the sampling period to be determined.

7.1.3 Data Analysis

The NO_2 and SO_2 sampling will provide a 1-month average ground-level concentration for each compound. Compliance with the relevant air quality standards will then be determined (Table 4.1-1). In addition, ambient air quality temporal trends of NO_2 and SO_2 concentrations will be determined, taking into consideration the time of year and meteorological conditions during the sampling period.

The monitoring data will also be used to provide feedback to modify the air quality management procedures incorporated at the site, if required. However, sampling does not occur in “real time” and there will be a delay between the events that lead to any elevated concentrations and the receipt of monitoring results.

7.2 DUSTFALL MONITORING

The main dust generation sources will be from wind erosion and movement of vehicles and large equipment on site. The dustfall monitoring program will measure the quantities of dust deposited near the Back River Project during construction and operation.

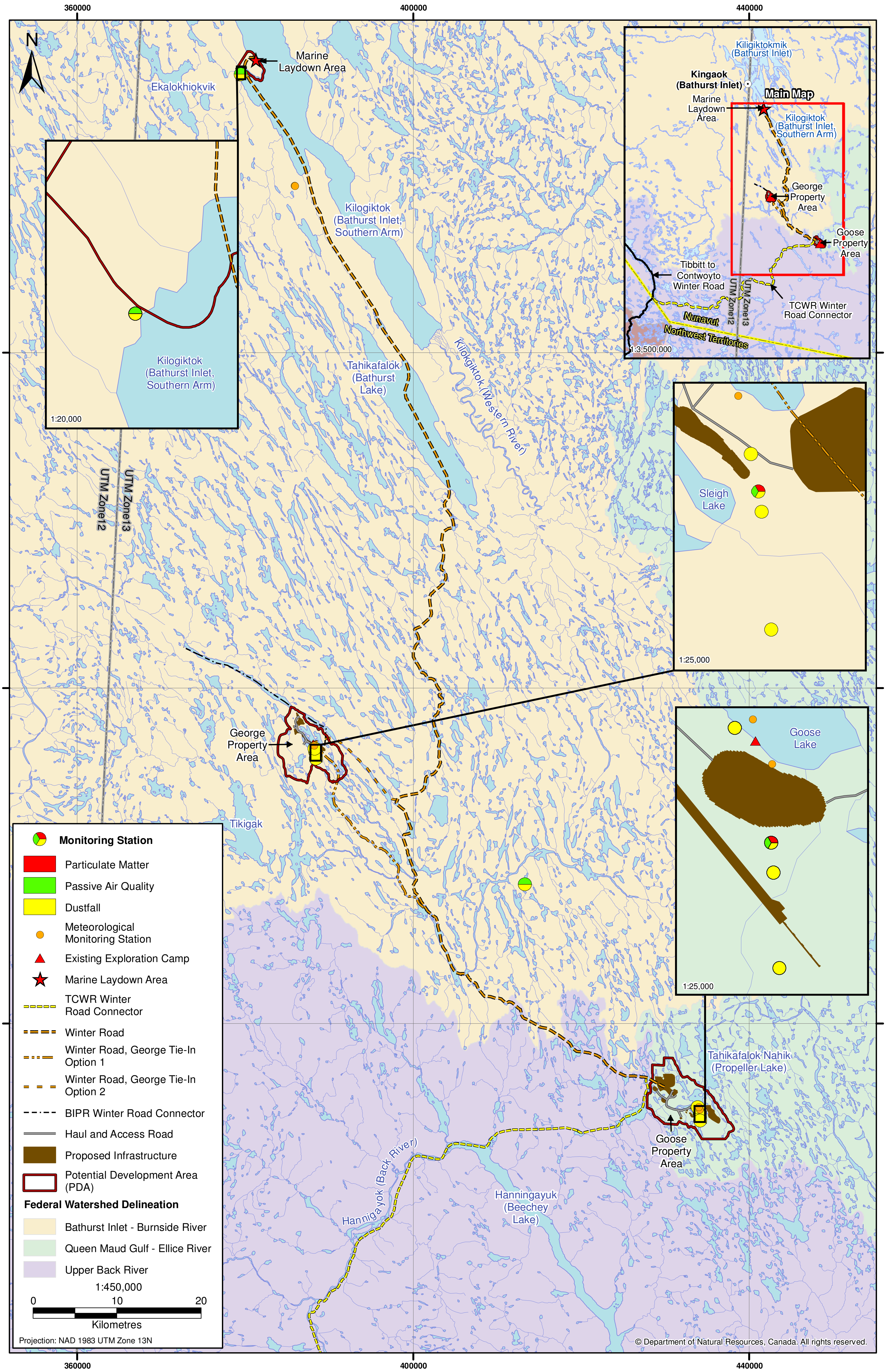

Figure 7.1-1

Example Air Quality and Dust Monitoring Locations

Sabina GOLD & SILVER CORP.

Rescan an ERM company

Figure 7.1-1

7.2.1 Sample Locations

Baseline dustfall data collection has taken place since 2011. The 2011 dustfall monitoring program was carried out at five locations within the Goose Property Area and in 2012 monitoring was carried out at four locations within the Goose Property Area, one location within the George Property Area and one location in the Marine Laydown Area. In 2013, there were six monitoring locations within the Project area. The stations monitor dustfall over consecutive 30 day periods from approximately June until September.

Upon Project approval, monitoring would be carried out during the construction and operation of the Project. At the Goose Property Area and the George Property Area, the monitoring will be sited approximately 100 m, 300 m, and 1 km downwind, and 100 m upwind of the location with the most activity – the locations will therefore change depending on which pit is operational. At the Marine Laydown Area a dustfall monitoring site will be sited approximately 100 m downwind of the site. An example of the monitoring locations is shown in Figure 7.1-1. The monitoring locations are based on the assumption that the Locale 2 Pit and the Main Pit are operational. The exact locations of the sites will be determined based on the final project specifications.

There will also be one additional monitoring site located between the Goose and George Project Areas, away from the project activities, in order to measure background concentrations (Figure 7.1-1).

7.2.2 Sampling Methods

Dustfall collection is a passive monitoring method which provides a measure of particulates that would be directly deposited onto vegetation or soil. There are various sampling methodologies available, but the basis of all methodologies is that canisters of a known cross sectional area are exposed in the field to collect and retain ambient dustfall. The canisters are then sent to a laboratory for analysis after a set exposure period.

The baseline dustfall monitoring program was developed in accordance with sampling method ASTM D1739-98 (ASTM Standard D1739-98 Reapproved 2010) and would continue to use this method for future monitoring. The dustfall monitoring stations collect particles small enough to pass through a 1 mm screen and large enough to settle by virtue of their weight. This method requires containers of a standard size and shape, which are sealed in a laboratory. The containers are installed on a 2 m pole, surrounded by a windscreen and are each exposed to the atmosphere for approximately 30 days during the summer months.

Samples are sent to the laboratory for analysis of total, soluble and insoluble particulate matter. Each dustfall station is comprised of two sample containers with separate mounts. One of the containers is analysed for particulates (total, soluble and insoluble) and anions (sulphate, nitrate, chloride and ammonia), while the other is analysed for total metals and various cations. The containers are partially filled with deionized water and algaecide to prevent re-suspension of dust and growth of algae in the containers. The windscreen around the sample container improves the dustfall collection efficiency and bird spikes are used to minimize contaminants from bird faeces.

7.2.3 Data Analysis

The dustfall monitoring provides a 1-month average ground-level mass of deposited dust. This is compared to the relevant BC guidelines since Nunavut does not have dustfall standards (Table 4.1-1). In addition, analysis of temporal trends is undertaken to determine any increasing trends in the measured concentrations, with consideration to the time of year and meteorological conditions.

The monitoring data will also be used to provide feedback to modify the dust management procedures incorporated at the site, if required. However, sampling does not occur in “real time” and there will be a delay between the events that lead to any elevated dust deposition and the receipt of monitoring results.

7.3 PARTICULATE MONITORING (PM_{10}, $PM_{2.5}$, AND TSP)

The generation of particulate matter is expected as a result of the movement of vehicles, mobile equipment, crushing, blasting, bulk handling and storage and other associated mineral processing and construction activities. Wind erosion can also generate particulate emissions. Suspended particulate matter is a complex multi-phase system of airborne solid and low vapour pressure liquid particles having aerodynamic particle sizes from 0.01 to 100 μm in diameter.

7.3.1 Sample Locations

Ambient suspended particulate matter will be measured via monitoring of TSP, PM_{10}, and $PM_{2.5}$ concentrations at the following four locations:

- At the Marine Laydown Area.
- At a dustfall/PASS site within the Goose Property Area.
- At a location along the proposed winter road connecting the George Property Area and the Goose Property Area.
- At a dustfall/PASS site within the George Property Area.

Monitoring will be carried out during the construction and operation of the Project. Specific station locations will be sited approximately 100 m downwind of the location with the most activity, the locations will therefore change depending on which pit is operational. The exact locations of the sites will be determined based on the final project specifications.

7.3.2 Sampling Methods

TSP, PM_{10}, and $PM_{2.5}$ measurements will be taken by drawing a known quantity of air through a pre-weighed filter using a BGI PQ100-FRM Sampler. Collection of TSP will occur simply by passing ambient air through the filter, while PM_{10} and $PM_{2.5}$ measurements will require the air to pass through a size exclusion cyclone prior to reaching the filter. All filters will be pre and post weighed by an accredited laboratory. Two 24-hour period samples for each type will be taken at each of the four different locations.

Monitoring of TSP, PM_{10}, and $PM_{2.5}$ concentrations will be carried out according to the National Air Pollution Surveillance (NAPS; Environment Canada 2011) schedule which follows a monitoring cycle where a single 24-hour sample is collected every six days. Sampling in accordance with the NAPS schedule provides consistency between the on-site stations and stations at other facilities across the country. In addition, by operating on a six day cycle, different days will be sampled each week thus allowing for differing production intensity, or other cyclical production variations.

Additional factors, not specified in standard site selection criteria, will also be considered. Due to the very cold climate the air samplers will be installed inside a shelter. This should minimize sample schedule interruptions potentially caused by cold weather, wet conditions and excess humidity (filter conditioning), air leaks, and pump malfunctioning. The monitoring site location will be free from obstructions and nearby pollutant sources that may cause interference in suspended particulate monitoring.

7.3.3 Data Analysis

The particulate sampling provides a 24-hour average ground-level concentration for each size fraction. This is compared to the relevant 24-hour standards (Table 4.1-1). In addition, temporal trends of the TSP, PM_{10}, and $PM_{2.5}$ ambient concentrations are examined taking in to consideration the time of year and meteorological conditions of the sampling period.

The monitoring data will also be used to provide feedback to modify the dust and air quality management procedures incorporated at the site, if required. However, sampling does not occur in "real time" and there will be a delay between the events that lead to any elevated concentrations and the receipt of monitoring results.

7.4 METEOROLOGICAL MONITORING PROGRAM

Baseline meteorological data collection has been collected episodically since 2004. A meteorological monitoring program is ongoing. There are currently three meteorological stations in the Back River Project area, one within the Goose Property Area, one within the George Property Area, both installed in August 2004, and a micro-met station at Goose Lake, which was installed in July 2012.

The Goose and George stations measure hourly values of temperature, wind speed, wind direction, relative humidity, solar radiation and rainfall. The Goose Lake micro-met station measures air temperature, water temperature, rainfall, wind speed, wind direction and global radiation in order to determine evaporation rates during the open water season.

Meteorological monitoring will occur at these locations during the construction and operation of the Project. The locations of the meteorological stations are shown in Figure 4.1-1.

7.5 INCINERATOR STACK TESTING

An Incinerator Stack Testing program will be implemented to measure emissions of dioxins, furans and mercury from the waste incinerator(s). A stack test will be conducted following the commissioning of each permanent incinerator. It will then be assumed that all other incinerators being operated under similar conditions will have similar emissions. Stack test results to be reported to NIRB and Environment Canada as required.

The sampling and analytical methods used for the dioxin and furan emissions testing will conform to the procedures outlined in the Environment Canada – Environmental Protection Service (EC-EPS 1989) emission monitoring reference method manuals. The sampling and analytical methods used for the mercury emissions testing will conform to the procedures outlined in the Environment Canada – Environmental Protection Service (EC-EPS 1993) emission monitoring reference method manuals.

The collection and analysis of samples will be undertaken by an accredited laboratory. Following each stack emissions testing program an Incinerator Stack Testing Compliance Report will be completed. This report will include a description of the incinerator and how it was being operated at the time of the stack emissions testing program, the methods used for sampling and analysis and a discussion of the results, including comparison with the Canada Wide Standards for Dioxins and Furans (CCME 2000a) and the Canada Wide Standards for Mercury (CCME 2000b).

7.6 CONSTRUCTION MONITORING

In addition to the dustfall monitoring stations described above, additional stations will be established to increase the number of dustfall stations used to monitor construction dust emissions. These monitoring locations will be selected based on the following:

- Samplers will be sited up and down wind of the zones of high activity, taking into account the dominant wind direction during the survey period.

- The samplers will be more than 20 m away from other structures, and major topographic features.
- The samplers will be safely accessible.

7.7 GHG MONITORING

A desktop assessment of GHG emissions will be carried out annually to determine whether reporting is required. Sources of GHG emissions (e.g. fuel use for power, mobile and stationary equipment operation) will be monitored and resultant data will be used for GHG assessments.

7.8 SUMMARY

Table 7.8-1 shows the monitoring schedule for air quality and GHG emission monitoring. Monitoring is not considered necessary during care and maintenance or closure phases as there is not expected to be any significant air emission sources.

8. Mitigation and Adaptive Management

The purpose of the Air Quality Monitoring and Management Plan is to document the mitigation measures that will be implemented on site and to document the monitoring programs that will be in place. The plan is intended to ensure air quality levels meet existing legislation, while taking into account operational requirements. Results from the monitoring programs will be reviewed annually to determine if any trends are evident and if target criteria are being met. The need for any corrective actions to on-site emission 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:

- Monitoring data showing concentrations greater then applicable standards.
- Monitoring data showing an increasing trend in contaminant concentrations.
- Issues raised by on-site staff, regulators, or local communities.

Discussions will be initiated to resolve any issues as soon as possible after the issue has been identified.

Measures described in the Air Quality Monitoring and Management Plan apply to all Project components for the life of the Project, unless otherwise indicated. This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the monitoring program (Section 7). The Management Plan is a “living document.” Components of the Air Quality Monitoring and Management Plan may need to be revised over the life of the Project, based on regulatory changes and/or technological advances. Any modifications made to the overall Plan will be communicated to regulatory authorities where applicable.

The monitoring program (Section 7) is intended to monitor the effectiveness of mitigation actions (Section 6). The results of mitigation activities will be reported in an annual report. In addition, the results of facility-specific monitoring programs will be reported in the annual report, along with suggestions for further mitigation activities.

This circle of mitigation activities, monitoring and evaluation and new mitigation activities will adaptively manage air quality issues identified and arising as a result of the Project.

Table 7.8-1. Air Quality Monitoring Schedule

Monitoring	Baseline and Pre-construction	Site Preparation and Construction	Operation	Temporary Closure	Care and Maintenance	Reclamation and Closure	Post-closure
PASS	Required	Required	Required	Monitoring is not considered necessary; however, the plan will be re-evaluated as required.			
Dustfall	Required	Required	Required	Monitoring is not considered necessary; however, the plan will be re-evaluated as required.			
Particulate Matter	Required	Required	Required	Monitoring is not considered necessary; however, the plan will be re-evaluated as required.			
Incinerator Stack Testing	Not considered necessary	Required if incinerator installed	Required if incinerator installed	Monitoring is not considered necessary; however, the plan will be re-evaluated as required.			
Construction Monitoring	Required	Not considered necessary	Not considered necessary	Monitoring is not considered necessary; however, the plan will be re-evaluated as required.			
GHG	Not considered necessary	Annual checks	Annual checks	Monitoring is not considered necessary; however, the plan will be re-evaluated as required.			

9. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project, and evaluates the compliance of the Project and its sub-contractors. Evaluation of predicted effects will be conducted through facility-specific monitoring (Section 7). The monitoring, quality control, and reporting procedures detailed in this plan will be used to:

- Assess the effectiveness of mitigation and management measures.
- Identify Project effects requiring further mitigation efforts.
- Comply with requests from regulators and stakeholders.
- Adapt to changes in the regulations or the Project.

10. Record Keeping

Record keeping will be conducted by The Proponent and its subcontractors. Data will be entered into suitable electronic databases, checked for quality control and stored with subcontractor responsible for monitoring and with The Proponent. Data will be entered in a format and program that allow for comparison between years and storage in a single file format for each type of survey or monitoring activity. QA/QCed data will be appended to the annual Air Quality Monitoring and Management Plan report and the compilation of all years data will be transferred for storage with the Government of Nunavut, Department of Environment.

All formal documents and reports will follow version-control procedures with revision tracking and version numbers. Version control information will be required for all documents and data that are issued, and approval will be given and tracked before issue. Designated personnel will coordinate preparation, review, and distribution, as appropriate, of the data and reports required for regulatory purposes.

11. Environmental Reporting

The results of the Air Quality Monitoring and Management Plan will be reported in various annual reports each year during construction and operation and will be provided to NIRB and other regulators where appropriate. The following reports will be produced:

- Annual Meteorology Compliance Report.
- Annual Air Quality Compliance Report.
- Incinerator Stack Testing Compliance report (when applicable).
- Construction Monitoring Report (when applicable).
- GHG Emission Report (when applicable).

It is not considered necessary to produce an annual report during care and maintenance, closure, periods of temporary closure and post closure. An air quality assessment will be carried out at the start of each of these stages and if no significant air quality sources are identified, no further reports will be produced. If significant sources are identified reporting will be continued on an annual basis.

12. Plan Effectiveness

The Plan is intended to ensure that the Project is conducted as proposed, mitigation and management measures are effective at mitigating adverse air quality effects, and relevant laws and regulations are met. As part of environmental reporting, The Proponent will distribute copies of the annual report to stakeholders. The Proponent will also conduct an annual (or as necessary) evaluation of the efficacy of mitigation and management activities and of monitoring activities using relevant methods. Should new, more sensitive, monitoring methods be introduced, or existing methods be found to lack statistical power or a robust design, updated methods will be proposed to the stakeholders in a revised plan. This Plan may be updated as frequently as every year, or not at all, if the mine plan, and methods for mitigation and monitoring be found to be robust. The new plan will be implemented following review by stakeholders and an opportunity for response by The Proponent.

13. QA/QC

Quality assurance and quality control (QA/QC) measures will be undertaken at three key stages in monitoring activities: 1) during data gathering, 2) during data entry and analysis, and 3) through reporting and reassessment of methods as part of the evaluation of Plan Effectiveness.

The process of data gathering in the field will be quality controlled through the use of qualified personnel and a system of pre- and post-field checks to ensure that consistent, repeatable data is being gathered. Standard Operating Procedures (SOP) will be established for all environmental data collection. All personnel will have necessary training and accreditation. QA/QC of data entry will be conducted via a process of standard data entry templates, and checking data through either double-entry data or feedback entry, where entered data is checked back to the field cards. QA/QC of data analysis will be conducted through a process of clear, written instructions for data analysis and pre-and post-analysis checks. Finally, the efficacy of the methods as a whole will be evaluated through repeated scrutiny of the data using power analysis and through review by stakeholders. SOPs will be reassessed and updated when necessary, as part of the re-iterative QA/QC process.

The re-iterative QA/QC procedures will continuously improve the effectiveness of the Management Plan to detect Project-related air quality effects. These QA/QC processes are important in the overall Adaptive Management of Project effects, and will support the goals of the Project to minimise, mitigate and/or manage potential adverse effects.

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18. Noise Abatement Plan

BACK RIVER PROJECT
Noise Abatement Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
NOISE ABATEMENT PLAN

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Appendix A. *Mine Health and Safety Act* – Consolidation of Mine Health and Safety Regulations

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

dBA	Sound levels measured with an A-weighted filter, which is within a response frequency range for humans and animals, between 1 kHz to 4 kHz (1,000 to 4,000 vibrations per second)
dBC	Unit used to measure C-weighted sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans.
DEIS	Draft Environmental Impact Statement
NIRB	Nunavut Impact Review Board
QA	Quality Assurance
QC	Quality Control
SOP	Standard Operating Procedures
VEC	Valued Ecosystem Component

1. Introduction

The Back River Project (hereafter "the Project") has been designed to minimize, mitigate, and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects. As part of the final Environmental Impact Statement (EIS) guidelines issued by the Nunavut Impact Review Board (NIRB), this document presents the Noise Abatement Plan that Sabina Gold & Silver Corp. (hereafter "Sabina") will follow concurrent with the development of the Project.

The Noise Abatement Plan is a "living document." It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes.

2. Scope and Objectives

The intent of this plan is to outline the requirements for occupational noise monitoring, control and worker protection. The Plan targets the noise valued ecosystem component (VEC) that is included in the draft Environmental Impact Statement (DEIS). Project activities will create noise, however, the Project has been designed to minimize or eliminate potential adverse effects on workers as described in this Plan.

This Plan includes the following:

- Applicable legislation and guidelines for occupational noise.
- Operational controls focused on worker protection.
- An occupational noise monitoring program.

Mitigation and adaptive management measures focused on minimizing the potential effects of noise on select wildlife species are provided in the Wildlife Mitigation and Monitoring Plan (Chapter 20).

3. Planning and Implementation

Planning for the Noise Abatement Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Noise management will be tracked, reviewed, and updated through ongoing maintenance of the plan. Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

The noise monitoring component of the Occupational Health and Safety Program will comply with the Consolidation of Mine Health and Safety Regulations under the territorial *Mine Health and Safety Act* (1994; Sections 9.19 through 9.26 and Schedule 5), the relevant portions of which can be found in Appendix A. Schedule 5 states:

> *No person may be exposed without hearing protection to -*
>
> *(a) steady state noise[1] over 109 dBA;*
>
> *(b) a maximum equivalent noise level exceeding 85 dBA for an eight-hour shift, or exceeding the equivalent exposure level set out in* [Table 4-1]*; and*
>
> *(c) impact noise[2] at a peak pressure level exceeding 140 dBC, or exceeding the maximum levels set out in* [Table 4-2].
>
> *Where the maximum noise level permitted in paragraph (1)(a), (b) or (c) is exceeded at a work site, a person shall be provided with and shall use the hearing protection recommended in Table A1 of the standard CAN/CSA Z94.2-94, Hearing Protectors.*

Table 4-1. Exposure Limits Equivalent to 85 dBA/Eight-hour Shift

Length of Exposure	Average Noise Level
16 hours	82 dBA
12 hours	83 dBA
10 hours	84 dBA
8 hours	85 dBA
4 hours	88 dBA
2 hours	91 dBA
1 hour	94 dBA
½ hour	97 dBA
¼ hour	100 dBA

Table 4-2. Impact Noise Exposure Limits

Peak Pressure Level (decibels)	Maximum Permitted (impulses per eight-hour day)
120	10,000
130	1,000
140	100
Greater than 140	0

Two main health effects of working with noise are hearing loss and stress. Workplace noise can be

[1] "steady state noise" means noise in which variations of peak pressure levels occur in one second or less.
[2] "impact noise" means noise in which variations of peak pressure levels occur at intervals greater than one second apart.

caused by traffic, pneumatic tools, power tools, machinery and ventilation systems, for example. Regulations followed by the employer are meant to protect workers from excessive noise levels.

Noise exposure limits depend on duration of exposure, noise level, and whether the noise is steady state (i.e., constant) or impulse. An employer must ensure that a worker is not working with a noise level above the exposure limits set in these regulations.

Sabina and its contractors will comply with the Mine Health and Safety Regulation requirements for the management and mitigation of workplace noise exposure.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Safety Superintendent along with his/her direct reports are responsible for the implementation of safety aspects of this plan including:

- Overall management of plan.
- Monitoring.
- Operational aspects.
- Internal reporting.
- External reporting.
- Ensuring compliance and adaptive management.

Section 9.19 of the Consolidation of Mine Health and Safety Regulations (Appendix A), states that ”The manager shall take all reasonable measures to ensure the noise levels at work sites in a mine do not exceed the exposure levels shown in Schedule 5 (Noise Exposure).”

6. Environmental Protection Measures

6.1 MITIGATION MEASURES

The following section outlines operational controls that will be implemented during the construction, operation, and care and maintenance and closure phases of the Project. These operational controls were developed in order to minimize workplace noise.

6.1.1 Construction Phase

Noise control during the construction phase of the Project will be focused on materials handling and transportation sources. Based on experience from other mine projects the following noise controls are being considered:

- Ensuring equipment is fitted with appropriate mufflers and silencers.

- Identifying enclosures, berms, acoustic screening and shrouding where stationary sources require control.
- Ensuring equipment is well maintained.

6.1.2 Operation Phase

Noise control during operations will focus on the quarry and crushing areas (materials handling), power generation, processing, mine ventilation and blasting activities. Based on experience from other mine projects the following noise controls are being considered:

- Ensuring equipment is fitted with appropriate mufflers and silencers.
- Identifying enclosures, berms, acoustic screening and shrouding where stationary sources require control.
- Ensuring equipment is well maintained.
- Housing stationary sources in buildings, where feasible.
- Impulse events, such as blasting, will be limited to certain times of the day.
- Scheduling of take-off and landing aircrafts will be limited to certain times of the day.
- Other possible general noise abatement measures that can be implemented on site to minimize static noise due to generators, vehicles, and other sources.

6.1.3 Care and Maintenance and Closure Phases

Noise control during closure will be focused on the tailings pond closure activities, plant and mine areas. Most of the noise sources during closure will be from transportation vehicles. Based on experience from other mine projects the following noise controls are being considered:

- Ensuring equipment is fitted with appropriate mufflers and silencers.
- Identifying enclosures, berms, acoustic screening and shrouding where stationary sources require control.
- House stationary sources in buildings.
- Ensuring equipment is well maintained.

Any sources requiring mitigation identified during monitoring will be addressed using the above mitigation or engineered controls as appropriate. Noise controls that are used will be documented in the noise monitoring report.

Initial controls will be documented prior to Project start-up and the list maintained as additional control needs are identified through the monitoring plan.

6.2 OCCUPATIONAL NOISE MANAGEMENT

The Occupational Noise Management Plan will outline steps that Sabina can take to mitigate negative effects caused by noise. These procedures include the following:

- Where the noise is constant and measurements show noise levels in excess of 85 dBA, the area shall be clearly marked by signs indicating that hearing protection is required.

- Attempting to lower the noise level, reduce the length of exposure, and separate the worker from the sources of noise where they exceed the allowable limits.
- Provide suitable hearing protection, to be used in accordance with recommendations outlined in the *Canadian Standards Association Standard Z.94.2-02, Hearing Protectors* (2002), where other mitigation and management options are not available or reasonable.
- In any area where the noise level may exceed 85 dBA, the manager shall ensure that effective procedures are provided to protect employees from any harmful effects of the noise and copies of the procedures are sent to the chief inspector and given to the Safety Superintendent.

In addition, Sabina will adopt an average constant upper noise limit of 83 dBA for determining where noise protection must be made mandatory and the point at which noise mitigation measures should be focused as a priority. This noise level corresponds with the noise level limit for a 12-hour exposure time.

Sabina and its contractors will comply with all applicable regulations, including the implementation of a hearing conservation program that will include the following (where required):

- Awareness and training of employees, contractors and visitors.
- Noise surveys of worksites and equipment.
- Engineering and administrative controls.
- Hearing protection for employees.
- Audiometric testing.
- Consultation with employees.

Sabina and its contractors will also follow the Mine Health and Safety Regulation requirements specific for:

- Noise exposure limits (including steady state (i.e., constant) and impulse noise).
- Measurement of noise levels.
- Hearing protection.
- Audiometric testing.

7. Monitoring Program

The purpose of the monitoring program is to assess the magnitude of noise impacts from Project activities. Section 9.20 of the Consolidation of Mine Health and Safety Regulations (Appendix A), states that the manager shall ensure that a noise level survey is conducted at all work sites and the results of every noise level survey shall be given to the Committee and made available to an inspector. Sabina does not currently have an Occupational Health and Safety Committee planned, therefore the results will be given to the Safety Superintendent.

The main activities expected to cause noise impacts included the mine site camp operations (including vehicles, generators, incinerators), aircraft activities, mining, crushing, drilling and transportation activities.

The noise monitoring will be carried out by a qualified professional using a noise level meter. The following noise levels will be monitored at all locations were workers may be present:

- dBA during an eight hour period.
- dBC during impact events.

A-weighting is the most commonly used parameter when a single-number overall sound level is needed. Results are expected to indicate human perception or the effects of sound on humans. A-weighting accounts for the reduced sensitivity of humans to low-frequency sounds, especially at lower sound levels. C-weighting is used to evaluate sounds containing strong low-frequency components. It was originally devised to approximate human perception of high-level sounds.

Table 7-1 shows the monitoring schedule for occupational noise monitoring. Monitoring is required when equipment is first commissioned and then on an annual basis, or if an employee requests monitoring to be undertaken. Monitoring is not considered necessary during care and maintenance or closure phases as there is not expected to be any significant noise sources.

Sabina will also have a noise monitoring component in the Occupational Health and Safety Program. The noise monitoring component of the Occupational Health and Safety Program will comply with the Consolidation of Mine Health and Safety Regulations under the territorial *Mine Health and Safety Act* (Sections 9.19 through 9.26 and Schedule 5), the relevant portions of which can be found in Appendix A.

8. Mitigation and Adaptive Management

The Noise Abatement Plan describes actions that are intended to reduce occupational noise effects on workers. The plan is intended to ensure occupational noise levels meet existing legislation, while taking into account operational requirements.

Measures described in the Noise Abatement Plan apply to all Project components for the life of the Project, unless otherwise indicated. This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the monitoring program (Section 7). The Management Plan is a “living document.” It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes

The monitoring program (Section 7) is intended to monitor the effectiveness of mitigation actions (Section 6). The results of mitigation activities will be reported in an annual report. In addition, the results of facility-specific monitoring programs will be reported in the annual report, along with suggestions for further mitigation activities.

This circle of mitigation activities, monitoring and evaluation and new mitigation activities will adaptively manage occupational noise issues identified and arising as a result of the Project.

Table 7-1. Occupational Noise Monitoring Schedule

Phase Component	Baseline and Pre-construction	Site Preparation and Construction	Operation	Temporary Closure	Care and Maintenance	Reclamation and Closure	Post-closure
All areas where workers will be present.	Noise monitoring is not considered necessary.	Commissioning of any new equipment. Annual checks. If requested by employee.	Commissioning of any new equipment. Annual checks. If requested by employee.	Noise monitoring is not considered necessary, however the plan will be re-evaluated as required.			

9. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project on workers, and evaluates the compliance of the Project and its sub-contractors. Evaluation of predicted effects will be conducted through facility-specific monitoring (Section 7). The monitoring, quality control, and reporting procedures detailed in this plan will be used to:

- Assess the effectiveness of mitigation and management measures.
- Identify Project effects requiring further mitigation efforts.
- Comply with requests from regulators and stakeholders.
- Adapt to changes in the regulations or the Project.

10. Record Keeping

Record keeping will be conducted by Sabina and its subcontractors. Data will be entered into suitable electronic databases, checked for quality control and stored with subcontractor responsible for monitoring and with Sabina. Data will be entered in a format and program that allow for comparison between years and storage in a single file format for each type of survey or monitoring activity. QA/QC data will be appended to the annual Noise Abatement report and the compilation of annual data will be transferred for storage with the Government of Nunavut, Department of Environment.

All formal documents and reports will follow version-control procedures with revision tracking and version numbers. Version control information will be required for all documents and data that are issued, and approval will be given and tracked before issue. Designated personnel will coordinate preparation, review, and distribution, as appropriate, of the data and reports required for regulatory purposes.

Section 9.20 of the Consolidation of Mine Health and Safety Regulations (Appendix A), states that the results of every noise level survey shall be given to the Committee and made available to an inspector. Section 9.20 also states that in any area where the noise level may exceed 85 dBA, the manager shall ensure that effective procedures are provided to protect employees from any harmful effects of the noise and copies of the procedures are sent to the chief inspector and given to the Committee. Sabina does not currently have an Occupational Health and Safety Committee planned, therefore the results will be given to the Safety Superintendent.

11. Environmental Reporting

The Noise Abatement Plan will be reported on each year during construction and operation. The report will include monitoring data from the monitoring programs. Reporting on mitigation and management activities, including performance will be reported in an appendix to the report.

The report may be delivered to relevant regulatory agencies and stakeholders, the Government of Nunavut, and any monitoring partners involved in collaborative effects assessment.

It is not considered necessary to produce an annual report during care and maintenance, closure, periods of temporary closure and post closure. A noise assessment will be carried out at the start of each of these stages and if no significant noise sources are identified, no further reports will be produced. If significant sources are identified reporting will be continued on an annual basis.

12. Plan Effectiveness

The Plan is intended to ensure that the Project is conducted as proposed, mitigation and management measures are effective at mitigating adverse noise effects on workers, and relevant laws and regulations are met. As part of environmental reporting, The Proponent will distribute copies of the annual report to stakeholders. The Proponent will also conduct an annual (or as necessary) evaluation of the efficacy of mitigation and management activities and of monitoring activities using relevant methods. Should new, more sensitive, monitoring methods be introduced, or existing methods be found to lack statistical power or a robust design, updated methods will be proposed to the stakeholders in a revised plan. This plan may be updated as frequently as every year, or not at all, if the mine plan, and methods for mitigation and monitoring be found to be robust. The new plan will be implemented following review by stakeholders and an opportunity for response by The Proponent.

13. QA/QC

Quality assurance and quality control measures will be undertaken at three key stages in monitoring activities: 1) during data gathering, 2) during data entry and analysis, and 3) through reporting and reassessment of methods as part of the evaluation of Plan Effectiveness.

The process of data gathering in the field will be quality controlled through the use of qualified personnel and a system of pre- and post-field checks to ensure that consistent, repeatable data is being gathered. Standard Operating Procedures (SOP) will be established for all environmental data collection. All personnel will have necessary training and accreditation. QA/QC of data entry will be conducted via a process of standard data entry templates, and checking data through either double-entry data or feedback entry, where entered data is checked back to the field cards. QA/QC of data analysis will be conducted through a process of clear, written instructions for data analysis and pre-and post-analysis checks. Finally, the efficacy of the methods as a whole will be evaluated through repeated scrutiny of the data using power analysis and through review by stakeholders. SOPs will be reassessed and updated when necessary, as part of the re-iterative QA/QC process.

The reiterative QA/QC procedures will continuously improve the effectiveness of the Management Plan to detect Project-related noise effects. These QA/QC processes are important in the overall Adaptive Management of Project effects, and will support the goals of the Project to minimize, mitigate and/or manage potential adverse effects on workers.

References

1994. *Mine Health and Safety Ac*t. SNWT (Nu) 1994, c 25.

Canadian Standards Association. *2002. Standard Z.94.2-02, Hearing Protection Devices - Performance, Selection, Care, and Use.*

Appendix A

Mine Health and Safety Act – Consolidation of Mine Health and Safety Regulations

(4) Abrasive blasting and similar operations conducted outside a building shall be conducted in a place and in a manner that prevents injury to persons.

Protective Equipment

9.16. (1) Where an abrasive blasting operation is being conducted, the manager shall supply and employees shall wear air-supplied hoods or respirators suitable for the work, together with gloves, leggings and clothing designed to protect the employees from dust and projected abrasive or other material.

(2) Air supplied to the hood or respirator shall meet the requirements of the standard CAN3-Z180.1-M85, *Compressed Breathing Air and Systems*, and the volume of air supplied shall be sufficient for respiration and to prevent the entry of contaminants into the hood or respirator and shall not be less than 105 *l* per minute of air to tight fitting face-pieces and 170 *l* per minute of air to loose-fitting helmets, hoods and suits.

Nozzles and Valves

9.17. (1) Blast cleaning nozzles shall be equipped with an operating valve that must be held open manually and the normal operation of this valve shall not be defeated.

(2) A support shall be provided on which the nozzle referred to in subsection (1) can be secured when not in use.

(3) In addition to the operating valve required by subsection (1), another operating control shall be readily accessible to the operator to enable the flow of abrasive material to be stopped immediately.

Workers to be Removed

9.18. (1) Where an abrasive blasting or a similar operation releases harmful substances into the atmosphere, persons who are not required to assist in the operation shall be removed from contaminated areas.

(2) Where removal of persons as required by subsection (1) is not practical, the exposed persons shall be advised of the hazard and supplied with suitable personal protective equipment and the exposed persons shall wear the equipment.

NOISE

Exposure Levels

9.19. The manager shall take all reasonable measures to ensure the noise levels at work sites in a mine do not exceed the exposure levels shown in Schedule 5 (Noise Exposure).

Measurements of Noise Levels

9.20. (1) The manager shall ensure that a noise level survey is conducted at all work sites.

(2) The results of every noise level survey shall be given to the Committee and made available to an inspector.

(3) Where the noise is constant and measurements show noise levels in excess of 85 dBA, the area shall be clearly marked by signs indicating that hearing protection is required.

(4) In any area where the noise level may exceed 85 dBA, the manager shall ensure that effective procedures are provided to protect employees from any harmful effects of the noise and copies of the procedures are sent to the chief inspector and given to the Committee.

(5) Where personal noise dosimeters are used they shall have the following measurement specifications:

(a) a noise measurement exchange rate of 3 dB;

(b) a threshold level of 75 dBA or lower; and

(c) if measurement is expressed as a percentage, a reading of 100% for an average exposure of noise equivalent to 85 dBA for eight hours (Lex).

R-016-2003,s.92.

9.21. Repealed, R-016-2003,s.93.

Hearing Protection

9.22. (1) Subject to subsection (2), the selection of the type of hearing protection devices provided by the owner is a matter to be jointly decided by the manager and the Committee or, where there is no Committee in place, other representatives of the employees.

(2) Hearing protective devices shall be used in accordance with the recommendations of Table A1 (Selection of Hearing Protectors) in the standard CAN/CSA Z.94.2-94, *Hearing Protectors*.

9.23. Where an inspector has reason to believe that the type of hearing protective device provided by the manager is unsuitable for use by the employee, the inspector may require the manager to provide an alternative type.

9.24. Every manager shall ensure that any mould of the auditory canal taken for manufacture of a hearing protective device shall be moulded for the employee by a qualified person and the initial fitting of the employee shall be done by a qualified person.

9.25. The manager shall develop and implement a hearing conservation program that shall include:

(a) education of the employees;
(b) noise surveys of work sites and equipment;
(c) engineering and administrative controls;
(d) hearing protection for employees;
(e) audiometric testing; and
(f) consultation with employees.

Audiometric Testing

9.26. (1) Every employee who works in an environment where the noise level is 80 dBA or greater shall, at the expense of the owner, be given an audiometric test for hearing acuity by a person who is certified, by a body acceptable to the chief inspector, to conduct such tests

(a) on commencing employment;
(b) annually on the anniversary of commencing employment; and
(c) at any other time when required by the manager or the chief inspector.

(2) The manager shall keep on file a record of the audiometric tests and the record shall be available for examination by an inspector.

(3) The manager shall give the results of an audiometric test of an employee to the employee within three days of receiving the results. R-016-2003,s.94.

NON-INHALATION EXPOSURE

Injury to Eyes

9.27. (1) Where there is potential for injury by eye contact, a manager shall

(a) provide exposed workers with such personal protective equipment as may be appropriate to their actual or potential exposure, including safety glasses, goggles or face shields or other eye protective equipment that complies with CSA Standard CAN/CSA Z94.3-M88, *Industrial Eye and Face Protectors*; and
(b) provide, at or near the exposure site, the appropriate hygiene facilities including portable eye wash stations or eye wash fountains and maintained in a hygienic and working condition.

SCHEDULE 5

(*Section 9.19*)

NOISE EXPOSURE

1. (1) In this Schedule,

(a) "steady state noise" means noise in which variations of peak pressure levels occur in one second or less; and

(b) "impact noise" means noise in which variations of peak pressure levels occur at intervals greater than one second apart.

(2) For purposes of Table 2, an unweighted peak measurement may be used if an instrument is not available to measure a C-weighted peak.

2. (1) No person may be exposed without hearing protection to

(a) steady state noise over 109 dBA;

(b) a maximum equivalent noise level exceeding 85 dBA for an eight-hour shift, or exceeding the equivalent exposure level set out in Table 1; and

(c) impact noise at a peak pressure level exceeding 140 dBC, or exceeding the maximum levels set out in Table 2.

(2) Where the maximum noise level permitted in paragraph (1)(a), (b) or (c) is exceeded at a work site, a person shall be provided with and shall use the hearing protection recommended in Table A1 of the standard CAN/CSA Z94.2-94, *Hearing Protectors*.

Table 1

Exposure Limits Equivalent to 85 dBA/Eight-Hour Shift

Length of Exposure	Average Noise Level
16 hours	82 dBA
12 hours	83 dBA
10 hours	84 dBA
8 hours	85 dBA
4 hours	88 dBA
2 hours	91 dBA
1 hour	94 dBA
½ hour	97 dBA
¼ hour	100 dBA

Table 2

Impact Noise Exposure Limits

Peak Pressure Level (decibels)	Maximum Permitted (impulses per eight-hour day)
120	10,000
130	1,000
140	100
greater than 140	0

19. Conceptual Aquatic Effects Management Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Conceptual Aquatic Effects Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
CONCEPTUAL AQUATIC EFFECTS MANAGEMENT PLAN

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Glossary and Abbreviations

AEMP	Aquatic Effects Monitoring Program
ANOVA	Analysis of Variance
ARD	Acid rock drainage
BACI	Before-After/Control-Impact
BMP	Best management practices
CCME	Canadian Council of Ministers of the Environment
DEIS	Draft Environmental Impact Statement
DFO	Department of Fisheries and Oceans
DO	Dissolved oxygen
EEM	Environmental Effects Monitoring
ISQG	Interim Sediment Quality Guidelines
LSA	Local study area
MEND	Mine Environmental Neutral Drainage
ML	Metal leaching
MLA	Marine Laydown Area
MMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NWB	Nunavut Water Board
PAG	Potentially Acid Generating
PEL	Probable effects levels
RSA	Regional study area
SOP	Standard Operating Procedures
the Project	the Back River Project
TBD	To be determined
TIA	Tailings Impoundment Area
VEC	Valued ecosystem component
WRSA	Waste Rock Storage Area
WMF	Water Management Facility

1. Introduction

The Back River Project (the Project) has been designed to minimize, mitigate and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects. As part of the requirements of the final Environmental Impact Statement (EIS) guidelines issued by the Nunavut Impact Review Board (NIRB 2013), this document presents the Aquatic Effects Management Plan that Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

The Aquatic Effects Management Plan is conceptual and will be developed further with the appropriate regulatory authorities. The Plan is a “living document” and may be updated based on regulatory changes, Project-related changes, or changes to existing mitigation measures.

2. Scope and Objectives

The Aquatic Effects Management Plan targets the following valued ecosystem components (VECs) that are included in the draft Environmental Impact Statement (DEIS):

1. Freshwater Water Quality.
2. Freshwater Sediment Quality.
3. Freshwater Fish/Aquatic Habitat.
4. Freshwater Fish (Arctic Grayling and Lake Trout).
5. Marine Water Quality.
6. Marine Sediment Quality.
7. Marine Fish/Aquatic Habitat.
8. Marine Fish (Arctic Char).

Project activities may interact with surface freshwater and marine environments through a variety of pathways. The Project has been designed to minimize or eliminate potential adverse effects on the freshwater and marine environments as described in this Plan. The Plan describes and presents the following components:

- The planning and implementation processes for the Plan, including the personnel and their responsibilities.
- The mitigation and adaptive management measures.
- The Aquatic Effects Monitoring Program (AEMP).
- The processes for adaptive management, checking, record keeping, reporting, and QA/QC.

3. Planning and Implementation

Planning for the Aquatic Effects Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies, and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operational, and closure phases of the Project. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria, and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOP) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Standards, Guidelines, and Regulations

This Aquatic Effects Management Plan has been designed to comply with existing regulations and follow the available guidelines provided by the federal government and the government of Nunavut. Applicable regulations include:

- *Arctic Waters Pollution Prevention Act* (1985a).
- *Canada Shipping Act* (2001).
- *Fisheries Act* (1985b), including the *Metal Mining Effluent Regulations* (SOR/2002-222).
- *Nunavut Environmental Protection Act* (1988).
- *Nunavut Land Claim Agreement Act* (1993).
- *Oceans Act* (1996).

Mitigation and management measures have been drawn from knowledge and experience contained in guidelines and research documents. Project infrastructure and activities would follow the relevant guidelines, and the adaptive management strategy includes seeking new knowledge and strategies to minimize Project effects on the aquatic environment. Relevant guidelines for the monitoring, mitigation, and management plans presented in this Aquatic Effects Monitoring Plan include:

- *A Guide to Canada's Ballast Water Control and Management Regulations* (Transport Canada 2007).
- *Acid Mine Drainage in Permafrost Regions: Issues, Control Strategies and Research Requirements* (MEND 1996).

- *Canadian Council of Ministers of the Environment Sediment Quality Guidelines for the Protection of Aquatic Life* (CCME 2013a).
- *Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life* (CCME 2013b).
- *DFO Nunavut Operational Statement: Culvert Maintenance* (Fisheries and Oceans Canada 2009).
- *DFO Nunavut Operational Statement: Timing Windows* (Fisheries and Oceans Canada 2009).
- *DFO Nunavut Operational Statement: Clear Span Bridges* (Fisheries and Oceans Canada 2009).
- *DFO Nunavut Operational Statement: Temporary Stream Crossing* (Fisheries and Oceans Canada 2009).
- *DFO Nunavut Operational Statement: Ice Bridges and Snow Fills* (Fisheries and Oceans Canada 2009).
- *DFO Nunavut Operational Statement: Mineral Exploration Activities* (Fisheries and Oceans Canada 2009).
- *Environmental Code of Practice for Metal Mines* (Environment Canada 2012a).
- *Environmental Guideline for Dust Suppression* (Environmental Protection Service 2002).
- *Environmental Guideline for the Burning and Incineration of Solid Waste* (Government of Nunavut 2012).
- *Good Environmental Practices for Northern Mining and Necessary Infrastructure Task 2 Report* (Nunavut Regional Adaptation Collaborative 2012).
- *Guidelines for Development and Management of Transportation Infrastructure in Permafrost Regions* (Transportation Association of Canada 2010).
- *Guidelines for the Operation of Tankers and Barges in Canadian Arctic Waters* (Transport Canada 1997).
- *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998).
- *Metal Mining Effluent Regulations* (SOR/2002-222).

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including:

- Overall management of plan.
- Monitoring.
- Operational aspects.
- Internal reporting.

- External reporting.
- Ensuring compliance and adaptive management.

The Safety Superintendent along with his/her direct reports are responsible for the implementation of safety aspects of this plan.

6. Environmental Protection Measures

6.1 GENERAL MITIGATION MEASURES

The primary mitigation approach will be to minimize the number and magnitude of pathways through which Project activities can adversely affect the aquatic environment. The Project has used design and alternatives analysis to control potential effects and will use relevant Best Management Practices (BMP) to further mitigate or eliminate effects on the freshwater and marine environments. The Project has been designed to reduce or eliminate direct runoff and discharge pathways to the aquatic environment by planning to have no direct discharge of site contact water, mine water, or treated sewage effluent during the construction and operational phases, and potentially throughout the life of the Project. Furthermore, efforts will be made during planning and construction to minimize the footprint of infrastructure in order to minimize disturbance of the landscape, which reduces the potential for the transport of sediment in runoff.

6.1.1 Site Water Management

The site water management plans have been designed to mitigate potential negative effects from Project activities on the aquatic environment. In the Goose Property Area, site contact water (including runoff from waste rock storage areas (WRSA) and mine water) and treated sewage effluent will be directed to the Tailings Impoundment Area (TIA) and discharged if necessary during the Reclamation and Closure Phase to an approved site and will meet applicable water licence criteria (Figure 6.1-1). The water management plan (Figure 6.1-2) for the George Property Area is very similar, with site contact water and treated sewage effluent being directed to the Water Management Facility (WMF). Water will be discharged from the WMF only if necessary, and will be discharged to an approved site and will meet applicable water licence criteria. At the MLA, treated sewage effluent will be discharged on-land at an approved site. If necessary, water from the collection pond will be discharged at an approved location and the discharged water will meet applicable water licence criteria (Figure 6.1-3).

6.1.2 Sediment and Erosion Control

Sediment and erosion control measures will be applied throughout construction and maintained from the life of the Project. Efforts will be made to minimize the disturbance of the landscape and natural vegetation cover, and to schedule ground preparation to maintain adequate cover and avoid activities during periods of expected rainfall. The Project has been designed to use winter road only access corridors thereby limiting stream crossing and instream works and hence the potential effects on water and sediment quality. Efforts will be made during the final design stage to have the right-of-way cross each stream as close to perpendicular as possible to minimize the amount of riparian vegetation that may need to be disturbed during construction. Depending on the site-specific requirements, civil design structures may be used to prevent erosion and the deposition of sediment in the aquatic environment (a list of potential structures and approaches shown in Table 6.1-1).

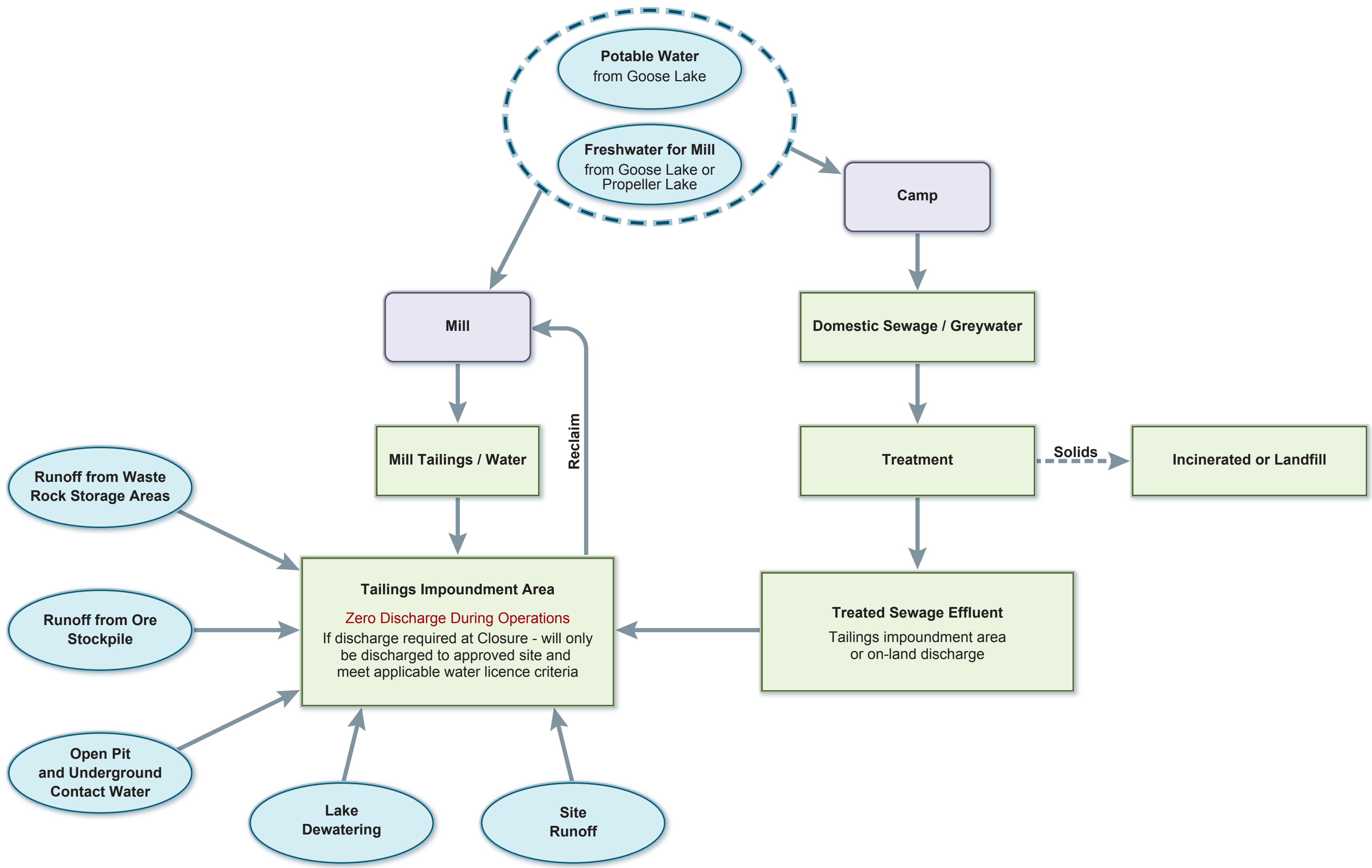


Figure 6.1-1

Sabina GOLD & SILVER CORP.

Conceptual Water Management - Goose Property Area

Figure 6.1-1

Rescan Engineers & Scientists

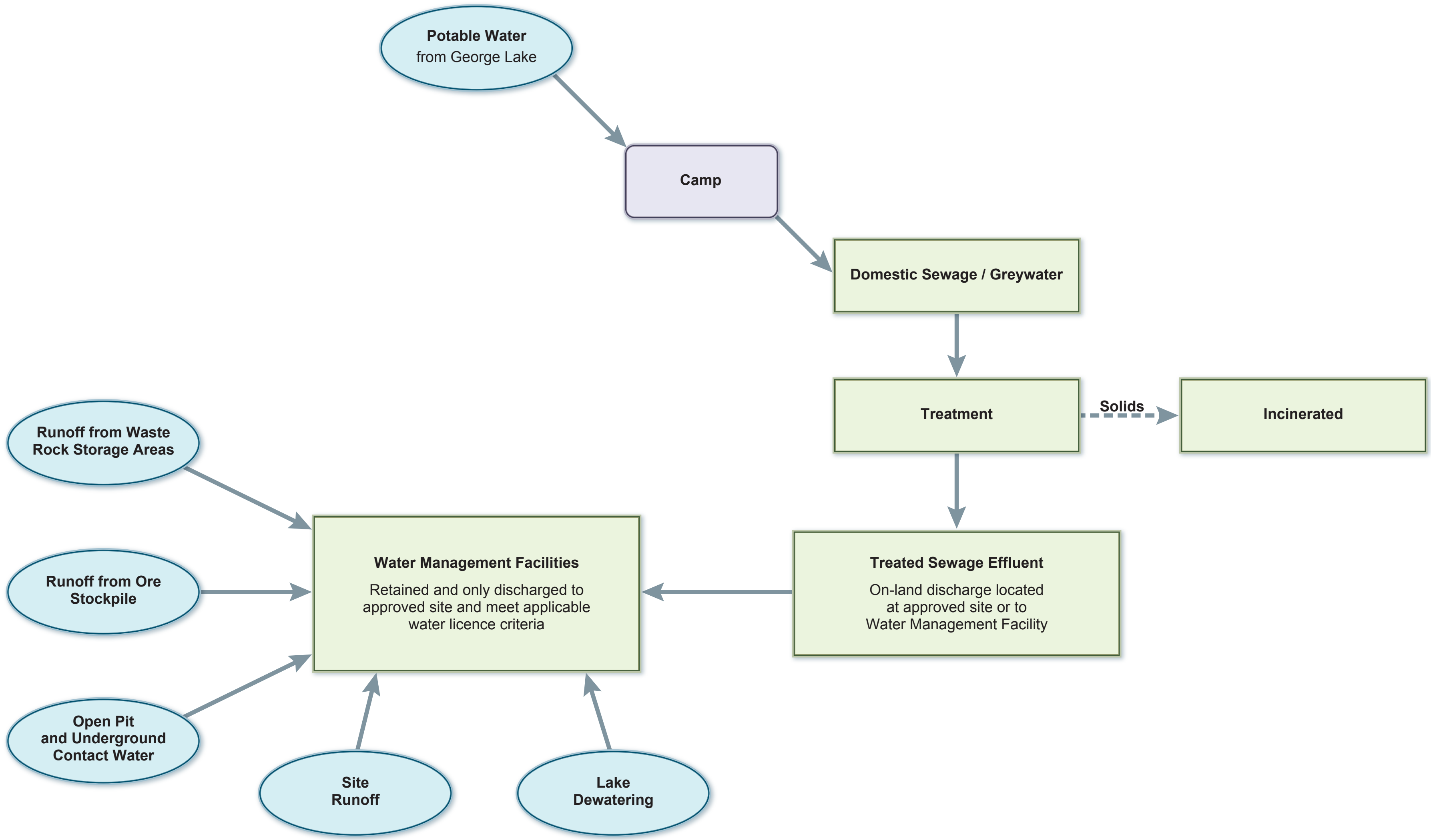


Figure 6.1-2

Sabina GOLD & SILVER CORP.

Conceptual Water Management - George Property Area

Rescan Engineers & Scientists

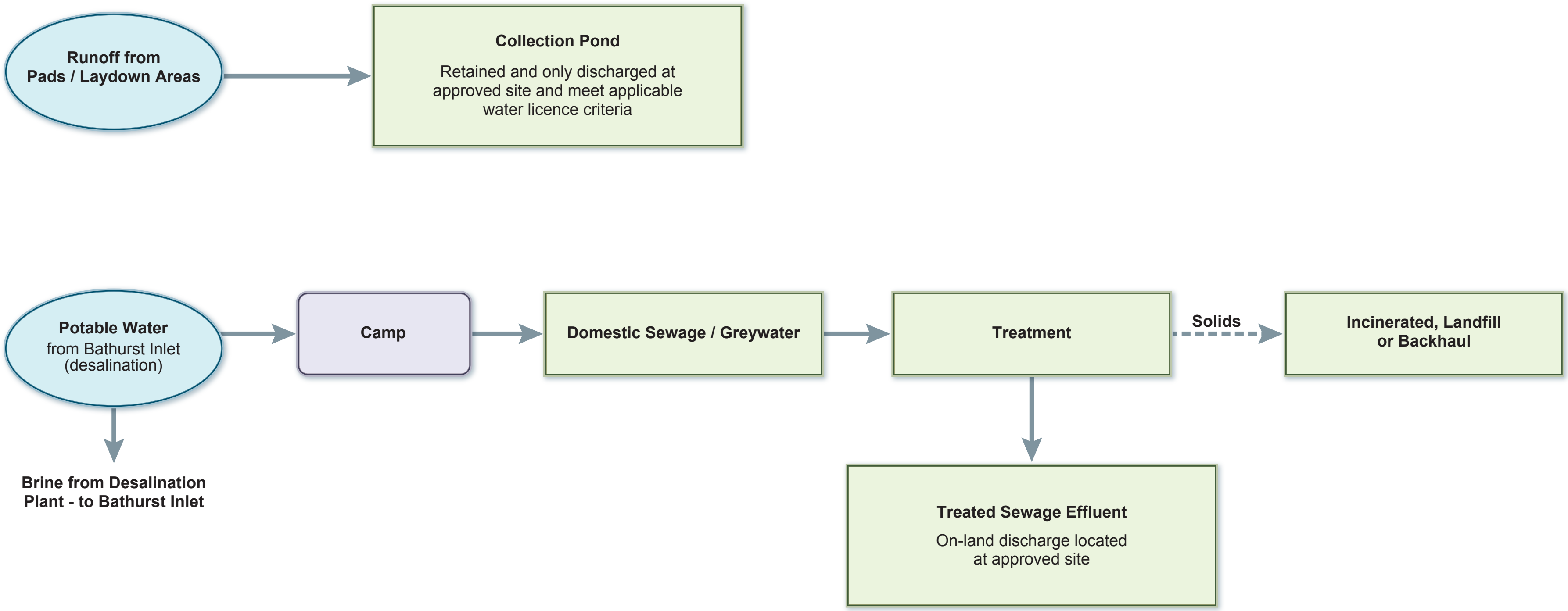


Figure 6.1-3

Conceptual Water Management - Marine Laydown Area

Table 6.1-1. Sediment and Erosion Control and Mitigation Measures, Back River Project

Slope Texturing	
Description	Contouring and roughening of slope face.
Installation Locations	Slopes and in large, flat surface areas
Performance Issues	May cause sloughing in very wet soils; should be used in combination with other measures.
Benefits	Reduces runoff flow velocities, increases infiltration, collects sediment, and promotes growth of vegetation.
Fibre Rolls	
Description	Tube-shaped devices filled with plant-derived fibres.
Installation Locations	Along slopes and in channels with low flow velocities.
Performance Issues	Labour intensive installation. Have limited sediment capture zones. May be displaced by soil movement (i.e., slumping) or by high flows.
Benefits	Function well in freeze-thaw conditions. Can be used on slopes too steep for silt fences. Biodegradable.
Check Dams and Energy Dissipation Structures	
Description	Structures made from rock that reduce flow velocities and dissipate energy.
Installation Locations	In-channel, particularly in regions of high flow velocities.
Performance Issues	Requires supply of suitable material non-potentially acid generating (PAG) or metal leaching (ML) rock. May require maintenance after high flow events.
Benefits	Permanent structures that reduce flow velocities and energy, and filter sediments. May be a suitable substitute for gabions and armouring entire channel.
Gabions	
Description	Caged structure filled with riprap or granular borrow material. Slows flow velocities and dissipates energy.
Installation Locations	In-channel or in runoff flow paths.
Performance Issues	Labour intensive installation. Requires supply of suitable material (non-PAG or ML rock).
Benefits	Robust structure able to resist high flow velocities. Can be built from riprap too small in diameter to be used as armouring.
Riparian Zones	
Description	Preserve a native vegetation buffer.
Installation Locations	Buffers along existing natural surface flow features.
Performance Issues	Requires careful planning and management during construction to preserve zone.
Benefits	Most effective natural sediment control feature; slows runoff velocity and filters sediment.
Silt Fences	
Description	Temporary barriers used to divert and slow runoff to allow suspended material to sediment before reaching water bodies.
Installation Locations	Used in areas of cuts and excavations, downslope from exposed or erodible areas.
Performance Issues	Temporary structures only for short-term diversion of sediments from aquatic systems.
Benefits	Usable in areas where armouring or other measures are not applicable.

(continued)

Table 6.1-1. Sediment and Erosion Control and Mitigation Measures, Back River Project (completed)

Armouring and Riprap	
Description	Quarry rock and/or natural granular borrow material used to protect fined-grained material from scour and erosion. Constructed barrier between water flows and areas susceptible to erosion. May be combined with geotextiles for addition protection.
Installation Locations	Used in areas of cuts and excavations, typically on exposed or erodible slopes. Road and pad embankments; water control and diversion structures, particularly where flow may be concentrated.
Performance Issues	Requires supply of suitable material (non-PAG or ML rock).
Benefits	Effective as a long-term erosion barrier. May be constructed from locally-source materials.
Geotextile (Woven and Non-woven)	
Description	Low erodible material placed on the surface as an erosion barrier
Installation Locations	Liner in water channels. Combined with riprap in areas of concentrated water flow.
Performance Issues	Installation requires anchoring. Difficult to remove once no longer required.
Benefits	Effective as an erosion barrier. Ease of installation. Can slow runoff velocities.

Runoff in the Project area occurs during a short period of June through September/October, due to the Arctic climate and permafrost ground conditions. Streams and rivers begin to flow in May, after freezing solid during the winter, and peak during freshet in June and July. The freshet period is typically short, and instantaneous flows can be quite large (see the Hydrology baseline information, Volume 6, Chapter 1 of the DEIS). Water control and erosion control structures will be designed to freshet peak flows, and areas and structures vulnerable to freshet flows will be identified. Water control structures will be monitored for ice and snow blockages, which will be cleared as necessary.

6.1.3 Fish and Fish Habitat Protection from Blasting

All Project activities requiring the use of explosives in or near water bodies will adhere to the *Guidelines for Use of Explosives In or Near Canadian Fisheries Waters*, as directed by Fisheries and Ocean Canada (DFO) (Wright and Hopky 1998). The blasting management plan will be discussed with DFO prior to any blasting activities, and subject to adaptive management.

6.1.4 Fish-out Program

A fish-out program will be carried out for any lakes that are lost as a result of the Project. The fish-out program would follow DFO's *General Fish-Out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut* (Tyson et al. 2011). A fish-out or the removal of fish from a waterbody offers a unique opportunity to gather information on lake productivity and the fish community, as well as avoid any "wastage" by making the fish available for traditional use by local communities (Tyson et al. 2011).

The DFO fish-out program protocol is divided into three components:

1. Fish Community, this is divided into three phases:
   - Marking Phase (part of a mark-recapture study).
   - Catch-per-Unit-Effort (CPUE)/Recapture Phase.

  – Final Removal Phase.

2. Aquatic Biology and Limnology.
3. Habitat Inventory.

In addition to following the DFO protocols for a fish-out, Sabina would collaborate with communities to involve interested parties in the program with the possibility to distribute fish for human or dog consumption.

The current mine plan includes the development of the Llama deposit, which is located under Llama Lake. The current mine plan is to develop an open pit and to dewater Llama Lake. The DFO fish-out protocols would be followed and Llama Lake would be fished-out prior to the open pit development.

6.1.4.1 Fish Community

Marking Phase

The Marking Phase is the first part of a mark-recapture study that will provide a population estimate for large-bodied fish, and help determine the end-point of the fish-out program. The Marking Phase will occur prior to the fish-out, preferably the year prior to lake dewatering to ensure adequate sampling time. There will be one week of gillnetting after ice-off (June/July), using smaller mesh gillnets of short one-hour sets to reduce mortalities. Nets will be periodically moved to survey all available habitats. All captured fish will be live-released. Additional capture methods, such as angling, may be employed if the mortality rate using gillnets is too high during the marking phase. Captured fish will be identified to species, measured for fork length and weight, noted for any signs of injury/stress, and all healthy fish (lake trout and round whitefish) will receive a caudal fin clip and a numbered T-bar anchor tag inserted through the dorsal sinus under the base of the dorsal fin. Metals and contaminants will be assessed in a sub-sample of fish by taking a non-lethal tissue biopsy sample after anaesthetization to confirm if fish are safe for transfer or human and/or dog consumption.

CPUE/Recapture Phase

The CPUE/Recapture Phase involves intensively fishing Llama Lake and is the recapture portion of the mark-recapture study. Fishing will occur between July and August of the year that lake dewatering will occur. During this phase, the standard unit of fishing effort remains unchanged (e.g., the duration of net sets are the same). Gillnets (for larger fish) and minnow traps (for smaller fish) will be set for 24 hours. The standard gillnet gang used throughout the CPUE/Recapture Phase will include different mesh sizes to obtain all sizes of fish (e.g., 102 mm (4"), 76 mm (3"), 51 mm (2"), 38 mm (1 ½"), 25 mm (1"), and 13 mm (1/2")). Baited Gee minnow traps fish the littoral zone for smaller fish. The number of nets/traps will vary throughout the fishing period (generally increasing as catches decrease yet depends on crew size) and are set randomly in the lake (only in the littoral zone for the minnow traps). Ideally, the CPUE/Recapture Phase is completed when no fish are captured for 24-48 hours of continuous netting, nets are removed for 48 hours, and then re-deployed for 24-48 hours and fish are still not captured. All fish will be sacrificed, sampled, and distributed to members of the communities. All fish will be identified by species, given a unique fish number, measured for fork length and weight, and the presence of tags (and tag numbers) and fin clips recorded. If the population is large, the following sampling will occur for the first 50 individuals per 20 mm size class (smaller size classes for smaller fish): sex, maturity, reproductive status, ageing structures taken (e.g., otoliths, pectoral fin rays, and scales), note obvious internal and external deformities, erosions, lesions and tumours (DELTs), and collect biological tissues (e.g., gonads, livers, stomachs, muscle tissue (for contaminants and stable isotopes)). All food fish will be eviscerated and prepared to be sent to local communities.

Final Removal Phase

The Final Removal Phase involves capturing the remaining fish using all available gear (plus the same gear as before). This final phase can start once the CPUE Phase is completed (typically between August and September) and can occur when lake dewatering has begun. Biological sampling is the same as the CPUE Phase. The Final Removal Phase is complete when the majority of marked fish have been captured.

6.1.4.2 Aquatic Biology and Limnology

The Aquatic Biology and Limnology component of the fish-out program includes physical limnology measurements, water quality, chlorophyll *a*, and zooplankton samples. All samples will be collected three times during the fish-out program: July (before the fish-out), August, and September (before dewatering). Benthic invertebrate sampling will be collected once in August, from four different depth intervals and sampling methods will be the same as those outlined in the Aquatic Effects Monitoring Program (AEMP).

6.1.4.3 Habitat Inventory

The Habitat Inventory component will be conducted using bathymetry and littoral habitat surveys prior to the fish-out in July as well as an additional habitat survey after lake dewatering has begun (e.g., September) to confirm accuracy of the original survey.

6.1.5 Routine Inspection and Monitoring

In addition to specific monitoring programs, including those required under regulatory approvals, routine inspections will be done on Project activities and components that could interact with the aquatic environment (Table 6.1-2). These routine inspections will ensure mitigation and management goals are met, help identify if additional mitigation measures are required, and provide important information on the performance of the Aquatic Effects Management Plan.

Table 6.1-2. Routine Inspection and Monitoring, Aquatic Effects Management Plan, Back River Project

Site	Routine Inspection
All Project Sites	Water management systems
Goose Property Area	Sediment and erosion control structures
George Property Area	Water intakes and outfalls
MLA	Flow meter readings
	Evidence of hydrocarbon leaks from containment areas
	Drip pans and spill response kits
	Supervision of fueling operations
	Equipment condition
	Road surface quality (rutting, washboarding)
	Dust suppressant application
	Geotechnical stability, including road embankments
	Snow and ice damming prior to and during freshet
	Culvert and water management structure obstructions
Mine sites	Sediment and erosion control structures
Goose Property Area	Evidence of hydrocarbon leaks from containment areas
George Property Area	Supervision of fueling operations
	Fuel leaks
	Equipment condition
	Geotechnical stability, permafrost degradation

(continued)

Table 6.1-2. Routine Inspection and Monitoring, Aquatic Effects Management Plan, Back River Project (completed)

<table>
<tr><th>Site</th><th colspan="3">Routine Inspection</th></tr>
<tr><td>Borrow sites and rock quarries</td><td colspan="3">Evidence of hydrocarbon leaks from containment areas
Supervision of fueling operations
Fuel leaks
Sediment and erosion control structures
Equipment condition
Geotechnical stability, permafrost degradation</td></tr>
<tr><td rowspan="2">Drill Sites</td><th>Pre-drilling</th><th>Drilling period</th><th>Post-drilling</th></tr>
<tr><td>Drillhole coordinates
Water source coordinates
Site and water source documentation (including photos)</td><td>Equipment condition
Fuel leaks
Spill response kits
Surface erosion and rutting
Water intake
Water management and flow meter reading</td><td>All material and debris removed from site
Document equipment, rods, and casings left in the hole
Site and water source documentation (including photos)
Water use assessment</td></tr>
<tr><td>Waste Rock Storage Areas
Goose Property Area
George Property Area</td><td colspan="3">Sediment and erosion control structures
Geotechnical stability and permafrost condition
Evidence of hydrocarbon leaks from containment areas
Evidence of ML/ARD
Equipment condition</td></tr>
<tr><td>Bulk Fuel Storage and Hazardous Waste Storage Areas
Goose Property Area
George Property Area
MLA</td><td colspan="3">Primary containment structure
Geotechnical stability and permafrost condition
Evidence of hydrocarbon leaks from containment areas
Equipment condition
Spill response kits</td></tr>
<tr><td>Explosives Storage
Goose Property Area
George Property Area</td><td colspan="3">Primary containment structure
Access and security
Equipment condition
Spill response kits</td></tr>
<tr><td>Laydown and Storage Areas
Goose Property Area
George Property Area
MLA</td><td colspan="3">Sediment and erosion control structures
Evidence of hydrocarbon leaks from containment areas
Equipment condition
Supervision of fueling operations
Fuel leaks
Spill response kits
Road surface quality (rutting, washboarding)
Geotechnical stability and permafrost condition</td></tr>
<tr><td>Tailings Impoundment Area
Goose Property Area
Water Management Facility
George Property Area
Collection pond*
MLA</td><td colspan="3">Inspections for physical stability, liner integrity, and leaks
Annual geotechnical inspection and report by a registered geotechnical engineer
Spill response kits
Equipment condition</td></tr>
</table>

**Only active in winter or short periods in summer.*

7. Aquatic Effects Monitoring Program

The overall purpose of the AEMP will be to monitor the receiving aquatic environment around Project infrastructure and activities. Results from the monitoring will be used to determine if existing mitigation and management measures are adequate and provide an opportunity for adaptive management on an annual basis. It is anticipated that an Aquatic Effects Monitoring Program (AEMP) will be a requirement of the future Type A Water Licence for the Project.

The AEMP has also been designed to meet the requirements of mining Environmental Effects Monitoring (EEM), as required by the Metal Mining Effluent Regulations (MMER; SOR/2002-222). The main objective of the EEM monitoring is to evaluate the effects of mining effluents on fish, fish habitat, and the use of fisheries resources. MMER EEM requirements will be triggered by the following activities:

- Effluent discharge rates exceed 50 m^3/d.
- Deleterious substances are discharged into any water body as per subsection 36(3) of the *Fisheries Act* (1985b).

7.1 SPECIFIC OBJECTIVES OF THE AEMP

The specific objectives of the AEMP are as follows:

1. Determine the short and long-term effects in the aquatic environment resulting from the Project.
2. Evaluate the accuracy of Project effect predictions.
3. Assess the effectiveness of mitigation and management measures on Project effects.
4. Identify additional mitigation measures to avert or reduce environmental effects due to Project activities.
5. Comply with MMER requirements, should an EEM program be triggered.

The first objective will be met by measuring the receiving environment in the short-term (on an annual basis) and the long-term (across all phases of the Project). Physical, chemical, and biological characteristics of the aquatic environment will be monitored to detect Project effects, and to determine the pathways and the magnitude of the effects.

The accuracy of effect predictions (Objective 2) will be based on the results of the monitoring program addressed in Objective 1, and will be assessed as required by NIRB under Section 12, Part 7 of the Nunavut Land Claims Agreement (NLCA, 1993).

The AEMP will assess the effectiveness of impact mitigation and management measures (Objective 3) by comparing the conditions in the receiving environment to baseline conditions and to reference sites, prior to and throughout the Project. The effectiveness of mitigation measures will be determined by analyses of the changes in the receiving environment measured by the sampling program. The AEMP will report the results of the sampling program and the analyses of effects throughout the project.

Objective 4 will be met by identifying changes in the receiving environment, and communicating those changes to Project management. As a key part of the adaptive management strategy, the reporting of adverse environmental changes will facilitate the identification and implementation of addition mitigation measures. These additional mitigation and management strategies will be detailed along with the relevant environmental monitoring information in the annual AEMP reports.

The objective of EEM will be met by monitoring components of the fish communities, fish habitat, and fisheries resources as outlined in the EEM guidance documents if MMER is triggered (Objective 5). These environmental components will be evaluated for effects by the methods outlined in the AEMP, which conform to the methods outlined in the EEM guidance documents (Environment Canada 2012b). All required monitoring and reporting will be completed as required should MMER be triggered.

7.2 AEMP STUDY DESIGN

7.2.1 Incorporation of MMER into AEMP Study Design

The Back River Project AEMP is designed to be consistent with the requirements and objects of the MMER. The primary goal of the mining EEM program is to evaluate the effects of mining effluents on fish, fish habitat, and the use of fisheries resources. The EEM program has two components:

- Effluent Characterization and Water Quality Monitoring Studies that are designed to aid the interpretation of biological data.
- Biological Monitoring Studies that include surveys for fish populations and health, fish prey resources (benthic invertebrate surveys), and fish usability (mercury/metal tissue content).

The Effluent Characterization and Water Quality Monitoring Studies consist of three components:

1. Effluent characterization (deleterious substances and other contaminants).
2. Water quality monitoring.
3. Sublethal toxicity testing.

The AEMP is designed to include the biological and water quality monitoring (including sediment quality) specified in the EEM guidance documents, even though no discharges of mining effluent are planned (Environment Canada 2012b). The AEMP includes the following components: water quality, phytoplankton and periphyton biomass, sediment quality, benthic invertebrate abundance and community composition, fish abundance and condition, and fish metal concentrations (including mercury). The methods used will be consistent with the EEM guidance documents. If one of the MMER criteria are triggered, then effluent characterization (deleterious substances and other contaminants) and sublethal toxicity testing will be added to the monitoring program and follow the methods in the EEM guidance documents.

7.2.2 Study Areas and Sampling Locations

The AEMP study area is comprised of those areas anticipated to be potentially influenced by Project activities (exposure areas), and those areas beyond Project influence (reference areas). In Schedule 5, Section 1 of the MMER, exposure areas are defined as “all fish habitat and waters frequented by fish that are exposed to effluent,” and a reference area is defined as “water frequented by fish that is not exposed to effluent and that has fish habitat that, as far as practicable, is most similar to that of the exposed area.” The exposure areas to be monitored as part of the AEMP have been expanded to encompass Project activities in addition to exposure to effluent. The primary Project activities that could affect the aquatic environment, and were considered for the AEMP sampling design, include:

1. Operation of the TIA and WMF in the Goose and George Property areas (potential changes to water quality).
2. Runoff from waste rock storage areas (WRSA), ore stockpiles, roads, site infrastructure, and explosive storage (potential changes to water quality).
3. Dust-generating activities, such as the operation of open pits, waste rock storage areas (WRSA), air strips, and roads (potential dust generation).

7.2.2.1 Goose Property Area

<u>Exposure Sites</u>

The principal exposure sites in the Goose Property Area are those waterbodies downstream and adjacent to the TIA, WRSA, and Project infrastructure (Table 7.2-1; Figure 7.2-1). Giraffe Lake is immediately downstream of the TIA. Rascal Lake is also close to WRSA. Goose Lake is adjacent to most of the Project infrastructure, and is the potential potable water source for the camp. Propeller Lake is downstream of Goose Lake, which is the main receiving environment for Project activities in the Goose Property Area.

Table 7.2-1. AEMP Sampling Locations, Descriptions, and Purposes, Back River Project

Sampling Location	Description	Purpose
Goose Property Area		
Lakes		
Reference B Lake	Reference lake located ~15 km to the southeast of the Goose Property	Reference lake
Goose Lake	Large lake adjacent to Project activities; potential source of potable water	Potential exposure lake due to proximity to Project infrastructure and activities, including water withdrawals.
Goose Lake - West		Potential exposure site in portion of Goose Lake receiving flow from Llama Watershed (Umwelt and Llama pits) and Echo Watershed (explosives storage facility).
Giraffe Lake	Lake adjacent to Project activities, in particular the Tailings Storage Area.	Potential exposure lake due to proximity to the TIA.
Umwelt Lake	Lake downstream of Llama open pit and adjacent to Umwelt open pit.	Potential exposure lake due to proximity to Project infrastructure and activities.
Rascal Lake	Lake proximate to airstrip and waste rock storage area.	Potential exposure lake due to proximity to Project infrastructure and activities.
Propeller Lake	Large lake downstream of catchments with the majority of Project activities.	Potential exposure lake due to location downstream of all Goose Property Area activities.
Streams		
RefB OF	Reference stream draining from the reference lake.	Reference stream site.
Goose OF	Outflow of large lake proximate to Project activities and infrastructure.	Potential exposure site and primary outflow from catchments encompassing the Project infrastructure.
Giraffe OF	Outflow of catchment containing the TIA.	Potential exposure lake due to proximity to Project infrastructure and activities.
Wolf OF	Outflow of catchment adjacent to WRSA and containing airstrip.	Potential exposure lake due to proximity to Project infrastructure and activities.
Umwelt OF	Outflow of lake adjacent to two open pits.	Potential exposure lake due to proximity to Project infrastructure and activities.
Llama OF	Outflow of catchment containing two open pits.	Potential exposure lake due to proximity to Project infrastructure and activities.
Propeller OF	Outflow of catchment containing majority of Project activities and infrastructure.	Potential exposure stream due to location downstream of all Goose Property Area activities.

(continued)

Table 7.2-1. AEMP Sampling Locations, Descriptions, and Purposes, Back River Project (completed)

Sampling Location	Description	Purpose
George Property Area		
Lakes		
Reference Q Lake	Reference lake located ~ 11 km to the southwest of the George Property.	Reference lake
Lower Long Lake	Lake proximate to LCP North open pit and WRSA.	Potential exposure lake due to proximity to Project infrastructure and activities.
McCoy Lake	Lake proximate to Project infrastructure.	Potential exposure lake due to proximity to Project infrastructure and activities.
George Lake	Lake proximate to Project activities and infrastructure, including deposits and WRSA.	Potential exposure lake due to proximity to Project infrastructure and activities. Potential water source.
Lytle Lake	Lake proximate to Locale 1 open pit. A small portion of the lake will be altered in order to develop the open pit.	Potential exposure lake due to proximity to Project infrastructure and activities.
Occurrence Lake	Lake downstream from Locale 1 open pit and directly adjacent to Locale 2 open pit.	Potential exposure lake due to proximity to Project infrastructure and activities.
Sleigh Lake	Lake proximate to Locale 2 open pit.	Potential exposure lake due to proximity to Project infrastructure and activities.
Komatic Lake	Lake downstream of majority of Project activities and infrastructure	Potential exposure lake due to proximity to Project infrastructure and activities.
Streams		
Ref Q OF	Reference stream draining from the reference lake.	Reference stream site.
McCoy Watershed OF	Outflow from watershed containing Project infrastructure and activities.	Potential exposure site due to proximity to Project infrastructure and activities.
Lytle OF	Outflow stream site from lake adjacent to Locale 1 open pit.	Potential exposure site due to proximity to Project infrastructure and activities.
Sleigh OF	Stream site immediately downstream of Locale 1 and Locale 2 resource pits, and adjacent to Project infrastructure.	Potential exposure site due to proximity to Project infrastructure and activities.
Dragon Watershed OF	Outflow of Dragon watershed containing majority of Project activities and infrastructure.	Potential exposure site due to proximity to Project infrastructure and activities.
Marine Laydown Area		
Marine Reference Site (Ref Site)	Near-shore marine reference site located ~29 km southeast of the MLA.	Reference site south of marine laydown area with similar local topography and bathymetry, but not adjacent to any Project-related or anticipated human activities.
Barge Landing near-shore (J-10)	Near-shore marine site at MLA.	Potential exposure site due to proximity to Project infrastructure and activities.
Barge Landing mid shore (J-12)	Mid-shore marine site at MLA.	Potential exposure site due to proximity to Project infrastructure and activities.

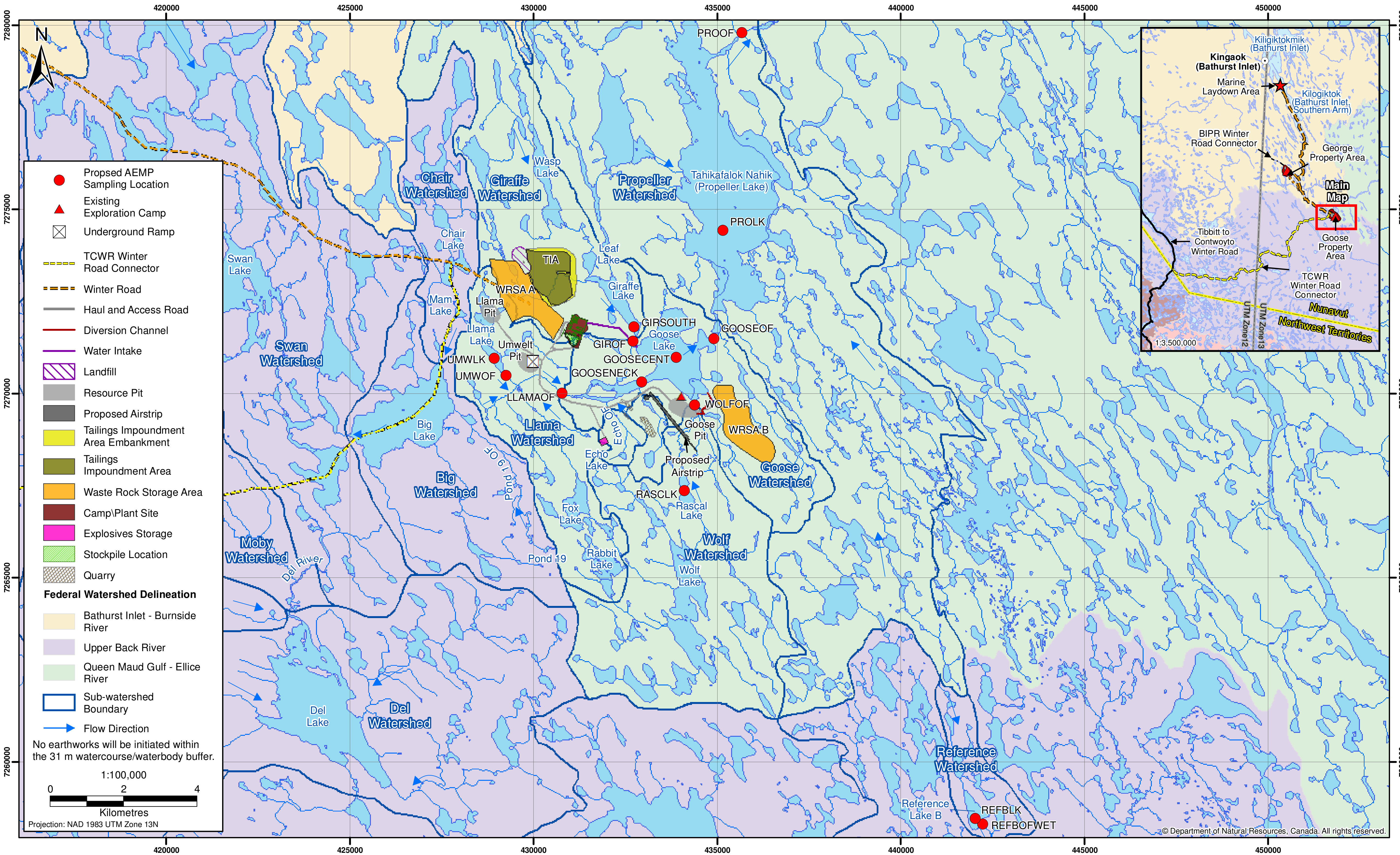


Figure 7.2-1

Proposed AEMP Sampling Locations in Goose Property Area, Back River Project

Reference Sites

Reference Lake B is ~15 km southeast of the Goose Property Area and is topographically and bathymetrically similar to lakes potentially exposed to Project activities. Reference B Lake, and its outflowing stream, have been sampled repeatedly since 2010 during the baseline sampling program, and will serve as a suitable reference site in the Before-After/Control-Impact (BACI) statistical analysis.

7.2.2.2 George Property Area

Exposure Sites

Like in the Goose Property Area, the exposure sites in the George Property Area were chosen based on their proximity to Project infrastructure and activities (Table 7.2-1; Figure 7.2-2). Long, George, Lytle, Occurrence, and Sleigh lakes are proximate to resource pits and Project activities. McCoy Lake is adjacent to possible Project infrastructure. Komatic Lake is directly downstream of Project infrastructure and activities, including the two open pits that will be adjacent to or within Lytle and Sleigh lakes.

Reference Sites

Reference Lake Q is ~11 km southwest of the Goose Property Area and is found in a topographic and geological environment similar to lakes potentially exposed to Project activities. Reference Q Lake and its outflowing stream have been sampled in the baseline sampling program and will serve as a suitable reference site in the BACI statistical analyses.

7.2.2.3 Marine Laydown Area

Exposure Sites

The MLA will be monitored at two sampling sites. The first site will be in the near-shore area, in water ~4 m deep, and likely will be the area of greatest influence from the barge unloading activities. A second site, in the mid-shore area in water ~13 m deep, will monitor the marine aquatic environment for effects beyond the immediate zone of influence (Table 7.2-1; Figure 7.2-3).

Reference Site

The marine reference site will be ~28 km south of the MLA on the western shore of Bathurst Inlet. It will be in an environment topographically and geologically similar to the MLA, and will be chosen from sites that have already been sampled as part of the baseline sampling program.

7.2.3 Sampling Design

The sampling design for the AEMP is designed to provide information for a statistical analysis incorporating a Multiple Paired Before-After/Control-Impact (BACI) design on water quality, sediment quality, and biological parameters sampled from lakes, streams, and near-shore marine habitat. Exposure sampling locations are listed in Table 7.2-1 and shown in Figures 7.2-1, 7.2-2, and 7.2-3.

All monitored parameters (see Section 7.2.5) will be analyzed using a BACI design. Multiple exposure (impact) and control sites from lake, stream, and marine habitats will be sampled at least annually, as outlined in Section 7.2.4. Each of the parameters will be collected at the same time (paired) over the course the AEMP and will be analyzed in a sequential statistical workflow starting with a before-after comparison and then a BACI analysis for Project effects. For each waterbody, a before-after comparison between the baseline and Project conditions will be conducted for each evaluated parameter. A mixed model Analysis of Variance (ANOVA) will be used for the before-after comparison.

The model will have fixed effects of *period* (before vs. after) and *season* (ice-cover vs. open-water; term included in model only if necessary), and a random effect of year to account for inter-annual variation. For the *period* effect, observations will be grouped into one of two *periods*: before the start of construction or after the start of site preparation. If the season term is necessary, then samples will be grouped into one of two *seasons* depending on the time of sampling; otherwise samples will be pooled by year. If the before-after analysis concluded a parameter is significantly different than the baseline condition, the next step of the workflow will be a BACI analysis to determine if the observed difference in the parameter was also seen at the reference site (which would indicate that the difference was due to a natural process). The BACI analysis adds a *class* term to the mixed model ANOVA, which is the classification of the waterbody as an exposure or a reference site. The interaction between the *period* and *class* terms will test if any change in the parameter that occurred at the exposure site also occurred at the reference site. If the change was statistically significant in the before-after analysis, but the BACI analysis concluded a parallel change occurred at the reference site, then this change will be interpreted as a natural phenomenon unrelated to the Project activities. The statistical analysis will use established methods and all assumptions will be detailed and examined using graphical techniques, statistical analysis, and best professional judgment as part of the analytical process.

7.2.4 Monitoring and Reporting Schedule

7.2.4.1 Core AEMP

The proposed monitoring schedule is detailed in Table 7.2-2. Baseline information has been collected from 2010 to 2013 for the 'Before' category. Additional baseline sampling may be required if the Project design changes in the future. Monitoring for the 'After' category would start upon Project approval and site preparation/construction.

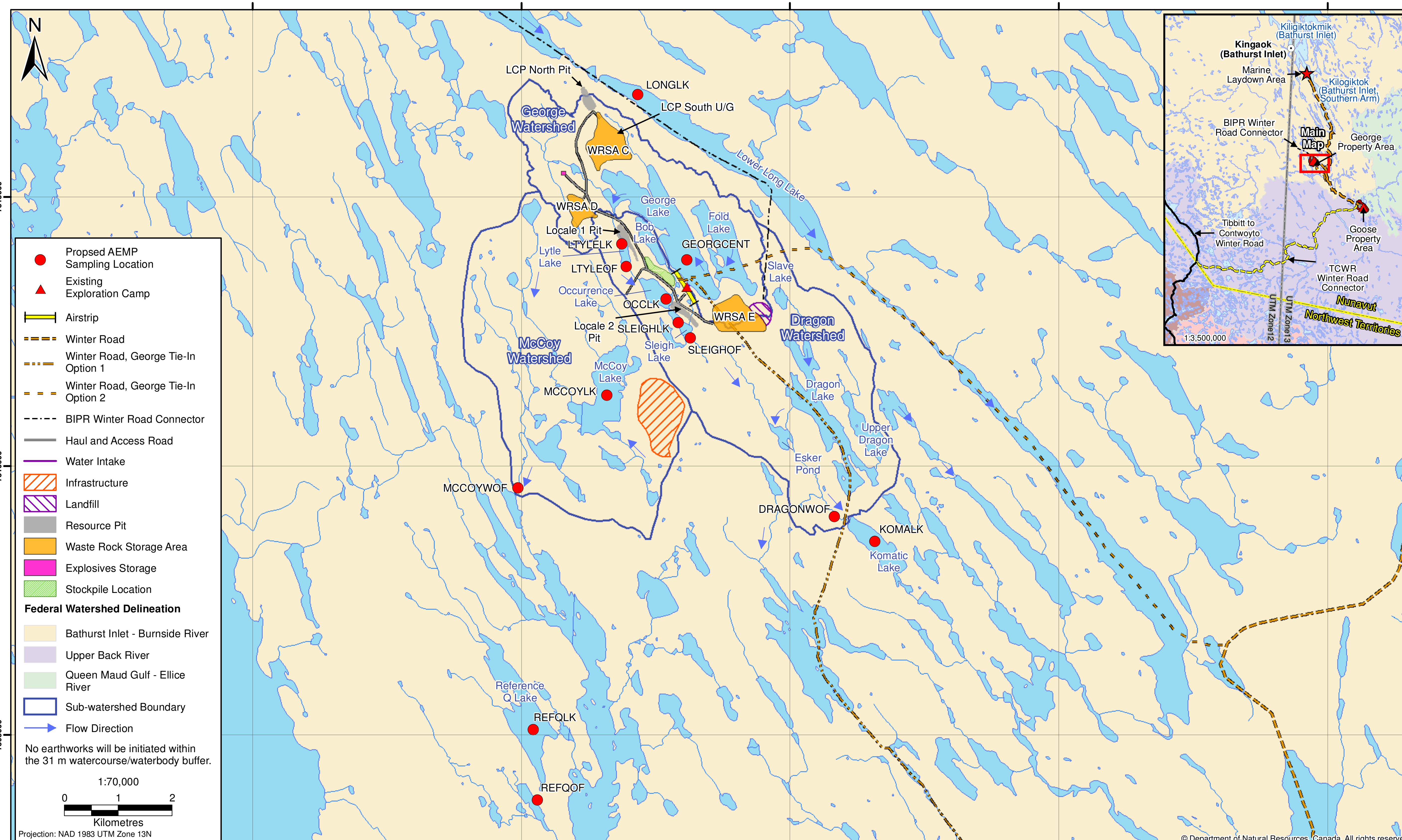
An AEMP report will be produced annually during construction and operational phases for submission to the Nunavut Water Board (NWB). The monitoring and reporting frequency should be re-evaluated prior to closure to determine an appropriate monitoring and reporting schedule at that time.

7.2.4.2 EEM

If MMER is triggered at any point during the Project, two reports will be required for the EEM program. A First Study Design report will be completed no more than 12 months after the mine becomes subject to MMER (Schedule 5, s. 14(a)), and six months before biological monitoring for EEM is initiated (Schedule 5, s. 15; SOR/2002-222). The First Study Design report will describe the sampling design for the EEM fish population monitoring, fish tissue, and benthic invertebrate community studies. Site characterization information is required as a subset of the biological monitoring studies (Schedule 5, s. 9) when mines become subject to MMER. If MMER is triggered, then this information will be included in the First Study Design report. The second report is the first EEM Cycle 1 Interpretive report that will present the findings of the fish population, fish tissue, and benthic invertebrate studies within 30 months of effluent discharge.

7.2.5 Summary of AEMP Sampling Details

Table 7.2-3 presents the physical, chemical, and biological parameters to be measured in the AEMP, and details on the proposed intra-seasonal sampling frequency, replication, timing, and sampling equipment. All proposed field sampling equipment and methods comply with the EEM guidance documents.



Sabina GOLD & SILVER CORP.
Rescan Engineers & Scientists

Figure 7.2-2
Proposed AEMP Sampling Locations in George Property Area, Back River Project

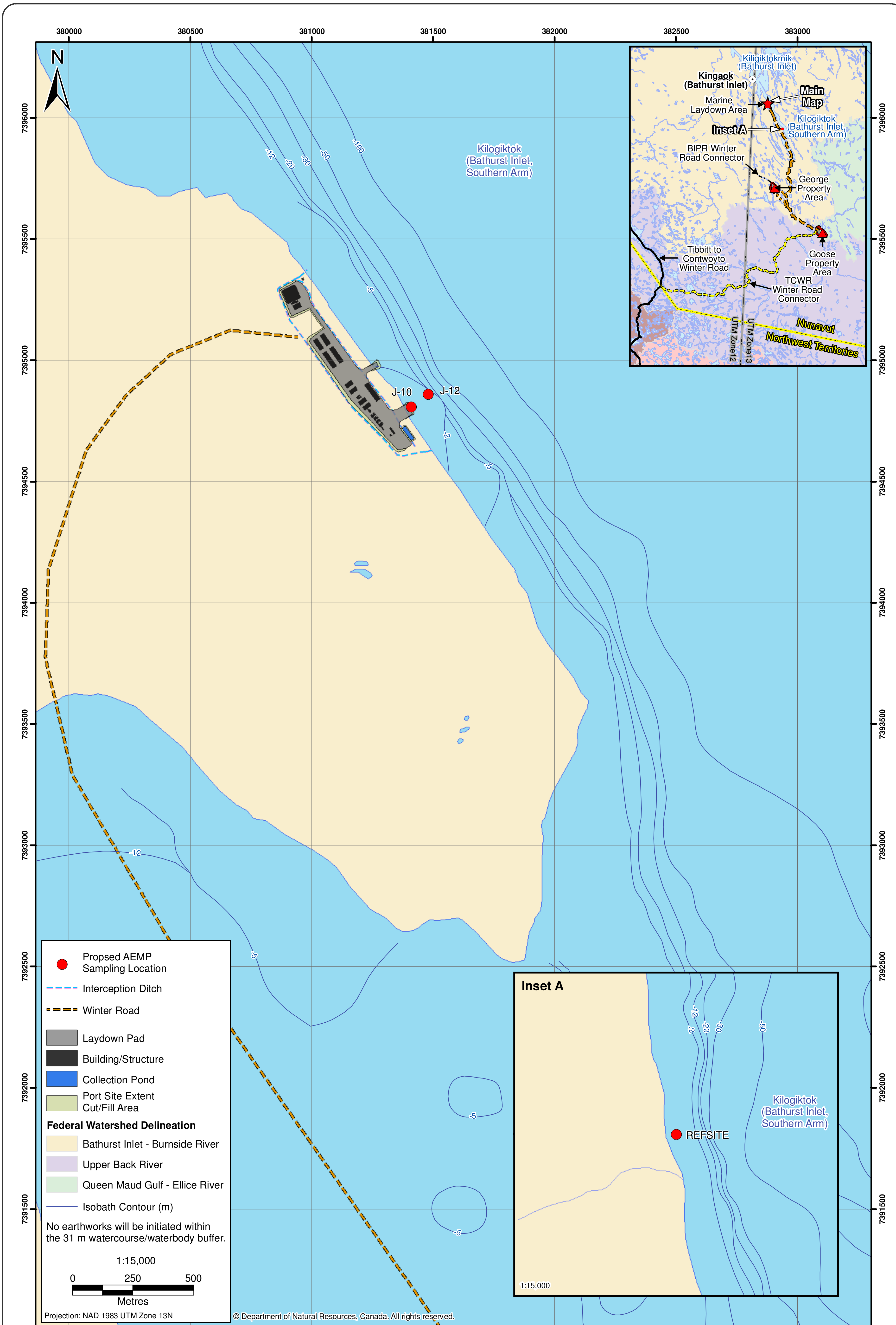


Figure7.2-3

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Proposed AEMP Sampling Locations in Marine Laydown Area, Back River Project

Rescan an ERM company

Figure 7.2-3

Table 7.2-2. AEMP Monitoring Schedule, Back River Project

Mine Phase[a]	Baseline and Pre-construction	Site Preparation and Construction	Operational	Temporary Closure[b]	Care and Maintenance[b]	Reclamation and Closure	Post-closure
Years	**Multiple years**	4 years	10 years	up to 2 years	2 to 10 years	2 years	at least 3 years
BACI Category	Before	After					
Reporting Schedual	Annual				Re-evaluated for AEMP and EEM requirements.		
Lakes							
Water Quality	2 times / yr	2 times / yr		Adaptively managed and re-evaluated for AEMP monitoring and EEM requirements.			
Phytoplankton Biomass	2 times / yr	2 times / yr					
Sediment Quality	1 time / yr	every 3 years[c]					
Benthic Invertebrates	1 time / yr	every 3 years[c]					
Fish Population/Condition	1 time / yr	every 3 years[c]					
Fish Tissue Hg/Metals	1 time / yr	every 3 years[c]					
Streams							
Water Quality	2 times / yr	2 times / yr		Adaptively managed and re-evaluated for AEMP monitoring and EEM requirements.			
Periphyton Biomass	1 time / yr	1 time / yr					
Sediment Quality	1 time / yr	every 3 years[c]					
Benthic Invertebrates	1 time / yr	every 3 years[c]					
Marine							
Water Quality	2 times / yr	2 times / yr		Adaptively managed and re-evaluated for AEMP monitoring and EEM requirements.			
Phytoplankton Biomass	2 times / yr	2 times / yr					
Sediment Quality	1 time / yr	every 3 years[c]					
Benthic Invertebrates	1 time / yr	every 3 years[c]					
Fish Population/Condition	1 time / yr	every 3 years[c]					
Fish Tissue Hg/Metals	1 time / yr	every 3 years[c]					

[a] *Monitoring schedules may differ between Goose and George Property areas based on the timing of their respective Project activities.*

[b] *Monitoring schedule post-closure will be initially set to the schedule during the previous year of operations, but may be subject to re-evaluation as part of adaptive management.*

[c] *Monitoring program will be conducted once during the Construction Phase and then continued every three years throughout the Operational Phase.*

Note: EEM studies only required if triggered. Effluent and Water Quality Monitoring Report due within 3 months following the calendar year of MMER trigger, EEM First Study Design Report due within 12 months (includes Site Characterization and detailed descriptions of Biological Monitoring Studies), and Cycle 1 Interpretative Report (detailing the methods and results of the Biological Monitoring Studies, as well as on-going Effluent and Water Quality Monitoring) within 30 months of MMER trigger.

Table 7.2-3. Physical, Chemical, and Biological Parameters in AEMP Sampling Program, Back River Project

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing	Sampling Equipment
Lake and Marine Water Quality				
Physical (dissolved oxygen, temperature, conductivity/salinity profile), nutrients, total metals, Secchi depth	2 ×	Lakes: n = 1 / site at 1 m below the surface and 2 m above the sediments; Marine: n = 2 / site; + 20% replication	April, August	GO-FLO sampling bottle, Conductivity-Temperature-Depth (CTD) probe; DO meter
Lake and Marine Phytoplankton				
Biomass (chlorophyll *a*)	2 ×	n = 3 / site at 1 m below the surface	April, August; coincident with lake and marine water quality sampling	GO-FLO sampling bottle
Lake and Marine Benthic Invertebrates				
Abundance and taxonomy	1 × (every 3 years)	n = 5 / site (3 replicate subsamples)	August; coincident with August lake and marine water quality sampling	Ekman grab (lakes) or Ponar grab (marine); 500 μm sieve
Lake and Marine Sediment Quality				
Physical characteristics, nutrients, metals, TOC	1 × (every 3 years)	n = 3 / site	August; coincident with August lake and marine water quality sampling	Ekman grab (lakes) or Ponar grab (marine)
Stream Water Quality				
Physical (temperature and dissolved oxygen), nutrients, total metals	2 ×	n = 2 / site	Freshet (June), August	Clean water sampling bottles; DO/Temperature meter
Stream Periphyton				
Biomass (chlorophyll *a*)	1 ×	n = 3 / site	August; coincident with stream water quality sampling	Artificial samplers (Plexiglas plates)
Stream Benthic Invertebrates				
Abundance and taxonomy	1 × (every 3 years)	n = 5 / site (3 replicate subsamples)	August; coincident with stream water quality sampling	Hess sampler
Stream Sediment Quality				
Physical characteristics, nutrients, metals	1 × (every 3 years)	n = 3 / site	August; coincident with stream water quality sampling	Ekman grab; 500 μm sieve
Freshwater Fish Survey				
Condition and reproduction (length, weight, age, DELT, liver weight, gonad weight, egg counts); tissue metals	1 × (every 3 years)	Lethal sampling: n = 60 fish per site (20 male + 20 female + 20 immature); Non-lethal sampling: n = up to 100 fish per site; 8 fish / site for tissue metals	August; coincident with August lake water quality sampling	Electrofishing; gillnetting; beach seine

(continued)

Table 7.2-3. Physical, Chemical, and Biological Parameters in AEMP Sampling Program, Back River Project (completed)

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing	Sampling Equipment
Marine Fish Survey (Shellfish)				
Condition (whole animal wet weight, soft tissue wet weight, shell length); tissue metals	1 × (every 3 years)	n = 20 shellfish / site (condition); n = 8 shellfish / site (tissue metals)	August; coincident with lake fish survey	Ponar; sieve

7.2.6 AEMP Sampling Details

7.2.6.1 Water Quality

Core AEMP

Water quality samples collected in the AEMP will focus on the receiving environment and reference areas. The results of the water quality sampling program will be analyzed for Project effects on the aquatic environment, and will be used to inform adaptive management. Water quality monitoring is also a component of the Effluent and Water Quality Monitoring Studies required by EEM, should MMER be triggered.

Lakes and Marine Areas

Water quality samples from lakes and the marine environment will be collected twice annually and no less than one month apart, from sampling stations used for the biological and sediment monitoring. Table 7.2-4 details the parameters to be monitored; including the parameters required under Schedule 5, section 7 of the MMER should it be triggered. Samples will be collected one time during ice-covered conditions in winter (late April, when under-ice water quality may be most strongly affected by seasonal changes), and one time during the open-water season (August).

Phytoplankton biomass (measured as chlorophyll *a* concentrations) and Secchi depths (water clarity; open-water only) will be measured to assess any changes in primary production due to eutrophication or other Project effects. The physical and chemical environment will be described by dissolved oxygen, temperature, and conductivity (salinity at marine sites) measurements through the water column at all lake and marine sites.

Streams

Stream water quality samples will be collected twice per year between June and September, depending on the duration of ice-free conditions. The first annual samples will be collected 1-2 weeks after freshet, which often occurs in mid to late-June, with subsequent samples collected in August.

The same water quality parameters will be analyzed for stream samples as for lakes (Table 7.2-4). Periphyton biomass (measured as chlorophyll *a* concentration) will also be sampled at the stream sites once annually in August, along with dissolved oxygen and temperature measurements to characterize the physical and chemical environment of the stream sites.

Table 7.2-4. AEMP Water Quality Parameters, Back River Project

Physical and Chemical Parameters	Nutrients	Total Metals (cont'd)
Conductivity[a]	Ammonia[c]	Lithium (Li)
Salinity[b]	Nitrate[c]	Magnesium (Mg)
Total Hardness[f]	Nitrite	Manganese (Mn)
pH[f]	Total Phosphorus	Mercury (Hg)[c]
Total Alkalinity[f]	**Total Metals**	Molybdenum (Mo)[c]
Total Suspended Solids[d]	Aluminum (Al)[c]	Nickel (Ni)[d]
Turbidity	Antimony (Sb)	Phosphorus (P)
Temperature[e]	Arsenic (As)[d]	Potassium (K)
Dissolved Oxygen (DO)[e]	Barium (Ba)	Selenium (Se)
Secchi Depth	Beryllium (Be)	Silicon (Si)
Water Depth	Bismuth (Bi)	Silver (Ag)
Anions	Boron (B)	Sodium (Na)
Chloride (Cl)	Cadmium (Cd)[c]	Strontium (Sr)
Fluoride (F)	Calcium (Ca)	Thallium (Tl)
Free Cyanide (CN)	Chromium (Cr)	Tin (Sn)
Total Cyanide (CN)[d]	Cobalt (Co)	Titanium (Ti)
Phytoplankton & Periphyton Biomass	Copper (Cu)[d]	Uranium (U)
Chlorophyll *a*	Iron (Fe)[c]	Vanadium (V)
	Lead (Pb)[d]	Zinc (Zn)[d]

[a] *freshwater samples*
[b] *marine samples*
[c] *subject to EEM Effluent Characterization Study (Schedule 5 s. 4(1a-g))*
[d] *MMER deleterious effluent substance (Schedule 4 - Column 1)*
[e] *subject to EEM Water Quality Monitoring Study (Schedule 5 s. 7(b))*
[f] *subject to EEM Water Quality Monitoring Study (Schedule 5 s. 7(c))*
Note: If MMER is triggered, the Effluent and Water Quality Monitoring Studies will also include Sublethal Toxicity Testing.

EEM

Effluent and Water Quality Monitoring Studies are required as part of an EEM, should MMER be triggered, and consist of Effluent Characterization, Sublethal Toxicity Testing, and Water Quality Monitoring. Effluent Characterization and Water Quality Monitoring will be done following the EEM Guidance document at an initial frequency of no less than 4 times per year (parameters described in Table 7.2-4). Sublethal Toxicity Testing will be conducted using the methodologies detailed in the EEM Guidance document at an initial frequency of no less than two times per year.

Quality Assurance/Quality Control

QA/QC principles will follow those outlined in the MMER guidance document throughout the field sample collection and laboratory analysis phases. All water quality samples will be collected by qualified personnel using suitable sampling equipment (e.g., acid-rinsed GO-FLO sampling bottles). Samples will be preserved (where applicable) in appropriate containers, and transported and stored following accepted procedures. Chain-of-Custody forms will be used to track the samples.

Replicate samples will be collected from a subset (10 to 20%) of all samples collected to quantify environmental variability and analytical consistency. Travel, equipment, and field blanks will be collected to detect potential sources of contamination.

Table 7.2-5 summarizes the proposed monitoring program for freshwater and marine water quality.

Table 7.2-5. Summary Description of Monitoring Program for Freshwater and Marine Water Quality VECs

Indicator/Monitoring Target	Freshwater and Marine Water Quality
Monitoring Category	AEMP (and MMER if triggered)
Design Type	Before-After, Reference-Exposure
Measurable Parameter and Endpoints	Parameters with CCME guidelines and MMER criteria
Key Project Interactions	Runoff, dust or sediment deposition/dispersion, wastewater discharge
Objective	Evaluate potential changes in water quality due to Project activities. Confirm EIS predictions; provide monitoring data for adaptive management.
Threshold	Early warning indicator: Significant change from background values Exceedance threshold: CCME Guidelines for the Protection of Freshwater or Marine Aquatic Life *or* greater than the 90% percentile of baseline values if indicator is naturally greater than CCME Guideline
Scope of Monitoring	Sampling program for Project effects on the freshwater and marine receiving environments that capture spatial and temporal variability.

7.2.6.2 Sediment Quality

Sediment quality samples will be collected every three years in conjunction with the benthic invertebrate surveys to measure Project effects on aquatic sediments, and by extension on the benthic invertebrate community and fish habitat. Sediment quality samples will measure the total organic carbon concentration and particle size distribution at each site, to provide contextual information for the benthic invertebrate community analysis as per the EEM guidance documents, as well as sediment total metal concentrations (Table 7.2-6).

Table 7.2-6. AEMP Sediment Quality Parameters, Back River Project

Physical and Chemical Characteristics	Metals (cont'd)	Metals (cont'd)
% Moisture	Bismuth (Bi)	Nickel (Ni)
pH	Cadmium (Cd)	Phosphorus (P)
% Gravel (>2 mm)[a]	Calcium (Ca)	Potassium (K)
% Sand (2 – 0.063 mm)[a]	Chromium (Cr)	Selenium (Se)
% Silt (0.063 mm – 4 µm)[a]	Cobalt (Co)	Silver (Ag)
% Clay (<4 µm)[a]	Copper (Cu)	Sodium (Na)
Organic Carbon	Iron (Fe)	Strontium (Sr)
Total Organic Carbon[a]	Lead (Pb)	Total Sulphur (S)
Metals	Lithium (Li)	Thallium (Tl)
Aluminum (Al)	Magnesium (Mg)	Tin (Sn)
Antimony (Sb)	Manganese (Mn)	Titanium (Ti)
Arsenic (As)	Mercury (Hg)	Vanadium (V)
Barium (Ba)	Molybdenum (Mo)	Zinc (Zn)
Beryllium (Be)		

[a] *mandatory for EEM benthic invertebrate surveys*

Power and Statistical Tests

The statistical analysis for Project effects on sediment quality requires estimation of the effect size of the effects on the quantitative measures of metal concentrations, organic carbon concentrations, and particle size composition. Adequate sample sizes will be determined using power analysis and estimates of parameter variability from the baseline and historical sampling programs. A preliminary power analysis, for an *a priori* effect size of ± 2 SD and $\alpha = \beta = 0.1$, estimated that three replicate sediment quality samples will have sufficient power ($1 - \beta = 0.9$) to detect a significant difference between a control site and a reference site. Statistical power, and the subsequent required sample sizes, will be re-assessed throughout the course of the AEMP.

Descriptive summary statistics will be reported for all collected sediment quality parameters. ANOVAs will be used to determine statistically significant difference in particle size composition and the concentrations of nutrients, metals, and organic carbon between reference and exposure areas. All statistical assumptions will be considered and met before accepting the results of statistical inference.

Quality Assurance/Quality Control

QA/QC principles will follow those outlined in the EEM guidance documents during sample collection and laboratory analyses. All sediment quality samples will be collected by qualified personnel using suitable sampling equipment (e.g., Ekman grabs). Samples will be stored in appropriate containers and transported following accepted procedures. Chain-of-Custody forms will be used.

Table 7.2-7 summarizes the proposed monitoring program for freshwater and marine water quality.

Table 7.2-7. Summary Description of Monitoring Program for Freshwater and Marine Sediment Quality VECs

Indicator/Monitoring Target	Freshwater and Marine Sediment Quality
Monitoring Category	AEMP (and MMER if triggered)
Design Type	Before-After, Reference-Exposure
Measurable Parameter and Endpoints	Parameters with CCME guidelines and MMER criteria
Key Project Interactions	Runoff, dust or sediment deposition/dispersion, wastewater discharge
Objective	Evaluate potential changes in sediment quality due to Project activities. Confirm EIS predictions; provide monitoring data for adaptive management.
Threshold	Early warning indicator: Significant change from background values Exceedance threshold: CCME Interim Sediment Quality Guidelines (ISQG) *or* greater than the 90% percentile of baseline values if indicator is naturally greater than CCME Guideline
Scope of Monitoring	Sampling program for Project effects on the freshwater and marine receiving environments that capture spatial and temporal variability.

7.2.6.3 Benthic Invertebrate Community

Core AEMP

Benthic invertebrate surveys will be conducted every three years to measure the effects of Project activities on the lower trophic levels of the aquatic environment, which serve as an important food resource for fish. The benthic invertebrate community will be sampled in all three aquatic habitats, lakes, streams, and the near-shore marine environment, and analyzed for abundance and taxonomic composition. From the taxonomic analysis of the benthic invertebrate community, the following summary statistics will be calculated and used to evaluate for potential Project effects:

- Total organism abundance.
- Taxon richness.
- Simpson's diversity and evenness indices.

Samples will be collected from the most "ecologically-relevant" area, after consideration by qualified personnel for the site-specific characteristics of habitat types and distributions. Benthic invertebrate surveys are planned to be conducted in August, which is the most "ecologically-relevant" season, and is when the benthic invertebrate community is most biologically-active and susceptible to Project-related effects. Benthic invertebrate surveys will coincide with water quality, primary producer (phytoplankton and periphyton) biomass, and sediment sample collection.

EEM

Biological Monitoring Studies are required by EEM, if MMER is triggered, and include a benthic invertebrate community survey. The benthic invertebrate community survey conducted for the core AEMP will be consistent with the requirements of EEM, and will occur annually at the selected exposure and reference areas. The details of the benthic invertebrate survey will be included in the First Study Design report.

Power and Statistical Tests

The statistical analysis for Project effects on the benthic invertebrate community requires estimation of the effect size of the effects on the quantitative measures of community structure, diversity, and abundance. Adequate sample sizes will be determined using power analysis and estimates of parameter variability from the baseline and historical sampling programs. A preliminary power analysis, for an *a priori* effect size of $\pm$ 2 SD and $\alpha = \beta = 0.1$, estimated that five replicate benthic samples will have sufficient power ($1 - \beta = 0.9$) to detect a significant difference between a control site and a reference site. Statistical power, and the subsequent required sample sizes, will be re-assessed throughout the course of the AEMP.

Descriptive summary statistics will be reported for all collected biological parameters. ANOVAs will be used to determine statistically significant differences for the four benthic invertebrate summary statistics (abundance, richness, diversity, and dissimilarity) between reference and exposure areas. All statistical assumptions will be considered and met before accepting the results of statistical inference.

Quality Assurance/Quality Control

QA/QC principles will follow those outlined in the EEM guidance document for the collection of samples and subsequent laboratory analyses. Samples will be collected by qualified personnel using suitable sampling equipment (e.g., Hess sampler in streams). Samples will be uniformly pre-sieved and preserved in appropriate containers. Samples will be stored and transported using accepted procedures.

All laboratory processing and taxonomic identification will be conducted by expert taxonomists and appropriate sub-sampling and random re-sorting techniques will be used. Data quality will be verified by screening for potential data entry errors. All samples will be stored for six years following analysis and a reference collection will be compiled.

Table 7.2-8 summarizes the proposed monitoring program for freshwater and marine benthic invertebrates.

Table 7.2-8. Summary Description of Monitoring Program for Freshwater and Marine Benthic Invertebrates

Indicator/Monitoring Target	Freshwater and Marine Benthic Invertebrates*
Monitoring Category	AEMP (and MMER if triggered)
Design Type	Before-After, Reference-Exposure
Measurable Parameter and Endpoints	Abundance of organisms, taxonomic diversity
Key Project Interactions	Runoff, dust or sediment deposition/dispersion, wastewater discharge
Objective	Evaluate potential changes in benthic invertebrate communities due to Project activities. Confirm EIS predictions, provide monitoring data for adaptive management, and meet EEM requirements (if necessary)
Threshold	Early warning indicator: Significant Project effects on water and sediment quality Exceedance threshold: Significant change in organism abundance and/or taxonomic diversity
Scope of Monitoring	Sampling program for Project effects on freshwater and marine benthic invertebrate communities.

* *Significant biological receptor in aquatic ecosystems and important for the freshwater and marine Fish/Aquatic Habitat VECs and Fish Community VECs.*

7.2.6.4 Fish Monitoring

<u>Core AEMP</u>

Fish population surveys and detailed biological sampling on a finned-fish species at lake habitats and bay mussels (*Mytilus trossulus*) at marine habitats will be conducted every three years. The streams in the Project area do not contain resident fish populations as they are completely frozen during the winter. Thus, freshwater sampling will be limited to lakes where potential Project effects are most likely to be detected. Sampling will occur at eight AEMP lake sites (Giraffe Lake, Goose Lake, Propellor Lake, Reference B Lake, George Lake, Komatic Lake, McCoy Lake, and Reference Q Lake) and three marine sites (2 sites at the MLA and the reference marine site). As part of the AEMP, fish or mussel tissue surveys will be conducted in exposure and reference sites every three years concurrent with the fish biological and population sampling outlined above.

Freshwater

Fish population surveys in lakes will take place every three years in August using gillnets, beach seines, and electrofishing. Sampling locations will be determined randomly and conducted throughout each lake to collect fish of all species and determine an unbiased catch-per-unit-effort (CPUE) within lakes. Fish to be used for tissue metal sampling are required to be of the same sex and approximate size, therefore, if random sampling does not result in sufficient sample size to meet these requirements, additional sampling may be conducted using targeted methods. For example, sampling for forage species may be conducted at a specific area of the lake, or using a single gillnet mesh size to capture fish of a certain size. CPUE for these methods will be recorded separately so as not to bias the results of the random sampling.

Freshwater biological sampling to assess fish and population health will focus on two sentinel species, Lake Trout (*Salvelinus namaycush*) and Slimy Sculpin (*Cottus cognatus*). Lake Trout are a large-bodied, long-lived species and thus highly susceptible to long-term population level effects from lethal sampling. To avoid any negative effects on population size and structure, non-lethal biological sampling will be employed for Lake Trout. Non-lethal sample sizes of up to 100 adults are recommended for each site (Environment Canada 2012b); however, it is recognized that this may not always be attainable for Lake Trout in northern waterbodies. Lethal sampling will, however, be employed on the small-bodied, short-lived, benthic Slimy Sculpin. The objective will be to collect data from 20 mature male, 20 mature female, and 20 juvenile Slimy Sculpin from each lake. However, 60 lethal samples of Slimy Sculpin may also be unattainable for most waterbodies in the AEMP. The EEM guidance document fully recognizes that this number samples is unlikely to be caught in many waterbodies (Environment Canada 2012b).

Survival, growth, reproductive and condition parameters will be collected from the fish and compared between sites and over time to properly assess changes in fish populations and health over the life of the mine. Lethal sampling of Slimy Sculpin will measure and assess all the biological variables and effects endpoints listed in Table 7.2-9, while only a subset of variables will be assessed from non-lethal sampling of Lake Trout.

Table 7.2-9. Fish Biological Variables and Effects Endpoints

Biological variables	Effects Endpoints	Lake Trout	Slimy Sculpin
Age	Age	X	X
Size (length and weight)	Condition (body weight against length)	X	X
Liver weight	Relative liver size (liver weight against body weight)		X
	Growth rate (body weight against age)	X	X
Gonad weight	Relative gonad size (gonad weight against body weight)		X
Fecundity (egg number and weight)	Relative fecundity (# of eggs/female against body weight)		X
	Relative egg size (mean egg weight against body weight [or age])		X
Stomach contents	Diet		X
DELT (deformities, eroded fins, lesions, and tumours)		X	X

Freshwater biological sampling to assess fish tissue contamination will focus on the same two sentinel species, Lake Trout and Slimy Sculpin. For each species, a minimum of eight samples of the same sex and approximate body size will be collected from each lake (Environment Canada 2012b) during the fish population surveys conducted every three years in August. To avoid any negative impacts on population size and structure, non-lethal sampling using tissue plugs will be employed for Lake Trout. Tissue plugs will be collected from Lake Trout for analysis using methods developed by Baker et al. (2004), whereas Slimy Sculpin will be sacrificed for whole-body tissue metal analysis.

Marine

For the marine areas, previous studies have shown that finfish biological sampling often performs poorly in the marine environment because of insufficient fish catches or inadequate quantification of effluent exposure. This is likely the result of the high mobility of fish in this environment. According to Section 2(b) of the *Fisheries Act*, ‘shellfish, crustaceans, marine animals…’ are considered ‘fish’ (1985b). Therefore, a bivalve mollusc commonly present in the marine sampling area will be used as a sentinel species in the AEMP analysis of effects.

For the marine component of the AEMP, the Bay Mussel will be collected every three years. This mollusc is present in Arctic marine habitats and is sufficiently large (>4 cm) for tissue collection. Parameters to be measured will include those required to address bivalve condition (whole animal wet weight, soft tissue wet weight, shell length, width, and height) as well as tissue metal and polycyclic aromatic hydrocarbon (PAH) concentrations. Twenty Bay Mussels will be collected from each marine area.

In the marine habitat, Bay Mussels will be collected for tissue metal analysis in a consumable species. A minimum of eight samples of the same approximate body size will be collected from each site (Environment Canada 2012b).

EEM

If the MMER is triggered by total discharges of more than 50 m^3/d and/or the release of deleterious substances into any water body, then Biological Monitoring Studies are required. The Biological Monitoring Studies include a site characterization, benthic invertebrate surveys (Section 7.2.6.3), and fish studies. The fish studies will be conducted in select exposure and reference areas, with the intent of evaluating the effects of mining effluents on two components: 1) Fish Population and Health; and 2) Fish Tissue Metal Concentration.

Site Characterization

The site characterization studies profile the physical, chemical, and biological nature of the sites and are required if the MMER is triggered for the First Study Design Report. Site characterization studies include:

- A description of effluent mixing with the exposure area, with an estimate of the effluent concentration in water 250 m from the discharge point.
- A description of the reference and exposure areas where the biological monitoring studies will be conducted. Information will include the geology, hydrology, oceanography, limnology, and the chemical and biological features of these areas.
- The type of production process used by the mine, and the environmental protection practices used.
- A description of any anthropogenic, natural, or other factors, unrelated to Project activities, that may contribute to an observed effect.
- Any additional information relevant to the site characterization.

Fish Population and Health

The EEM program requires fish population monitoring to be undertaken if the effluent in the exposure area is greater than 1% in the area located within 250 m of a final discharge point (MMER, Schedule 5, s. 9(b); SOR/2002-222). In the freshwater environment, fish population surveys will occur annually at the selected exposure and reference areas. The surveys will follow the protocols and methods as the proposed AEMP. Fish health biological sampling in the EEM program will also follow the approach as described for the proposed AEMP. Lake Trout and Slimy Sculpin will continue to serve as the sentinel species, with non-lethal sampling employed for Lake Trout health sampling.

If MMER is triggered in the marine environment, the Bay Mussel will be the target for EEM biological sampling. Sampling for Bay Mussel population and health will occur annually to assess for effluent effects, and will follow the methods used in the AEMP sampling program.

Fish Tissue – Use of Fisheries Resources

Effects on fish usability are monitored by comparing contaminants in edible fish tissue. For the EEM program, the mercury concentration in fish tissue is used to determine if fish are safe for human consumption, and monitoring is triggered when the mercury concentration in the mining effluent (determined during effluent characterization) equals or exceeds 0.10 μg/L (MMER, Schedule 5, s. 9(c); SOR/2002-222). If MMER is triggered, then sampling for the use of fisheries resources will be incorporated into the fish health sampling program. Tissue samples from Lake Trout and Slimy Sculpins (freshwater) or Bay Mussels (marine) will be collected and analyzed for contaminants in tissue.

Power and Statistical Tests

When assessing fish population and health, collecting and lethally sampling more than 20 Slimy Sculpin of each sex and 20 juveniles at each site does little to increase the statistical confidence in the parameter estimates (i.e., confidence limits). Non-lethal sampling of a minimum of 100 Lake Trout at each site is recommended (Environment Canada 2012b), although this sample size may be unachievable in Arctic waterbodies.

Effects endpoints will be considered statistically different between reference and exposure sites at $\alpha=0.1$. For fish tissue, an effect on fish usability is defined as measurements of total mercury that exceed 0.5 mg/kg wet weight of fish tissue taken from an exposure area that are statistically different from fish tissue measured in a reference area (MMER, Schedule 5, s. 1; SOR/2002-222). While most sample sizes in this study were set to achieve a power of 0.9 ($\beta=0.1$), fish tissue metal analyses will be conducted using a power of 0.95 (which will be achieved with eight samples from each site; Environment Canada 2012b). Adjustment to sample sizes for future sampling may be required and will be determined based on power calculations from the data collected from previous AEMP sampling and professional judgement.

Descriptive summary statistics will be reported for all collected biological parameters. Potential effects to fish size (length and weight) and age will be determined using Analysis of Variance (ANOVA). All ANOVA assumptions will be met prior to analysis, including normally distributed populations, equal variances between populations, and sample independence. If populations or variances are unequal, the appropriate transformation will be applied before ANOVA is carried forth.

The remaining effects endpoints, except diet and DELT (see Table 7.2-9), will be analyzed for statistical differences and interactions between the exposure and reference sites using Analysis of Covariance (ANCOVA). Assumptions of normality and constant variance will be met before an ANCOVA is applied. The assumption of equal regression slopes will also need to be met for relative fecundity, to control for variability in weight. However, for most of the endpoints (excluding relative fecundity), the slope of the natural log of the dependent variable and covariate is the endpoint of interest (e.g., the slope of ln(weight) and ln(length) is condition). Thus, it is the differences in slope that indicates significant effect, and thus the assumption of equal regression slopes will not apply.

Potential differences in DELT characteristics between exposure and reference sites will be compared using the Chi Square (X^2) test. While multivariate tests (e.g., multi-response permutation procedures; MRPP) will determine potential differences in diet composition between exposure and reference sites.

Quality Assurance/Quality Control

QA/QC measures will be followed throughout the data, field, and laboratory phases. Data quality will be screened for entry errors and will be checked for outliers using the appropriate boxplot, residual plot or quantile-quantile plot. It will be determined whether outliers are due to data entry or occur through biological means (e.g., sick or damaged fish, parasitized fish). If there is no clear explanation for the outlier, analysis will be conducted in the presence and in the absence of the outlier(s) to determine the magnitude of influence it has on the conclusions. Data entry errors will be corrected, while outliers may be removed to avoid strong leverage.

In the field, all personnel will have suitable expertise to conduct surveys and perform dissections. All safety measures and SOP will be followed. Proper sampling gear (e.g., dissecting equipment) and methods (e.g., electrofishing) will be employed by personnel while in the field. All sampling information will be appropriately documented, preserved (as necessary), stored, and shipped. Chain of Custody forms will used to track all sample shipments.

Fish samples will be analyzed by accredited laboratories with trained staff. Analyses will be conducted by recognized protocols and methods with properly calibrated and maintained instrumentation. Records of samples, analyses, method detection limits, and laboratory staff conducting analyses must be kept and be readily available. Analyses will be conducted by as few as technicians as possible to maintain consistency and reduce measurement error. If sub-sampling is required (e.g., fecundity, egg size), efficiency and accuracy results of the technique must be documented and the information used to calculate appropriate correction or scaling factors to minimize potential differences in methods and efficiency. All records of lesions, parasites, and other deformities will be noted.

Table 7.2-10 summarizes the proposed monitoring program for freshwater and marine fish.

Table 7.2-10. Summary Description of Monitoring Program for Freshwater and Marine Fish VECs

Indicator/Monitoring Target	Freshwater and Marine Fish Communities
Monitoring Category	AEMP (and MMER if triggered)
Design Type	Before-After, Reference-Exposure
Measurable Parameter and Endpoints	Relative Abundance, Size, Age, Growth rate, Relative gonad size, Condition, Relative liver size, Relative fecundity, Relative egg size, and mercury tissue concentration
Key Project Interactions	Runoff, dust or sediment deposition/dispersion, wastewater discharge
Objective	Evaluate potential changes in fish population and health. Confirm EIS predictions, provide monitoring data for adaptive management.
Threshold	Early warning indicator: Significant Project effects on water and sediment quality Exceedance threshold: 0.5 mg/kg wet weight mercury levels; Significant change in fish population or biological variable
Scope of Monitoring	Sampling program for Project effects on freshwater and marine fish and fish habitat that capture spatial and temporal variability.

8. Mitigation and Adaptive Management

The Aquatic Effects Management Plan is a "living document." It may be updated based on regulatory changes, Project-related changes, incident investigations, or the need for changes to existing mitigation measures. The Aquatic Effects Monitoring Program (AEMP) is central to the plan, as it serves as the early warning indicator to identify effects, and trigger additional monitoring or the implementation of additional mitigation measures.

Unless otherwise indicated, measures described in the AEMP apply to all Project components for the life of the Project. This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the monitoring program. The plan presented here is only the beginning of a chain of plans and reports that will ensure the Project minimizes its effects on the aquatic environment.

9. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project on freshwater and marine water quality, sediment quality, fish habitat, and fish populations, and evaluates the compliance of the Project and its sub-contractors. Evaluation of predicted effects will be conducted through the AEMP. The monitoring, quality control, and reporting procedures detailed in this plan will be used to:

- Assess the effectiveness of mitigation and management measures.
- Identify Project effects requiring further mitigation efforts.
- Comply with requests from regulators and stakeholders.
- Adapt to changes in the regulations or the Project.

10. Record Keeping

Record keeping will be conducted by the Proponent and its subcontractors. Data will be entered into suitable electronic databases (e.g., MS Access), checked for quality control and stored with subcontractor responsible for monitoring and with The Proponent. Data will be entered in a format and program that allow for comparison between years and storage in a single file format for each type of survey or monitoring activity. QA/QCed data will be appended to the annual AEMP report and the compilation of all cumulative data will be transferred for storage with the Government of Nunavut, Department of Environment.

All formal documents and reports will follow version-control procedures with revision tracking and version numbers. Version control information will be required for all documents and data that are issued, and approval will be given and tracked before issue. Designated personnel will coordinate preparation, review, and distribution, as appropriate, of the data and reports required for regulatory purposes.

11. Environmental Reporting

11.1 ANNUAL AEMP REPORT

An annual AEMP report on the status of the aquatic environment and detailing any observed trends will be prepared during site preparation/construction and operational phases of the Project. Reporting of environmental monitoring will include documentation of data collection methodology and data management. The reporting process is an important component of adaptive management, and will serve to track developments in mitigation measures to minimize Project effects on the aquatic environment.

All formalized documents and reports will follow version-control procedures to ensure they are approved before use and the internal and external users are accessing the most current information. All monitoring will be done using documented and accepted methods. All sampling and analytical services will have the necessary accreditation and qualifications, and QA/QC procedures will be used. Quality assurance procedures will include internal audits, management of non-conformance to QA/QC protocol events, report, and data management, as well as sampling verification and validation studies. The QA/QC procedures will help to continuously improve the effectiveness of the sampling program, and will be a key component of the adaptive management of the Aquatic Effects Management Plan.

Reporting of all environmental monitoring data will be conducted in accordance with all licences and approvals. Regulatory requirements are anticipated to entail formal annual reports, including disclosure of issues of non-conformance. The annual AEMP report will include the following:

- A description of Project activities during the monitoring interval.
- All of the raw monitoring data obtained during the most recent reporting period.
- Description of the methods used for sample and data collection.
- A detailed evaluation of effects on the designated monitored parameters.
- Results from the evaluation of effects, in text and figures.
- Conclusions from the evaluation of effects.
- Description of mitigation measures in place, and a discussion of effectiveness.
- Identification of additional mitigation measures.

Standardized formats will be used for the annual reports, and reports will be kept on file and made available upon request.

11.2 REPORTS UNDER MMER

If MMER is triggered at any time, then the AEMP will conform to the reporting requirements of MMER in addition to the annual AEMP reports. An initial study design will be submitted to an authorization officer with 12 months of the trigger and six months before biological monitoring is initiated (Schedule 5, s. 14(a) and 15; SOR/2002-222). This report will contain:

- A site characterization.
- A detailed description of the fish population study.
- A detailed description of the fish tissue study.
- A detailed description of the benthic invertebrate surveys.
- The sampling schedule.
- A description of the quality assurance and quality control measures for the EEM program.

Pursuant to Schedule 5, s. 18(a) of the MMER, the first interpretative report will be submitted within 30 months after the mine becomes subject to MMER (SOR/2002-222). The first Cycle 1 interpretative report would follow the Study Design Report, and would occur during any phase where discharge occurs. The interpretative report will contain:

- Documentation of latitude and longitude of sampling areas and a sufficient description of sampling areas to allow proper identification.

- Schedule of sample collection.
- Sample design, including sample sizes.
- The results of data assessment with appropriate statistical analyses and all supporting raw data.
- The identification of any biological effects.
- The comparison of any effects with results from sublethal toxicity testing (from effluent characterization).
- The conclusions of biological monitoring and water quality studies, taking into account any other potential factors not related to the effluent (anthropogenic or natural), and a description of quality assurance and control measures that were implemented.
- A description of how future study design for monitoring will be affected by the results.
- The date when the next biological EEM cycle will commence.

12. Plan Effectiveness

The Plan is intended to ensure that the Project is conducted as proposed, mitigation and management measures are effective at mitigating adverse effects on the freshwater and marine environments, and relevant laws and regulations are met. As part of environmental reporting, The Proponent will distribute copies of the annual AEMP report to stakeholders and conduct annual information sharing workshops with the Kitikmeot Inuit Association to report on mitigation, management and monitoring activities. The Proponent will also conduct annual (or as necessary) evaluations of the efficacy of mitigation and management activities and of monitoring activities using relevant methods, such as power analyses or time series analyses. Should new, more sensitive, monitoring methods be introduced, or existing methods be found to lack statistical power or a robust design, updated methods will be proposed to the stakeholders in a revised AEMP plan. This plan may be updated as frequently as every year, or not at all, if the mine plan and methods for mitigation and monitoring be found to be robust. The new AEMP plan will be implemented following review by stakeholders and an opportunity for response by The Proponent.

13. QA/QC

The Aquatic Effects Management Plan will use re-iterative quality assurance and quality control processes to ensure the Plan's goals are met. QA/QC measures will be applied to each stage of the monitoring program, starting with data collection, then to data entry and analysis, and through reporting. The process will be iterative and reassessment of methods and processes will occur for every annual cycle.

Standard Operating Procedures (SOP) will be established for all environmental data collection. All personnel will have necessary training and accreditation. The SOP will cover all aspects of data collection, data processing, data QA/QC, and data management. SOP will include duplicate sampling, relevant blanks, chain-of-custody procedures, and record keeping. SOP will be reassessed and updated when necessary, as part of the re-iterative QA/QC process. Data analysis will be conducted using established and standardized workflows, and analytical results will be cross-checked and validated.

Statistical hypothesis testing will be validated using power analysis and any other relevant methods. Internal quality audits will be conducted to record and analysis quality issues and will be subject to quality assurance procedures for documenting, tracking, and resolving QA/QC issues. The annual AEMP reports will include detailed descriptions of the analytical methods, including the relevant validation and QC procedures.

The re-iterative QA/QC procedures will continuously improve the effectiveness of the AEMP to detect Project-related effects in the freshwater and marine environments. These QA/QC processes are important in the overall Adaptive Management of Project effects, and will support the goals of the Project to minimize, mitigate and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects.

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20. Wildlife Mitigation and Monitoring Plan

an ERM company

Sabina

GOLD & SILVER CORP.

BACK RIVER PROJECT
Wildlife Mitigation and Monitoring Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
WILDLIFE MITIGATION AND MONITORING PLAN

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1. Introduction

The Back River Project (the Project) has been designed to minimize, mitigate, and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects. As part of the requirements of the final Environmental Impact Statement (EIS) guidelines issued by the Nunavut Impact Review Board (NIRB), this document presents the Wildlife Mitigation and Monitoring Plan Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

This Plan describes actions that are intended to reduce Project-related effects on wildlife. The Plan is intended to ensure wildlife habitats and populations are maintained in the area that will be influenced by Project development, while taking into account operational requirements and the safety of Project employees.

Unless otherwise indicated, measures described in the Plan apply to all Project components for the life of the Project. This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the monitoring program (Section 7).

1.1 INTEGRATION OF TRADITIONAL KNOWLEDGE

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 considered as 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, 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 holding IQ both in the field and through workshops.

2. Scope and Objectives

The Wildlife Monitoring and Management Plan targets the following valued ecosystem components (VECs) that are included in the draft Environmental Impact Statement (DEIS):

1. Caribou (Bathurst, Ahiak, and Dolphin and Union herds).
2. Grizzly bear.
3. Muskox.
4. Wolverine/furbearers.
5. Migratory birds (waterbirds, upland breeding birds).
6. Raptors (e.g., falcons, eagles, hawks, ravens, and owls).
7. Seabirds and seaducks.
8. Marine mammals (ringed seals).

Mitigation for potential effects of the Project was taken into consideration in the Project design and included avoidance of key wildlife habitats. The process of Project design and avoidance was conducted during the preparation phase for the DEIS and the DEIS evaluates the potential for effects given the final footprint after the redesign of Project elements. The overall objective of the Wildlife Mitigation and Monitoring Plan is to minimize effects due to the Project given this, final, footprint design.

The objectives of the Wildlife Mitigation and Monitoring Plan are to:

- Guide on-site adaptive management (both monitoring and mitigation activities) at the Project site.
- Minimize any Project-related effects on wildlife species and their habitat.
- Avoid adverse effects on protected species, and their habitats.
- Describe regional-based monitoring activities for selected wildlife VEC species and their habitat.
- Provide achievable and measureable goals for evaluating mitigation and monitoring activities.
- Ensure monitoring is based on current methods that consistent with other monitoring programs in the Arctic, and identify opportunities for regional, collaborative monitoring with government agencies where a need has been identified.

The Wildlife Monitoring and Management Plan describes and presents the following components:

- The planning and implementation processes for the Plan, including the personnel and their responsibilities.
- The mitigation and adaptive management measures that will be carried out on site to reduce any predicted effects due to the Project (Section 6).
- The Wildlife Effects Monitoring Program (WEMP) including.
  - An on-site monitoring program to evaluate the success of, and guide adaptive mitigation and management activities (Sections 7.2).
  - A species-specific monitoring program to monitor regional populations of selected VEC species (Section 7.3).
- The process for adaptive management, checking, recordkeeping, reporting, and QA/QC.

Sabina is committed to considering and incorporating traditional knowledge, into the Plan. The incorporation of traditional knowledge 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. As for all aspects of the Plan, the incorporation of traditional knowledge will be a continuously evolving process.

3. Planning and Implementation

Planning for the Wildlife Monitoring and Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and monitoring will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the KIA and NIRB.

The DEIS identified potential effects of the Project on VECs. Mitigation to reduce these effects and monitoring to evaluate the efficacy of mitigation and interactions between the Project and wildlife VECs is included in the Plan (Sections 6 and 7.2). Evidence from the facilities monitoring program (Section 7.2) will guide future mitigation activities (Section 6).

Regional VEC monitoring is described (Section 7.3) for those VEC species included in the assessment. Results of these studies will guide management activities (Section 6). The Plan will be updated periodically, as mitigation standards have changed, due to data recorded in the WEMP and/or due to data available from outside sources. In some cases, such as caribou, regional monitoring is planned through a process of collaboration with government biologists and other industrial operations. To date, no regional monitoring plan is available for Sabina to contribute to. Should this plan be developed by GN DOE (or approved of by GN DOE, KIA and NIRB), Sabina will work with the GN DOE to monitor caribou through this plan.

4. Applicable Legislation and Guidelines

Mitigation measures to lessen Project effects on wildlife are derived from federal and territorial legislation. A summary of this legislation are listed in Table 4-1.

Table 4-1. Relevant Acts or Regulations for Wildlife and Wildlife Habitat

Act or Regulation	Implications for Management
Canada *Species at Risk Act* (2002a)	• Protects wildlife on federal lands as well as the critical habitat of those species listed on the "List of Wildlife Species at Risk," and protects all SARA-listed migratory birds. • Section 137 amends the *Canadian Environmental Assessment Act* (1992) to clarify, for greater certainty, that environmental assessments must always consider effects to listed wildlife species, their critical habitat, or the residences of individuals of that species. • Section 79(2) states "the person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans."
Canada *Migratory Birds Convention Act* (1994a)	• Prohibits the taking or killing of migratory birds, their nests, and eggs, and the deposition of harmful substances in areas frequented by migratory birds. • Species protected include waterbirds, cranes, rails and coots, shorebirds including gulls and terns, pigeons and doves, insectivorous songbirds (excluding blackbirds), seabirds, loons, grebes, herons, egrets, and bitterns. Raptors are not protected under the Act.
Nunavut Wildlife Act (2003)	• Provides guidelines on wildlife harvesting, habitat protection, respectful conduct toward wildlife, and designation and protection of species at risk and their habitat. • Pertinent Regulations are: Wildlife General Regulations (1999), and Wildlife Licenses and Permits Regulations (1999).
Nunavut Land Claims Agreement Act (1993)	• Provides guidelines for NIRB on the review of potential environmental and social effects of development projects.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including

- *Overall management of plan.*
- *Monitoring.*
- *Operational aspects.*
- *Internal reporting.*
- *External reporting.*
- *Ensuring compliance and adaptive management.*

The Safety Superintendent along with his/her direct reports are responsible for the implementation of safety aspects of this plan.

6. Environmental Protection Measures

6.1 OVERVIEW

This section identifies mitigation measures that are proposed to eliminate or minimize effects of the Project for wildlife. These measures are outlined in the following sections.

The overall Wildlife Monitoring and Management Plan is subdivided into several individual plans, as shown in Table 6.1-1. The plans are designed to be effective and achievable, and will incorporate the latest scientific information, best management practices, and the results of monitoring activities specifically designed to evaluate the efficacy of the mitigation and management activities.

Table 6.1-1. Application of Wildlife Management Plans to Project Phases

Wildlife Management Plans	Baseline/ Pre-Cons.	Site Prep/ Cons.	Operation	Temp. Closure	C&M	Reclam./ Closure	Post Closure
Wildlife Construction and Operations Management	X	X	X	X	X	X	
Waste and Wildlife Attractant Management	X	X	X	X	X	X	
Road Management for Wildlife		X	X			X	
Aircraft Management for Wildlife	X	X	X	X	X	X	X
Wildlife Noise Abatement Plan		X	X				
General Wildlife Mitigation	X	X	X	X	X	X	X
Problem Wildlife Management	X	X	X	X	X	X	X
Employee Wildlife Education	X	X	X	X	X	X	X

To meet the objectives of the Wildlife Mitigation and Monitoring Plan, evaluation of the effectiveness of mitigation measures to minimize effects to wildlife VECs will be conducted. Evaluation of the mitigation measures will be addressed with the intent to monitor effectiveness and adaptively manage measures. Monitoring activities are described in Section 7.0. Mitigation and Management activities are described in the following sections, in seven separate plans. The timing of implementation of these plans is described in Table 6.1-1.

6.2 WILDLIFE CONSTRUCTION AND OPERATIONS MANAGEMENT

6.2.1 Project-specific Issues

The DEIS evaluated the following potential effects for wildlife that may result from the construction and operation of the Project:

- Habitat loss.
- Disturbance of wildlife, including caribou, due to noise.
- Disruption of wildlife movement.
- Direct mortality during clearing and construction.
- Indirect mortality due to increased hunting pressure and predation.
- Attraction to Project infrastructure.
- Contaminant exposure.
- Reduction in reproductive productivity.

6.2.2 Goals and Objectives

The goal of the Wildlife Construction and Operations Management Plan is to minimize wildlife disturbance and mitigate effects of developments associated with the Project on wildlife. This section focuses on the construction of haul roads during construction and operation phases, and construction of MLA facilities, camps, and Project infrastructure (e.g., pits, quarries, TIA). Objectives of the construction and operations management strategies are to:

- Minimize effects of habitat loss by designing project infrastructure outside of sensitive areas for wildlife.
- Minimize effects of disruption of movement through design and/or management of project infrastructure to reduce the production of linear barriers.
- Minimize effects of direct mortality and disturbance by conducting grubbing and vegetation clearing outside of wildlife sensitive periods.

6.2.3 Mitigation and Management

6.2.3.1 Infrastructure Location - Avoidance of Sensitive Areas

Construction of Project infrastructure will avoid, where possible, wildlife sensitive areas such as critical habitat for caribou calving and high quality habitat for foraging during post-calving, important cliff habitat for raptor nesting, eskers and denning habitat, and important waterbird staging areas.

If it is not possible to avoid wildlife sensitive areas, mitigation measures to minimize disturbance of wildlife sensitive areas include:

- Pre-clearing surveys for grizzly bear and wolverine dens and raptor and upland breeding bird nests will be conducted to ensure that wildlife are not destroyed or disturbed (Section 7.2).
- Caribou abundance, distribution and movement relative to the winter roads and project roads will be monitored to determine whether mitigation strategies need to be adjusted.

6.2.3.2 Construction Periods - Avoidance of Sensitive Periods

Mitigation measures to minimize disturbance of wildlife during road and infrastructure construction and operation include:

- Construction and operations activities will be scheduled, where possible, to avoid disturbance of wildlife during sensitive periods (Table 6.2-1).
- If it is not possible to avoid wildlife sensitive periods, then pre-construction surveys will be conducted (Section 7.2).

Table 6.2-1. Wildlife Sensitive Periods Applicable to the Project

VEC	Activity	Sensitive Period
Caribou	Spring migration	April 15 to June 4[1] April 17 to June 30[2]
	Calving	June 5 to June 15[3]
	Post calving	June 16 to July 20[3]
	Fall Migration	October 20 to November 28
Muskox	Calving	April 1 to May 31
Grizzly Bear	Denning Cub rearing	October 15 to May 7 May 7 to October 15
Wolverine/Furbearers	Denning Early pup rearing	February 21 to May 7 May 7 to July 1
Wolves	Natal Denning Early pup rearing	May 1 to September 15 September 15 to October 31
Raptors	Nesting	April 15 to August 15
Migratory Birds	Nesting	June 1 to July 31
Ringed seals	Pupping	February 15 to April 15
	Moulting	April 15 to June 30

[1]: Bathurst and Beverly herd.
[2]: Dolphin and Union herd.
[3]: Bathurst herd.

6.2.3.3 Minimize Sensory Disturbance

Mitigation measures to limit sensory disturbance include:

- All equipment will be appropriately maintained to reduce noise.

6.2.3.4 Infrastructure Design

Infrastructure components will be designed, where possible, to mitigate the effects on wildlife and include the following measures:

- Design project infrastructure to reduce attractiveness of the site to bears and wolverines – provide bear and wolverine-proof waste storage and management facilities, an incinerator facility with adequate storage and exclusion capabilities.
- Design buildings to exclude wildlife (e.g., construct vents to prevent small mammals and birds entering and build skirting around the bottom of buildings to exclude wolverine).
- Build berms or other markers at high walls of quarries to deflect wildlife movement and prevent falls or injury.
- Construct fencing (or other suitable structures to exclude bears and wolverine) around Project infrastructure may be implemented if wildlife are frequently found using the Project footprint.

6.2.3.5 Triggers and Actions during Construction

During construction, if wildlife sensitive periods cannot be avoided, then pre-clearing surveys will be conducted. The following actions will be taken if wildlife are detected during construction:

- If a wildlife feature that is legislatively protected (raptor nest, carnivore den, or SARA-listed bird species), then a buffer will be established and the feature will be avoided until such time as the wildlife has completed the use of the feature. Following wildlife leaving the site, activities within the buffer will resume and the feature may be removed if within the stated Project footprint.
- If a wildlife feature that is legislatively protected (raptor nest, carnivore den, or SARA-listed bird species), within a buffer of 1.0 km of construction activities, then the feature will be monitored for the duration of the season and the breeding success of the wildlife VEC will be reported in the following WEMP report.

Subject to specific approvals from land use authorities, the Interim Caribou Protection Measures of the draft WKRLUP (NPC 2005) will be used as guiding principles for Project construction and operations. Mitigation measures to minimize disturbance of caribou during sensitive periods include:

- Construction will be managed to limit disturbance (e.g., limiting above ground blasting) during sensitive periods for caribou (May 15 to 31 and June 15 to July 20) when caribou are within 500 m of Project activities.

6.2.3.6 Triggers and Actions following Construction

Surveys will be conducted for a variety of VEC species during operations. These surveys, and incidental observations, may report the presence of wildlife near the Project footprint. These wildlife observations fall into three categories: 1) wildlife have built a physical structure such as a nest or den near or on the Project footprint, 2) wildlife have moved near to the Project footprint as part of their yearly migration, and 3) wildlife have interacted directly with infrastructure.

<u>Nests or Dens near the Project</u>

The assumption is that these animals have chosen to den or nest on or near active infrastructure and therefore are acclimated to the Project activities. In general, the response will be to leave the den or nest alone and monitor it until the adult and offspring have left the den. If wildlife are observed near or on the Project footprint, actions will be taken that include the following measures:

- If special habitat features (active carnivore den or raptor nest) is located within 1.5 km or on the Project footprint during active operations, the feature will be monitored until the cubs or chicks leave the den or nest.

Intermittent disturbances, such as blasting at the pits or quarries, may allow a raptor to construct a nest between blasts and then be disturbed when blasts occur. In the event that an active raptor nest is observed within pits with active blasting, actions will be taken that include the following measures:

- If a raptor nest is observed (see raptor nest monitoring in the pits) being constructed in the pits, but the raptor has not yet laid eggs, then the nest will be removed.
- If locations are found that are frequently uses as nests, then appropriate mitigation will be used to dissuade raptors from using this area (e.g., netting, bird spikes, etc).

<u>Wildlife Migrating near Project</u>

If wildlife (including caribou) are observed within 500 m of the Project site during sensitive periods (for caribou, this is May 15 to May 31 and June 15 to July 20), then a staged reduction in activities will occur to reduce effects on caribou, which may include:

- Helicopter management (see Aircraft Management for Wildlife; Section 6.5).
- Vehicle management (see Road Management for Wildlife; Section 6.4).
- Management of blasting activities to reduce disturbance (e.g., limiting or ceasing above-ground blasting).
- Wildlife monitoring.

<u>Direct Interactions between Wildlife and the Project</u>

Mitigation and monitoring will be implemented to limit direct interactions between wildlife and the Project. Facility monitoring will be conducted to examine if wildlife are interacting with the Project infrastructure (particularly under buildings, in vents) or are present in the TIA during operations and closure (see Infrastructure Monitoring). If wildlife are observed using the Project infrastructure, the following activities will be conducted:

- If wildlife are able to access buildings through damaged skirting, then skirting will be repaired immediately.
- If wildlife are able to access buildings through vents, windows, or by other means, then measures will be taken to exclude wildlife.
- If waterbirds are observed using the TIA or other water bodies containing water that does not meet water quality standards, then measures will be taken to exclude waterbirds from these areas (e.g., bangers; see Waste and Wildlife Attractant Management).
- If wildlife are found using waste-management facilities, then appropriate physical means of excluding wildlife may be taken (see Waste and Wildlife Attractant Management).
- If wildlife, particularly caribou are observed on the runway, then appropriate measures will be taken to guide the wildlife away from the area by use of a vehicle.

6.3 WASTE AND WILDLIFE ATTRACTANT MANAGEMENT

6.3.1 Project-specific Issues

Features or substances that interest or may be resources to wildlife are considered to be wildlife attractants. Within the Project area, the following may be potential wildlife attractants: standing waters, waste, waste storage facilities, buildings, and lights. The following potential effects and concerns exist for wildlife due to Project-specific attractants:

- Potential for wildlife to be attracted to Project sites by the presence of waste and waste management facilities.
- Potential for wildlife to ingest or use poor-quality water sources as habitat, and thereby become exposed to metals and/or other substances.
- The road may act as an attractant (scavenging road-killed carrion) which may increase risk of vehicle-wildlife interactions and road-related mortality (direct mortality).
- Artificial light on infrastructure as an attractant to migratory birds, which may result in bird disorientation and increase risk of direct mortality (i.e., collisions and disruption of migration).

6.3.2 Goals and Objectives

The goal of the Waste and Wildlife Attractant Management Plan is to minimize the potential for human-wildlife interactions through control of wastes and potential wildlife attractants in the Project area. The objectives are to:

- Ensure Project infrastructure and activities minimize potential attractants that could affect wildlife.
- Reduce and manage wastes to minimize wildlife attraction to Project facilities.
- Minimize standing water and restrict access to contaminated water through standard methods such as fencing or behavioural modifiers.

6.3.3 Mitigation and Management

6.3.3.1 Overview

Mitigation measures to minimize and eliminate Project-specific effects on wildlife due to attractants are described in the following sections and include:

- Management of standing and contaminated water.
- Waste storage and incineration.
- Carrion (animal carcasses) control.
- Minimizing sensory attraction.

In addition to the above, mitigation and management directives outlined in the Employee Wildlife Education Plan (Section 6.9) will be applied during all Project activities (e.g., no littering policy, no feeding wildlife policy).

All mitigation and management directives related to Waste and Wildlife Attractant Management will apply to all employees and other persons associated with the Project. Education and training programs

(Section 6.9) to ensure understanding and compliance with Waste and Wildlife Attractant Management provisions will be undertaken.

6.3.3.2 Standing and Contaminated Water Management

Wildlife, especially waterbirds, may be attracted to standing water. Mitigation measures to reduce the potential for wildlife being exposed to contaminated water include:

- Monitoring the quality of standing water in Project areas, as outlined in the Surface Water Management Plan (Volume 10 of the DEIS).
- Employing wildlife exclusion measures if wildlife are observed to be using contaminated water or hazardous liquids.

6.3.3.3 Waste Storage and Incineration

Various waste products that will be produced during the construction and operation of the Project include kitchen, petroleum, and sewage wastes. Wildlife species, particularly grizzly bear and wolverine, may be attracted to the site if these waste products are not properly managed. Mitigation and monitoring to minimize attractants will include the following measures:

- Incinerate all kitchen wastes within a timely manner.
- Store recyclable wastes and chemicals in wildlife-proof facilities.
- Store all attractants and wastes (garbage, food waste) at temporary (construction) and permanent site infrastructure in bear-proof storage containers. Bear-proof containers must be tightly secured at all times. Standard procedures for waste containers to be considered effective at preventing bears from accessing wastes will be implemented.
- Conduct regular road and camp cleanups to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife and ensure proper storage and disposal of hazardous wastes.
- Remove waste from collection sites regularly, incinerate in an approved incinerator or store in wildlife-proof areas and wildlife-proof buildings until incineration.
- Dispose of all waste which should not be incinerated at an approved disposal site as soon as possible.
- Use landfills only for disposal of non-wildlife attracting waste.
- Prevent wildlife from entering landfills, incinerators and sewage treatment facilities, where possible, using appropriate wildlife exclusion techniques.

6.3.3.4 Carrion Control

Wildlife scavengers (e.g., grizzly bears, wolverines) in the Project area will be attracted to animal carcasses. Mitigation measures to address any carcasses in areas of human use include:

- Removal of road-kill from the road and disposal using approved methods (i.e., incineration or transport away from the Project site) as quickly as possible to avoid attracting carrion feeders to the road side.
- Removal of naturally occurring wildlife kills located near roads and Project infrastructure or, if more appropriate, marking the area with temporary signage indicating scavengers may be present in the area. Signage will be removed when carcass is no longer an attractant.

- Enforcing temporary closures of areas where wildlife carcasses cannot be removed until the carcass has been consumed and scavengers have left the area.

6.3.3.5 Minimize Sensory Disturbance

Lights are an attractant to many species of wildlife, especially birds. Lighting on infrastructure will be designed to minimize potential impact to wildlife while ensuring safe operating conditions. Mitigation measures to reduce sensory disturbance to wildlife include:

- The use of directed lighting rather than broad lighting whenever possible.
- Directing all lighting into the facility and toward the ground to limit stray light as a visual disturbance.
- Avoiding the design of tall towers requiring the use of solid and pulsating red lights, which seem to be more attractive to birds at night during inclement weather conditions than are white strobe lights (Erickson et al. 2002).

6.4 ROAD MANAGEMENT FOR WILDLIFE

6.4.1 Project-specific Issues

The DEIS identified three potential effects of roads on wildlife:

- Disturbance to wildlife.
- Disruption of movement.
- Direct mortality due to vehicle strikes.

6.4.2 Goals and Objectives

The goal for the Road Management Plan is to minimize or reduce potential effects of all-season and winter roads on wildlife VECs. This plan will include mitigation for road-related effects during the construction and operation phases. Objectives include the following:

- Avoid direct and indirect wildlife mortality due to Project activities.
- Maintain the permeability of the landscape by enabling wildlife free passage across the road.
- Prevent unauthorized use of the road.
- Limit habitat loss or degradation to the Project footprint through dust and vehicle controls.
- Gather knowledge on the use of the road by wildlife.

6.4.3 Mitigation and Management

6.4.3.1 Avoidance of Wildlife Sensitive Areas

Mitigation measures to minimize disturbance in wildlife sensitive areas are to:

- Identify locations of dens and raptor nests within 2 km of Project footprint prior to construction.
- Identify eskers used for migration by caribou within 2 km of Project footprint prior to construction.
- Road routing will be conducted to avoid active carnivore dens or raptor nests, where possible.

- No use of eskers containing known carnivore dens as source of quarry material.
- Quarries will be designed to avoid known dens by 1.0 km; if additional dens are discovered during construction or use of the quarry, then appropriate monitoring and mitigation will be used (see Wildlife Construction and Operations Management – Section 6.2).
- Limit planned construction activities within 1.0 km of active wolf, fox, bear and wolverine dens, and 1.0 km of raptor nests during the active season (see Wildlife Construction and Operations Management – Section 6.2). Note that this is for planned activities based on results of existing baseline surveys for wildlife. If unforeseen dens or raptor nests are observed during pre-construction surveys, appropriate mitigation and monitoring will occur, which may include a buffer distance to limit disturbance (Section 6.2).
- Restrict vehicles to road and quarry footprints during construction and operations to avoid unnecessary disturbance to tundra.

6.4.3.2 Road Access and Traffic Management

Measures to reduce impacts to wildlife due to roads include:

- Minimize effects of direct mortality by designing and operating roads and infrastructure so as to ensure safe operation (e.g., good sight lines) and eliminate any infrastructure that can trap or injure wildlife.
- Truck speed limit will be 60 km/hour, and trucks will slow to 40 km/hour when wildlife are observed within 250 m of the road or in wildlife sensitive areas.
- Traffic will be managed, dispatched, and monitored.
- Road will be closed to the public and to all foot traffic. Road use will be restricted only to persons required for Project construction, operations, and maintenance.
- Prohibit private vehicles (including snowmobiles and all-terrain vehicles) on the road.

6.4.3.3 Wildlife Right of Way

There is potential for vehicles to encounter wildlife during road construction. Measures to reduce impacts to wildlife within the road right-of-way include:

- Wildlife will be given the right-of-way on all roads at all times.
- Trucks will stop when groups of wildlife are crossing the road.
- To allow small groups (<10) or individual wildlife standing on the road to move off the road unalarmed, trucks will stop for 20 minutes, then proceed slowly (<15 km/hour) if wildlife have not moved within 20 minutes.
- If larger groups (>10) caribou are standing on the road, then the caribou will be given the right of way and traffic will stop until the caribou have moved off of the road.
- A reporting system will be in place for wildlife encounters (observations or interactions) along all roads.
- Development of appropriate mitigation strategies (e.g., signage) for areas of higher frequency of encounters with wildlife.

6.4.3.4 *Road-related Wildlife Mortalities*

Despite measures taken to avoid wildlife, accidental vehicle-wildlife collisions are possible. Mitigation measures for managing road-related wildlife mortalities include:

- Signage will be installed to alert drivers of speed limits, identified wildlife movement corridors, and wildlife sensitive areas (e.g. nearby active carnivore den).
- Road kill will be removed in a timely manner.
- A reporting system will be in place to record all road-killed or injured wildlife.

6.4.3.5 *Wildlife Incident and Accident Reporting*

Mitigation measures to reduce the incidence of wildlife-vehicle interactions include:

- A reporting system for all wildlife-vehicle interactions and wildlife-road structure interactions (e.g., caribou resting on road turn-outs) will be created.
- The reporting system will allow employees to raise concerns anonymously or report observed non-compliance.
- Location, species, date, and type of wildlife-vehicle interactions will be reviewed annually to identify any areas with higher frequencies of interactions.
- All Project or contractor employees will be trained on reporting procedures for wildlife observations and interactions through the Employee Wildlife Education and Compliance Measures (Section 6.9).
- A standard response plan for Project-related wildlife incidents and accidents to ensure the safety of Project employees and wildlife. The plan will be reviewed and adapted as necessary to reduce the incidence of wildlife-vehicle interactions.

6.4.3.6 *Dust Reduction and Control*

Mitigation measures to manage dust production from onsite road traffic include:

- Compliance with road access and traffic restrictions.
- Avoidance of dust suppressants that can act as wildlife attractants.

6.5 AIRCRAFT MANAGEMENT FOR WILDLIFE

6.5.1 Project-specific Issues

The DEIS identified one project-specific issue for aircraft:

- Disturbance to wildlife.

6.5.2 Goals and Objectives

The goals and objectives of the Aircraft Management Plan for Wildlife is to reduce sources of disturbance to wildlife from aircraft overflights.

6.5.3 Mitigation and Management

Prior to construction, important habitat areas for wildlife will be identified and provided as a map to pilots. This map will include:

- Identified areas with concentrations of wildlife during certain seasons, such as lakes used for staging by waterbirds and raptor nests.
- Water crossing locations used by caribou to limit disturbance to these areas.
- Other important habitat locations used by caribou.
- Dens that are repeatedly used between seasons, such as wolf, fox, and wolverine dens.

Pilots flying helicopters and fixed wing aircraft used for Project activities will adhere to wildlife-recommended guidelines designed to:

- Avoid low-level aircraft flight paths over high densities of wildlife or over sites expected to support high densities of wildlife.
- Avoid low-level flights over any observed wildlife by 300 m.
- Avoid low-level flights over observed groups of caribou by 610 m vertically or horizontally.
- Reduce disturbance to colony nesting birds and important staging areas during sensitive periods by maintaining an aircraft flight altitude of at least 650 m during horizontal (point to point) flights.
- Reduce disturbance to colonies of resting, feeding, or moulting birds by maintaining a distance of 300 m from flocks of birds.
- Monitor all airstrips to ensure the landing strip is free of wildlife prior to landing and take-off.
- Avoid wildlife harassment and disturbance at all times.

6.6 WILDLIFE NOISE ABATEMENT PLAN

The Wildlife Noise Abatement Plan focuses on environmental airborne noise levels that could affect wildlife Valued Ecosystem Components (VECs).

6.6.1 Project-specific Issues

The DEIS identified three potential effects of noise on wildlife:

- Disturbance to wildlife resulting in functional habitat loss.
- Disturbance to wildlife resulting in behavioural changes.
- Reduction in Reproductive productivity as a result of the cumulative effects of the Project including noise.

6.6.2 Goals and Objectives

The goal of the Wildlife Noise Abatement Plan is to minimize or reduce potential effects of noise disturbance to wildlife VECs. The plan will include mitigation for the effects of noise during the construction and operations phases of the Project. Objectives include the following:

- Limit functional habitat loss and habitat degradation for wildlife VECs due to Project noise.
- Reduce disturbance to wildlife due to noise generation as a result of Project activities.

6.6.3 Mitigation and Management

Mitigation measures to minimized disturbance to wildlife are detailed in the Wildlife Noise Abatement Plan (Section 6.6) and are summarized in this section. Mitigation measures to minimize disturbance to wildlife as a result of Project noise include those listed in the Wildlife Construction and Operations Management Plan (Section 6.2), the Road Management Plan for Wildlife (Section 6.4), and the Aircraft Management Plan for Wildlife (Section 6.5) in addition to the following:

- Ensuring equipment is fitted with appropriate mufflers and silencers.
- Ensuring equipment is well maintained.
- Enclosures, berms, acoustic screening and shrouding where stationary sources requiring control are identified.
- Strategic placement of waste rock piles to block plant sources of noise.
- House stationary sources of noise in buildings.
- Wherever possible, impulse events, such as blasting, will be scheduled outside of the peak wildlife sensitive periods and limited to certain times of the day and year.
- Management of blasting operations to reduce disturbance (e.g., this may include delay or cessation of above ground blasting, as needed) if caribou are observed in the area (groups of 30 or greater adult caribou or 10 or greater female caribou with calves) are within 500 m of the blast area, as determined by ground-based observations.
- Helicopters will avoid the groups of caribou where possible.
- The required minimum altitude limit of 300 m for aircraft flight will be adhered to (with the exception of take-off and landing).
- Helicopters are operated above 610 m when caribou are present, as per the caribou protection measure guidelines. Whenever possible, landing and takeoff are only conducted when herds of caribou are not present in the immediate area.
- Implement pilot education on the potential effects of helicopters on caribou and the importance of maintaining proper distances from animals.
- Annual surveys of Project infrastructure by environment staff and removal of any nest-building materials prior to egg-laying.
- If a nest is successfully built on Project infrastructure adjacent to an above-ground blasting site, the patterns of blasting may be altered to minimize disturbance to raptors.
- Other possible general noise abatement measures that can be implemented on site to minimize static noise due to generators, vehicles, and other sources.

6.7 GENERAL WILDLIFE MITIGATION

6.7.1 Project-specific Issues

The DEIS identified several potential effects on wildlife related to general wildlife mitigation, including:

- Attraction and problem wildlife, particularly bears and wolverines.
- Indirect mortality to wildlife from hunting.

6.7.2 Goals and Objectives

The goals and objectives of the General Wildlife Mitigation Plan are to:

- Minimize any attractants to site through animal feeding, and protect worker safety from wildlife incidents as a consequence.
- Minimize any litter or waste on the tundra that may attract wildlife, or cause a wildlife incident.
- Prohibit hunting on the Project site.

6.7.3 Mitigation and Management

6.7.3.1 No Feeding of Wildlife Policy

Wildlife may be attracted to Project areas by natural curiosity or because of the resources that Project areas provide. Management strategies to minimize human-wildlife interactions will include:

- A policy of no feeding and no intentional attraction of wildlife.

6.7.3.2 No Littering Policy

Management strategies to minimize littering will include:

- A policy of no littering to commence at the start of construction and to continue throughout the life of the Project.

6.7.3.3 No Hunting Policy

In addition to a policy prohibiting hunting and trapping by all Project and contractor employees throughout the life of the Project, management strategies to restrict hunting will include:

- Prohibition of hunting from roads, and, to ensure human safety, prohibition of hunting within a buffer area along roads.
- Reporting procedures for any poaching or evidence of illegal hunting and trapping to government authorities.
- Prohibition of all Project and contractor employees from carrying personal firearms except in the case of a certified wildlife monitor who is carrying a firearm for the safety of workers in the field when a problem bear has been identified.

6.8 PROBLEM WILDLIFE MANAGEMENT

6.8.1 Project-specific Issues

Although mitigation measures can greatly reduce the probability of negative wildlife interactions, animals may still be attracted to a Project site. The provisions of the Problem Wildlife Management Plan address potential effects of the Project including:

- Features acting as an attractant.
- Mortality (direct and indirect).
- Reduction in reproductive productivity.

6.8.2 Goals and Objectives

The goal of the Problem Wildlife Management Plan is to minimize wildlife-human interaction, ensure safety of Project employees, and prevent avoidable wildlife mortalities. Objectives include:

- Provide a response plan for dealing with adverse human-wildlife interactions.
- Prevent habituation of wildlife to Project facilities and people.
- Avoid destruction of wildlife, unless absolutely necessary.

6.8.3 Mitigation and Management

6.8.3.1 Protocol for Human-wildlife Interactions

Mitigation and management measures to address problem wildlife interacting with the Project are outlined in the Protocol for Human-Wildlife Interaction. The Protocol is written to address problem bears, however it can be modified to address other problem wildlife, if necessary (Table 6.8-1). Details of these management responses to human-wildlife interactions are as follows:

1. Monitoring: report and record wildlife sightings and signs.
2. Post warning: provide accurate and current information of all potentially dangerous wildlife in the area.
3. Area closure: develop a system by which worker access to areas with problem wildlife is restricted, pending suitable controls.
4. Adverse conditioning (AVCD): apply AVCD activities to problem wildlife to prevent or reverse habituation.
5. Translocation: capture and relocate problem animals away from the Project area.
6. Destruction: undertake (with authorization from appropriate wildlife management authority) only when an animal is determined to pose an unacceptable hazard to human safety.

Table 6.8-1. Protocol to Determine Appropriate Management Responses to Human-Animal Interactions

	Management Response					
Type of Human-Animal Interaction	**Monitor**	**Post Warning**	**Area Closure**	**AVCD**	**Trans-locate**	**Destroy**
1. Animal sighting or sign reported	X	X				
2. Animal showing normal feeding behaviour and avoids people	X	X				
3. Animal reacting defensively following surprise or provoked encounter (defensive aggression)	X	X	X			
4. Animal tolerates people but ignores them and their facilities (no threat present)	X	X	X	X		
5. Animal shows repeated interest in people and/or human facilities, which will likely result in food-conditioning or close approaches (habituated)	X	X	X	X		
6. Animal receives minimal or low-level reinforcement to unnatural food sources (mildly food-conditioned)	X	X	X	X	X	

(continued)

Table 6.8-1. Protocol to Determine Appropriate Management Responses to Human-Animal Interactions (completed)

Type of Human-Animal Interaction	Management Response					
	Monitor	Post Warning	Area Closure	AVCD	Trans-locate	Destroy
7. Animal is heavily habituated to people and has repeatedly obtained unnatural foods (food-conditioned)	X	X	X	X	X	
8. Animal has previously been relocated and is unlikely to change its behaviour		X	X	X		X
9. Animal displays aggressive, offensive, or predatory behaviour and is an imminent threat to human safety.		X	X			X

Mitigation measures to manage for problem wildlife in the Project area include:

- Disseminate protocol for Human-Wildlife Interactions to all employees and contractors as part of orientation with lead management responses undertaken by identified supervisors, wildlife biologists and conservation officers.
- Identify appropriate personnel (i.e., environmental monitor, wildlife biologist) to monitor and evaluate human-wildlife conflicts carefully using the protocol for Human-Wildlife Interactions to determine whether animal should be considered a problem animal and appropriate course of action.
- Leave wildlife that avoid humans and show normal feeding behaviour alone.
- Avoid destruction of wildlife unless no other recourse is possible. Bears or other wild animals that cause injury to humans as a result of natural defensive or protective behaviour (e.g., protecting its young during a startling encounter) should not be destroyed or translocated.
- Inform employees of the disciplinary consequences of disregarding measures taken to manage problem wildlife (e.g., area closures).

6.9 EMPLOYEE WILDLIFE EDUCATION

6.9.1 Project-specific Issues

Employee wildlife education addresses potential effects of the Project on wildlife including: habitat loss, disturbance (to feeding, nesting, denning or breeding habitats), attraction to Project infrastructure and activities, and mortality, both directly due to Project activities and indirectly as a result of increased hunting access.

Employees and contractors will be educated on basic local wildlife ecology (focused on VECs), Project-related concerns for wildlife and biodiversity. All Project personnel will be encouraged to promote stewardship activities. Employees and contractors will also be expected to comply with the direction provided in the overall General Wildlife Management and other subject-specific management provisions.

6.9.2 Goals and Objectives

The goal of Employee Wildlife Education is to create employee and contractor awareness for the potential effects of Project facilities and Project operations on wildlife, minimize disturbance and disruption to wildlife, and ensure safety of all employees. The objectives of Employee Wildlife Education include:

- Providing an accessible and comprehensible wildlife awareness program.
- Ensuring awareness and understanding for the recommended mitigation measures and procedures outlined throughout this document.
- Promoting compliance with mitigation measures through education and enforcement.

6.9.3 Mitigation and Management

6.9.3.1 Employee Wildlife Education Program

All contractors and employees working on the Project will participate in the Employee Wildlife Education program in conjunction with Project orientation. Mandatory annual refresher courses will ensure ongoing employee awareness of wildlife concerns and mitigation procedures for the Project. This program will be supported by standard operating procedures, reporting forms, information sheets, and awareness posters and signage. The education program will include training in the following areas:

- Access road restrictions and operating protocols (e.g., wildlife right-of-way, speed limits, check-ins, road-wildlife reporting programs).
- Awareness of wildlife-sensitive locations (e.g., movement corridors, breeding areas) and wildlife-sensitive periods.
- Local wildlife species of concern and threats to native biodiversity.
- Waste and wildlife attractant management.
- No feeding of wildlife policy.
- No harassment of wildlife.
- No-hunting policies.
- Bear-aware training for relevant staff who work outside.
- Wildlife incidental observation reporting.
- Wildlife incident/accident reporting and response procedures.
- Anonymous reporting system for employees to voice concerns and inform management of non-compliance.
- Compliance requirements and disciplinary action that will be enforced by Project management.

7. Wildlife Effects Monitoring Program (WEMP)

7.1 INTRODUCTION

7.1.1 Overview

A Wildlife Effects Monitoring Program (WEMP) is proposed to evaluate the effectiveness of mitigation and management in reducing potential effects of the Project on identified wildlife VECs (Table 7.1-1) and to monitor the regional populations of selected species. The proposed WEMP is presented as a draft framework for 1) facility-specific monitoring, and 2) wildlife-specific monitoring.

1. Facility-specific (e.g., road traffic measures, problem wildlife, waste management) monitoring will focus on effectiveness of mitigation measures to minimize disturbance and effects of the Project on wildlife and guide adaptive management.
2. Focal species monitoring (i.e., VEC species) is outlined with a focus on wildlife abundance, movement, and distribution relative to the Project activities and facilities. In some cases, the proposed monitoring program may be combined with monitoring related to other projects or the Nunavut government where cumulative or range-wide monitoring is deemed appropriate at the behest of the Nunavut government.

Table 7.1-1. List of VEC Wildlife Species Included in Facility and Focal-Species Monitoring

VEC	Facility-specific Monitoring	Focal Species Monitoring
Caribou	X	X
Grizzly Bear	X	X
Muskox	X	X
Wolverine/Furbearers	X	X
Migratory Birds	X	X
Raptors	X	X
Seabirds and Seaducks	X	X
Ringed Seals	X	X

A draft framework for the proposed WEMP is outlined in the following sections, with the caveat that a formal and detailed program will be developed prior to initiation of works associated with the proposed Project. The framework identifies each monitoring component, methodology to be used, spatial extent, frequency and duration of monitoring, monitoring objective (quantify impact or assess mitigation), and parameters measured.

7.1.2 Goals and Objectives

The goal of the WEMP is to assess interactions between the Project and wildlife populations in order to modify operations if it is found that the Project is having a measurable negative effect on specific wildlife populations in the monitored area. The objectives of the WEMP are split into two groups: i) facilities monitoring, and ii) focal species monitoring.

Facilities Monitoring is designed to:

- Monitor wildlife interactions with Project infrastructure.
- Monitor mitigation actions and their efficacy.
- Identify opportunities for adaptive management.

Focal Species Monitoring is designed to:

- Evaluate impact predictions in the effects assessment.
- Continuously reduce uncertainty of Project effects on wildlife.
- Collaborate with other industry parties, government, and Inuit peoples in the event that long term wildlife monitoring programs are initiated in the Kitikmeot region of Nunavut.

7.1.3 Approach

The final WEMP that emerges from the Final EIS will be developed by Sabina and shared for review and approval by stakeholders and government, including the KIA.

7.1.4 Study Area

For terrestrial wildlife, including ungulates (caribou and muskox), carnivores (grizzly bears, wolverine and furbearers), raptors and migratory birds, the Regional Study Area (RSA) encompasses the Marine Laydown Area (MLA), the George and Goose Properties, the winter roads connecting the George and Goose Properties and the MLA, and a 30 km buffer on either side of all proposed Project infrastructure, covering an area of 12,620 km^2 (Figure 7.1-1). The LSA encompasses a 1 km buffer around all proposed Project infrastructure and the winter roads connecting these Properties, covering 1,344 km^2 (Figure 7.1-1).

For marine wildlife including marine mammals (ringed seals) and seabirds/seaducks, the marine RSA encompasses the marine areas of Bathurst Inlet from the southern-most tip of the Inlet to approximately 15 km north of Omingmaktok and is approximately 75 km in width, covering an area of 34,000 ha within Bathurst Inlet (Figure 7.1-2). The marine LSA encompasses a 1 km buffer around the shoreline of the MLA and 500 m on either side of the winter road where it crosses the inlet covering an area of 2,700 ha (Figure 7.1-2).

Facilities monitoring will largely be conducted on and adjacent to the Project footprint and winter roads within the LSA. Focal species monitoring will be conducted largely within the RSA. If a collaborative approach to wildlife monitoring is taken with other stakeholders, some of the monitoring work may occur outside of the RSA, particularly for species like caribou which range over a wider area.

7.1.5 Reporting

The results of the facilities monitoring and focal species monitoring will be reported regularly in the WEMP and distributed to regulatory agencies and the Kitikmeot Inuit Association (see Section 11, Environmental Reporting).

Should periods of temporary closure or care and maintenance occur, some facilities monitoring will continue, which will be summarized in a memo to regulators. The periodicity of reporting for the closure and post closure phases will be agreed upon prior to closure commencing.

7.2 PART I: FACILITY-SPECIFIC WILDLIFE MONITORING

Certain Project facilities, structures, and activities pose potential obstacles and hazards for wildlife, as discussed in the DEIS. These facilities will be monitored to determine whether wildlife effects are occurring and to ensure that mitigation commitments are being implemented.

Facilities that will be monitored for wildlife effects include:

- Project site roads and winter roads (when actively used or when road construction is taking place).
- Active mine sites: Goose Property and George Property.
- The Marine Laydown Area.
- Areas with exploration drilling activities.

The facility-specific monitoring program is summarized in Table 7.2-1. Those parts of the program that are carried forward during care and maintenance are described further in the following sections.

Table 7.2-1. Facility-Specific Wildlife Monitoring Program and Project Phases

Facilities Monitoring Sub-Programs	Baseline/ Pre-Construction	Site Prep/ Construction	Operations	Temporary Closure*	Care and Maintenance*	Reclamation/ Closure*	Post Closure
Footprint Monitoring *Mapping Project Footprint (as-built surveys)*		Yearly	Yearly	--	--	Yearly	As needed to track reclamation
Human Activity Monitoring *Reporting Hunting and Fishing on the Project site*	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	--
Pre-Clearing Surveys for Nests *Area to be cleared for Project infrastructure will be pre-surveyed for nesting birds*	--	Yearly, In Spring	Yearly, In Spring	--	--	--	--
Pit and Quarry Wall Nest Monitoring *During spring, observations will be made of pits to determine if raptors are nesting and appropriate mitigation will be enacted*	--	Yearly, In Spring	Yearly, In Spring	--	--	--	--
Waste Monitoring *Monitoring waste storage areas for misdirected waste or signs of wildlife*	Weekly	Weekly	Weekly	--	Weekly	Weekly	--
Fence/Skirting Monitoring *Fence inspections and wildlife observations*	--	Monthly	Monthly	--	Monthly	Monthly	--
Wildlife-Vehicle Interactions *Observations of wildlife and wildlife mortalities along the site roads and winter roads*	--	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Ringed Seal Monitoring *Survey area of sea ice prior to on-ice works during April and May during years of MLA activity*	2 years baseline	In March-April if MLA is active	In March-April if MLA is active	--	--	--	--
Incidental Wildlife Reporting *Incidental Wildlife Observations*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Noise Monitoring *Monitor noise levels outside the footprint*	One time during Baseline	One time during Construction	One time every three years during operations	--	--	One time during Reclamation and Closure	--

** Monitoring is dependent on personal being present at site.*

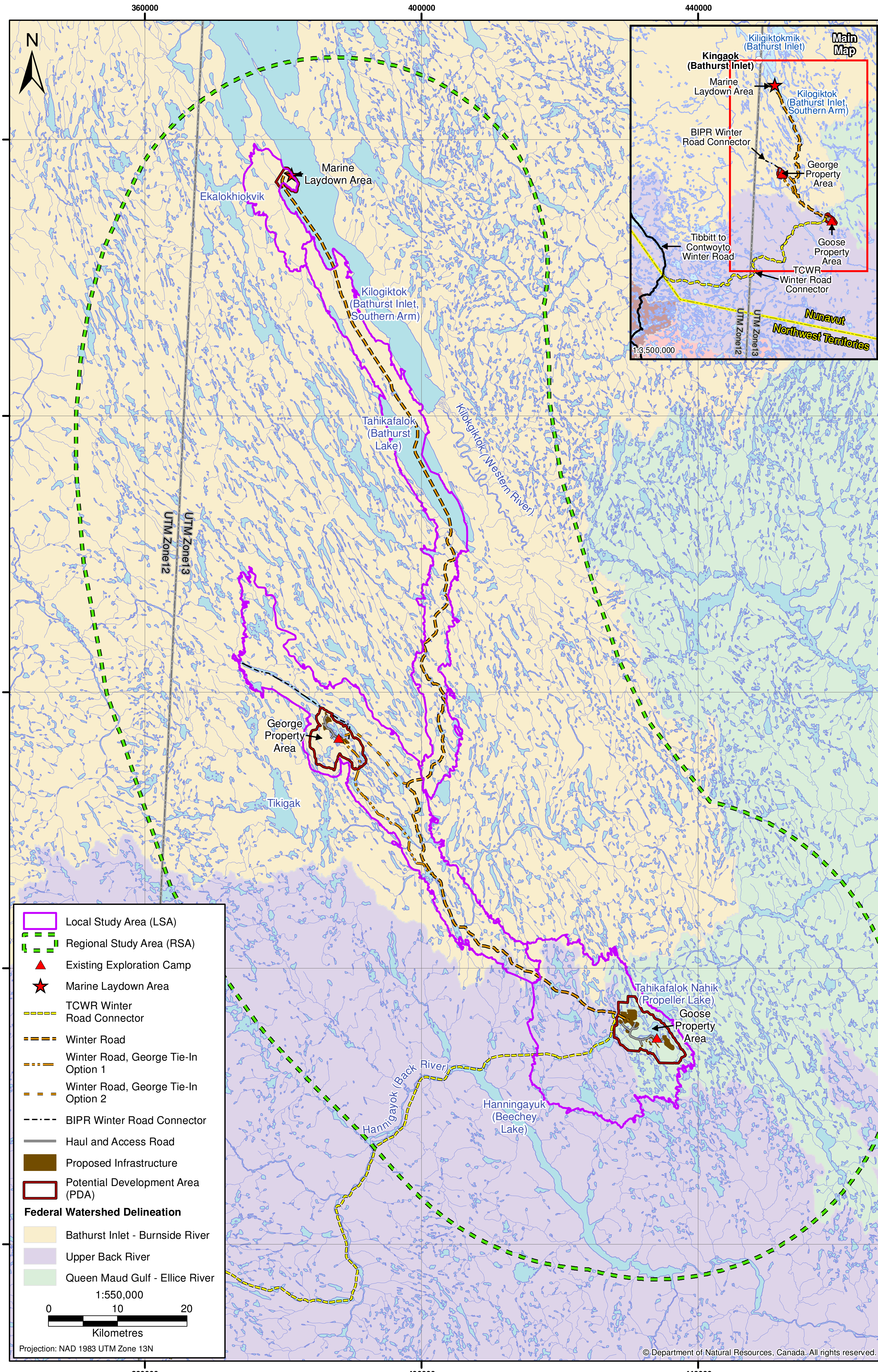

Figure 7.1-1

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Local and Regional Study Areas for Terrestrial Wildlife

Rescan Engineers & Scientists

PROJECT #0194096-0040 GIS # BAC-23-092 September 18 2013

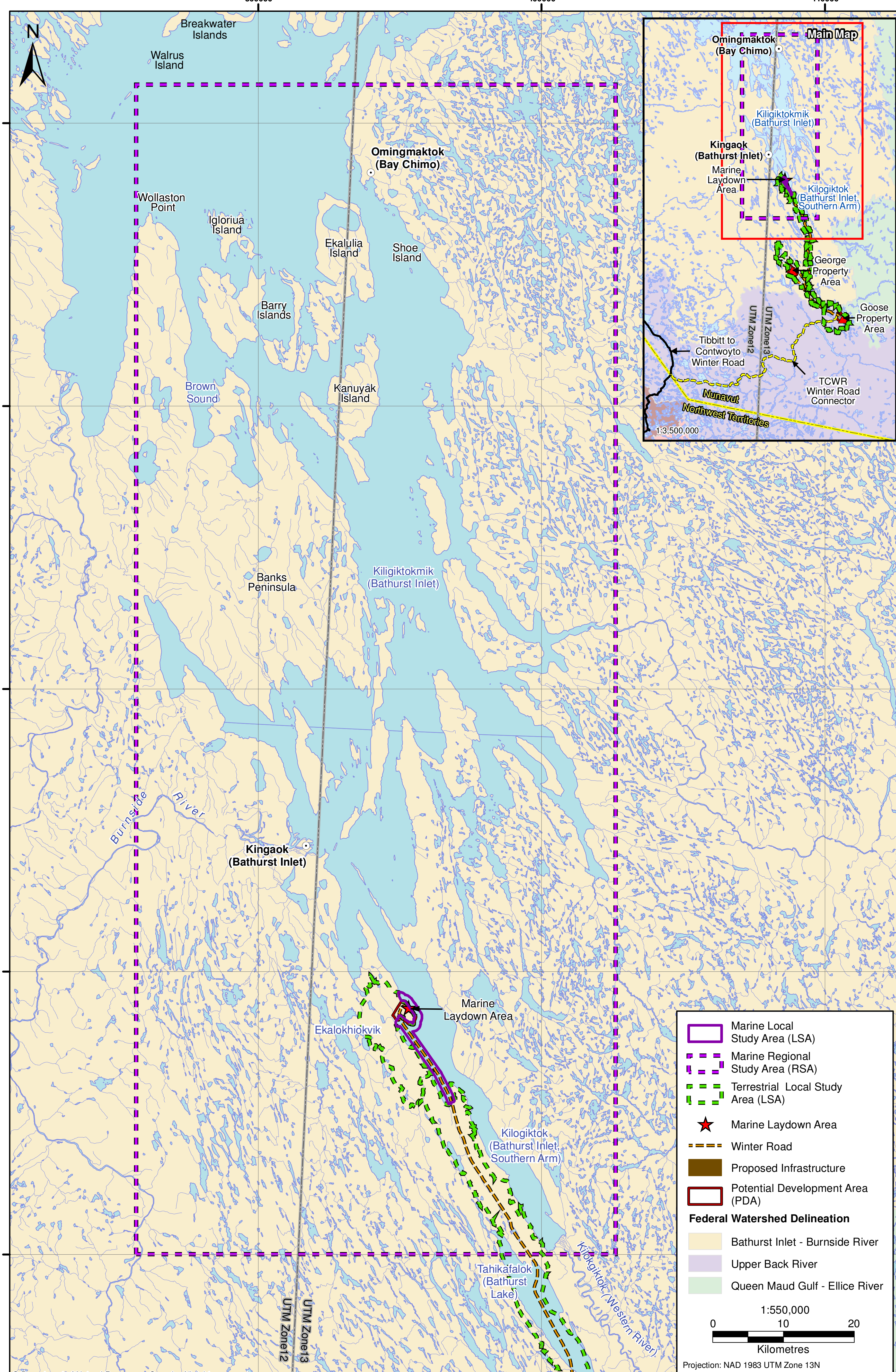

Figure 7.1-2

Local and Regional Study Areas for Marine Wildlife

Sabina GOLD & SILVER CORP.

Rescan Engineers & Scientists

Facility-specific wildlife monitoring will be conducted by on-site environmental staff or by designated professionals. This ensures that wildlife monitoring will be conducted by personnel who are familiar with:

- Predicted wildlife-project conflicts.
- Wildlife mitigation commitments.
- Site history of wildlife interactions and conflicts.
- The evolving adaptive management process.

This facility-specific monitoring program enables effective data collection and the implementation of a consistent adaptive management process. The Environment Team, in collaboration with security staff, can also play a role in managing wildlife safety issues (i.e., problem bears) from a position of site-specific wildlife knowledge.

The results of facility-specific monitoring will be reported regularly (see Section 11, Environmental Reporting).

7.2.1 Footprint Monitoring

Construction of the infrastructure for the Project will result in both short and long term reduction of a small area of existing wildlife habitat and may, in some instances, create new habitat. It is anticipated that advanced planning of infrastructure, progressive reclamation during operations, and final reclamation of the areas affected by mining activities following closure will limit this disturbance to the greatest degree possible and provide alternative, functional habitats for wildlife in the future.

The objective of Footprint Monitoring is to quantify habitat losses due to construction and clearing of areas for Project infrastructure, site roads, mine sites, and camps. By overlaying any changes in the project footprint on baseline habitat maps, the amount of habitat altered each year can be calculated.

The footprint will be overlain on previous years footprints, the planned footprint, and wildlife habitat maps on a yearly basis. The yearly footprint will be taken from engineering drawings for the site, provided by the Project engineering staff.

Areas available for progressive reclamation will be identified and recorded separately.

7.2.2 Human Activity Monitoring

The construction of winter roads could increase the accessibility of non-Project people accessing the area for hunting and recreational activities. As part of the mitigation measures to minimize additional access to the areas surrounding the Project, all winter roads will be closed to the public. Road use will be restricted only to persons required for Project construction, operations, and maintenance.

All winter roads, site roads, and emergency shelters will be monitored for human activity by Project staff during all project phases except post-closure. If evidence of use is observed along the Project roads and infrastructure the following will be documented:

- Type of vehicles of access (e.g., snowmobile, quad, truck, etc.).
- Number of individuals.
- Purpose of access (e.g., hunting, recreational use).

- Outcome of any interactions with project personnel.

7.2.3 Pre-clearing Surveys for Nests

The objective of pre-clearing surveys for nests is to identify active bird (raptor, waterbird, and upland breeding bird) nests at risk of disturbance from vegetation clearing. Site clearing is planned for outside of bird sensitive periods. However, if some clearing is scheduled for inside bird nesting periods, pre-clearing surveys would be triggered. If bird nesting activity is identified in areas slated for clearing, monitoring will:

- Document birds nesting in areas slated for clearing.
- Document locations and habitat where active nesting is occurring.
- Identify opportunities for protecting established nests.

Nest surveys will be conducted within 14 days in areas scheduled to be cleared for construction using standard observation techniques by a qualified person. The surveyors will walk through an area slated for clearing, each following a transect 15 m apart from the adjacent surveyor. Observers will stop every 100 m and note all birds within a 50 m radius. Observers will use a GPS to mark bird territories and nest sites.

Species-specific buffers will follow best management practices. When raptor nests are encountered, a species-specific buffer will be assigned. Surveys will be repeated if clearing activities do not occur within 14 days of the original survey. Records will be kept of all nest survey effort and findings. Reports of active nests will be provided to the appropriate regulators on a case-by-case basis to advise on the management response, if necessary.

7.2.4 Pit and Quarry Wall Nest Monitoring

The objective of the pit and quarry wall nest monitoring is to identify active raptor nests at risk of disturbance from blasting activities. Nest monitoring at pit and quarry sites will be conducted during the raptor nesting period if blasting is planned to ensure that incubating adults and young are not disturbed.

When an active nest is observed on the pit wall, the location and habitat where nesting is occurring will be recorded, and the following steps will be taken:

- If the nest is still being built and the raptors have not laid eggs, then the nest will be removed.
- If the nest has eggs or young, then weekly observations of nests will be made to document when young have fledged the nest.

In all instances, environment staff will identify opportunities for protecting established nests.

7.2.5 Waste Management Monitoring

Preventing wildlife attraction and habituation is critical for ensuring both wildlife and worker safety. A waste management program will be implemented during all phases of the Project except post-closure. Waste segregation and containerization within camps, frequent incineration, electric fencing around selected camp facilities (if required), staff awareness and participation in proper waste disposal protocols, and the use of steel bins for landfill and other applicable wastes will ensure minimal wildlife/waste interaction.

Waste disposal facilities will be monitored weekly to ensure that wastes are being properly disposed of. Waste facilities will be inspected for signs of wildlife activity (e.g., chew marks on waste, wildlife mediated waste dispersion, wildlife scat or tracks). All personnel will report to the Environmental Department when they observe waste disposed of in a manner that could attract wildlife (i.e., littering, misdirected waste, uncontained waste, wildlife accessing waste).

Cases of misdirected waste or wildlife-waste interaction will be recorded in a waste inspection log, which may include the following information:

- Location, date, and time.
- Type and amount of waste.
- Species, number of animals, age, and sex (if possible).
- Behaviour (e.g., feeding).
- Condition (e.g., limping, wounded, salivating).
- Any damage to mine property.

Any incidents where wildlife has been observed to interact directly with wastes, or observations of habituated wildlife (particularly bears and wolverine) will be reported to Project environment staff and appropriate regulatory agencies and authorities. Problem wildlife may be evaluated by Environment Team and corrective measures implemented in consultation with the Nunavut Department of Environment.

In addition, an annual audit will be conducted of the various camps and facilities to evaluate any opportunities for improvement in the handling of wastes and wildlife attractant management (Section 6.3).

7.2.6 Skirting/Fencing Monitoring

Skirting and fences play a key role in preventing wildlife-human interactions at project facilities. Regular inspections of facility fencing and skirting will ensure that fences are operational and effective at excluding wildlife without causing them harm.

Environmental staff will monitor skirting and fencing on a monthly basis. Monitors will walk the perimeter of the skirting/fencing looking for damage, downed fencing, animals, or animal sign inside the fence. Cases where the fence/skirting has been damaged or breached will be recorded in an inspection log, and may include the following information:

- Damage to the fencing or materials that may be causing the fence to be ineffective (i.e., snow, vegetation).
- Any wildlife observed accessing through the fencing/skirting.

Damaged skirting and fencing will be reported to maintenance staff for immediate repair. Wildlife discovered in poor condition will be reported to the appropriate regulatory authorities (i.e., the Nunavut Department of Environment).

7.2.7 Wildlife-vehicle Interactions

Wildlife activity along the Project site roads and winter roads will be recorded during all Project phases when they are active. The objectives for collecting this information are to:

- Document wildlife observations along roads.
- Document wildlife-vehicle collisions.
- Identify sections of the road that might be at risk of collisions (e.g., adjacent to high quality forage and near movement corridors).
- Identify opportunities for reducing risks.
- Assess effectiveness of mitigation measures over time.

Wildlife activity will be documented along the Project site roads and winter roads. Environment staff will record wildlife or wildlife sign whenever they drive the road, and note areas that may pose potential wildlife hazards (e.g., high snow banks or good forage in road verge). In addition to opportunistic monitoring by environment staff, all site personnel will be asked to report any observations or incidents involving wildlife species near or on the roads. All traffic along the site roads and winter roads will be equipped with radios, which will allow timely reporting of wildlife-vehicle and wildlife-road interactions to the Environment Team.

Wildlife activity along the road will be recorded in a road wildlife log. When VEC wildlife or wildlife carcasses are observed along the access road, the wildlife log may include the following information:

- Location (nearest 1 km road marking or landmark, or GPS location), date and time.
- Weather (e.g., light snow fall, rain) and road conditions (e.g., ice on road).
- Species, number of animals, sex and age.
- Cause of death (if a mortality).
- Behaviour (e.g., travelling along road, grazing at road edge).
- Condition.
- Description of any potential wildlife attractants along the road (e.g., food resources).
- Any potential wildlife hazards along the road (e.g., 2 m snow banks along road preventing caribou crossing).

When vehicle-caused wildlife mortalities are observed, carcasses will be removed to avoid attraction of carrion feeders to the road. Carcass removal will be tasked to road maintenance crews. Carcasses will either be incinerated or moved to a location away from any traffic activity (> 2 km from the road). Vehicle-caused mortality for all VEC wildlife species will be immediately reported to the appropriate regulatory authorities.

7.2.8 On-ice Monitoring at the MLA

During March and April, ringed seals create lairs under pressure ridges and snow drifts on sea ice to have their pups. The DEIS evaluated the risk of on-ice operations at the MLA that may result in the damaging of lairs and the injury or mortality of ringed-seals. If the MLA is active, monitoring for ringed-seals will include pre-construction surveys prior to on-ice operations using suitable methods (e.g., working with Inuit hunter or thermal-vision camera). On-ice operations will be moved based on locations of lairs to provide a 50 m buffer between on-ice operations and lairs.

7.2.9 Incidental Wildlife Monitoring

General wildlife observations of interest (e.g., species of conservation concern, migratory birds, raptors) made by environment staff and other mine personnel will be recorded in a general wildlife log.

Incidental wildlife data cards will be included in Project vehicles that frequently drive on the Project roads and staff will be trained to fill in the observation cards and report their observations to the Environment Team.

Objectives for keeping this log include:

- Recording general wildlife activity in the Project area.
- Identifying unexpected conflicts or potential conflicts posed by existing Project facilities for wildlife.
- Identifying opportunities for adaptive management if a new risk to wildlife is identified.

All personnel will be asked to report observations of wildlife species interacting with Project facilities to the Environmental department. Environment staff will routinely inspect all Project facilities to check for signs of wildlife interaction or conflict. Additional areas that wildlife may show interest in include:

- Storage facilities and buildings that may serve as refuge.
- Areas where chemicals may have been applied (e.g., dust suppressants).
- Lighting or power poles that may be used for nesting.

When wildlife are observed the following information may be recorded:

- Location, date, and time.
- Type of interaction (e.g., attraction, nesting).
- Species, number of animals, age, and sex (if possible).
- Behaviour (e.g., feeding, resting).
- Condition (e.g., limping, wounded, salivating).
- Any damage to or interaction with mine property.

Wildlife in poor condition, that may be diseased, or that may have been harmed by mine structures or processes will be reported to regulatory authorities.

7.2.10 Noise Monitoring

This section describes the noise monitoring that has taken place already (baseline survey) as well as outlining the plan for future noise monitoring on site.

7.2.10.1 Schedule

Noise baseline monitoring was undertaken at ten locations in March and June of 2012. Noise monitoring will continue at appropriate sites where noise is predicted to be high.

The March and June time periods were chosen to include the bird nesting period and a portion of the caribou migration in June. These two periods also encompass a wide range of environmental variation, the first being conducted during winter conditions, with cool air and snow cover on the ground while the second occurred during summer.

7.2.10.2 Locations for Monitoring

The locations of the ten noise monitoring sites were selected to characterize the range of baseline conditions in the region, based on their proximity to known deposits and sensitive wildlife receptors.

Research on caribou in Nunavut and the NWT using both aerial surveys and GPS collar information has reported a zone of influence (ZOI) of between 12 and 14 km radius around operating mines (Boulanger 2009). Research on raptors in the NWT, using similar methods to those at the Project have reported a zone of influence, with reduced productivity (successful chicks in August per occupied nest in June) within 1 km of operating mines (Rescan *in prep*). Hence, noise monitoring points during both the spring and summer sampling periods will measure sound within, beyond and at the ZOI boundary for both groups.

The specific distances where noise levels will be monitored relative to project activities at the Goose and George Properties are as follows:

1. To address potential effects on birds: along the 45 dBA contour, 1 km and 3 km.
2. To address potential effects on caribou: 1 km, 3 km, 5 km, and 14 km.

The predominant wind directions will be used to choose the direction from the site activities that each of the stations will be sited. The monitoring locations are based on the assumption that the Locale 2 Pit and the Main Pit are operational. The exact locations of the sites will be determined based on the final project specifications.

There will also be one additional monitoring site located between the Goose and George Property Areas, away from the project activities, in order to measure background concentrations (Figure 7.2-1).

7.2.10.3 Methodology

<u>Equipment</u>

Baseline noise samples were collected using a Brüel & Kjaer (B&K) Model 2250 sound level meter capable of logging data. The sound level meter samples in decibels using the "A" standardized frequency rating (dBA, designed to match the frequency response of the human ear) for both average and maximum peak sound levels. The meters were equipped with sound recording capabilities to capture audible noises in the area and were calibrated before each measurement. Noise measurements were made once every minute 1.5 m above ground for 24 consecutive hours. The B&K Model 2250 sound level meter is a Type 1 instrument that has a suitable operating range that captures low sound levels that are typical for an undisturbed wilderness area. Sound level meters were enclosed in a weather-proof case during monitoring.

Weather data from one of the two on-site weather stations were used to validate data collected.

<u>Noise Data Collection</u>

The following overall noise levels were and will continue to be measured every minute over a 24-hour sample period:

- L_{Aeq} (equivalent continuous sound pressure level in dBA).
- L_{Amax} (absolute maximum in dBA).
- L_{Amin} (absolute minimum in dBA).
- L_{Ceq} (the C weighted equivalent continuous sound pressure level in dBC).

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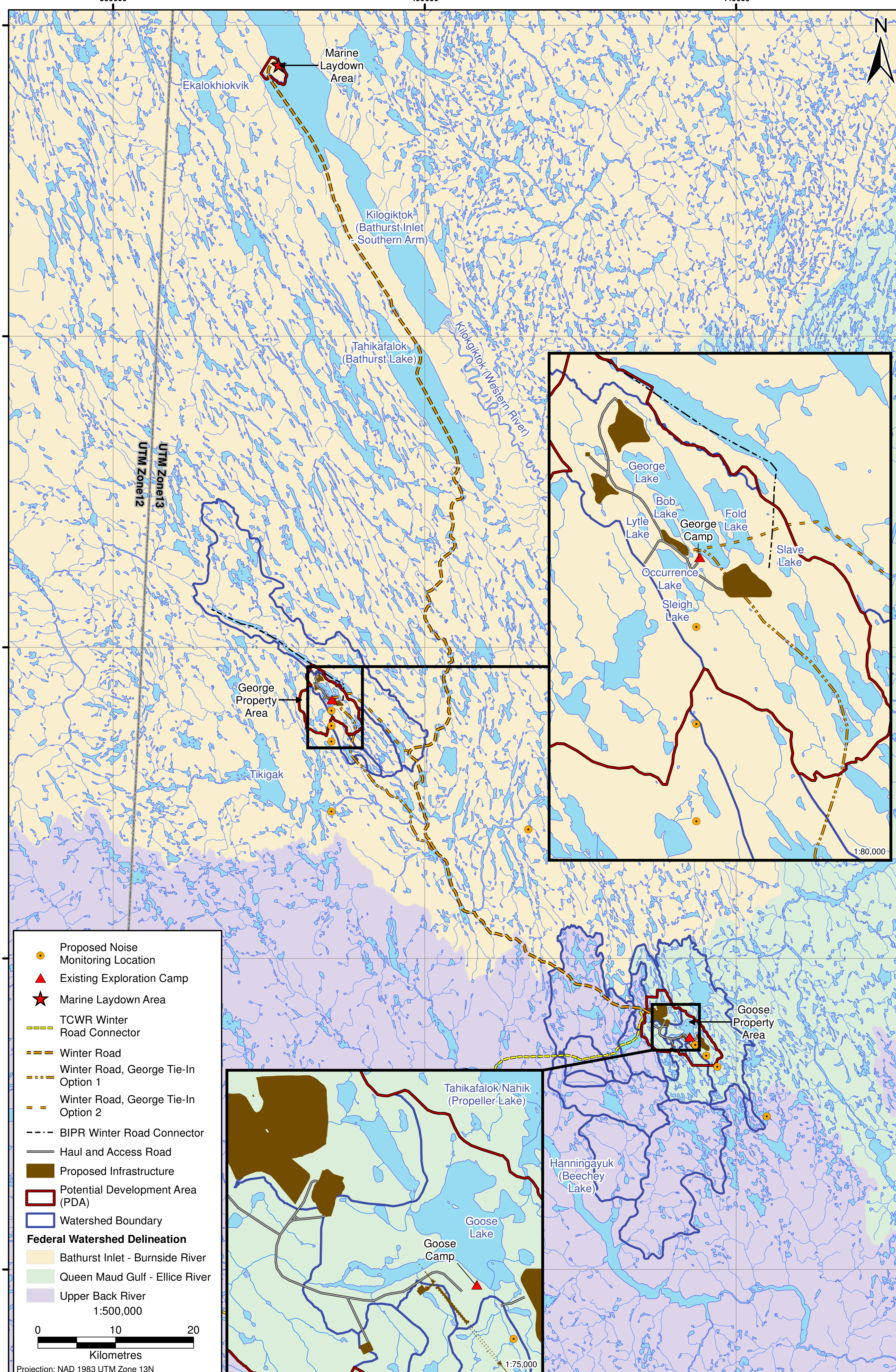

Figure 7.2-1

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Proposed Noise Monitoring Locations

Figure 7.2-1

Rescan Engineers & Scientists

A-weighting is the most commonly used parameter when a single-number overall sound level is needed. Results are expected to indicate human perception or the effects of sound on humans. A-weighting accounts for the reduced sensitivity of humans to low-frequency sounds, especially at lower sound levels. C-weighting is used to evaluate sounds containing strong low-frequency components. It was originally devised to approximate human perception of high-level sounds.

Often a single overall sound level is not sufficient to evaluate or specify the noise environment fully. This is especially the case for steady sounds of long duration. In such cases it is usually desirable to ensure that the quality of the sound matches the normal expectation in the environment. Evaluating both aesthetic appeal and speech interference requires knowledge of the frequency content of the sound. Octave band curves have been used for evaluating outdoor noise. Therefore, 1/3 band octave data will be collected once per project stage. Octave band data will also be collected if levels exceeding project criteria are found, in order to locate the primary source requiring mitigation.

Two, 24-hour logging periods will be conducted at each location, at a 1-minute logging rate. It should be noted that if longer monitoring periods at each location are required, the logging rate would need to increase. This may result in loss of definition in measurements, making it difficult to determine the influence of short-term noise events such as aircraft flyovers. Simultaneous sound recordings will also be collected during the measurement period to identify peak events and sources of sound.

Weather Conditions

The following weather parameters were and will continue to be documented for the time period of each noise measurement:

- Temperature (degrees Celsius).
- Relative humidity (%).
- Wind speed (km/h or m/s).
- Wind direction (degrees from true North).
- Precipitation (mm).

Weather data from one of the on-site stations were and will continue to be used. Preferred weather conditions for noise monitoring are:

- Wind speeds less than 20 km/h.
- Relative humidity less than 90%.
- No active precipitation (rain or snow).
- Temperatures such that the meter body can be maintained within manufacturer's specifications.

Field Notes

The following information was, and will continue to be, recorded in the field during the noise monitoring program:

- Description of the monitoring site with sketch and pictures.
- Time of set up and tear down.
- Time of calibration.

- Type of surface the meter is standing on.
- Observed audible noise sources.
- Distance from all obstacles in the area (cannot be closer than 3 m to any surface except the ground).
- GPS location.
- Which meter is being used.
- Weather conditions at each site at the time of set up and tear down including precipitation and cloud cover.

It is imperative that detailed field notes are recorded during the monitoring period. The site visits to collect the sound level data were, and will continue to be, conducted by experienced technicians to ensure that the proper documentation and field observations are made to identify audible noise sources and to check the equipment.

Reporting

Data collected from the Noise Monitoring Program will be reported regularly (see Section 11, Environmental Reporting). It is proposed to conduct the Noise Monitoring Program as follows:

- One time during baseline conditions.
- One time during construction.
- One time every three years during operations.
- One time during reclamation and closure.

The reports will generally include a summary of the methods and equipment, summary tables for the weather and noise data along with graphs of the raw noise data, a map showing the location of monitoring sites and photos of each site. Any noise sources that are causing criteria to be exceeded will be identified. Short-term source measurements may be conducted where necessary to allow appropriate mitigation design.

The noise data reports will provide input to the ongoing Wildlife Mitigation and Monitoring Program on site.

7.2.10.4 Logistics and Management

Logistics will have to consider the effects of the northern climate on the instrumentation. The noise meters cannot operate reliably at air temperatures below -20°C, therefore, if necessary, an insulated casing device will be used to keep the meter within its nominal temperature operating range. Such a device does not affect the microphone or the quality of noise measurements. Wildlife tampering is also a concern for the equipment, as some animals tend to eat cable wire and use objects such as these for scratching posts. To prevent this, a portable electric fence will be installed around the monitors when conditions allow for it. All equipment will be calibrated before and after each 24-hour survey to insure the noise meter and microphone are still properly operating. All information will be recorded by the field technician. QA/QC will be conducted on the downloaded data; field QA/QC of equipment operation is not practical as the climate and areas are not conducive for frequent checks.

Prior to any field work a Task Hazard Assessment (THA) and Journey Management Plan (JMP) will be completed; JMPs will be reviewed with the site safety representative. The THA and JMP will include details such as communication and access to sites.

7.3 PART II: FOCAL SPECIES MONITORING

Focal species monitoring will be conducted in order to evaluate the health of the wildlife populations in the monitored area, and evaluate the predictions of Project-related effects on wildlife that were indicated in the DEIS. Surveys have been conducted for VEC groups during baseline surveys including: caribou, grizzly bears, muskox, wolverine and furbearers, migratory birds (upland and waterbirds), raptors, seabirds/seaducks and ringed seals. The following wildlife VECs are included in the proposed focal-species monitoring:

1. Caribou.
2. Grizzly bear.
3. Muskox.
4. Wolverine/Furbearers.
5. Migratory birds (waterbirds & upland breeding birds).
6. Raptors.
7. Seabirds/seaducks.
8. Marine Mammals (Ringed Seals).

The baseline program to date as well as the proposed focal-species monitoring programs are described in the following sections and outlined in Table 7.3-1.

7.3.1 Caribou

7.3.1.1 Introduction

Baseline survey data documenting the distribution of caribou during the winter, calving, and post-calving, and summer periods suggest that the regional study area for the Project lies within the seasonal ranges of the Bathurst and Beverly herds while the marine study area overlaps the winter range of the Dolphin and Union caribou herd (Figure 7.3-1). The Bathurst caribou herd calves and spends the summer to the west of the study area. The Bathurst herd is found in the Regional Study Area (RSA), primarily during spring migration, and post-calving, with a peak during the post-calving period. The calving range of the Beverly herd (previously the Ahiak) occurs to the east of the study area in the Queen Maud Gulf Migratory Bird Sanctuary, but the Beverly herd may occur in the RSA during the late summer, early fall, and winter.

The Dolphin-Union herd winters on the coast, sometimes within the northern reaches of the Project study area. This herd migrates north at the end of April through end of June to Victoria Island to calve and spend the summer, returning to the mainland during the fall when the sea ice has frozen; typically in early November. The Dolphin and Union herd is federally listed on Schedule 1 as a species of special concern in 2004 (Government of Canada 2013). The Bathurst and Beverly herds have not been assessed by COSEWIC.

Table 7.3-1. Focal Species Monitoring Programs

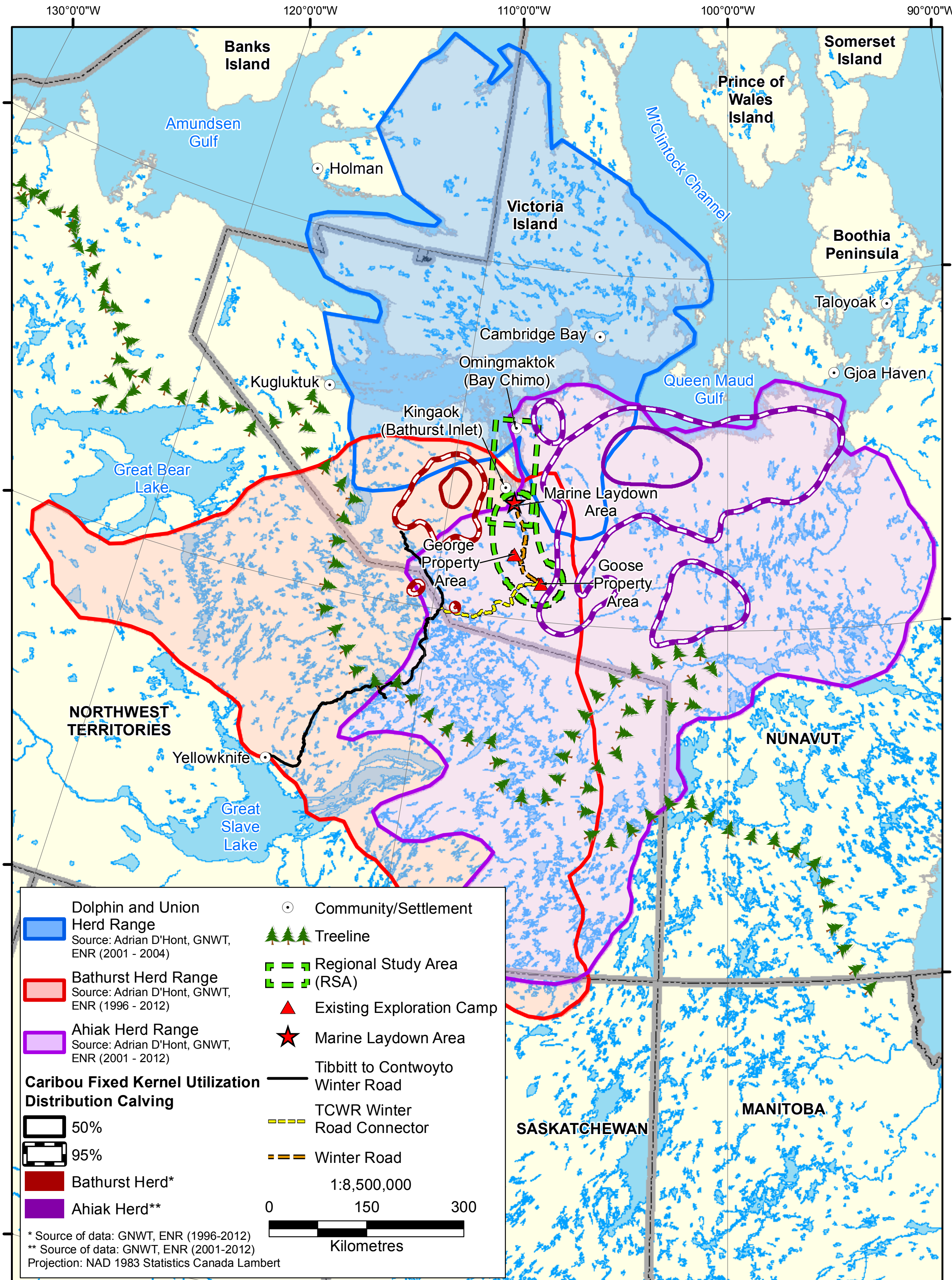
Focal Species Monitoring	Baseline/ Pre-Construction	Site Prep/ Construction	Operations	Temporary Closure	Care and Maintenance	Reclamation/ Closure	Post Closure
Caribou Monitoring							
1) Aerial surveys	3 years	--	--	--	--	--	--
2) Analysis of collaring data	Yes	--	Every 3 years	--	--	--	--
3) Motion-triggered cameras	2 years	Every 3 years	Ongoing	--	Ongoing	Ongoing	--
4) Habitat suitability mapping	Baseline	--	--	--	--	--	--
5) Contribution to regional monitoring initiatives	--	TBD	TBD	TBD	TBD	TBD	--
6) Facilities monitoring with cameras	Baseline	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Grizzly Bear Monitoring							
1) DNA-based mark-recapture pop estimates	2 years	--	--	--	--	--	--
2) Habitat suitability mapping	Baseline	--	--	--	--	--	--
3) Incidental obs. during monitoring dens for wolves	3 years	Concurrent with wolf den monitoring	Concurrent with wolf den monitoring	--	--	--	--
4) Facilities monitoring with cameras	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Muskox Monitoring							
1) Aerial surveys	3 years	--	--	--	--	--	--
2) Habitat suitability mapping	Baseline	--	--	--	--	--	--
3) Facilities monitoring with cameras	Baseline	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Wolverine/Furbearer Monitoring							
1) DNA-based mark-recapture pop estimates for wolverine	2 years	--	--	--	--	--	--
2) Monitoring dens for wolves and foxes	3 years	3 years survey (2 times yearly), 3 years no survey, repeated	3 years survey (2 times yearly), 3 years no survey, repeated	--	--	--	--
4) Habitat suitability mapping	Baseline	--	--	--	--	--	--
3) Facilities monitoring with cameras	Baseline	Ongoing	Ongoing	--	Ongoing	Ongoing	--

(continued)

Table 7.3-1. Focal Species Monitoring Programs (completed)

Focal Species Monitoring	Baseline/ Pre-Construction	Site Prep/ Construction	Operations	Temporary Closure	Care and Maintenance	Reclamation/ Closure	Post Closure
Migratory Bird Monitoring							
1) PRISM/ VRPC surveys for upland breeding birds	3 years	Every 2 years	Every 2 years	--	--	--	--
2) Aerial and ground surveys to measure breeding for waterbirds (waterfowl and seabirds)	3 years	Every 2 years	Every 2 years	--	--	--	--
3) Aerial surveys to examine staging areas for waterbirds	3 years	Every 2 years (2 times yearly)	Every 2 years (2 times yearly)	--	--	--	--
Raptor Monitoring							
1) Aerial monitoring to estimate productivity	3 years	Every 3 years	Every 3 years	--	--	--	--
2) Habitat suitability mapping for peregrine falcon and short-eared owl	Baseline	--	--	--	--	--	--
Seabirds/Seaducks*							
1) Aerial and ground surveys to measure breeding for waterbirds (waterfowl and seabirds)	3 years	Every 3 years*	Every 3 years*	--	--	--	--
2) Aerial surveys to examine staging areas for waterbirds	3 years	Every 3 years (2 times yearly)*	Every 3 years (2 times yearly)*	--	--	--	--
Ringed Seals*							
1) Aerial surveys to estimate seal density and distribution	2 years	1 time	1 time every 3 to 5 years				

**Proposed monitoring for seabirds/seaducks and ringed seals would be conducted only when the MLA is active.*
Note: Survey frequency may change dependent on Project-related changes to population abundances and distributions or climate change or upon consultation with stakeholders.



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Annual Ranges of the Bathurst, Beverly, and Dolphin and Union Caribou Herds

Figure 7.3-1

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The two objectives of the focal species monitoring for caribou are to:

1. Describe the existing baseline surveys that has been conducted to date in the RSA, including:
    - Aerial surveys.
    - Analysis of satellite collar data.
    - Results of remote motion-triggered camera surveys.
    - Habitat suitability modeling.
    - Resource selection function surveys for caribou.
2. Describe the monitoring work that is proposed for the focal-species monitoring portion of the WEMP, which include:
    - Monitoring use of the RSA and areas near proposed Project infrastructure for caribou using remote motion-triggered cameras.
    - Contributing to a regional habitat monitoring program for the Bathurst herd caribou to assess the quality of habitat on the post-calving and summer grounds.

7.3.1.2 Existing Baseline Surveys

Five separate types of surveys have been conducted for caribou in the regional study area during baseline surveys including: i) aerial surveys conducted in the RSA during key periods; ii) analysis of satellite collar data to determine movement patterns and seasonal ranges; iii) the use of remote motion-triggered cameras for monitoring habitat use of certain habitat features and for determining detailed timing information for when caribou use these features, iv) habitat suitability mapping for caribou in the RSA to determine the proportion of good quality habitat for caribou, and v) a resource selection study for caribou.

<u>Aerial Surveys</u>

Aerial surveys were conducted in 2001, 2002, 2007, 2008 and 2010 in the RSA (extending 30 km from all proposed infrastructure) using standard census techniques for caribou (Rescan 2002, 2007, 2008, 2011). Data from these surveys are summarized in the existing environment and baseline information section of the caribou effects assessment (Volume 5, Section 5.1). These surveys had three important results:

1. Few caribou (typically less than 20) were detected during the peak of calving for the Bathurst caribou herd – indicating that the RSA does not overlap the calving grounds.
2. The peak numbers of caribou were observed during post-calving.
3. Despite coordinating surveys with data from GPS collars to survey when the maximum number of caribou are typically in the RSA, surveys recorded few (typically less than 100) caribou.

Due to the low numbers of animals being recorded using aerial surveys, this monitoring technique is not planned to be extended into the WEMP in favour of collaborative monitoring programs with Government of Nunavut Department of Environment (GN DOE).

<u>Satellite Collar Program</u>

The satellite collar program used data provided by the government of NWT and NU. These governments initiated satellite collaring programs in 1996 for the Bathurst herd and Beverly herds however, the number of collared Beverly caribou was minimal until 2006. Each year, satellite collars are fitted on a group of female caribou during the winter. The data generated from these programs allow researchers to investigate seasonal trends in habitat use as well as track real time movements of caribou herds.

Data analysis for the Back River project baseline surveys focused on the Bathurst and Beverly caribou herds from 1996 to present. However these data are biased towards later years (2008 to 2012) as GPS collars in later years resulted in six times the location positioning (or more) relative to previous years with the use of GPS collars with satellite uplink. As the data for Dolphin and Union herd using GPS collars is fairly minimal and no GPS collars have functioned since 2006, satellite collar data used for the Dolphin and Union herd in baseline programs included that obtained between 1999 and 2004.

Caribou use of the land can broadly be classified into two groups: 1) migrations (spring and fall) when the animals are moving quickly across the landscape, and 2) sedentary periods (calving, post calving, summer, and winter) when the daily movement rate of caribou is lower than migrations and the herd tends to occupy a distinct range of the landscape. In order to map habitat use by caribou during each season, two methods were used.

During spring and fall migrations, the movement paths of individual collared caribou were plotted and used to evaluate whether there are key routes used by caribou on the tundra. During winter, calving, post calving and summer, when caribou occupy a definable home range on the landscape, the extent of caribou range was calculated for each season using fixed kernel utilization distributions (UDs). This analysis used all available collar data from 1996 to September 2012 in order to provide an overview of caribou habitat use. Core use areas were calculated (termed 50% kernel UD) as well as areas of active use (95% kernel UD). The 50% kernel UD represents an area with a 50% probability that an animal (or group of animals) is inside that area; the same is true for the 95% kernel UD.

Data was analyzed by season/life history stage as described in the existing environment and baseline information section of the caribou assessment (Volume 5 Section 5.1). These data indicated that the Back River RSA occurs largely to the east of the Bathurst post-calving and summer ranges and on the western edge of the Beverly summer range.

Analysis of data from collared caribou will be carried forward into the WEMP to monitor if the larger caribou herds are using the RSA, during what seasons, and if this pattern of use is changing.

Remote Motion-Triggered Cameras

In order to examine when caribou are using the Project area, and examine their use of selected features on the landscape, motion-triggered cameras were deployed in the RSA and in an area adjacent to and west of the RSA in order to look at spatial trends on a larger scale (Rescan 2013c, 2014b).

Remote motion-triggered cameras are a reliable method for examining ungulate migratory timing and habitat associations given the landscape's short vegetation and features such as eskers and river crossings that direct caribou movement through the landscape (Cutler and Swann 1999; Noel et al. 2006).

Thirty cameras were deployed in the RSA in spring 2012 and an additional 30 cameras were added in spring 2013. The same number of cameras were also located in an adjacent study area in 2012 and 2013, immediately to the west of the RSA. The cameras in the RSA were left in the field as part of future construction phase monitoring, while those in the western study area were demobilized in August 2013. In August 2013, 25 cameras were placed along the southern road alignment from the Project area to the junction with the Tibbett to Contwoyto Road.

The study design for 2012 investigated if there were key habitats used on the tundra by caribou. Hence, camera placement was focused on areas such as river crossings, eskers, lakeshores, and the isthmus between lakes. Cameras were also used to assess the use of the proposed Project site by caribou. For

2013, the study design was changed to create a series of three transects stretching south-west to north-east across the RSA – roughly perpendicular to the movement pattern of caribou during the post-calving and summer periods. The centres of each transect are bisected by the George Property, the Goose Property and the ice road connecting the two properties. The study area to the west of the RSA followed the same study designs for 2012 and 2013, until demobilization in August 2013.

Cameras were left in the field from August to May and checked, on average, every four weeks during the summer months. Cameras were programmed to take one photo every half hour and 10 photos when the camera is triggered by motion. The number and behavior of caribou were recorded, pooled by camera and season, and compared between sites and habitats using a metric of caribou/day. Results are presented in the existing environment and baseline information for the caribou effects assessment (Volume 5, Section 5.1). The primary results from this analysis were that:

- Caribou were most commonly observed during the post calving and summer periods.
- Caribou selected areas with more available forage (which correlates with their requirements for food during the post-calving and summer).
- Caribou were less common on proposed project infrastructure sites, compared to controls (likely because some control areas included high value habitats for caribou, such as lake shore and crossing points on rivers).

Monitoring of infrastructure, key caribou habitats, and control areas with remote motion-triggered cameras will continue in the WEMP.

Habitat Suitability Modelling

Wildlife habitat suitability modelling was conducted within the LSA and RSA to inventory and rate the habitat types for caribou and quantify suitable habitat available for this species within the LSA and RSA (Rescan 2013a). Habitat suitability modelling methodology was guided by BC Resource Information Standards Committee standards (RIC 1999b). Results are presented in the existing environment and baseline information section for the caribou effects assessment (Volume 5 Section 5.1). The primary results from this analysis were:

- Calving habitat within both the LSA and the RSA was evenly distributed between high, moderate, low and nil rated habitats.
- For the post-calving and summer season, the LSA contained proportionally less high value habitat relative to the RSA and both the LSA and RSA were dominated by moderate value habitat.
- Approximately half of the habitat in the LSA and RSA was rated as high value habitat for the fall season, while approximately a third was considered low in both of these study areas.

Resource Selection Function for Caribou

A Resource Selection Function (RSF) was conducted for the Bathurst caribou herd on the post-calving and summer range of this herd. . RSFs are increasingly being used to provide information on essential resources needed to manage and conserve rare, threatened, and endangered species in complex socio-environmental landscapes (Johnson et al. 2006). RSFs provide an objective and explanatory framework to assess habitat selection and relative habitat quality at multiple scales and across individuals and populations (Johnson et al. 2006).

The development of Resource Selection Functions (RSFs) for the Bathurst caribou herd will directly contribute to the implementation of Strategies #5 and #7 in the Barren Ground Caribou Management

Strategy for the Northwest Territories 2011-2015. Strategy #5 aims to understand the effect of a broad suite of environmental conditions on caribou populations. Strategy #7 aims to assess cumulative impacts of land use activities and natural factors on caribou habitat and develop best management practices to mitigate and minimize these impacts.

During 2013, RSFs were developed for the Bathurst caribou herd. Satellite collar data was used from 2001 to 2011, based on the types of GPS collars available and additional base data. Habitat selection by caribou was modelled according to their seasonal ranges and by year in relation to factors, including: climate, changing habitat quality and productivity across regional scales, and the progression of development across the landscape. RSFs were developed across scales, including the assessment of important habitats within seasonal ranges and critical time periods (e.g., calving and winter) and at broader scales examining potential mechanisms for variations in migration routes over time. Available demographic data, such as calf:cow ratios, calf survival, and recruitment, and GIS data including MODIS, AVHRR, and Landsat. Detailed results are included in Rescan (Rescan 2013d).

7.3.1.3 Caribou Monitoring for the WEMP

The WEMP will contain three components which aim to monitor Project effects on caribou herds in the terrestrial RSA, including:

1. Collaborative programs with GN DOE.
2. GPS collar analysis
3. Remote motion-triggered cameras.

As part of their direction on caribou monitoring, both GN DOE and the Government of the Northwest Territories Environment and Natural Resources (GNWT ENR) have requested that mines conduct caribou monitoring at two scales: regional and local. Regional monitoring would evaluate the effects of the project on the Bathurst, Beverly, and Dolphin and Union caribou herds, and their large scale use of the landscape. Local-scale monitoring would evaluate how caribou interact with the Project and evaluate the efficacy of mitigation initiatives. The proposed collaborations with GN DOE and satellite collar analysis are meant to satisfy the request for regional-scale monitoring, while the motion-triggered camera study is meant to satisfy the request for local-scale monitoring.

Collaborations with GN DOE Caribou Programs

During February, 2013, meetings were held in Yellowknife at the invitation of GNWT ENR wildlife research, and including representatives from GN DOE and industry representatives, to decide the course of caribou research to investigate cumulative effects on the Bathurst caribou herd. The results of this meeting indicated that collaborative research projects between industry partners and government biologists was the path forward, in lieu of project-specific regional monitoring activities.

To that end, Sabina is proposing to work collaboratively with wildlife biologists from GN DOE and GNWT ENR (included because of the co-management of the Bathurst herd) to conduct collaborative regional research on cumulative effects. The format of this collaboration has yet to be formalized but could include contributing funds (e.g., purchasing collars or funding calving ground surveys), in kind funds (fuel and accommodation) and/or consultant time to work with the GN and GNWT on government-lead research projects (e.g., continued resource selection function modelling, or vegetation monitoring on the summer range).

This proposed research collaboration, along with analysis of satellite collar data, is meant to satisfy the GN DOE requirements to monitor caribou on a regional scale. This work would also replace more traditional regional-scale monitoring such as aerial surveys.

Satellite Collar Program

The analysis of satellite collar data during baseline studies revealed that the Back River RSA occurs to the north-east of the Bathurst post-calving and summer ranges and on the western edge of the Beverly summer range. Caribou herds have moved their calving and summer ranges over the past 30 years (e.g., the Bathurst caribou herd used to calve to the east of Bathurst Inlet in the 1980s) and may move again in response to climate, vegetation, or population triggers. The baseline satellite program used 50% kernel UD and 95% kernel UD measures to evaluate the location of the core habitat and areas of active use, respectively.

As part of the WEMP, this analysis will be repeated periodically (every 3 years) to evaluate whether the primary herds in the Project area (Bathurst and Beverly) have altered their use of the tundra and changed the timing or extent of use of the RSA.

Remote Motion-triggered Cameras

Caribou use of the Project facilities will continue to be monitored every three years during Construction, and every three years during all other phases using motion-triggered, all-weather cameras. A passive monitoring system was set up in 2012 and 2013 with the deployment of 60 motion-triggered cameras (Reconyx PC800 HyperFire™ Professional Semi-Covert Infrared) in the RSA to document caribou (and other wildlife) activity around camp infrastructure, and on the tundra. Cameras were positioned at key proposed infrastructure locations, such as the proposed tailings impoundment area and at the various camp infrastructure locations of the Goose and George camps and proposed marine laydown area. Control areas will also be monitored to evaluate the use of the Project locations compared to undisturbed areas of the tundra near the camp. Finally, areas predicted to be important for caribou were also monitored – such as river crossings, lake shores, eskers, and locations with abundant caribou trails on the tundra. Cameras will be checked twice per year at minimum by on-site environment technicians. Cameras may be repositioned as deemed necessary pending results of the photo data.

The five objectives of this program will be to:

1. Monitor the Project site to examine how caribou interact with Project facilities (e.g., on roads, pits).
2. Monitor the Project site at areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., in areas with dust, vs. without).
3. Monitor areas identified as important for caribou from land user knowledge (e.g., eskers, river crossings) and at points with high number of caribou identified during baseline studies (e.g., the river crossing at the east end of Beechey Lake).
4. Monitor control areas distant from the mine and away from areas identified in 3).
5. Record the times at which caribou use the RSA during the year.

The existing cameras in the RSA will be re-evaluated for how they address the five objectives above and re-deployed, if necessary. Cameras will record one photo every 30 minutes and 10 photos whenever they are triggered by movement as they did during baseline surveys.

For each photo that includes a wildlife observation the following data will be recorded: date, time, photo type (M = motion or T = timed (T) photos), photo number, number of photos, number of triggers, species, number of animals, and their behaviour (i.e., resting, foraging, traveling). Individual caribou that are recorded 30 minutes apart in triggered photos will be considered different individuals, unless behaviour suggests that they are the same individual (i.e., individuals resting on the tundra).

For small numbers of caribou observed by motion triggered photos, the exact number of individuals will be determined. For large numbers of caribou in herds, the number of individuals will be determined over entire motion triggered photo set where the greatest number of individuals observed will be recorded for that time period. All photo observations of caribou will be checked by a second observer to ensure that the number of individuals was recorded accurately.

To assess the temporal and spatial distribution of caribou in the RSA the data will be pooled by day (temporal trends), camera (spatial trends), and within each season of caribou life history stages (Table 5.1-1 in Volume 5 Section 5.1) such as calving, post-calving, and summer.

In order to compare the number of caribou observations between sites (e.g., on and off proposed infrastructure, and between various vegetation types) the number of caribou will be calculated per day as the total number of caribou observed, compared to the number of days the camera is active. Some cameras will be obscured by snow, fail due to cold, or be knocked over by wildlife or wind. These periods of inactivity will be removed prior to analysis. To assess habitat use by caribou, mean caribou detection rates and associated standard errors will be calculated for each habitat type.

7.3.2 Grizzly Bears

7.3.2.1 Background

Baseline survey data and Inuit Traditional Knowledge indicate that grizzly bears are found throughout the RSA, especially in association with major river systems, watersheds, and coastal areas (Gartner Lee Ltd. 2008; Rescan 2011; KIA 2012; Rescan 2012, 2013c). Grizzly bears are listed as a species of "Special Concern" (COSEWIC 2012); but are not yet listed under SARA. In the NWT and Nunavut, the Canadian Endangered Species Conservation Council lists grizzly bears as Sensitive (Working Group on General Status of NWT Species 2006; CESCC 2010). Grizzly bears are included as a VEC in the environmental assessment and thus, an assessment of potential local impacts from the Project on grizzly bear has been included in the WEMP.

The two objectives of this component of the WEMP are to:

1. Describe the monitoring work that has been conducted to date in the RSA, including:
   - Population-estimates using DNA mark-recapture.
   - Carnivore den surveys.
   - Habitat Suitability modeling.
   - Incidental observations of grizzly bears using remote motion-triggered cameras.
2. Describe the monitoring work that is proposed for the WEMP, which includes:
   - Monitoring use of the areas near proposed Project infrastructure for grizzly bears using remote motion-triggered cameras.

7.3.2.2 *Existing Baseline Surveys*

The Project has conducted four types of baseline surveys for grizzly bears in the regional study area including: i) population-estimation using DNA mark-recapture, ii) den surveys, iii) habitat suitability modelling, and iv) incidental observations during other environmental baseline surveys conducted in the RSA and via remote motion-triggered cameras.

<u>DNA Mark-Recapture</u>

The DNA based mark-recapture program was conducted in 2012 and 2013 in an area consisting of approximately 17,300 km^2 surrounding the Project location (Rescan 2013b). The survey included a 120 cell grid of 12 X 12 km cells. Each cell contained a baited post to attract bears which would investigate the post and leave hairs on barbed wire wrapped around the post. The posts were checked 6-8 times during the summer, every 9-12 days. Bears were identified from their hairs and a population estimate was calculated from the proportion of bears that return to the posts during the summer. Overall results of the program generate a super-population estimate, spatial and temporal distribution, calculate demographic variables, and identify individuals outside of the study area observed by other surveys. Results from these surveys are summarized in the existing environment and baseline information section of the grizzly bear effects assessment (Volume 5, Section 6.1). The main results indicate:

- A total of 111 grizzly bears were detected by mark-recapture in the grizzly bear study area in 2012. Of these bears, 61 individuals were detected in the RSA and only 12 bears were common to both the RSA and the adjacent western cells.
- Grizzly bears were generally concentrated near major river systems in early spring and spread evenly throughout the RSA during summer.
- Female grizzly bears had smaller ranges and maximum distances travelled during the survey period relative to male bears, suggesting that females may have stronger site fidelity.

<u>Den Surveys</u>

Carnivore den surveys were carried out via low level aerial surveys in esker and glacial-fluvial habitat during the end of May or early June, and July of 2007, 2011, 2012, and 2013 (Gartner Lee Limited 2007; Rescan 2012, 2013c). During these surveys, any grizzly bear dens observed were recorded. See Carnivore Den Surveys in Section 7.3.4.2 for more information. Results indicated that:

- Dens were difficult to find during aerial surveys although one den was observed during the July survey conducted in 2012.
- Two dens were observed incidentally during breeding bird surveys conducted in 2007 (Gartner Lee Limited 2007), and one den observed incidentally in June 2012 during other baseline surveys (Rescan 2013c).

<u>Habitat Suitability Modeling</u>

Wildlife habitat suitability modelling was conducted within the LSA and RSA to inventory and rate the habitat types for grizzly bear and quantify suitable habitat available for this species within the LSA and RSA (Rescan 2013a). Habitat suitability modelling methodology was guided by BC Resource Information Standards Committee standards (RIC 1999b). Results are presented in the existing environment and baseline information section for the grizzly bear effects assessment (Volume 5, Section 6.1). The primary results from this analysis were:

- High value denning habitat was very limited in both the LSA and RSA, as was moderate value habitat in either study area due to the limited extent of eskers and lacustrine deposits, and the dominance of boulder tundra and rocky areas.
- High value spring habitat was also limited in both the LSA and RSA, with moderate habitat comprising the majority of the of these study areas.
- Summer and fall habitat in the LSA and RSA was largely mapped as moderate and low value.

Remote Motion-triggered Cameras

Incidental observations of grizzly bears were recorded in the RSA via images captured by the 60 remote cameras distributed throughout the RSA for caribou surveys in 2012 and 2013. Images from these cameras were quality checked to remove duplicate images of the same individual and documented. Details of the methodology for remote cameras can be found in the 2012 Wildlife Baseline Report (Rescan 2013c). Grizzly bears were frequently detected via remote motion-triggered cameras with a total of 85 unique observations captured by the 60 cameras located in the RSA.

7.3.2.3 Focal-species Monitoring for the WEMP

The focal-species monitoring program will include monitoring grizzly bear by remote motion-triggered cameras. Currently motion-triggered cameras are located on the tundra in strategic positions to capture caribou movements and habitat use (Rescan 2013c, 2014b). Grizzly bears along with other wildlife are often recorded by these cameras. The use of remote cameras for annual monitoring of caribou is currently proposed for the WEMP (Section 7.3.1.3). Incidental observations of grizzly bears detected by remote camera along with incidental observations during other wildlife monitoring surveys will continue to be recorded.

The four objectives of this local-scale monitoring program are to:

1. Monitor the Project site to examine how grizzly bear interact with Project facilities (e.g., on roads, pits).
2. Monitor the Project site at areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., in areas with dust vs. without).
3. Monitor areas identified as important for grizzly bears from land user knowledge (e.g., eskers) and at points with high number of grizzly bears identified during baseline surveys (e.g., the habitat along the shoreline of Bathurst Inlet near the MLA).
4. Record the times at which grizzly bear use the RSA during the year.

Methods for data management and analysis will follow those for caribou.

7.3.3 Muskox

7.3.3.1 Background

Baseline surveys conducted between 2001 and 2012 indicate that muskox are present in the study area. Muskox are designated as a VEC for the EIS. An assessment of potential local impacts from the Project on muskox has been included in the WEMP as muskox data have been collected in conjunction with the caribou monitoring program.

The two objectives of the focal species monitoring for muskox are to:

1. Describe the monitoring work that has been conducted to date in the RSA, including:
   - Aerial surveys.
   - Habitat suitability modelling.

7.3.3.2 Existing Baseline Surveys

Two types of surveys have been conducted for muskox in the regional study area during baseline surveys including: i) aerial surveys conducted concurrently with the caribou aerial surveys; and ii) habitat suitability mapping for muskox in the RSA during summer and winter seasons to determine the proportion of good-quality habitat for muskox.

Aerial Surveys

In 2001, 2002, 2007, 2008, and 2010, data on muskox distribution and group composition were collected concurrently with the caribou aerial surveys and followed the same study design and field methods provided for caribou (Figure 8.3-2). Additionally, incidental observations of muskox were collected during baseline surveys conducted on other wildlife species in 2007 and 2011 through 2013.

Muskox have been observed in the study area throughout the year, and in all years where baseline surveys have been conducted in the Project area (Volume 5, Section 7.1). However, muskox densities tend to be low and highly variable between years. Due to theses low densities and high variability there is insufficient data to conduct a statistical analysis of the muskox population in the RSA – and therefore evaluate whether a ZOI exists around Project infrastructure during operations. Muskox appear to be more common during summer than during winter, and calf numbers are generally low.

Habitat Suitability Modelling

Wildlife habitat suitability modelling was conducted within the LSA and RSA to inventory and rate the habitat types for muskox and quantify suitable habitat available for this species within the LSA and RSA (Rescan 2013a). Habitat suitability modelling methodology was guided by BC Resource Information Standards Committee standards (RIC 1999b). Results are presented in the existing environment and baseline information section for the muskox effects assessment (Volume 5 Section 7.1). The primary results from this analysis were:

- Approximately one third of the LSA and RSA was rated as high or moderate value summer habitat for muskox.
- A little under one third of the LSA and RSA was rated as high or moderate value winter habitat for muskox.

7.3.3.3 Focal-species Monitoring for the WEMP

A monitoring program for muskox is not planned as part of the WEMP. Local-scale monitoring was conducted as part of baseline surveys using remote-triggered cameras. The local-scale monitoring program will be continued into the WEMP using remote-triggered cameras.

Currently motion-triggered cameras are located on the tundra in strategic positions to capture caribou movements and habitat use (Rescan 2013c, 2014b). Muskox along with other wildlife are often recorded by these cameras. The use of remote cameras for annual monitoring of caribou is currently proposed for the WEMP (Section 7.3.1.3). Incidental observations of muskox detected by remote camera along with incidental observations during other wildlife monitoring surveys will continue to be recorded.

The four objectives of this local-scale monitoring program are:

1. Monitor the Project site to examine how muskox interact with Project facilities (e.g., on roads, pits).
2. Monitor the Project site at areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., in areas with dust vs. without).
3. Monitor areas identified as important for muskox from landuser knowledge (e.g., eskers, windswept benches) and at points with high number of muskox identified during baseline studies (e.g., the hilly area west of the MLA).
4. Record the times at which muskox use the area near the Project during the year in order to guide mitigation activities.

Methods for data management and analysis will follow those for caribou.

7.3.4 Wolverines/Furbearers

7.3.4.1 Background

Arctic furbearers include wolverine, wolves, red and Arctic foxes, Arctic hare, and Arctic ground squirrels, and to a lesser degree lynx and marten which are found closer to the treeline. Wolverines and grey wolves are representative furbearer species with wolves acting as a proxy for foxes (both canids). Baseline survey data and Inuit Traditional Knowledge indicate that wolverine and wolves are found throughout the RSA (Gartner Lee Ltd. 2008; Rescan 2011; KIA 2012; Rescan 2012, 2013c). The western Canada population of wolverine, including Nunavut, is listed as a species of special concern by COSEWIC (2007a). The Arctic grey wolf is federally listed as “Data Deficient” (COSEWIC 2007b), but is listed as secure in Nunavut (CESCC 2010). Wolverine and furbearers are included as a VEC in the environmental assessment and thus, an assessment of potential local impacts from the Project on wolverine and furbearers has been included in the WEMP.

The two objectives of this component of the WEMP are to:

1. Describe the monitoring work that has been conducted to date in the RSA, including:
   - Population-estimates using DNA mark-recapture for wolverine.
   - Carnivore den surveys.
   - Habitat Suitability modeling for wolverine and wolves.
   - Incidental observations of wolverine and furbearers using remote motion-triggered cameras.
2. Describe the monitoring work that is proposed for the WEMP, which includes:
   - Carnivore den surveys.
   - Monitoring use of the RSA and areas near proposed Project infrastructure for wolverine and furbearers using remote motion-triggered cameras.

7.3.4.2 Existing Baseline Surveys

The Project has conducted four types of baseline surveys for wolverine and furbearers in the regional study area including: i) population-estimation using DNA mark-recapture for wolverine, ii) carnivore den surveys, iii) habitat suitability modelling for wolverine and wolves, and iv) incidental observations of wolverine and furbearers during other environmental baseline surveys conducted in the RSA and via remote motion-triggered cameras.

DNA Mark-Recapture

A wolverine DNA mark-recapture study was conducted in 2012 and 2013 (Rescan 2013c). The survey area in 2012 for the wolverine DNA hair study was a 1,692 km^2 grid, roughly centered between Goose and George camps, with no post closer than 5 km from either camp . The survey grid was divided into 49 cells, with each cell being 6 km x 6 km. In 2013 a second year of data collection for wolverine hair was repeated in this survey grid and an additional 2,000 km^2 survey grid consisting of 50 cells roughly centred on the proposed marine laydown area was initiated (Rescan 2014a) For both years, within each cell, a 1.5 meter post wrapped with barbed wire was set and secured with rocks. A long-distance (strong-smelling) lure was used to draw in wolverines and a piece of fish was used as a food reward to provide incentive for wolverines to climb the posts. Three checks to collect hair samples were conducted: these were spaced a minimum of 10 days and a maximum of 14 days apart. DNA extracted from samples went to a multi-locus analysis of individual identity. Details of the methods are reported in the 2012 Grizzly Bear and Wolverine Baseline Report (Rescan 2013b). Results from these surveys are summarized in the existing environment and baseline information section of the wolverine and furbearers effects assessment (Volume 5, Section 8.1). The main results indicate:

1. A total of 12 wolverines were detected in the 2012 wolverine DNA study area, indicating that the Project area supports a moderately sized wolverine population.
    - Wolverines were concentrated in the southwest and central portion of the survey grid.
    - One wolverine detected in the 2012 study was previously detected in a DNA study area conducted approximately 225 km to the southwest of the Back River DNA study area, indicating that wolverines can have large home ranges.

Carnivore Den Surveys

For carnivores including wolverine and wolves, den surveys were conducted to identify the number and distribution of existing dens within the RSA, to identify dens that are active, and to identify resident carnivore species utilizing the RSA (Gartner Lee Limited 2007; Rescan 2012, 2013c). Two surveys were conducted, an occupancy survey (May/June) and a productivity survey (July). The occupancy survey identified that a den was “occupied” and used for breeding, while the productivity survey was conducted to examine if the den was successful (adults and young were present) or abandoned (suggesting the pups died and the den failed for that year).

These surveys were carried out via low level aerial surveys in esker and glacial-fluvial habitat. Occupancy surveys were carried out in 2007 (Gartner Lee Limited 2007), while both occupancy and productivity surveys were conducted in 2011 (Rescan 2012) and 2012 (Rescan 2013c) throughout the RSA. Surveys were flown at an altitude of 50 to 100 m above the terrain and at ground speeds between 30 to 80 km/h to minimize disturbance to carnivores in the area but to maintain an effective height and speed for observers to effectively discern dens and signs of activity (i.e. animals, scat, tracks, or prey remains). Full details of the carnivore den survey methods can be found in the 2011 and 2012 Wildlife Baseline Reports (Rescan 2012, 2013c). Results from these surveys are summarized in the existing environment and baseline information section of the wolverine and furbearers effect assessment (Volume 5, Section 8.1). The main results indicate:

- Two active wolverine dens exist in rocky boulder areas located within 1 km of proposed site infrastructure, one of which was approximately 2 km away from Goose Camp in the “goose neck” of Goose Lake.
- Two active wolf dens were recorded in esker habitat in the RSA in 2012 and five in 2007. One of these sites in 2007 was located near (north of) George Property.

- No denning activity was recorded at several historic wolf den sites during all years surveyed.

Habitat Suitability Modeling

Wildlife habitat suitability modelling was conducted within the LSA and RSA to inventory and rate the habitat types for wolverine and wolves and quantify suitable habitat available for this species within the LSA and RSA (Rescan 2013a). Methods was guided by BC Resource Information Standards Committee standards (RIC 1999b). Denning habitat was modeled for wolverine and wolves. Results are presented in the existing environment and baseline information section for the wolverine and furbearer effects assessment (Volume 5, Section 8.1). The primary results from this analysis were:

- Less than half of the LSA and RSA contained habitat features that may offer denning opportunities for wolverine; however, these results are assumed to be a coarse assessment of denning potential in the area.
- Potential denning habitat for wolves in the LSA and RSA are not common as there is a limited number of eskers and other suitable terrain features within these areas. However, additional denning areas may exist near river and lake banks (lacustrine materials), which were not included in the modeling due to the inability to differentiate between suitable lake banks and open water.

Remote Motion-triggered Cameras

Incidental observations of wolverines and furbearers were recorded in the RSA via images captured by the 30 remote cameras distributed throughout the RSA for caribou surveys in 2012 and 60 cameras used in the RSA in 2013(Rescan 2013c, 2014b). Fourteen cameras were located at and facing wolverine posts during DNA surveys to determine capture failure of Mark Recapture DNA methods. Remote cameras for the wolverine DNA study recorded observations from March to early May 2012 and cameras for the caribou baseline surveys recorded observations from late May to August 2012. Images from these cameras were quality checked to remove duplicate images of the same individual and documented. Details of the methodology for remote cameras can be found in the 2012 Wildlife Baseline Report (Rescan 2013c). Wolverines and wolves were frequently detected via remote cameras with a total of 51 observations captured by 30 cameras located in the RSA. However, several of these observations are likely re-counted individuals.

7.3.4.3 Focal-species Monitoring for the WEMP

The WEMP will contain one regional and one local scale monitoring program which aim to monitor Project effects on wolverines and furbearers in the RSA and near Project infrastructure.

Carnivore Den Surveys

The carnivore den surveys will follow a three year pattern. Surveys will be conducted for three consecutive years (surveyed two times yearly) and then not conducted for the following three consecutive years. This pattern will repeat throughout the Construction and Operation phases as part of the regional program to monitor the distribution of wolverine and furbearers in the RSA.

Remote Motion-triggered Cameras

Currently motion-triggered cameras are located on the tundra in strategic positions to capture caribou movements and habitat use (Rescan 2013c, 2014b). Wolverine/furbearers along with other wildlife are often recorded by these cameras. The use of remote cameras for annual monitoring of caribou is currently proposed for the WEMP (Section 7.3.1.3). Incidental observations of wolverines and furbearers detected by remote camera along with incidental observations during other wildlife monitoring surveys will continue to be recorded.

The four objectives of this local-scale monitoring program are to:

1. Monitor the Project site to examine how wolverine and furbearers interact with Project facilities (e.g., on roads, pits).
2. Monitor the Project site at areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., winter roads, and areas with dust vs. without).
3. Monitor areas identified as important for wolverine and wolves from land user knowledge (e.g., eskers).
4. Record the times at which wolverine and furbearers use the RSA during the year.

Methods for data management and analysis will follow those for caribou.

7.3.5 Migratory Birds

7.3.5.1 Background

The wildlife operations section within the Government of Nunavut's Department of Environment covers and enforces the territorial and federal laws protecting migratory birds including the *Migratory Birds Convention Act* and the *Nunavut Wildlife Act (2003)*. The *Nunavut Wildlife Act* includes reference to the *Canadian Migratory Bird Convention Act* (1994c) that protects avian species that migrate between countries. The Canadian Endangered Species Conservation Council (CESCC) producing a list of the conservation status ranks of birds for each province and territory and due to the migratory nature of upland breeding birds and waterbirds, particular attention was paid to each species in its breeding grounds (CESCC 2010).

<u>Waterbirds</u>

The lakes and wetlands of the tundra host a large number of migratory waterbird species, including tundra swans, loons, sandhill cranes, geese, and ducks. The breeding distribution of several species including the yellow-billed loon, tundra swan, and greater white-fronted goose is exclusive to the tundra region. Species richness of waterfowl is considered a valuable indicator of the quality of wetland habitats. Although predicted to be minor, indirect effects from mine-related activities, such as noise and dust, have the potential to change the distribution and species richness of waterbirds within the study area.

Identifying species of conservation concern is imperative to meet the obligations of the *Species At Risk Act* (SARA; 2002b), which protects threatened and endangered species and their habitats. In Nunavut, several species of waterbird are listed as sensitive and occur in the Back River terrestrial RSA including: long-tailed duck, Arctic tern, and glaucous gull.

<u>Upland Breeding Birds</u>

Upland breeding birds include songbirds (passerines, with the exception of common raven, which is included under raptors), shorebirds, and ptarmigan. During the breeding period, natural and anthropogenic disturbances can be associated with changes in density and species richness of bird communities. For example, a recent eight-year study at the EKATI Diamond Mine indicated temporal changes in the diversity and density of bird species associated with landscape scale and population level effects (A. C. Smith et al. 2005).

Nine species of upland breeding birds recorded in the Back River study area are listed by the Canadian Endangered Species Conservation Council (CESCC 2010) in Nunavut as “Sensitive,” including the American golden plover, American pipit, American tree sparrow, Harris’ sparrow, hoary redpoll, least sandpiper, red-necked phalarope, semipalmated sandpiper, and white-crowned sparrow. There are no upland breeding bird species currently observed in the Project area that are SARA-listed species.

The two objectives of this component of the WEMP are to:

1. Describe the monitoring work that has been conducted to date in the RSA, including:
   - Staging and breeding surveys for waterbirds.
   - PRISM Plot surveys for upland breeding birds.
2. Describe the monitoring work that is proposed for the WEMP, which includes:
   - Determining if the Back River Project influences the species richness and density of waterbirds in the local and regional study areas during migration periods, establishment of nesting territories period, and brood rearing period.
   - Determining if the mine influences upland breeding bird density and species richness within the study area using PRISM plot surveys.

7.3.5.2 Existing Baseline Surveys

The Project has conducted aerial surveys for waterbirds during staging and breeding periods in the terrestrial RSA, and two types of baseline surveys for upland breeding birds in the terrestrial RSA including: i) PRISM Plot surveys, and ii) point count surveys.

Aerial Surveys for Waterbirds

Aerial surveys were flown between 2011 and 2013 in the terrestrial RSA (Rescan 2012, 2013c, 2014b). Survey methodology followed established protocols described by the Canadian Wildlife Service (CWS) and the United States Fish and Wildlife Service (USFWS)(CWS and USFWS 1987). Flights were conducted by helicopter at speeds of 40 to 100 km/hour and at an altitude of approximately 45 m in five survey areas within the RSA. These areas include two survey blocks near Goose Property, two surveys blocks near George Property and one larger survey block near the proposed Marine Laydown Area.

Survey blocks consisted of eight transects (16 km long and spaced 2 km apart) arranged latitudinally and were flown once for each aerial survey. One or two main observers and at least one data recorder were present in the helicopter in addition to the pilot. Observers searched lake surfaces and wetlands for waterbirds and/or waterbird broods and identified and recorded waterbirds within 400 m of either side of the aircraft during staging surveys and within 200 m of the aircraft during breeding surveys. Whenever waterbirds were observed they were identified to the species level, when possible. The timing of these surveys was planned to coincide with the staging periods in late May and late August and the breeding periods including pairing (mid-June) and brood-rearing (mid-July). Full detailed methodology can be found in the 2012 Wildlife Baseline Report (Rescan 2013c).

In 2011, two aerial surveys were conducted in the survey blocks near Goose Property, one in July (early breeding survey) and one in August (late breeding/early staging survey). Four aerial surveys were flown in the four survey blocks surrounding the Goose and George Properties in 2012 and in the large survey block near the proposed MLA in 2013: one in late-May corresponding to spring staging, one in June corresponding to waterbird courting, one in mid-July to document breeding, and one in late-August corresponding to fall staging.

A summary of results of baseline waterbird monitoring can be found in the existing environment and baseline information section of the migratory birds chapter in the DEIS (Volume 5, Section 9.1) and detailed results are found in the annual baseline reports for 2011 and 2012 (Rescan 2012, 2013c). The primary results of this study indicate:

- A total of 24 waterbird species have been detected in the terrestrial RSA, five of which are species of conservation concern listed as "Sensitive" in Nunavut: long-tailed duck, Arctic tern, glaucous gull, common eider, and king eider.
- Large flocks of geese and ducks move through the area during migration periods on their way to their breeding and/or wintering grounds.
- A greater number of flocks were observed in the southern portion of the terrestrial RSA near the Goose Property relative to the central portion of the RSA near George property.
- Flocks of waterbirds have been consistently documented in both spring and fall surveys on one small lake northwest of the George Property, inside of the terrestrial LSA.
- Evidence of breeding during baseline surveys was minimal in the terrestrial RSA with confirmed breeding documented for three species including Canada geese, northern pintail, and sandhill crane. A small number of waterbird pairs, mostly long-tailed ducks, were documented in the terrestrial RSA during pair surveys.

<u>PRISM Plot Surveys for Upland Breeding Birds</u>

Surveys for upland breeding birds were carried out in June of 2011, 2012, and 2013 based on the rapid survey technique from The Program for Regional and International Shorebird Monitoring (PRISM) instituted by Canadian Wildlife Service (CWS) to monitor continental trends in shorebird populations. PRISM plots (each 12 ha or 300 x 400 m) are established at randomly selected locations throughout the study area, covering high, moderate and low quality shorebird habitats (Rescan 2012, 2013c, 2014b). Data were also collected in 2007 combining modified PRISM plots (400 m x 400 m) and transects (400 m – 800 m).

Full survey details can be found in the annual wildlife baseline reports (Rescan 2012, 2013c). Beginning in the southwest corner of each plot, observers slowly walked back and forth along six paired 400 m transects spaced 25 m apart. All upland breeding birds observed on the ground or flushed within 12.5 m on either side of each transect line were noted along with habitat data. Broad upland and lowland classifications consisted of three habitat types; dry, moist, and wet. Observers recorded nine mirco-habitat types from dry to wet: Dry: beach, esker, rocky heath, heath lichen; Moist: heath hummock, short shrub, tall shrub; and Wet: sedge wetland, and water.

Baseline surveys for upland breeding birds focused on describing species density, diversity, and richness within the study area and relating these to habitat associations. Surveys for upland breeding birds in the study area were conducted using Prism Plot surveys in a focused survey area roughly centered on the Goose Property and a nearby reference area (2011 and 2012), in a focused survey area roughly centered on the George Property and a nearby northern reference area (2012), and in a survey area encompassing and radiating inland from the MLA (2012 and 2013).

A summary of results of baseline upland breeding bird surveys can be found in the existing environment and baseline information section of the migratory birds chapter in the DEIS (Volume 5, Section 9.1) and detailed results are found in the annual baseline reports for 2011 and 2012 (Rescan 2012, 2013c). The primary results of this study indicate:

- A total of 22 upland breeding bird species (10 songbirds, nine shorebirds, and two ptarmigan) were observed during PRISM surveys including 10 species listed as “Sensitive” in Nunavut: American golden-plover, American pipit, American tree sparrow, dunlin, Harris’s sparrow, hoary redpoll, least sandpiper, red-necked phalarope, semipalmated sandpiper, and white-crowned sparrow.
- Songbird territories were the dominant group of upland breeding birds observed representing 88% of all territories recorded.
- Three communities of songbirds were recorded – one associated with wet habitat types such as wetlands and sedge meadow, the second associated with moist habitats with tall shrubs, and the third associated with upland heath habitat.
- Shorebirds were most often associated with moist and wet habitat classifications.
- Ptarmigan were most often observed in the dry and moist habitat types.

<u>Point Count Surveys for Upland Breeding Birds</u>

In 2013, point count surveys were conducted for upland breeding birds based on established protocols for songbirds in forested and non-forested environments (Ralph et al. 1993; RIC 1999a; Environment Canada 2004). Point counts were conducted using a fixed radius of 100 m and were randomly distributed across upland habitats in the study area.

Full survey details can be found in the annual wildlife baseline report (Rescan 2014b). Surveys were conducted between 7:00 to 12:00 to capture the time when territorial male songbirds sing most frequently. After a settling period of two minutes after arriving at each point count station (to allow bird activity to return to normal), all birds seen and heard within a five minute period were recorded, as well as their distance and location with respect to the observers. All birds were identified to species and to gender when possible; detections were noted as visual, song, or call, and any evidence of breeding (e.g., nests, territorial and mating displays) were also noted. Birds that were detected beyond the 100 m radius survey area, were flying over stations, or were detected after the five minute point count were also recorded. Observers also recorded the habitat type(s) present within the point count survey area, using ten broad habitat categories ranging from driest to wettest: Esker, Beach, Bedrock Lichen Heath, Dry Heath Tundra, Mesic Tundra, Low Shrub, Tall Shrub, Hummocky sedge meadow, Moist sedge meadow, Wet sedge meadow.

Point count surveys for upland breeding birds focused on describing species density, diversity, and richness within the study area and relating these to habitat associations. Specifically, this methodology was instituted to describe the upland breeding bird community in habitats surrounding the proposed MLA. Point count surveys were conducted within a five kilometer area surrounding the proposed MLA, and in a similar reference site located approximately 20 km north of the MLA (Rescan 2014b).

Results from point count surveys conducted in 2013 are currently being analyzed. When available, these results will be incorporated in to the existing environment and baseline information section of the migratory birds chapter in the FEIS (Volume 5, Section 9.1).

7.3.5.3 Focal-species Monitoring for the WEMP

A biennial migratory bird monitoring program is proposed for the WEMP, including programs for waterbirds, and upland breeding birds.

Waterbird Monitoring

Waterbird monitoring will consist of two types surveys: i) surveys to assess Project-related changes in the distribution of waterbirds in the RSA during staging periods, and ii) surveys to assess the effect of the Project on resident breeding waterbirds in the RSA. Analyses will be conducted to determine trends over time in the distribution, and productivity of waterbirds in relation to mine infrastructure.

Staging Surveys

Aerial surveys will be conducted during spring and fall staging periods following established protocols described by the Canadian Wildlife Service (CWS) and the United States Fish and Wildlife Service (USFWS)(CWS and USFWS 1987) and will be continued on a three year schedule while the Goose and George PDAs are active. In addition to these surveys, all wetlands within a 5 km radius of the Project infrastructure will be surveyed on biennial basis for staging waterfowl during the spring and fall staging periods.

While survey methods established by CWS and USFWS allow the contribution of data to a national waterfowl database for comparison to other areas, as well as annual changes in data, these surveys do not adequately detect waterbird abundance and distribution as birds are often not detected, especially during breeding periods, and the data are not powerful enough to detect change at various distances from a Project. By surveying all wetlands within a 5 km radius of the Project infrastructure on the Goose and George Properties, and the MLA, a zone of influence can be measured to detect whether the Project has an effect on waterbird staging in the RSA.

Breeding Surveys

Aerial surveys were conducted to detect evidence of waterbird breeding in the terrestrial RSA. Data gathered during these baseline surveys indicated that evidence of breeding was low in the Project area. A limited number of broods were observed in the waterbird survey blocks in the terrestrial RSA in 2011 and 2012. However, it is not clear whether the limited number of broods detected in the RSA was a function of survey platform, or whether the Project area is an area which supports limited breeding for waterbirds.

Going forward, for the WEMP, ground-based surveys are proposed on an annual basis to detect evidence of breeding in the terrestrial RSA focusing on areas within 5 km of Project Infrastructure in the Goose and George Properties and the MLA. These ground-based survey methods are currently under development and will be implemented upon consultation with CWS in the FEIS. Aerial surveys may be conducted every three years during breeding timing for comparison with national data and biennial data recorded in the Project area.

Upland Breeding Bird Monitoring

For upland breeding bird monitoring, a combination of variable radius point count surveys and PRISM plots will be used to monitor potential effects of the Project on upland breeding birds annually, with continued focus on areas near Goose and George Properties and the Marine Laydown Area. A suite of approximately 50 PRISM plots at varying distances from mine infrastructure within the RSA will be revisited and/or established. The plots will be distributed amongst representative cover types, and each plot will be located in a single cover type.

The number and locations of PRISM plots and point counts will be reviewed prior to each biennial survey, and they may change as data become available to ensure that changes in breeding bird density and species richness can be accurately assessed relative to the mine site. These surveys contribute data on density, richness, and diversity of other upland nesting species in the Arctic. Two trained biologists will conduct the survey according to established CWS guidelines. Incidental bird observations will also continue to be recorded on and near the mine site.

A review of all available upland breeding bird data collected to date via PRISM plot surveys will be conducted to assess differences from baseline patterns in species density and richness. This analysis will be based on the most current analytical techniques and based on advice from the Canadian Wildlife Service.

7.3.6 Raptors

7.3.6.1 Background

Raptors in the Project area include peregrine falcon, gyrfalcon, rough-legged hawk, golden eagle, bald eagle, short-eared owl, snowy owl, and northern harrier (Rescan 2013c). Common ravens are included as functional raptors in Nunavut because they compete for the same resources as the cliff-nesting raptors in the Project area (White and Cade 1971). The tundra peregrine falcon is federally listed on Schedule 3 as a population of Special Concern under the Species at Risk Act (SARA; Government of Canada 2012) and short-eared owl are listed on Schedule 1 as species of special concern(Government of Canada 2012) , while the golden eagle, peregrine falcon, and the short-eared owl is listed on Schedule 1 as a species of Special Concern and are listed as sensitive in Nunavut (CESCC 2010). Golden eagle, gyrfalcon, and rough-legged hawk are also listed as "Sensitive in Nunavut (CESCC 2010).

Raptor breeding activity is monitored as part of the WEMP because raptors were designated a VEC in the EIS and because raptors and their nests are legally protected under the Nunavut *Wildlife Act* (2003). Raptors are also considered valuable indicators of environmental change (Furness and Greenwood 1993). Peregrine falcon and short-eared owl were chosen for the environmental assessment as representative cliff-nesting and tundra-nesting raptor species respectively.

The two objectives of this component of the WEMP are to:

1. Describe the monitoring work that has been conducted to date in the RSA, including:
   - Occupancy and productivity nest surveys.
   - Habitat suitability modeling for peregrine falcon and short-eared owl.
2. Describe the monitoring work that is proposed for the WEMP, including:
   - Occupancy and productivity nest surveys to determine if the mine influences the distribution, occupancy rate, nest success rate, or productivity of raptors nesting in the study area.

7.3.6.2 Existing Baseline Surveys

The Project has conducted two types of baseline surveys for raptors in the regional study areas including: i) raptor nest surveys, and ii) habitat suitability modelling for peregrine falcon and short-eared owl.

<u>Raptor Nest Surveys</u>

Surveys were conducted in 2002 (Rescan 2002), 2007 (Gartner Lee Limited 2007), 2011 (Rescan 2012), 2012 (Rescan 2013c) and 2013 (Rescan 2014b) to estimate the abundance, distribution, and breeding productivity of cliff-nesting raptor species within the RSA. Raptor surveys were conducted for cliff nesters from a helicopter with two observers. Ground nesting raptors, nests were recorded during the upland breeding bird surveys.

Aerial survey flights were flown at a minimum of 50 m from the cliff and flying speed was between 30 to 80 km per hour to prevent disturbing the nesting raptors and still maintain an effective height for distinguishing raptor species brood data. Nest sites were determined from previous datasets and surveys, while new nests were recorded and added to the dataset.

Two surveys were conducted each year: i) the spring occupancy survey to determine whether historical nests were occupied and if any new nests were built, and ii) the summer productivity survey to determine the proportion of occupied nests that were productive, and the productivity of these nests (number of chicks produced and fledged at each nest site where possible.

The timing of the surveys was coordinated to best maximize observing all raptor species, however, due to the staggered timing of nesting and fledging of some species (for example: gyrfalcon fledge before peregrine falcon nestlings) this survey has some limitations. The spring survey occurred in late May/June and summer survey in late July/August. Full details of the survey methodology can be found in the 2007, 2011, and 2012 Wildlife Baseline Reports (Gartner Lee Limited 2007; Rescan 2012, 2013c).

During previous baseline surveys (2002 to 2012), 234 raptor nest sites were identified and monitored in the study area(Rescan 2002; Gartner Lee Limited 2007; Rescan 2012, 2013c, 2014b). This historical data set and subsequent surveys led to the identification of new potential and actual nesting sites in the study area. In addition, rough-legged hawks and ravens typically build new nests each year. The actual number of nesting sites monitored in each year varies as new nests are built and old nests fall apart or are not found in certain years.

Habitat Suitability Modeling

Wildlife habitat suitability modelling was conducted within the LSA and RSA to inventory and rate the habitat types for raptors and quantify suitable habitat available for these species within the LSA and RSA (Rescan 2013a). Habitat suitability modelling methodology was guided by BC Resource Information Standards Committee standards (RIC 1999b). Raptor nesting habitat was modeled for peregrine falcon and short-eared owl. Results are presented in the existing environment and baseline information section for the raptor effects assessment (Volume 5, Section 10.1). The primary results from this analysis were:

1. Very little habitat in the LSA and RSA contained habitat features that offer suitable nesting habitat for raptors due to the limited amount of cliff habitat in these areas.
2. Approximately half of the LSA was considered to be suitable habitat for nesting for short-eared owl, while only about a third of the RSA was considered to be suitable, largely based on the portion of both study areas that contain tall or dense shrubby areas.

7.3.6.3 Focal-species Monitoring for the WEMP

Raptor Nest Surveys

A raptor monitoring program occurring every three years is proposed for the WEMP. Raptor breeding sites in the Back River RSA will be monitored to determine distribution, occupancy, and productivity at nest sites that have been mapped in the study area. The survey methods will follow previously established protocols used during baseline surveys. Analyses will be conducted to determine trends over time in the distribution, occupancy rate, and productivity rate of raptors in relation to mine infrastructure. Nests within 1.5 km of Project infrastructure will be a priority for monitoring in addition to nests in undisturbed reference areas nearby.

7.3.7 Seabirds and Seaducks

7.3.7.1 Background

Seabirds/seaducks include those waterbird species that are reliant on marine environments during various life history stages, such as foraging or staging (Gill et al. 1996). The Queen Maud Gulf Migratory Bird Sanctuary is approximately 200 km east of Bathurst Inlet. The sanctuary is an important bird area with about 60 goose colonies and more than 12 species of waterbirds breeding within the sanctuary. It is possible that in addition to locally breeding waterbirds some of the breeding species from the sanctuary could use Bathurst Inlet as a staging area prior to fall migration.

Seabirds/seaducks and their habitat are protected under several forms of federal legislation. Migratory marine bird species receive protection under the federal *Migratory Bird Convention Act (1994b)*, which includes regulations that prohibit the killing, capturing, injuring, taking or disturbing of migratory birds, or the damaging, destroying, removing or disturbing of nests (Canadian Wildlife Service 1991). The federal *Species at Risk Act* (SARA; 2002a) protects threatened marine bird species and their habitats.

Identifying species of conservation concern is imperative to meet the obligations of the *Species At Risk Act* (SARA; 2002b), which protects threatened and endangered species and their habitats. In Nunavut, several species of waterbird are listed as sensitive and occur in the Back River marine RSA including: Arctic tern, glaucous gull, common eider, and king eider.

7.3.7.2 Existing Baseline Surveys

The Project has conducted aerial surveys for seabirds/seaducks during staging and breeding periods in the marine RSA using three survey methods including: 1) survey block transects; 2) shoreline transects; and 3) marine transects. In addition, ground surveys were conducted for seabirds/seaducks in the marine RSA in 2011.

Aerial surveys were conducted in 2010, 2011, 2012, and 2013 in Bathurst inlet to document seabirds/seaducks using marine habitat near the proposed MLA. Two surveys were conducted in Bathurst inlet during each of the years surveyed: one in July during the breeding season, and one in August during fall staging. In 2010, surveys were conducted in the southern portion of the marine RSA in two survey blocks totalling 75 km of overwater distance in each survey block. Flight altitude and speed during these flights was 45 m (150 ft) and 80 to 100 km/h respectively. In 2011, 2012, and 2013, aerial surveys were conducted in the marine RSA along shoreline transects and along marine transects in 2011 only (Figure 8.3-10). Flight altitude and speed was similar to those in 2010 except for during the 2011 marine transect surveys where flights altitude as 150 m (500 ft). Observers noted all seabirds/seaducks within 500 m of either side of the aircraft during these surveys.

<u>Ground Surveys for Seabirds/seaducks</u>

In 2011, ground surveys were conducted in the marine RSA during the breeding season to locate marine bird nests along the shoreline. Surveys were conducted within 100 m of the shoreline of Bathurst Inlet. Two observers spaced 25 m apart walked along the shoreline searching for nests of seabirds/seaducks. Surveys were conducted for 30 minutes; because shoreline topography was not consistent along transects, transect length varied between 1 and 1.8 km. When nests were detected, the observers recorded the location, species, nest contents, and observations of birds flying along shorelines and on the water. No nests or young were observed during this survey.

A summary of results of baseline seabird/seaduck monitoring can be found in the existing environment and baseline information section of the seabirds/seaducks chapter in the DEIS (Volume 7, Section 6.1) and detailed results are found in the annual baseline reports for 2010 (Rescan 2010), 2011 (Rescan 2012), 2012 (Rescan 2013c), and 2013 (Rescan 2014b). The primary results of this study indicate:

- A consistent staging area was observed in a section of Bathurst Inlet directly south of the propose MLA within the marine LSA.
- Evidence of breeding was negligible in the areas surveyed in the marine RSA.

7.3.7.3 Focal-species Monitoring for the WEMP

A seabird/seaduck monitoring program every three years is proposed for the WEMP when the MLA is active. Seabird/seaduck monitoring will consist of two types surveys: i) surveys to assess Project-related changes in the distribution of seabirds/seaducks in the RSA during staging periods, and ii) surveys to assess the effect of the Project on resident breeding seabirds/seaducks in the RSA. Analyses will be conducted to determine trends over time in the distribution, and productivity of seabirds/seaducks in relation to mine infrastructure.

Staging Surveys

Aerial surveys will be conducted in the marine RSA during spring and fall staging periods following established protocols described by the Canadian Wildlife Service (CWS) and the United States Fish and Wildlife Service (USFWS)(CWS and USFWS 1987) and will be continued on a three year schedule while the MLA is active. All marine areas within a 5 km radius of the Project infrastructure will be surveyed on an annual basis for staging waterfowl during the spring and fall staging periods.

While survey methods established by CWS and USFWS allow the contribution of data to a national waterfowl database for comparison to other areas, as well as annual changes in data, these surveys do not adequately detect seabird/seaduck abundance and distribution, especially during breeding periods, as birds are often not detected, and the data are not powerful enough to detect change at various distances from a Project. By surveying all marine areas within a 5 km radius of the Project infrastructure at the MLA, a zone of influence can be measured to detect whether the activities at the MLA have an effect on seabird/seaduck staging in the RSA.

Breeding Surveys

Aerial surveys were conducted to detect evidence of seabird breeding in the marine RSA. Data gathered during these baseline surveys indicated that evidence of breeding was low in the Project area. No broods were detected in areas surveyed in the marine RSA in any year surveyed. However, it is not clear whether the limited number of broods detected in the marine RSA was a function of survey platform, or whether the Project area is an area which supports limited breeding for seabirds/seaducks.

Going forward, for the WEMP, ground-based surveys are proposed on an annual basis to detect evidence of breeding in the marine RSAs focusing on areas within 5 km of Project Infrastructure at the MLA. These ground-based survey methods are currently under development and will be implemented upon consultation with CWS in the FEIS. Aerial surveys may be conducted every three years during breeding timing for comparison with national data and yearly data recorded in the Project area.

7.3.8 Ringed Seals

7.3.8.1 Background

Ringed seals are year-round residents of the Arctic and are highly adapted for living in the winter fast-ice environment. Ice conditions influence ringed seal distribution and abundance (T. G. Smith and Stirling 1975, 1978; Moulton et al. 2002). Ringed seal seasonal distribution is related to prey availability, stable ice conditions, and physical ice characteristics (McLaren 1958; T. G. Smith and Stirling 1975). During winter and late spring (roughly November to mid-June), when virtually the entire Canadian Arctic Archipelago is icebound, ringed seals may occur in Bathurst Inlet in moderate abundance. As the ice forms in late autumn, ringed seals maintain breathing holes in new thin ice and cracks with the claws of their foreflippers (T. G. Smith and Stirling 1975; T. G. Smith and Hammill 1981). Ringed seal are dependent on marine ice, utilizing stable ice platforms for pupping and nursing (McLaren 1958, 1962; T. G. Smith and Stirling 1975; Finley et al. 1983; Kelly 1988). During March and April, ringed seals create lairs under pressure ridges and snow drifts on sea ice where breathing holes are often maintained to have their pups. Ringed seals also haul out on sea ice to moult and rest from approximately mid-May through mid-July depending on the region and annual conditions (Vibe 1950; McLaren 1958; T. G. Smith 1973; T. G. Smith and Hammill 1981; T. G. Smith 1987; Kunnasranta et al. 2002). Ice begins to break up in June (late spring), and the open water period usually lasts throughout July, August, and September or October. During the open water period, ringed seals can be found in low densities often widely distributed.

7.3.8.2 Existing Baseline Surveys

Aerial surveys were conducted in the marine RSA for seals during baseline surveys conducted in 2004, 2007, 2012 and 2013 to determine their distribution and population size in Bathurst Inlet. In 2004 surveys were conducted in early September (September 8), while surveys conducted in 2007, 2012, and 2013 were conducted in late May or June to coincide with the peak period of seal haul-out during the spring moulting period. Additionally, ringed seals were recorded in summer (July and August) 2010 and 2011 during marine bird surveys in Bathurst Inlet and in July 2012 during other environmental baseline surveys.

Aerial surveys for ringed were conducted using strip transect methodology following previously established methods (Stirling, Kingsley, and Calvert 1982; Kingsley, Stirling, and Calvert 1985; Lunn, Stirling, and Nowicki 1997; Frost et al. 2002). Flights were conducted using fixed wing aircraft at an altitude of approximately 152 m (500 ft) above sea level and a grounds speed of approximately 220 km/h (120 knots) during the open water survey and an altitude of 91 m (300 ft) above sea level and at a ground speed of approximately 130 – 157 km/h (70 – 85 knots) for surveys conducted during the ice-covered season during ringed seal moulting periods. Surveys were usually flown during mid-day, when numbers of seals hauled out on the ice were expected to be highest.

Transect lines (approximately 2.8 km apart during all years and areas surveyed, except south of Kingaok in 2012 and 2013 where transects were 1.4 km apart) were flown in Bathurst Inlet. The transect strip width was approximately 500 m surveyed on either side of the aircraft. However, seals that were directly under the plane to approximately 100 m from the centerline on either side of the aircraft were not visible to the observers, thus the effective survey strip was approximately 400 m of either side of the aircraft.

A summary of results of baseline ringed seal surveys can be found in the existing environment section of the marine mammals (ringed seal) chapter in the DEIS (Volume 7, Section 7.1) and detailed results are found in the 2012 annual wildlife baseline report (Rescan 2013c). Results from 2013 are currently being analyzed and will be available for the Final EIS. The primary results of this study indicate:

- Density (corrected density for detection bias) of ringed seals in Bathurst Inlet is approximately 2.0 seals/km^2 (uncorrected density was approximately 0.55 seals/km^2).
- Density was considerably lower south of Kingaok relative to areas north of Kingaok. However, ice melt south of Kingaok was further advanced at the time of survey.

- Density was related to ice cover and ice condition. The greatest density occurred on cracked ice followed by solid ice, with lower densities in areas with high ice deformation and extensive melt water.
- No lairs were observed south of Kingaok. Seventeen pups were observed during the 2012 surveys with the majority (90%) observed north of Kingaok.

7.3.8.3 Focal-species Monitoring for the WEMP

A ringed seal monitoring program is proposed for the WEMP, when the MLA is active. Ringed seal monitoring will follow previously established methods, such as those used during baseline surveys, to assess Project-related changes in the density and distribution of ringed seals in the RSA. Analyses will be conducted to determine trends over time in the density and distribution of ringed seals in relation to Project infrastructure.

Aerial surveys will be conducted once during construction during the spring moulting period and will be continued on a three to five year schedule during operations while the MLA is active. Timing and frequency of these surveys may be adjusted if Project-related changes or climate related changes to density or distribution are identified during monitoring or upon consultation with stakeholders. For example, ringed seal lair surveys may be conducted if disturbance to pups in lair has been identified through facility or focal-species monitoring.

8. Mitigation and Adaptive Management

The Wildlife Mitigation and Monitoring Plan describes actions that are intended to reduce Project-related effects on wildlife. This plan is intended to ensure wildlife habitats and populations are maintained in the area that will be influenced by Project development, while taking into account operational requirements and the safety of Project employees.

Unless otherwise indicated, measures described in the Wildlife Mitigation and Monitoring Plan apply to all Project components for the life of the Project. This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the Wildlife Effects Monitoring Program (Section 7).

The facility-specific wildlife monitoring program (Section 7.2) is intended to monitor the effectiveness of mitigation actions (Section 6). The results of mitigation activities will be reported regularly (see Section 11, Environmental reporting), and will include Key Performance Indicators that will be developed with the Standard Operating Plans (SOPs) for each mitigation plan. The results of focal-species monitoring programs will also be included in the report.

This circle of mitigation activities, monitoring and evaluation, and new mitigation activities will adaptively manage wildlife issues identified and arising as a result of the Project.

9. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project on wildlife VECs, and evaluates the compliance of the Project with issued licences and permits (e.g. Project Certificate).

Evaluation of predicted effects will be conducted through a combination of facility-specific monitoring (Section 7.2) and focal-species monitoring (Section 7.3) depending on the scale of the predicted effect. If checks and monitoring identify issues with human safety due to wildlife interactions or non-compliance with issued licenses or permits, then corrective action will be taken.

10. Record Keeping

Record keeping will be conducted by the Proponent and its subcontractors. Data will be entered into suitable electronic databases (e.g., MS Access), checked for quality control, and stored with subcontractor responsible for monitoring and with the Proponent. Data will be entered in a format and program that allow for comparison between years and storage in a single file format for each type of survey or monitoring activity. Data will be appended to each report and the compilation of all years data will be transferred for storage with the Government of Nunavut, Department of Environment. Data may also be shared, upon request, with the Canadian Wildlife Service (CWS), and the GNWT ENR for inclusion in regional monitoring programs.

11. Environmental Reporting

The WEMP will be reported during construction, operations, care and maintenance, and closure (excluding periods of temporary closure and post closure). The periodicity of reporting for the closure and post closure phases will be agreed upon prior to closure commencing. The WEMP report will include monitoring data from the facility-specific and focal species monitoring programs. Results from both monitoring programs will be analyzed with comparisons to findings from earlier years (i.e., baseline and annual monitoring) and recommendations for change to the wildlife monitoring and management practices or new adaptive management measures (if any) will also be included.

Reporting on mitigation and management activities, including performance as evaluated by mitigation plan KPIs will be included in an Appendix to the WEMP.

The WEMP report will be delivered to regulatory agencies and stakeholders, including:

- The Government of Nunavut.
- The Kitikmeot Inuit Association or designate.
- The Canadian Wildlife Service.
- Any monitoring partners involved in collaborative effects assessment.

12. Plan Effectiveness

As part of environmental reporting, Sabina will distribute copies of the WEMP report to stakeholders and collaborate with the Kitikmeot Inuit Association to report on mitigation, management, and monitoring activities. The Proponent will also conduct an evaluation (as necessary) of the efficacy of mitigation and management activities and of monitoring activities using relevant methods, such as power analyses. Should new, more sensitive, monitoring methods be introduced, or existing methods be found to lack statistical power or a robust design, updated methods will be proposed to the stakeholders in a revised Wildlife Mitigation and Monitoring Plan. This plan may be updated as frequently as every year, or not at all, if the mine plan, and methods for mitigation and monitoring are robust. The new Wildlife Mitigation and Monitoring Plan will be implemented following review by stakeholders and an opportunity for response by the Proponent.

13. QA/QC

Quality assurance and quality control measures will be undertaken at three key stages in monitoring activities: 1) during field data gathering, 2) during data entry and analysis, and 3) through reporting and reassessment of methods as part of the evaluation of Plan Effectiveness.

The process of data gathering in the field will be quality controlled through the use of qualified wildlife biologists and a system of pre- and post-field checks to ensure that consistent, repeatable data is being gathered. Checks will be carried out by a second qualified biologist. QA/QC of data entry will be conducted via a process of standard data entry templates, and checking data through either double-entry data or feedback entry, where entered data is checked back to the field cards. QA/QC of data analysis will be conducted through a process of clear, written instructions for data analysis and pre-and post-analysis checks by a second qualified biologist. Finally, the efficacy of the methods as a whole will be evaluated through repeated scrutiny of the data using power analysis and through review by stakeholders.

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21. Draft Conceptual Fish Offsetting Plan (No Net Loss Plan)

Sabina Gold & Silver Corp.

BACK RIVER PROJECT
Draft Conceptual Fish Offsetting Plan (No Net Loss Plan)

Sabina GOLD & SILVER CORP.

Rescan an ERM company

Rescan™ Environmental Services Ltd., an ERM company
Rescan Building, Sixth Floor - 1111 West Hastings Street
Vancouver, BC Canada V6E 2J3
Tel: (604) 689-9460 Fax: (604) 687-4277

December 2013

BACK RIVER PROJECT

DRAFT CONCEPTUAL FISH OFFSETTING PLAN (NO NET LOSS PLAN)

December 2013
Project #0194096-0040

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BACK RIVER PROJECT

DRAFT CONCEPTUAL FISH OFFSETTING PLAN (NO NET LOSS PLAN)

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

CCME	Canadian Council of Ministers of the Environment
Chl *a*	Chlorophyll *a*
CPUE	Catch per unit effort
DFO	Fisheries and Oceans Canada
ha	Hectare(s)
HU	Habitat Unit(s)
KIA	Kitikmeot Inuit Association
LSA	Local Study Area
MLA	Marine Laydown Area
MMER	Metal Mining Effluent Regulations
NNL	No Net Loss
PAD	Permanent alteration to, or destruction of, fish habitat
Project, the	The Back River Project
RSA	Regional Study Area
TIA	Tailings Impoundment Area
TK	Traditional Knowledge

1. Introduction

1.1 OVERVIEW

The Back River Project (the Project) is a proposed gold mining and milling operation located in the West Kitikmeot region of Nunavut (Figure 1.1-1). The Project includes three areas connected by winter road access: Goose Property, George Property, and Marine Laydown Area (Figure 1.1-2). The operational mine plan for the Project includes a 10 year mine life with a total ore feed from both Properties of 20 - 28 million tonnes (Rescan 2012a). All ore will be processed at a single mill at the Goose Property. Currently open pit and underground mining methods are under consideration for mineral extraction at all deposits. The optimal mining methods will be determined as part of the ongoing pre-feasibility and future feasibility studies.

The Project infrastructure will include camps, a mineral processing plant, storage areas, maintenance and mechanical repair warehouses, fuel storage tanks, a Tailings Impoundment Area (TIA), waste rock storage areas, airstrips, winter and all-weather roads within each Property, winter roads connecting the Properties, and a marine landing at the Marine Laydown Area. Most of these facilities would be removed at the end of mine life. Roads, airstrips, tailings storage and waste rock storage areas cannot be removed and would be returned to an agreed-upon land use with regulators and the communities.

1.2 REGIONAL SETTING

The Project Area lies at approximately 65˚ to 66˚ north latitude, 106˚ to 107˚ west longitude near the northern reaches of the North American continent in the West Kitikmeot region. The region is subject to cold, dry Arctic air masses and continental air masses to the south. The area can be subject to high wind speeds due to the relative absence of obstructions that normally impede and slow wind. Total annual precipitation, which consists of snow and rain, can range from approximately 125 to 344 mm (Rescan 2012a).

The West Kitikmeot region is characterized by long dark cold winters and short bright summers. In most years, the ground is covered in snow from October to June. Lakes are typically ice-covered from approximately October to June, with ice thickness reaching depths of 2 m.

The Project is subdivided into three general areas: the Marine Laydown Area on southern Bathurst Inlet, George Property, and Goose Property (Figure 1.1-1). The northern portion of the proposed Project falls within the 'Bathurst Hills' ecoregion, which extends through Bathurst Inlet and along the coastline of Coronation Gulf (WKRLUP 2005). This ecoregion is characterized by higher elevations that are moderated by open water during the late summer and early fall.

Marine shoreline habitat is dominated by a shallow water shelf which extends at a slope of approximately 8% to a depth of approximately 10 m and a distance of 120 m offshore (Rescan 2012a). Beyond this distance, the shoreline drops off steeply at a gradient of 30% to depths greater than 40 m. The nearshore bottom substrate is often a mix of sand, soft marine silts, and clays, with the occasional presence of gravel and cobble rock along the shore and narrow intertidal band.

The Goose and George Properties lie within the 'Takijuq Lake Uplands' ecoregion, which covers the south central portion of the West Kitikmeot region (WKRLUP 2005). This ecoregion is made up of broad, sloping uplands, plateaus, and lowlands, along with the rugged ridges of the Bathurst Hills, and is dotted with thousands of lakes.

Figure 1.1-1

Project Location

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PROJECT #0194096-0028 GIS # BAC-06-112 September 24 2013

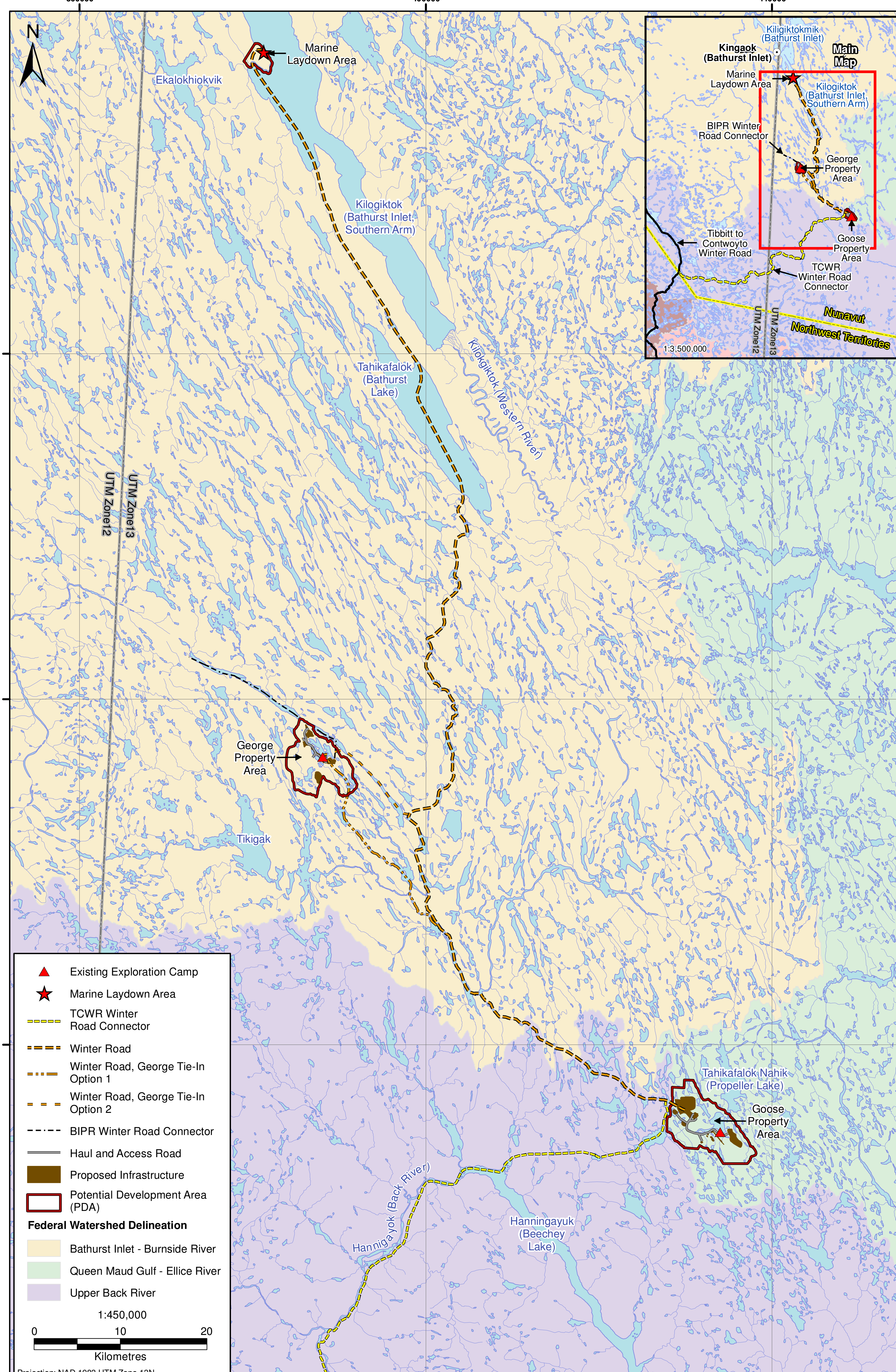

Figure 1.1-2

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Back River Project Layout

Figure 1.1-2

Rescan Engineers & Scientists

Most of the lakes in the George and Goose Property areas feature shorelines dominated by mixed rock, with occasional outcrops of bedrock, or sometimes overlain with organic fine sediments (fines; Rescan 2010a, 2012b, 2012c). Larger waterbodies may contain deeper sections that remain unfrozen throughout the year, however, smaller lakes and ponds are generally shallow (less than 3 m deep) and likely freeze to the bottom in winter months.

Stream habitat in the George and Goose Property areas features some well-developed beaded tundra streams, which contain deep pools interspersed with runs and occasional riffles (Rescan 2010a, 2012b, 2012c). In addition, reaches featuring substantial cobble and boulder fields, shallow wetted depths, low flow, and riffle morphology are often present. Smaller streams may be ephemeral, running only during spring freshet periods (Rescan 2010a, 2012b, 2012c).

1.3 REGULATORY FRAMEWORK

1.3.1 Legislation

1.3.1.1 The Fisheries Act

Fish and fish habitat are protected under the *Fisheries Act* (1985), as well as other federal regulatory acts and principles. In 2012, the *Fisheries Act* was amended to establish into legislation the federal government's direction to focus efforts on protecting the productivity of commercial, recreational, and Aboriginal fisheries; to institute enhanced compliance and protection tools that are more easily enforceable; to provide clarity, certainty, and consistency of regulatory requirements; and to enable enhanced partnerships with stakeholders.

The changes to the *Fisheries Act* include a prohibition against causing serious harm to fish that are part of or support a commercial, recreational, or Aboriginal fishery (Section 35), provisions for flow and passage (Sections 20 and 21), and a framework for regulatory decision-making (Sections 6 and 6.1).

The new Purpose section states that the fisheries protection provisions of the *Fisheries Act* aim to provide for the sustainability and ongoing productivity of commercial, recreational, and Aboriginal fisheries.

The four factors in Section 6 and 6.1 to be taken into account by the Minister in decision-making (e.g. issuing authorizations) or making regulations are:

- The contribution of the relevant fish to the ongoing productivity of commercial, recreational, or Aboriginal fisheries.
- Fisheries management objectives.
- Whether there are measures and standards to avoid, mitigate, or offset serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery.
- The public interest.

For the purposes of the *Fisheries Act*, serious harm to fish includes the death of fish or any permanent alteration to, or destruction of, fish habitat (PAD). The *Fisheries Act* defines fish habitat as "spawning grounds and any other areas, including nursery, rearing, food supply, and migration areas, on which fish depend directly or indirectly in order to carry out their life processes." The term "fish" includes parts of fish; shellfish, crustaceans, marine animals, and any parts of shellfish, crustaceans, or marine animals; and the eggs, sperm, larvae, spat, and juvenile stages of fish, shellfish, crustaceans, and marine animals.

On November 1, 2013, The Fisheries Protection Policy Statement (DFO 2013a) was issued and replaced the earlier Policy for the Management of Fish Habitat (DFO 1986). Although the new policy statement does not include the “no net loss” principle, as outlined in the earlier policy, application of this NNL principle provides some useful guidance when considering “serious harm to fish”. In addition, the direction found within the 2013 scientific guidance document (Koops et al. 2013; Randall et al. 2013) has been consulted and followed.

Any project or activity that causes a serious harm to fish that are part of, or support, a commercial, recreational, or Aboriginal fishery requires an authorization from DFO. Regulations have been developed to guide the application for this authorization: Applications for Authorization under Paragraph 35(2)(b) of the Fisheries Act Regulations. DFO has issued additional guidance in “The Fisheries Protection Program Operational Approach”.

1.3.1.2 Metal Mining Effluent Regulations

In 1996, Environment Canada undertook an assessment of the aquatic effects of mining in Canada. This assessment provided recommendations regarding the review and amendments of the Metal Mining Liquid Effluent Regulations, currently titled the Metal Mining Effluent Regulations (MMER; SOR/2002-222), and the design of a national Environmental Effects Monitoring (EEM) program for metal mining. The MMER, under the *Fisheries Act*, instruct metal mines to conduct EEM as a condition governing the authority to deposit effluent (MMER, Part 2, section 7).

The MMER (SOR/2002-222) permit the deposition of mine effluent into water containing fish if the effluent pH is within a defined range, if the concentrations of the MMER deleterious substances in the effluent do not exceed authorized limits, and if the effluent is demonstrated to be non-acutely lethal to Rainbow Trout (*Oncorhynchus mykiss*). These discharge limits were established to be minimum national standards based on best available technology economically achievable at the time that the MMER were promulgated. To assess the adequacy of the effluent regulations for protecting the aquatic environment, the MMER include EEM requirements to evaluate the potential effects of effluents on fish, fish habitat, and the use of fisheries resources.

Regulations Amending the MMER were published in the Canada Gazette, Part II, in October 2006 (Canada Gazette 2006). The purpose of these amendments was to clarify the regulatory requirements by addressing matters related to the interpretation and clarity of the regulatory text that had emerged from the implementation of the Regulations.

Additional amendments to the MMER were published in the Canada Gazette, Part II, in March 2012 (Canada Gazette 2012). The following changes were made to improve the EEM provisions of the MMER:

- Modifications to the definition of an “effect on fish tissue” in order to be consistent with the Health Canada fish consumption guidelines and to clarify that the concentration of total mercury in tissue of fish from the exposure area must be statistically different from and higher than its concentration in fish tissue from the reference area.
- Addition of selenium and electrical conductivity to the list of parameters required for effluent characterization and water quality monitoring.
- Exemption for mines, other than uranium mines, from monitoring radium 226 as part of the water quality monitoring, if 10 consecutive test results showed that radium 226 levels are less than 10% of the authorized monthly mean concentration (subsection 13(2) of the Regulations; SOR/2002-222).

- Change to the time frame for the submission of interpretative reports for mines with effects on the fish population, fish tissue, and benthic invertebrate community from 24 to 36 months.
- Change to the time frame for the submission of interpretative reports for magnitude and geographic extent of effects, and for investigation of cause of effects, from 24 to 36 months.
- Minor changes to the wording for consistency within Schedule 5.

1.3.2 The *No Net Loss* Principle

Currently, DFO is in a transition phase with respect to implementing *Fisheries Act* legislative changes. In developing the Conceptual Fish Offsetting Plan described herein, the guiding principles found in the Policy for Management of Fish Habitat (DFO 1986) were followed along with new scientific guidance documents for managing fisheries (Koops et al. 2013, Randall et al. 2013). DFO's past policy was to maintain *No Net Loss* (NNL) of fish habitat in order to "balance unavoidable habitat losses with habitat replacement on a project-by-project basis so that further reductions to Canada's fisheries resources due to habitat loss or damage may be prevented" (DFO 1986). To achieve this goal, the recommended strategy is to compensate for lost fish habitat in a 2:1 compensation ratio (Minns and Moore 2003), though increasing the amount of offset habitat alone is not entirely sufficient to ensure NNL (Quigley and Harper 2005). As the amended *Fisheries Act* and new policies are implemented in the coming year other available Fish Offsetting Plan options that could provide more value may be pursued.

The objective of DFO's '*No Net Loss*' principle, outlined in the *Policy for Management of Fish Habitat* (DFO 1986), is to balance unavoidable habitat losses with habitat replacement or with other mitigation measures, such as improved access to spawning or rearing areas. This principle aims to prevent overall reductions in the productive capacity of fisheries resources by maintaining overall fish population sizes and the areas of suitable fish habitat through time. Proceeding from DFO's most preferred option to the Department's least preferred option, *No Net Loss* is achieved through a "hierarchy of preferences" as follows:

- Avoidance of a serious harm to fisheries through the redesign of the project.
- Compensation (offsetting) by replacing lost habitat with similar habitat in the same ecological unit (i.e., like-for-like compensation).
- Compensation (offsetting) by increasing the productive capacity of existing habitat with unlike habitat in the same ecological unit.
- Compensation (offsetting) by replacing lost habitat with natural habitat in another ecological unit.
- Compensation (offsetting) by using artificial production (i.e., building hatcheries or fertilizing lakes).

1.4 INCORPORATION OF TRADITIONAL KNOWLEDGE (TK)

Available traditional knowledge (TK) on important fish species and Aboriginal fishery locations was obtained through the Kitikmeot Inuit Association's (KIA's) Naonaiyaotit Traditional Knowledge Project (NTKP) database. This is summarized in the report entitled *Inuit Traditional Knowledge of Sabina Gold & Silver Corporation's Back River (Hannigoyok) Project NTKP Report* (KIA 2012).

Maps presented in Figures 30–32 in Chapter 7 of the *NTKP* report (hereafter, TK Report) specifically indicate the presence of important freshwater fishing locations for Arctic Char (*Salvelinus alpinus)* and Arctic Grayling (*Thymallus arcticus*) in the Western River (*Kilokgiktok*). The Western River lies within the freshwater Regional Study Area (RSA) of the George Property Area (see Volume 6, Chapters 6 and 7). In addition, the maps in the TK Report indicate that, outside the Goose and George Property freshwater RSAs, important marine fishing sites occur in Bathurst Inlet (i.e., within the Project's marine RSA). The maps in the TK Report also show that other freshwater fishing sites of value to the Inuit occur in and around Beechey Lake, which is located just south of the Goose and George Property freshwater RSAs.

Pertinent information on Aboriginal fisheries resources was also obtained from Land Use Focus Group Sessions, which were held in November of 2012; these sessions included Inuit hunters and trappers from Kugluktuk, Cambridge Bay, Omingmaktok, and Bathurst Inlet (see Chapter 4, Land Use, in Volume 8: Human Environment). The Focus Group participants from Bathurst Inlet and Omingmaktok described and mapped a contemporary travel route that leads from Bathurst Inlet (community) south past Bathurst Lake and George Lake, down to the Beechey Lake and Goose Lake areas (Figure 4.1-2 in Chapter 4, Volume 8). These participants also indicated that Bathurst Lake, located in the George Property RSA, is fished, specifically for Lake Trout (*Salvelinus namaycush*). The participants also indicated that hunting and fishing take place along the length of this route. The people may stop at George Lake, located in the freshwater Local Study Area (LSA) of the George Property Area, to take a break and hunt and/or fish. Focus group participants reported that they stay near Beechey Lake while hunting, trapping, and fishing in the area. Goose Lake, located in the Goose Property LSA, was also identified as an area where fishing may occur while staying near Beechey Lake. While Goose Lake and George Lake may be fished by traditional land users, they are not known to be destinations or key locations for fishing (Volume 8, Chapter 4).

In the TK Report (KIA 2012), the Inuit note that fish are present throughout the landscape surrounding and including the Project Area. This is exemplified by the following quotations contained in the TK Report:

> *... This river (Hiukkittak) has a really strong current and they used to have a weir back then on it right by this bend (near the mouth). There is also another weir around here. I remember we restored the stones and used that ancient weir for spearing fish...*
>
> *... The fish go further up into the lakes using the rivers. All kinds of fish do this. They also use the same river to go down to the ocean.*
>
> *Sometimes the fish will winter in the lakes because the rivers get too shallow for the fish to go down river. In the spring they start to migrate down river...*
>
> *When the fish went up the river (Arctic Charr fall migration) at Hiukkittak... Inuit speared them or used baskets to scoop them up.*
>
> *... There would be lots of fish at Hiukkittak, Kugyoak and around Kangihoakyok (waters feeding into Kangihoakyok) during the spring. Even in the summer when the fish were ready to go up river, there was lots of fish...*
>
> *Inuit jigged for fish where the fishing was good. They fished in the lakes.... They fished these places using hooks during the spring or winter and sometimes they used nets.*
>
> *... The people from Kingaok and Omingmaktok must know about that river (Hiukkittak). It is really sandy from all the way up here (at the mouth) downstream... People fish the ocean at the mouth of the river. I have nets at Ehokhikhiovik (initial river section of Hiukkittak)... I usually have nets at this place...*

Inuit fished anywhere in the rivers. They fished the river when the fish were going downriver and upriver, when they needed food. (We fished at Hakvaktok (south coast of Melville Sound), Naoyak and Etibliakyok, Kolgayok (Tingmeak River), Kunayok (Ellice River). Hiukkittak, Aniakhiokvik (Fishing Creek), Kingaok, Daniel Moore Bay (Kangihoakyok) and all along the coast of Victoria Island up to Wellington Bay (including Paatlik or Byron Bay)...

These areas (coastal Parry Bay, Etibliakyok (Kent Peninsula isthmus), Kolgayok (Tingmeak River, and an area east of Fishing Creek) are fishing places. They have charr and trout... and cisco whitefish...

Lake trout, charr, whitefish and grayling are found in lakes.

When we were young, the fishing areas were identified by our parents. You should mark that place (mouth of Burnside River (Ayapakpaktokvik)) because people still go there to fish. Our parents taught us these things, even about tomcod fishing.

I remember those fishing places because my parents stayed there when I was growing up. Niptanatiak(s) and Tigitkok(s) used to stay there (south portion of Gordon Bay and the inlet to the west)...

The lake is where we would have nets in the winter. lnukholik (near Hiukkittak) is where they would set nets in the winter...

... At the rivers (mouth of Hannigayok (Back River) at Beechey Lake and stream on north-central shore of Beechey Lake) they liked to net for fish, for... lake trout and whitefish.

They net fish near Kingaok every fall Ayapakpaktokvik (Burnside River). This lake (Ekalokhiokvik (Tahikafalok Lake)) has a small river to the ocean (Aniakhiokvik (Fishing Creek)). That is another area that they mainly fish, I know this because my grandfather liked fishing there...

... Inuit fished along the shore... at Kingaok (northwest of Fishing Creek). Over here at Kingaok (stream leading into and south of Ayapakpaktokvik (Burnside River) near its mouth) Inuit have fished for a long time. That river has charr and whitefish...

... They would jig for fish in the lakes around here (north of Beechey Lake) when they were traveling to see the white people (to the trading post at Kingaok). They jigged for fish in the lakes as they were traveling, when they camped... They fished when they stopped so they could have fresh food, I remember. I was following them that time.

... These parts of the Jakes (narrows)... are called 'kongunik' (pl.) and that is why this is called 'konngok' (sf.). This narrow spot (at the narrows of Hanningayuk (Beechey Lake)) never freezes all winter. That is why they tell Inuit who are traveling to be careful because this narrow spot doesn't freeze. We call those narrow parts of the Jakes 'kongunik'. We know about that konngok where Inuit set fish nets because it doesn't freeze all winter. You have to be careful when you travel through there...

Those rivers where Inuit mostly fish (Ayapakpaktokvik and Hivogahik) and where they hunted the caribou near the mouth of the lakes are important. Some of these areas *where they mostly fished during the winter don't freeze that well. These areas sometimes are scary (dangerous places for traveling).*

In the fall we used gill nets to catch a lot of fish for the dogs, and for dry fish too. All these places where we had our nets have inokhok or rock pile markers. On our trap Jines too we fished. We did a lot of fishing especially on the days that were stormy. We did a lot of fishing to pass the time...

In the Bathurst Inlet area C51 mapped Tagionoak (Goulburn Lake), Swan Lake (Tagionuak), and a lake west of Amagok as good for fishing.

This is a good spot for fishing too (at the mouth of Ayappappaktokvik). This long arm in here, it's a good spot for fishing. When I was there in February, it was good, a good fishing spot there...

There is a river there as well Kokiviayok. It's small but there are a lot of fish.

Based on the above information in the TK Report (KIA 2012), as well as the information gathered from the Focus Group Sessions (Volume 8, Chapter 4 of the DEIS), the Conceptual Fish Offsetting Plan described herein focuses the freshwater offsetting options on three freshwater (either resident or anadromous) fish species: Arctic Grayling, Lake Trout, and Arctic Char. In contrast, the single marine offsetting option (described below) focusses more on general habitat offsetting for the marine fish community as a whole (Volume 7, Chapter 5), though Arctic Char and Arctic Cod (*Arctogadus glacialis*) were identified in the TK Report as being important marine fisheries species in various parts of Bathurst Inlet.

The Project design has been planned such that placement of infrastructure on locations identified as important freshwater *or* marine fish habitat will be avoided to the extent feasible. Ongoing consultation with DFO, and future engagement with the KIA and other stakeholders, regarding the further development of the Conceptual Fish Offsetting Plan, including the development of additional or alternative options that could provide value to the local communities, is intended through 2014.

1.5 OBJECTIVES

The objectives of this Draft Conceptual Fish Offsetting Plan are as follows:

- Describe the fish habitat and species in areas with predicted project effects.
- Describe the concepts proposed to offset lost fish production and fish habitats.
- Describe the proposed monitoring program for each potential offsetting project.

2. Summary of Predicted Project Effects

Several Project activities have the potential to result in serious harm to fish habitats and species inhabiting the Project footprint. In Bathurst Inlet, such activities include a very small area of in-water work: the construction of a rock ramp and seasonal dock for land-sea access. At Goose Property potentially harmful activities include the development of open pit mines at Llama Lake and the southwestern inflow to Goose Lake, and the withdrawal of water from Goose and Propeller lakes for camp and mill activities. At George Property activities include the development of open pits impinging on Lytle and Occurrence lakes and occupying a small section of the stream connecting George and Lytle lakes.

Road works and other onsite construction activities also have the potential to cause serious harm to fish habitat and species. For the purposes of this draft plan, any permanent alteration or destruction of fish habitat resulting from such activities will be avoided through Project design and by following DFO operational statements for Nunavut.

Construction of the Tailings Impoundment Area (TIA) will cover sections of an ephemeral freshwater stream discharging to Giraffe Lake at the Goose Property. However, no fish were captured during the baseline sampling of this stream in 2013 (Rescan 2013a). Moreover, the presence of barriers to fish entering the stream also indicates that this ephemeral stream is fishless (Rescan 2013a). Therefore, no fish offsetting is planned for the waterbodies covered by the TIA (see Section 2.2.2 for further detail).

2.1 MARINE LAYDOWN AREA IN BATHURST INLET

A marine ramp and seasonal dock at the proposed Marine Laydown Area in southern Bathurst Inlet will be constructed for annual resupply and seasonal transport during the open-water season to bring in equipment, supplies, and fuel. The beach ramp and dock will be rock-filled structures built perpendicular to shore with above water dimensions measuring approximately 30 x 30 m and 20 x 20 m, respectively. The side-slope of constructed infrastructure is assumed to be approximately 2:1, with a maximum depth below high water of 5 m, resulting in a total area of in-water infrastructure of 0.15 ha and 0.08 ha, respectively.

2.1.1 Marine Habitat

Marine fish habitat has been documented in southern Bathurst Inlet in 2001 and 2007 (Rescan 2007b), in 2010 (Rescan unpublished data), 2012 (Rescan 2012d) and 2013 (Rescan 2013b). Shoreline habitat along the western shore in southern Bathurst Inlet is dominated by a shallow water shelf which extends at a slope of 8% to a depth of approximately 10 m and a distance of 120 m offshore. Beyond this distance, the shoreline drops off steeply at a gradient of 30% to depths greater than 40 m. During the spring freshet, sediment enters Bathurst Inlet and settles to the bottom, resulting in a fine, marine clay substrate that supports flatfish, marine bivalves, and crustaceans. Sediment is likely deposited along the shoreline as well; however, yearly ice scour prevents significant amounts of fine sediment from accumulating in the intertidal zone.

In 2012, substrate composition was mapped along the shoreline region of the inlet adjacent to the MLA (Figure 2.1-1; Rescan 2012b), and in 2013 substrate composition was mapped along the shoreline of the MLA (Rescan 2013b). It was found that gravel and cobble dominated the beach along the shoreline throughout the MLA (Plate 2.1-1). Nearshore intertidal and subtidal substrate was generally composed of distinct patches of gravel/cobble rock or fine sand/clay.

Plate 2.1-1. Typical beach zone substrate at MLA looking north. Bathurst Inlet, July 2012.

In deeper waters, fine clay and silt dominated the substrate composition. Marine algae and invertebrates were only found in deeper water below the depth of ice scour (Plate 2.1-2). Moreover, larger diameter rocky substrates (gravel, cobble, and boulder) were only found very close to shore and not found deeper than 2 m. Soft, fine substrates (soft mud, firm mud, and/or fine sand) predominated in deeper water (Rescan 2012d).

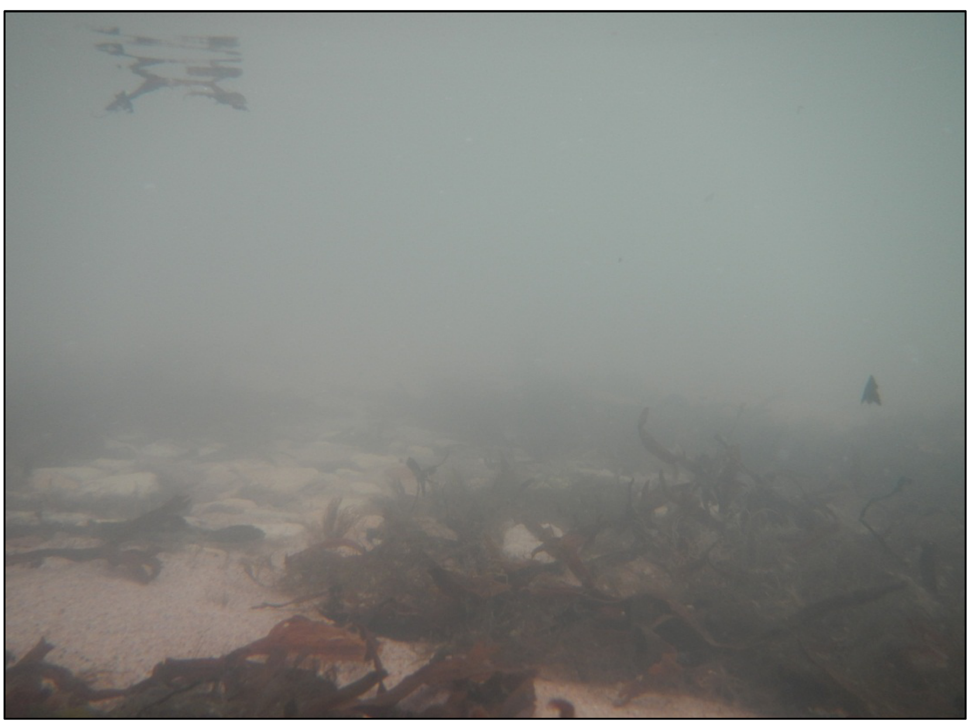

Plate 2.1-2. Sparse subtidal algae on fine sand at MLA. Bathurst Inlet, July 2012.

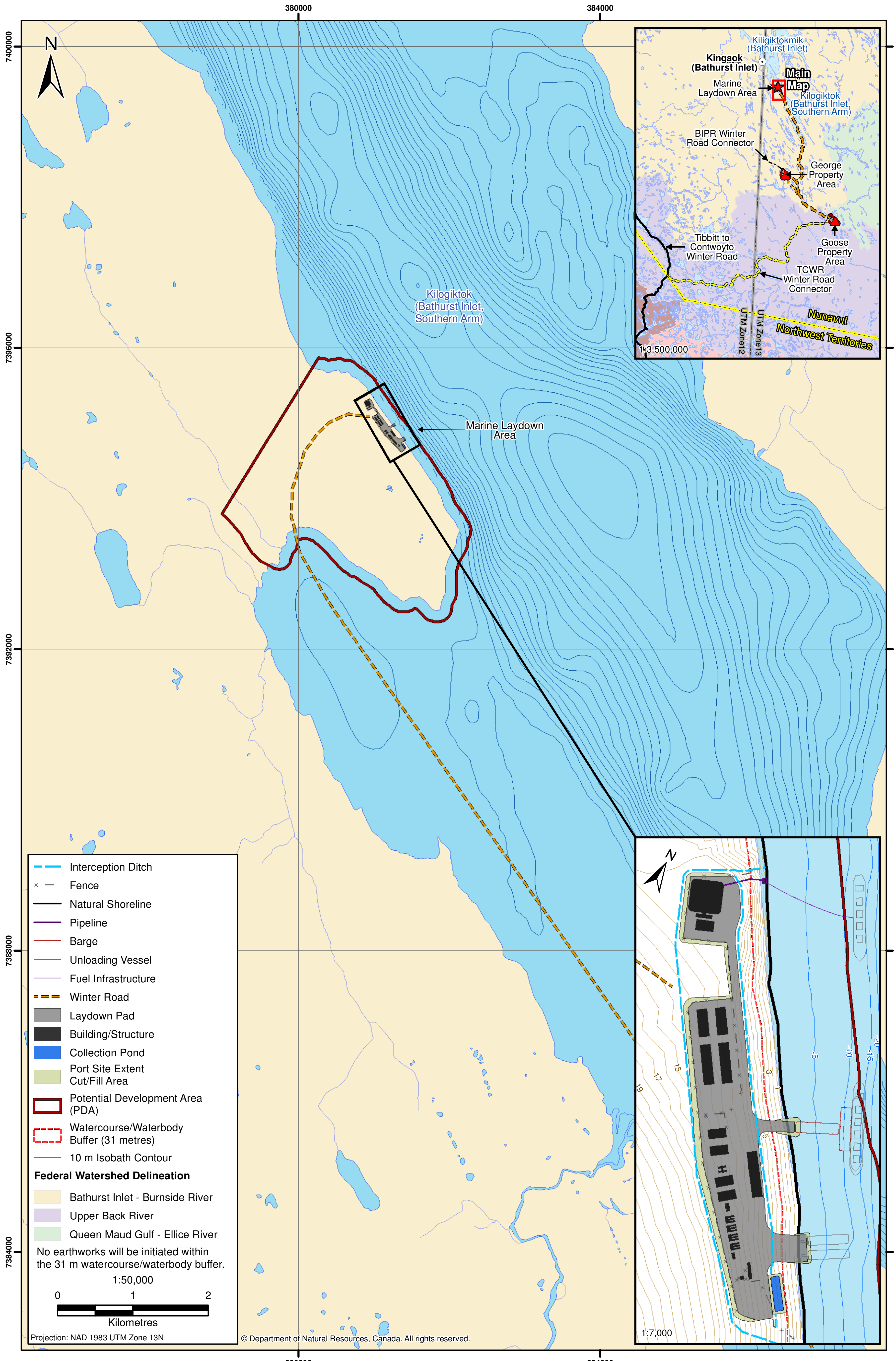

Figure 2.1-1

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Marine Laydown Area

Figure 2.1-1

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2.1.2 Marine Fish

Approximately 0.23 ha of fish habitat will be adversely affected by the construction of the proposed in-water infrastructure. This is equivalent to the surface area of the beach ramp, seasonal dock and associated side slopes on the surface of the sea floor. The in-water infrastructure will be placed on primarily medium-quality fish habitat — marine sands, silts, and clays — that likely freezes 2 m depth throughout the winter.

Marine baseline studies (Rescan 2012d) showed that 12 fish species have been captured near the proposed Marine Laydown Area (Table 2.1-1; Appendix 2.1-1), though only a few are specialized for inhabiting the fine sediment located in the nearshore area of the MLA (namely the flounders). None of the fish species found thus far in Bathurst Inlet are currently considered threatened or endangered (COSEWIC 2010), though the Bering Wolfish is currently listed as data deficient. The construction of the ramp and seasonal dock could potentially shift feeding opportunities for flounder species away from the immediate area, as well as remove spawning sites for Capelin. However, Bathurst Inlet contains an abundance of other areas that are dominated by marine sand, silt, and/or clay.

Table 2.1-1. Fish Species Captured near the Marine Laydown Area in Bathurst Inlet, 2001, 2010 and 2012

Common Name	Scientific Name	Primary Habitat	Depth Range
Arctic Char	*Salvelinus alpinus*	Freshwater/Anadromous	Benthopelagic
Arctic Cisco	*Coregonus autumnalis*	Freshwater/Brackish	Benthopelagic
Arctic Cod	*Arctogadus glacialis*	Marine	Bathypelagic
Arctic Flounder	*Liopsetta glacialis*	Marine	Demersal
Bering Wolffish	*Anarhichas orientalis*	Marine	Demersal
Broad Whitefish	*Coregonus nasus*	Freshwater/Brackish	Benthopelagic
Capelin	*Mallotus villosus*	Marine	Pelagic
Fourhorn Sculpin	*Myoxocephalus quadricornis*	Marine/Brackish	Demersal
Lake Trout	*Salvelinus namaycush*	Freshwater/Anadromous	Benthopelagic
Least Cisco	*Coregonus sardinella*	Marine/Anadromous	Pelagic
Ninespine Stickleback	*Pungitius pungitius*	Freshwater/Estuarine	Benthopelagic
Ogac (Greenland Cod)	*Gadus ogac*	Marine	Demersal
Pacific Herring	*Clupea pallasii*	Marine	Pelagic
Rainbow Smelt	*Osmerus mordax*	Anadromous	Pelagic
Round Whitefish	*Prosopium cylindraceum*	Freshwater/Brackish	Demersal
Saffron Cod	*Eleginus gracilis*	Marine/Brackish	Demersal
Slender Eelblenny	*Lumpenus fabricii*	Marine	Demersal
Sockeye Salmon	*Oncorhynchus nerka*	Anadromous	Pelagic
Starry Flounder	*Platichthys stellatus*	Marine/Brackish	Demersal

Note: Species highlighted in grey were not captured during Baseline sampling in 2010 and 2012, but they have an historic precedence of capture in Bathurst Inlet (Richardson 1833; Senate of Canada 1888; Walters 1955; Ellis 1962, Stewart et al. 1993).

2.2 FRESHWATER AREAS WITH PREDICTED PROJECT EFFECTS

The predicted project effects to freshwater fish and fish habitat at the Goose Property are anticipated to include the loss of Llama Lake and the loss of one of the Goose Lake inflows to open mine pits (the Llama and Main deposits, respectively; see Figure 2.2-1). Predicted effects at the George Property are the loss of approximately half of the stream (i.e., the lower section) discharging from George Lake into Lytle Lake, and the loss of small sections of Lytle and Occurrence lakes, to open mine pits (Figure 2.2-2).

2.2.1 Freshwater Habitat

Goose Property

Fish habitat was assessed in the Goose Property area in 2007, 2010, 2011, 2012 and 2013 (Rescan 2010a, 2012b, 2012c, 2013a). Good quality littoral (i.e., nearshore) fish habitat is present in the lakes located within the potential impact areas, including Llama Lake and Goose Lake (Golder 2007; Rescan 2010a, 2012b, 2012c, 2013a). Most lakes in the region feature littoral habitat well suited for northern fish species, i.e., shorelines dominated by mixed rock, with occasional outcrops of bedrock (Rescan 2010a, 2012c, 2013a; Figure 2.2-3; Plate 2.2-1). However, deeper lake areas (> 2.5 m), which serve as fish overwintering habitat, are found less commonly in the Goose Property area and may be limiting fish population sizes in many lakes and ponds in this area (Rescan 2012c).

Plate 2.2-1. Typical shoreline substrate of lakes in the Goose Property area. Llama Lake, August 2012.

Pond habitat in the Goose Property area is generally shallow and many of the ponds featured ephemeral inflows or outflow that would limit fish migration into and out of these waterbodies (Rescan 2012c; Plate 2.2-2). Owing to their shallow depths, these ponds freeze all the way to the bottom in winter, making them unsuitable for overwintering habitat.

George Property

Fish habitat in the George Property area was assessed in 1990, 2007, 2012 and 2013 (Sekerak 1990; Golder 2007; Rescan 2012c, 2013a). Good to fair quality fish habitat is present in larger waterbodies that contain deeper water within potential impact areas (Figure 2.2-4). Most of the lakes and streams in the George Property contain cobble or boulder substrates, which are overlaid with fine organic sediments in some areas. Both Lytle and Occurrence lakes are small, shallow (<2 m deep) lakes that contain poor quality habitat for rearing, because they provide little cover, or for overwintering, because they freeze to the bottom during winter (Rescan 2012c).

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September 24, 2013

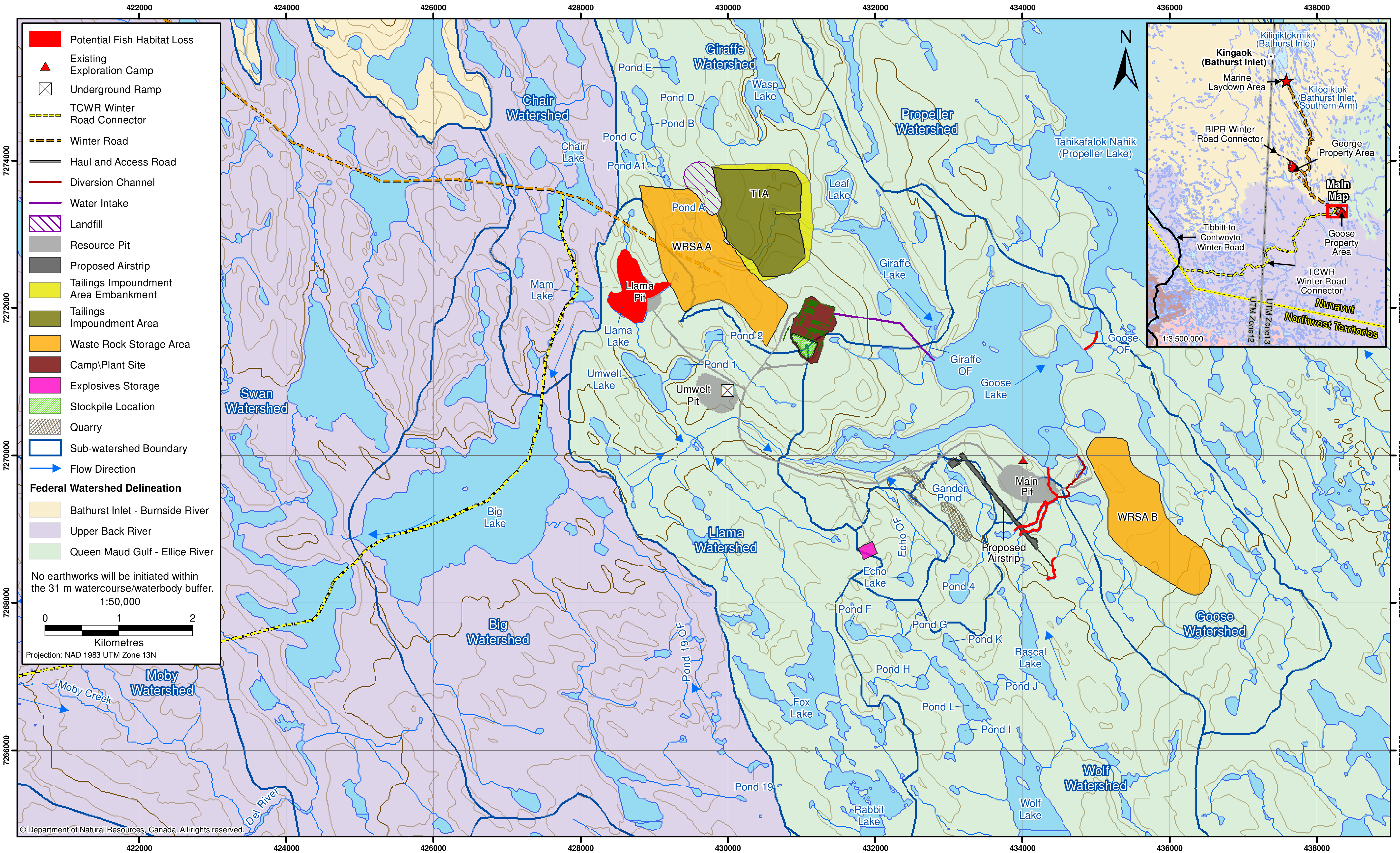

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Figure 2.2-1

Infrastructure Layout and Locations of Potential Habitat Loss, Goose Property Area, Back River Project, 2013

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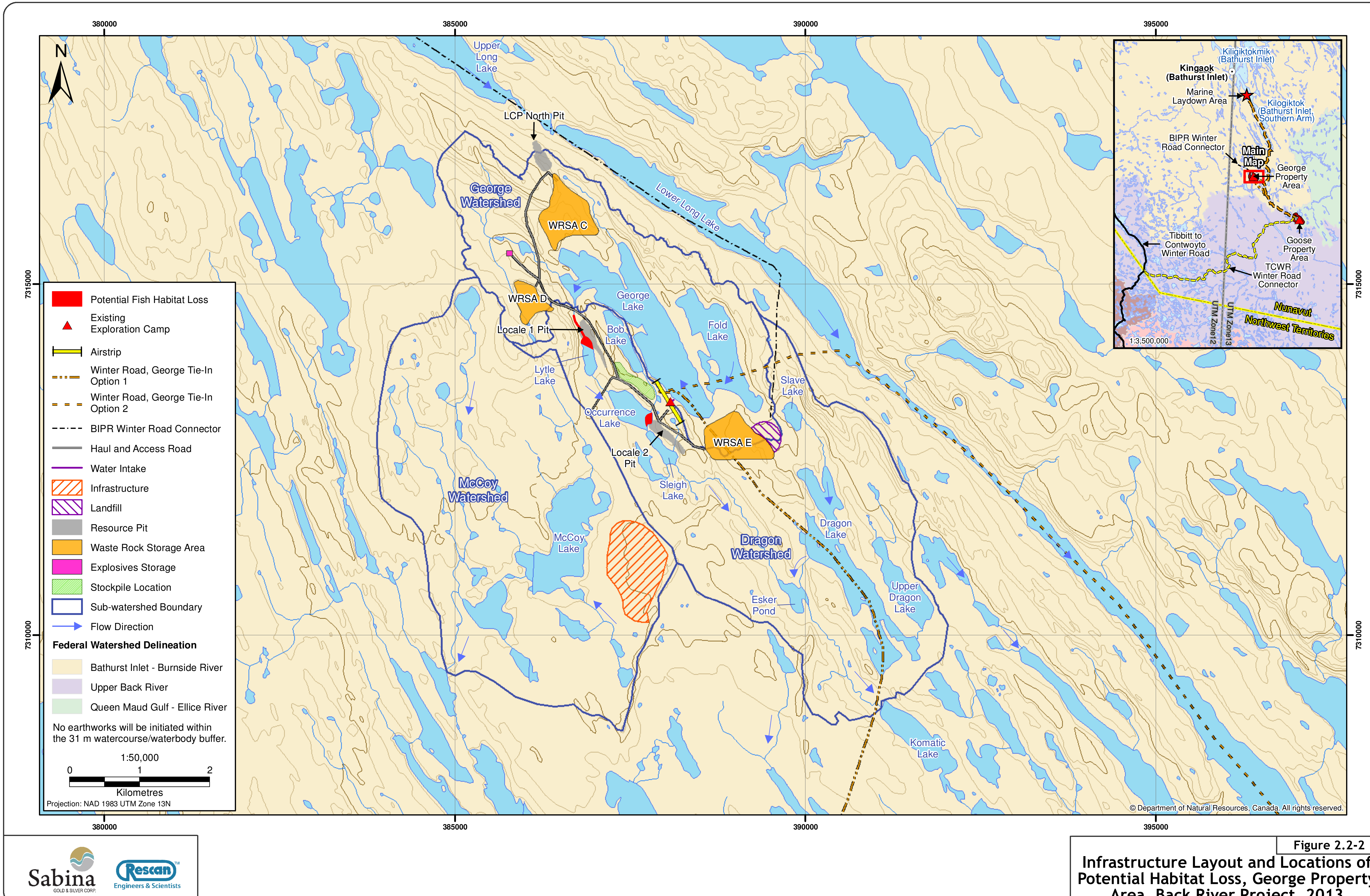

Figure 2.2-2

Infrastructure Layout and Locations of Potential Habitat Loss, George Property Area, Back River Project, 2013

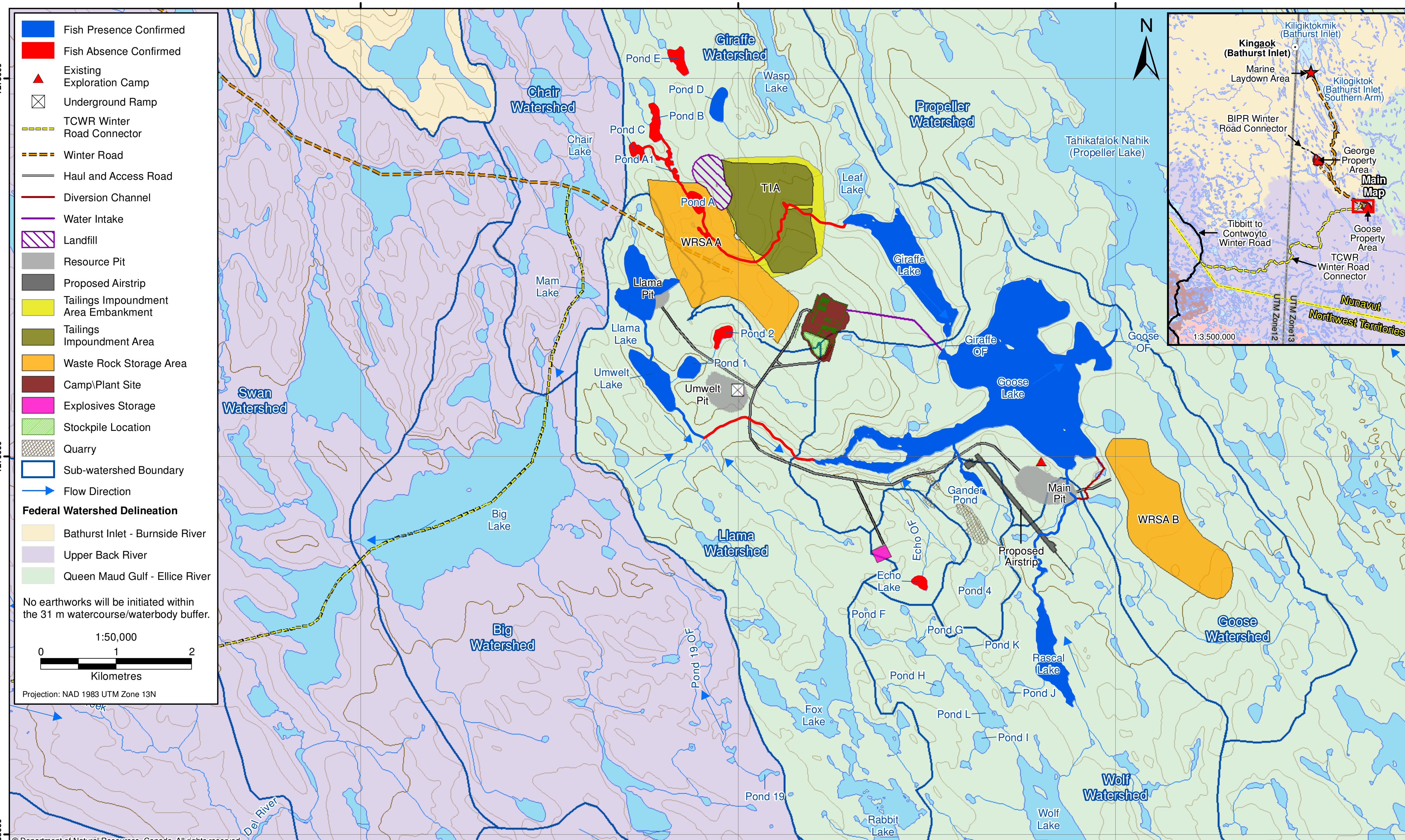

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Figure 2.2-3

Fish Presence / Absence at Goose Property Area, Back River Project, 2013

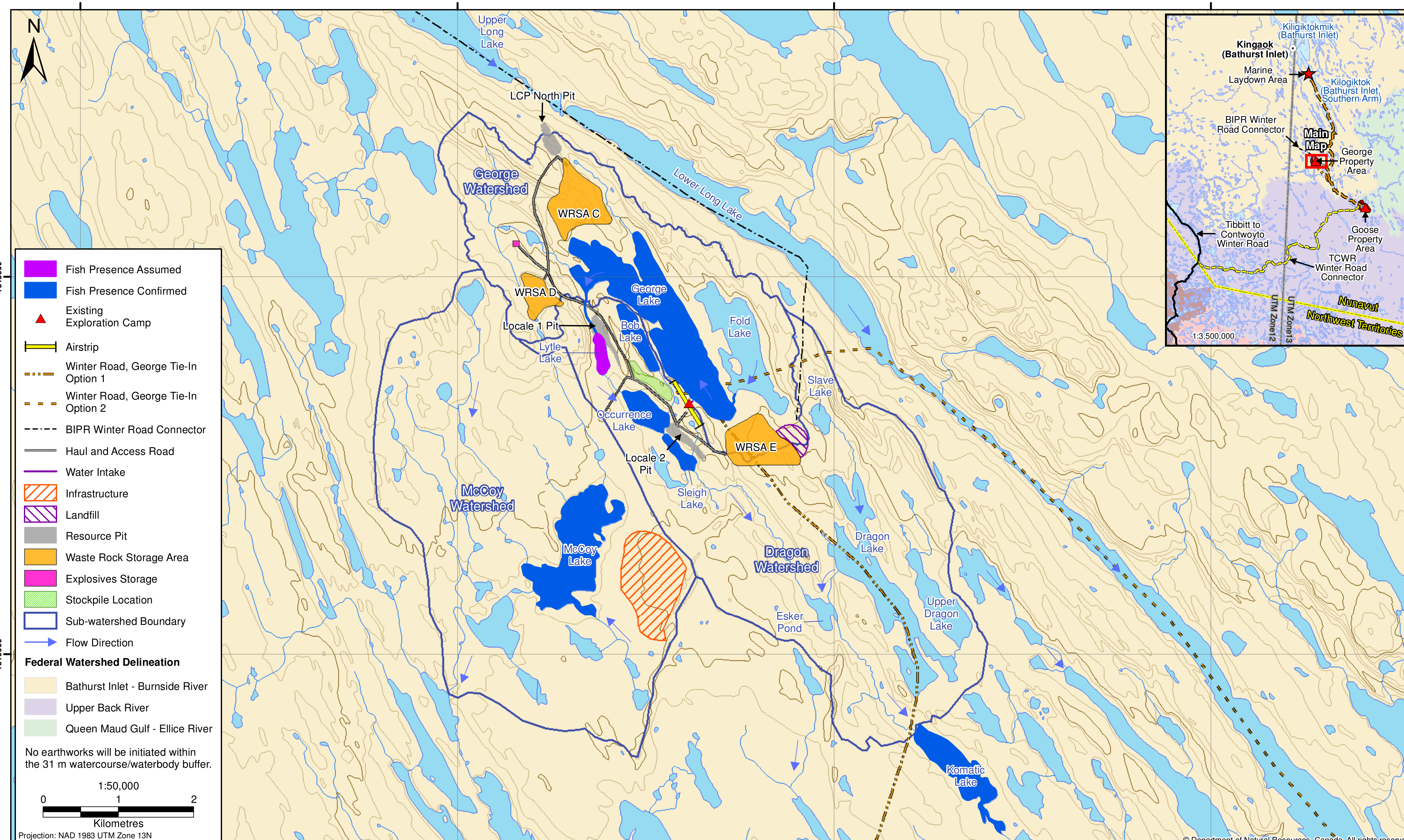

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Figure 2.2-4

Fish Presence / Absence at George Property Area, Back River Project, 2013

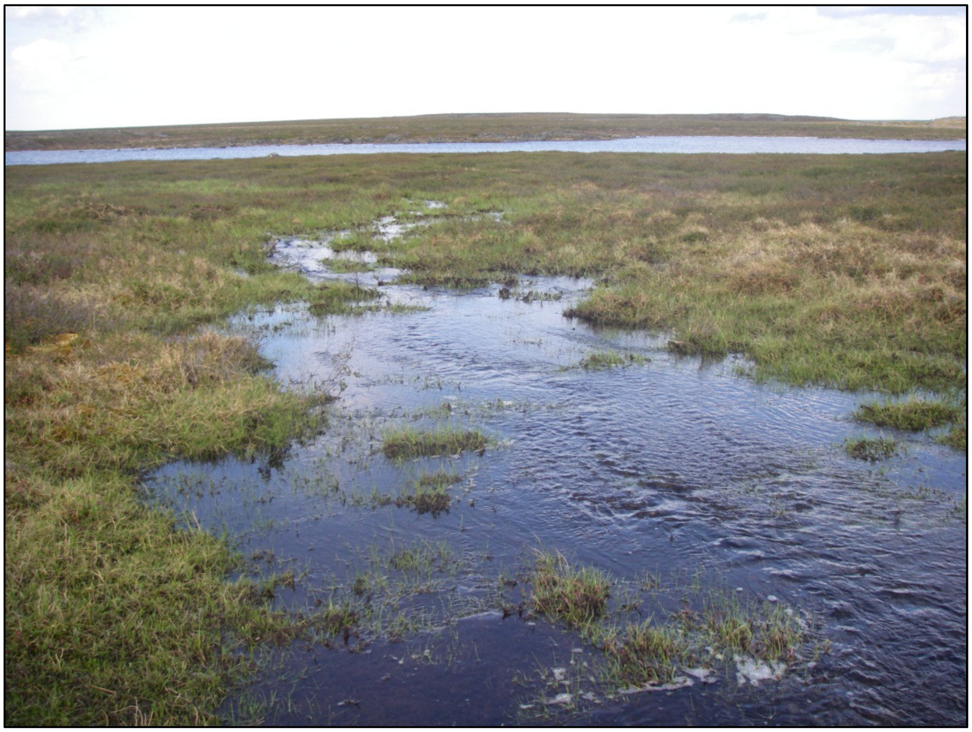


Plate 2.2-2. Ephemeral outflow from a Goose Property pond, featuring overland flow and seepage properties. Pond H, July 2011.

Stream habitat in the George Property is characterized by well-developed beaded tundra streams with deep pools, interspersed with runs and occasional riffles (Rescan 2012c). Fish habitat in the beaded channels was generally considered good quality for rearing and feeding, while cobble and gravel habitat may provide good spawning habitat for spring spawning species such as Arctic Grayling. However, periodic reaches featuring cobble and boulder fields, shallow flow, and riffle morphology are also present and may limit fish migration during low flow periods.

2.2.2 Freshwater Fish

Goose Property

Information on freshwater fish and fish habitat in the Goose Property area is available for 1997, 2007, 2010, 2011, 2012 and 2013 (Rescan 2010a, 2012a, 2012b, 2012c, 2013a). The data collected in 1997 was not directly available from the consultant; however, it was referenced by Hubert and Associates Ltd. (2004) in a review of the existing baseline studies. Fish sampling in 2007 focused on Goose Lake and its outflow (Golder 2007).

The Goose Property area is located north of Back River, straddling the watershed divide between the regional Back River and Ellice River watersheds. The area of predicted Project-related effects contains a total of seven freshwater fish species (Table 2.2-1; Appendix 2.2-1 and 2.2-2), four of which are Lake Trout, Round Whitefish, Lake Whitefish, and Arctic Grayling. None of these species are fished locally for commercial or sporting purposes.

Table 2.2-1. Fish Species Captured near Potential Areas of Impact in the Goose Property Area, 1997 to 2012

Waterbodies Sampled	Species						
	Lake Trout (*Salvelinus namaycush*)	Round Whitefish (*Prosopium cylindraceum*)	Lake Whitefish (*Coregonus clupeaformis*)	Arctic Grayling (*Thymallus arcticus*)	Burbot (*Lota lota*)	Slimy Sculpin (*Cottus cognatus*)	Ninespine Stickleback (*Pungitius pungitius*)
Goose Lake	X	X	X	X	X	X	X
Goose-Rascal Inflow	-	-	-	X	-	-	-
Umwelt Lake	X	X	-	X	-	-	X
Llama Lake	X	X	-	-	-	X	-
Rascal Lake	X	X	-	X	-	-	-
Canyon Lake	X	X	-	X	X	X	X
Propeller Lake	X	X	-	X	X	X	X
Gander Pond and Outflow	-	-	-	X	X	X	X

Llama Lake

The proposed future development of the Llama deposit will result in the complete loss of Llama Lake, equalling 33.6 ha of fish habitat (Figure 2.2-5; Appendix 2.2-3). Although the loss of Llama Lake will result in serious harm to three fish species (Lake Trout, Round Whitefish, and Slimy Sculpin), the total number of fish in Llama Lake is estimated to be rather low. The entire lake contains an estimated 226 individuals of Lake Trout and Round Whitefish, combined (Rescan 2010a). Although this is the best estimate of the total fish population size of these two species combined, there are wide confidence limits around this estimate, reflecting a substantial degree of uncertainty surrounding the population sizes of either species. Approximately 60% of this estimate is through to consist of Round Whitefish individuals, whereas the remaining 40% is thought to consist of Lake Trout individuals. The only species of forage fish collected in Llama Lake was Slimy Sculpin (Table 2.2-1). Only a small number of Slimy Sculpin individuals were captured during the baseline fish surveys in Llama Lake (Rescan 2010a), possibly because the baseline sampling methods did not target Slimy Sculpin and were focused on assessing the two larger species, Lake Trout and Round Whitefish. As noted in Chapter 6 of Volume 6 (see Table 6.1-7 of that Chapter), Llama Lake was assigned a forage-fish quality rating of fair based on all data collected during the baseline surveys.

Goose Lake

Withdrawal of water from Goose Lake will be required for mill and camp use throughout the year. Based on the maximum allowable winter withdrawal of 10% under ice volume (DFO 2010), a total of 2,208 m^3/day would be permitted for withdrawal (Figure 2.2-6). The project will require water withdrawal during construction (2-4 years), operation (10 years) and possibly closure.

To avoid serious harm to fish production in Goose Lake, maximum water withdrawal volumes will be implemented such that resulting changes to lake outflow volume and water level do not impact Lake Trout, Round Whitefish or Arctic Grayling life histories. The maximum water volumes are 1,000 m^3/day throughout the year with an increase to 2,000 m^3/day during freshet. However, the operational water needs of the Project may vary below these estimates.

For Goose Outflow, maximum water withdrawal volumes would reduce the average daily discharge by 20.6% and have a negligible effect on habitat use for Arctic Grayling and Round Whitefish. Baseline flow and water level in Goose Outflow are marginal to insufficient for fish production during critical periods (flow less than 20% Mean Annual Discharge; DFO 2013b; Figure 2.2-7) and the 20.6% reduction in discharge does not alter the date or duration of the critical period when Goose Outflow is marginal for fish use.

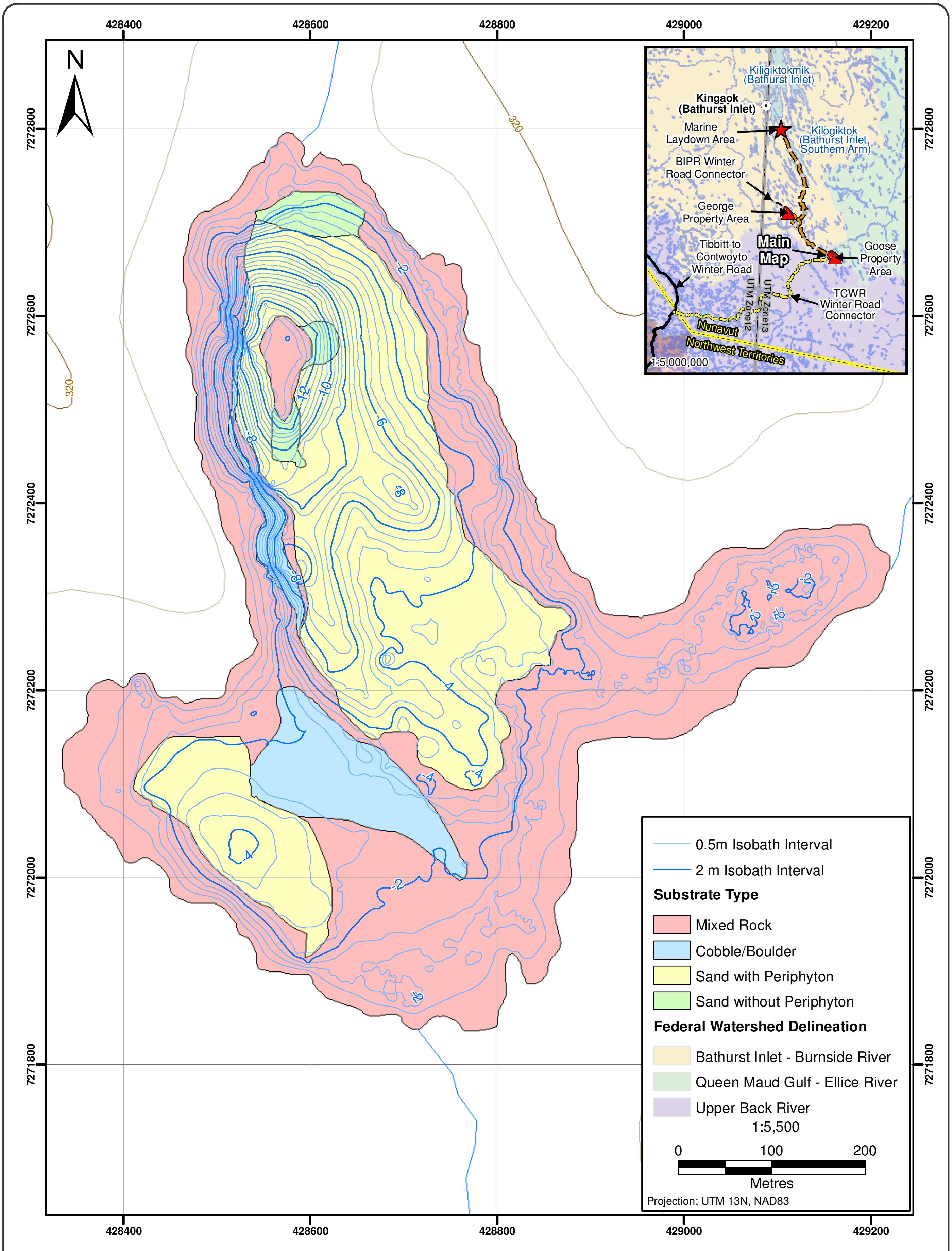


Figure 2.2-5

Substrate Composition of Llama Lake, Back River Project, 2013

For Goose Lake, maximum summer water withdrawal volumes would result in an average daily reduction in water level of 2 cm (maximum 6 cm), which is within the range of seasonal variation for Goose Lake (approximately 30 cm; Figure 2.2-7). During winter months, maximum water withdrawal is estimated to result in a cumulative reduction in water level of 10 cm under ice potentially exposing overwintering Lake Trout eggs to air. The effect of opening up 10 cm of airspace on Lake Trout eggs is considered negligible as ice thickness in Goose Lake varies up to 20 cm among years and locations (Rescan 2012e, Rescan 2012f). Moreover, bathymetry and substrate type indicate that Lake Trout spawning sites are found at depths greater than 2.5 m (Rescan 2013a).

Propeller Lake

Withdrawal of water from Propeller Lake may be required during operations and closure. A maximum water withdrawal volume for Propeller Lake has been set at 1,510 m^3/day (2,510 m^3/day during freshet). This maximum is based on removing no more than 10% of the available outflow volume of Propeller Lake. The assumption of “no serious harm to fish” as a result of the maximum water withdrawal volume will be verified by analyzing bathymetric and substrate composition to be collected in September 2013.

Stream Connecting Rascal and Goose Lakes

Fish habitat that will be adversely affected by the construction of the airstrip and the Main deposit is a 1.82 km length section of high-quality stream connecting Rascal and Goose lakes (Plate 2.2-3; Appendix 2.2-4). This stream is the lower reach of the stream connecting several medium-sized lakes (upstream) to Goose Lake (downstream). Artic Grayling have been observed in large numbers within this section of stream, and this species use this reach for spawning, nursery, and foraging habitat (Hubert et al. 1985; Rescan 2012c). Upstream lakes within the Wolf Watershed, as well as the downstream Goose Lake, likely serve as overwintering habitat (Rescan 2012c). Maintaining connectivity between Goose Lake and the upper reaches of the Wolf Watershed is likely critical for conserving the Arctic Grayling population in this system.

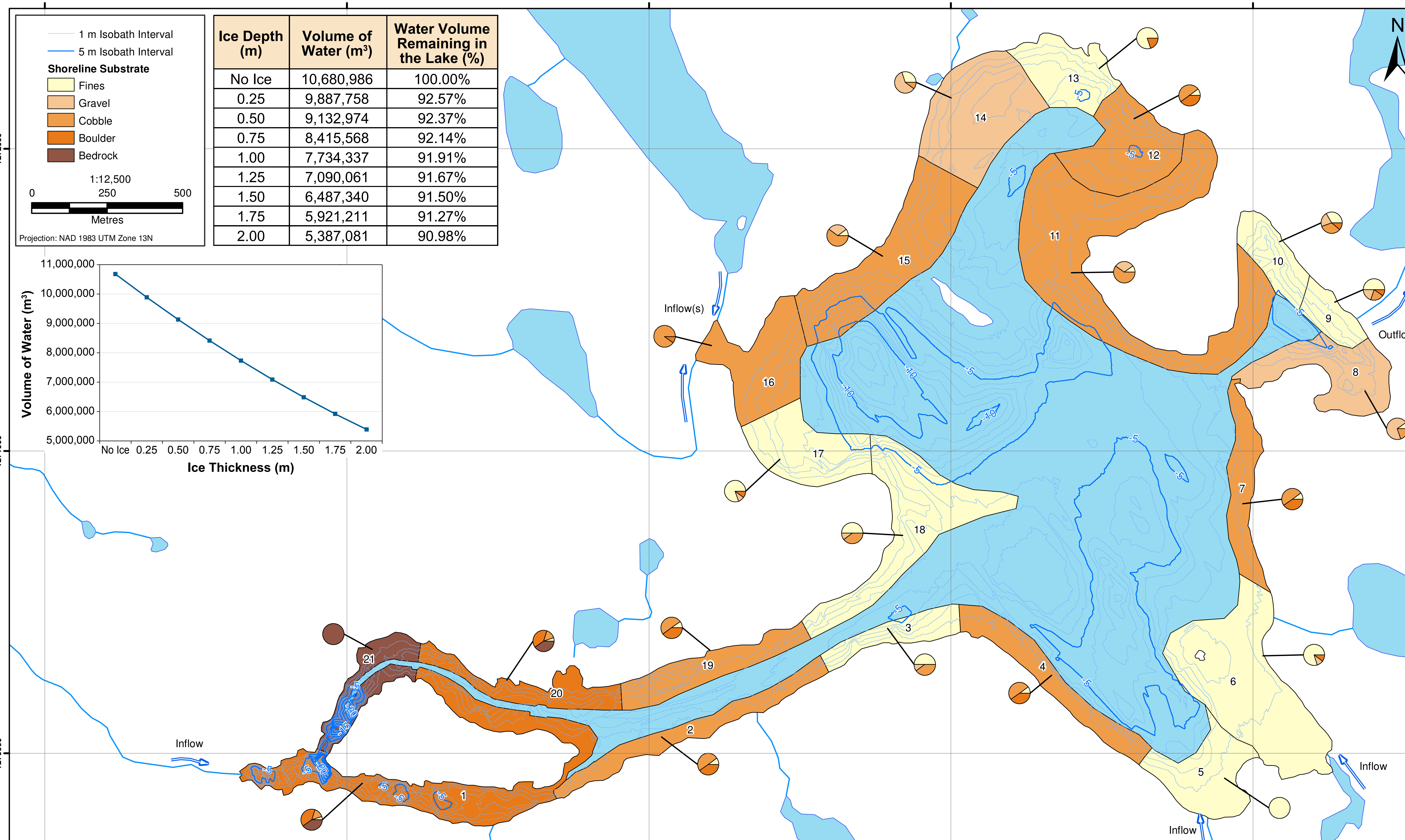
Tailings Impoundment Area: Giraffe Inflow Stream

Approximately 3.1 km of ephemeral stream and shallow ponds will be affected by the construction of the TIA (Figure 2.2-1). Electrofishing sampling and habitat assessment completed in 2013 demonstrated that this stream is devoid of fish due to the presence of several natural fish barriers located adjacent to the inflow of Giraffe Lake, and due to seasonal interruptions in flow (Plate 2.2-4). No fish have been caught in the small ponds connected by Giraffe Inflow Stream (Ponds A-C; Table 2.2-1).

In addition to Giraffe Inflow Stream, a larger, approximately 2 m deep Pond (Pond A) is located within the potential TIA boundary. This pond features one ephemeral outflow and one ephemeral inflow, and its shoreline is dominated by fines (Plate 2.2-5). No fish have been captured at Pond A, and, because migration into Pond A from the nearest lake (Giraffe Lake) is inhibited by impassible barriers, it is not considered fish bearing.

George Property

Information on freshwater fish in the George Property Area has been collected in 1990, 2007, 2012, and 2013 (Sekarak 1990; Golder 2007; Rescan 2012c, Rescan 2013a). The George Property is located in the headwaters of the Western River watershed, which flows north into Bathurst Inlet. The area of predicted project effects contains a total of four species (Table 2.2-2), two of which are Lake Trout and Arctic Grayling. Neither of these species is fished locally for commercial or sporting purposes.



Ice Depth (m)	Volume of Water (m³)	Water Volume Remaining in the Lake (%)
No Ice	10,680,986	100.00%
0.25	9,887,758	92.57%
0.50	9,132,974	92.37%
0.75	8,415,568	92.14%
1.00	7,734,337	91.91%
1.25	7,090,061	91.67%
1.50	6,487,340	91.50%
1.75	5,921,211	91.27%
2.00	5,387,081	90.98%

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Figure 2.2-6

Under Ice Water Volume and Substrate in Goose Lake, Back River Project, 2013

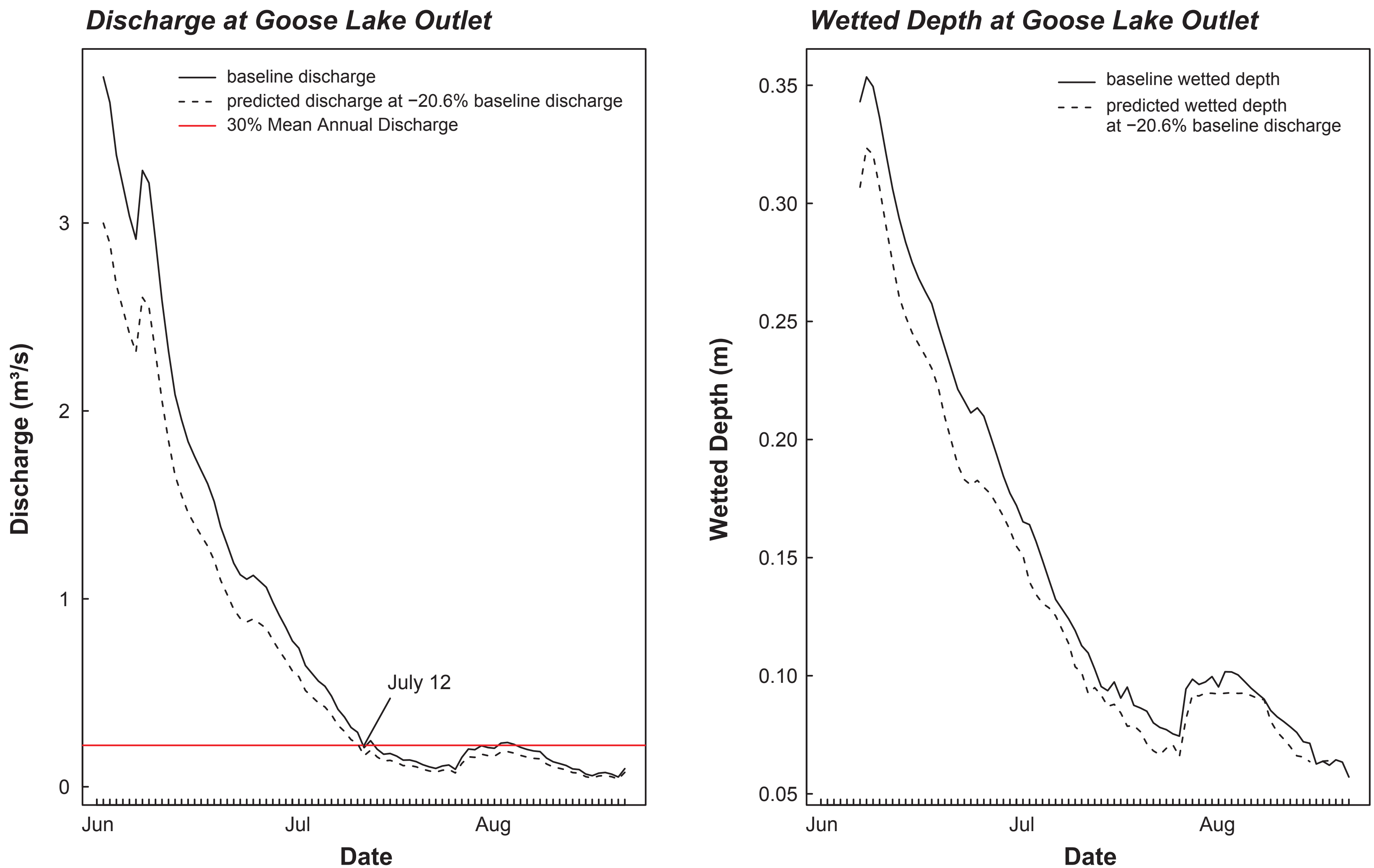


Figure 2.2-7

Daily Discharge and Wetted Depth at Goose Lake Outlfow, Back River Project, 2013

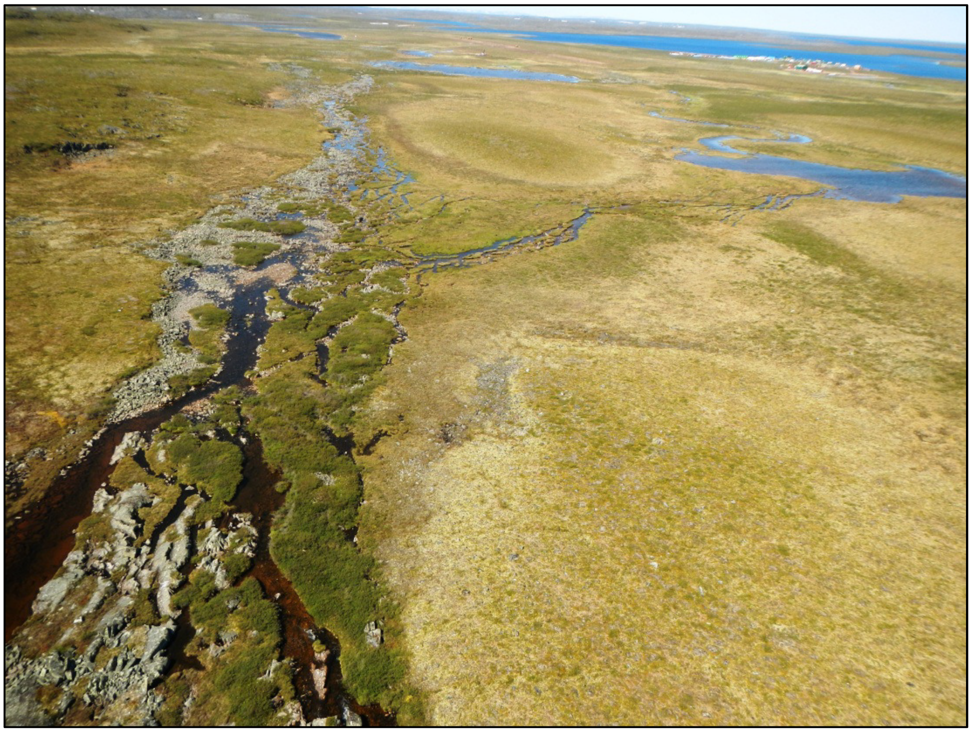


Plate 2.2-3. Goose-Rascal Outflow, looking north from Rascal Lake towards Goose Lake and existing Goose exploration camp (upper right). July 2012.

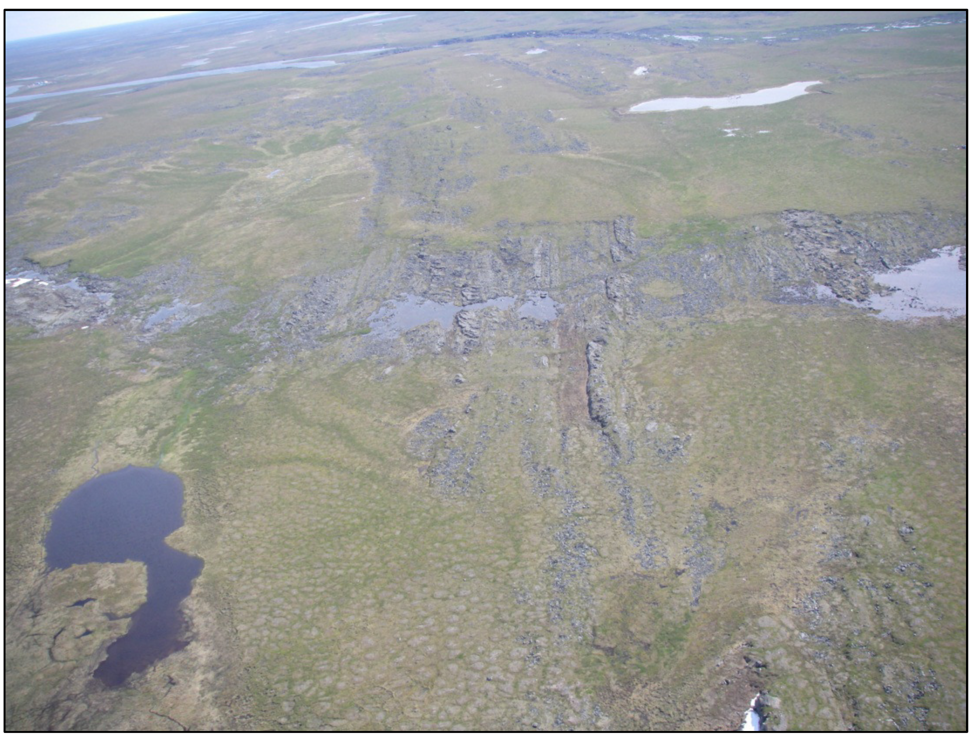


Plate 2.2-4. Aerial view of Giraffe Inflow Stream, looking south towards Goose Lake. July 2011.

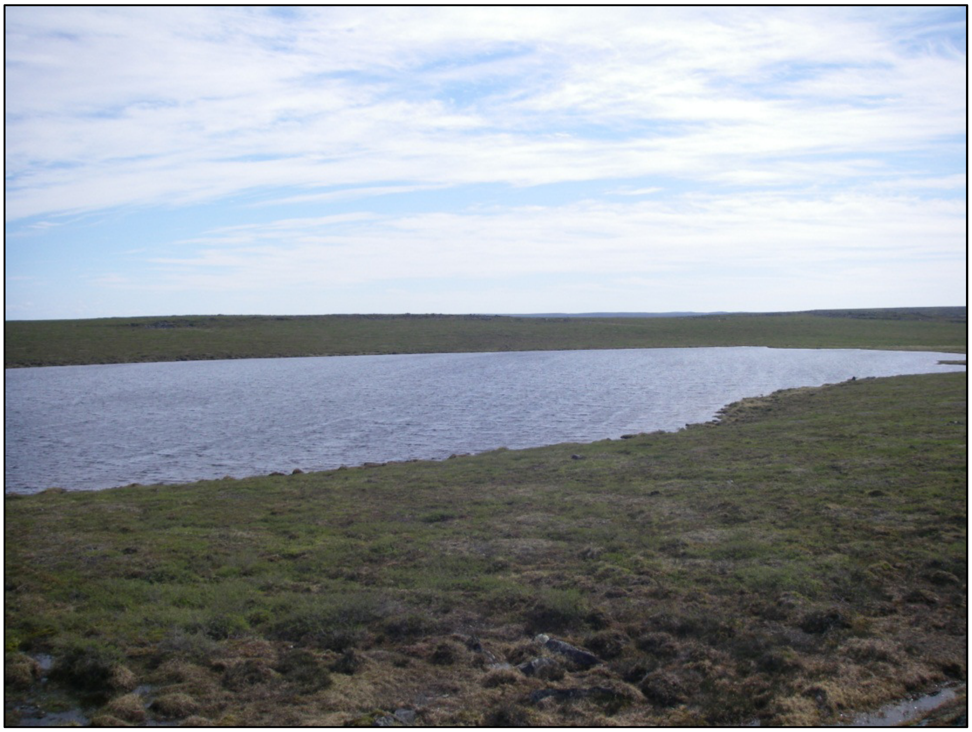


Plate 2.2-5. Pond A, looking south. July 2011.

Table 2.2-2. Fish Species Captured near Potential Areas of Impact in the George Property Area, 1990 to 2012

Waterbodies Sampled	Species						
	Lake Trout (*Salvelinus namaycush*)	**Round Whitefish** (*Prosopium cylindraceum*)	**Lake Whitefish** (*Coregonus clupeaformis*)	**Arctic Grayling** (*Thymallus arcticus*)	**Burbot** (*Lota lota*)	**Slimy Sculpin** (*Cottus cognatus*)	**Ninespine Stickleback** (*Pungitius pungitius*)
George Lake	X	-	-	X	-	X	-
Bob Lake	X	-	-	-	-	-	-
Lytle Lake	-	-	-	-	-	-	-
Occurrence Lake	-	-	-	X	-	-	-
George Outflow	X	-	-	X	X	X	-

Lytle Lake

The future development of Locale 1 Pit will result in the partial loss of Lytle Lake, equalling 1.53 ha of fish habitat (Appendix 2.2-5). No fish have been captured in Lytle Lake (Table 2.2-2; Appendix 2.2-1 and 2.2-2) and the shallow depth results in freezing to bottom during winter months. However, Lytle Lake may provide seasonal habitat for fish moving between George Lake and waterbodies lower in the watershed as Arctic Grayling have been captured both upstream in George Outflow and downstream in Occurrence and Sleigh lakes. Thus for the purposes of this draft plan, a conservative approach was taken and it was assumed that Arctic Grayling inhabit Lytle Lake during the summer months.

Occurrence Lake

The future development of Locale 2 Pit will result in the partial loss of Occurrence Lake, equalling 0.74 ha of fish habitat (Appendix 2.2-6). In 2013 only a single Arctic Grayling has been captured

(Table 2.2-2; Appendix 2.2-1 and 2.2-2). Occurrence Lake may provide seasonal habitat for fish moving between George Lake and waterbodies lower in the watershed. However, this lake is likely to freeze to bottom during winter owing to its shallow depth, and no overwintering habitat is available in this lake.

George Outlfow

The future development of Locale 1 Pit will result in the partial loss of George Outflow, equalling 0.41 ha of the section of stream adjacent to Lytle Lake (Appendix 2.2-7). Juvenile Lake Trout, Arctic Grayling, Slimy Sculpin and Burbot have been captured and observed using George Outflow in the section of stream nearest George Lake. No fish have been caught further downstream near Lytle Lake where substrate is mainly boulders and stream flow becomes subsurface after high freshet flow.

3. Fish Offsetting Options

Mitigation measures by Project design will be incorporated during Project development and construction to reduce the amount of fish habitat altered or lost. However, there are particular, unavoidable habitat losses requiring fish offsetting. Such offsetting options must follow a preferred hierarchy (DFO 2012):

1. Create or increase the productive capacity of like-for-like habitat in the same ecological unit.
2. Create or increase the productive capacity of unlike habitat in the same ecological unit.
3. Create or increase the productive capacity of habitat in a different ecological unit.

As a last resort, DFO may approve (a) offsetting options that use artificial production techniques to maintain one or more stocks of fish, (b) deferred offsetting, or (c) offsetting based on the restoration of chemically-contaminated sites.

Other, possibly more valuable, Fish Offsetting options may be available as the new Fisheries Protection Policy is implemented (DFO 2013a). These options may be developed with DFO and other stakeholders through the coming year.

Several Project activities outlined in Chapter 2 of this document will result in permanent alteration to, or destruction of, fish habitat. The offsetting strategy for each of these unavoidable losses is outlined below in Sections 3.1 and 3.2.

3.1 PROPOSED MARINE FISH OFFSETTING

Marine fish offsetting options accepted by DFO have historically employed either biological or physical (habitat) manipulation of the marine environment (Sikumiut 2011). Manipulation of the biological habitat primarily involves establishing nearshore aquatic vegetation (e.g., eelgrass) to serve as foraging, shelter, and/or nursery habitat for both fish and invertebrate species (CRD 2002; DFO 2004). This method has been somewhat effective in maintaining or increasing productivity at marine areas in southern Canadian latitudes, particularly in British Columbia (DFO 2006). However, re-vegetation has limited value in the Arctic, where ice scour in the nearshore marine environment prevents aquatic plant communities from becoming established (DFO 2009; Stephenson and Stephenson 1972).

Alternatively, physical manipulation, often in the form of creating artificial reefs, has been an acceptable and effective offsetting measure in the Arctic marine environment (DFO 1990; Rescan 2010b). Artificial reefs have the capacity to increase productivity in the nearshore environment by providing habitat for multiple trophic levels in the marine food web:

> *An artificial reef enhances fish aggregation and production habitat required by various invertebrates and fishes. Increased habitat complexity and heterogeneity of habitats created by the artificial reef provide a multitude of microhabitats for many invertebrates. These in turn provide food for fishes and many invertebrates. The reef also provides shelter for many fishes and motile invertebrates* (DFO 1990).

Following this model, two rock shoals are proposed to be constructed to ensure NNL of habitat by compensating for the 0.23 ha of nearshore marine habitat required to construct the marine jetty in Bathurst Inlet. The surface area of each of these rocky reefs will measure approximately 0.087 ha with the following dimensions: 45 m long, 15 m wide, and 1.5 m high with a 1:1 side slope. In addition to these rock shoals, the side slopes of the beach ramp and seasonal dock will provide an additional 0.100 ha of artificial reef. Therefore, this offsetting plan will result in a total of 0.274 ha of newly built rocky reef habitat after the loss of marine fish habitat due to construction of the marine ramp and seasonal dock, for a net increase of approximately 0.044 ha of high quality marine fish habitat in Bathurst Inlet (Table 3.1-1).

Table 3.1-1. Marine Fish Offsetting Habitat Budget

Type	Waterbody and Physical Works	Area (ha)
Loss	Bathurst Inlet; construction of rock jetty and associated in-water structures	0.230
Gain	Bathurst Inlet; creation of 2 offsetting reefs and side slopes of in-water ramps and landings	0.274
Ratio of Gain to Loss		**1.2 : 1.0**

Note:
This budget assumes the dimensions of ramps and landings as stated in Chapter 2 of this document. Offsetting is based on surface area of the rock jetty rather than habitat units because Habitat Suitability models for Arctic marine fish are not well developed.

The outer face of artificial reefs will be constructed of run-of-quarry rock (up to 0.5 m diameter) in order to form a complex three-dimensional microhabitat, with abundant interstitial spaces for fish, invertebrates and algae to colonize. Each of the two shoals will be laid down in water of approximately 3 m depth with a distance between reefs of approximately 20 m to minimize their effect on nearshore sediment transport (MHBL 2005).

The exact location of rock shoals will depend on final Project design, but the location is anticipated to be on the northeastern side of the bay located just south of the MLA (Figure 3.1-1). The final choice of locations will be aimed to minimize any potential negative impact that jetty traffic might have on offsetting reef habitat.

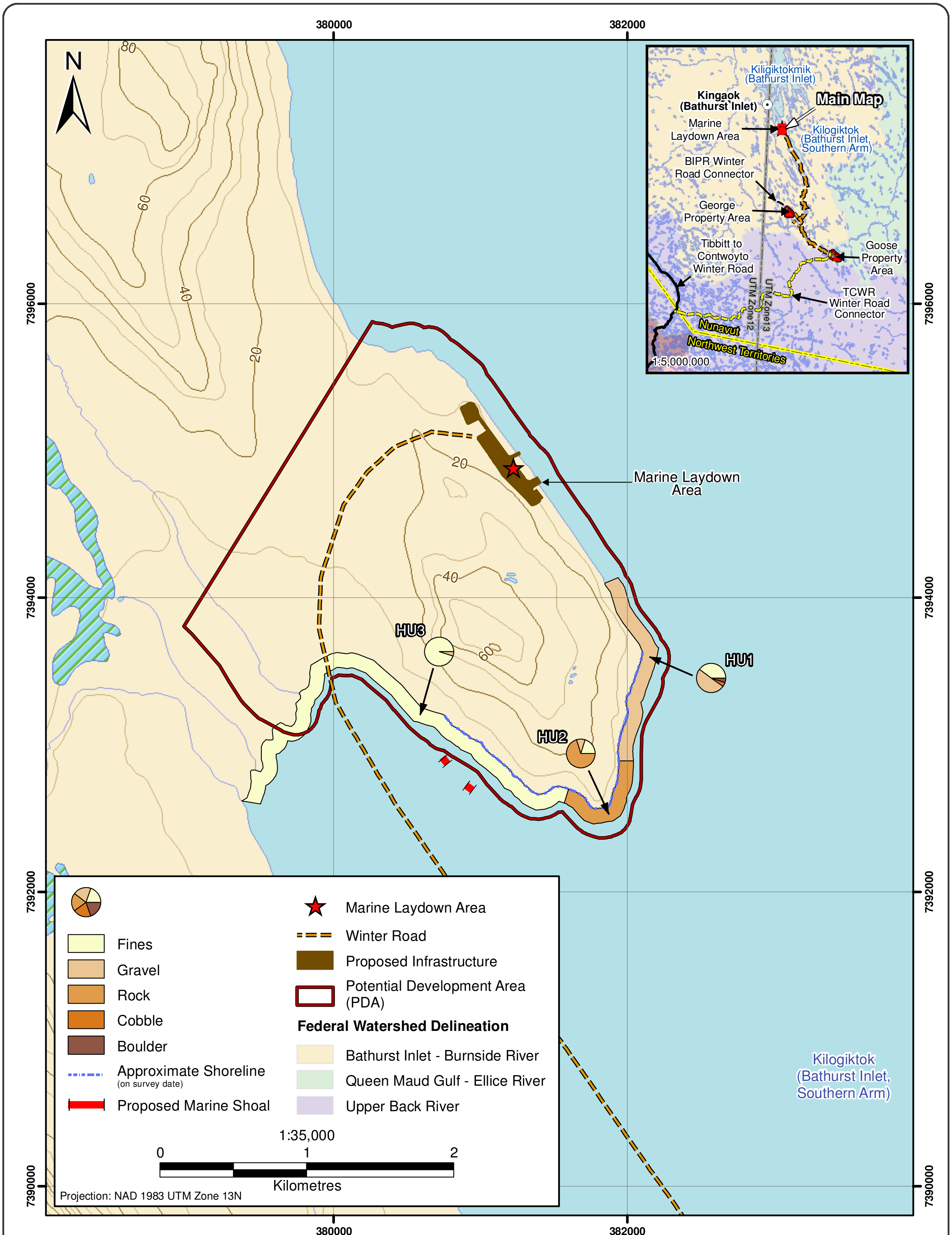
***Timing of Construction*:** This offsetting project is unconstrained by the timing of mine operations; however, the schedule of rock shoal construction should coincide with the construction of the beach ramp and temporary dock.

3.2 PROPOSED FRESHWATER FISH OFFSETTING

The location of potential fish offsetting projects include the Rascal Outlet and Stream in the Goose Property area, a set of canyon lakes approximately 18 km northeast of the Goose Property area, and Bathurst Lake, which lies at the southern end of Bathurst Inlet and empties into the Inlet via the Western River (Figure 3.2-1; Table 3.2-1).

3.2.1 Rascal Lake to Goose Lake Stream Realignment Option

This proposed offsetting project involves the redirection of water from the eastern channel of the northern-flowing drainage from Rascal Lake into Goose Lake to be diverted wholly into the western channel, which flows through Gander Pond (Plate 3.2-1; Figure 3.2-2). Both channels currently drain northward from Rascal Lake into Goose Lake, with the eastern channel traversing the proposed airstrip and Main pit. This diversion will help minimize runoff from the Main pit from entering Goose Lake via the western channel. Moreover, the enhanced western Gander Pond channel will ensure the continued presence of a corridor for fish migration between Rascal Lake and Goose Lake, and it will provide enhanced spawning, foraging, and rearing habitat to the Arctic Grayling currently preferring this section of stream.



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Proposed Marine Shoal Locations, Back River Project, 2013

Figure 3.1-1

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Table 3.2-1. Freshwater Fish Offsetting Habitat Budget

Type	Waterbody	Physical Work	Area (ha)	Habitat Units	Population Size (95% CI)	Species Present
Loss	Llama Lake	Deposit Development	33.6	48.9	226 (4, 1794)	LKTR, RWF, SS
	Goose-Rascal Inflow	Deposit Development	0.44	0.77	NA	ARGR
	Lytle Lake	Deposit Development	1.53	0.99	NA	ARGR
	Occurrence Lake	Deposit Development	0.74	0.32	NA	ARGR
	George Outflow near Lytle Lake	Deposit Development	0.42	0.71	NA	ARGR , LKTR, SS, BB
Gain	Rascal Outlet and Stream	Enhancement	5.9	5.85	NA	ARGR
	Canyon Lakes	Enhancement; Deep Water Creation	9	24.7	NA	LKTR, ARGR, SS
	Bathurst Lake	Establish access for anadromous Arctic Char	8000	NA	NA	ARCH, LK, ARGR

Notes:
LKTR = Lake Trout, RWF = Round Whitefish, SS = Slimy Sculpin, ARGR = Arctic Grayling, ARCH = Arctic Char, BB = Burbot.
NA= data not available.
See Appendix 3.2-1 and 3.2-2 for methods used to calculate Habitat Units. Species composition for Bathurst Lake has not been determined. Arctic Char and Lake Trout are thought to reside in Bathurst Lake based on the traditional knowledge report for the Back River Project (KIA 2012).

Table 3.2-2 presents a summary of the freshwater fish offsetting options currently being considered.

Table 3.2-2. Conceptual Fish Offsetting Project Summary

Offsetting Project	Biologically Feasible	Target Species	Offsetting Classification	Distance from Goose Property (km)	Value to Freshwater Fish and Fish Habitat
Rascal Lake to Goose Lake Stream Realignment (Section 3.2.1)	YES	Arctic Grayling	increase the productive capacity of like-for-like habitat in the same ecological unit	0	5.9 ha of spawning, rearing, foraging and migratory channel and off-channel habitat
Canyon Lakes Berm (Section 3.2.2)	YES	Lake Trout, Arctic Grayling	increase fish productivity in different ecological unit	18	2.9 ha of deep overwintering habitat, 0.3 ha spawning, 9 ha total area
Bathurst Lake Arctic Char Passage (Section 3.2.3)	YES	Arctic Char	increase fish productivity in different ecological unit	85	8000 ha of spawning and overwintering habitat

To achieve this offsetting, one large berm, or a series of small berms, will need to be constructed to divert flow away from the eastern channel and constrain the combined flow to fall within the existing topography of the western channel. It is recommended that the berm(s) be constructed at minimum of 31 m away from the existing and planned infrastructure.

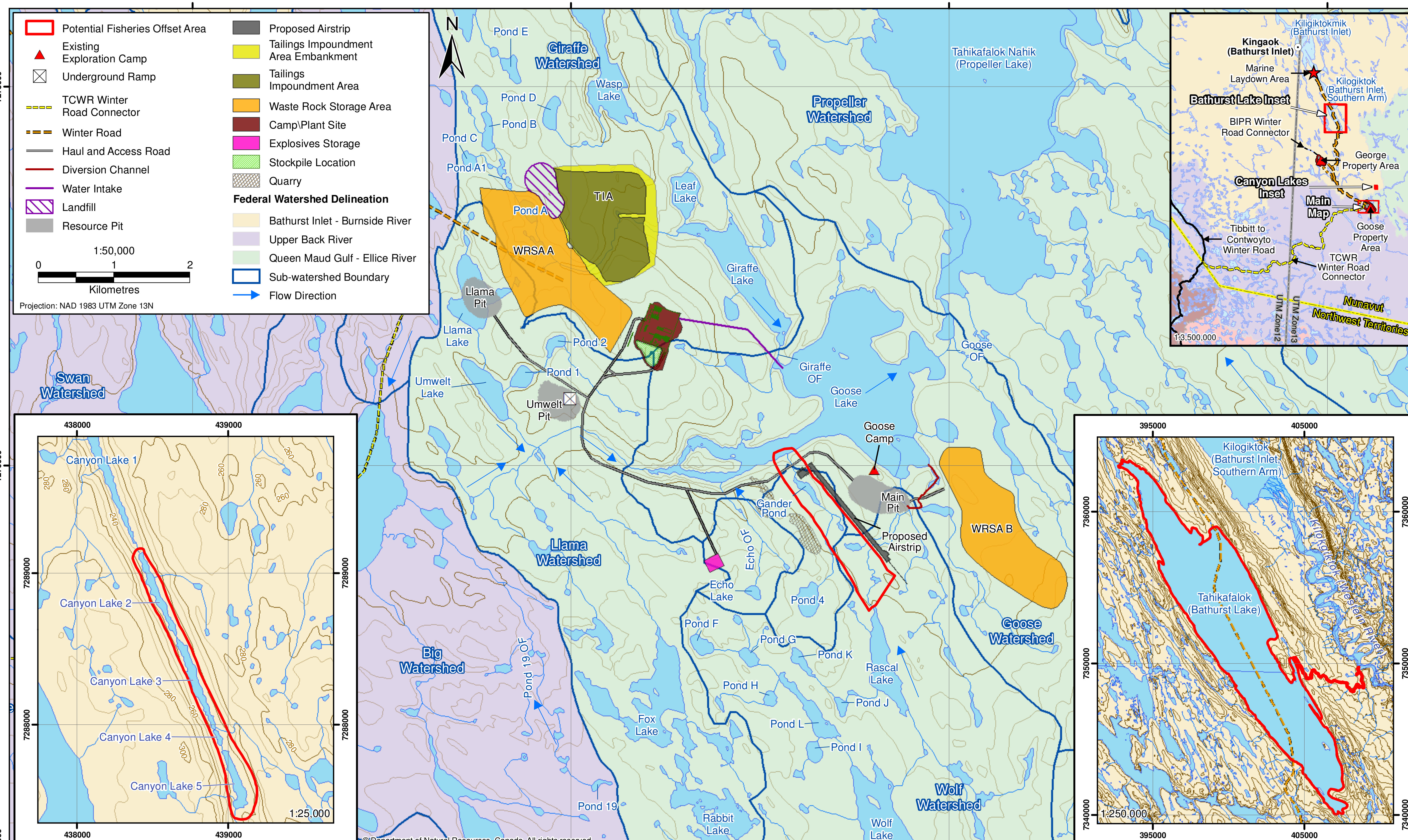

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Figure 3.2-1

Potential Fisheries Offset Areas, Back River Project, 2013

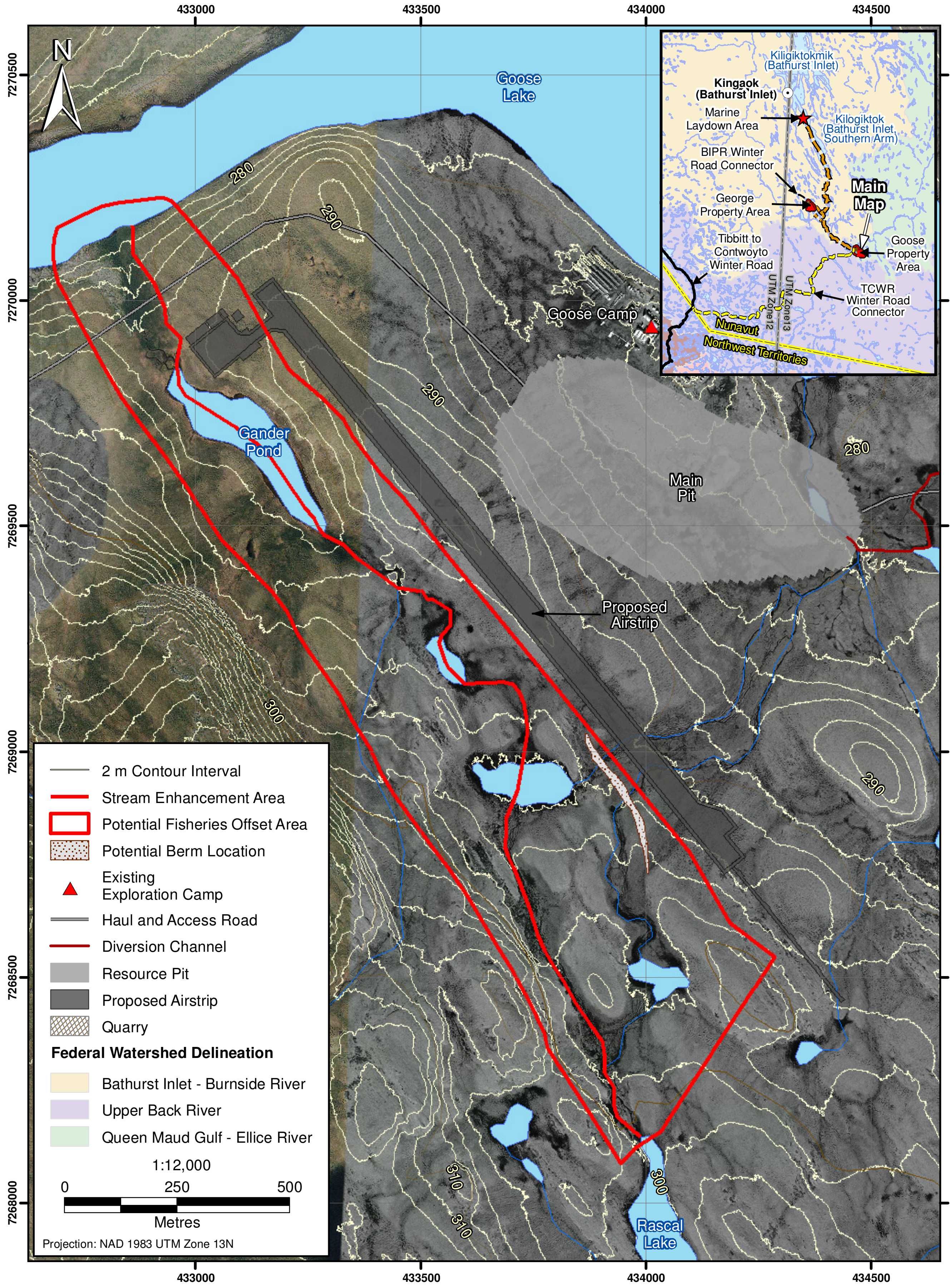

Figure 3.2-2

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Potential Fisheries Offset Area at Rascal Outlet and Stream, Back River Project, 2013

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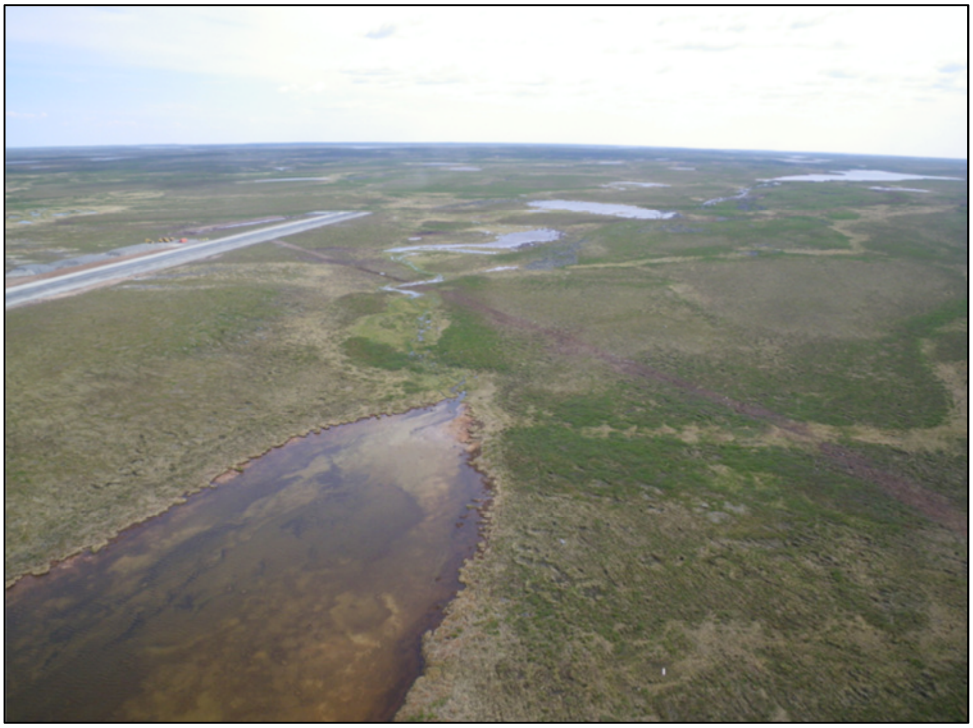

Plate 3.2-1. Site of the potential offsetting project in the western section of stream connecting Rascal Lake to Gander Pond (aerial view of Gander Pond in the foreground, looking south toward Rascal Lake at the top right). June 22, 2013.

In addition to enhancing the main stream channel with spawning gravel and cobble rock, the berm(s) will result in the development of multiple habitat types including shallow marsh and Arctic Graying rearing habitat. The total area of gained habitat for Arctic Grayling is estimated at 6.2 ha, including the enhanced stream and shallow wetlands (Appendix 3.2-3). It is expected that the consolidated flow will redefine the channels to ensure continuity and create additional habitat features. Based on field observations it is anticipated that gravel, suitable for Arctic Grayling spawning, will be exposed by the additional flow. If required, supplementary spawning gravel and cobble can be added to the new western channel using materials retrieved from appropriate sections of the eastern channel. The proposed substrate composition of newly created stream habitat is 50% cobble, 25% gravel, 15% boulder and 10% fines to facilitate spawning and rearing of Arctic Grayling (Hubert et al. 1985).

***Value to Freshwater Fish and Fish Habitat*:** The enhanced western channel will be approximately 5.9 ha in area when including the small wetland area. This section of stream will maintain continuity of spawning, rearing, foraging, and migratory habitat for Arctic Grayling between Goose and Rascal lakes.

***Timing of Construction*:** To avoid negatively impacting Arctic Grayling spawning in the stream between Goose and Rascal lakes, construction of the offset habitat will be required to take place prior to the loss of habitat associated with the airstrip, Main Pit, and haul road connecting Main Pit to the Goose Waste Rock Storage Area.

3.2.2 Canyon Lakes Berm Option

This proposed offsetting project involves creating additional deep-water overwintering habitat for Lake Trout and Arctic Grayling in a canyon lake system approximately 18 km northeast of the Goose Property area. Currently, four lakes (Canyon Lakes 2 to 5; Figure 3.2-3) are proposed to be deepened by 3 m through the creation of a berm at the northern end of Lake 2 (Figure 3.2-3; Plate 3.2-2). The channels within the canyon appear to be confined within bedrock resulting in berm dimensions of approximately three metres high, 50 metres wide, with a 1:3 side slope. Additional spawning, rearing, and foraging habitat for Lake Trout and Arctic Grayling will be created along the up and downstream ends of the berm. This will be accomplished by establishing a rocky shoal 50 m wide and 3 m deep at the up and downstream ends of the berm in Canyon Lakes 1 and 2, respectively.

Plate 3.2-2. Potential location of berm at the narrowing between Canyon Lakes 1 and 2. July 17, 2013.

***Value to Freshwater Fish and Fish Habitat*:** The total estimated habitat area gained will be approximately 9 ha, with an increase in deep-water overwintering habitat of 2.9 ha for Lake Trout and Arctic Grayling (Appendix 3.2-3). In addition, this offsetting option will result in a 0.03 ha increase of Lake Trout spawning and rearing habitat through berm construction.

***Timing of Construction*:** This offsetting project is unconstrained by the timing of mine operations; however, in order to avoid affecting fish passage, water level and discharge in lakes downstream of the berm, the raising of the berm may need to be completed in stages. Additional baseline data is required prior to construction.

3.2.3 Bathurst Lake Arctic Char Passage Option

This proposed offsetting project involves opening up access to 8,000 ha in Bathurst Lake for anadromous Arctic Char to spawn and overwinter (Figure 3.2-4). Bathurst Lake currently contains a freshwater resident population of Arctic Char, along with Lake Trout and Arctic Grayling. Other species are likely to reside in the lake, but data on species composition is deficient and relies on anecdotal evidence from local fishermen.

There is an approximately 4 m high water fall located on the outlet channel of Bathurst Lake (Plate 3.2-3; UTM 13 W 0405475 m E 7349337 m N) connecting the lake to the Western River (Figure 3.2-4). The fall, located approximately 6.5 km upstream from the confluence with the Western River, inhibits upstream migration into the lake for all species, including anadromous Arctic Char. Anadromous Arctic Char are an important fish species, both culturally and economically, for Inuit resource users in Nunavut, with many populations experiencing heavy harvesting pressures (Roux et al. 2011). Thus, there is a high priority to implement mitigation strategies to offset impacts to existing *S. alpinus* populations, for example by creating new habitats for anadromous Arctic Char.

Plate 3.2-3. Bathurst Lake falls. June 15, 2013.

In addition to this main water fall barrier, there is minor cascade (Plate 3.2-4; UTM 13 W 0408105 m E 7348172 m N) located approximately 2.75 km upstream from the confluence with the Western River, which also presents a barrier for fish migration. The outfall channel from Bathurst Lake to the Western River is approximately 8.5 km in length total, 2 km of which occurs above the major fall and 6.5 km of which occurs below the major fall. The distance from (a) the confluence of the Bathurst Lake outlet channel and the Western River and (b) the point at which the Western River discharges into Bathurst Inlet is 13 km total. Therefore, in addition to the major falls and minor cascade, a grand total of 21.5 river km separates Bathurst Lake from Bathurst Inlet.

***Value to Freshwater Fish and Fish Habitat*:** Approximately 8,000 ha of spawning, rearing, and overwintering habitat could be accessible to anadromous Arctic Char from the Western River if the major falls and minor cascade were modified to be passable by this species. Opening up 8,000 ha would primarily provide extremely valuable spawning and overwintering habitat to Arctic Char residing in Bathurst Inlet and the Western River. As a secondary, passive consequence, opening up Bathurst Lake to migrating Arctic Char will initiate a stable, long-term yearly influx of marine nutrients from the Bathurst Inlet to Bathurst Lake, thereby increasing the productive capacity of the whole lake ecosystem and of the Arctic Char populations in particular.

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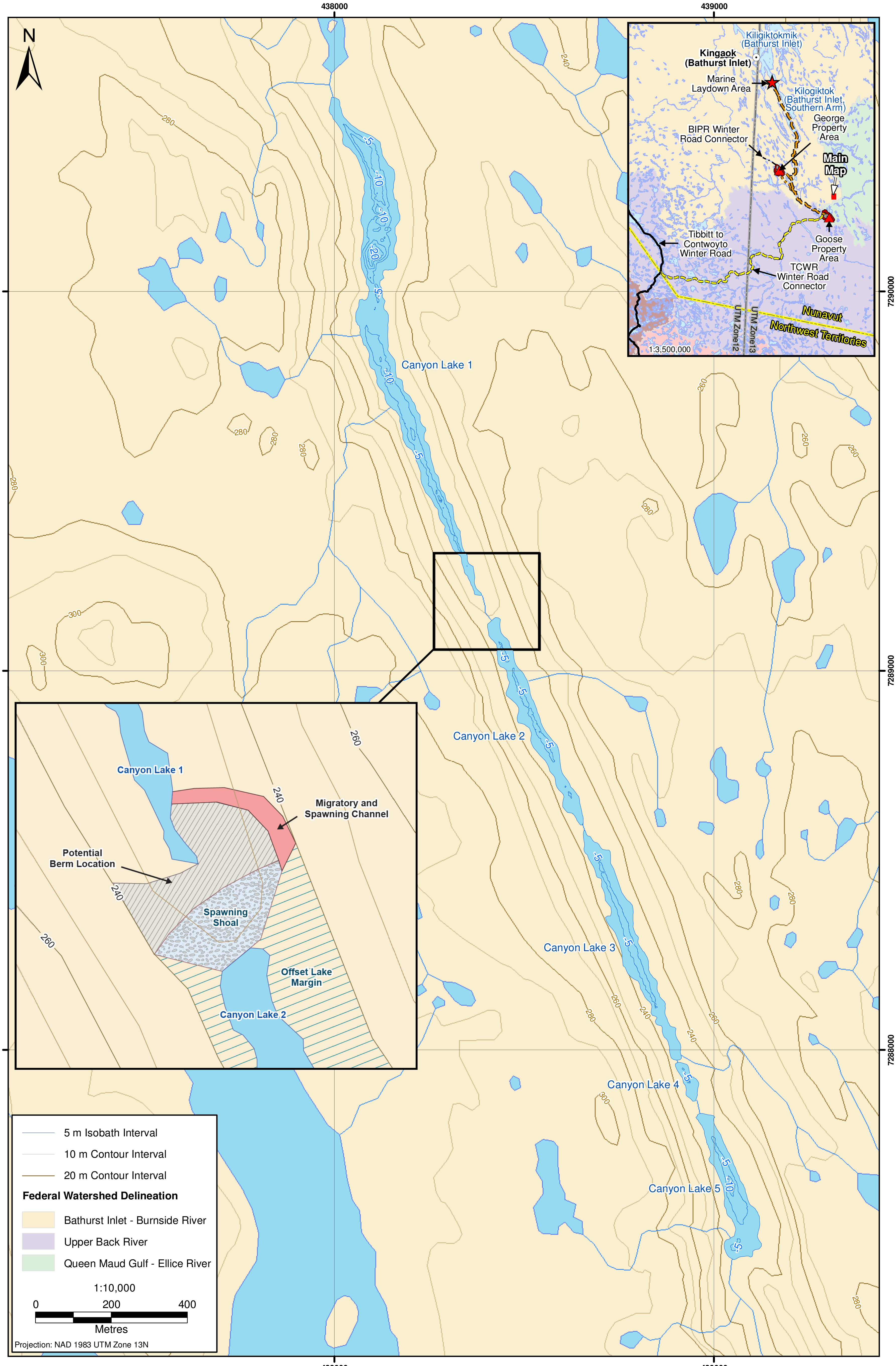

Figure 3.2-3

Potential Fisheries Offset Area at Canyon Lakes, Back River Project, 2013

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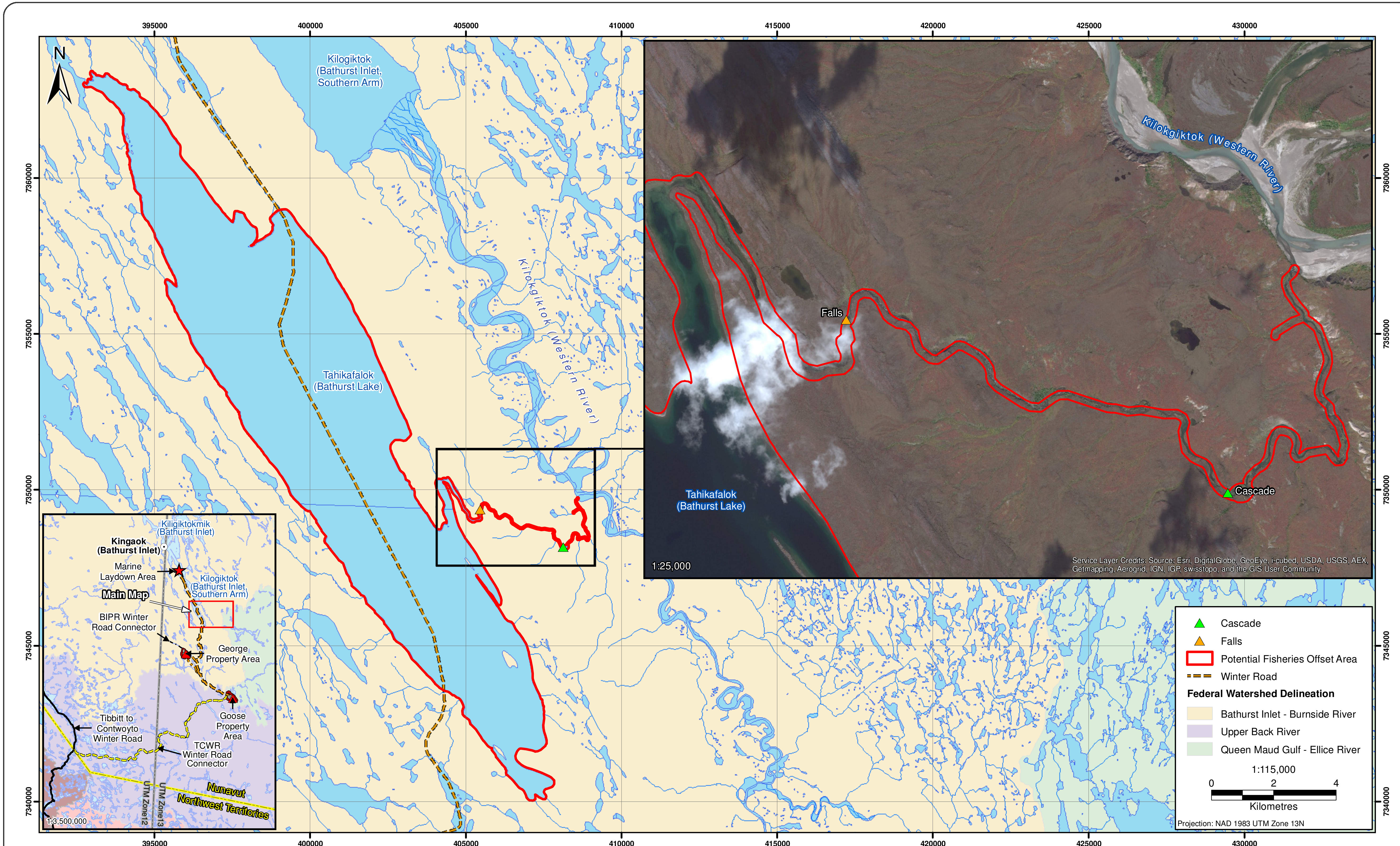

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Figure 3.2-4

Potential Fisheries Offset Area at Bathurst Lake, Back River Project, 2013

Plate 3.2-4. Cascade downstream of Bathurst Lake Outflow. June 15, 2013.

In the Canadian Arctic, distinct subspecies of Arctic Char may be either anadromous for their entire lives or ‘freshwater resident’ within single lakes throughout life. Moreover, up to four different ecomorphs of freshwater Arctic Char co-occur in some Arctic or sub-Arctic lakes (Skúlason and Smith, 1995). Within individual aquatic systems, these ecomorphs are often distinct from one another in terms of morphology, resource use, growth rate, physiology, and genetics (Gulseth and Nilssen, 2001; Johnston et al., 2004; Wilson et al., 2004).

Modifications to the main falls and minor cascade on the Bathurst Lake Outlet could pose potential risks to freshwater resident Arctic Char population(s) in Bathurst Lake. The reason for this is that freshwater residents are isolated and do not face competition for spawning sites and resources with anadromous members of the same species. An introduction of anadromous Arctic Char could negatively impact the population size or genetic integrity freshwater residents through competition for limited resources and gene flow through hybridization with freshwater residents.

Alternatively, freshwater resident and anadromous Arctic Char subpopulations may coexist with each other, as observed in some coastal Arctic lakes (Jonsson and Jonsson 1993; Swanson et al. 2010). The monitoring program found in Section 4.2.3 identifies baseline data requirements to be addressed prior to construction of this offsetting program.

Collection of baseline data will help determine the value of introducing anadromous Arctic Char to Bathurst Lake compared to the risk of such an introduction to the freshwater resident population of Arctic Char currently inhabiting Bathurst Lake.

***Timing of Construction*:** This offsetting project is unconstrained by the timing of mine operations; however, additional baseline data is required prior to construction.

4. Conceptual Compliance Monitoring Program

A compliance monitoring program will be implemented to determine if projects have been built as specified and approved, and that they are functioning effectively within the offsetting strategy. This will take place once the KIA and additional stakeholders have been consulted, the Final Fish Offsetting Plan has been approved by DFO, and the offsetting projects have been completed. The endpoint of this monitoring program will be to evaluate whether the offsetting projects are meeting the performance targets set out in the offsetting plan, and that the Project is successful in resulting in no net loss of fisheries productivity. In addition to monitoring offsetting projects, fish and fish habitat directly affected by the creation of Fish Offsetting Plan components will be monitored during construction to ensure that no additional effects are incurred on existing fisheries species.

The following Sections 4.1 and 4.2 outline the monitoring programs for the fish offsetting concepts outlined in chapter 3.

4.1 MARINE FISH OFFSET MONITORING

The marine offset monitoring plan is based upon the DFO approved plan for monitoring artificial marine shoals in a nearby project in Nunavut (Rescan 2010b). The two newly created artificial shoals would be placed on fine marine sediment and two natural rock shoals and two fine marine sediment sites will be chosen as control/reference sites.

The marine shoal monitoring program will assess the following according to the schedule set out in Table 4.1-1:

- Structural stability of artificial shoals.
- Sediment transport within the bay containing artificial shoals.
- Primary productivity.
- Invertebrate colonization and use.
- Fish use.

Table 4.1-1. Schedule of Marine Fish Offset Monitoring Program

	Sampling Locations		Monitoring Years (Post-construction)			
Sampling Program	**Artificial Marine Shoals**	**Reference Sites**	**Year 1**	**Year 2**	**Year 5**	**Year 6**
Physical parameters						
Stability of project works	X		X	X	X	X
Sediment transport	X		X	X	X	X
Biological parameters						
Primary productivity	X	X	X	X	X	X
Marine invertebrate use	X	X	X	X	X	X
Fish use	X	X	X	X	X	X

Physical Sampling

The physical conditions at the in-water infrastructure and offsetting sites will be monitored according to the schedule set out in Table 4.1-1. The structural stability of the jetty and rock shoals will be monitored visually and photographed to ensure that they are functioning as designed. Nearshore sediment transport around the jetty will be assessed using staff gauges installed at locations proximate to the shoals. Staff gauge data collected each sampling year will be compared to the first year of collection to document changes in sediment transport through time post-construction.

Biological Sampling

To evaluate the offsetting project's success for no net loss of fisheries productivity, primary production (as Chl *a*), algal community composition, invertebrate community composition and fish community composition will be compared to two reference habitat types (natural rocky shoals and fine marine sediments) using a Control-Impact design. The marine shoals will be considered successful once invertebrate and fish community structure and size are found to be: 1) greater than that found in reference fine sediment sites, or 2) indistinguishable to that found at reference rocky shoals.

4.2 FRESHWATER FISH OFFSET MONITORING

4.2.1 Rascal Lake to Goose Lake Stream Realignment Option

The proposed monitoring program includes measuring stream flow, temperature, water and sediment quality, primary productivity, benthic invertebrate community composition, and fish biology and habitat use. During the baseline year this data would be collected in both the enhanced western stream and the pre-construction eastern stream connecting Rascal Lake to Goose Lake.

A general schedule of sampling parameters is presented in Table 4.2-1. Not all parameters are scheduled to be sampled in each monitoring year, but rather at intervals which allow the stream community to establish and which promotes quantitative assessment of the offsetting program's effectiveness.

Table 4.2-1. Sampling Components and Frequency for the Rascal-Goose Stream Realignment Monitoring Program

Offsetting Project	Sampling Program	Baseline	Monitoring Years			
			Year 1	Year 2	Year 5	Year 6
Rascal Lake to Goose Lake Stream Realignment (Section 3.2.1)	**Physico-chemical parameters**					
	Stream flow	X	X	X	X	X
	Water quality[1]		X	X	X	X
	Sediment quality[1]		X	X	X	X
	Biological parameters					
	Primary productivity	X	X	X	X	X
	Benthic invertebrates	X	X	X	X	X
	Number of Arctic Grayling spawners[2]	X	X	X	X	X
	Visual counts of Arctic Grayling fry[2]	X	X	X	X	X
	Number of outmigrant Arctic Grayling[2]	X	X	X	X	X

Note: Monitoring of project construction is not included, but required for all projects;
[1] Baseline data collected in 2013;
[2] Sampling of Arctic Grayling spawners and outmigrants will be done in both the eastern and western channels of the stream from Rascal to Goose Lake in the baseline sampling year;

Physico-chemical Sampling

Stream Flow, Water Quality and Sediment

Stream velocity/depth measurements will be taken at the upstream and downstream ends of the enhanced stream to ensure the flow conditions are within the range of values to support the Arctic Grayling life cycle. In addition to measurements take at the outflow of Rascal Lake and inflow of Goose Lake, velocity measurements will be taken at multiple locations grouped by habitat type which will be determined post-construction.

Water temperatures will be monitored with stationary data loggers installed in the enhanced stream and wetland. Wetted and bankfull stream depth and width measurements will be taken at the outflow of Rascal Lake and inflow of Goose Lake. To ensure water and sediments fall within CCME guidelines for aquatic life, water and sediment quality will be monitored within the enhanced stream and wetland.

The schedule for each physic-chemical sampling event will be completed according to the schedule set out in Table 4.2-1.

Biological Sampling

Primary Productivity

Periphyton samples will be collected to determine the primary productivity (using Chl *a*) and community composition. Periphyton plates will be used at three sites: the outflow of Rascal Lake, the inflow of Goose Lake and at two locations within the enhanced wetland. Three replicates will be placed at each location. Samplers will be submerged at the end of July and recovered in late August or early September.

Benthic Invertebrates

Designated sampling locations for benthic invertebrate community structure will be located next to the locations selected for periphyton sampling stations. Benthic invertebrates will be collected using Hester-Dendy samplers to document invertebrate colonization. Samplers will be submerged at the end of July and recovered in late August or early September of each sampling year (Table 4.2-1). Three replicate samples will be collected within 15 m of each designated location.

Number and Biological Characteristics of Spawners

Spring migration of adult spawners through the enhanced stream will be enumerated using fish boxes according to the schedule set out in Table 4.2-1. In the enhanced stream, one fish box net will be located at the outlet of Rascal Lake, and another fish box net will be located at the inflow to Goose Lake. In addition, ratios of visual-survey-fish-counts to box-trap-counts will also be calculated to account for potential visual underestimation during the spring spawner surveys.

The fish boxes will be visited (by biologists) once each day during peak spawning migration and once every two days after peak migration. During each visit, all fish will be counted, identified to species, sub-sampled for length and weight, and released in the direction they were swimming. All Arctic Grayling ≥ 170 mm long will be tagged with a unique T-bar Floy Tag attached below the dorsal fin. Tagging of Arctic grayling will allow for evaluation of fish movement patterns and time spent rearing in the channel, and it will also provide further insights into the overwintering potential of Rascal Lake and Goose Lake.

Fish Surveys

Fish surveys will be conducted according to the schedule set out in Table 4.2-1. Emergent Arctic Grayling fry will be enumerated in mid-July to help determine if the enhanced stream diversion is being used successfully for spawning. Fry will be counted using walking surveys of the enhanced stream and the reference stream. Subsequent dipnet/pole seine surveys will used to determine fish-size-at-sampling-date. These data will allow for the direct comparisons of fry health and growth between the enhanced western channel and baseline measurements taken at the eastern channel. Electrofishing surveys also will be conducted to determine which fish species utilize the newly created habitat in the enhanced stream. These electrofishing surveys will take place in mid-August at the same locations as used for the dipnet/pole seine surveys, though additional fry length/weight measurements will be made during the electrofishing surveys.

Number and Biological Characteristics of Outmigrants

Juvenile fish movement through the enhanced stream prior to winter freeze-up will be monitored using fyke nets. Two nets will be installed from early July until mid-October: one at the outlet of Rascal Lake and a second located at the inflow to Goose Lake. All fyke nets will be visited (by biologists) once each day during peak outmigration, and once every two days after peak migration. During each visit, all fish will be counted, identified to species, sub-sampled for length and weight, and released in the direction they were swimming. Fyke nets will allow for the determination of stream residence time of fry and juvenile fish, as well as the total growth of fry during their stream residence.

<u>Evaluating Success of the Offsetting Project</u>

To evaluate the offsetting project's success for no net loss of fisheries productivity, primary production (as Chl*a*), periphyton community composition, invertebrate community composition and fish use parameters will be compared to baseline conditions using a Before-After/Control-Impact (BACI) design. Temporal trends in measured parameters will also be examined.

The offsetting project will be considered successful if parameters measured in the western stream are found to be: 1) greater than that found during baseline conditions in the western stream (before-after), 2) indistinguishable to that found during baseline conditions in the eastern stream (control-impact), and 3) improve over successive sampling intervals post-construction (trends through time).

4.2.2 Canyon Lakes Berm

The proposed monitoring program includes stability surveys, stream flow measurements, water and sediment quality, primary productivity, benthic invertebrate community composition, and fish community composition, biology and habitat use.

A general schedule of sampling parameters is presented in Table 4.2-2. Not all parameters are scheduled to be sampled in each monitoring year, but rather, at intervals which allow the ecological community to establish and which promotes quantitative assessment of the offsetting program's effectiveness. For example, the lake perimeter survey and bathymetry and habitat surveys are scheduled to occur twice in the monitoring period because changes in these parameters are not expected over short time scales.

<u>Physico-chemical Sampling</u>

Lake Perimeter Survey

The lake perimeter will be surveyed prior to berm construction and lake inundation to provide detailed information on the structure of the shoreline and newly created littoral habitat after lake expansion. The surveyed area will include the side slopes of canyon walls around the perimeter of the lake, so that shoreline stability can be monitored. All surveys will be tied in to local survey benchmarks.

Table 4.2-2. Sampling Components and Frequency for the Canyon Lakes Berm Monitoring Program

Offsetting Project	Sampling Program	Baseline	Monitoring Years			
			Year 1	Year 2	Year 5	Year 6
Canyon Lakes Berm (Section 3.2.2)	**Physico-chemical parameters**					
	Lake perimeter survey	X	X		X	
	Bathymetry[1] and habitat survey	X	X		X	
	Stability of berm		X	X	X	X
	Discharge and water level		X	X	X	X
	Water quality	X	X	X	X	X
	Sediment quality	X	X	X	X	X
	Biological parameters					
	Primary productivity	X	X	X	X	X
	Benthic invertebrates	X	X	X	X	X
	Fish community, population, biology	X	X	X	X	X
	Spawning survey			X	X	X

Note: Monitoring of project construction is not included, but required for all projects;
[1] Baseline data collected in 2013.

Bathymetry and Habitat Survey

Bathymetric surveys will be used to track subsurface stability of lake slopes and habitat features including spawning shoals. These surveys will be performed while following established transects. Sampling locations along transects will be closely spaced to provide accurate surveys with good data coverage.

Bathymetric assessments will be completed according to the schedule set out in Table 4.2-2. The frequency of surveys will be reassessed instability is observed.

Visual Stability Assessment

During each year of monitoring, a visual inspection of the berm will be completed. Detailed notes and photographs will be collected and compared to previous assessments. The berm will be assessed for all signs of structural instability. The stability of fish habitat features will be visually assessed and photographed.

Discharge and water level

A hydrometric monitoring station will be installed and operated throughout the year to track the water level and discharge rate of the lake.

Water and Sediment Quality

To ensure water quality and sediment quality fall within CCME guidelines for aquatic life after the lakes have been inundated, metal concentrations will be monitored within each canyon lake. One water quality station will be set up in each canyon lake and additional measurements of dissolved oxygen (DO) and temperature profiles will also be collected.

Biological Sampling

Primary Productivity

Periphyton samples will be collected to determine the primary productivity (using Chl *a*) and community composition. Periphyton plates will be used at three sites within each lake and within the stream channel created on the berm. Three replicates will be placed at each location. Samplers will be submerged at the end of July and recovered in late August or early September.

Benthic Invertebrates

Designated sampling locations for benthic invertebrate community structure will be located next to the locations selected for periphyton sampling stations. Hester-Dendy samplers will be used to provide results on short-term invertebrate colonization. Samplers will be submerged at the end of July and recovered in late August or early September of each sampling year (Table 4.2-2). Three replicate samples will be collected within 15 m of each designated location.

Fish Community, Population and Biology

The goal of fish community and biological sampling is to determine if fish productivity for targeted species (Lake Trout and Arctic Grayling) increases. To accomplish this, several community, population and individual level parameters will be assessed in each lake by stratified random gillnetting each sampling year (Table 4.2-2). Overall fish community and composition in each of the canyon lakes will be assessed using overall catch per unit effort (CPUE) and species relative species abundance. Population abundance and structure will be examined through species specific CPUE, and length and age frequency analysis. Fish health and condition will be examined using condition (i.e., weight-length regression) and external examination for deformities, eroded fins, lesions, and tumours (DELT).

Spawning Survey

A survey of Lake Trout spawning along the up and downstream edges of the constructed berm will be accomplished starting the second year post-construction. Spawning surveys will be conducted in September of each sampling year found in Table 4.2-2. Surveys will consist of underwater video capture, or snorkel survey, both at night and during daylight to document spawning, egg deposition, and substrate rubbing. Short-term gillnetting with small mesh gillnets will be used to confirm reproductive status of individuals caught on spawning sites. Egg nets or mats will be used to collect and enumerate the Lake Trout spawning.

Evaluating Success of the Offsetting Project

To evaluate the offsetting project's success for no net loss of fisheries productivity, primary production (as Chl *a*), periphyton community composition, invertebrate community composition and fish community, population and biology parameters will be compared to baseline conditions using a Before-After design and by examining temporal trends.

The offsetting project will be considered successful if post-construction parameters measured are found: 1) to be greater than that found during baseline conditions (before-after), or 2) to increase over successive sampling intervals post-construction (trends through time). In addition, successful Lake Trout spawning on newly created spawning habitat will also confirm the success of the offsetting project.

4.2.3 Bathurst Lake Arctic Char Passage

The proposed Bathurst Lake monitoring program includes stability surveys, stream flow measurements, primary productivity, benthic invertebrate community composition, fish community composition, and Arctic Char biology and monitoring of migratory patterns.

A general schedule of sampling parameters is presented in Table 4.2-3. All parameters are not scheduled to be sampled in each monitoring year, but rather, at intervals which allow ecological community to establish and promote quantitative assessment of the offsetting program's effectiveness.

Table 4.2-3. Sampling Components and Frequency for the Bathurst Lake Arctic Char Passage Monitoring Program

Offsetting Project	Sampling Program	Baseline	Monitoring Years			
			Year 1	Year 2	Year 5	Year 6
Bathurst Lake Arctic Char Passage (Section 3.2.3)	**Physical parameters**					
	Stability of project works		X	X	X	X
	Stream flow project works		X	X	X	X
	Biological parameters					
	Primary productivity (periphyton and phytoplankton) [1]	X	X	X	X	X
	Invertebrates (benthos and zooplankton) [1]	X	X	X	X	X
	Fish community structure[1]	X	X	X	X	X
	Arctic Char population structure[1]	X	X[2]	X[2]	X[2]	X[2]
	Number of migrant Arctic Char[1]	X	X	X	X	X

Note: Monitoring of project construction is not included, but required for all projects;
[1] *Baseline sampling for Bathurst Lake should be done a minimum of 2 years prior to construction to evaluate the programs potential for success;*
[2] *Morphological and genetic sampling of Arctic Char may be removed from monitoring years if no differences are found between freshwater resident and anadromous fish in baseline sampling.*

<u>Physical Sampling</u>

Stability of Project Works

The stability of all modifications to the falls and cascade will be surveyed starting in year 1 post-construction (Table 4.2-3). All surveys will provide photographs at standardized locations which are to be tied in to local survey benchmarks.

Stream Flow Project Works

To ensure the flow conditions are within the range of values to support the Arctic Char migration, stream velocity measurements will be taken at six locations: the outflow of Bathurst Lake, upstream and downstream of the construction sites (falls and cascade), and where the stream discharges into the Western River. In addition, wetted and bankfull stream depth and width measurements will be taken at each site to monitor stream morphology.

<u>Biological Sampling</u>

Primary Productivity

Periphyton samples will be collected to determine the primary productivity (using Chl *a*) and community composition. Periphyton plates will be used at four sites within the stream discharging Bathurst Lake to the Western River: 1) Bathurst Outflow, 2) downstream of the construction site at the falls, 3) downstream of the construction site at the cascade, and 4) upstream of the stream outlet to the Western River. Three replicates will be placed at each location. Samplers will be submerged at the end of July and recovered in late August or early September.

Phytoplankton biomass (measured as Chl *a* concentration) and Secchi depths (water clarity; open-water only) will be measured to assess any changes in Bathurst Lake primary production. Three replicate samples will be taken once per year in August at three station locations in Bathurst Lake, one station near the outflow and two stations located in open water.

Invertebrates: Benthos and Zooplankton

Lower trophic level sampling will be conducted at both stream and lake sites. Stream sampling locations for benthic invertebrate community structure will be positioned next to the locations selected for periphyton sampling stations. Hester-Dendy samplers will be used to provide results on short-term invertebrate colonization. Samplers will be submerged at the end of July and recovered in late August or early September of each sampling year (Table 4.2-3). Three replicate samples will be collected within 15 m of each designated location.

Lake benthic invertebrate community structure will be completed using an Ekman grab at five sites within Bathurst Lake during the month of August in sampling years (Table 4.2-3). Sampling sites will be located: one site within the bay at Bathurst Outflow and four sites chosen near Arctic Char spawning grounds.

Lake zooplankton community structure will be assessed by performing vertical zooplankton tows at the same three stations selected for phytoplankton sampling. For each sampling station, six zooplankton tows will be performed for a total of 18 samples per station. Sampling will be completed in August of each sampling year (Table 4.2-3) coinciding with phytoplankton sampling.

Fish Community Structure

To assess the fish community composition, species relative abundance and CPUE in Bathurst Lake, the stream connecting Bathurst Lake to the Western River, and the Western River, stratified random, non-lethal sampling will be conducted using a variety of gear types, including: gillnets, fyke nets, beach seines and minnow traps and electrofishing, where appropriate.

Biological sampling of 30 individuals of each species will also be conducted to determine the health, size and age structure of populations. This will include collecting data on individual length, weight, condition, age (from scales and fin rays), diet and trophic status (stable isotopes of Carbon and Nitrogen) and DELTs. More detailed biological data will be collected on incidental mortalities, including gonad and liver weight and removing otoliths for aging.

Community structure will be assessed in baseline and monitoring years according to the schedule set out in Table 4.2-3.

Arctic Char Population Structure

Additional data collected on Arctic Char is required to assess and monitor the population structure, morphology, migratory pattern, and population divergence of freshwater residents from Bathurst Lake and anadromous Arctic Char from the Western River. Data collected on Arctic Char captured during the stratified random sampling for fish community structure will be used. However, if sample sizes are insufficient to meet the statistical requirements additional sampling will be completed. A minimum of

30 individuals are required to examine change in mean length, however a minimum sample size of 100 is recommended to examine changes in size classes (Guy and Brown 2007).

In addition to length, weight, condition, age, diet and DELTs, morphological features known to distinguish freshwater resident from anadromous Arctic Char will be made. These measures include: relative body depth, relative head and eye sizes, and gill raker density (Skúlason and Smith 1995; Parsons et al. 2010).

Migratory history (i.e., anadromy or freshwater residence) and population (genetic) divergence of Arctic Char will be examined on samples from 15 randomly selected individuals from Bathurst Lake and in the Western River during baseline, and in Bathurst Lake and at the fish fence during monitoring years (see below). For each individual, migratory history will be assessed using the strontium/calcium (Sr/Ca) ratio found in otoliths. Analyses of the Sr/Ca ratio and the growth ring structure of Arctic Char otoliths allow fisheries biologists to distinguish lake resident from anadromous individuals, and to determine growth rates and life history characteristics (Radtke et al. 1996; Babaluk et al. 2001). Population genetic divergence will be assessed using fin tissue clips preserved in 95% ethanol and then genotyped at 12-18 microsatellite loci (Moore et al. *In Press*).

Arctic Char population structure will be assessed in baseline and monitoring years according to the schedule set out in Table 4.2-3. In the event that freshwater resident Bathurst Lake and anadramous Western River populations are not found distinguishable morphologically or genetically in baseline sampling, morphology and genetics may be removed from the sampling program in monitoring years.

Number of Migrant Arctic Char

The most effective measure of migration of Arctic Char into Bathurst Lake will be achieved by installing and monitoring a fish fence near the outflow of Bathurst Lake. This method involves enumerating adult Arctic Char passing through a fence and trap box over the migratory window from late July to early September in each monitoring year (Table 4.2-3).

Additional biological data will be collected from Arctic Char migrating through the fish fence. These include the marking of individuals with tagged with a unique pit or T-bar Floy Tag to identify and estimate survival in migrants returning in multiple years and non-lethal measurements of length, weight, age and DELTs to monitor changes in fish health.

<u>Evaluating Success of the Offsetting Project</u>

To evaluate the offsetting project's success for no net loss of fisheries productivity, primary production (as Chl *a*), periphyton community composition, invertebrate community will be compared to baseline conditions using a Before-After design and by examining temporal trends. The number, biology and health of migrants and stability of population structure in Bathurst Lake will be compared using a Before-After design and by examining temporal trends.

The offsetting project will be considered successful if: 1) an anadromous Arctic Char migration into Bathurst Lake is achieved over monitoring years and 2) the biology and health of Arctic Char in Bathurst Lake remains the same or improves over baseline conditions or with time (before-after). In addition, successful fish offsetting will be achieved if post-construction parameters of primary production and lower trophic level community structure are found to be: a) greater than that found during baseline conditions (before-after), or b) increase over successive sampling intervals post-construction (trends through time).

4.3 ADAPTIVE MANAGEMENT

Once the monitoring programs demonstrate that the enhanced features are functioning as intended no further monitoring obligations will occur. Any components of which do not function as intended may require additional monitoring and/or remedial activities until the offset habitat is demonstrated to be functioning as intended.

4.4 FISH-OUT PROGRAM

A fish-out program will be carried out for any lakes that are lost as a result of the Project. The fish-out program would follow DFO's *General Fish-Out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut* (Tyson et al. 2011). A fish-out or the removal of fish from a waterbody offers a unique opportunity to gather information on lake productivity and the fish community, as well as avoid any "wastage" by making the fish available for traditional use by local communities (Tyson et al. 2011).

The DFO fish-out program protocol is divided into three components:

1. Fish Community, this is divided into three phases:
   - Marking Phase (part of a mark-recapture study).
   - Catch-per-Unit-Effort (CPUE)/Recapture Phase.
   - Final Removal Phase.
2. Aquatic Biology and Limnology.
3. Habitat Inventory.

In addition to following the DFO protocols for a fish-out, Sabina would collaborate with communities to involve interested parties in the program with the possibility to distribute fish for human or dog consumption.

4.4.1 Fish Community

<u>Marking Phase</u>

The Marking Phase is the first part of a mark-recapture study that will provide a population estimate for large-bodied fish, and help determine the end-point of the fish-out program. The Marking Phase will occur prior to the fish-out, preferably the year prior to lake dewatering to ensure adequate sampling time. There will be one week of gillnetting after ice-off (June/July), using smaller mesh gillnets of short one-hour sets to reduce mortalities. Nets will be periodically moved to survey all available habitats. All captured fish will be live-released. Additional capture methods, such as angling, may be employed if the mortality rate using gillnets is too high during the marking phase. Captured fish will be identified to species, measured for fork length and weight, noted for any signs of injury/stress, and all healthy fish (Lake Trout and Round Whitefish) will receive a caudal fin clip and a numbered T-bar anchor tag inserted through the dorsal sinus under the base of the dorsal fin. Metals and contaminants will be assessed in a sub-sample of fish by taking a non-lethal tissue biopsy sample after anaesthetization to confirm if fish are safe for transfer or human and/or dog consumption.

<u>CPUE/Recapture Phase</u>

The CPUE/Recapture Phase involves intensively fishing Llama Lake and is the recapture portion of the mark-recapture study. Fishing will occur between July and August of the year that lake dewatering will occur. During this phase, the standard unit of fishing effort remains unchanged (e.g., the duration of net sets are the same). Gillnets (for larger fish) and minnow traps (for smaller fish) will be set for

24 hours. The standard gillnet gang used throughout the CPUE/Recapture Phase will include different mesh sizes to obtain all sizes of fish (e.g., 102 mm [4”], 76 mm [3”], 51 mm [2”], 38 mm [1.5”], 25 mm [1”], and 13 mm [0.5”]). Baited Gee minnow traps fish the littoral zone for smaller fish. The number of nets/traps will vary throughout the fishing period (generally increasing as catches decrease yet depends on crew size) and are set randomly in the lake (only in the littoral zone for the minnow traps). Ideally, the CPUE/Recapture Phase is completed when no fish are captured for 24-48 hours of continuous netting, nets are removed for 48 hours, and then re-deployed for 24-48 hours and fish are still not captured. All fish will be sacrificed, sampled, and distributed to members of the communities. All fish will be identified by species, given a unique fish number, measured for fork length and weight, and the presence of tags (and tag numbers) and fin clips recorded. If the population is large, the following sampling will occur for the first 50 individuals per 20 mm size class (smaller size classes for smaller fish): sex, maturity, reproductive status, ageing structures taken (e.g., otoliths, pectoral fin rays, and scales), note obvious internal and external deformities, erosions, lesions and tumours (DELTs), and collect biological tissues (e.g., gonads, livers, stomachs, muscle tissue (for contaminants and stable isotopes)). All food fish will be eviscerated and prepared to be sent to local communities.

Final Removal Phase

The Final Removal Phase involves capturing the remaining fish using all available gear (plus the same gear as before). This final phase can start once the CPUE Phase is completed (typically between August and September) and can occur when lake dewatering has begun. Biological sampling is the same as the CPUE Phase. The Final Removal Phase is complete when the majority of marked fish have been captured.

4.4.2 Aquatic Biology and Limnology

The Aquatic Biology and Limnology component of the fish-out program includes physical limnology measurements, water quality, chlorophyll *a*, and zooplankton samples. All samples will be collected three times during the fish-out program: July (before the fish-out), August, and September (before dewatering). Benthic invertebrate sampling will be collected once in August, from four different depth intervals and sampling methods will be the same as those outlined in the Aquatic Effects Monitoring Program (AEMP).

4.4.3 Habitat Inventory

The Habitat Inventory component will be conducted using bathymetry and littoral habitat surveys prior to the fish-out in July as well as an additional habitat survey after lake dewatering has begun (e.g., September) to confirm accuracy of the original survey.

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Appendix 2.1-1

Summary of Mean CPUE near the Marine Laydown Area, 2012

Appendix 2.1-1. Summary of Mean CPUE near the Marine Laydown Area, 2012

	Gillnet (no. fish/100 m^2/h)			Long Line (no. fish/number of pairs of hooks/h			Beach Seine (no. fish/100 m^2)			Crab trap (no. fish/day)			Minnow trap (no. fish/day)		
Species	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**
Arctic Cisco	6	1.36	0.53	2	0	0	10	0	0	12	0	0	28	0	0
Arctic Flounder	6	0.1	0.09	2	0	0	10	0.2	0.19	12	0.08	0.27	28	0	0
Broad Whitefish	6	0.07	0.06	2	0	0	10	0	0	12	0	0	28	0	0
Capelin	6	0	0	2	0	0	10	29.39	18.8	12	0	0	28	0	0
Fourhorn Sculpin	6	2	1.81	2	0	0	10	2.17	1.36	12	0	0	28	0.07	0.27
Pacific Herring	6	4.47	2.47	2	0	0	10	0	0	12	0	0	28	0	0
Rainbow Smelt	6	0.48	0.34	2	0	0	10	0	0	12	0	0	28	0	0
Saffron Cod	6	4.42	3.86	2	0.015	0.02	10	0	0	12	0	0	28	0	0
Slender Eelblenny	6	0.24	0.22	2	0	0	10	0.2	0.19	12	0	0	28	0	0
Starry Flounder	6	0.3	0.28	2	0	0	10	32.41	19.52	12	0	0	28	0	0
Ninespine Stickleback	6	0	0	2	0	0	10	0	0	12	0	0	28	0.04	0.19

Appendix 2.2-1

Summary of Mean CPUE in Waterbodies within the Goose and George Properties, 1990, 2010 and 2012

Appendix 2.2-1. Summary of Mean CPUE in Waterbodies within the Goose and George Properties, 1990, 2010 and 2012

Property	Waterbody	Year	Floating Gillnet (no. fish/100 m²/h) n	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	Sinking Gillnet (no. fish/100 m²/h) n	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	Minnow trap (no. fish/day) n	Slimy Sculpin
Goose	Llama Lake	2010	2	0	0.14 (0.19)	0.05 (0.07)	0	3	0	0.14 (0.16)	0	0	0	-
		2011	0	-	-	-	-	11	0	0.19 (0.19)	0.03 (0.09)	0	0	-
		2012	0	-	-	-	-	4	0	0.4 (0.20)	0.98 (0.46)	0	0	-
	Umwelt Lake	2010	1	0.09	0	0	0	2	0.2 (0.27)	0	0.06 (0.09)	0	0	-
		2011	0	-	-	-	-	4	0	0	0.14 (0.29)	0	0	-
		2012	0	-	-	-	-	6	0.07 (0.06)	0.05 (0.05)	0	0	0	-
	Goose Lake	2011	0	-	-	-	-	8	0	0.33 (0.46)	0	0	0	-
		2012	0	-	-	-	-	6	0	0.29 (0.13)	0	0	0	-
	Rascal Lake	2012	0	-	-	-	-	7	0	0.19 (0.08)	0	0	0	-
	Rascal-Goose Inflow	2012	0	-	-	-	-	0	-	-	-	-	0	-
	Llama-Umwelt Inflow	2012	0	-	-	-	-	0	-	-	-	-	0	-
	Pond 1	2011	0	-	-	-	-	2	0	0	0	0	9	0
	Pond 2	2011	0	-	-	-	-	0	-	-	-	-	10	0
	Pond A	2011	0	-	-	-	-	3	0	0	0	0	10	0
	Pond B	2011	0	-	-	-	-	3	0	0	0	0	10	0
	Pond C	2011	0	-	-	-	-	2	0	0	0	0	9	0
	Pond D	2011	0	-	-	-	-	3	0	0	0	0	9	0.11 (0.32)
	Pond E	2011	0	-	-	-	-	0	-	-	-	-	10	0
George	George Lake	1990	0	-	-	-	-	1	X	X	0	0	0	-
		2007	0	-	-	-	-		0	X	0	0		0
		2012	0	-	-	-	-	6	0	0.85 (0.67)	0	0	0	-
	Bob Lake	1990	0	-	-	-	-	1	0	0	0	0	0	-
		2007	0	-	-	-	-		0	X	0	0		0
	Occurrence Lake	2007	0	-	-	-	-		0	0	0	0		0
		2012	0	-	-	-	-	6	0	0	0	0	0	-
	Lytle Lake	1990	0	-	-	-	-	1	0	0	0	0	0	-
		2007	0	-	-	-	-		0	0	0	0		0
		2012	0	-	-	-	-	0	-	-	-	-	0	-
	Sleigh Lake	2012	0	-	-	-	-	0	-	-	-	-	0	-
	George Outflow	1990	0	-	-	-	-	0	-	-	-	-	0	-
		2007	0	-	-	-	-	0	-	-	-	-	0	-
		2012	0	-	-	-	-	0	-	-	-	-	0	-

Note: Each data cell shows mean CUPE followed by standard deviation in parenthesis. Electrofishing results are single observatations derived from the equation shown in the column header

n = number of nets set

dashes indicate data not available

X = fish were present, catch-per-unit-effort could not be determined from the source report (Sekerak 1990; Golder 2007)

Appendix 2.2-1. Summary of Mean CPUE in Waterbodies within the Goose and George Properties, 1990, 2010 and 2012

			Beach Seine (no. fish/100 m^2)						Electrofishing (no. fish/100 s)						Visual Observation	
Property	Waterbody	Year	n	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	Ninespine Stickleback	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	Burbot	Ninespine Stickleback	Arctic Grayling	Lake Trout
Goose	Llama Lake	2010	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		2012	9	0	0	0.97 (0.83)	0.19 (0.12)	0	-	-	-	-	-	-	-	-
	Umwelt Lake	2010	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		2012	2	4.53 (2.01)	0	0	0	0	-	-	-	-	-	-	-	-
	Goose Lake	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		2012	12	0.06 (0.16)	0	1.92 (3.26)	0.04 (0.14)	0.19 (0.45)	-	-	-	-	-	-	-	-
	Rascal Lake	2012	4	0	1.00 (0.47)	0	0	0	-	-	-	-	-	-	-	-
	Rascal-Goose Inflow	2012	0	-	-	-	-	-	0	0	0	0.71	0	1.32	>300	0
	Llama-Umwelt Inflow	2012	0	-	-	-	-	-	1.19	0	0.11	0.65	0	0	>20	0
	Pond 1	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond 2	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond A	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond B	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond C	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond D	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond E	2011	0	-	-	-	-	-	-	-	-	-	-	-	-	-
George	George Lake	1990	2	0	0	0	0	0	-	-	-	-	-	-	-	-
		2007		-	-	-	-	-	-	-	-	-	-	-	-	-
		2012	10	0	0	0	0.21 (0.45)	0	-	-	-	-	-	-	-	-
	Bob Lake	1990	2	0	0	0	0	0	-	-	-	-	-	-	-	-
		2007	0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Occurrence Lake	2007		0	0	0	0	0	-	-	-	-	-	-	-	-
		2012	4	0	0	0	0	0	-	-	-	-	-	-	-	-
	Lytle Lake	1990	1	0	0	0	0	0	-	-	-	-	-	-	-	-
		2007	0	-	-	-	-	-	-	-	-	-	-	-	-	-
		2012	12	0	0	0	0	0	-	-	-	-	-	-	-	-
	Sleigh Lake	2012	12	0.29(0.62)	0	0	0	0	-	-	-	-	-	-	-	-
	George Outflow	1990	1	X	X	0	0	0	-	-	-	-	-	-	-	-
		2007	0	-	-	-	-	-	0.1	0	0	0.194	0.29	0	-	-
		2012	0	-	-	-	-	-	0	0.16	0	0	0	0	0	2

Note: Each data cell shows mean CUPE followed by standard deviation in parenthesis. Electrofishing results are single observatations derived from the equation shown in the column header

n = number of nets set

dashes indicate data not available

X = fish were present, catch-per-unit-effort could not be determined from the source report (Sekerak 1990; Golder 2007)

Appendix 2.2-2

Tabulated Fishing Effort and Catch Numbers between June and August, 2013

Appendix 2.2-2. Tabulated Fishing Effort and Catch Numbers between June and August, 2013

			Floating Gillnet (# fish)					Sinking Gillnet (# fish)					Beach Seine (# fish)					
Property	Waterbody	Year	n	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	n	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	n	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	Ninespine Stickleback
Goose	Propellor	2013	2	0	1	0	0	1	0	3	0	0	-	-	-	-	-	-
	Ref. B	2013	2	0	1	0	0	2	0	3	5	0	-	-	-	-	-	-
	Giraffe	2013	2	0	2	0	0	2	0	7	2	0	-	-	-	-	-	-
	Goose	2013	2	0	0	0	0	2	0	3	0	0	-	-	-	-	-	-
	Propeller Lake	2013	6	0	2	4	0	5	0	1	0	0	-	-	-	-	-	-
	Canyon Lakes	2013	6	4	0	0	0	6	10	7	0	0	-	-	-	-	-	-
	Giraffe inflow	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wasp inflow	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Umwelt-Goose	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gander pond outflow	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gander pond inflow	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Echo lake	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond 1	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond 2	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond D	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pond E	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Llama-Umwelt	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lytle	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Occurrence	2013	2	0	0	0	0	2	0	0	0	0	-	-	-	-	-	-
George	Bob	2013	2	0	0	0	0	2	0	2	0	0	-	-	-	-	-	-
	Komatic	2013	1	0	4	0	0	2	0	6	0	0	-	-	-	-	-	-
	Ref. Q	2013	4	0	4	0	0	4	0		6	0	-	-	-	-	-	-
	George	2013	3	0	6	0	0	5	0	2	0	0	14	6	0	0	4	0
	McCoy	2013	4	0	3	0	0	4	0	6	0	0	-	-	-	-	-	-
	Lytle	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Occurrence	2013	2	1	0	0	0	1	0	0	0	0	-	-	-	-	-	-
	George inflow	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	George outflow	2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Each data cell shows the total number of individuals caught.

The electrofishin effort is estimated from field notes, the final effort will be calculated when all data is analysed for the 2013 Baseline report.

Appendix 2.2-2. Tabulated Fishing Effort and Catch Numbers between June and August, 2013

			Electrofishing (#. fish)							Visual Observation		Angling (# fish)			
Property	Waterbody	Year	n (days)	Arctic Grayling	Lake Trout	Round Whitefish	Slimy Sculpin	Burbot	Ninespine Stickleback	Arctic Grayling	Lake Trout	n (days)	Arctic Grayling	Lake Trout	Round Whitefish
Goose	Propellor	2013	-	-	-	-	-	-	-	0	0	1	0	6	0
	Ref. B	2013	1	0	0	0	20	0	0	0	0	1	0	6	0
	Giraffe	2013	1	0	0	0	39	0	0	0	0	1	0	3	0
	Goose	2013	-	-	-	-	-	-	-	0	0	0	0	0	0
	Propeller Lake	2013	1	3	0	0	10	4	9	0	0	0	0	5	0
	Canyon Lakes	2013	-	-	-	-	21	2	1	0	0	0	2	1	0
	Giraffe inflow	2013	1.5	0	0	0	0	0	0	0	0	-	-	-	-
	Wasp inflow	2013	0.5	1	0	0	1	0	0	0	0	-	-	-	-
	Umwelt-Goose	2013	1	0	0	0	0	0	0	0	0	-	-	-	-
	Gander pond outflow	2013	1.5	1	0	0	1	1	14	0	0	-	-	-	-
	Gander pond inflow	2013	0.5	0	0	0	0	0	0	0	0	-	-	-	-
	Echo lake	2013	0.5	0	0	0	0	0	0	0	0	-	-	-	-
	Pond 1	2013	0.5	0	0	0	0	0	1	0	0	-	-	-	-
	Pond 2	2013	0.5	0	0	0	0	0	0	0	0	-	-	-	-
	Pond D	2013	0.5	0	0	0	0	0	0	0	0	-	-	-	-
	Pond E	2013	0.5	0	0	0	0	0	0	0	0	-	-	-	-
	Llama-Umwelt	2013	0.5	2	0	0	2	0	2	0	0	-	-	-	-
	Lytle	2013	0.5	0	0	0	0	0	0	0	0	0	0	0	0
	Occurrence	2013	0.5	0	0	0	0	0	0	0	0	0	0	1	0
George	Bob	2013	0.5	0	1	0	0	0	0	0	0	-	-	-	-
	Komatic	2013	1	0	2	0	34	0	0	0	0	-	-	-	-
	Ref. Q	2013	2	0	0	0	32	0	0	0	0	-	-	-	-
	George	2013	2	0	0	0	34	0	0	0	0	-	-	-	-
	McCoy	2013	1	0	0	0	22	0	0	0	0	-	-	-	-
	Lytle	2013	1	0	0	0	0	0	0	0	0	-	-	-	-
	Occurrence	2013	1	0	0	0	0	0	0	0	0	-	-	-	-
	George inflow	2013	0.5	10	1	0	3	0	0	0	0	-	-	-	-
	George outflow	2013	0.5	0	1	0	0	0	0	0	0	-	-	-	-

Note: Each data cell shows the total number of individuals caught.
The electrofishin effort is estimated from field notes, the final effort will be calculated when all data is analysed for the 2013 Baseline report.

Appendix 2.2-3

Habitat Unit Loss in Llama Lake

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Appendix 2.2-3. Habitat Unit Loss in Llama Lake

Species	Habitat Type	Habitat Area (ha)	Spawning/Nursery		Rearing		Foraging		Overwintering		Total	
			HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA	SWHU
Lake Trout	Nearshore with fines (< 2.5 m)	5.85	0.00	0.0	0.00	0.0	0.25	1.5	0.00	0.0	1.5	0.6
	Nearshore with large substr. (< 4 m)	17.56	0.25	4.4	0.50	8.8	0.50	8.8	0.25	4.4	26.3	10.5
	Deepwater (> 4 m) plus > 2.5 with fines	13.17	0.25	3.3	0.25	3.3	0.50	6.6	0.75	9.9	23.1	9.2
	Lake Trout Total	**36.59**		**7.7**		**12.1**		**16.8**		**14.3**	**50.9**	**20.3**
Round Whitefish	Nearshore with fines (< 2.5 m)	5.85	0.00	0.0	0.00	0.0	0.25	1.5	0.00	0.0	1.5	0.9
	Nearshore with large substr. (< 4 m)	17.56	0.25	4.4	0.50	8.8	0.50	8.8	0.25	4.4	26.3	15.8
	Deepwater (> 4 m) plus > 2.5 with fines	13.17	0.25	3.3	0.25	3.3	0.25	3.3	0.75	9.9	19.8	11.9
	Round Whitefish Total	**36.59**		**7.7**		**12.1**		**13.5**		**14.3**	**47.6**	**28.5**
Grand Total		**36.59**		**15.4**		**24.1**		**30.4**		**28.5**	**98.4**	**48.9**

Notes: LT = Lake Trout, RW = Round Whitefish, HSI = Habitat Suitability Index, WSA = Weighted Suitable Area, SWHU = Species Weighted Habitat Units

Appendix 2.2-4

Habitat Loss in Rascal to Goose Stream

Appendix 2.2-4. Habitat Loss in Rascal to Goose Stream

Species	Habitat Type	Habitat Area (ha)	Spawning		Nursery		Rearing		Foraging		Total WSA
			HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	
Arctic Grayling	Organics	0	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines	0	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Gravel	0	1.00	0.0000	0.50	0.0000	0.25	0.0000	0.25	0.0000	0.000
	Cobble	0.1365	0.00	0.0000	0.50	0.0683	1.00	0.1365	1.00	0.1365	0.341
	Boulder	0.0455	0.00	0.0000	0.25	0.0114	0.75	0.0341	0.75	0.0341	0.080
	Bedrock	0	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Bedrock/Boulder	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Bedrock/Cobble	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Organics	0	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines/Gravel	0	0.75	0.0000	0.75	0.0000	0.25	0.0000	0.25	0.0000	0.000
	Fines/Cobble	0	0.00	0.0000	0.75	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Boulder	0	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Cobble/Boulder	0	0.00	0.0000	0.25	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Cobble	0	0.75	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Boulder	0	0.50	0.0000	0.25	0.0000	0.75	0.0000	0.75	0.0000	0.000
Total Area		0.182									
Total HU											**0.421**

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Appendix 2.2-5

Habitat Loss in Lytle Lake

Appendix 2.2-5. Habitat Loss in Lytle Lake

Species	Habitat Type	Habitat Area (ha)	Spawning/Nursery		Rearing		Foraging		Overwintering*		Total WSU
			HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	
Arctic Grayling	Nearshore with fine sediment (< 2.5 m)	0.719	0.000	0.000	0.000	0.000	0.250	0.180	0.000	0.000	0.180
	Nearshore with large substrate (< 4 m)	0.811	0.000	0.000	0.500	0.405	0.500	0.405	0.250	0.000	0.811
	Deepwater (> 4 m) plus > 2.5 m with fine sedim	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.750	0.000	0.000
Total		1.530		0.000		0.405		0.585		0.000	0.991

*Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area, *Overwintering WSA set to zero because lake freezes to bottom in winter*

Appendix 2.2-6
Habitat Loss in Occurrence Lake

Appendix 2.2-6. Habitat Loss in Occurrence Lake

Species	Habitat Type	Habitat Area (ha)	Spawning/Nursery		Rearing		Foraging		Overwintering*		Total WSA
			HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	
Arctic Grayling	Nearshore with fine sediment (< 2.5 m)	0.562	0.000	0.000	0.000	0.000	0.250	0.141	0.000	0.000	0.141
	Nearshore with large substrate (< 4 m)	0.178	0.000	0.000	0.500	0.089	0.500	0.089	0.250	0.000	0.178
	Deepwater (> 4 m) plus > 2.5 m with fine sedime	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.750	0.000	0.000
Total		0.740		0.000		0.089		0.229		0.000	0.318

*Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area, *Overwintering WSA set to zero because lake freezes to bottom in winter*

Appendix 2.2-7

Habitat Loss in George Outflow

Appendix 2.2-7. Habitat Loss in George Outflow

Species	Habitat Type	Habitat Area (ha)	Spawning		Nursery		Rearing		Foraging		Total WSA
			HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	
Arctic Grayling	Organics	0	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines	0	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Gravel	0	1.00	0.0000	0.50	0.0000	0.25	0.0000	0.25	0.0000	0.000
	Cobble	0	0.00	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Boulder	0.408	0.00	0.0000	0.25	0.1020	0.75	0.3060	0.75	0.3060	0.714
	Bedrock	0	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Bedrock/Boulder	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Bedrock/Cobble	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Organics	0	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines/Gravel	0	0.75	0.0000	0.75	0.0000	0.25	0.0000	0.25	0.0000	0.000
	Fines/Cobble	0	0.00	0.0000	0.75	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Boulder	0.008	0.00	0.0000	0.50	0.0040	0.50	0.0040	0.50	0.0040	0.012
	Cobble/Boulder	0	0.00	0.0000	0.25	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Cobble	0	0.75	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Boulder	0	0.50	0.0000	0.25	0.0000	0.75	0.0000	0.75	0.0000	0.000
Total Area		0.416									
Total HU											**0.714**

Appendix 3.2-1
Habitat Budget Methods

Appendix 3.2-1. Habitat Budget Methods

HABITAT EVALUATION PROCEDURE (HEP)

For this conceptual compensation plan, HEP was utilized to construct a habitat budget (USFWS 1980). HEP is a generalized procedure for assessing habitat suitability in streams and lakes. By multiplying habitat area (measured in m^2) by a Habitat Suitability Index (HSI, no units), the HEP produces Habitat Units (HU) that are indices of both habitat quantity and quality. HU are the currency of habitat budgeting and compensation planning.

HEP is a tool for developing habitat budgets for compensation planning in Canada (e.g., Diavik 1998; BHP Billiton 2002; RL&L/Golder 2003; Rescan 2005; Rescan 2007; Rescan 2010). The HEP approach has two advantages. First, it provides an objective method to characterize the quality or importance of affected habitats to fish species and aquatic resources. Second, it allows standardization of habitat quality ratings relative to other habitats that have different physical characteristics (e.g., lakes versus streams). This facilitates comparisons among habitat types and ultimately allows affected habitats to be evaluated as a single group for the compensation calculation.

Where the Project causes a PAD, affected habitats are quantified and characterized in terms of their importance to fish. The compensation plan components are based on the type of habitat affected. Compensation of newly created habitat for lost habitat is based upon the estimation of HUs lost. Overall, the HEP is based upon the suitability of a habitat type to support different life history stages of a species. HSIs, derived primarily from scientific literature, are used to quantify the suitability of the habitat type to support each critical life history stage.

There are four steps in HEP that are followed in the development of a fish habitat compensation plan:

1. Initial scoping of the study area and relevant species. This includes brief reviews of the life histories of relevant species, followed by justification of the decision to base habitat compensation planning on certain species habitat requirements.
2. Utilization and/or development of HSI models for target fish species.
3. Habitat assessment of the Project area and of the proposed compensatory works.
4. Preparation of a budget of lost and gained HUs.

The ratio of compensation area to PAD area is dependent on the value of the habitat destroyed as well as the value of the proposed compensation habitat. For example, high quality habitat may require additional compensation area in order to ensure no net loss of productive capacity. Alternatively, low quality habitat may be replaced with a smaller area of higher quality habitat. The value of the habitat is multiplied by the area of the compensation or PAD to create HUs which are used to construct the habitat budget.

Multiple species may be affected by habitat loss or benefit from compensation projects, depending upon site specific habitat. For each water body, the number of HUs for each life stage within a species is calculated as the Weighted Suitable Area (WSA) for each habitat type. The WSA is the product of the surface area of the habitat type and the Habitat Suitability Index (HSI) for a particular life-stage. Surface area for each habitat was obtained using polygon area traced from habitat maps. The life-stage specific WSAs are then summed to obtain a total number of HUs for that species. This species specific HU is then weighted by the relative abundance of the species resulting in a Species Weighted Habitat Unit (SWHU). Finally, a grand total of the HUs affected is calculated for a water body by summing all SWHUs over all species in that waterbody. To be comparable with the HUs calculated for the compensated projects, all target species are included for HU calculation.

HABITAT SUITABILITY INDICES (HSI) MODEL

Model Selection

There are no established and uniformly accepted regional HSI models for northern Mining Projects. Each compensation project adjusts existing models to the specific habitat and fish species being negatively affected. For this conceptual compensation plan, the HSI models were adapted from three sources: the Doris North Project (Golder 2007); the Gahcho Kue Project (Golder 2012); and the Ekati Diamond Mine (Rescan 2010).

Habitat categories for lakes were taken from the Doris North model. Doris North's *No Net Loss Plan* refined the lake trout HSI model developed for the Diavik Diamond Project (1998) and also used in the Snap Lake Project (De Beers 2002). The Doris North HSI lake habitat model was determined to be most appropriate because, in addition to being close geographically, lakes within the Back River Project area are more biologically and physically similar to lakes within the Doris North Project area than other Project areas.

The HSI values for Lake Trout, Round Whitefish and Arctic Grayling were modified from Gaucho Kue (Golder 2012; Appendix 3.2-2 in this report). The Gaucho Kue Project developed HSI models for species occurring at northern mining projects in consultation with DFO. The models were updated primarily from those developed for Snap Lake. For habitats and species not included in the Snap Lake assessment, new HSI curves were developed based on general life history requirements for fish species in the north (Richardson et al. 2001).

Stream habitat types and HSI models for Arctic Grayling were developed from previously successful methods for northern mining projects (Debeers 2002; Diavik 1998; Evans et al. 2002; Golder 2012; Stewart et al. 2007).

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Appendix 3.2-2

Habitat Suitability Indices

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Appendix 3.2-2. Habitat Suitability Indices

Habitat Suitability Indices and Descriptions	
HSI Value	**Habitat Description**
1.00	Optimal
0.75	Above Average
0.50	Average
0.25	Below Average
0.00	**Unsuitable**

Note: HSI = Habitat Suitability Index

Lake Habitat Suitability Indices by Habitat Type					
Species	**Habitat Type**	**Spawning/Nursery**	**Rearing**	**Foraging**	**Overwintering**
Lake Trout	Nearshore with fine sediment (< 2.5 m)	0.00	0.00	0.25	0.00
	Nearshore with large substrate (< 4 m)	0.25	0.50	0.50	0.25
	Deepwater (> 4 m) plus > 2.5 m with fine sediment	0.25	0.25	0.50	0.75
Round Whitefish	Nearshore with fine sediment (< 2.5 m)	0.00	0.00	0.25	0.00
	Nearshore with large substrate (< 4 m)	0.25	0.50	0.50	0.25
	Deepwater (> 4 m) plus > 2.5 m with fine sediment	0.25	0.25	0.25	0.75
Arctic Grayling	Nearshore with fine sediment (< 2.5 m)	0.00	0.00	0.25	0.00
	Nearshore with large substrate (< 4 m)	0.00	0.50	0.50	0.25
	Deepwater (> 4 m) plus > 2.5 m with fine sediment	0.00	0.00	0.25	0.75

Stream Habitat Suitability Indices by Habitat Type					
Species	**Habitat Type**	**Spawning**	**Nursing**	**Rearing**	**Foraging (adult)**
Arctic Grayling	Organics	0.00	0.25	0.00	0.00
	Fines	0.00	1.00	0.00	0.00
	Gravel	1.00	0.50	0.25	0.25
	Cobble	0.00	0.50	1.00	1.00
	Boulder	0.00	0.25	0.75	0.75
	Bedrock	0.00	0.00	0.00	0.00
	Bedrock/Boulder	0.00	0.00	0.50	0.50
	Bedrock/Cobble	0.00	0.00	0.50	0.50
	Fines/Organics	0.00	1.00	0.00	0.00
	Fines/Gravel	0.75	0.75	0.25	0.25
	Fines/Cobble	0.00	0.75	0.50	0.50
	Fines/Boulder	0.00	0.50	0.50	0.50
	Cobble/Boulder	0.00	0.25	1.00	1.00
	Gravel/Cobble	0.75	0.50	1.00	1.00
	Gravel/Boulder	0.50	0.25	0.75	0.75

Source: Diavik 1998; Debeers 2002; Stewart et al. 2007; Golder 2013; Mainstream Aquatics 2004; Evans et al. 2002

Appendix 3.2-3

Habitat Gain in Proposed Rascal Lake to Goose Lake Stream Realignment

Appendix 3.2-3. Habitat Gain in Proposed Rascal Lake to Goose Lake Stream Realignment.

A. Natural conditions at stream

		Habitat	Spawning		Nursery		Rearing		Foraging		Total
Species	Habitat Type	Area (ha)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Arctic Grayling	Organics	0.000	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines	0.181	0.00	0.0000	1.00	0.1810	0.00	0.0000	0.00	0.0000	0.181
	Gravel	0.013	1.00	0.0129	0.50	0.0065	0.25	0.0032	0.25	0.0032	0.026
	Cobble	0.039	0.00	0.0000	0.50	0.0194	1.00	0.0388	1.00	0.0388	0.097
	Boulder	0.026	0.00	0.0000	0.25	0.0065	0.75	0.0194	0.75	0.0194	0.045
	Bedrock	0	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Bedrock/Boulder	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Bedrock/Cobble	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Organics	0	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines/Gravel	0	0.75	0.0000	0.75	0.0000	0.25	0.0000	0.25	0.0000	0.000
	Fines/Cobble	0	0.00	0.0000	0.75	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Boulder	0	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Cobble/Boulder	0	0.00	0.0000	0.25	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Cobble	0	0.75	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Boulder	0	0.50	0.0000	0.25	0.0000	0.75	0.0000	0.75	0.0000	0.000
Total Area		0.2585									
Total HU											**0.349**

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area, habitat in this section will be considered lost in calculation of total habitat gained.

B. Value of stream after enhancement

		Habitat	Spawning		Nursery		Rearing		Foraging		Total
Species	Habitat Type	Area (ha)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Arctic Grayling	Organics	0.000	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines	0.026	0.00	0.0000	1.00	0.0259	0.00	0.0000	0.00	0.0000	0.026
	Gravel	0.065	1.00	0.0646	0.50	0.0323	0.25	0.0162	0.25	0.0162	0.129
	Cobble	0.129	0.00	0.0000	0.50	0.0646	1.00	0.1293	1.00	0.1293	0.323
	Boulder	0.038775	0.00	0.0000	0.25	0.0097	0.75	0.0291	0.75	0.0291	0.068
	Bedrock	0	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Bedrock/Boulder	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Bedrock/Cobble	0	0.00	0.0000	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Organics	0	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.000
	Fines/Gravel	0	0.75	0.0000	0.75	0.0000	0.25	0.0000	0.25	0.0000	0.000
	Fines/Cobble	0	0.00	0.0000	0.75	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Fines/Boulder	0	0.00	0.0000	0.50	0.0000	0.50	0.0000	0.50	0.0000	0.000
	Cobble/Boulder	0	0.00	0.0000	0.25	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Cobble	0	0.75	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.000
	Gravel/Boulder	0	0.50	0.0000	0.25	0.0000	0.75	0.0000	0.75	0.0000	0.000
Total Area		0.2585									
Total HU											**0.546**

Note: Proposed enhancement will result in a substrate composition of 50% cobble, 25% gravel, 15% boulder and 10% fines

C. Value of new wetland

Gain of Habitat Units Calculated for Arctic Grayling in Rascal Lake to Goose Lake Stream Realignment Option										
	Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
Habitat Type	Area (ha)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Pond B										
Nearshore with fines (< 2.5 m)	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.00	0.0	0.0
Nearshore with large substr. (< 4 m)	5.65	0.00	0.0	0.50	2.8	0.50	2.8	0.25	0.0	5.7
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	**5.65**		**0.0**		**2.8**		**2.8**		**0.0**	**5.7**

Note: Overwintering WSA was set to zero to reflect the high liklihood that ponds will freeze to bottom in winter

Appendix 3.2-4
Habitat Gain in Canyon Lakes Offset Project

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Appendix 3.2-4. Habitat Gain in Canyon Lakes Offset Project

Canyon Lake 2

		Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering*		Total
Species	**Habitat Type**	**Area (ha)**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**WSA**
Lake Trout	Nearshore (< 4 m)	1.68	0.25	0.42	0.50	0.84	0.50	0.84	0.25	0.42	2.52
	Deepwater (> 4 m)	1.135	0.25	0.28375	0.25	0.28375	0.50	0.5675	0.75	0.85125	1.98625
	Lake Trout Total			0.70375		1.12375		1.4075		1.27125	4.50625
Arctic Grayling	Nearshore (< 4 m)	1.68	0.00	0	0.50	0.84	0.50	0.84	0.25	0.42	2.1
	Deepwater (> 4 m)	1.135	0.00	0	0.00	0	0.25	0.28375	0.75	0.85125	1.135
	Arctic Grayling Total			0		0.84		1.12375		1.27125	3.235
Total Area		2.815									
Total HU				0.70375		1.96375		2.53125		2.5425	**7.74125**

Canyon Lake 3

		Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering*		Total
Species	**Habitat Type**	**Area (ha)**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**WSA**
Lake Trout	Nearshore (< 4 m)	2.14	0.25	0.535	0.50	1.07	0.50	1.07	0.25	0.535	3.21
	Deepwater (> 4 m)	1.1	0.25	0.275	0.25	0.275	0.50	0.55	0.75	0.825	1.925
	Lake Trout Total			0.81		1.345		1.62		1.36	5.135
Arctic Grayling	Nearshore (< 4 m)	2.14	0.00	0	0.50	1.07	0.50	1.07	0.25	0.535	2.675
	Deepwater (> 4 m)	1.1	0.00	0	0.00	0	0.25	0.275	0.75	0.825	1.1
	Arctic Grayling Total			0		1.07		1.345		1.36	3.775
Total Area		3.24									
Total HU				0.81		2.415		2.965		2.72	**8.91**

Canyon Lake 4

		Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering*		Total
Species	**Habitat Type**	**Area (ha)**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**WSA**
Lake Trout	Nearshore (< 4 m)	0.41	0.25	0.1025	0.50	0.205	0.50	0.205	0.25	0.1025	0.615
	Deepwater (> 4 m)	0.075	0.25	0.01875	0.25	0.01875	0.50	0.0375	0.75	0.05625	0.13125
	Lake Trout Total			0.12125		0.22375		0.2425		0.15875	0.74625
Arctic Grayling	Nearshore (< 4 m)	0.41	0.00	0	0.50	0.205	0.50	0.205	0.25	0.1025	0.5125
	Deepwater (> 4 m)	0.075	0.00	0	0.00	0	0.25	0.01875	0.75	0.05625	0.075
	Arctic Grayling Total			0		0.205		0.22375		0.15875	0.5875
Total Area		0.485									
Total HU				0.12125		0.42875		0.46625		0.3175	1.33375

Appendix 3.2-4. Habitat Gain in Canyon Lakes Offset Project

Canyon Lake 5

Species	Habitat Type	Habitat Area (ha)	Spawning/Nursery		Rearing		Foraging		Overwintering*		Total WSA
			HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	
Lake Trout	Nearshore (< 4 m)	1.84	0.25	0.46	0.50	0.92	0.50	0.92	0.25	0.46	2.76
	Deepwater (> 4 m)	0.59	0.25	0.1475	0.25	0.1475	0.50	0.295	0.75	0.4425	1.0325
	Lake Trout Total			0.6075		1.0675		1.215		0.9025	3.7925
Arctic Grayling	Nearshore (< 4 m)	1.84	0.00	0	0.50	0.92	0.50	0.92	0.25	0.46	2.3
	Deepwater (> 4 m)	0.59	0.00	0	0.00	0	0.25	0.1475	0.75	0.4425	0.59
	Arctic Grayling Total			0		0.92		1.0675		0.9025	2.89
Total Area		2.43									
Total HU				0.6075		1.9875		2.2825		1.805	6.6825

Notes: Habitat classification of bottom type has not been collected as of 2013 and the habitat classes rely on depth only, not substrate type.

Assumptions: the difference in elevation between lakes 2-3 is 0.5m. The elevation difference between lakes 2 and 4 and 2 and 5 has not been measured, but estimated at 1 m. Thus, a 3 m increase in depth at lake 2 will result in a 4 m depth overwintering habitat zone at the bathymetric contours of 1 m in lake 3, and 2 m in lakes 4 and 5.

This will need to be confirmed by surveying in canyon along length to deterime exact increase in habitat.

22. Metal Leaching and Acid Rock Drainage Management Plan

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BACK RIVER PROJECT
Metal Leaching and Acid Rock Drainage Management Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
METAL LEACHING AND ACID ROCK DRAINAGE MANAGEMENT PLAN

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Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AANDC	Aboriginal Affairs and Northern Development Canada
ARD	Acid Rock Drainage
GPT	Grams Per Tonne
ML	Metal Leaching
MLA	Marine Laydown Area
nPAG	Not Potentially Acid Generating
PAG	Potentially Acid Generating
QA	Quality Assurance
QC	Quality Control
TIA	Tailings Impoundment Area
WRSA	Waste Rock Storage Area

1. Introduction

The Metal Leaching and Acid Rock Drainage (ML/ARD) Management Plan is designed to ensure that the ML/ARD potential of geologic materials disturbed by Project activities is identified to inform management to minimize the potential for generation of ARD and leaching of elevated concentrations of water quality parameters (including metals). Management of the ML/ARD potential is intended to protect the following Valued Ecosystem Components (VECs), identified for the draft Environmental Impact Statement:

- Freshwater Water Quality.
- Freshwater Sediment Quality.
- Freshwater Fish/Aquatic Habitat.
- Freshwater Fish (Arctic Grayling and Lake Trout).
- Marine Water Quality.
- Marine Sediment Quality.
- Marine Fish/Aquatic Habitat.
- Marine Fish (Arctic Char).

Project activities including quarrying, open pit operations, waste rock storage, ore storage, and tailings storage expose material such that the ML/ARD potential may be realized. Baseline ML/ARD characterization programs inform Project design, including waste rock and tailings management strategies for potentially acid generating (PAG) and not potentially acid generating (nPAG) materials.

The ML/ARD Management Plan informs Project design to reduce realization of ML/ARD potential and minimize interaction of potentially poor quality water with the aquatic environment in conjunction with the Site Water Monitoring and Management Plan (Volume 10, Chapter 7), the Ore Storage Management Plan (Volume 10, Chapter 8), the Mine Waste Rock and Tailings Management Plan (Volume 10, Chapter 9), the Borrow Pits and Quarry Management Plan (Volume 10, Chapter 16), and the Aquatic Effects Management Plan (AEMP, Volume 10, Chapter 19).

The ML/ARD Management Plan includes the following:

- Applicable legislation and guidelines.
- An ML/ARD characterization program and relevant Project design for each Project phase and its adaptation as additional information from ongoing characterization is available.
- A monitoring plan to collect on-site geochemical and seepage water quality data to allow for an adaptive approach to ML/ARD management.

The ML/ARD Management Plan is a “living document.” It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes. Because of linkages to other Management Plans, update and revision will be incorporated into these documents as well.

2. Scope and Objectives

Management of the ML/ARD potential is intended to ultimately protect aquatic environments, particularly minimizing effects to water quality. This management assists with water quality compliance with existing regulations and guidelines provided by the federal and territorial governments.

3. Planning and Implementation

Planning for the ML/ARD management plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

The ML/ARD Management Plan has been designed to comply with existing regulations and follow available guidelines. Applicable legislation includes:

- *Arctic Waters Pollution Prevention Act* (1985a).
- *Canadian Environmental Assessment Act* (1992).
- *Fisheries Act* (1985b).
- *Nunavut Environmental Protection Act* (1988).

Canada's national, territorial, and provincial governments have established policies and guidelines for the prediction, prevention, control, and mitigation of ML/ARD. The relevant documents include:

- *Acid Mine Drainage in Permafrost Regions: Issues, Control Strategies and Research Requirements* (Dawson and Morin 1996).
- *Environmental Code of Practice for Metal Mines* (Environment Canada 2009).

- *Guidelines for Acid Rock Drainage Prediction in the North* (INAC 1992).
- *Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials* (Price 2009).

There are currently no federal, or territorial legislation or standards for criteria defining potentially acid generating (PAG) material due to site-specific requirements and conditions; however, non-site-specific guidance is provided in INAC (1992) and related documents listed above.

ARD potential is commonly assessed by the ratio of neutralization potential (NP) to acid potential (AP). This assessment can be applied to any exposed material such as mineral waste, ore, exposed mine workings, quarry operations, and stripped overburden. For the Back River Project material, individual lithological units were characterized.

As part of ongoing prefeasibility work, the screening criteria used to determine ML/ARD potential for the Back River Project is the ratio of the adjusted neutralization potential to the sulphide acid potential. Adjusted NP is calculated by subtracting the unavailable NP from the bulk Sobek NP with the unavailable NP determined by laboratory methods. Unavailable Neutralization Potential is defined as the portion of the measured NP that is not reactive or available under on-site field conditions. At the Back River Project, Unavailable NP is set by using the Sobek NP value for samples with a paste pH below 6.0.

Screening criteria values are outlined in Table 4-1. Material screened as PAG has a neutralization potential to acid potential ratio equal, or less than, 1. Material with a ratio greater than 3 is considered nPAG. Those ratios that are between 1 and 3 are classified as having uncertain potential for acid generation (uPAG). Ongoing characterization will continue to assess the application of these screening criteria and refine the identified uncertain range.

Table 4-1. Acid Rock Drainage Potential Criteria

ARD Potential	Ratio of Neutralization Potential to Sulphide Acid Potential (SNPR)
Potentially Acid Generating (PAG)	SNPR ≤1.0
Uncertain Potential Acid Generating (uPAG)	1< SNPR <3
Not Potentially Acid Generating (nPAG)	SNPR >3.0

For mine planning purposes, the application of the precautionary principle led to the assumption that any material with uncertain potential would be classified as PAG.

Assessment of the applicable screening criteria for the Back River Project will continue with on-going engineering and geochemical characterization work. In particular consideration of buffering capacity with reactive carbonates and sulphide reactivity will determine a site specific NPR ratio and possibly a ratio of 2, consistent with federal guidance documents (Price 2009). This Management Plan will be updated as refined screening criteria are developed.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including:

- Overall management of plan.
- Monitoring.
- Operational aspects.
- Internal reporting.
- External reporting.
- Ensuring compliance and adaptive management.

The Safety Superintendent, along with his/her direct reports, is responsible for the implementation of safety aspects of this plan.

6. Environmental Protection Measures

6.1 METAL LEACHING/ACID ROCK DRAINAGE POTENTIAL

An extensive ML/ARD prediction program was completed to support mine waste and water management options. The ML/ARD prediction program was based on lithological units (Rescan 2013; Volume 11, Chapter 2). The assumption behind this sampling approach is that the ML/ARD potential of lithological units is comparable among deposits and properties. Using estimated proportions of PAG and nPAG material for each lithologic unit, the geologic and mine models estimated material extracted from the Project operations and the associated ML/ARD potential. These proportions will be refined as additional information becomes available with ongoing mine planning, feasibility and geochemical studies. Ongoing programs will include assessing these assumptions with input from monitoring programs, exploration geologists, and mine engineers.

The ML/ARD potential of geologic materials and wastes that will be produced and stored during the site preparation, operations, and closure and post-closure phases of the Project was assessed through static and kinetic testing. Detailed test methods and results are available in the *Geochemical Characterization and ML/ARD Potential Report* (Rescan 2013; Volume 11, Chapter 2).

The potential for ML/ARD (based on the SNPR and the current screening criteria) has determined that overall, the AP and NP content is relatively low throughout the Project; however, the ratio of NP to AP suggests that individual samples may be PAG or have uncertain ARD potential. It was also identified that some metals may be of concern, most notably arsenic, because of its elevated presence in the material. There is buffering capacity in waste rock and ore from all deposits and ongoing kinetic tests will allow an assessment of relative leaching of AP and NP as well as the development of site specific screening criteria. Therefore, ARD is not anticipated to be of concern from a waste rock management perspective with implementation of appropriate mitigation measures described in the waste management plans. These mitigation measures include minimizing exposure/use of PAG material, segregation of PAG and nPAG material, encapsulation in frozen/permafrost conditions, and subaqueous disposal. ML/ARD management practices will continue to incorporate results from ABA and on-going humidity cell test data as part of the overall site environmental plan.

6.1.1 Overburden, Quarry, and Cut/Fill ML/ARD Prediction Program

Overburden and potential quarry materials were collected from the Goose Property. The ARD potential of the overburden is moderate; more than half the samples from the region around the Main Deposit had a SNPR value greater than 3.0, but samples collect above the Llama and Umwelt deposits were PAG or uPAG. The ARD potential of quarry material varied by lithological unit but was usually nPAG or uPAG. Gabbro samples were the most likely to be nPAG. The ML potential indicates a possibility for elevated nickel concentrations in drainage. There was no correlation between the concentration of a parameter in the solid phase and the concentration of a parameter in the leachate. Selection of additional quarry sites has been limited by the variability in ARD potential. As a result, waste rock from starter quarries located at open pits will be used in place of dedicated quarries. When a dedicated quarry is required, the siting of the quarry will comply with the Quarry and Borrow Management Plan.

6.1.2 Mine Workings and Waste Rock ML/ARD Prediction Program

The major lithological units for the deposits of the Goose and George properties were evaluated for ML/ARD potential through sampling of drill core. Table 6.1-1 summarizes the estimated quantities of PAG and nPAG material by deposit and lithology. Estimates will be refined as additional data becomes available and Project design advances.

Table 6.1-1. Acid Rock Drainage Potential of Waste Rock (as of September 2013)

	George Property†		Main Deposit		Llama Deposit		Umwelt Deposit	
Lithology	**PAG**	**nPAG**	**PAG**	**nPAG**	**PAG**	**nPAG**	**PAG**	**nPAG**
Greywacke	81%	19%	38%	62%	55%	45%	49%	51%
Iron Formation	38%	62%	22%	78%	68%	32%	57%	43%
Mudstone	81%	19%	31%	68%	53%	47%	31%	69%
Felsic Dike	100%	0%	0%	100%	46%	54%	29%	71%
Gabbro	0%	100%	13%	87%	22%	78%	6%	94%

† George Property proportions are not differentiated by deposit
Proportion of PAG and nPAG based on proportion of samples classified as PAG (adjSNPR <= 3.0) and nPAG (adjSNPR > 3.0) (Table 4-1)

The proportion of PAG versus nPAG samples has informed the design process for the waste rock storage areas (WRSAs) and reclamation strategies.

The ML potential of the mine working and waste rock material was assessed using results from shake flask extractions, laboratory humidity cells, and field leach barrels. One sample had an arsenic concentration greater than the MMER limit (SOR/2002-222). Arsenic was, therefore, identified as the primary element of concern for the Project site. Elevated arsenic concentrations in leachate were not confined to a specific deposit or lithological unit or ARD classification. The most effective method of managing ML is to limit the movement of water through progressive reclamation. Details on the management of ML from mine workings and waste rock are contained in the Mine Waste Rock Management Plan.

6.1.3 Ore and Low Grade Ore ML/ARD Prediction Program

Ore grade samples (gold content greater than 3.0 gpt) from iron formation lithologies from the Main, Llama, and Umwelt deposits were assessed for ML/ARD potential. The ARD potential of the ore and low grade ore samples was high due to high total sulphur contents (greater than 1.0%) associated with sulphide minerals and moderate to low NP values. Although these samples are screened to have a high potential for ML/ARD, this potential may not be realized in the time frame that the ore is exposed to air and water prior to processing.

Ore stockpiles will be operated according to the Ore Storage Management Plan that will take into account the overall screened potential of the material and the lag time to realize that potential.

6.1.4 Tailings ML/ARD Prediction Program

Preliminary, bench-scale, development testing and metallurgical characterization of ore material was undertaken by ALS Metallurgy in 2012. This was followed by small-scale cyanide detoxification testwork at ALS Metallurgy (Perth; ALS Metallurgy 2013).The post-cyanide destruction tailings samples from Goose and George Property ore were assessed for ML/ARD potential. The target for the cyanide detoxification testing was to produce tailings with less than 5 parts per million (ppm) weak acid dissociable (WAD) cyanide in the supernatant; this target was not achieved in all the test work variability samples (ALS Metallurgy 2013). Tailings material is predicted to be PAG due to high total sulphur contents and moderate to low NP. The ML potential was assessed by laboratory humidity cells and supernatant ageing batch tests. Cyanide, arsenic, and copper concentrations in the supernatant ageing test were higher than MMER limits.

The high ML/ARD potential of the tailings has influenced the construction, operation, and closure planning of the TIA. The berms of the TIA will be constructed from quarry material and lined so as to limit discharge to the environment. During operations, approximately 70% of the tailings material will be stored under water which will limit oxidation reactions and generation of ARD. Fresh tailings slurry will be pumped over exposed tailings to minimize oxidation reactions and generation of ARD. At closure the TIA will be drained and covered with nPAG material.

6.1.5 Ongoing Characterization Programs – Screening Tools

As project design and feasibility assessment continues, characterization programs will continue to evaluate:

- The application of screening criteria to individual units and the implication of applying to bench-scale operations.
- The application of site-specific screening criteria.

6.2 MITIGATION BY PROJECT DESIGN

Table 6.2-1 outlines the potential mass of material affected by this ML/ARD management plan and the project phase that the plan covers as presented in prefeasibility and EIS documents. The material and associated volumes may change as project design/engineering and environmental assessment progresses. Mitigation measures are outlined in management plans with summary points provided in the following text.

Table 6.2-1. Mine Components Affected by ML/ARD Management Plan and Temporal Phase (as of September 2013)

Component	Mass Material (kt)†	Site Preparation and Construction	Operation	Closure/ Post-Closure
Overburden, Quarry and Cut/Fill	1,200 at Goose 100 at George 100 at MLA	X	X	X
Roads and Infrastructure	Unknown	X		

(continued)

Table 6.2-1. Mine Components Affected by ML/ARD Management Plan and Temporal Phase (as of September 2013) (completed)

Component	Mass Material (kt)†	Site Preparation and Construction	Operation	Closure/ Post-Closure
Pit Walls	Unknown		X	X
Underground Workings	2,549 at Umwelt		X	X
WRSA	33,500 from Llama 33,000 from Umwelt 39,000 from Main 5,500 from Locale 1 2,600 from Locale 2 5,500 from LCP North		X	X
Ore Stockpiles	50		X	X
TIA	16,300		X	X

† Masses of material from Volume 2, Section 6.10

6.2.1 Quarry and Borrow Sources

Measures to avoid ML/ARD related from quarry and borrow material are included in the Quarry and Borrow Management Plan and may include the following:

- Early identification and screening of ML/ARD potential of possible quarry and borrow sources and avoiding development of PAG material.
- Implementation of best management practices in *Northern Land Use Guideline Access: Pits and Quarries* (INAC 2010).
- Performing an ML/ARD assessment of potential quarry material prior to development.
- Utilizing nPAG quarries.
- Minimizing quarry development through preferential use of open pit development material.
- Diverting non-contact water around quarries.
- Progressively reclaiming quarries.

6.2.2 Infrastructure

Measures to minimize realizing ML/ARD potential related to construction of site infrastructure may include the following:

- Constructing with nPAG material.
- Diverting non-contact water around infrastructure.
- Scheduling ground preparation to maintain adequate cover during periods of expected rainfall.
- Progressively reclaiming infrastructure.

6.2.3 Open Pit Walls

ML/ARD management of pit walls would be incorporated into the Site Water Management Plan and Mine Waste Rock Management Plan and may include the following:

- Diversion of non-contact water around open pits.

- Collection of pit wall runoff in sumps and discharge to the TIA.
- Backfilling with mine waste (with or without cement) and/or flooding of Goose Property open pits at closure to reduce oxidation rates.
- Flooding and/or backfilling of George Property open pit with PAG material covered with sufficient nPAG material to allow freezing of PAG material.

6.2.4 Underground Workings

ML/ARD management of underground workings would be incorporated into the Mine Waste Rock Management Plan and may include the following:

- Potentially backfilling underground workings with PAG material.
- Allowing underground workings to flood and freeze.

6.2.5 Waste Rock Storage Areas

ML/ARD management of WRSAs is outlined in the Mine Waste Rock Management Plan and may include the following:

- PAG waste rock will be segregated and encapsulated at closure beneath a depth of nPAG cover materials equivalent to the active layer, so that the PAG waste will freeze and remain permanently frozen.
- No PAG overburden or waste rock material will be used in the WRSA cover.
- Progressive reclamation of WRSAs will be carried out during the operations phase, to the extent feasible.
- Establishment of a final drainage system including contouring of waste rock piles to reduce infiltration.

6.2.6 Ore Stockpiles

ML/ARD management of ore stockpiles is included in the Ore Management Plan and may include the following:

- Diversion of non-contact water around ore and low grade ore stockpiles.
- Ore stockpiles will be processed in a timely fashion to reduce the risk of ML/ARD.
- Ore stockpiles will be removed at closure.

6.2.7 Tailings

ML/ARD management of the tailings material is included in the Tailings Management Plan and may include the following:

- Subaqueous deposition of tailings with a water cover of at least 2 m to prevent oxidation.
- Deposition of the tailings material will occur in a manner that will reduce the formation of ice lenses.
- Lining of the TIA to prevent pore water seepage into the receiving environment.

- At closure, an engineered cover will be placed on the surface of the proposed tailings and capped with nPAG waste rock and overburden to reduce infiltration and promote progradation of permafrost.
- Where feasible, at closure the slopes may be revegetated to maintain slope stability.

6.2.8 Ongoing Characterization Programs – Program Design

As project design and feasibility assessment continues, characterization programs will continue to evaluate:

- The types, volumes and ML/ARD potential of exposed material at the Project.
- Project design and management plans that minimize the potential for ML/ARD.

7. Monitoring Program

The ML/ARD Monitoring Program consists of the following components and is summarized in Table 7-1:

- ML/ARD characterization.
- Pit wall monitoring.
- Contact water monitoring.
- Reporting.

Table 7-1. Summary of ML/ARD Monitoring Program

Component	Purpose	Program	Frequency
Quarry and Cut/Fill	Classify ML/ARD potential Inventory characteristics	ML/ARD Characterization Contact water monitoring	One sample of drill cuttings per 625 m^2 Monthly during summer season
Mine Workings and Waste Rock	Classify ML/ARD potential Inventory characteristics	ML/ARD Characterization Pit wall monitoring Contact water monitoring	One sample of drill cuttings per 625 m^2 Monthly prior to closure Monthly during summer season
Ore and Low Grade Ore	Classify ML/ARD potential Inventory characteristics	ML/ARD Characterization Contact water monitoring	One sample of drill cuttings per 625 m^2 Monthly during summer season
Tailings	Classify ML/ARD potential Inventory characteristics	ML/ARD Characterization Contact water monitoring	Monthly Monthly

7.1 ML/ARD CHARACTERIZATION

The primary objective of the ML/ARD characterization program is to provide early and on-going identification of ML/ARD potential to provide informed management decisions to minimize realization of that potential. To facilitate this objective, the program needs to incorporate a sampling program that will statistically, and realistically, represent the material to be exposed and can be completed in a logistically-feasible and timely manner to meet mine scheduling needs.

The following sections provide a preliminary approach to characterization based on the findings to date.

7.1.1 Sample Collection

A composite sample of rock chips generated during drilling of each blast hole will be collected for static test analyses. In the underground mine workings, one sample will be collected every 25 m that the underground workings are advanced. A composite tailings slurry sample will be collected monthly during mill operation.

7.1.2 Analytical Methods

An on-site laboratory will be established to allow for timely ARD characterization and management of site material. ARD characterization methods will follow standard practices outlined in ML/ARD guidance documents (Price 2009). Off-site duplicate analyses by a laboratory with personnel who are experienced in ARD characterization will be performed on 5% of samples to confirm the reliability of the analytical results during the first six months of operation of the on-site laboratory. If the relative percent difference (RPD) of on-site and off-site analyses exceeds 20%, the reason for the variability will be investigated by reviewing sample identification, calculations, and protocols. Once the precision and accuracy of the on-site laboratory achieves acceptable levels of less than 20% RPD, the frequency of off-site duplicate analysis will decrease to 1%.

The following analyses will be performed at the on-site laboratory:

- Paste pH.
- Total sulphur determined by Leco furnace.
- Sobek bulk neutralization potential (Sobek et al. 1978; EPA-600/2-78-054).

Total sulphur concentrations will be used to calculate acid potential and adjusted Sobek bulk neutralization potential will provide the neutralizing capacity of the material. The ratio of neutralization potential to acid potential will be used to classify the sample as outlined in Table 4-1.

Additional tests that will be performed off-site as part of the ML/ARD characterization monitoring program are:

- Solid phase elemental analysis by aqua regia digestion and ICP analysis.
- Shake flask extraction (Price 2009).
- Leachate from ongoing field leach barrels.
- Leachate from ongoing laboratory humidity cells.

These tests are part of the assessment of ML potential. The solid phase analyses coupled with the shake flask extractions will be used to determine if there is a correlation between solid and leachate. Additionally shake flask extraction acts as an initial screening tool to determine if disturbing material will result in elevated concentrations of metals during the first flushing event.

The ongoing field and laboratory tests will be used in water quality modelling as source terms for site-specific SNPR screening criteria and to estimate lag times to the onset of acidic drainage.

7.2 PIT WALL MONITORING

To assist with closure planning, exposed mine workings may be included in the monitoring program. This program would include wash stations established using the following general outline:

- As possible at the maximum pit extent in the year prior to closure of open pit.
- Where feasible one wall washing station per pit lithological unit (greywacke, iron formation, mudstone, felsic dike, and gabbro).

- Sampling once a month during summer (expected June to September).
- The parameters to be analyzed are presented in Table 7.2-1.

Table 7.2-1. ML/ARD Water Quality Parameters for Open Pit Wash Stations, Back River Project

Physical and Chemical Parameters	Total and Dissolved Metals	Total and Dissolved Metals (*cont'd*)
Conductivity	Aluminum (Al)	Phosphorus (P)
Total Hardness	Antimony (Sb)	Potassium (K)
pH	Arsenic (As)[a]	Selenium (Se)
Total Alkalinity	Barium (Ba)	Silicon (Si)
Total Suspended Solids[a]	Beryllium (Be)	Silver (Ag)
Total Dissolved Solids	Bismuth (Bi)	Sodium (Na)
Turbidity	Boron (B)	Strontium (Sr)
Temperature	Cadmium (Cd)	Thallium (Tl)
Anions	Calcium (Ca)	Tin (Sn)
Bromide (Br)	Chromium (Cr)	Titanium (Ti)
Chloride (Cl)	Cobalt (Co)	Uranium (U)
Fluoride (F)	Copper (Cu)[a]	Vanadium (V)
Sulphate (SO_4)	Iron (Fe)	Zinc (Zn)[a]
Nutrients	Lead (Pb)[a]	
Ammonia	Lithium (Li)	
Nitrate	Magnesium (Mg)	
Nitrite	Manganese (Mn)	
Total Kjeldahl Nitrogen (TKN)	Mercury (Hg)	
Ortho-Phosphate	Molybdenum (Mo)	
Total Phosphorus	Nickel (Ni)[a]	

[a] *MMER deleterious effluent substance (Schedule 4)*

7.3 CONTACT WATER MONITORING

Site water management includes collection of any water that may come in contact with material at the Project. The site water management and monitoring is outlined in the Site Water Management Plan and AEMP (Volume 10), and the findings of that program will inform the ML/ARD Management Plan and the effectiveness of the best management practices presented. This plan will be revised accordingly in order to meet the plans objectives.

8. Mitigation and Adaptive Management

The ML/ARD Management Plan is a "living document." It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project- related changes.

Unless otherwise indicated, measures described in the ML/ARD Management Plan apply to all Project components. In conjunction with other management plans, this plan is designed to be adaptive, effective, and achievable in both the short and long term.

The monitoring, quality control, and reporting procedures detailed in this plan will all be combined and used to:

- Assess the effectiveness of mitigation and management measures.
- Identify Project effects requiring further mitigation efforts.
- Comply with requests from regulators and stakeholders.
- Adapt to changes in the environment, regulations, and the Project.

Examples of adaptive management are:

- Refined screening criteria and analysis that are site specific.
- Changing sampling needs to reflect site conditions and mine plans.
- Identifying additional quarry or borrow sources if unsuitable material is identified.
- Revision of predicted water quality in response to site water quality monitoring as part of assessing site specific screening criteria.
- Revision of waste rock storage options due to refined estimates of PAG and nPAG volumes.
- Revision to meet closure objectives.

9. Checking and Corrective Action

Checking and corrective action will occur through evaluation of monitoring data. Results of the monitoring program will be reviewed by the Environmental Specialist and trends will be updated on a time scale relevant to the Project. This program will allow early detection of changes in the predicted quantities of PAG material and implementation of corrective actions, if required.

10. Record Keeping

Record keeping will be conducted by the Proponent and its subcontractors. Data will be entered into suitable electronic databases and checked for quality control and stored in a format and program that allows for ongoing review of monitoring results.

All formal documents and reports will follow version-control procedures with revision tracking and version numbers. Version control information will be required for all documents and data that are issued, and approval will be given and tracked before issue. Designated personnel will coordinate preparation, review, and distribution, as appropriate, of the data and reports required for regulatory purposes.

11. Environmental Reporting

All formalized documents and reports will follow a version-control procedure to ensure they are approved before use and the internal and external users are accessing the most current information.

Reporting of all environmental monitoring data will be conducted in accordance with all licenses and approvals. Regulatory requirements are anticipated to include formal annual reports, including disclosure of issues of non-conformance with laboratory analyses.

11.1 ANNUAL ML/ARD SUMMARY REPORT

An annual summary report including results of the geochemical inventory and monitoring programs will be prepared during construction and operations. The year prior to closure the annual report will include an assessment of the necessity for additional monitoring and reporting during the closure phase. The report will include documentation of data collection methodology and data management and will detail observed trends.

The annual monitoring report will include the following:

- A description of Project activities during the monitoring interval.
- Monitoring data obtained during the most recent reporting period.
- Description of the methods used for sample and data collection.
- Results from updated predictive modelling.
- Conclusions from the updated predictive modelling.
- Evaluation of mitigation measures.
- Discussion of the need for any additional corrective actions or control measures.

Standardized formats will be used for the annual reports, and reports will be kept on file and made available on request.

11.2 INTERIM SUMMARY REPORT

An interim, mid-year, summary report will be generated for the Environmental Superintendent annually. The interim report will provide a summary of the trends in the geochemical inventory and identify any additional mitigation measures that are appropriate as part of the adaptive management approach.

12. Plan Effectiveness

The ML/ARD Management Plan is intended to ensure that the Project is conducted as proposed, mitigation and management measures are effective at mitigating adverse effects on VECs, and relevant laws and regulations are met. As part of environmental reporting, the Proponent will distribute copies of the ML/ARD report to stakeholders and conduct annual information sharing workshops with the Kitikmeot Inuit Association to report on mitigation, management, and monitoring activities. The Proponent will also conduct annual (or as necessary) evaluations of the efficacy of mitigation and management activities and of monitoring activities. Should new, more sensitive, monitoring methods be introduced, or existing methods found to lack robust design, updated methods will be proposed to the stakeholders in a revised ML/ARD management plan. This plan may be updated as frequently as every year, or not at all, if the mine plan and methods for mitigation and monitoring be found to be robust. The new ML/ARD plan will be implemented following review by stakeholders and an opportunity for response by the Proponent.

13. Quality Assurance / Quality Control

Quality assurance and quality control measures will be applied to each stage of the monitoring program, starting with data collection, then to data entry and analysis, and through reporting. The process will be iterative and reassessment of methods and processes will occur every annual cycle.

Standard Operating Procedures (SOP) will be established for all environmental data collection. All personnel will have necessary training and accreditation. The SOPs will cover all aspects of data collection, data processing, data QA/QC, and data management. SOP will include duplicate sampling, relevant blanks, chain-of-custody procedures, and recordkeeping. SOP will be reassessed and updated when necessary, as part of the re-iterative QA/QC process. Data analysis will be conducted using established and standardized workflows, and analytical results will be cross-checked and validated. Internal quality audits will be conducted to record and analyse quality issues and will be subject to quality assurance procedures for documenting, tracking, and resolving QA/QC issues. The annual ML/ARD report will include detailed descriptions of the analytical methods, including the relevant validation and QC procedures.

The re-iterative QA/QC procedures will continuously improve the effectiveness of the ML/ARD management plan to detect Project-related effects to VECs. These QA/QC processes are important to the overall adaptive management of Project effects, and will support the goals of the Project to minimize, mitigate and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects.

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23. Socio-economic Monitoring Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Socio-economic Monitoring Program

December 2013

REVISION E.1

BACK RIVER PROJECT
SOCIO-ECONOMIC MONITORING PROGRAM

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1. Introduction

The Back River Project (the Project) has been designed to minimize, mitigate and/or manage potential adverse effects on communities while systematically seeking to enhance positive effects. In support of the requirements of the final Environmental Impact Statement (EIS) guidelines (NIRB 2013) issued by the Nunavut Impact Review Board (NIRB), this document presents the Socio-economic Monitoring Program (SEMP) that Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

The SEMP has been developed in accordance with internal company and government regulatory requirements, and to be aligned with the current efforts of the Kitikmeot Region Socio-economic Monitoring Committee (SEMC). It has been further informed by community-based research and a review of literature discussing the lessons learned of other proximally located mine projects.

Sabina is committed to managing the social and economic impacts of the Project in such a way so as to maximize potential positive and beneficial outcomes and reduce, or where possible eliminate, negative or adverse effects. To this end, the following SEMP has been developed for the Project.

The SEMP is related to a number of specific management plans developed to respond to, manage and/or mitigate the potential social and economic effects identified in the EIS. The primary socio-economic management plans that have been identified for the Project include the following:

- Business Development Plan (Volume 10, Chapter 24).
- Human Resources Plan (Volume 10, Chapter 28).
- Community Involvement Plan (Volume 10, Chapter 26).

The development and effective implementation of these management plans depends on good measurement and tracking of socio-economic change. Monitoring is important to confirm baseline status of social and economic conditions in the communities and across the Kitikmeot Region, and to measure and track changes over time. Such monitoring allows for the identification, evaluation and, ultimately, a management response to social and economic changes, as and where appropriate. Monitoring enables Project managers, governments, and community leaders alike to assess the extent to which such changes are related in whole or in part to the development of the Project. In this way, the SEMP supports the effective implementation of management plans for the Project.

2. Scope and Objectives

The SEMP was developed to comply with the relevant sections of the Nunavut Land Claims Agreement (NLCA), and the relevant directives as outlined in the EIS guidelines (NIRB 2013). Beyond regulatory compliance, the purpose of the monitoring program is to help ensure that the Project fulfills best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project, especially for Inuit. Equally, monitoring will provide relevant and timely information to enable Project managers, governments, and community leaders to respond proactively to potential risks and adverse socio-economic effects. Data and analysis generated by the monitoring program will support an adaptive management approach.

This report describing the SEMP is a ‘living document’. It will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes. The SEMP may be revisited and updated or adapted on an annual basis. As Sabina works to address impacts and enhance benefits identified over time, changes may be made to this program to better achieve desired outcomes. The adaptive management strategy enables engaged parties to instigate change where required and to employ the use of new data and best practices as they become available, using information generated by the monitoring program throughout the life of the Project.

In support of these broad aims, there are three overarching objectives of the monitoring program:

1. Verify the accuracy of key predictions made in the EIS with respect to the direction and magnitude of socio-economic effects, gauge the efficacy of mitigation measures, and facilitate early identification of any unanticipated effects.
2. Contribute to and support adaptive management through evaluation of planned mitigation measures. Monitoring results will be used to provide a basis from which to develop additional or alternative mitigation plans in cases where initial mitigation measures are insufficient or ineffective.
3. Help ensure that, wherever possible, the monitoring program design and methodologies themselves are culturally appropriate and relevant to the issues and concerns of local Inuit, including respect for the confidentiality of certain socio-economic information. In part, this objective will be achieved by the consideration and incorporation of Inuit Qaujimajatuqangit (Inuit knowledge) into the SEMP, when and as appropriate.

3. Applicable Legislation and Guidelines

3.1 SABINA OPERATING RULES AND PRACTICES

Sabina is committed to contributing to the social, cultural, and economic development of sustainable communities near our operations. To this end, socio-economic monitoring is important to:

- Help ensure that the Project impacts and benefits are being realized according to or better than predicted.
- Inform adaptive management should changes be required to Project activities, such that Project benefits are maximized and adverse effects on communities are minimized.

Sabina supports the sharing of monitoring information with governments, communities, and other stakeholders, and their participation in evaluating and responding to changing socio-economic conditions.

3.2 GOVERNMENT LEGISLATION AND POLICIES

Article 12, Part 7 of the NLCA provides for the establishment of a project-specific monitoring program as part of the terms and conditions contained in a NIRB Project Certificate. Subsection 12.7.2 describes the purpose of such a monitoring program as:

a. to measure the relevant effects of projects on society, the economy, and ecosystems in the Nunavut Settlement Area;

b. to determine whether or not and to what extent the land or resource use in question is carried out within the predetermined terms and conditions; and

c. to assess the accuracy of the predictions contained in the project impact statements.

The NIRB requirements specific to the environmental assessment of the Project are defined in the final EIS guidelines for the Back River Project (NIRB 2013). This SEMP was developed in anticipation of their being a requirement for the development of a Project-specific SEMP, consistent with current practice in Nunavut.

4. Roles and Responsibilities

Implementation of the SEMP, as well as on-going performance evaluations, updates or revisions to the SEMP, will be the responsibility of the Manager of Community Affairs or similar position, or another designated management personnel with requisite skill set and experience. The Manager of Community Affairs may also delegate responsibility for specific components of the SEMP to other personnel. Other supporting roles and responsibilities of staff will be identified during implementation based on needs.

Sabina is committed to regular engagement of the NIRB, Community Advisory Groups, the Back River Project SEMC, the Kitikmeot Region SEMC, the Kitikmeot Inuit Association (KIA), and Kitikmeot communities and seeking feedback on potential areas for improvement in the SEMP over the life of the Project. In this regard, the role of these organizations, community stakeholders, and the public is important to support continual improvement and adaptive management.

5. Monitoring Program

The monitoring program is for use by the Manager of Community Affairs and the Back River Project SEMC, in collaboration with the Manager of Procurement and the Manager of Human Resources, as a means to track the accuracy of impact predictions and to guide implementation and, when necessary, the modification of various mitigation and adaptive management measures. This section outlines the scope and approach of the monitoring program.

5.1 SCOPE OF MONITORING PROGRAM

The scope of the SEMP includes both spatial and temporal dimensions. The spatial boundaries for monitoring socio-economic effects reflects the communities and region of the local study area (LSA) and the regional study area (RSA) as defined for the Socio-economic Effects Assessment (Volume 8, Chapter 3). For consistency, indicators will be developed in line with the jurisdictions for which necessary data and statistical information are collected and tracked. For the purposes of this program, data will be tracked, whenever possible, at the local level for both the Project itself and for the communities identified in the LSA. Regional data will be collected, tracked, and monitored, where relevant and available, for both the Kitikmeot Region and for Nunavut as a whole.

The temporal extent of the monitoring program will include construction, operation, and reclamation and closure phases. Regular and systematic collection of data will take place annually. Analysis and reporting will be done on an annual basis or as required by the NIRB. It is expected that when the

Project enters the post-closure phase, and should the Project enter the temporary closure or care and maintenance phases, the monitoring program would be discontinued.

5.2 APPROACH TO MONITORING

The SEMP is organized according to the valued socio-economic components (VSECs) established for the EIS and, where possible, aligned with reporting practices used by the Kitikmeot Region SEMC. Central to the monitoring program is the identification of appropriate indicators that can be used to measure and track changes in social and economic conditions (i.e., community characteristics/components) especially with respect to those that may in whole or in part be a result of or in response to impacts and effects of the Project.

The monitoring program relies on quantifiable measures of social and economic components or phenomena. Official government statistics and census data will be the primary sources of data for indicators related to the territory, region or communities including, for example, demand on social services, crime statistics, or migration patterns. Sabina will collect data related to Project-specific information such as employment numbers and lost-time incidents. The Government of Nunavut tracks a variety of data, much of which is used by the Kitikmeot Region SEMC in their reports (Kitikmeot Socio-Economic Monitoring Committee n.d.). The current program will also draw on Government of Nunavut data for consistency with Kitikmeot Region SEMC reporting. Proponent generated data will help to isolate specific effects and changes related to the Project.

The indicators will consist of measureable criteria that can be linked either directly or indirectly to potential Project effects. Where possible, the focus will be on those effects of greatest interest or concern to communities, and appropriate indicators will be linked to various policies, guidelines, or other initiatives put forth by Sabina so as to be able to measure and track the efficacy of such efforts.

The proposed monitoring program, in keeping with the Kitikmeot Region SEMC and industry practice, is built around quantifiable phenomena which are assumed to give an objective, value-free measure of change. Quantifiable metrics, as noted, are generally proxies for potentially less tangible aspects of social or economic change. It is desirable to support the use of quantifiable indicator data and trends with input and feedback from key stakeholders. Information collected through the activities of the Community Involvement Plan will add important qualitative detail and context necessary to ensure the reliability and accuracy of both the selection of specific indicators and the interpretation of trends and results.

5.3 INDICATOR SELECTION, RATIONALE, AND ASSUMPTIONS

The proposed indicators for the SEMP, and the corresponding social or economic phenomena that are to be measured or tracked, are defined in Table 5.3-1. These metrics are selected as a proxy measurement of potential changes in community characteristics or components that may be linked to the activities of the Project. For each indicator, the adjacent cells in Table 5.3-1 provide brief description of: 1) the objective of the indicator or rationale behind its selection; 2) the key source for associated data including the responsible body or organization; and 3) the level of analysis appropriate and/or available for each indicator. In this context, the territorial level refers to Nunavut, the regional level refers to the Kitikmeot Region, and the local level reference to the presentation of data for each of the Kitikmeot Region communities.

Table 5.3-1. Back River Project Socio-economic Monitoring Program Indicators

VSEC	Sub-component	Indicator	Rationale/Objective	Data Source	Level of Data Collection
Economic Development	Territorial, Regional, and Local Growth	Total annual spending on direct employment (payroll)	Overall economic benefit of the Project, contribution to territorial, regional, and local economies	Sabina Gold & Silver	Total, territorial, and regional
		Total annual spending on direct employment (payroll) by Kitikmeot community			By community
		Total annual spending on contracts and supplies			Total
		Total number, value, and percentage of contracts awarded to Inuit-owned businesses			Total, territorial, regional, and by community
Employment	Direct Employment	Number of persons directly employed with the Project	Changes to the levels of employment in the region and the general economic benefit of the Project	Sabina Gold & Silver	Territorial, regional, and by community
		Number of person days worked by all employees			
		Number of person days worked by Inuit employees			
		Percentage of direct employees by gender	Gender equity in project employment		
		Number of Inuit employees from the Kitikmeot Region and the number of Inuit employees from elsewhere in Nunavut	Preferential hiring of and economic benefit to Kitikmeot and Nunavut Inuit		
		Percentage of Inuit in each job category			
Business Opportunities	Direct Employment and Procurement	Total value of contracts awarded to Inuit-owned businesses	Local and regional economic benefits of the Project to Inuit-owned businesses	Sabina Gold & Silver	Total, territorial, regional, and by community
		Number of contracts, including percentage of total contracts, awarded to Inuit-owned businesses			
		Total value of contracts awarded to business in the Kitikmeot Region	Local and regional economic benefits of the Project to the Kitikmeot Region		
		Number of contracts, including percentage of total contracts, awarded to businesses in the Kitikmeot Region			

(continued)

Table 5.3-1. Back River Project: Proposed Socio-economic Monitoring Program Indicators (continued)

VSEC	Sub-component	Indicator	Rationale/Objective	Data Source	Level of Data Collection
Education and Training	Capacity Building and Employee Retention	Number of Inuit filled apprenticeships supported by Project	Commitment to local, Inuit education and training/building community capacity	Sabina Gold & Silver	Total, regional, and by community
		Number of employees that complete on-the-job training courses	Commitment to provide training and increase employee retention		Total and by community
		Number of Inuit employees that complete on-the-job training courses			
		Number of person-courses completed by employees by type of course	Commitment to provide opportunities for career advancement and to increase employee retention		Total and by community
		Number of person-courses completed by Inuit employees by type of course			
		Average number of years of mining experience as a result of the Project	Changes to the work experience of the local and regional workforce		Total and by community
		Number of high school graduates by community	Changes to high school completion rates	Nunavut Bureau of Statistics	By community
		NAC enrollment by program type and campus	Changes to demand for education and training	NAC	Regional and by community
Health and Community Well-being	Delivery of Health Care and Social Services	Number of annual health centre visits by community	Changes to demand on health care and service providers	Nunavut Bureau of Statistics	Regional and by community
		Proponent use of community Emergency Health Services (EHS) by Project employees and/or contractors		Sabina Gold & Silver	Total and by community
		Number and percentage of direct employees that are Kitikmeot residents by community	Population stability and demographic changes		Regional and by community
		Total number of police calls by community	Changes to demand on police services	Nunavut Bureau of Statistics	By community
		Total value of social assistance by community	Promote levels of self-reliance		Regional and by community

(continued)

Table 5.3-1. Back River Project: Proposed Socio-economic Monitoring Program Indicators (completed)

VSEC	Sub-component	Indicator	Rationale/Objective	Data Source	Level of Data Collection
Health and Community Well-being (cont'd)	Individual Lifestyle and Family Structure and Function	Inuit employee retention rate	Maintenance of long-term employment within Inuit culture and lifestyle	Sabina Gold & Silver	Total, Regional, and by community
		Utilization rate of Employee and Family Assistance Program (EFAP)	Demand and need for support services		Total and by community
		Total annual dollar value of the sale of alcoholic beverages	Positive changes to consumption and spending patterns	Nunavut Bureau of Statistics	Kitikmeot Region
		Total annual impaired driving and drug violations by community	Positive changes to individual lifestyle		By community
	Family Well-being and Food Security	Number of annual lost time incidence	Occupational health and safety of Project related work	Sabina Gold & Silver	By community
		Overall annual crime rate and type	Change to levels of crime and number of police incidents in Kitikmeot communities	Nunavut Bureau of Statistics	By community
		Revised Northern Food Basket (RNFB)	Stabilize consumer prices	Nutrition North	By community
Subsistence Economy and Land Use	Traditional Land Use	Average number of days on the land per Inuit employee (while not on shift)	Maintain or enhance traditional land use by Project employees	Sabina Gold & Silver	Project level
		Number of times unauthorized use of Project roads reported	Prevent increase in access to land using Project roads		Project level
		Number of times land users utilized Project camp facilities	Maintain or enhance traditional land use		Project level

Consolidation of Economic Development Agreements Act (1988)
GN Department of Economic Development and Transportation. n.d. Strategic Investments Program Policy.
Miscellaneous Statutes Amendment Act (2011), No. 3

Indicators are used within each framework element to characterize community impacts. Indicators were selected based on a number of criteria:

- The link between the indicator and impact of concern.
- The correspondence of the indicator to community and corporate values.
- The sensitivity of the indicator to changes in socio-economic conditions.
- The ability of the indicator to be measured accurately.
- The feasibility of data collection from existing sources.
- The adequacy of spatial and temporal coverage.
- The ease of interpretation of the results.

The selected indicators are used to identify potential community development changes of concern, not to fully characterize those changes or explain the reasons behind the observed changes. Changes in monitored elements of the community may be directly or indirectly as a result of Project activities, or may ultimately be unrelated to the Project. As is the purpose of a monitoring system, the indicators are used to identify areas of potential concern for further investigation.

Selection of the indicators provided below is based on past experience and examples from other Projects in the Kitikmeot Region and the initiatives of the Kitikmeot Region SEMC. It must be emphasized that the proposed SEMP indicators are subject to revision prior to finalization. It is anticipated that a Back River Project SEMC will be established, including definition of an operational Terms of Reference (TOR), with membership from Project staff, the Government of Nunavut, and the Government of Canada (and potentially others). In collaboration with the NIRB and the Back River Project SEMC, the selected indicators, data sources and collection methods, and analysis methods will be confirmed. This will help ensure that the indicators are appropriate and complete, where possible, and capable of measuring socio-economic changes in the communities that are of concern to stakeholders.

Of the 37 indicators proposed for the monitoring program, the Project will provide data for 28 indicators. The remaining 9 indicators will be based on Government of Nunavut data, Nunavut Arctic College (NAC), Nutrition North Canada, and/or data obtained from the federal government, primarily through Statistics Canada Census data, as provided and reported by the Kitikmeot Region SEMC initiative.

5.4 INTERPRETATION, EVALUATION, AND REPORTING

Interpretation and analysis of indicator data is a core dimension of the Back River Project SEMP and requires rigorous evaluation of assumptions. One of the key challenges will be to determine the meaning of change. That is, does a particular change in the indicator variable or metric indicate a change for the better or worse? What is the relative influence of the Project as a driver of change in any one or series of indicator data? Technical expertise and traditional/community knowledge and experience will inform the analysis of indicator data and the interpretation of trends.

In the Kitikmeot Region SEMC Fall 2012 Report (GN DED&T 2013), committee members stated a preference for information on rates and trends to assist with the comparability of indicator statistics. There is also a preference for community-level data over more general territorial data when possible, although the availability of community data is more limited and dependent on what is published and available from government.

As far as is possible, reporting will be consistent with the format and approach developed by the Kitikmeot Region SEMC for efficiency and comparability. In the monitoring report, indicators will be defined in plain language including what is being measured, how it is being measured, and the meaning and reliability of the findings. Where appropriate, results from the monitoring program will be discussed and assessed in the context of community development goals and anticipated stakeholder benefits as these relate to specific commitments and expected outcomes from the Project.

The findings of the SEMP will be reviewed in collaboration with other members of the Back River Project SEMC, as well as to the larger Kitikmeot Region SEMC, and will be used to inform modifications and updates of the SEMP as necessary. Internally, the findings of the SEMP will also be reviewed by the Manager of Community Affairs, Manager of Procurement, and Manager of Human Resources with respect to the use of the SEMP to monitor the performance of Project mitigation and management plans. Key findings and recommendations will be incorporated into an annual report to the NIRB. Reporting of monitoring results will also be provided to the Back River Project SEMC and the Kitikmeot Region SEMC. The monitoring report will be produced on an annual basis and distributed in electronic and hardcopy format to all stakeholders and interested parties.

The SEMP has been developed to help ensure that the Project fulfills best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project, especially for Inuit. Equally, monitoring will provide relevant and timely information to enable Project managers, governments, and community leaders to respond proactively to potential risks and adverse socio-economic effects.

Sabina recognizes that the Project will present Inuit communities with both substantial opportunities as well as changes to current social and economic conditions. Sabina is committed to implementing measures to enhance the benefits of the Project for individuals residing in the Kitikmeot Region communities. Mitigating existing and potential impacts, and promoting individual, family, and community well-being is a shared responsibility of Sabina, the KIA, the hamlets, and the Government of Nunavut. Commitments to enhance regional employment and training and the provision of community programs and services to enhance community well-being do not impose responsibility on Sabina to assume the role of government. Sabina will cooperate in these efforts. For the benefits of the Project to be fully realized at the local level the communities must be engaged in the implementation of strategies to build capacity to enhance well-being, which contributes to the ability of communities to deal with current and future challenges and to retain the benefits beyond the life of the Project.

There is inherently some uncertainty associated with predicting the social impacts prior to the implementation of Project activities. Sabina will work to address impacts and enhance benefits as they are identified over time. Adaptive management as a method used for the creation and implementation of management plans and the monitoring program enables the engaged parties to instigate change where required and to employ the use of new data and best practices as they become available. Data and analysis generated by the monitoring program will support an adaptive management approach within each of the plans. Further, the adoption of adaptive management practices enables the engaged parties to adjust plans based on the findings of the monitoring program throughout the life of the Project.

6. Summary

The Project aims to provide employment that will attract, develop, and retain qualified personnel, and business opportunities that support the development of suppliers in the region's communities, while supporting the health and well-being of Kitikmeot Region communities and the continuation of traditional activities and practices. The SEMP details methods and indicators for use in tracking the results and outcomes of the Business Development Plan, Human Resources Plan, and Community Involvement Plan, as well as other aspects of socio-economic performance. This SEMP incorporates the monitoring of all three plans and aligns with existing regional monitoring in Nunavut.

The objective of the SEMP is to collect and analyze information on socio-economic conditions and trends to inform the ongoing management and mitigation of the potential social and economic effects identified in the EIS and to facilitate best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project. The monitoring program is based on an approach of adaptive management designed to enable Project managers and community leaders to respond proactively and in a timely manner to any undesirable changes to socio-economic conditions.

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24. Business Development Plan

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BACK RIVER PROJECT
Business Development Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
BUSINESS DEVELOPMENT PLAN

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1. Introduction

The Back River Project (the Project) has been designed to minimise, mitigate and/or manage potential adverse effects on communities while systematically seeking to enhance positive effects. As part of the requirements of the final Environmental Impact Statement (EIS) guidelines (NIRB 2013) issued by the Nunavut Impact Review Board (NIRB), this document presents the Business Development Plan (the Plan) that Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

The Plan has been developed in accordance with internal company and regulatory requirements. The Plan has been further informed by community-based research and a review of literature discussing the lessons learned of other northern mine projects. The measures set out in the Plan correlate directly to potential socio-economic effects of the Project which were identified during the environmental assessment process (see Volume 8, Chapters 3 and 4 of the Back River Project Draft EIS).

The Plan is a living document and will be regularly updated based on management reviews, incident investigations, regulatory changes, or other Project-related changes. In order to effectively support business development in the Kitikmeot Region, community input and the results of ongoing engagement with local businesses and entrepreneurs will provide additional content to reflect changing realities over the life of the Project. As Sabina works to address impacts and enhance benefits identified over time, changes may be made to this Plan to better achieve desired outcomes. The adaptive management strategy enables engaged parties to instigate change where required and to employ the use of new data and best practices as they become available.

2. Scope and Objectives

The Project aims to provide contract opportunities that will attract, develop and retain effective businesses, and provide business opportunities that support the development of suppliers in the region's communities. The objective of the Plan is to encourage the involvement of local and regional Inuit-owned businesses in Project work to both enhance benefits and to promote the retention of Project benefits with the Kitikmeot Region and within Nunavut.

The Plan has been focused to: 1) ensure regional businesses are aware of the Project and understand Project procurement practices and opportunities; 2) increase the ability of regional businesses to respond to procurement notices and become suppliers to the Project; and 3) maximize contract and subcontract opportunities for regional businesses.

The Project is predicted to positively impact the regional economy and business activities. The Plan is aimed at maximizing benefits in the Kitikmeot Region through contracting opportunities. The specific elements of the Plan include: a Procurement Strategy; a Local Business and Entrepreneur Capacity Building Strategy; and Community-based Investments for Business Development. Sabina will work to implement these strategies over the life of the Project.

The Plan would apply from the time of approval of all required licences and permits to allow construction of the Project to begin. The temporal extent of the Plan will be the life of the Project itself, including construction, operation, reclamation and closure, and temporary closure/ care and maintenance phases.

3. Applicable Legislation and Guidelines

3.1 SABINA OPERATING RULES AND PRACTICES

Sabina supports the sustainable development of the communities that are impacted by its projects. This is enacted through various project plans focused on minimizing adverse effects and enhancing positive effects of the Project. The activities defined by the Plan will help to maximize the regional benefits of procurement. This includes enabling local businesses to respond to bid notices and encouraging the development of local businesses for the realization of long-term economic benefits to the region.

3.2 GOVERNMENT LEGISLATION AND POLICY

Economic development, including business promotion and the provision of support programs to businesses in the Kitikmeot Region, is led by the Government of Nunavut Department of Economic Development and Transportation (GN DEDT).

Economic development in Nunavut was previously guided by the consolidation of the *Economic Development Agreements Act* (1988), adopted in 1999 from the NWT when Nunavut become a territory and amended in 2010. The Act was repealed in 2011 and has not yet been replaced with new legislation. Rather, the Nunavut Economic Forum and Co-Management Committee is spending two years (2012 to 2014) conducting a communication consultation process that aims to explore specific elements that should be included in the next ten year Nunavut Economic Development Strategy (NEDS), slated to be released in spring 2014.

Relevant government policy and programs includes Nunavut's Development Partnership Agreement (DPA) Policy, Nunavut Economic Development Strategy, and the Small Business Support Program Policy.

Nunavut's DPA Policy sets out the framework for the development of voluntary agreements between the Government of Nunavut and resource companies. DPAs are to set out how proponents and government will work together to help Nunavut, their businesses and their communities benefit from resource development projects in Nunavut. To enable flexibility for the subsequent initiation of DPA negotiations, Sabina will work to negotiate a DPA with the Government of Nunavut that may be linked to any one or more of the following outcomes:

- Education and training for Nunavummiut, resulting in transferrable skills and recognized credentials that will allow them to participate in the economy.
- Infrastructure development and investment (potentially including physical, energy, communications, and organizational infrastructure) that strengthens the community.
- Developing and diversifying local businesses.
- Collecting and sharing information about the local community or region.
- Investing in new or existing programs to build capacity, social well-being, and economic strength of communities to help employees, their families, and the community address challenges that may arise as result of the Project.
- Other benefits identified by relevant stakeholders in the communities and across the Kitikmeot Region.

The Nunavut Economic Development Strategy (NEDS; 2003) is based on four areas prioritized for strategic planning including: 1) the land; 2) the people; 3) the community; and 4) the territorial economy. This prioritization indicates that respect for the land and the people is first and foremost, and community decision-making and control are placed next in priority, with the Nunavut economy as the final consideration. This approach to strategic planning provides a foundation for the decision-making process that ensures the economy is based on sustainability, families, and communities. The NEDS is currently (2012/2013) under review by Nunavut's Economic Forum with the aim of renewing the NEDS over the next two years. Following a series of roundtable discussions with key sector groups, as well as other research and consultation, the renewal process is to be finalized at the Nunavut Sivummut Conference in February 2014.

The GN DEDT's Small Business Support Program Policy includes the Small Business Opportunities Fund and the Entrepreneur Development Fund that support new and expanding small businesses managed by entrepreneurs who have identified promising business opportunities. The fund provides accountable contributions to offset costs associated with a wide range of planning, start-up, expansion, and marketing activities. The fund also provides assistance for small businesses facing viability or wind-down challenges.

In addition, government services are provided to local businesses at the hamlet level through the community Economic Development Officers (EDOs). The EDOs are funded through the GN DEDT and provide a community-level link to the administration of DEDT programs. In addition, EDOs provide other services including assistance in the development of business proposals and plans, referrals to business management, accounting and financial services, and general assistance in accessing necessary licensing, permits, training programs, and funding. At a broader scale, EDOs are responsible for implementing a hamlet's Economic Development Plan. This often includes community-wide initiatives focused on developing and diversifying the local economy with identified specific sectors of focus (e.g., tourism, fisheries development).

A Memorandum of Understanding (MOU) between the Canadian Economic Development Agency and the KIA (2012) confirms the commitment of each party in supporting responsible resource and regional infrastructure development in the Kitikmeot Region through cooperation and respectful engagement. The objective of the MOU is to identify potential opportunities and challenges related to participation in major projects so the Kitikmeot Region can grow and prosper as a result of their involvement.

4. Roles and Responsibilities

Implementation of the Plan, as well as on-going performance evaluations, updates or revisions to the Plan, will be the responsibility of the Manager of Procurement for the Project or similar position, or another designated management personnel with requisite skill set and experience. The Manager of Procurement may also delegate responsibility for specific components of the Plan to other personnel. Aspects of the Plan associated with community investments and donations will be the responsibility of the Manager of Community Affairs (see Community Involvement Plan, Volume 10, chapter 26). Other supporting roles and responsibilities of staff will be identified during implementation based on needs.

Sabina is committed to regular engagement of the NIRB, the KIA, and Kitikmeot communities and seeking feedback on potential areas for improvement in the Plan over the life of the Project. In this regard, the role of these organizations, community stakeholders, and the public is important to support continual improvement and adaptive management.

5. Management Measures

A Socio-economic Monitoring Program (Volume 10, Chapter 23) has been developed to help ensure that the Project fulfills best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project, especially for Inuit. Equally, monitoring will provide relevant and timely information to enable Project managers and community leaders to respond proactively to potential risks and adverse socio-economic effects.

In order to support management measures associated with the Plan, a number of Project-specific indicators have been defined to monitor Plan performance and achievement of management objectives with respect to business development and business opportunities (Table 5-1). Thresholds for each indicator will be determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee (see Socio-economic Monitoring Program, Volume 10, Chapter 23). Where Project performance is addressed by the Inuit Impact and Benefit Agreement (IIBA), it is anticipated that applicable thresholds will be defined in reference to the provisions of the IIBA. For all indicators, management action will be triggered when annual performance is below threshold. Specific actions will be determined in consultation with the NIRB and the KIA (when applicable to the IIBA). This will involve an evaluation of the existing mitigation and management measures, and identification of appropriate adjustments to the Plan.

Table 5-1. Indicators, Thresholds, and Triggers to Support Management Measures

Valued Socio-economic Component (VSEC)	Indicator	Threshold	Trigger	Suggested Action
Socio-Economics: Economic Development	Total annual spending on direct employment (payroll)	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.
	Total annual spending on direct employment (payroll) by Kitikmeot community	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.
	Total annual spending on contracts and supplies	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.
Socio-Economics: Business Opportunities	Total value of contracts awarded to Inuit-owned businesses	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.

(continued)

Table 5-1. Indicators, Thresholds, and Triggers to Support Management Measures (completed)

Valued Socio-economic Component (VSEC)	Indicator	Threshold	Trigger	Suggested Action
Socio-Economics: Business Opportunities *(continued)*	Number of contracts, including percentage of total contracts, awarded to Inuit-owned businesses	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.
	Total value of contracts awarded to business in the Kitikmeot Region	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.
	Number of contracts, including percentage of total contracts, awarded to businesses in the Kitikmeot Region	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/ adjust mitigation as appropriate.

6. Monitoring Program

Sabina will track outcomes of the Business Development Plan and report results as described by the Back River Socio-Economic Monitoring Program (Volume 10, Chapter 23).

7. Mitigation and Adaptive Management

7.1 PROCUREMENT STRATEGY

7.1.1 Mitigation and Targeted Outcomes

Sabina recognizes the potential the Project has to positively affect local and regional economic development and is committed to enhancing this potential through both the direct and indirect expenditures through the purchase of goods and services on a competitive basis. Sabina is committed to providing contracting and procurement opportunities within Nunavut and, more specifically, the Kitikmeot Region. An internal policy covering contracting and procurement will be established which will ensure regional businesses receive first opportunity, where competitive. First opportunity hiring and contracting is one means though which Project benefits will remain in the Kitikmeot Region and Nunavut. Sabina is committed to sourcing goods and services needed for the Project locally, where possible. More specifically, a Procurement Strategy will be developed to facilitate regional business involvement in the Project to maximize benefits. In the evaluation of contract bids, the level of Inuit content will be one of the primary considerations.

In addition, Sabina will support the development of a fund and/or access to expertise and business development models through work with community and other third party partners (e.g., the Nunavut Arctic College, NAC) which may promote economic diversity through the establishment of new businesses with the Kitikmeot Region.

An important part of the Procurement Strategy will be communication of procurement opportunities. Sabina is committed to providing accessible and timely provision of contracting opportunities information to the Inuit-owned businesses and others in the Kitikmeot Region.

Specific commitments for the hiring and contracting of Inuit (e.g., workforce percentages) will be a topic of discussion during IIBA negotiations between Sabina and the KIA. Strategies to enhance the participation of Inuit businesses in contract and subcontract work with the Project are discussed below.

7.1.2 Actions and Adaptive Management

Sabina aims to establish a contracting environment that actively attracts and encourages Inuit firms to contract and subcontract work with the Project, and will work to maximize the contracting and subcontracting opportunities for qualified Inuit firms though the construction, operation, and reclamation and closure phases of the Project. These measures are included with the aim of retaining project specific benefits within the Kitikmeot Region.

To enhance Inuit participation in Project contract work, Sabina will actively target Inuit businesses through the use of the Nunavut Tunngavik Inc.'s (NTI's) Inuit Firms Registry (Appendix 1), the Kitikmeot Inuit Businesses Listing (Appendix 2), and other sources. Contractors will be invited via email to view the Back River Project website (www.backriverproject.com) and express interest in Project work. The Back River Project website is publically available and may house current notifications for upcoming work, as well as notification of work awarded, to promote transparency and accountability. Where Inuit firms have expressed an interest in Project work, Sabina will request a skills and experience inventory to match that company with current and potential future Project contracts. Further communication methods aimed to share information with local and regional business is provided in the Community Involvement Plan (Volume 10, Chapter 26).

Similarly, Sabina will develop an Inventory of Regional Suppliers able to provide goods and/or services required by the Project. Sabina will also, where appropriate, provide early notice of opportunities within a specified timeframe to so that Inuit firms have an extended period to develop proposals. The inventory of suppliers will be in the form of a Supplier Prequalification List that will include those suppliers that have been pre-screened for meeting standard supplier requirements (e.g., health and safety, management systems).

In the evaluation of all bids, the extent to which Inuit beneficiaries will be employed and/or Inuit-based businesses will be used (either as the proposed prime contractor or as a subcontractor) will be included in evaluation criteria. Those pre-qualified suppliers that employ Inuit beneficiaries will be given preference over suppliers who employ non-residents. In addition, those awarded contracts with the Project will be encouraged to use the Supplier Prequalification List to identify potential indirect suppliers or subcontractors for procurement opportunities. This will be a full and fair opportunity for suitable and registered regional companies to bid for the supply of Project good and services.

Sabina will work to ensure access to information related to contracting opportunities are available to regional business and will provide information sessions that assist regional businesses in understanding how to access their opportunities through the use of an online information sharing system that provides transparent and consistent information such as: qualifications requirements, health and safety requirements, current and future supply opportunities, quality and business conduct expectations, and required technical standards. This information sharing system will be based within Sabina's Back River Project website. Sabina will also host group presentations or workshops, as requested, to enable better understanding of business opportunities, standard supplier requirements, and the process of obtaining Project contracts. Sabina will also communicate information on procurement practices, requirements, and opportunities to businesses through print and electronic means (e.g., email distribution). In sum, these workshops aim to assist Inuit firms in obtaining work with the Project, through the development of capacity as related to the bidding process and means through which contracts with the Project will be carried out. Lastly, these workshops will be available to interested entrepreneurs and local business owners with the intent of also providing support to those interested in business initiatives unrelated to the Project.

More specifically, Sabina will hold workshops in Kitikmeot communities to familiarize local business on how to obtain contracts and at that time will begin to pre-screen businesses to become prequalified suppliers. This will include provision of information on requirements for business insurance and bonding. The workshops will detail what is required to take advantage of small, medium, and large contracts, as well as details on the Project opportunities available. Larger contractors that obtain Project work will also be encouraged to breakdown contracts into smaller subcontracts to increase the accessibility of Project work for smaller Inuit firms. In other words, the creation of smaller contracts that can be fulfilled by local Inuit firms will be encouraged and larger contractors that can oversee this process will be preferred over those who are not willing to follow this approach. The workshops will also include sessions to discuss information related to successful business structure and operation fundamentals, and assist in the preparation of bids for contracts currently available, from the perspective of what would be expected from a Project supplier.

Bid solicitation methods that target increased participation by Inuit firms include early communication of opportunities, communication of preference for bids with Inuit content, and capacity building workshops for Inuit entrepreneurs and business owners. Capacity building as related to the bidding process might include assistance with the general approach to the preparation of contract bids, early review of information describing the requirements businesses must meet to be considered for Project work, and the provision of information related to the process of fulfilling contract obligations.

In sum, first opportunity contracting and procurement methods will include the following:

- Inviting Inuit firms to view to contract opportunities on the Back River Project website and to encouraging expressions of interest.
- Developing an Inventory of Regional Suppliers who are pre-screened and able to provide goods and services to the Project.
- Providing early notification of contract opportunities to Inuit firms included in the Inventory of Regional Suppliers.
- Providing preference to employers and suppliers who employ Inuit beneficiaries over those who employ non-residents.
- Encouraging firms that obtain contracts with the Project to use the Inventory of Regional Suppliers list to identify indirect suppliers and/or subcontractors for procurement opportunities.

- Providing ready access to information related to project opportunities through 1) the Back River Project website, 2) group presentations, 3) targeted email, and 4) print materials that will be distributed locally and available at the Sabina office in Cambridge Bay.
- Inviting local Inuit firms to attend workshops aimed to increase business capacity and inform interested parties of the requirements that must be met to be considered for Project work.

Additional specifics related to contracting and Inuit-owned companies, including procurement targets, will be discussed during the IIBA negotiations between Sabina and the KIA. The relevant terms and conditions of the IIBA, where applicable to procurement of Inuit-owned businesses and where agreed to with the KIA, will be directly communicated to businesses through the Inventory of Regional Suppliers.

7.2 LOCAL BUSINESS AND ENTREPRENEUR CAPACITY BUILDING STRATEGY

7.2.1 Mitigation and Targeted Outcomes

There are many small and medium-sized businesses in the Kitikmeot Region. Some businesses, mainly located in the communities of Cambridge Bay and Kugluktuk, have been successful in the past in competitively supplying the mining sector. Others have found it difficult to bid on larger projects due to their small size and limited capital for investment (related to the high capital costs of operating a business in Nunavut), lack of, or inability to retain, skilled employees, lack of prior experience, and/or lack of experience with the bidding process. Through the process of awarding contacts for Project work Sabina aims to increase the number of Inuit firms engaged with the Project and enhance the capacity of those firms further contributing to regional economic development.

7.2.2 Actions and Adaptive Management

The capacity of local businesses and entrepreneurs will be increased through their involvement with the Project in the following ways:

- Provision of opportunities for long-term contracts, where feasible, to encourage the formation and/or expansion of local and regional contractors and suppliers.
- The tailoring of schedules to meet local and regional business capabilities (e.g., packaging contacts or the restructuring of large contracts into smaller pieces that smaller firms are able to accommodate).
- The provision of early notice to Inuit businesses about upcoming contracts, including details on proposal/bid requirements.
- Provision of information to potential suppliers that will strengthen the ability of local and regional businesses to tender effectively for contracts (e.g., sources of training and certification).
- Cooperation with local economic development agencies and educational institutions to encourage local business development (e.g., sponsor courses and workshops on business development and contract tendering) and develop supplier networks.

Sabina may request designated Inuit firms provide information that enables Sabina to access their qualifications and experience or may communicate directly with firms regarding their qualifications as related to Project work. For services that normally require bonding, an Inuit firm from the Kitikmeot Region must be bondable to be considered. Sabina will track the distribution of contract work to Inuit-owned companies in the Kitikmeot Region in order to understand the share of contracts being awarded to businesses based in each community. Sabina will work to ensure equitable distribution of contracts between communities, where possible. This will include consideration of businesses located in the eastern Kitikmeot Region.

In addition, Sabina will provide support to individuals and small corporations to grow their businesses and increase their capacity through work with third party partners (e.g., the NAC) and existing GN DEDT, KIA, or hamlet administered business development programs. This type of support may include assistance to coordinate available resources, provision of personnel with business expertise, and/or guidance related to meeting the requirements associated Project contract work. Assistance can also be made available to develop new skills related to the provision of goods and/or services to the Project, through available education and training programs. Sabina will support the development of Inuit firms interested in contract work with the Project by assisting them to develop capacity in the following areas:

- Business management.
- Financial management.
- Performance assurance (e.g., health and safety).
- Contracts and procurement.
- Human resources management.

Additionally, some education and training opportunities available in the Kitikmeot communities as a result of the Project can be made available to the employees of local businesses and entrepreneurs through pre-arrangement. This might include certificate-based training programs already scheduled for mine employees (e.g., heavy equipment operator, WHIMIS, first aid, and other relevant training programs). Employees of local Inuit owned business can submit an application to participate in one or more programs through Sabina's CLO located in Cambridge Bay.

7.3 COMMUNITY-BASED INVESTMENTS FOR BUSINESS DEVELOPMENT

7.3.1 Mitigation and Targeted Outcomes

Sabina is committed to promoting economic development and diversity in the Kitikmeot Region communities. Sabina recognizes there is potential for a general increase in wealth in the Kitikmeot Region as a result of the Project and related spin-offs. In order to maximize economic benefits to local communities, Sabina will actively promote a diversification of economic development through community-based investments that are focused to increase the capacity of local businesses to broadly meet the demands associated with the increase in economic activity.

Community-based investments will complement the Local Business and Entrepreneur Capacity Building Strategy (Section 7.2) by targeting broader-based community development initiatives that promote business development.

7.3.2 Actions and Adaptive Management

Sabina will work to ensure access and use of available funding for community-based investments for local business development. This includes the following actions:

- Defining, in a clear and transparent manner, the criteria and expectations for program or project funding support.
- Appointing a single point of contact to assist small businesses and non-government organizations (NGOs) in completing the necessary applications and steps to access funding.

- Developing informational materials that describe funding available for applicable business activities and providing to community EDOs and other interested parties.
- Identifying potential partnerships and funding opportunities for community investments, with a priority given to co-funded opportunities.
- Developing and/or sponsoring projects in partnerships with communities to enhance facilities, programs, and/or services.
- Maintaining a register of community development projects and commitments including a description of the objectives, community partners, schedule, contribution, and outcomes.
- Reviewing and analyzing the outcomes and lessons learned of Sabina-funded community development projects.

Sabina will provide community investments and funding that is demand driven and based on the needs and wants of communities and is in line with Sabina's community engagement policy. Contributions will be made to communities based on requests from representative organizations (e.g., requests for funding for community feasts, youth camps, and requests to provide equipment for students). Sabina will sponsor select community events, particularly those intended to showcase trade and economic activity in the Kitikmeot Region. Particular consideration will be provided to community-based investments for youth and/or youth groups with the aim of providing support to further enhance youth capacity both generally and as related to training, education and healthy lifestyle. Types of support might include youth camps, annual awards, workshops, and other education sessions.

Further, Sabina has established a donations policy that aims to enhance livelihoods and socio-economic development in the Kitikmeot Region. The donations policy is applicable to initiatives pertaining to 'youth and education' and 'community wellness and traditional lifestyles' in Kitikmeot communities. Where possible, Sabina's donation policy will complement existing programs and funding to maximize the benefits of and provide support for local initiatives. Donation requests will be considered by Sabina's Manager of Community Affairs. Sabina will also partner with local hamlets and other organizations in partnership with other mining companies, as appropriate, for larger projects and/or contributions.

8. Reporting and Plan Effectiveness

Reports on Plan outcomes and performance, as well as any recommended additional adaptive management actions, will be prepared at a minimum annually for internal company distribution and use. The Plan will be evaluated against the defined scope and objectives (Section 2).

As part of the Back River Socio-Economic Monitoring Program (Volume 10, Chapter 23), the relevant findings will be reviewed in collaboration with other members of the Back River Project Socio-Economic Monitoring Committee (SEMC) and the NIRB. Key findings and recommendations will be incorporated into an annual report to the NIRB. Reporting of monitoring results will also be provided to the Back River Project SEMC and the Kitikmeot Region SEMC.

9. Summary

The Project aims to provide contract opportunities that will attract, develop and retain effective businesses, and provide business opportunities that support the development of suppliers in the region's communities. The objective of the Plan is to encourage the involvement of local and regional Inuit-owned businesses in Project work to maximize the benefits of the Project within the Kitikmeot Region. To meet the objective, the Plan includes: 1) a Procurement Strategy; 2) a Local Business and Entrepreneur Capacity Building Strategy; and 3) a Community-based Investments for Business Development.

Concurrent with the Plan, the Socio-economic Monitoring Program (Volume 10, Chapter 23) is to collect and analyze information on socio-economic conditions and trends to inform the ongoing management and mitigation of the potential social and economic effects identified in the EIS and to facilitate best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project. This includes monitoring the achievement of objectives associated with the Business Development Plan. The monitoring program will be established to enable Project managers and community leaders to respond proactively and in a timely manner to any undesirable changes to socio-economic conditions.

Sabina recognizes that the Project will present Inuit communities with both substantial opportunities as well as changes to current social and economic conditions. Sabina is committed to implementing measures to enhance the benefits of the Project for individuals residing in the Kitikmeot Region communities. Mitigating existing and potential impacts, and promoting individual, family, and community well-being is a shared responsibility of Sabina, the KIA, the hamlets, and the Government of Nunavut. Commitments to enhance regional employment and training and the provision of community programs and services to enhance community well-being do not impose responsibility on Sabina to assume the role of government. Sabina will cooperate in these efforts. For the benefits of the Project to be fully realized at the local level the communities must be engaged in the implementation of strategies to build capacity to enhance well-being, which contributes to the ability of communities to deal with current and future challenges and to retain the benefits beyond the life of the Project.

There is inherently some uncertainty associated with predicting the social impacts prior to the implementation of Project activities. Sabina will work to address impacts and enhance benefits as they are identified over time. Adaptive management as a method used for the creation and implementation of the Business Development Plan and the monitoring program enables the engaged parties to instigate change where required and to employ the use of new data and best practices as they become available. Further, the adoption of adaptive management practices enables the engaged parties to adjust plans based on the findings of the monitoring program throughout the life of the Project.

References

1988. *Economic Development Agreements Act*, RSNWT (Nu)

NIRB. 2013. *Guidelines for the Preparation of an Environmental Impact Statement For Sabina Gold & Silver Corp.'s Back River Project*. (NIRB File No. 12MN036). Cambridge Bay, Nunavut.

Appendix 1

Kitikmeot Region Inuit Firm Registry Database
(as at May 29, 2013)

Appendix 1. Kitikmeot Region Inuit Firm Registry Database (as at May 29, 2013)

ID	Name	Summary	Location	Phone	Email
IFR0053	Kitikmeot Corporation	Construction, property management, land surveying, real estate	(*Kitikmeot*) Cambridge Bay	867-983-2200	davidgeneral@qiniq.com
IFR0270	Kitikmeot Air Ltd	Fixed wing Aircraft charter service	(*Kitikmeot*) Cambridge Bay	867-983-2569	cambridgebay@adlair.ca
IFR0273	Kitikmeot Cleaning Services	Janitorial cleaning & retail	(*Kitikmeot*) Cambridge Bay	867-983-2006	egotik@qiniq.com
IFR0384	Kitikmeot Helicopters Ltd	Helicopter contracting service	(*Kitikmeot*) Cambridge Bay	867-983-2705 or 2544	manager.ikaluktutiak@arcticco-op.com
IFR0554	Kitikmeot Caterers Ltd	Camp Catering, Camp Management and Janitorial Services	(*Kitikmeot*) Cambridge Bay	867-983-2200	davidgeneral@qiniq.com
IFR0567	Kitikmeot Cementation Mining and Development	Underground Mine Development and Training	(*Kitikmeot*) Cambridge Bay	867-983-2200	davidgeneral@qiniq.com
IFR0633	Kitikmeot Blasting Services Ltd.	Provide Explosives and explosive related services	(*Kitikmeot*) Cambridge Bay	867-983-2200	davidgeneral@qiniq.com
IFR0739	Kitikmeot Region Properties Inc.	Real Estate Development	(*Kitikmeot*) Cambridge Bay	867-983-2200	davidgeneral@qiniq.com
IFR0743	Ryfan Kitikmeot Ltd.	Construction and Contracting	(*Kitikmeot*) Kugluktuk	867-982-3201	stanley.anablak2@gmail.com
IFR0735	Sanakatiit Kitikmeot Ltd.	General Contractor	(*Kitikmeot*) Kugluktuk	867-982-3201	stanley.anablak2@gmail.com

Appendix 2

Kitikmeot Inuit Business Listing (as at March 8, 2013)

Appendix 2. Kitikmeot Inuit Business Listing (as at March 8, 2013)

Business Name	Activity	Phone	Email
	CAMBRIDGE BAY		
5136 Nunavut Ltd	Support Services for exploration, Medical Staff, Kitchen Staff, Local Training & Programs	983-3860	lisetompson@1984inc.com
Qillaq Innovations [5140 Nunavut Ltd]	General Contracting and Retail Sales of Modular Buildings	983-2868	sgillis@qillaq.ca
Angulaalik & Associates	Language consulting, teaching, interpreting and translating	983-2054	gangulalik@qiniq.com
Arctic Closet	Retail, Arts and Crafts, Souvenirs, Giftware, Sportswear	983-2555 or 2414	arctic_closet@qiniq.com
Aurizon Investments Ltd	Real estate investment, Residential housing complex	983-2309	inukshuk@netkaster.ca
Caribou Ventures	Financial Accounting, General Consulting	983-2868	caribouv@qiniq.com
Elu Inlet Lodge Ltd	Tourism Lodge	445-8774	peterkapolak@netkaster.ca
Ikaluktutiak Co-operative Ltd.	Store, Inns North Hotel and other hotel	983-2201	manager.Ikaluktutiak@arcticco-op.com
Kiiliniq Corporation Ltd	Property Management	983-2309	inukshuk@netkaster.ca
Kitikmeot Supplies Ltd.	Building Materials and Hardware	983-2227	wkillin@kitnuna.ca
Kitikmeot Corporation	Real estate development, Property management	983-2200	davidgeneral@qiniq.com
Kitnuna Projects Inc	Construction / Equipment Rentals / Vehicle Rentals	983-7500	atooke@kitnuna.ca
Kitikmeot Air Ltd	Fixed wing Aircraft charter service	983-2569	cambridgebay@adlair.ca
Kitikmeot Cleaning Services	Janitorial cleaning & retail	983-2006 or 445-3680	egotik@qiniq.com
Kitikmeot Helicopters Ltd	Helicopter contracting service	983-2705 or 2544	manager.ikaluktutiak@arcticco-op.com
Kitnuna Expediting Services Ltd	Expediting services	983-7500	atooke@kitnuna.ca
Kitikmeot Caterers Ltd	Camp Catering, Camp Management, Janitorial Services, Provision of Modular Structures	983-2200	davidgeneral@qiniq.com
Kitikmeot Cementation Mining and Development	Underground Mine Development and related training services	983-2200	davidgeneral@qiniq.com
Kitikmeot Blasting Services Ltd.	Provide Explosives and explosive related services	983-2200	davidgeneral@qiniq.com
Medic North Nunavut Ltd.	Remote site medical services, medical equipment supply	983-2200	davidgeneral@qiniq.com
Nunavut Expediting Services Ltd	Expediting, camp building & supply	983-2705	manager.ikaluktutiak@arcticco-op.com
Kalvik Enterprises Incorporated	Construction, Renovations, Repairs, Rentals	983-2996	kalvikenterprises@netkaster.ca

Business Name	Activity	Phone	Email
Trinity-Qillaq Helicopters Limited	Helicopter Charter Services	983-2868	sgillis@qillaq.ca
QDC Logistics Ltd	Logistical services, aviation brokering, expediting, remote site management, camp buildings	983-2868	sgillis@qillaq.ca
Sura Safety & Contracting Ltd	Safety Supplies and Paramedical Services	780-968-7661	mike@surasafety.com
Kitnuna Corporation	Trade and Services	983-7500	atooke@kitnuna.ca
Kitnuna Petroleum Ltd	Fuel Supply	983-7500	atooke@kitnuna.ca
Kitnuna Pharmacy Ltd	Pharmacy Services, Medical Supplies	983-7500	atooke@kitnuna.ca
5317 Nunavut Limited	Air, Marine and Logistic Services and Industrial Supplies Freight forwarding, warehouse/storage; purchasing, and procurement, Customs clearance facilitation; Steel fabrication and repair, Heavy Equipment attachment design and manufacturing; telescopic crane manufacturing	780-423-9268	tlt@norterra.com
Kitikmeot Region Properties Inc.	Real Estate Development	983-2200	davidgeneral@qiniq.com
NATCO [Nunavut Arctic Transportation Company]	Marine Transportation Industry	983-2818	sgillis@qillaq.ca
Nanook Woodworking	Construction / Expediting / Snow Removal	983-2925	-
Hadlari Consulting	Language, Cultural, Arts Services	983-2439	elisabeth@hadlariconsulting.com
Kalluk Corporation	Bookkeeping / Accounting / Consulting	983-2868	sgillis@qillaq.ca
A&R Cleaning Ltd	Janitorial Services	983-3888	-
B & J Flyfishing Adventures	Guiding and Flyfishing Services	983-2261	-
Hakongak Outfitting	Sport Hunting / Fishing / Sightseeing	983-5617	-
Ekaluktutiak Sports Hunt Ltd.	Sport Hunting / Guiding	983-2426	ehtocb@qiniq.com
Tunungagut Outfitting	Sport Hunting / Guiding	-	-
Arctic View Properties Inc	Commercial/Residential Property	983-2868	sgillis@qillaq.ca
Haogak Outfitting	Sport Hunting / Guiding	-	-
Nakashook Outfitting	Sport Hunting / Contracting / Taxi Driving	-	-
Go-Cargo Taxi	Taxi Service	983-2001	go_cargo_taxi@qiniq.com
Akhok Taxi	Taxi Service	983-5292	-
Wolf Tracks Taxi	Taxi Service	983-2300	-
Inukshuk Enterprises Ltd.	Contracting / Property Management / Retail store	983-2806	-
Haomik Enterprises	ATV & Truck rentals / Sewing / Carpentry	983-2156	-

Business Name	Activity	Phone	Email
Qillaq Denton Cho Logistics Inc	Contractor for Logistics / Remote Camps	983-2868	sgillis@qillaq.ca
Jago Services Inc	Mechanical / Electrical / Plumbing / Heating	983-2268	wwilcox@xplornet.com
Angulaalik Inuinnaqtun	Translations	983-2054	-
KUGLUKTUK			
Nokalak Sculptures/Outfitting Enterprise	Arts & Crafts Sales / Outfitting	982-3861	-
Webb Outfitting Nunavut (2011) Ltd.	Outfitting/Guiding	360-7123	-
JMS Supplies Ltd.	General Merchandise Retail	982-3324	jms_manfred@yahoo.com
Angoniatit Niovikvia Ltd.	Retail / Operations of KHA services	982-4908	
Kikiak Contracting Ltd.	General Contractor / Rental / Repair / Taxi	982-4713	kikiak_cw@netkaster.ca
Kitikmeot Cleaning Services	Janitorial Services	983-2006	egotik@qiniq.com
Ryfan Kitikmeot Ltd.	Construction and Contracting	982-3901 or 3102	stanley.anablak2@gmail.com
Sanakatiit Kitikmeot Ltd.	General Contractor	982-3901 or 3102	stanley.anablak2@gmail.com
5296 Nunavut Ltd	n/a	982-3901	kelvinn@enokhok.com
TALOYOAK			
Lyall Construction Ltd.	Construction	561-5500	lyallconstruction@netkaster.ca
Aqsaqniq Airways Ltd.	Charters / Contracts, Aviation	561-5500	lyallconstruction@netkaster.ca
Okalik Translating Services	Translating / Interpreting	n/a	-
Ugruk's House Repairs & Renovation	Repairs / Renovations	-	-
Linda Tucktoo Production	Professional Services	-	-
Taloyoak Hunter & Trappers Association	Cultural Activities	561-5066	hunter@qiniq.com
Inuit Broadcasting Corporation	Professional Services	561-6251	-
David Nanook Shop	Retail	561-5434	-
Peter & Helen Qayutinnuaq Cleaning Services	Janitorial Services	561-5323	-
GJOA HAVEN			
Gjoa Haven Takeout Ltd	Food / Retail	n/a	-
Hummiktuq Construction	Construction	n/a	-

Business Name	Activity	Phone	Email
Qiruaqraq Holding Ltd.	n/a	n/a	-
Arktis Piusitippaa Incorporated	Engineering, professional consulting services	360-6308	-
Tamarvik Suites	Accommodation	360-6362	Tamarvik.ltd@gmail.com
Central Arctic Ventures [4660 Nunavut Ltd]	Outfitting and Tourism	360-6272	brunocapenterprise@gmail.com
North Star Taxi	Taxi Services	360-6189	palla_p@hotmail.com
KUGAARUK			
Nanaok Interpreting/Translating Services	Interpreting / Translating	769-6401	amautinuar@qiniq.com
Apsaktaun's Construction	Construction	769-7341	-
Alina Tungilik's Art Pieces	Art sales	769-6218	-
Guy's Arctic Char	Commercial Fishing	769-6037	georgekakkianiun@yahoo.ca
Inutuinaq Construction	Construction	n/a	-
Kaunak's Post Office	Business/Industry Support	769-7960	-
Angutitjuk Enterprises	Retail	n/a	-
Emily's Art Work	Retail	769-7607	-
Nirrukkalik Enterprises	Tourism	769-6169	-
Koomiut Co-operative Association	Store, Inns North Hotel, Other accommodations	769-6231	manager.koomiut@arcticco-op.com

25. Occupational Health and Safety Plan

an ERM company

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Occupational Health and Safety Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
OCCUPATIONAL HEALTH AND SAFETY PLAN

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1. Introduction

1.1 OVERVIEW

Sabina and its contractors will provide a safe and healthy workplace for all persons, and during all phases of the Project. This Health and Safety Management Plan is a living document and continues to evolve as the Project advances. It will be adapted to the scope of activities at every phase of Project development. The elements of the Health and Safety Management Plan apply equally to the engineering, procurement and construction phase of the project.

1.2 SCOPE AND OBJECTIVES

Sabina will support and work with managers, supervisors, workers and contractors to attain effective health and safety programs that comply with and exceed legislated requirements in order to strive for best possible working conditions and behaviour.

The following objectives have been identified:

- Protect worker health.
- Prevent incidents or workplace accidents and injuries.
- Ensure a consistent approach to safety.
- Maintain productivity by directly or indirectly enhancing social conditions to positively affect the well-being of workers.
- Provide a safe and healthy workplace for all employees, contractors and visitors.
- Train and motivate all people to work in a safe and responsible manner.
- Integrate the highest safety standards through exploration, design, construction, operations and closure.
- Apply “best practice” to health and safety activities.
- Comply with relevant legislation and strive to exceed community expectations for health and safety.
- Strive for continuous improvement in health and safety.
- Hold all people accountable for health and safety.
- Ensure all people understand that “no task is so important that time cannot be taken to complete work safely.”
- Attain zero accidents.
- Attain high worker satisfaction with the construction health and safety program.
- Meet stakeholders’ expectations to ensure the health and safety of all persons on-site, including meeting training needs.
- Identify and make provisions to address the needs of all individuals with respect to health and safety; in a manner that their ability to do work is not compromised.

- Share information related to the health and safety of workers so they can share and contribute to the achievement of goals.

1.3 PLANNING AND IMPLEMENTATION

Planning for the Safety Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies.

This Plan is currently conceptual in nature and strategies and procedures will be refined and implemented prior to the construction and operation of the Project.

Health and safety will be tracked, reviewed, and updated through ongoing maintenance of the Plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

1.4 SABINA OCCUPATIONAL HEALTH AND SAFETY POLICY

People who work for Sabina are the key to the Company's success and we are committed to the health, safety and well-being of our entire workforce.

Sabina requires and enables each of its employees and contractors to maintain the health and safety of all individuals engaged in Sabina's operations and to strive to achieve an incident/accident free workplace.

Sabina provides its employees and contractors with the necessary resources to:

- Promote, prescribe and implement, health and safety practises and standards throughout the Company's operations in every stage of exploration, development, production and closure.
- Meet and, where reasonably practical, exceed regulatory requirements and continually strive to achieve best practises, notwithstanding any absence of legislation.
- Educate and train, on an ongoing basis, the individuals involved in Company operations to protect against injury, accidents and hazards.
- Institute health and safety reporting and accountability requirements and monitor same on an ongoing basis.
- Thoroughly investigate accidents, incidents and near misses and implement procedures and policies in a timely fashion to prevent re-occurrence.
- Work proactively with the public, contractors and governmental agencies to foster collaborative working relationships.

1.5 APPLICABLE LEGISLATION AND GUIDELINES

Specific knowledge of legal and other requirements and associated tasks are necessary to establish objectives and targets as well as to develop adequate management plans and operational controls to achieve the objectives and targets.

The significant current legislation governing occupational health and safety is as follows:

- *Mine Health and Safety Act* and Regulations; S.N.W.T. (Nu.) 1994, c. 25.
- Environmental Tobacco Smoke Worksite Regulations, Nu. Reg. 029-2003.

- Mine Health And Safety Regulations, N.W.T. Reg. (Nu.) 125-95.
- Mine Health and Safety Regulations, Amendment, Nu. Reg. 016-2003.
- *Safety Act* and Regulations, R.S.N.W.T. (Nu.) 1988, c. S-1.
- Asbestos Safety Regulations, N.W.T. Reg. (Nu.) 016-92.
- Environmental Tobacco Smoke Work Site Regulations, Nu. Reg. 027-2003.
- General Safety Regulations, R.R.N.W.T. (Nu.) 1990 c. S-1.
- General Safety Regulations, Amendment, Nu. Reg. 021-2000.
- Safety Forms Regulations, N.W.T. Reg. (Nu.) 102-91.
- Silica Sandblasting Safety Regulations, N.W.T. Reg. (Nu.) 015-92.
- Work Site Hazardous Materials Information System Regulations, R.R.N.W.T. (Nu.) 1990 c. S-2.
- *Workers' Compensation Act*, R.S.N.W.T. (Nu) 1988 c. W-6.
- Assignment of Statutes Administration Order, N.W.T. Reg. (Nu.) 040-96.
- Workers' Compensation General Regulations, R.R.N.W.T. (Nu.) 1990 c. W-21.
- *Workers' Compensation Act* (Consolidation) S.Nu. 2007,c.15, 2007 - Workers' Compensation General Regulations, R-022-2008.
- Assignment of Statutes Administration Order, N.W.T. Reg. (Nu.) 040-96.
- *Transportation of Dangerous Goods Act*, 1990, R.S.N.W.T. (Nu.) 1988, c. 81 (Supp.).

Sabina health and safety staff will continually monitor legislation for any amendments and implement compliance program and employee communication, with these changes, as required.

1.6 SITE DESCRIPTION

The Back River Project is currently an advanced exploration gold project located in the West Kitikmeot region of Nunavut. The Project is located at approximately 65° to 66° north latitude, and 106° to 107° west longitude. Following future approval and implementation, the Project will include two primary mining areas (Goose Property and George Property), a Marine Laydown Area in southern Bathurst Inlet, and connecting local all-weather roads and a winter access road.

2. Roles and Responsibilities

Employee involvement is essential. Involvement of employees at all levels is needed for effective performance of health and safety related tasks. All employees are required to practice good housekeeping, participate in training, report hazards and injuries, use personal protective equipment, and practice safe work habits. It is necessary that roles, responsibilities, and accountabilities be defined, documented, and communicated.

The **General Manager** is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The **Mine Manager** along with his/her direct reports are responsible for the implementation of this plan including:

- Overall management of plan.
- Monitoring.
- Operational aspects.
- Internal reporting.

The **Safety Superintendent** along with his/her direct reports are responsible for the implementation of this plan including:

- External reporting.
- Compliance and adaptive management.

Sabina will regularly review and update any changes in roles, responsibilities, and accountabilities.

3. Risk Assessment and Management

3.1 HAZARD IDENTIFICATION

Knowledge of hazards and evaluation of associated risks are necessary requirements for establishing health and safety objectives and targets, and for setting priorities to control the identified risks to employees and others on an ongoing basis. All contractors and subcontractors involved in the exploration, construction, and operation of the Project are required to carry out hazard identification.

For all phases of the Project, Sabina will have knowledge of potential hazards through such sources as:

- Legal and regulatory requirements.
- Company sustainable development policy and supporting policies.
- Records of incidents, accidents and non-conformances.
- Health and safety management system audits.
- Company health and safety audits.
- Communications from employees and others.
- Information from health and safety consultations.
- Information on best practices, typical hazards for the industry, and incidents and accidents in other organizations.
- Details of changes in occupations, facilities and activities.
- Inventory of hazardous materials and the toxicology of the hazardous materials.
- Monitoring data.
- Existing administrative, engineering and personal protective equipment controls.
- Workplace knowledge and other data.
- Professional judgment.
- Process hazard analysis.

- Management of change process.

Sabina uses its Hazard Identification, Risk Assessment, and Controls Methodology to document ongoing identification of hazards and classification of risks for routine and non-routine events associated with activities, occupations, and facilities for all phases of the project. Based on this methodology, Sabina on this methodology, Sabina creates a list of associated hazards with established priorities for risk control and action.

The result of the hazard identification and risk assessment is a basis for establishing and documenting health and safety objectives and targets, and subsequent action to achieve established objectives and targets. Each hazard classified as representing a priority risk requires an action plan with recommendations to control the risk. Recommendations include consideration for operational controls, training and awareness, and performance measurement and monitoring.

The action plan and recommendations are forwarded to the area management responsible for follow-up. In all cases, the action plan and recommendations are communicated to the interested and affected employees (and others as required). Typically, the recommendations are implemented in consultation with interested and affected employees (and others as required).

3.2 OCCUPATIONAL HEALTH AND SAFETY COMMITTEE

Involvement of everyone in health and safety activities is the most powerful way to develop personal appropriate values and build awareness and commitment. Sabina encourages employee participation by providing mechanisms that:

- Support participation (by identifying and removing barriers to participation).
- Establish a workplace health and safety committee(s) and employee representatives.
- Ensure that employees and employee representatives are trained in, and consulted on, all aspects of health and safety associated with their work.

An health and safety Committee(s) is established at the operation/facility that will at minimum meet the requirements of the *Nunavut Mines Act*. Sabina will ensure that:

- Meetings are held regularly, at least every 30 days.
- Employees are represented in health and safety committees through all levels of the organization and criteria for minimum participation (i.e., attendance) of committee members are established and enforced.
- Health and safety committees have goals and objectives that support the overall operational goals and objectives, that progress is tracked, and results are reported and followed-up.
- Minutes of committee meetings and follow-up action plans are documented and available to all employees. Minutes include attendance and follow-up action plans to identify outstanding issues, recommendations to management, planned action, assigned responsibility, and timeframes for completion. Action plans are reviewed at subsequent health and safety meetings. Action plan items are completed within a reasonable timeframe.

3.3 HAZARD AND RISK IDENTIFICATION REVIEWS

Sabina determines and communicates appropriately a timeframe to complete written initial hazard identification and risk assessment of identified occupations, activities, and facilities that might present health hazards.

Sabina has written operational controls to review hazard identification, risk assessment, and risk control. Reviews will be conducted quarterly and the review documented and made available for all employees.

Sabina has a written operational control to necessitate a review of any occupation, facility, and activity when there has been a change in the occupation, facility, or activity, or any other change that could affect the initial hazard identification and risk assessment.

3.4 HEALTH AND SAFETY STRATEGIES

Senior Management:

- Senior management must provide leadership for health and safety activities and assumes overall responsibility for success of the Health and Safety Management System.

Line Management driven:

- Line supervisors play a pivotal role in the success of the health and safety programs.
- Health and safety policies, programs, and procedures are consistently applied throughout the Project by Sabina’s supervisors as they direct the workforce in their daily duties.

Visibly demonstrated commitment:

- Health and safety excellence only occurs when supervisors, managers, and executives demonstrate their values through actions and their credibility by engaging employees to actively participate in the program.

Annual target reductions:

- By establishing annual leading and lagging indicators for health and safety improvements, Sabina will strive for continuous improvement by meeting these reductions.

High level of accountability:

- Every employee is held accountable for exercising sound judgment and skills in a reasonable, practical, and timely way to prevent accidents and injuries.

3.5 HEALTH AND SAFETY PRINCIPLE

All incidents can be prevented. Sabina believes that:

- All injuries and environmental incidents are preventable.
- Injuries and incidents are not mere chance occurrences, but represent a system failure.

- Employee involvement is essential. Employees are required to practice good housekeeping, participate in training, report hazards and injuries, use personal protective equipment, and practice safe work habits.
- Management is responsible and accountable for preventing injuries. Leadership is all about people, and safety, at its essence, is respect through action for the well-being of people.
- Working safely is a condition of employment. Sabina's approach is "Put Safety First and it will Last until the End." Each employee is held accountable for using sound judgment to prevent injuries.
- All operating exposures can be controlled. Sabina will continually analyze its process and procedures to maximize efficiency and reduce safety risks.
- A "world-class" health and safety program is achieved when incidents and injuries are intolerable, responsibilities and expectations are clearly defined, communication is open, and the organization is employee-centred.

3.6 GOALS AND OBJECTIVES

Objectives and targets are necessary and can be established at all levels of the company. They are documented and measurable objectives and targets to monitor and improve health and safety performance regarding health and safety risks, and environmental aspects and impacts.

3.6.1 Objectives and Targets

Each operating department will establish and document specific objectives and targets and are to be aligned with Sabina objectives and targets, demonstrate continuous improvement in health and safety performance and achieve the goal of "zero harm."

Each operating department will establish health and safety targets and objectives annually. Each target and objective is to have an associated action plan. The plan for achieving objectives and targets includes:

- Identifying the planned action.
- Designating responsibility for achieving objectives and targets.
- Determining timeframe within which the objectives and targets are to be achieved.
- Verifying completion.

3.6.2 Review of Objectives and Targets

Targets and objectives are reviewed regularly (at least annually) and progress toward meeting established objectives is measured and tracked (e.g., key performance indicators for health and safety).

3.6.3 Communication of Targets and Objectives

Objectives and targets for the operating department are communicated to employees throughout the organization, and facility or department objectives and targets are communicated throughout the respective areas.

3.7 HEALTH AND SAFETY BEST PRACTICES

A “world-class” health and safety workplace incident rate is considered 2 or less, with a severity rate of 1 or less. Incident rate is usually calculated by multiplying the number of total recordable injuries by 200,000 and divide by the hours worked. Severity rate is usually calculated by multiplying the number of lost-time workdays by 200,000 and dividing by the hours worked.

Sabina will strive to reduce these rates to the lowest possible level.

Sabina strives to continuously improve to achieve world-class performance. The company intends to be the leader in Nunavut Mining by ensuring strict adherence to the following strategies:

- Health and safety is line management-driven.
- Annual target reduction for health and safety.
- Performance accountability (covered in annual performance review).
- High visibility for health and safety (site inspection and job observations).
- Compliance auditing (planned inspections).
- Practical risk assessment.
- Team communication and consultation (health and safety meetings, OHSC meetings).
- Training and awareness (all employees).
- Recognition for individual and team health and safety performance.
- Document and data control.
- Emergency preparedness and response.
- Audits and assurance.
- Management reviews.

3.8 TRAINING AND AWARENESS

All employees need some level of training depending on whether they manage, perform, or verify activities affecting health and safety risks or environmental aspects. A key factor is to match training provided with training needed. Training and awareness needs are determined by:

- Results of hazard identification, risk assessment, and risk control.
- Results of the environmental aspects evaluation.
- Company sustainable development policy and supporting policies.
- Legal and regulatory requirements.
- Established objectives and targets.
- Management Plans.

Sabina identifies and documents training needs and delivers appropriate training to all employees whose work might affect risks to health and safety in the workplace and whose work might create a significant environmental impact. All Sabina contractors are required to abide by this requirement.

Employees and others are made aware of:

- Importance of conformance to requirements of the health and safety Management System and health and safety policies.
- Risk associated with work in a remote environment.
- Risk associated with work in extreme climatic conditions.
- Risk to the environment and to health and safety of their work activities.
- Risk to the environment and to health and safety of deviations from specified operational controls.
- Benefits of a healthy and safe workplace.
- Their specific roles and responsibilities in achieving compliance.

Sabina's training and awareness plan considers:

- The differing levels of risk.
- The remoteness of the site and the climate.
- The different responsibilities, abilities, and literacy of employees.
- The culture.
- Trainers.
- Training methods and settings.
- Training frequency.
- Contractors.
- Documentation of training.
- Evaluation of training.

Sabina regularly reviews and updates the training and awareness plan based on changes in training needs related to Health and Safety Management System awareness, occupation-specific training, and regulatory-required training.

3.9 REPORTING AND DOCUMENTATION

Reporting and documentation requirements are outlined in Back River - Incident Investigation and Reporting Policy. During all phases of the project the company will implement a reporting and documentation system that satisfies Sabina's health and safety documentation and reporting standards.

3.10 OPERATIONAL CONTROL

Operational controls include administrative, engineering, and personal protective equipment controls and other protective measures (e.g., machine guarding, railing). Administrative controls include programs, standard operating procedures, practices, guidelines, and instructions. Operational controls are the significant means and actions to control health and safety hazards and risks, and environmental aspects and significant impacts. They help achieve the requirements of the company Occupational Health and Safety Policy and supporting policies, established objectives and targets, and compliance with legal and other requirements.

Sabina will regularly review:

- Legal and regulatory requirements.
- Occupations, facilities, and activities where the level of risk is such that further control measures are needed.

When considering the outcome of such reviews, Sabina develops operational controls:

- To control identified health and safety risks (including those that could be introduced by others such as contractors and visitors) and the significant environmental impacts.
- That stipulate operating criteria.
- For the design of workplace, process, installations, machinery, operational controls, and the work organization (e.g., 8-hour and 12-hour shifts), including their adaptation to human capabilities to eliminate or control adverse environmental impacts, and health and safety risks at their source.
- To cover situations where their absence could lead to non-conformance with legal and other requirements, the company sustainable development policy and supporting policies, and established objectives and targets.

Sabina regularly reviews and updates the operational controls for suitability and effectiveness in controlling health and safety risks, and adverse environmental impacts.

3.11 EMERGENCY PREPAREDNESS AND RESPONSE

Emergencies that could result in an accident or incident causing injuries, illnesses, or environmental impacts, or that could cause health and safety risks need to be considered in the health and safety Management System.

Sabina establishes and maintains operational controls to identify the potential for and responses to accidents, incidents, and emergency situations, and to prevent and mitigate the likely associated injury, illness, and adverse environmental impacts (see Risk Management and Emergency Response Plan).

Sabina regularly reviews its emergency preparedness and response plans and operational controls. In addition, a timely review will be undertaken after accidents, incidents, or emergency situations.

3.12 INTERACTION WITH NUNAVUT’S MEDICAL SYSTEM

The current intervention procedure for injuries will be as follows:

- Stabilize the injured person and administer medical treatment within the capabilities of the medical professionals at site.
- Depending on the nature of the injuries, the patient might be flown to Cambridge Bay for stabilization and then flown by med-evac aircraft to Yellowknife.
- If the patient is stabilized and is low risk to transfer to the Yellowknife Regional Hospital, they will be taken by aircraft chartered by Sabina.
- Depending on the severity of the injury, the patient will be flown to a major hospital (Edmonton) as soon as possible.

Key responders and medical professionals will be trained in current first aid and cardiopulmonary resuscitation (CPR) techniques.

In addition automated external defibrillators (AED) will be located in strategic locations and all responders and medical professionals will be properly trained in its use.

During all phases of the project, Sabina will establish a appropriate first aid rooms at Goose and George Properties will continue in operation where qualified medical staff will attend to medical emergencies. These facilities will remain functional for the entire duration of the project. The existing med-evac procedure will continue to be used.

Sabina recognizes and will adhere to the Government of Nunavut's policy on medical evacuation of non-Nunavummiut.

3.13 PERFORMANCE MEASUREMENT AND MONITORING

It is important to identify key parameters to measure and communicate performance internally and externally, including compliance with relevant legal and other requirements, incident trends and progress toward objectives and targets.

The ultimate indicators of the effectiveness of the health and safety Management Plan are show in Table 3.13-1.

Table 3.13-1. Ultimate Indicators of the Effectiveness of the Health and Safety Management Plan

Indicator (as Defined by OSHA)	Sabina Performance Target
Recordable incident rate	Less than 2
Lost-time injury rate	Less than 1

Note: OSHA (United States Occupational Safety and Health Administration)

Sabina recognizes that there is no single reliable measure of health and safety performance. What is required is a "basket" of measures or a "balanced scorecard" that provides information on a range of health and safety activities. A number of leading indicators, or positive performance measures (PPM), provide information on how the system operates in practice, identifies areas where remedial action is required, provides a basis for continuous improvement, and provides a mechanism for feedback and consequential motivation (Tables 3.13-2 and 3.13-3). Monitoring these leading indicators (PPM) will ensure the effectiveness of the health and safety Management Plan and that Sabina's targets and objectives are met.

3.14 ACCIDENTS, INCIDENTS, NON-CONFORMANCES, AND CORRECTIVE AND PREVENTATIVE ACTION

Root or basic cause analysis is important for evaluating and investigating accidents, incidents and non-conformance in establishing objectives and targets for a successful corrective action program. Through this process, the actions taken to address non-conformance can result in permanent and positive changes in the health and safety Management System and continuous improvement. It is important that employees with health, safety, and environmental responsibility be part of this process to assist in identifying actual and potential health and safety risks, and adverse environmental impacts.

Table 3.13-2. Examples of Positive Performance Measure for Safety

Objective	Indicator	Measure/Monitor	Results	Improvement
All activities to be subject to hazard analysis and risk assessment	Risk Assessment	% Risk assessment complete % Control measures implemented	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement
Written work procedures in place for critical activities	Work procedures	% Written procedures complete	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement
Provision of safe workplace	Work place inspection target for each frontline supervisor across whole site on a monthly basis each with specific area. Workplace visibility tour by middle and senior managers in their work area once per month.	% Scheduled inspections complete by name and work area/department % Actions arising complete by name and work area/dept % Visibility/inspection tours complete	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement
Employees working safely	Performance-based observations	% Employees working safely % Personnel protective equipment (PPE) compliance	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement
Incident reporting and implementation of remediation measures	Timeliness of reporting Incident investigation effectiveness Log of corrective actions	% Incidents reported within 24 hours % Near-miss incidents % Incident investigation complete on time % Corrective actions implemented All by area/dept.	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement
Safe and competent employees	Performance assessment including training needs identification Training records	% Performance assessments complete % Scheduled training complete All by area/dept.	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement

Table 3.13-3. Examples of the Application of Positive Performance Measures for Safety

Objective	Indicator	Measure/monitor	Results	Improve
Improve safety awareness	Toolbox talks on targeted topics monthly by all Supervisors	% Toolbox talks complete by department % Employees attending % Actions arising complete All by area/dept. % Safety Representatives Trained	Track reported % monthly by area/department	Review progress at monthly senior management meetings, target areas for improvement
Improve safety culture	Annual climate survey	Overall findings based on selected criteria All by area/dept.	Track trends annually by area/department	Review progress at annual senior management meetings, target areas for improvement

Sabina has written operational controls for handling and investigating potential accidents, incidents, and non-conformance that includes:

- Tracking and recording details of accidents, incidents, and other non-conformance.
- Root or basic cause analysis.
- Mitigating any health and safety risks and adverse environmental impacts that arise from accidents, incidents, or other non-conformance, including corrective and preventive action.
- Where mitigation is necessary, conducting a health and safety risk assessment and significance evaluation of the environmental aspects of the proposed corrective and preventive action(s) to determine appropriateness and effectiveness.
- Implementing, recording, and communicating changes arising from the corrective and preventive action, e.g., changes in operational controls.

3.15 RECORDS AND RECORDS MANAGEMENT

Sabina maintains and preserves internal and external records that are critical to design and performance of the health and safety Management System. These records include:

- Employee training records.
- Inspection reports.
- Consultation reports.
- Accident, incident, and non-conformance reports and follow-up corrective and preventive action reports.
- Medical test reports (medical test reports and health surveillance reports might be considered confidential).
- Health surveillance reports.

3.16 AUDITING, REVIEW, AND UPDATE

Sabina conducts internal audits to determine the degree of implementation and to verify performance of the health and safety Management System. Management and labour representatives may undertake audits. The results of audit(s) and management review(s) form the basis for the annual written statement of assurance by management on effectiveness of the health and safety Management System.

3.17 MANAGEMENT REVIEW

Senior management reviews the health and safety Management System to determine its continued suitability, adequacy, and effectiveness. Outcomes of a management review include recommendations to revise Sabina's Sustainability Policy and supporting policies, to revise established objectives and targets, and to specify corrective actions for individual management with target dates for completion.

- Cases of occupational disease and compensation claims.
- Audits and assurances.
- Management reviews.
- Other reviews.
- Emissions measurements.
- Exposure measurement records.
- Hazard identification, risk assessment and risk control records.
- Government reports.

26. Community Involvement Plan

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BACK RIVER PROJECT
Community Involvement Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
COMMUNITY INVOLVEMENT PLAN

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1. Introduction

The Back River Project (the Project) has been designed to minimize, mitigate and/or manage potential adverse effects on communities while systematically seeking to enhance positive effects. As part of the requirements of the final Environmental Impact Statement (EIS) Guidelines (NIRB 2013) issued by the Nunavut Impact Review Board (NIRB), this document presents the Community Involvement Plan that Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

The Community Involvement Plan (the Plan) is a living document and will be regularly updated based on management reviews, community engagement feedback, incident investigations, regulatory changes, or other Project-related changes. The Plan will be revisited and updated or adapted on an annual basis. As Sabina works to address impacts and enhance benefits identified over time, changes may be made to this plan to better achieve desired outcomes. The adaptive management strategy enables engaged parties to instigate change where required and to employ the use of new data and best practices as they become available, for example, data and analysis generated by the monitoring program throughout the life of the Project. Community involvement will be ongoing and will be implemented by Sabina's community relations and management staff.

2. Scope and Objectives

Sabina is dedicated to working closely with Kitikmeot residents, communities and stakeholders so that the Project is built in a manner consistent with regional needs and aspirations. The Plan will apply from the time of approval of all required licences and permits to allow construction of the Project to begin. The temporal extent of the Plan will be the life of the Project itself, including construction, operation, reclamation and closure, and temporary closure/ care and maintenance phases.

The objective of the Plan is to fulfil Project external public engagement commitments and maintain meaningful relationships with communities and the public. For the purpose of the Plan, the term 'public' refers to populations within the area of influence and the term 'community' will refer the communities within the Kitikmeot Region.

The results of community engagement, Community Advisory Group (CAG) meetings, and community research to date have informed the development of the Plan. Identified topics of interest, common community concerns, and suggestions that were identified as valuable by local individuals have been considered and integrated into the Plan where possible. Sabina's community engagement and outreach activities to date have included meetings with:

- The public (2012 and 2013).
- Hunter and Trapper Organizations (HTOs).
- Hamlet Mayors and Councils.

Community engagement methods employed by Sabina are numerous and have included presenting Project related information in community newsletters, during radio shows, and the use of the social media among other methods. Community engagement methods as defined by the Plan are further detailed in Section 7.2.1.

CAGs have been established to maintain clear and open lines of communication about the Project between CAG representatives and Sabina. CAG representatives include individuals associated with local HTOs, the Kitikmeot Heritage Society, Hamlet Councils, as well as local Elders and youth. CAG meetings to date have included Project planning discussions, information sharing and Project updates, and the identification of potential community issues.

Sabina will continue to engage with CAGs, Kitikmeot residents, communities, and stakeholders throughout the Project development process and will ensure the provision of timely Project updates and responses to feedback provided. Inuinnaqtun and Inuktitut interpretation/translation will be provided, and written materials provided in those languages, throughout the consultation process to enable participation of all community members. This Plan details those efforts Sabina will make to communicate and engage with residents, communities, and stakeholders throughout the life of the Project.

3. Applicable Legislation and Guidelines

3.1 SABINA OPERATING RULES AND PRACTICES

Sabina is committed to following mining industry best practices in its public consultation and engagement activities and to following the Prospectors Development Association of Canada (PDAC) (2013) basic principles for successful community engagement as follows:

- *Respect* – respect for all parties in the process.
- *Honesty* – full, true, and plain disclosure of information.
- *Inclusion* – maintain an inclusive process, so all parties who should be present are present.
- *Transparency* – establish and maintain complete transparency.
- *Communication* – promote two-way communication with community members.

Sabina will also maintain a community donations policy focused on supporting initiatives pertaining to ‘youth and education’ and ‘community wellness and traditional lifestyles’ in Kitikmeot communities. Sabina will provide annual awards to support youth involvement and in northern training and facilitate the retention of youth in the North. Donation request forms will be made available at various locations in English, Inuktitut, and Inuinnaqtun. Further engagement of youth may be undertaken with aim of matching community-based investment with local demand and the needs of the Project. These activities are defined further in Section 7.

In addition, Sabina is committed to acting as a steward of the environment and promoting sustainable development of communities in the Kitikmeot Region. To fulfill this responsibility in regards to community involvement, Sabina has established Socio-economic Management Plans, including the Community Involvement Plan, that commits the Company to communicate openly with employees, contractors, local stakeholders, governments and the public on Project activities and environmental and social programs and performance.

3.2 GOVERNMENT LEGISLATION AND POLICY

Although specific legislation has not yet been developed to guide community involvement or community consultation, there are a number of regulatory bodies that have established requirements which pertain to mining projects in Nunavut. The NIRB, the Nunavut Water Board (NWB), the Government of Nunavut Department of Economic Development and Transportation (GN DEDT), and Nunavut Tunngavik Incorporated (NTI) have each developed guidelines for community consultation and engagement, including:

- As part of their mandate, the NIRB was established so that Inuit have an opportunity to be formally involved in impact assessment in Nunavut, typically through requiring mineral development proponents to consult with all potentially affected-communities during the environmental assessment process.
- The NWB requires community involvement in water licensing process for mining projects, through public comment and public hearing mechanisms.
- The GN DEDT has developed the "Consulting with Communities in Nunavut: Guide to Community Consultation for the Mineral Exploration and Mining Sector" to help ensure that meaningful benefits from resource development flow to Nunavummiut. The guide provides a 'who's who' in communities and outlines various cultural differences of which southerners may not be aware.
- NTI's *Mining Policy* (NTI 1997) contains provisions related to community consultation and engagement. NTI requires that all stakeholders be given a meaningful opportunity to participate in mineral development decision-making, and that all these participatory processes be open, transparent, timely, and well-defined.

In addition, there are project-specific guidelines that detail community involvement and consultation for specific projects, for example, those developed by the Nunavut Planning Commission to consult with communities regarding the content of the Draft Nunavut Land Use Plan, and those developed by the NIRB for resource development projects in the region. For the Project, consultation and community engagement requirements as determined by government are specified by the Project Guidelines for the Preparation of an Environmental Impact Statement (NIRB 2013).

4. Roles and Responsibilities

Implementation of the Plan, as well as on-going performance evaluations, updates or revisions to the Plan, will be the responsibility of the Manager of Community Affairs or similar position, or another designated management personnel with requisite skill set and experience. The Manager of Community Affairs may also delegate responsibility for specific components of the Plan to other personnel. Sabina will maintain an office location in Cambridge Bay staffed by a Community Liaison Officer (CLO), where community members can obtain Project-related information, apply for employment, and have complaints or other issues addressed.

In the implementation of the Plan, Community Affairs will also work in collaboration with the Manager of Human Resources and the Manager of Procurement and their staff (e.g., the Inuit Training and Employment Coordinator) to ensure efforts are coordinated as it applies to the Plan. Other supporting roles and responsibilities of staff will be identified during implementation based on needs.

Sabina is committed to regular engagement of the NIRB, the KIA, and Kitikmeot communities and seeking feedback on potential areas for improvement in the Plan over the life of the Project. In this regard, the role of these organizations, community stakeholders, and the public is important to support continual improvement and adaptive management.

5. Management Measures

A Socio-economic Monitoring Program (Volume 10, Chapter 23) has been developed to help ensure that the Project fulfills best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project, especially for Inuit. Equally, monitoring will provide relevant and timely information to enable Project managers and community leaders to respond proactively to potential risks and adverse socio-economic effects.

In order to support management measures associated with the Plan, a number of Project-specific and community-level indicators have been defined as detailed in the Socio-economic Monitoring Program. Monitoring is designed to measure social performance broadly with respect to health and community well-being, as well as traditional land use. Other monitoring of achievements with respect to employment, education and training are identified as they apply to the Human Resources Plan (Volume 10, Chapter 28). Monitoring of achievements with respect to economic development and business opportunities are identified as they apply to the Business Development Plan (Volume 10, Chapter 24).

Thresholds for each indicator will be determined in consultation with the NIRB, CAGs, and the Back River Project Socio-economic Monitoring Committee (see Socio-economic Monitoring Program, Volume 10, Chapter 23). Where Project performance is addressed by the Inuit Impact and Benefit Agreement (IIBA), it is anticipated that applicable thresholds will be defined in reference to the provisions of the IIBA. For all indicators, management action will be triggered when annual performance is below threshold. Specific actions will be determined in consultation with the NIRB and the KIA (when applicable to the IIBA). This will involve an evaluation of the existing mitigation and management measures, and identification of appropriate adjustments to the Plan.

6. Monitoring Program

The Back River Socio-economic Monitoring Program (Volume 10, Chapter 23) details the approach and methods through which Project outcomes will be monitored and reported.

7. Mitigation and Adaptive Management

Plan activities include the following main elements:

- Methods to promote community involvement.
- Project updates.
- Incorporation of public feedback and community input.
- Promotion of Inuit participation in employment and contracting opportunities.
- Communication of research results.

7.1 METHODS TO PROMOTE COMMUNITY INVOLVEMENT

7.1.1 Community Engagement Methods

Sabina's community engagement methods include public meetings, stakeholder meetings, the Sabina office and Community Liaison Officer (CLO) in Cambridge Bay, CAGs, site visits, social media, project newsletter, other distribution materials, radio shows, and trade show participation. These methods will be used to provide project updates (Section 7.2), incorporate public feedback and community input (Section 7.3), promote Inuit participation in employment and contracting opportunities (Section 7.4), and to communicate research results (Section 7.5). Sabina's community engagement methods are summarized in Table 7.1-1.

Table 7.1-1. Community Engagement Methods

	Description
Public Meetings	Public meetings are open to all members of a community. Sabina will provide Project information and updates, solicit feedback, and be available to answer the public's questions. Public meetings will be interpreted into local dialects and minutes will be taken by Sabina. Seasonal residents of Bathurst Inlet and Omingmaktok will be engaged in Cambridge Bay.
Stakeholder Meetings	Meetings with key community stakeholder groups (e.g., HTOs, Hamlets, Aboriginal organizations) will be conducted to provide Project updates, discuss particular Project-related topics, and solicit feedback as appropriate. Meetings will be interpreted into local dialects and minutes will be taken by Sabina.
Sabina Office / Community Liaison Officer	Sabina will maintain an office location in Cambridge Bay where community members can obtain Project-related information, apply for employment, and have complaints or other issues addressed. This office will be staffed by a Community Liaison Officer (CLO). The possibility of adding more offices and CLOs in other Kitikmeot communities will be assessed in the future.
Community Advisory Groups	Meetings will be held with Community Advisory Groups (CAGs) to provide Project information and updates, solicit feedback, and to answer questions. CAGs have been established in Cambridge Bay and Kugluktuk and consist of HTO, Hamlet, Elder, and youth representatives. The Cambridge Bay CAG selected the name 'Kiilinakmiut' for their group and includes representatives from Bathurst Inlet and Omingmaktok. The Kugluktuk CAG selected the name 'Kugluktumi Sabinakut Katimayiit' for their group. Meetings will be interpreted into local dialects as needed and minutes will be taken by Sabina.
Site Visits	Visits to the Project site will be provided to selected stakeholders. Site visit participants will be shown different Project areas, provided with relevant Project information, and introduced to different Project staff.
Social Media	Sabina will continue to maintain a Project website (www.backriverproject.com) that provides up-to-date information on the Project and its community engagement activities. Email distribution lists, and RSS and Twitter feeds will also continue to be utilized to share Project-related information.
Project Newsletter	Sabina will continue to issue a semi-annual (or more regular) Project newsletter to share information and keep communities and other stakeholders informed of Project-related developments. This newsletter will be translated into local dialects and distributed through Sabina's social media outlets and at physical locations throughout the Kitikmeot Region.
Other Distribution Materials	Other informational materials (e.g., handouts, posters, popular summaries, company reports) will be made available to communities and stakeholder groups in order to widely share Project-related information. These will be translated into local dialects were appropriate.
Radio Shows	Radio shows provide a way to share Project-related information with a wide audience. Radio shows can be of a call-in nature where Sabina can answer the public's questions, or of an informational nature where only Project updates are provided.
Trade Show Participation	Trade show participation (e.g., display booths, presentations, sponsorships) provides a way to share Project-related information and interact with the public.

Community engagement will first take place with the residents of those communities located nearest to the Project site, specifically with residents of Cambridge Bay, Kugluktuk, Bathurst Inlet, and Omingmaktok. Meetings will take place and materials will be available in Cambridge Bay and Kugluktuk. Secondly, Sabina will also engage residents of the eastern Kitikmeot Region (Taloyoak, Gjoa Haven, and Kugaaruk) using similar methods.

7.1.2 Community Engagement Activities by Project Phase

Community engagement activities during the construction phase of the Project will focus on:

- Providing communities with Project and construction-related progress updates.
- Informing communities of training and hiring opportunities during construction and operations.
- Identifying community issues and concerns regarding construction-related activities.
- Continuing discussions on the development of community-based monitoring programs.
- Providing information on future Project development plans.

Sabina will actively engage communities during the construction phase of the Project. Construction will be a time of increased activity at the Project site, with an influx of large numbers of construction personnel, new machinery, and infrastructure and building materials. The Project will evolve rapidly during the construction phase, and it will be necessary to keep the local communities informed of Project changes and advancements. Community meetings, ongoing communication with community stakeholders, use of social media, and other forms of engagement will be utilized during this period.

Community engagement activities during the operations phase of the Project will focus on:

- Providing communities with Project updates and informing communities of any proposed operational changes (e.g., mine expansions, new infrastructure development).
- Informing communities of training and hiring opportunities during operations and closure/post-closure.
- Identifying community issues and concerns regarding operations-related activities.
- Updating communities on the results of Project monitoring and mitigation programs, and soliciting feedback.
- Providing information and soliciting community feedback on mine reclamation and closure plans and activities.

Sabina will continue to actively engage communities during the operation phase of the Project. While the mine and its facilities will be very active locations, the operation phase of the Project will be highly routinized and employment numbers will stabilize. However, operational plans may evolve over the course of the Project; for example, project expansions may be proposed that require new regulatory approvals and community consultation. Community meetings, ongoing communication with community stakeholders, use of social media, and other forms of engagement will be utilized during this period.

Community engagement activities during the reclamation and closure, and post-closure phases of the Project will focus on:

- Providing communities with Project and reclamation and closure-related updates.

- Informing communities of training and hiring opportunities during reclamation and closure, and post-closure.
- Identifying community issues and concerns regarding reclamation and closure-related activities.
- Updating communities on the results of reclamation and closure-focused monitoring and mitigation programs, and soliciting feedback.

Community engagement activities will be less intensive during the reclamation and closure, and post-closure phases of the Project. Prior to final closure, ore production will permanently stop, much of the infrastructure will be removed from the site, and necessary Project land will be remediated. While effects monitoring will continue, only a small staff of closure professionals will remain at the Project site. Community meetings, ongoing communication with community stakeholders, use of social media, and other forms of engagement will be utilized during this period.

7.2 PROJECT UPDATES

Successful engagement will be based on timely and transparent communication regarding the status of the Project and related topics including training and employment opportunities. Project updates including progress, current initiatives, and future work have already been initiated and will continue throughout the life of the Project. Community newsletters are distributed by Sabina's CLO and are readily available to the public and the communities. Sabina will provide Project updates to all employees, the communities, and the public regarding any notable changes to Project activities, including changes to production and operations (such as temporary closure or care and maintenance periods) and shipping schedules. Communication will mainly take place through the following means:

- In-person to employees via managers during staff meetings, which will be followed by informational posts on bulletin boards at several location in the camps as well as the Sabina office in Cambridge Bay (postings will be provided in English, Inuinnaqtun, and Inuktitut).
- Community radio broadcasts that inform listeners of Project updates and other Project related information.
- Online, through the use of company provided updates to the Back River Project website (www.backriverproject.com), and other social media including email distribution lists, Twitter, and RSS feeds.
- Public meetings that are open to all community members.
- Stakeholder meetings with HTOs, Hamlets, Aboriginal organizations, and governments held periodically at major Project milestones through the life of the Project.
- Distribution of Project bulletins or newsletters (The Back River Project Newsletter, provided in English, Inuinnaqtun, and Inuktitut) online and in print within Kitikmeot Region communities (printed copies provided in government offices and public buildings, and directed to individuals who have requested to be kept up-to-date on the Project).
- Distribution of other Project materials including handouts, posters, popular summaries, and company reports.
- Meetings with CAGs in Cambridge Bay and Kugluktuk to further facilitate the provision of project updates, and other project related information.

7.3 INCORPORATION OF PUBLIC FEEDBACK AND COMMUNITY INPUT

The Plan was developed based on the requirements for the EIS with consideration for issues discussed during socio-economic and land use community research and the annual Kitikmeot Region Socio-economic Monitoring Committee meetings and reports. The results of Sabina's existing community engagement program have also informed the development of the Plan.

Addressing and incorporating public suggestions and concerns related to the Project is a goal Sabina will meet through the use of public and stakeholder meetings, the Back River Project website, and community research. This work began early in the environmental assessment process and will continue through the life of the Project. Sabina will continue to provide information and request feedback at all public and stakeholder meetings. Community suggestions and concerns are also elicited during community research and through the use of the Project website which provides a forum for the public to provide feedback. Public engagement efforts will be evaluated through the record of public meetings, HTO and government meetings, and CAG meetings, and will include any feedback provided by community members regarding the involvement process. Sabina will respond to community suggestions and concerns in-person when possible, for example at community meetings, through the CAGs, through the CLO, by providing updates in Project newsletters and bulletins, and/or on the Back River Project website, as applicable. Overall, the Plan is designed to help ensure the timely consideration and resolution of all substantive issues, concerns, and comments raised by stakeholders.

Public feedback will be solicited through public and stakeholder meetings, through the Sabina office in Cambridge Bay, meetings with the CAGs, call-in radio shows, and by encouraging local employees and contractors to share their thoughts and suggestions with community relations and management staff. These methods of engagement also provide an effective form of two-way communication and an opportunity for Sabina to provide responses to inquiries, for example, comments, suggestions, and/or concerns about the Project. Sabina will also solicit feedback about the Project through the provision of forms available at various locations in the Kitikmeot Region and has established a procedure to address public feedback in a timely, effective, and transparent manner. Sabina will track and monitor community views on the issues and concerns that arise through public meetings, stakeholder meetings, public comment forms, and/or CAG meetings, and are documented and tracked by Sabina through a community engagement database. Local employees and contractors will also be encouraged to provide direct feedback on workplace and Project-related issues that arise.

As mentioned previously, Sabina employs a CLO in Cambridge Bay that facilitates the distribution of Project information, maintenance of relationships, and receipt of community feedback about the Project. Many community involvement methods continue throughout the life of the Project. The adaptive management approach enables the continual integration of community input into design and implementation of the Plan.

7.4 PROMOTION OF INUIT PARTICIPATION IN EMPLOYMENT AND CONTRACTING OPPORTUNITIES

Sabina will communicate upcoming employment and contracting opportunities through the use of a public online database housed within the Back River Project website. Additionally, formal targeted communications strategies will include providing information and materials to community Economic Development Officers (EDOs), the Sabina CLO, and education institutions (i.e., the Nunavut Arctic College, NAC), while more informal means of communication will include posting information in strategic community locations and at the mine site. Sabina will host public meetings to provide communities with information regarding employment and training opportunities throughout the life of the Project. Employment opportunities will also be communicated via the Back River Project Newsletter which will be available in English, Inuktitut, and Inuinnaqtun.

Contractors listed on the Nunavut Tunngavik Inc. (NTI) Inuit Firms Registry Database, on the Kitikmeot Inuit Business Listing, and as identified through other means will be invited via email to provide information about their firms and area of expertise and to bid on Project work. For further information related to Inuit contracting opportunities and local sourcing refer to the Business Development Plan (Volume 10, Chapter 24). The use of a variety of methods of communication will ensure that information is publically assessable and readily available.

Sabina will develop a number of measures to promote Inuit participation in employment such as preferential hiring and contracting, a viable work rotation schedule, the fly-in/fly-out operation of the Project, which enables workers to return to their home communities regularly during time off, as well as training opportunities and career counselling to advance the careers of Inuit employees. Sabina's approach to promoting Inuit participation in Project employment is detailed in the Human Resources Plan (Volume 10, Chapter 28). Similarly, several measures to promote the participation of local Inuit businesses in contract work with the Project will be established. For example, first opportunities for contracts to Inuit-owned businesses, encouragement of contractors to breakdown larger contracts into parcelled components readily subsumed by equipped Inuit firms, and demand-driven workshops to build business capacity. Further details are provided in the Business Development Plan (Volume 10, Chapter 24).

Other programs to promote Inuit participation in employment and contracting opportunities include the Employee and Family Assistance Program (EAFP) which provides counselling related to financial management and budgeting, addictions counselling, stress management, as well as individual and family counselling, among others. The EAFP is detailed in the Human Resources Plan (Volume 10, Chapter 28).

7.5 COMMUNICATION OF RESEARCH RESULTS

Results of community research of social, cultural, and ecological conditions will be publicly available on the NIRB website, on the Back River Project website, and at the Sabina office in Cambridge Bay. The information available will include all submissions included as part of the EIS, as well as on-going annual environmental and socio-economic monitoring reports. Where appropriate, the interim results of research can be provided to community or government organizations upon request. If additional research or studies are conducted over the course of construction or operations on topics other than those defined by the monitoring programs, these results may also be similarly shared with communities.

8. Reporting and Plan Effectiveness

Reports on Plan outcomes and performance, as well as any recommended additional adaptive management actions, will be prepared at a minimum annually for internal company distribution and use. The Plan will be evaluated against the defined scope and objectives (Section 2).

As part of the Back River Socio-Economic Monitoring Program (Volume 10, Chapter 23), the relevant findings will be reviewed in collaboration with other members of the Back River Project Socio-economic Monitoring Committee (SEMC) and the NIRB. Key findings and recommendations will be incorporated into an annual report to the NIRB. Reporting of monitoring results will also be provided to the Back River Project SEMC and the Kitikmeot Region SEMC.

9. Summary

The Plan aims to help minimize the negative effects and to maximize or enhance the potential benefits of the Project within the communities of the Kitikmeot Region. The objective of the Plan is to fulfil Project external public engagement commitments and maintain meaningful relationships with communities and the public. The Plan is to outline the efforts Sabina will make to communicate and engage with residents, communities, and stakeholders throughout the life of the Project. Specifically, the Plan describes Sabina's commitment to provide Project updates, to incorporate public feedback, to promote Inuit participation in employment and contracting opportunities, to receive community input, and to communicate research results.

The Socio-economic Monitoring Program will provide information to assist in the management of the outcomes of the Plan and will collect and analyze information on conditions and trends. The monitoring program will inform the ongoing management and mitigation of the potential social and economic effects identified in the EIS and will facilitate best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project. The monitoring program will be established to enable Project managers and community leaders to respond proactively and in a timely manner to any undesirable changes to socio-economic conditions.

Sabina recognizes that the Project will present Inuit communities with both substantial opportunities as well as changes to current social and economic conditions. Sabina is committed to implementing measures to enhance the benefits of the Project for individuals residing in the Kitikmeot Region communities. Mitigating existing and potential impacts, and promoting individual, family, and community well-being is a shared responsibility of Sabina, the KIA, the hamlets, and the Government of Nunavut. Commitments to enhance regional employment and training and the provision of community programs and services to enhance community well-being do not impose responsibility on Sabina to assume the role of government. Sabina will cooperate in these efforts. For the benefits of the Project to be fully realized at the local level the communities must be engaged in the implementation of strategies to build capacity to enhance well-being, which contributes to the ability of communities to deal with current and future challenges and to retain the benefits beyond the life of the Project.

There is inherently some uncertainty associated with predicting the social impacts prior to the implementation of Project activities. Sabina will work to address impacts and enhance benefits as they are identified over time. Adaptive management as a method used for the creation and implementation of the Human Resources Plan and the monitoring program enables the engaged parties to instigate change where required and to employ the use of new data and best practices as they become available. Further, the adoption of adaptive management practices enables the engaged parties to adjust plans based on the findings of the monitoring program and community feedback throughout the life of the Project.

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27. Cultural and Heritage Resources Protection Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Cultural and Heritage Resources Protection Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
CULTURAL AND HERITAGE RESOURCES PROTECTION PLAN

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Appendix A. Archaeological Sites within 1,000 m of the Project Footprint

Appendix B. Archaeological Chance Find Procedure

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Borden Number	An alphanumeric designation used as a unique identifier for archaeological sites recorded in Canada (i.e., MbNj-52). The system consists of a grid based on the National Topographic Series of maps published by Natural Resources Canada. Two upper case letters which run from south to north and from east to west, identify each grid block. Each upper case letter is followed by a close case letter which designates a subdivision of the grid block based on latitude and longitude. Site within each lower case block are assigned sequential numbers by a responsible institution (the Canadian Museum of Civilization assigns these numbers for sites recorded in Nunavut).
DEIS	Draft Environmental Impact Statement
GN-DCH	Government of Nunavut Department of Culture and Heritage
GPS	Global Positioning System
IHT	Inuit Heritage Trust
LSA	Local Study Area
NIRB	Nunavut Impact Review Board
the Plan	The Cultural and Heritage Resources Protection Plan for the Back River Project.
the Project	The Back River Project
PDA	Proposed Development Area
RSA	Regional Study Area
Sabina	Sabina Gold & Silver Corp.

1. Introduction

The intent of the Cultural and Heritage Resources Protection Plan (the Plan) is to detail the protection of cultural and heritage resources which have been identified within or adjacent to the Back River Project (the Project) footprint. The Plan has been prepared as part of the Project Environmental Impact Statement and follows the Guidelines issued by the Nunavut Impact Review Board (NIRB) for the Project. The Plan will be reviewed and updated on an as-needed basis as the Project proceeds into detailed design, construction, operations, and closure.

There are four key elements which have been addressed in the Plan:

1. A summary of applicable legislation and guidelines for management of potential impacts to identified cultural and heritage resources;
2. An inventory of known archaeological resources in the Project area, including the results of the archaeological investigations undertaken for the Project;
3. A summary of the archaeological resources which may be impacted by the Project, as outlined in the DEIS for the Project; and
4. General and site-specific measures for the protection of archaeological sites and mitigation of potential adverse impacts.

2. Scope and Objectives

Management of cultural and heritage resources will be an important part of the on-site management program. The intent for this plan is to describe the commitments and philosophy for the management of cultural and heritage resources in relation to the Project. Management of cultural and heritage resources will be accomplished through consultation and collaboration between Sabina Gold & Silver Corp. (Sabina), the Project archaeologist, and the Government of Nunavut Department of Culture and Heritage (GN-DCH).

3. Planning and Implementation

Planning for the Cultural and Heritage Resources Management Plan started with the development of the DEIS, which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and social aspects will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through the contractor job-specific standard operating procedures (SOPs) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

4. Applicable Legislation and Guidelines

All archaeological and paleontological sites in Nunavut are protected under territorial or federal legislation. Archaeological and paleontological sites are protected under Section 51 of the *Nunavut Act* (*Nunavut Archaeological and Paleontological Sites Regulations*, 2001). In addition, archaeological sites and as yet unrecorded archaeological sites found on federal Crown Land are protected by the *Territorial Land Use Regulations* (2013) of the *Territorial Lands Act* and by the *Canada Oil and Gas Operations Act* (*Canada Oil and Gas Geophysical Operations Regulations*, 2012).

Permits to conduct archaeological and paleontological research throughout Nunavut are applied for and issued under the *Nunavut Act* (*Nunavut Archaeological and Paleontological Sites Regulations*, 2001). In addition, work conducted on Inuit Owned Lands or within the Nunavut Settlement Area will be conducted in accordance with Articles 21 and 33 of the *Nunavut Land Claims Agreement Act* (1993).

There are two administrative bodies that are involved in the protection and management of archaeological sites in Nunavut. The GN-DCH is the government agency responsible for the administration of all regulations concerning archaeology in Nunavut and is designated as such under the *Nunavut Land Claims Agreement Act* (1993). The Inuit Heritage Trust (IHT) was created to “support, encourage and facilitate the conservation, maintenance, restoration and display of archaeological sites and specimens in the Nunavut Settlement Area”, as outlined under Article 33 of the *Nunavut Land Claims Agreement Act* (1993).

Additionally, locational information pertaining to archaeological sites is protected by a Data Licence Agreement issued by GN-DCH. A condition of the data license stipulates that archaeological sites will not be plotted on a map which could be made available to the public unless the scale of the map is less than or equal to 1:2,000,000 and the positional accuracy has been randomized. Due to these restrictions no maps depicting archaeological site locations are included in this document.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of the plan and approves all relevant policies and documents, auditing, action planning and the verification process.

The Environmental Superintendent along with his/her direct reports are responsible for the implementation of this plan including:

- Overall management of plan.

- Monitoring.
- Operational aspects.
- Internal reporting.
- External reporting.
- Ensuring compliance and adaptive management.

6. Environmental Protection Measures

Protection of cultural and heritage resources will include monitoring of known archaeological sites within the local study area LSA (Section 7) and the institution of a chance find procedure for the protection of currently unknown sites that may be identified during Project phases (Appendix B). Avoidance is always the preferred mitigation measure for cultural and heritage site; however, if avoidance is not feasible a systematic data recovery program may be instituted that will be designed in consultation with the GN-DCH to reduce the negative effect to a not significant level (Section 8).

7. Monitoring Program

7.1 REPORTING RESPONSIBILITIES

Sabina will maintain documentation regarding archaeological site monitoring, chance finds, and will report any impacts to archaeological sites. Sabina will work in collaboration with the Project archaeologist and will coordinate site monitoring/inspection and documentation of chance archaeological finds.

Sabina will arrange for site orientation and training of all employees and on-site personnel with regards to compliance with the *Nunavut Archaeological and Paleontological Sites Regulations* (2001) and the use of the Project's Archaeological Chance Find Procedure (see Section 7.3). Training and site orientation will be provided for all new employees and refresher training will be provided to all employees and on-site personnel on an annual basis. This training will focus on not disturbing known archaeological sites, the procedures in place for responding to newly identified sites, as outlined in the Project's Archaeological Chance Find Procedure, and how to report these sites or observed site impacts.

7.2 ARCHAEOLOGICAL SITE MONITORING AND FLAGGING

Archaeological site monitoring and/or site flagging during construction, operations, and closure is identified in Section 8 as a management measure for archaeological sites which are located within 50 to 150 m of all Project infrastructure (Section 7.2.1 and 7.2.2) and those located within 150 to 1,000 m (Section 8.2.3) from the Project footprint, with the exception of winter roads. This section describes how and when monitoring and site flagging will take place at those identified sites as well as the use of the Project's Archaeological Chance Find Procedure.

7.2.1 Archaeological Site Construction Monitoring – 50 to 150 m

Construction occurring near archaeological sites which are within 50 to 150 m of the Project footprint will have an Environmental Monitor present during construction and the sites will be flagged/fenced prior to construction. Development maps will clearly indicate the location of archaeological site boundaries in relation to Project footprint components. The Environmental Monitor will watch for archaeological site impacts or situations where construction activities are occurring less than 50 m from a site. Should impacts be anticipated to occur less than 50 m from a site, the Project archaeologist will be contacted to determine if mitigation measures, which may include systematic data recovery, are required.

Flagging/fencing of archaeological site boundaries will take place prior to construction during snow-free conditions and when the ground is not frozen. Flagging/fencing will be conducted by the Project archaeologist and an Environmental Monitor. Archaeological sites in this region typically contain surface scatters of artifacts; therefore installation of flagging/fencing is best conducted when the surface of the site is visible to prevent any unnecessary damage. Installation of flagging/fencing when the ground is not frozen is recommended for ease of installation where rebar or wooden stakes will be used (see Section 7.2.2).

The Environmental Monitor will document, by means of photographs and field notes, the type of construction and disturbance occurring near a site, weather conditions, personnel present, and other pertinent details. It is imperative that detailed field notes are recorded during monitoring. This information will be summarized in an Archaeological Site Monitoring report to be provided to the GN-DCH.

7.2.1.1 Field Notes

The following information will be recorded in the field during the archeological site monitoring program for sites within 50 to 150 m from construction activities:

- Borden number (i.e. MbNj-52) of the site being monitored.
- Photographs in cardinal directions (N, E, S, W) of the site and photographs illustrating any construction or other activity being conducted nearby.
- All photograph numbers, direction of image, and a description of each image must be recorded in the field notes.
- Date and time monitoring was undertaken and completed at the site.
- Nature of construction or other activity being undertaken.
- Distance to construction or other activity being conducted.
- GPS location.
- Personnel involved in construction activities and the name(s) of the Environmental Monitor(s).
- General observations of the condition of the site.
- Weather conditions at each site at the time of monitoring.

It is imperative that detailed photographs are taken and that detailed field notes are recorded during site monitoring.

7.2.1.2 Reporting

A data report will be completed following monitoring conducted at each site. The reports will generally include the site's Borden number, a summary of the methods and equipment used, GPS location, a photo log of the photographs taken during monitoring, and a map showing the location of the site being monitored in relation to the Project component.

7.2.2 Archaeological Site Boundary Flagging

Site boundaries for sites which fall between 50 to 150 m of proposed infrastructure will be flagged prior to construction by the Project archaeologist and an Environmental Monitor. Typically, site boundary flagging involves the use of rebar or wooden stakes with snow fencing, or other visible barrier, running around the outside of the site boundary. Similarly, brightly coloured stakes installed at intervals around the boundaries of the site can be used if snow fencing or other visible barriers are impractical or constitute a barrier for wildlife. In either case, fencing will be visible above the anticipated snowline, particularly where sites are located along winter roads.

It is best practice to have the Project archaeologist mark the boundaries and erect the flagging/fencing in order to limit impacts to the site and to avoid any sensitive areas which may be present. Once the site has been flagged, the site will be visited during and after construction activities to determine if impacts have occurred. Environmental Monitors will also check on and maintain these flagged boundaries if future construction or other development activities are planned nearby in the future.

7.2.3 Archaeological Site Monitoring – 150 to 1,000 m

Archaeological sites which are within 150 to 1,000 m of the Project footprint will have the Project archaeological and/or an Environmental Monitor check on these sites periodically to determine that they remain intact and unaffected by the Project.

Should impacts be observed at archaeological sites, the Project archaeologist and the GN-DCH will be contacted and notified of any impacts. Post-impact mitigation plans will be developed in consultation with the GN-DCH on a case-by-case basis.

The Project archaeologist and/or the Environmental Monitor will document, by means of photographs and field notes, the type of impact (if present), weather conditions, personnel present, and other pertinent details. It is imperative that detailed field notes are recorded during monitoring. This information will be summarized in an Archaeological Site Monitoring report to the GN-DCH.

7.2.3.1 Field Notes

The following information will be recorded in the field during the archeological site monitoring program for sites within 150 to 1,000 m from proposed infrastructure:

- Borden number (i.e. MbNj-52) of the site being monitored/inspected.
- Photographs in cardinal directions (N, E, S, W) of the site and photographs illustrating the current condition of the site and any impacts (if present).
- All photograph numbers, direction of image, and a description of each image must be recorded in the field notes.
- Date and time monitoring was undertaken and completed at the site.
- Nature of impact at the site (if present).
- GPS location.
- Personnel involved in monitoring/inspection activities.
- General observations of the condition of the site.
- Weather conditions at each site at the time of monitoring.

It is imperative that detailed photographs are taken and that detailed field notes are recorded during site monitoring.

7.2.3.2 Reporting

A data report will be completed following monitoring conducted at each site. The reports will generally include the site's Borden number, a summary of the methods and equipment used, GPS location, a photo log of the photographs taken during monitoring, a map showing the location of the site being monitored in relation to the Project component.

7.3 ARCHAEOLOGICAL CHANCE FIND PROCEDURE

As part of the baseline studies undertaken for the Project, an Archaeological Chance Fine Procedure was developed and implemented to assist in the chance discovery of archaeological materials by Project personnel. The Archaeological Chance Find Procedure will continue to be used during construction, operations, and closure and has been appended to this plan (Appendix B).

All Project personnel will be training to use the Archaeological Chance Find Procedure and the protocols and steps which will be followed should archaeological materials be encountered during construction, operations, or closure.

8. Mitigation and Adaptive Management

This section includes an inventory of known archaeological sites within the Project's local study area (LSA) taking in a 5 km area on either side of the Project footprint. Sites within 1,000 m of Project footprint components that will potentially be impacted by the Project are summarized in Appendix A. Due to the sensitive nature of archaeological sites, locational information is not provided in this document but will be illustrated on construction maps. Sites that are within the LSA but are more than 1,000 m away from the Project footprint are provided for reference but are not considered further in this plan as they are outside of the anticipated impact zones. The Project footprint considered in this plan, as well as the regional study area (RSA) and LSA, are illustrated in Figure 9-1. Should Project footprint components be revised during the course of construction, operations, and closure, the site inventory included in Appendix A and construction maps showing the locations of these sites will be consulted to determine if any known archaeological sites may be in conflict.

Mitigation and adaptive management measures for archaeological sites within 1,000 m of the Project footprint have been included in this plan on a site-by-site basis. Several levels of direct and indirect impacts from Project developments have been considered. Where a site is:

- **0 m** to **50 m** from the Project footprint, direct impact from construction activities is anticipated.
- **50 m** to **150 m** from the Project footprint, indirect impact from construction activities is anticipated.
- **150 m** to **1,000 m** from the Project footprint, indirect impact from increased human presence is anticipated.
- **Greater than 1,000 m** from the Project footprint, no impact is anticipated.

Archaeological sites can be impacted during construction by the movement, excavation, or disturbance of soils including the clearing and grading of roads, building foundations and footings, and earthworks, excavation, and blasting related to open pits, adits, and other minesite infrastructure. In addition, archaeological sites can be impacted by increased human presence in the area as sites within the LSA often have archaeological materials present on the surface.

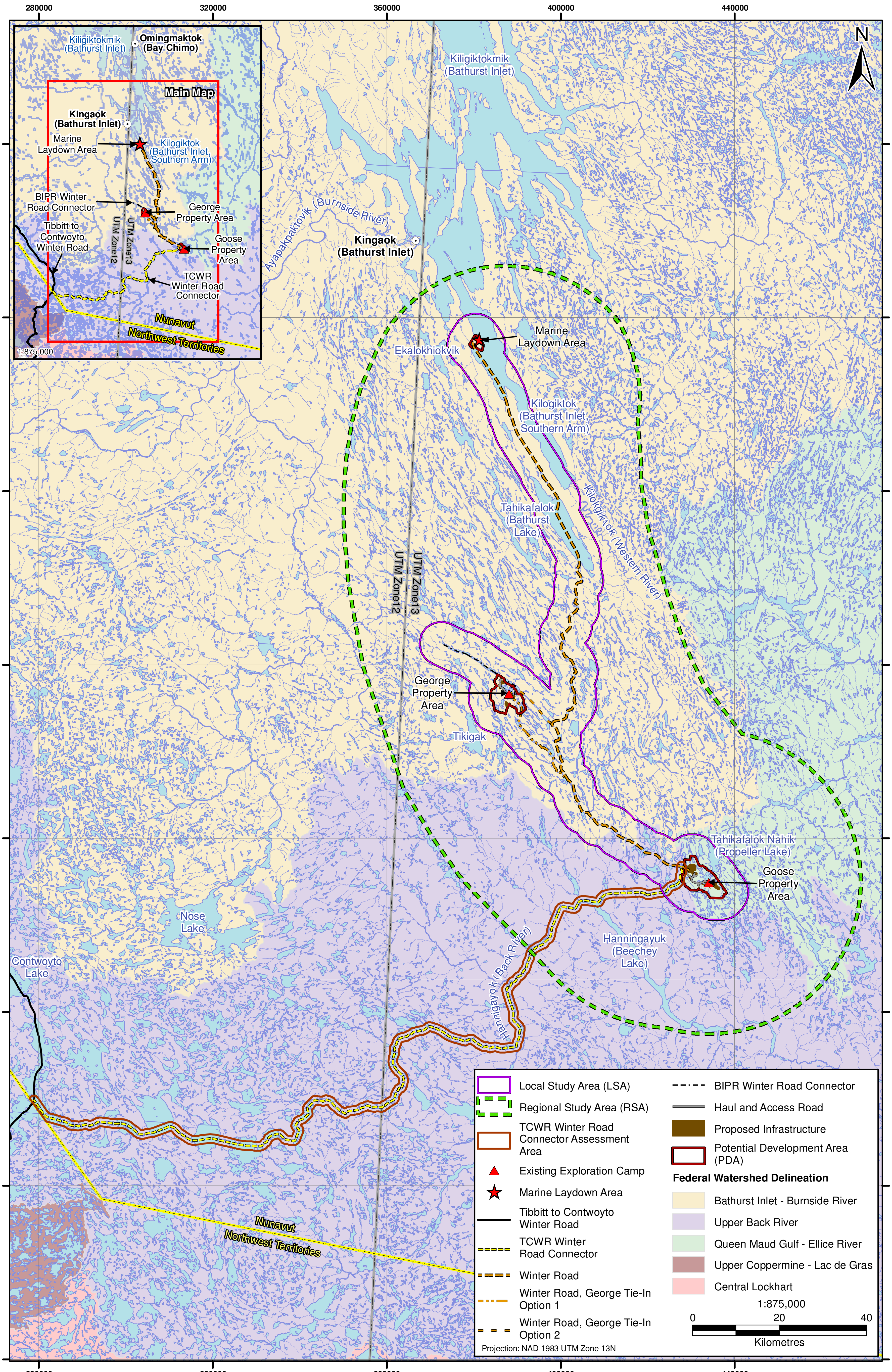

Figure 9-1

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Local Study Area and Regional Study Area for Archaeology

Rescan Engineers & Scientists

Where sites fall within 0 to 50 m of proposed infrastructure, the risk of direct impacts from construction activities is high. Typically, site avoidance through Project redesign is the recommended management option. However, if avoidance is not possible, mitigation of such sites will be conducted prior to construction activities. Mitigation measures are determined in consultation with the GN-DCH and carried out by a professional archaeologist. Mitigation may involve detailed mapping, photography, and systematic data recovery through surface collection, and, if subsurface deposits are present, controlled excavations of evaluative units. Upon approval by the GN-DCH development in these areas can proceed.

Where sites fall within 50 to 150 m of proposed infrastructure, the risk of indirect impacts from construction activities is moderate to high. These areas will be marked as “No Work Zones” on development maps. An Environmental Monitor will be present during construction activities near such sites and/or the site boundary will be flagged or fenced to limit any indirect impacts. Caution will be exercised during construction activities near the site. If direct impact at these sites is anticipated during construction, mitigation measures will be required (see above).

Where sites fall within 150 to 1,000 m of proposed infrastructure, the risk of increased human presence in the area is low to moderate. Efforts will be made to avoid these sites during construction, operations, and closure. These areas will be marked as “No Work Zones” on development maps. Where sites are within 150 to 1,000 m of winter roads, continued site avoidance will be practiced. Where sites are within 150 to 1,000 m of Project infrastructure, not including winter roads, continued site avoidance will be practiced and monitoring and inspection of these sites will be undertaken periodically to determine that they remain intact and unaffected by the Project. Project personnel will be educated about the Project’s Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites (see Section 8.3).

Sites beyond 1,000 m of proposed infrastructure are at low risk of direct and/or indirect impacts from construction and/or human presence, unless the Project footprint is revised during construction, operations, and/or closure. Therefore, sites beyond 1,000 m of proposed infrastructure are not discussed further in this plan.

Any archaeological sites discovered during construction, operations, and closure or sites which fall within 1,000 m of revisions to the Project footprint that are not currently discussed in this document will be subject to the same level of management and mitigation afforded to archaeological sites outlined in this plan. Archaeological sites not previously recorded will be inspected by the Project archaeologist and documented under a Class 2 Nunavut Territory Archaeologists Permit, issued by GN-DCH.

For ease of review, archaeological sites within 1,000 m of the Project footprint are discussed in this Plan in relation to proposed development components, as illustrated in Figure 9-1, followed by site-specific management and mitigation measures for the protection of archaeological sites from potential adverse impacts. Appendix A describes the distance from archaeological site boundaries to Project components and also outlines proposed mitigation and management measures for each site within 1,000 m of the Project footprint.

8.1 GEORGE PROPERTY PROPOSED DEVELOPMENT AREA

There are fourteen archaeological sites located within 1,000 m of the Proposed Development Area (PDA) at the George Property (an area including open pits, adits, laydown areas, waste rock storage, etc.): LlNk-1, LlNk-2, LlNk-5, LlNk-6, LlNk-7, LlNk-8, LlNk-9, LlNk-10, LlNk-11, LlNk-12, LlNk-17, LlNk-20, LlNk-21, and LlNk-22.

8.1.1 Site-specific Effects, Management, and Mitigation

8.1.1.1 Sites LlNk-1, LlNk-2, LlNk-5, LlNk-7, LlNk-8, LlNk-9, LlNk-10, LlNk-11, LlNk-12, LlNk-20 and LlNk-21

These sites fall within 0 to 50 m of the PDA for the George Property and are at risk of direct impacts from construction activities. Site avoidance through Project redesign is the recommended management option. If avoidance is not possible, mitigation of these sites will be conducted prior to construction activities. Mitigation measures will be determined in consultation with the GN-DCH. Mitigation may involve detailed mapping and systematic data recovery though surface collection, detailed site mapping, photography and controlled subsurface excavations of evaluative units if subsurface deposits are present (see Appendix A for site specific mitigation measures). Upon approval of the GN-DCH development in this area can proceed.

8.1.1.2 Site LlNk-22

Only one site, LlNk-22 is within 50 to 150 m of the PDA for the George Property and is at risk if indirect impacts from construction activities. The site area will be marked as a “No Work Zone” on development maps. An Environmental Monitor will be present during construction activities near the site and/or the site boundary will be flagged/fenced to limit any indirect impacts. Caution will be exercised during construction activities by construction crews during work near the site.

8.1.1.3 Sites LlNk-6 and LlNk-17

Sites LlNk-6 and LlNk-17 are located within 150 to 1,000 m of the PDA for the George Property and have the potential to be indirectly impacted by increased human presence in the area. These areas will be marked as “No Work Zones” on development maps and Project personnel will be educated about the Project’s Chance Find Procedure and protocols around the management and protection of archaeological sites. Efforts will be made to avoid these sites during construction, operations, and closure. Monitoring and inspection of these sites will be undertaken periodically to determine that they remain intact and not effected by the Project.

8.2 GOOSE PROPERTY PROPOSED DEVELOPMENT AREA

There are five archaeological sites located within 1,000 m of the PDA at the Goose Property (an area including open pits, adits, laydown areas, waste rock storage, etc.: LjNh-1, LjNh-2, LjNh-3, LjNh-4, and LjNh-5.

8.2.1 Site-specific Effects, Management, and Mitigation

8.2.1.1 Sites LjNh-1, LjNh-2, LjNh-4, and LjNh-5

These sites fall within 0 to 50 m of the PDA for the Goose Property and are at risk of direct impacts from construction activities. Site avoidance through Project redesign is the recommended management option. If avoidance is not possible, mitigation of these sites will be conducted prior to construction activities. Mitigation measures will be determined in consultation with the GN-DCH. Mitigation may involve detailed mapping and systematic data recovery though surface collection, detailed site mapping, photography and controlled subsurface excavations of evaluative units if subsurface deposits are present (see Appendix A for site specific mitigation measures). Upon approval of the GN-DCH development in this area can proceed.

8.2.1.2 Site LjNh-3

Site LjNh-3 falls within 150 to 1,000 m of the PDA for the Goose Property and has the potential to be indirectly impacted by increased human presence in the area. This area will be marked as a "No Work Zone" on development maps and Project personnel will be educated about the Project's Chance Find Procedure and protocols around the management and protection of archaeological sites. Efforts will be made to avoid this site during construction, operations, and closure. Monitoring and inspection of this site will be undertaken periodically to determine that it remains intact and not effected by the Project.

8.3 PROPOSED WINTER ROAD FROM GEORGE PROPERTY TO PROPOSED BATHURST INLET PORT ROAD

There are 20 archaeological sites located within 1,000 m of the proposed winter road between George and the proposed Bathurst Inlet Port Road (BIPR): LlNk-7, LlNk-11, LlNk-13, LlNk-14, LlNk-15, LlNk-16, LlNk-17, LlNk-18, LlNk-19, LlNl-14, LlNl-15, MaNl-1, MaNl-2, MaNl-3, MaNl-4, MaNl-5, MaNl-6, MaNl-7, MaNl-8, and MaNl-9.

8.3.1 Site-specific Effects, Management, and Mitigation

8.3.1.1 Site LlNk-18

Site LlNk-18 falls within 0 to 50 m of the proposed winter road centre line and is at risk of direct impacts from construction activities. Site avoidance through Project redesign is the recommended management option. If avoidance is not possible, mitigation of this site will be conducted prior to construction activities. Mitigation measures will be determined in consultation with the GN-DCH. Mitigation may involve detailed mapping and systematic data recovery though surface collection, detailed site mapping, photography and controlled subsurface excavations of evaluative units if subsurface deposits are present (see Appendix A for site specific mitigation measures). Upon approval of the GN-DCH development in this area can proceed.

8.3.1.2 Sites LlNk-7, LlNk-11, LlNk-13, LlNk-14, LlNk-15, LlNk-16, LlNk-17, LlNk-19, LlNl-14, LlNl-15, MaNl-1, MaNl-2, MaNl-3, MaNl-4, MaNl-5, MaNl-6, MaNl-7, MaNl-8, and MaNl-9

These sites fall within 150 to 1,000 m of the proposed winter road centerline and maybe indirectly impacted by increased human presence in the area. These areas will be marked as "No Work Zones" on development maps. Efforts will be made to avoid these sites during construction, operations, and closure. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.

While sites MaNl-1 and MaNl-4 are within 150 to 1,000 m no further work is required at these sites as all artifacts have been collected and features have been documented by photography and mapping.

8.4 PROPOSED WINTER ROAD TO THE PROPOSED MARINE LAYDOWN AREA FROM GEORGE AND GOOSE PROPERTIES

There are 41 archaeological sites located within 1,000 m of the proposed winter road between the proposed marine laydown area and the George and Goose Properties: LjNh-1, LjNh-2, LjNi-1, LkNj-1, LlNj-1, MaNj-5, MaNj-6, MaNj-7, MbNj-1, MbNj-2, MbNj-7, MbNj-8, MbNj-17, MbNj-18, MbNj-19, MbNj-21, McNj-17, McNj-18, McNk-15, McNk-19, McNk-20, McNk-23, McNk-24, MdNk-24, MdNk-25, MdNk-27, MdNk-43, MdNk-44, MdNk-45, MdNk-46, MdNk-47, MdNk-48, MdNl-9, MdNl-12, MdNl-13, MdNl-14, MdNl-16, MdNl-17, MdNl-18, MdNl-19, and MdNl-20

8.4.1 Site-specific Effects, Management, and Mitigation

8.4.1.1 Site McNj-18

Site McNj-18 falls within 0 to 50 m of the proposed winter road and is at risk of direct impacts from construction activities. Site avoidance through Project redesign is the recommended management option. If avoidance is not possible, mitigation of this site will be conducted prior to construction activities. Mitigation measures will be determined in consultation with GN-DCH. Mitigation may involve detailed mapping and systematic data recovery though surface collection, detailed site mapping, photography and controlled subsurface excavations of evaluative units if subsurface deposits are present (see Appendix A for site specific mitigation measures). Upon approval of the GN-DCH development in this area can proceed.

8.4.1.2 Sites MaNj-5, MaNj-6,MbNj-7, MbNj-18, McNj-17, McNk-15, and McNk-23

These sites fall within 50 to 150 m of the proposed winter road and are at risk if indirect impacts from construction activities. These areas will be marked as “No Work Zones” on development maps. An Environmental Monitor will be present during construction activities near these sites and/or the site boundaries will be flagged/fenced to limit any indirect impacts. Caution will be exercised during construction activities by construction crews during work near the site.

McNk-15 is an exception to the above. All artifacts at the site have been collected and no features or subsurface deposits are present. The site has been mitigated and no further work is required.

8.4.1.3 Sites LjNh-1, LjNh-2, LjNi-1, LkNj-1, LlNj-1, MaNj-7, MbNj-1, MbNj-2, MbNj-8, MbNj-17, MbNj-19, MbNj-21, McNk-19, McNk-20, McNk-24, MdNk-24, MdNk-25, MdNk-27, MdNk-43, MdNk-44, MdNk-45, MdNk-46, MdNk-47, MdNk-48, MdNl-9, MdNl-12, MdNl-13, MdNl-14, MdNl-16, MdNl-17, MdNl-18, MdNl-19, and MdNl-20

These sites fall within 150 to 1,000 m of the proposed winter road centerline and may be indirectly impacted by increased human presence in the area. These areas will be marked as “No Work Zones” on development maps. Efforts will be made to avoid these sites during construction, operations, and closure. Project personnel will be educated about the Project’s Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.

8.5 PROPOSED WINTER ROAD TIE-IN TO PROPOSED MARINE LAYDOWN AREA FROM GEORGE PROPERTY

There are no archaeological sites located within 1,000 m of the proposed tie-in winter road centerline between the George Property and the Marine Laydown Area.

Additional field assessments are planned for the 2013 field season for this Project component. Should additional archaeological sites be identified, the management and mitigation measures established for other sites in the area will be followed.

8.6 PROPOSED WINTER ROAD BETWEEN GEORGE AND GOOSE PROPERTIES

There are ten archaeological sites which are located within 1,000 m of the proposed winter road between the George and Goose Properties: LjNh-1, LjNh-2, LjNi-1, LkNj-1, LlNk-1, LlNk-2, LlNk-3, LlNk-4, and LlNk-5, LlNk-6.

8.6.1 Site-specific Effects, Adaptive Management, and Mitigation

8.6.1.1 Sites LjNh-1, LjNh-2, LjNi-1, LkNj-1, LlNk-1, LlNk-2, LlNk-3, LlNk-4, LlNk-5, and LlNk-6

These sites fall within 150 to 1,000 m of the proposed winter road and maybe indirectly impacted by increased human presence in the area. These areas will be marked as “No Work Zones” on development maps. Efforts will be made to avoid these sites during construction, operations, and closure. Project personnel will be educated about the Project’s Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.

8.7 MARINE LAYDOWN AREA PROPOSED DEVELOPMENT AREA

There are 15 archaeological sites which are located within 1,000 m of the proposed Marine Laydown Area on Bathurst Inlet: MdNl-5, MdNl-6, MdNl-7, MdNl-8, MdNl-9, MdNl-10, MdNl-11, MdNl-12, MdNl-13, MdNl-14, MdNl-16, MdNl-17, MdNl-18, MdNl-19, and MdNl-20.

8.7.1 Site-specific Effects, Adaptive Management, and Mitigation

8.7.1.1 Sites MdNl-5, MdNl-6, MdNl-7, MdNl-8, MdNl-9, MdNl-10, MdNl-11, MdNl-12, MdNl-13, MdNl-14, MdNl-16, MdNl-17, MdNl-18, MdNl-19, and MdNl-20

These sites fall within 0 to 50 m of the proposed Marine Laydown Area and are at risk of direct impacts from construction activities. Site avoidance through Project redesign is the preferred management option. If avoidance is not possible, mitigation of these sites will be conducted prior to construction activities. Mitigation measures will be determined in consultation with GN-DCH. Mitigation may involve detailed mapping and systematic data recovery though surface collection, detailed site mapping, photography and controlled subsurface excavations of evaluative units if subsurface deposits are present (see Appendix A for site specific mitigation measures). Upon approval of the GN-DCH development in this area can proceed.

8.8 TCWR WINTER ROAD CONNECTOR

There are 50 archaeological sites which are located within 1,000 m of the TCWR Winter Road Connector: LfNn-1, LfNo-1, LfNo-2, LfNo-3, LfNo-4, LfNo-5, LfNo-6, LfNo-7, LfNo-8, LfNo-9, LfNo-10, LfNo-11, LfNo-12, LfNo-13, LfNo-14, LfNo-15, LfNo-16, LfNp-1, LfNp-2, LfNp-3, LfNp-4, LfNq-3, LgNm-1, LgNm-2, LgNm-3, LgNm-4, LgNm-5, LgNm-6, LhNk-1, LhNk-2, LhNk-3, LhNk-4, LhNk-5, LhNk-6, LhNk-7, LiNj-1, LiNj-2, LiNj-3, LiNj-4, LiNk-1, LjNh-1, LjNh-2, LjNh-3, LjNi-3, LjNi-4, LjNj-2, LjNj-3, LjNj-4, LjNj-5, and LjNj-6.

8.8.1 Site-specific Effects, Adaptive Management, and Mitigation

8.8.1.1 Sites LfNo-3, LfNo-5, and LhNk-4

These sites fall within 0 to 50 m of the proposed TCWR Winter Road COnnector and are at risk of direct impacts from construction activities. Site avoidance through Project redesign is the preferred management option. If avoidance is not possible, mitigation of these sites will be conducted prior to construction activities. Mitigation measures will be determined in consultation with GN-DCH. Mitigation may involve detailed mapping and systematic data recovery though surface collection, detailed site mapping, photography and controlled subsurface excavations of evaluative units if subsurface deposits are present (see Appendix A for site specific mitigation measures). Upon approval of the GN-DCH development in this area can proceed.

8.8.1.2 Sites LfNo-2, LfNq-3, LgNm-6, LhNk-2, LhNk-3, LhNk-5, and LiNj-4

These sites fall within 50 to 150 m of the proposed TCWR Winter Road Connector and are at risk if indirect impacts from construction activities. These areas will be marked as “No Work Zones” on development maps. An Environmental Monitor will be present during construction activities near these sites and/or the site boundaries will be flagged/fenced to limit any indirect impacts. Caution will be exercised during construction activities by construction crews during work near the site.

8.8.1.3 Sites LfNn-1, LfNo-1, LfNo-4, LfNo-6, LfNo-7, LfNo-8, LfNo-9, LfNo-10, LfNo-11, LfNo-12, LfNo-13, LfNo-14, LfNo-15, LfNo-16, LfNp-1, LfNp-2, LfNp-3, LfNp-4, LgNm-1, LgNm-2, LgNm-3, LgNm-4, LgNm-5, LhNk-1, LhNk-6, LhNk-7, LiNj-1, LiNj-3, LiNk-1, LiNj-2, LjNi-3, LjNi-4, LjNh-1, LjNh-2, LjNh-3, LjNj-2, LjNj-3, LjNj-4, LjNj-5, and LjNj-6

These sites fall within 150 to 1,000 m of the proposed TCWR Winter Road Connector and maybe indirectly impacted by increased human presence in the area. These areas will be marked as “No Work Zones” on development maps. Efforts will be made to avoid these sites during construction, operations, and closure. Project personnel will be educated about the Project’s Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.

8.9 REVISIONS TO PROJECT FOOTPRINT DURING CONSTRUCTION, OPERATIONS, AND CLOSURE

Any archaeological sites discovered, as a result of revisions to the Project footprint during construction, operations, and closure within 1,000 m will be subject to the same level of management and mitigation afforded archaeological sites outlined in this plan. These sites will be inspected by a professional archaeologist and documented in a Class 2 Nunavut Territory Archaeologists Permit, issued by GN-DCH.

9. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project on the Heritage VSECs, and evaluates the compliance of the Project and its sub-contractors. Evaluation of predicted effects will be conducted through monitoring of archaeological sites within 1,000 m of Project developments (Section 7.2).

10. Record Keeping

Record keeping will be conducted by Sabina and its subcontractors. Data will be entered into suitable electronic databases (e.g., MS Access), checked for quality control and stored with subcontractor responsible for monitoring and with Sabina. Data will be entered in a format and program that allow for comparison between years and storage in a single file format for each type of survey or monitoring activity. QA/QCed data will be appended to the annual Archaeologist’s report and the compilation of all years data will be transferred for storage with the GN-DCH.

11. Environmental Reporting

Monitoring and if necessary systematic data recovery for archaeological sites within the LSA will be carried out under Nunavut Archaeologist Permits and the final reports will be submitted to the GN-DCH and all other communities and organizations specified under the terms of the permit. If systematic data recovery is recommended due to concerns raised during site monitoring a data recovery program will be developed in consultation with the GN-DCH.

12. Plan Effectiveness

Mitigation and management and monitoring activities will be carried out under Nunavut Archaeologist permits. The Nunavut Archaeological permitting system allows the GN-DCH to comment on the proposed methodology prior to approving the work and to assess it efficacy upon receiving the final permit report.

13. QA/QC

Quality assurance and quality control measures will be undertaken at three key stages in monitoring activities: 1) during field data gathering, 2) during data entry and analysis, and 3) through reporting and reassessment of methods as part of the evaluation of Plan Effectiveness.

The process of data gathering in the field will be quality controlled through the use of qualified archaeologists and a system of pre- and post-field checks to ensure that consistent, repeatable data is being gathered. Data in the field will be collected using an electronic data collector (currently using an ESRI platform) or through field notes collected in a field notebook. Data will either be entered directly into the database from the data collector or transcribed into a database from field notes. QA/QC of data entry will be conducted through an assessment of the completeness and accuracy of the field data. QA/QC of data analysis will be conducted through a process of clear, written instructions for data analysis and pre-and post-analysis checks by a second qualified archaeologist. Finally, the efficacy of the methods as a whole will be evaluated through repeated scrutiny of the data and through review by stakeholders.

References

1993. *Nunavut Land Claims Agreement Act*. SC 1993, c29. Last amended 21 May 2004.

2001. *Nunavut Archaeological and Paleontological Sites Regulations*. SOR/2001-220. 14 June 2001.

2012. *Canadian Environmental Assessment Act*. S.C. 2012, c. 19, s. 66. 6 July 2012.

2012. *Canada Oil and Gas Geophysical Operations Regulations*. SOR/96-117. 10 December 2012.

2013. *Territorial Land Use Regulations*. C.R.C., c. 1524. 10 June 2013.

Appendix A

Archaeological Sites within 1,000 m of the Project Footprint

Appendix A. Archaeological Sites within 1,000 m of the Project Footprint

Borden Number	Distance to Nearest Project Component	Nearest Project Component(s)	Distance to Second Nearest Project Component	Second Nearest Project Component	Proposed Mitigation, Monitoring and Management Measures	Permit Number
LjNh-1	0	Goose Property PDA	186	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2010-024A
LjNh-2	0	Goose Property PDA	169	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2010-024A
LjNh-3	838	Goose Property PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and protocols around the management and protection of archaeological sites. Monitoring and inspection at this site will be undertaken on an annual basis to determine that it remains intact and unaffected by the Project.	2010-024A
LjNh-4	1	Goose Property PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2011-022A
LjNh-5	0	Goose Property PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2011-022A
LjNi-1	856	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	856	Winter Road - Between George and Goose PDAs	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
LkNj-1	800	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
LlNj-1	746	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
LlNk-1	0	George Property PDA	358	Winter Road - Between George and Goose PDAs	Systematic data recovery through detailed site mapping and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2010-024A
LlNk-2	0	George Property PDA	775	Winter Road - Between George and Goose PDAs	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2010-024A
LlNk-3	238	Winter Road - Between George and Goose PDAs	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
LlNk-4	440	Winter Road - Between George and Goose PDAs	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
LlNk-5	0	George Property PDA	642	Winter Road - Between George and Goose PDAs	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2010-024A
LlNk-6	239	George Property PDA	968	Winter Road - Between George and Goose PDAs	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and protocols around the management and protection of archaeological sites. Monitoring and inspection at this site will be undertaken on an annual basis to determine that it remains intact and unaffected by the Project.	2010-024A
LlNk-7	0	George Property PDA	761	Winter Road - George PDA to BIPR	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-8	0	George Property PDA	n/a	n/a	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A

Appendix A. Archaeological Sites within 1,000 m of the Project Footprint

Borden Number	Distance to Nearest Project Component	Nearest Project Component(s)	Distance to Second Nearest Project Component	Second Nearest Project Component	Proposed Mitigation, Monitoring and Management Measures	Permit Number
LlNk-9	0	George Property PDA	n/a	n/a	Systematic data recovery through detailed site mapping and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-10	0	George Property PDA	n/a	n/a	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-11	0	George Property PDA	243	Winter Road - George PDA to BIPR	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-12	0	George Property PDA	n/a	n/a	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-13	160	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
LlNk-14	232	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
LlNk-15	470	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
LlNk-16	178	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
LlNk-17	170	George Property PDA	180	Winter Road - George PDA to BIPR	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and protocols around the management and protection of archaeological sites. Monitoring and inspection at this site will be undertaken on an annual basis to determine that it remains intact and unaffected by the Project.	2012-012A
LlNk-18	3	Winter Road - George PDA to BIPR	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-19	300	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
LlNk-20	0	George Property PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-21	5	George Property PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
LlNk-22	128	George Property PDA	n/a	n/a	Site boundaries will be flagged/fenced and the site will be marked as a 'No Work Zone' on construction maps. Monitoring will be conducted when construction occurs within 150 m of the site.	2012-012A
LlNl-14	858	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
LlNl-15	838	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MaNl-1	819	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2001-019A

Appendix A. Archaeological Sites within 1,000 m of the Project Footprint

Borden Number	Distance to Nearest Project Component	Nearest Project Component(s)	Distance to Second Nearest Project Component	Second Nearest Project Component	Proposed Mitigation, Monitoring and Management Measures	Permit Number
MaNl-2	702	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2001-019A
MaNl-3	808	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2001-019A
MaNl-4	564	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2001-019A
MaNl-5	193	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MaNl-6	190	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MaNl-7	177	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MaNl-8	434	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MaNl-9	637	Winter Road - George PDA to BIPR	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MbNj-1	586	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
MbNj-2	327	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
MbNj-7	136	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	Site boundaries will be flagged/fenced and the site will be marked as a 'No Work Zone' on construction maps. Monitoring will be conducted when construction occurs within 150 m of the site.	2010-024A
MbNj-8	257	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
MbNj-17	328	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MbNj-18	99	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	Site boundaries will be flagged/fenced and the site will be marked as a 'No Work Zone' on construction maps. Monitoring will be conducted when construction occurs within 150 m of the site.	2012-024A
MbNj-19	748	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A

Appendix A. Archaeological Sites within 1,000 m of the Project Footprint

Borden Number	Distance to Nearest Project Component	Nearest Project Component(s)	Distance to Second Nearest Project Component	Second Nearest Project Component	Proposed Mitigation, Monitoring and Management Measures	Permit Number
McNj-17	117	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	Site boundaries will be flagged/fenced and the site will be marked as a 'No Work Zone' on construction maps. Monitoring will be conducted when construction occurs within 150 m of the site.	2010-024A
McNj-18	51	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2010-024A
McNk-15	142	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	Artifacts from this site have been collected and no features or subsurface deposits are present. The site has been mitigated and no further work is required.	2010-024A
McNk-19	893	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
McNk-20	742	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
McNk-23	152	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	Site boundaries will be flagged/fenced and the site will be marked as a 'No Work Zone' on construction maps. Monitoring will be conducted when construction occurs within 150 m of the site.	2012-012A
McNk-24	278	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MdNk-24	738	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
MdNk-25	846	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
MdNk-27	716	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2010-024A
MdNk-43	877	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MdNk-44	814	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MdNk-45	738	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MdNk-46	862	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MdNk-47	721	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A

Appendix A. Archaeological Sites within 1,000 m of the Project Footprint

Borden Number	Distance to Nearest Project Component	Nearest Project Component(s)	Distance to Second Nearest Project Component	Second Nearest Project Component	Proposed Mitigation, Monitoring and Management Measures	Permit Number
MdNk-48	751	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	n/a	n/a	The site will be marked as a 'No Work Zone' on construction maps and the site will be avoided. Project personnel will be educated about the Project's Chance Find Procedure and training provided pertaining to the protocols around the management and protection of archaeological sites.	2012-012A
MdNl-5	0	Marine Laydown Area PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	78-432, 2012-012A
MdNl-6	0	Marine Laydown Area PDA	n/a	n/a	It is recommended that the site be revisited, if additional artifacts are located, systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-7	0	Marine Laydown Area PDA	n/a	n/a	Some artifact collection has been conducted at this site. Additional artifacts are located at the site; therefore systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-8	0	Marine Laydown Area PDA	n/a	n/a	Some artifact collection has been conducted at this site. Additional artifacts are located at the site; therefore systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface	2012-012A
MdNl-9	0	Marine Laydown Area PDA	790	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through detailed site mapping and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-10	0	Marine Laydown Area PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-11	0	Marine Laydown Area PDA	n/a	n/a	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-12	0	Marine Laydown Area PDA	991	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through detailed site mapping and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-13	0	Marine Laydown Area PDA	948	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-14	0	Marine Laydown Area PDA	295	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through detailed site mapping and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-16	0	Marine Laydown Area PDA	818	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-17	0	Marine Laydown Area PDA	219	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through detailed site mapping and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-18	0	Marine Laydown Area PDA	177	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. Controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-19	0	Marine Laydown Area PDA	569	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A
MdNl-20	0	Marine Laydown Area PDA	292	Winter Road - George-Goose PDAs to Marine Laydown Area PDA	Systematic data recovery through surface collection, detailed site mapping, and photography will be undertaken. If subsurface deposits are present, controlled subsurface excavations of evaluative units will be conducted.	2012-012A

Appendix B
Archaeological Chance Find Procedure

SABINA GOLD & SILVER CORP.

BACK RIVER Project Archaeological Chance Find Procedure

In Nunavut archaeological and paleontological sites are protected under Section 51 of the *Nunavut Act* (*Nunavut Archaeological and Palaeontological Sites Regulations)*. In addition, archaeological sites and as yet unrecorded archaeological sites found on federal Crown Land are protected by the *Territorial Land Use Regulations* of the *Territorial Lands Act* and by the *Canada Oil and Gas Operations Act* (*Canada Oil and Gas Geophysical Operations Regulations*). There are more than 5,000 archaeological sites currently recorded in the Northwest Territories and Nunavut with many more being added to the territorial inventory every year. However, this represents only a small portion of the total number of sites that exist and have yet to be recorded. This protocol has been established to increase awareness of this important resource and to assist in planning future developments.

Permits to conduct archaeological and paleontological research throughout Nunavut are applied for and issued under the *Nunavut Act* (*Nunavut Archaeological and Paleontological Sites Regulations*). In addition, work conducted on Inuit Owned Lands or within the Nunavut Settlement Area should be conducted in accordance with Articles 21 and 33 of the *Nunavut Land Claims Agreement*. Locational information pertaining to archaeological sites is protected by a Data License Agreement issued by the Government of Nunavut. The location of archaeological sites should not be depicted on publically available maps. No ground disturbance or alteration should occur within 30 metres of a known archaeological site. The *Regulations* stipulate that only individuals who have obtained a permit can investigate archaeological or palaeontological sites. Under the *Nunavut Act*, individuals who contravene these *Regulations* are guilty of an offense punishable on summary conviction.

The remnants of Nunavut's earliest cultures are represented in today's landscape by a wide variety of site types, most of which are related to art, habitations, resource gathering and production, tool making, and traditional ceremonial or ritual activities. Some sites that may be immediately visible include:

- Rock cairns (inukshuks) and rock piles.
- Surface features such as camp sites, fish traps, stone circles, caches and burned rock.
- Artifacts that have become visible on the land surface owing to erosion or recent land altering activity. These may be produced in a variety of materials such as stone, bone, antler, wood, or shell. Buried cultural remains that may be sighted in a cut-bank, excavation, eroded shoreline, or other exposed deposit.

If you discover a site in the course of your work that you suspect may be a possible archaeological site;

- Stop all work in the area to avoid damaging the site.
- **Do not disturb any archaeological remains that you may encounter.**
- Report your discovery to your supervisor.
- Isolate and protect the area.
- Note the location and leave all discoveries in place.

- Prepare an initial Chance Find Form.
- Sabina Gold & Silver Corp. will contact the Project Archaeologist.
- The Project Archaeologist will assess the potential significance of the find. If it is determined to be archaeological in nature they will contact the Nunavut Department of Culture and Heritage.
- The archaeologist, in consultation with the Nunavut Department of Culture and Heritage, will conduct an investigation consistent with the Archeology Permit.
- The archaeologist will work with Sabina Gold & Silver Corp. to prepare a Site Instruction to recommence work in the area.
- A site report will be submitted to Sabina Gold & Silver Corp., the Inuit Heritage Trust, and the Nunavut Department of Culture and Heritage.

If you discover what you suspect may be a possible human remains in the course of your work;

- Stop all work in the area to avoid damaging the site.
- Report your discovery to your supervisor or if they are unavailable, the site supervisor, who will provide further instructions.
- **<u>Do not disturb any possible human remains that you may encounter.</u>**

The following steps will generally be followed:

- The Coroner's Office and local policing authority are notified and the Coroner's Office determines whether the matter is of contemporary forensic concern.
- If the remains are not of forensic concern, the Nunavut Department of Culture and Heritage will attempt to facilitate disposition of the remains.
- If a cultural affiliation for the remains can be determined, the Department of Culture and Heritage will contact an organization representing that cultural group. If the remains are of aboriginal ancestry, attempts to contact the relevant organization(s) will be made.
- Generally, if remains are still buried and are under no immediate threat of further disturbance, they will not be excavated or removed.

Summary of Legislation Protecting Heritage Resources in Nunavut

The *Nunavut Archaeological and Palaeontological Sites Regulations*, pursuant to the *Nunavut Act*, apply throughout Nunavut and state:

Archaeology:

> 4. No person shall search for archaeological sites or archaeological artifacts, or survey an archaeological site, without a Class 1 or Class 2 permit.
>
> 5(1). No person shall excavate, alter or otherwise disturb an archaeological site, or remove an archaeological artifact from an archaeological site, without a Class 2 permit.

On federal Crown Land, the **Territorial Land Use Regulations**, pursuant to the *Territorial Lands Act*, also apply. Two sections are relevant to archaeological sites:

> 10(a). No permittee shall, unless expressly authorized in his permit or expressly authorized in writing by an inspector conduct a land use operation within 30 metres of a known monument or a known or suspected archaeological site or burial ground; and
>
> 16. Where, in the course of a land use operation, a suspected archaeological site or burial ground is unearthed or otherwise discovered, the permittee shall immediately:
>
> - suspend the land use operation on the site; and
> - notify the engineer or an inspector of the location of the site and the nature of any unearthed materials, structures or artifacts.

Archaeological Chance Find Report Form

Recorder's Name/Affiliation:

Date:____

Location of chance find (Location description, UTM coordinates, depth below surface):____

Description of find:____

Method used to mark and protect find:____________________________________

Distribution:

☐	☐	☐	☐
Site Manager	Sabina Gold & Silver Corp.	Site Archaeologist	Nunavut Department of Culture and Heritage

Sketch Map	Photo

28. Human Resources Plan

an ERM company

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Human Resources Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
HUMAN RESOURCES PLAN

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1. Introduction

The Back River Project (the Project) has been designed to minimise, mitigate and/or manage potential adverse effects on communities while systematically seeking to enhance positive effects. As part of the requirements of the final Environmental Impact Statement (EIS) guidelines (NIRB 2013) issued by the Nunavut Impact Review Board (NIRB), this document presents the Human Resources Plan that Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

The Human Resources Plan (the Plan) has been developed in accordance with internal company and regulatory requirements. The Plan has been further informed by community-based research and a review of literature discussing the lessons learned of other northern mine projects. The measures set out in the Plan correlate directly to potential socio-economic effects of the Project which were identified during the environmental assessment process (See Volume 8, Chapters 3 and 4 of the Back River Project Draft EIS).

The Human Resources Plan is a living document and will be regularly updated based on management reviews, community feedback, incident investigations, regulatory changes, or other Project-related changes. The Plan will be revisited and updated or adapted on an annual basis. As Sabina works to address impacts and enhance benefits identified over time, changes may be made to this plan to better achieve desired outcomes. The adaptive management strategy enables engaged parties to instigate change where required and to employ the use of new data and best practices as they become available, for example, data and analysis generated by the Socio-economic Monitoring Program. Sabina's Senior Management and Human Resources staff will work to implement and update this plan throughout the life of the Project.

2. Scope and Objectives

The Project has the potential to enhance the work experience, education, and skill levels of the regional workforce. These capabilities also help maximize the retention of workers and contribute to the overall development of human capital (and employability) of workers. Workforce training to achieve these ends will also support the development of a workforce capable of meeting Project needs.

The Project has the potential to positively and adversely impact the regional workforce. The following potential Project effects and topics of concern to communities that are addressed by this Human Resources Plan include:

- Changes to employment levels and income.
- Changes to work experience, education, and skill levels.
- Changes to family and community dynamics that result from the fly-in/fly-out worker rotation schedule.
- Changes to individual and community participation in traditional land based activities.
- Unemployment associated with job loss at Project closure.

The objective of the Human Resources Plan is to maximize the employment, income, and education and training benefits available to local and regional communities, while mitigating any related potential negative impacts associated with these benefits. These Project effects are addressed through the following four elements:

- Labour Relations Strategy.
- Preferential Recruitment Strategy.
- Workforce Training Strategy.
- Workforce Transition Strategy.

Sabina aims to maximize employee retention and minimize worker turnover and will provide employment financial management and life skills training for all workers (based on demand). Hiring and training will be conducted with consideration for Inuit people and gender equity. Equal opportunities and career advancement will be provided to all individuals employed with the Project.

The Human Resources Plan would apply from the time of approval of all required licences and permits to allow construction of the Project to begin. The temporal extent of the Plan will be the life of the Project itself, including construction, operation, reclamation and closure, post-closure, and temporary closure/ care and maintenance phases.

3. Applicable Legislation and Guidelines

3.1 SABINA OPERATING RULES AND PRACTICES

Sabina will establish a number of operating rules and practices that respond to the needs of the company and those of Kitikmeot residents. These rules and practices will apply to all Project employees, contractors, and subcontractors both at the Project site and while in transit to the Project site. Company rules and practices will govern activities and behaviour at the Project site including the use of drugs and alcohol, harvesting activities, external communications, use of languages, availability of country foods, discrimination and harassment, firearms, smoking and gambling.

Sabina will develop rules and practices consistent with the requirements of the forthcoming Inuit Impact and Benefit Agreement (IIBA) between Sabina and the Kitikmeot Inuit Association (KIA) as stated in Article 26 of the Nunavut Land Claims Agreement (NCLA).

3.1.1 Alcohol and Drugs

Sabina will establish a No Alcohol and Drug Rule in compliance with Nunavut's *Mine Health and Safety Act (1994)*. Under this rule, alcohol, non-prescription drugs, and other intoxicants are prohibited substances. Community-based research has indicated that local communities place high value on measures related to ensuring all Project sites in the region provide a drug and alcohol free environment. This requirement is not only linked to the safety of workers at the Project site, but also to common understanding that some individuals struggle with substance abuse issues. The call for random drug and alcohol testing on behalf of local communities is a result of experience with past mine projects. However, in light of the recent Supreme Court of Canada ruling (Supreme Court of Canada 2013), which indicates random alcohol testing is a violation of individual privacy rights, Sabina will commit to the use of security personnel to enforce the zero tolerance policy by screening and controlling access to the worksite. Pre-hiring and scheduled drug and alcohol testing may be implemented. Employees' belongings and luggage may be examined for the presence of alcohol and/or drugs during transport to and from the mine site. Peer monitoring and reporting at the worksite will also be encouraged. All employees will be made aware of that alcohol, non-prescription drugs, and other intoxicants are not permitted at the Project site, the adherence to, zero tolerance, and the consequences for those who do not comply. In addition to the defined enforcement and compliance measures, Sabina will provide access to addictions counselling through the Employee and Family Assistance Program (EFAP).

In summary, employee drug and alcohol use will be minimized through the following actions:

- Pre-screening of workers (e.g., examination of belongings) prior to accessing the mine site.
- Establishing and instituting a zero tolerance policy for onsite drug and alcohol use, including pre-employment/site access testing, scheduled and post-incident testing, and clear communication of these rules and consequences of non-compliance to all workers.
- Providing access to addictions counselors and Inuit Employment and Training Coordinators who communicate with community alcohol and drug workers as well as community mental health professionals as necessary.

3.1.2 Harvesting

Sabina may develop rules regarding harvesting (hunting, fishing, trapping, and gathering) by Inuit and non-Inuit employees alike. Sabina will avoid having unnecessary firearms and firearms activity to facilitate the safety of all Project employees and any others present at the Project Site. Sabina will establish a No Harvesting Rule for all mine employees during the course of their employment and time at the mine site and related camps. Inuit mine employees will be engaged in a variety of work schedules, the majority based on 12-hour work days, and are expected to return to their home community when not on shift. With the anticipated two-week on/two-week off shift schedule, Inuit workers will have considerable time off shift to be able to continue to participate in traditional land-use and harvesting activities.

Sabina will adopt the No Harvesting Rule to avoid any unnecessary impacts on wildlife and fish populations and vegetation at the Project site. Mine employees will also be prohibited from engaging in harvesting activities during the course of their employment and time in the Project area. To facilitate this, recreation and other activities will be provided at the camps, which will be well-appointed facilities. This regulation will provide assistance in the management of access to land areas currently in use by local Inuit. This preserves areas near the Project site and camps for the current users while enabling Inuit employees to continue to engage in traditional harvesting activities while not at work.

Sabina recognizes the rights and needs of individuals who are not employed by the Project but are travelling through the area as part of regular subsistence land use activities. Individuals who are travelling through the area will be supported in their activities (e.g., potentially provided with short-term room and board on request). During any stay, individuals will also be provided with a camp safety induction describing relevant safety information regarding the Project. This safety information is provided so local hunters are aware of Project activities and can adjust their land use activities accordingly. Section 5.7.1.7 of the NLCA limits the right of Inuit to hunt within one mile of buildings, structures, or facilities on lands under surface lease, an agreement for sale, or owned in fee simple. In accordance with the Section 5.7.1.7, hunting will not be permitted within a one mile radius of the surface lease associated with the Project.

All employees will be asked to report sightings of non-Project individuals in the vicinity of the Project. These individuals will be contacted to make them aware of the risks associated with the use of firearms near the Project, and will be asked to refrain from such use. Use of firearms will be strictly prohibited within the active Project Development Areas.

Sabina will make reasonable efforts to ensure country foods are available to mine employees and that all catering and food provision contracts include country food provisions. This will serve the dual purpose of providing country foods to Inuit employees and enabling non-Inuit employees to experience Inuit culture. The contract for catering at the mine camps will be awarded to a facility approved by the Canadian Food Inspection Agency (CFIA), as is required for kitchen operations. It is recognized that currently the availability of country foods from a CFIA-approved food processing facility is limited (i.e., Kitikmeot Foods in Cambridge Bay being the only regional supplier). Given this limitation, it may be that the ability to provide country foods on a regular basis to mine employees will be limited. Sabina will explore with Inuit employees other options to facilitate the consumption of country foods while at site (e.g., an employee country food storage and cooking facility).

3.1.3 External Communications

Communication between mine employees and their family members will be facilitated by access to phone and internet connections. Appropriate use of technologies, such as internet-based video calls, will be encouraged. This will enable workers to maintain contact with family members on a daily or semi-daily basis while working away from home for extended periods. This measure may address certain aspects of community well-being in that, for Inuit, prolonged separation from family directly affects identity, belonging, and other aspects of self and family relations. Essentially, maintaining communication within the family unit will enable Inuit mine employees to retain their employment without significantly compromising their cultural values of family and social ties to community. The communications policy will apply for all mine employees.

3.1.4 Anti-harassment and Discrimination

Sabina is committed to providing a workplace free of all types of harassment. All types of harassment are illegal and are strictly prohibited. Any individuals who feel they have been harassed or who witness harassment are obligated to report the harassment to the Sabina human resources representative at the mine site. All mine employees will receive cross-cultural and gender sensitivity training and are expected to understand what behaviours are and are not acceptable including the changes to employment status that may occur if they are found to be non-complaint. All alleged cases of harassment and discrimination will be investigated and key findings reported to Sabina management and other individuals appointed to deal with violations.

3.1.5 Language

Nunavut’s *Official Languages Act* (GN 2006) recognizes three official languages: Inuit language, English, and French. The Act guarantees the use any official language in legislative, judicial, and government communications. The *Inuit Language Protection Act* (2008) is federal legislation that aims to protect and revitalize a first peoples’ language.

Although the working language in the mine will be English, Sabina is committed to providing culturally appropriate conditions in the workplace and will establish rules and practices that promote the use of Inuit languages to the extent possible. All signs and postings at the mine site and camps will be provided in English, Inuktitut, and Inuinnaqtun. Sabina will provide support for employees interested in improving their English, Inuinnaqtun, or Inuktitut skills.

Sabina will explore the possibility of establishing Inuit language speaking work groups within sub-activities of the Project, with the provision that members of each work group can communicate competently in English with other personnel on the Project. This would be contingent upon the number of Inuit language speakers employed within each Project activity group. There is a risk that the use of other languages by Project employees could pose a safety risk on the worksite. A paramount consideration is the optimal functioning of the workplace and safety of all employees – with this in mind, all employees will be required to be functionally proficient in English.

3.1.6 Firearms, Smoking, and Gambling

Safety at the Project site will be promoted by a no firearms rule. Although firearms will be kept on site and adequate secure storage will be provided for this purpose, mine employees flown into the mine site will be prohibited from transporting firearms for any purpose.

Sabina will discourage employees from smoking in mine camps and will prohibit smoking at the mine site. In camps, smoking will be permitted at designated locations. Gambling between workers will be prohibited on site and in camps during the course of their employment. Well-appointed recreation facilities and other activities will be provided in camps to provide alternatives and help encourage compliance.

3.2 GOVERNMENT LEGISLATION AND POLICY

The *Labour Standards Act (1988a)* regulates employment in Nunavut. Other supporting legislation includes:

- *Mine Health and Safety Act* and Regulations, S.N.W.T. (Nu.; 1994; 2008), c. 25.
- *Safety Act*, R.S.N.W.T. (Nu.; 1988c), C. S-1.
- *Workers' Compensation Act,* R.S.N.W.T. (Nu.; 1988d) c. W-6.
- *Workers' Compensation Act* (Consolidation) SNu. (2007), C. 15.
- *Labour Standards Act* R.S.N.W.T (Nu.; 1988a) c.L-1.
- *Nunavut Employees Union* R.S.N.W.T. (Nu.; 1988b), c.U-1.
- *Consolidation of Official Languages Act* R.S.N.W.T. (Nu.; 2006), c.O-1.
- *Consolidation of Official Languages Act* SNu. (2006), c.17.

Sabina will develop rules and practices that comply with the requirements of these acts and the forthcoming IIBA between Sabina and the KIA as stated in Article 26 of the NCLA.

4. Roles and Responsibilities

Implementation of the Human Resources Plan, as well as on-going performance evaluations, updates or revisions to the Plan, will be the responsibility of the Manager for Human Resources or similar position, or another designated management personnel with requisite skill set and experience. The Manager of Human Resources may also delegate responsibility for specific components of the Plan to other personnel. Specifically, the Inuit Training and Employment Coordinator will have direct responsibility for provisions of the Plan associated with recruitment or workforce training, reporting to the Manager for Human Resources. Other supporting roles and responsibilities of staff will be identified during implementation based on needs.

Sabina is committed to regular engagement of the NIRB, the KIA, and Kitikmeot communities and seeking feedback on potential areas for improvement in the Human Resources Plan over the life of the Project. In this regard, the role of these organizations, community stakeholders, and the public is important to support continual improvement and adaptive management.

5. Management Measures

A Socio-economic Monitoring Program (Volume 10, Chapter 23) has been developed to help ensure that the Project fulfills best practices in social responsibility as it relates to community engagement, capacity building, and realization of benefits from the Project, especially for Inuit. Equally, monitoring will provide relevant and timely information to enable Project managers and community leaders to respond proactively to potential risks and adverse socio-economic effects.

In order to support management measures associated with the Human Resources Plan, a number of Project-specific indicators have been defined to monitor Plan performance and achievement of management objectives with respect to employment, education and training (Table 5-1). Thresholds for each indicator will be determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee (see Socio-economic Monitoring Program, Volume 10, Chapter 23). Where Project performance is addressed by the IIBA, it is anticipated that applicable thresholds will be defined in reference to the provisions of the IIBA. For all indicators, management action will be triggered when annual performance is below threshold. Specific actions will be determined in consultation with the NIRB and the KIA (when applicable to the IIBA). This will involve an evaluation of the existing mitigation and management measures, and identification of appropriate adjustments to the Human Resources Plan.

Table 5-1. Indicators, Thresholds, and Triggers to Support Management Measures

Valued Socio-economic Component (VSEC)	Indicator	Threshold	Trigger	Suggested Action
Socio-Economics: Employment	Number of persons directly employed with the Project	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of person-days worked by all employees	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of person-days worked by Inuit employees	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/adjust mitigation as appropriate.

(continued)

Table 5-1. Indicators, Thresholds, and Triggers to Support Management Measures (continued)

Valued Socio-economic Component (VSEC)	Indicator	Threshold	Trigger	Suggested Action
Socio-Economics: Employment *(cont'd)*	Percentage of direct employees by gender	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance (number of female workers) below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of Inuit employees from the Kitikmeot Region and the number of Inuit employees from elsewhere in Nunavut	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Percentage of Inuit in each job category	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
Socio-Economics: Education and Training	Number of Inuit filled apprenticeships supported by the Project	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of employees that complete on-the-job training courses	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of Inuit employees that complete on-the-job training courses	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of person-courses completed by employees by type of course	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/adjust mitigation as appropriate.
	Number of person-courses completed by Inuit employees by type of course	Determined in reference to the IIBA provisions.	Annual performance below threshold	Determined in consultation with the NIRB and the KIA. Evaluate mitigation and apply additional/adjust mitigation as appropriate.

(continued)

Table 5-1. Indicators, Thresholds, and Triggers to Support Management Measures (completed)

Valued Socio-economic Component (VSEC)	Indicator	Threshold	Trigger	Suggested Action
Socio-Economics: Education and Training *(cont'd)*	Average number of years of mining experience as a result of the Project	Determined in consultation with the NIRB, Community Advisory Groups, and the Back River Project Socio-economic Monitoring Committee	Annual performance below threshold	Determined in consultation with the NIRB. Evaluate mitigation and apply additional/adjust mitigation as appropriate.

6. Monitoring Program

Sabina will track and manage outcomes of this Human Resources Plan as described by the Back River Socio-Economic Monitoring Program (Volume 10, Chapter 23).

7. Mitigation and Adaptive Management

7.1 LABOUR RELATIONS STRATEGY

The Labour Relations Strategy aims to reduce labour force entry barriers and improve employee retention. To this end, the strategy details skills and entrance requirements, employee benefits, employee communication, work rotation schedules, and employee orientation programs.

7.1.1 Skills and Entrance Requirements

Sabina is involved in ongoing discussions with communities regarding prerequisite skills and entry requirements for employment with the Project. Employment opportunities and conditions include anticipated minimum qualifications for entry level (unskilled jobs). These include completion of grade twelve (or equivalent), ability to pass a criminal records check (leniency for pardons for minor crimes will be considered), and the ability to pass a health acreening, specifically a drug and alcohol check. Sabina will work with Inuit associations and communities, governments, women's groups, as well as other groups as appropriate, to assist individuals in decisions about career opportunities with the Project.

Barriers to employment for Inuit can include a lack of education and skills, a criminal record, and personal and family issues (including time away from family). To help address these issues, the following will be undertaken:

- Sabina will work with regional education providers (e.g., Nunavut Arctic College) to support the provision in Kitikmeot communities of education and training programs that prepare workers for employment. This includes programs ranging from, for example, Adult Basic Education (ABE) to pre-trades and trades. In addition, on-the-job training will be made available as it relates to an individual's job requirements and desired career development path, as applicable.
- Sabina may, on a case-by-case basis, establish a process of review for employees that meet all other employment requirements but have a criminal record to assess whether leniency can be

granted. Sabina will also support and encourage applicants to access the KIA pardon process where relevant.

- Sabina's external communications practices (see Section 3.1.3) aim to provide the opportunity for employees to remain in contact with their family members on a regular basis, in turn providing support to employees and increasing employee retention. Sabina is committed to providing assistance in overcoming obstacles to employment.

7.1.2 Employee Benefits

Individuals who obtain full time employment with the Project will be compensated in terms of employment income and benefits. Sabina will offer a complete range of benefits consistent with mine industry standards now in place in Nunavut. All mine employees will receive these benefits, which include for example:

- **Health Care Plan:** provides coverage for a range of health care services and medications potentially required by the employee and immediate family. Options for extended health care, including vision and dental care, will also be provided.
- **Employee and Family Assistance Program (EFAP):** provides counseling related to financial management, drug and alcohol dependency issues, work related stress, and many other employee concerns.
- **Vacation:** granted in accordance with Nunavut legislation. All employees are required to take vacation annually.
- **Pension Plan:** will be provided to reflect industry standards.

Through the EFAP, all employees will have direct access to counselling and other forms of personal assistance. Inuit employees will also have access to the Inuit Employment and Training Coordinator who will facilitate access to counselling and information resources, such as for substance abuse, financial management, work related stress, employee and family well-being, or employment and career counselling. These services are aimed at maximizing employee retention and providing a positive work experience for all employees.

7.1.3 Employee Communication

Sabina's Human Resources Department will be responsible to receive and address employee concerns, complaints, grievances, or suggestions. Conflicts and concerns will be treated confidentially and will be addressed promptly and effectively. Employees will be made aware of this mechanism during employee orientation. For Inuit employees, the communication processes will be complemented by the services of the Inuit Employment and Training Coordinator who will work with the Human Resource Department as necessary.

The relevant terms and conditions of the IIBA, where applicable to Inuit employment and where agreed to with the KIA, will be directly communicated to employees.

7.1.4 Work Rotation Schedules

Sabina has structured work rotation schedules to enable employees to continue to participate in traditional activities from their home communities. This will generally be facilitated by the two weeks in/two weeks out shift schedule which provides employees with an extended period of time off to participate in land use and community activities. Cambridge Bay and Kugluktuk are expected to be major points of hire and as such there will be direct flights from both communities to and from the Project site for shift changes. The provision of direct charter flights from other Kitikmeot communities, including Gjoa Haven, Taloyoak, and Kugaaruk, will be determined based on need. Sabina will provide direct airfare from points of hire at no-cost for all employees allowing workers to continue to live in their home communities.

Additionally, Sabina may consider granting leave without pay on a case-by-case basis for Inuit employees requesting additional time off for cultural reasons, for example, to participate in major community harvesting activities or important community and cultural events.

7.1.5 Orientation Programs

Sabina will provide orientation programs to employees that will develop understanding of what is expected in terms of work responsibilities, environmental protection, and health and safety management. All orientation programs will be provided to employees as part of their employment training and aim to public safety and well-being at the Project site. Orientation programs will include:

- Workplace preparedness orientation.
- Environmental protection and health and safety orientation.
- Financial management orientation.
- Cross-cultural and gender-sensitivity orientation.

7.1.5.1 Workplace Preparedness Orientation

The Workplace Preparedness Orientation Program will describe employment details such as:

- An overview of day-to-day mine operations and work schedules, layout of the mine site and camps, brief descriptions of what activities are taking place in different areas, locations of all employees resources.
- Means through which employees can remain in contact with their family members, location of these facilities, and appropriate use (including number of contacts made per day and length of time per contact) to facilitate communication with family and community while at camp.
- A review of acceptable and unacceptable conduct at the mine site and camps including a review of company rules and practices (e.g., drug and alcohol, harassment, no hunting/no fishing) and changes to employment status that may occur if employees are found to be non-compliant with company policies.
- A review of attendance and truancy guidelines, including a discussion of actions that are potential cause for termination of employment.

Sabina will also offer an optional Workplace Preparedness Orientation Program for new workers and their families that want to learn more about the mine employment lifestyle, the various challenges that may need to be overcome, and support options available to employees and their families.

7.1.5.2 Environmental Protection and Health and Safety Orientation

The Environmental Protection and Health and Safety Orientation Program will include details regarding:

- Acceptable means of work conduct as related to environmental protection including environment and wildlife awareness training. Workers and visitors will be provided with information about the Arctic environmental and informed as to the appropriate conduct when in the presence of wildlife in the Project area, including encounter and conflict avoidance techniques.

- An overview of policies related to the use of resources such as recycling and waste management, water management, and use and access of surrounding lands.
- Review of health services and how to access on-site health services generally and in the case of an emergency, as well as protocols to follow.
- How, where, and under what circumstances to access relevant personnel such as the Manager of Health and Safety, Manager of Environment, and Management of Community. and the Manager of Human Resources.

Health and safety orientation will vary as to each employees job description; however, a general safety orientation will be provided to all mine employees describing appropriate conduct including mine site and camp safety policies. Sabina will provide suitable work facilities and conditions with the objective of safeguarding the health, safety, and general well-being of employees. Sabina will require all employees and contractors to maintain safe work practices, including adherence to all legislated and company health and safety requirements.

7.1.5.3 Cross-cultural and Gender Sensitivity Orientation

Sabina will provide a Cross-cultural and Gender Sensitivity Orientation Program for all mine employees and contractors (Inuit and non-Inuit employees and managers) aimed at enhancing positive interaction between Inuit and non-Inuit in the workplace. This workshop will be designed in consultation with local Inuit and will provide information about culture and gender differences among the workers. Examples of what constitutes appropriate and inappropriate workplace conduct will be reviewed. The program will also provide guidance as to how individuals experiencing or witnessing inappropriate behaviour can address the issue and will outline the consequences of inappropriate behaviour. Overall, the Cross-cultural and Gender Sensitivity Orientation Program is designed to facilitate effective working relationships between employees and to establish and maintain a positive work environment.

Cross-cultural aspects of the program will be primarily focused to provide non-Inuit employees with opportunities to better understand Inuit culture and communities. Sabina will work to provide workplace conditions that are respectful of all cultures in order to provide a suitable work environment and help attract and retain Inuit employees.

Further, gender sensitivity training will occur to educate mine workers as to what actions are considered sexual harassment and will outline the consequences. Gender sensitivity training will also inform individuals of the steps to take to address this situation if one arises, including reporting procedures and resources. This training aims to promote gender equality in the workplace.

Sabina will employ Inuit Employment and Training Coordinators to assist Inuit employees in accessing this program, the EFAP, health care, and other programs as needed. These individuals will provide an important means through which Inuit employees can obtain employment support, and Project management can obtain valuable information on the efficacy of this Human Resources Plan.

7.1.5.4 Financial Management Orientation

Sabina will arrange for Financial Management Orientation for employees. Employee financial management and life skills development will be provided through the following actions:

- Financial management and life skills training for all workers, which will include various aspects of household budgeting.

- Banking and financial services information provided in collaboration with regional financial service providers, which will include an overview of available services in the region, the benefits of services, and what is needed to access these services.
- Additional advice and/or financial management counseling for employees upon request, to be accessed through the Inuit Employment and Training Coordinator.

Financial management training will include information about the function of banks and other financial services, how to become a client and obtain an account, as well as appropriate and inappropriate use of bank accounts, bank cards, and cheques. This session will incorporate information on family and individual budgeting. Employees who do not have bank accounts will be encouraged to obtain one, although employment income can either be deposited into an employee's bank account or by other arrangement. Sabina will work with the Nunavut Housing Corporation (NHC) to integrate information describing changes to rent levels (as this is indexed to household income level) and how to budget for same each month or how to set up monthly direct payment to the NHC.

The Inuit Training and Employment Coordinator will work in cooperation with Kitikmeot Region counsellors to assist mine employees and their families, as requested, to adjust to lifestyle changes associated with full time employment and financial management/budgeting.

7.2 PREFERENTIAL RECRUITMENT STRATEGY

The intent of the Preferential Recruitment Strategy is to maximize the engagement of the Kitikmeot Inuit in the Project workforce though regular information updates regarding employment and training opportunities, hiring plans, and Project schedules. This process will utilize both formal targeted as well as informal means to communicate employment information.

7.2.1 Mitigation and Targeted Outcomes

The Preferential Recruitment Strategy focuses on areas to enhance local Inuit employment in the Project. Defined targets include:

- Inuit residing in the Kitikmeot region, specifically in Cambridge Bay and Kugluktuk, are aware of employment and training opportunities with the Project, and understand what steps to take to obtain Project employment.
- A maximum number of Kitikmeot Inuit become employed and are retained with the Project.

A number of methods will be employed in this management plan that aim to promote the participation and retention of Nunavummiut in Project employment, including:

- Cultural awareness policies.
- Financial management and substance abuse counseling.
- Means to communicate with family while away at work.
- Work rotation schedules that give consideration to cultural activities.
- Providing and promoting training activities, mentorship programs, and engaging youth through information sessions.
- Communicating early and clearly the employment and training opportunities available.
- Providing assistance to individuals that meet all employment requirements who are barred from employment as a result of their criminal record.

- Provision of culturally appropriate food options, where feasible.

Further details of the strategies that will be used to promote Inuit participation in employment and contracting opportunities are provided in the Community Involvement Plan (Suppl. Vol. 10).

7.2.2 Adaptive Management

Sabina is committed to providing continuing employment opportunities for Kitikmeot Region residents. First opportunity for hire will be provided to residents of Cambridge Bay and Kugluktuk and former residents of Bathurst Inlet and Omingmaktok who now reside in these communities as a result of their traditional and contemporary ties to the Project area. However, residents from the eastern Kitikmeot communities (i.e., Gjoa Haven, Kugaaruk, and Taloyoak) will also be provided with hiring opportunities wherever possible. Specific objectives for employment will be subject to the results of IIBA negotiations between Sabina and the KIA.

Given the Project workforce requirements, workers will be hired from various areas of Canada with specific focus on communities throughout the Kitikmeot Region. Cambridge Bay and Kugluktuk will serve as major points of hire with direct flights to and from the Project. If employment numbers are sufficient in other Kitikmeot communities, direct flights to and from the Project may also be organized. Northern workers will generally work two week in/two week out shift. The southern workforce will be directed though Edmonton, Yellowknife or a similar location with direct flights possible from one or more of those locations.

Awareness of Project opportunities will be enhanced by providing public presentations within local communities, such as hosting local job fairs and community feasts to further establish positive relationships with communities and to provide advanced notification of employment opportunities and expectations. Through these events and coordination with local education and training facilities, Sabina will provide early and clear public communications of hiring schedules and skill/certification requirements for positions.

Sabina will also develop and maintain employment opportunity information online. The Back River Project website (www.backriverproject.com) provides public access to information about Project-related employment, including the type of jobs that will be available, a description of responsibilities, and the requirements for that type of employment, such as education and experience. Additionally, employment opportunity postings including the same information will be provided in Project camp sites, hamlet offices (or other appropriate community organization), and at the Sabina office in Cambridge Bay. Further to this notification of recruitments, Sabina will collaborate with local training facilities (i.e., the NAC) to provide them with the Project information necessary in advance to help the educational institutions offer programs that help prepare workers for Project employment.

7.3 WORKFORCE TRAINING STRATEGY

The Workforce Training Strategy was designed to assist the local labour force with potential employment with the Project. To achieve this, Sabina seeks to establish strategic partnerships with local post-secondary education institutions, to provide program and training contributions, to provide in-house training and career development, to employ an Inuit Employment and Training Coordinator, and to promote youth employment.

7.3.1 Mitigation and Targeted Outcomes

The Project has the potential to enhance the work experience, education and skill levels of the local workforce, and human capital in the region. The Workforce Training Strategy seeks to maximize these benefits. In order to maximize Inuit employment, experience, education, and skill levels, Sabina intends to support worker training programs through external education and training institutions. In-house training and career development opportunities will also be provided to local Inuit in order to meet the employment demands of the Project.

In sum, through education and training initiatives, Sabina aims to:

- Maximize prospects for Inuit employment and retention in the Project workforce.
- Assist Inuit in developing the practical skills and education qualifications that enable them to work effectively and advance in their employment.
- Contribute to the human capital and well-being of the Kitikmeot Region.
- Reduce barriers to employment throughout the life of the Project.

Sabina will identify existing barriers to employment for Inuit and will work with the Inuit Education and Training Coordinator, and others to implement measures that reduce these barriers.

7.3.2 Actions and Adaptive Management

To enhance benefits of the Project related to employment Sabina will take measures to enhance the experience, education, and skill levels of the local workforce by:

- Developing strategic partnerships.
- Contributing to local programs and training initiatives.
- Providing in-house training and career development.
- Employment of an Inuit Employment and Training Coordinator.
- Engaging youth through mentorship programs.

7.3.2.1 Strategic Partnerships

Sabina will develop strategic partnerships with local post-secondary education institutions in the region (i.e., the NAC) to support those institutions in establishing worker training programs that would help meet the requirements of the Project. Sabina will work with post-secondary institutions to help ensure the availability of space in education and training programs does not become a significant barrier to mine employment for Inuit in the Kitikmeot Region. Sabina will provide early and clear communication related to employment requirements and hiring schedules to education and training facilities.

Throughout the life of the Project, Sabina will continue to work with education and training providers by providing information related to ongoing employment requirements to coordinate with the provision of additional (more advanced) programs, based on demand, that would enable individuals to increase their skills training, certification, supervisory, and management skills with the intention of qualifying Inuit employees for future skilled and supervisory positions with the Project. Through their work with local training and education providers, Sabina will contribute to and support a system through which successfully completed training leads to employment.

Sabina will seek to maintain ongoing working relationships with the NAC, Kitikmeot Region high schools, Kitikmeot School Operations, Government of Nunavut Department of Education, Government of Nunavut Municipal Training Organization, and other relevant organizations.

7.3.2.2 Program and Training Contributions

Sabina will work with and contribute to the exiting pre-trades programs offered by the NAC and high schools in the Kitikmeot Region by providing experienced individuals to speak with students and offer presentations about work in the mining industry. Sabina will also consider contributions to other education and training activities and will work with the KIA to identify additional resources for Inuit training, potentially including joint applications to Human Resources and Skills Development Canada (HRSDC), the Mining Industry Human Resource Council, and Aboriginal Affairs and Northern Development Canada.

Along with the federal government, other mine and mineral corporations, the three territorial governments and other Aboriginal governments, Sabina also intends to support the mine training initiative of the soon-to-be-born Nunavut Mine Training Society (MTS). The Nunavut MTS is backed by the three Inuit Associations within Nunavut, the NWT, and Nunavut Chamber of Mines, with the support of the Government of Nunavut.

7.3.2.3 In-house Training and Career Development

In-housing training and career development opportunities will be maximized by: developing worker training programs as part of worker recruitment (e.g., needs based training); developing on-the-job training programs to enhance worker job experience and to promote worker advancement; and by providing information and counselling as to individual career development plans for Project workers. Career development opportunities will be available in all departments and career counselling sessions will be made available periodically to review employee progress and define next steps and experience needed to achieve specific employment milestones.

Sabina will also consider supporting requests for external training, to advance Project related careers. Sabina will develop detailed continuing education practices consistent with the requirements of the IIBA negotiated between Sabina and the KIA. Additionally, Sabina will facilitate apprenticeship opportunities where possible and will work to increase the availability of these types of opportunities throughout the life of the Project. In-housing training and career development opportunities seek to encourage Inuit to remain in the Kitikmeot Region and to increase the retention of Project benefits.

7.3.2.4 Inuit Employment and Training Coordinator

Sabina will hire an Inuit Employment and Training Coordinator that will facilitate all aspects of mine employment for Inuit workers. Responsibilities will include, for example, arranging access to training programs, orientation, and counselling, and providing advice, solutions, or alternatives to Inuit employees as needed. The person in this position is also expected to act as a career counsellor and will provide information and direction for those workers who wish to increase their skill level for the purpose of career advancement.

7.3.2.5 Youth Employment

In partnership with local educational facilities (Kitikmeot Region high schools and the NAC), Sabina will host educational sessions with youth (target ages 15 to 29) in Kugluktuk, Cambridge Bay, Gjoa Haven, Taloyoak, and Kugaaruk aimed to provide background and context about the mining industry, the types of employment available in the mining industry, and what it is like to be at a mine site. Information about training opportunities will also be provided. For high school students, this will include an overview of what high school courses would provide a foundation for the type of mine employment of interest to them. It is anticipated that this will be coordinated with any relevant mining sector or pre-trades Multiple Options program streams offered in the high schools. For youth who have completed high school or equivalent, a similar overview of available training opportunities and related requirements will be provided.

Sessions will also include information for those interested in employment that allows individuals to understand how they would continue to connect with their friends and family while working at the mine site. An overview of employee support programs, such as financial planning, addictions counselling, wellness counselling and others, will also be provided. If possible, Sabina will work to have a currently employed local Inuk speak to youth about their experience at the mine.

7.4 WORKFORCE TRANSITION STRATEGY

The Workforce Transition Strategy details the actions Sabina will take to enhance the ability of Project employees to transition to other employment following the completion of Project activities.

7.4.1 Mitigation and Targeted Outcomes

Upon Project decommissioning, loss of employment with the Project may create negative impacts for workers and communities, such as increased levels of unemployment. The intent of the Workforce Transition Program is to minimize these adverse effects by easing the transition of workers to other employment opportunities in the region.

The objective of this strategy is to enhance employees' ability to secure suitable employment elsewhere during the closure phase of the Project. This strategy focuses on areas likely to enhance employees' ability to secure suitable employment and aims to achieve the following:

- Maximize the transferability of workers skills and experience.
- Provide job search assistance to all workers seeking the service.
- Maximize the number of workers that find alternative suitable employment.

7.4.2 Actions and Adaptive Management

In order to maximize the transferability of workers skills and experience Sabina will develop materials and tools that will enable workers to: 1) identify the skills they acquired and used throughout their employment on the Project by providing relevant listings and descriptions of training and other employment achievements to workers from their personnel records; 2) match skills to alternative industries and positions; and 3) articulate and present skills and experience effectively in personal resumes and other job search materials to target those alternative industries and positions.

To provide assistance with job search capabilities and to maximize the number Project workers that find alternative suitable employment, Sabina will: 1) develop a readily accessible job bank listing local and regional job opportunities potentially suitable for workers; 2) create an inventory, with the agreement of workers, of available workers and their skills/experience and make this available to external human resources officials; 3) support employees' job searching skills by facilitating connection with external job search facilities and assistance; 4) offer resume-writing and interviewing skills-building services, as requested; and 5) coordinate with appropriate regional training institutions to provide industry-specific retraining information sessions in response to the level of interest by Project workers.

8. Reporting and Plan Effectiveness

Reports on Plan outcomes and performance, as well as any recommended additional adaptive management actions, will be prepared at a minimum annually for internal company distribution and use. The Plan will be evaluated against the defined scope and objectives (Section 2).

As part of the Back River Socio-Economic Monitoring Program (Volume 10, Chapter 23), the relevant findings will be reviewed in collaboration with other members of the Back River Project Socio-Economic Monitoring Committee (SEMC) and the NIRB. Key findings and recommendations will be incorporated into an annual report to the NIRB. Reporting of monitoring results will also be provided to the Back River Project SEMC and the Kitikmeot Region SEMC.

9. Summary

The Project aims to provide employment that will attract, develop, and retain qualified personnel, and business opportunities that support the development of suppliers in the region's communities. The objective of the Human Resources Plan is to maximize the employment, income, and education and training benefits available to local and regional communities, while mitigating any related potential adverse effects associated with these benefits. To meet this objective, the Human Resources Plan includes: 1) Labour Relations Strategy; 2) Preferential Recruitment Strategy; 3) Workforce Training Strategy; and 4) Workforce Transition Strategy.

The monitoring of Plan outcomes will inform the ongoing management and mitigation of the potential social and economic effects identified in the EIS and will facilitate best practices in social responsibility as it relates to worker engagement, capacity building, and the realization of benefits from the Project. The monitoring program will be established to enable Project managers and community leaders to respond proactively and in a timely manner to any undesirable changes to socio-economic conditions.

Sabina recognizes that the Project will present Inuit communities with both substantial opportunities as well as changes to current social and economic conditions. Sabina is committed to implementing measures to enhance the benefits of the Project for individuals residing in the Kitikmeot Region communities. Mitigating existing and potential impacts, and promoting individual, family, and community well-being is a shared responsibility of Sabina, the KIA, the hamlets, and the Government of Nunavut. Commitments to enhance regional employment and training and the provision of community programs and services to enhance community well-being do not impose responsibility on Sabina to assume the role of government. Sabina will cooperate in these efforts. For the benefits of the Project to be fully realized at the local level the communities must be engaged in the implementation of strategies to build capacity to enhance well-being, which contributes to the ability of communities to deal with current and future challenges and to retain the benefits beyond the life of the Project.

There is inherently some uncertainty associated with predicting the social impacts prior to the implementation of Project activities. Sabina will work to address impacts and enhance benefits as they are identified over time. Adaptive management as a method used for the creation and implementation of the Human Resources Plan and the monitoring program enables the engaged parties to instigate change where required and to employ the use of new data and best practices as they become available. Further, the adoption of adaptive management practices enables the engaged parties to adjust plans based on the findings of the monitoring program throughout the life of the Project.

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29. Mine Closure and Reclamation Plan

Sabina
GOLD & SILVER CORP.

BACK RIVER PROJECT
Mine Closure and Reclamation Plan

December 2013

REVISION E.1

BACK RIVER PROJECT
MINE CLOSURE AND RECLAMATION PLAN

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1. Introduction

1.1 OVERVIEW

The Sabina Gold & Silver Corp. (Sabina) Back River Project (the Project) is located in the southwestern part of the Nunavut Territory, Canada (107°W longitude and 65°N latitude) as shown in Figure 1.1-1. The closest community to the Project is Bathurst Inlet NU, which is located approximately 165 km to the northeast. The Project is situated 520 km northeast of Yellowknife NWT, 220 km east of the closed Lupin Mine (which is currently owned by Elgin Mining Inc.), and 65 km southeast of Glencore Xstrata's Hackett River Silver and Zinc Project. The Property covers approximately 52,014 ha (128,529 ac).

1.2 PROPONENT INFORMATION

1.2.1 Sabina's Contact Information

Sabina's corporate office is located at the following:

Sabina Gold & Silver Corp.
#202 - 930 West 1st Street
North Vancouver, BC Canada V7P 3N4
Tel: (604) 998-4175
Fax: (604) 998-1051
Toll Free: (888) 648-4218

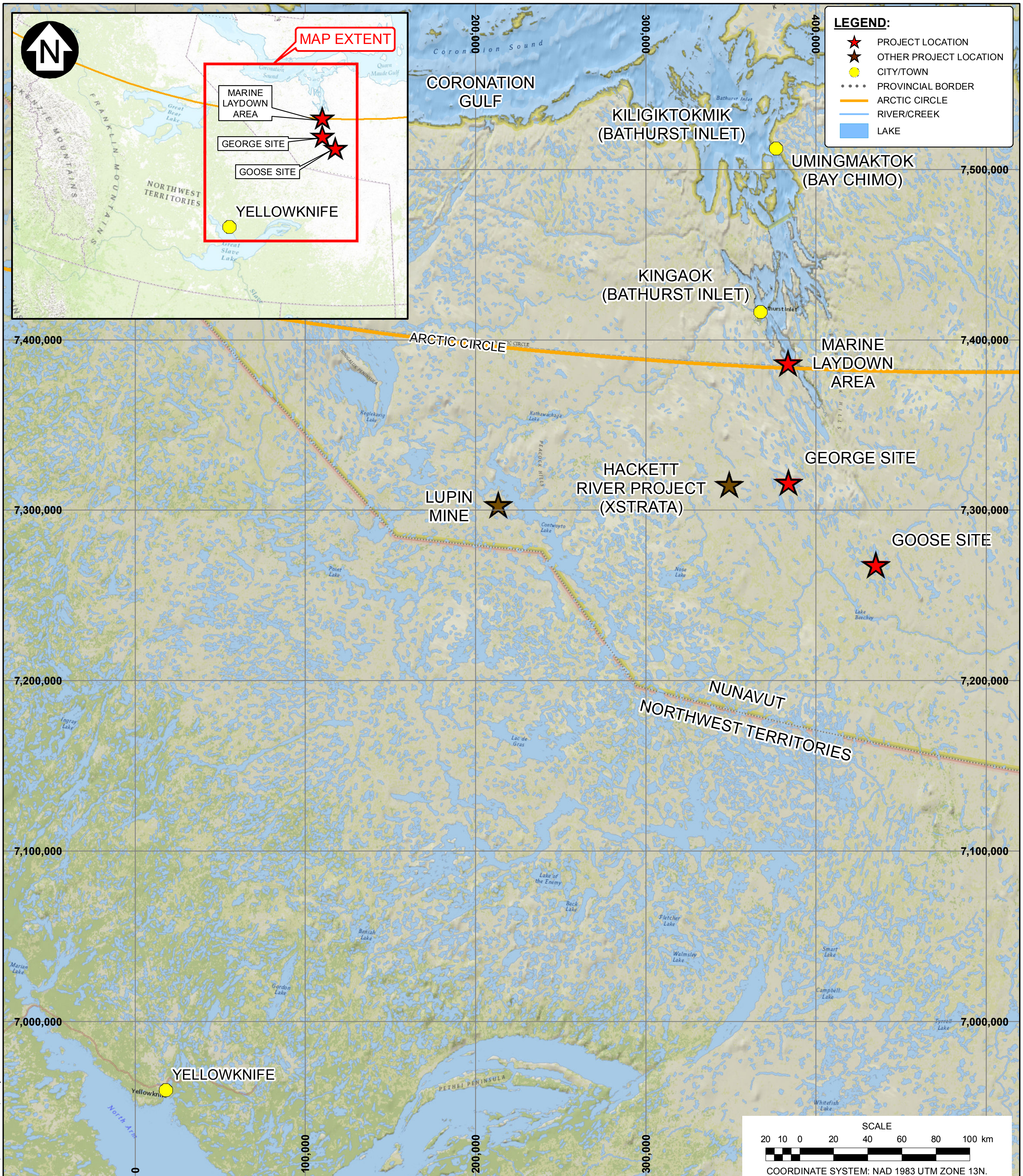
1.2.2 Sabina's Environmental Policy

The following is Sabina's environmental policy (Sabina, 2013):

"Sabina takes its responsibility to act as a steward of the environment seriously.

To fulfill this responsibility, Sabina strives to:

- *Ensure that we design our activities and operate in compliance with all environmental regulations to minimize our impact on the environment.*
- *Promote responsibility and accountability of managers, employees and contractors to protect the environment and make environmental performance an essential part of the management/contractor review process.*
- *Provide resources, personnel and training to enable management, employees and contractors to implement programs and policies to protect the environment.*
- *Communicate openly with employees, contractors, local stakeholders and government on our environmental protection and sustainability programs and performance. We will also address any concerns pertaining to potential hazards and impacts.*
- *Promote the development and implementation of systems and technologies to reduce environmental risks.*
- *Establish and maintain appropriate emergency response plans for all activities and facilities.*
- *Maintain a self-monitoring program at each facility to ensure compliance and to proactively address plans to correct potential deficiencies.*



NOTES:

1. BASE MAP: NATIONAL GEOGRAPHIC TOPOGRAPHIC MAP.

2. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 13N.

3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,000,000 FOR 8.5x11 (LETTER) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

PROJECT LOCATION

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-517/2	4

FIGURE 1.1-1 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	21OCT'13	ISSUED WITH REPORT	CC	SWK	RAC	KJB

SAVED: I:\101\00517\02\A\GIS\Figs\A01_r0.mxd; Oct 21, 2013 5:08 PM; asimpson

- *Work cooperatively with government agencies, local communities and contractors to develop and enhance systems and technologies to improve environmental and sustainability practices.*
- *Encourage all employees, contractors or stakeholders to report to management any known or suspected departures from this policy or its related procedures".*

1.2.3 Towards Sustainable Mining – Mine Closure Framework

Sabina subscribes to the Towards Sustainable Mining (TSM) Initiative, including the implementation of the TSM Guiding Principles/Protocols and the Mine Closure Framework. A copy of the TSM Mine Closure Framework is included in Appendix A.

1.3 OVERVIEW OF MINE DEVELOPMENT AND OPERATING PLAN

The Back River Project involves the construction, operation and closure of two mine sites: the Goose site and George site. A marine laydown area (MLA) will be established at Bathurst Inlet to deliver supplies, along with a new 100 km winter road connecting the MLA to the Goose site via the George site (Figures 1.1-1 and 1.3-1).

The mine plan consists of six (6) open pits and an underground mine operation supporting a 5,000 t/d milling operation over an estimated 8.5 year mine life plus ancillary facilities (plant site, MLA, administration offices, etc.). The six proposed open pit mines include the Umwelt pit, Llama pit, and Goose Main pit (all located at the Goose Project), and the Locale 1, Locale 2 and Low Cow Pond (LCP)-North pits (located at the George Project). There is one underground mine in the Umwelt deposit.

Mining will begin with pre-stripping at the Umwelt pit in Year -1.5 (i.e., during construction). Open pit mining at the Goose pits will be complete by Year 6. Underground mining at Umwelt will occur between Year 3 and the end of mining at Year 8.5. Additionally, mining of the George pits will occur in Year 6 through Year 8.5 once open pit mining has concluded at the Goose site. The mine production schedule is presented on Figure 1.3-2.

All milling will occur at a process plant at the Goose mine site with tailings discharged to a tailings impoundment area (TIA) located next to the process plant. Waste rock will be stored in waste rock storage areas (WRSAs) established near to each pit, with potentially acid generating (PAG) waste rock stockpiled separately from not potentially acid generating (nPAG) waste rock. High and low grade ore stockpiles will be established at the Goose mine site and an ore stockpile at the George mine site will store ore seasonally for shipment to the Goose mine site over a winter road each year.

Site layouts are included in Appendix B.

1.4 HISTORY OF THE SITE

The Property comprises 45 Federal Mineral Leases and 16 Federal Mining Claims covering approximately 52,014 ha (Figure 1.3-1). The Property is divided into two projects: Goose and George, and four exploration prospects: Boot, Boulder, Del, and Bath.

There have been a number of owners from the start of exploration activities in 1982. Most recently, Dundee Precious Metals (DPM) owned the Property from 2005 until the Property was purchased by Sabina in 2009. Periods of intensive exploration were undertaken from 1987 to 1992 by Homestake Minerals, in 1997 by Auruco, and almost continuously from 1999 to the present by Kinross, Miramar and DPM. There has been no production from any of the deposits associated with the Project.

Figure 1.3-1. Land Ownership and Mineral Tenure

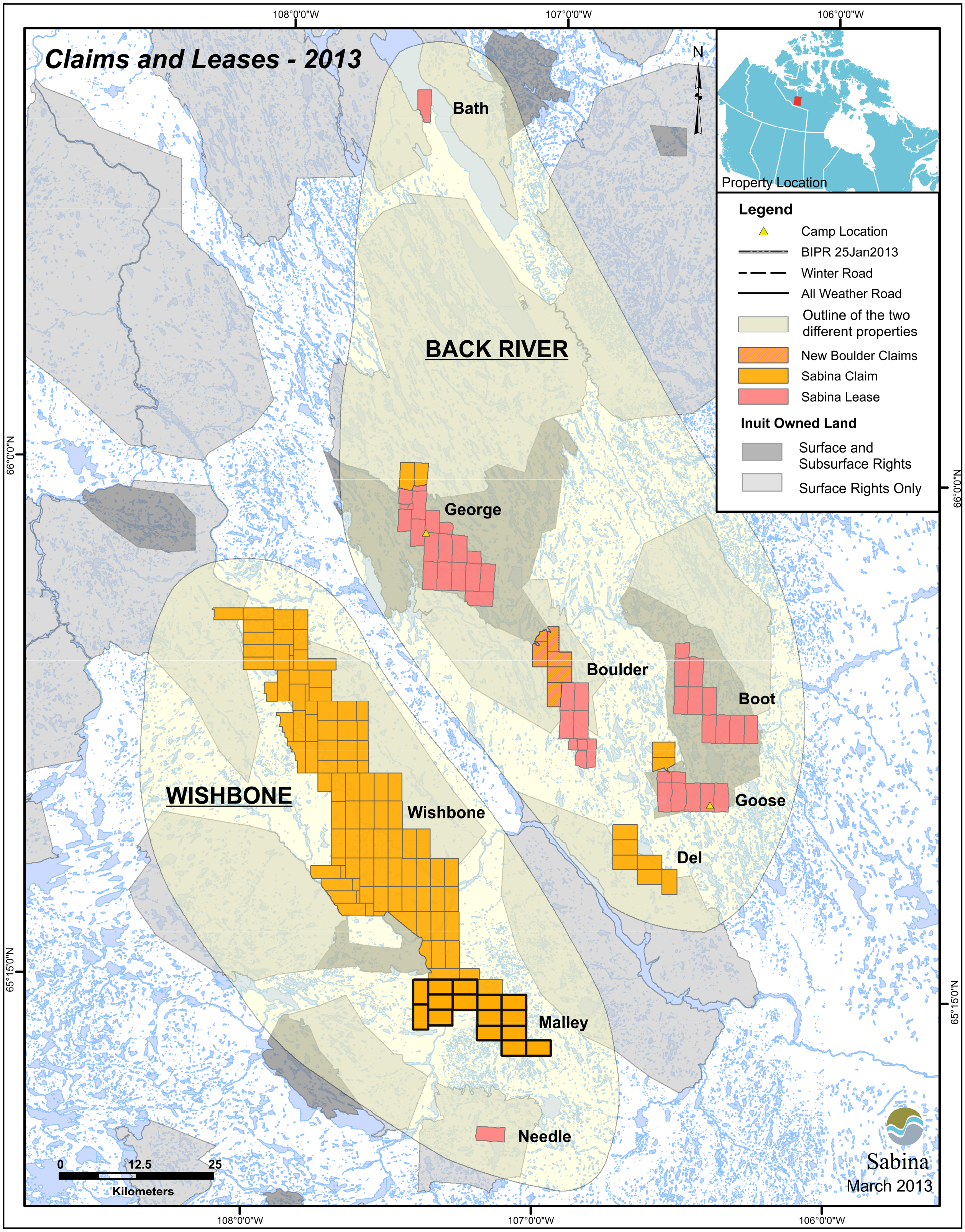
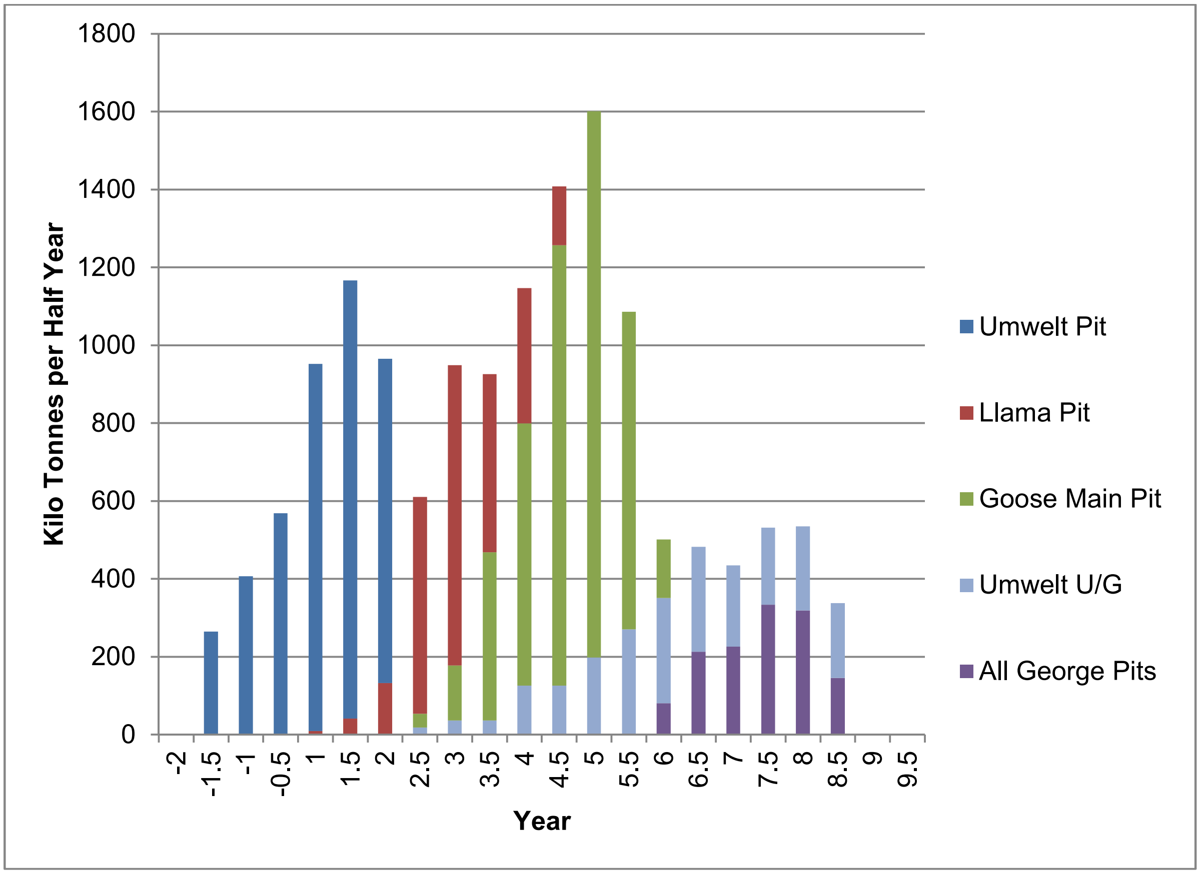


Figure 1.3-2. Mine Production Schedule by Deposit



1.5 CURRENT EMOTIONAL CONDITIONS

1.5.1 General

This Preliminary Mine Closure and Reclamation Plan (MCRP) will be submitted with the Draft Environmental Impact Statement (DEIS), which covers the current environmental conditions in great detail. A future iteration of the Plan will include additional detail regarding environmental conditions, pending approval of the Final Environmental Impact Statement (FEIS).

1.5.2 Social Conditions

The Project is located in a remote area in Nunavut with virtually no development and very little human disturbance, aside from various mineral exploration campaigns conducted since 1982. These campaigns are discussed in Section 1.4.

1.5.3 Permafrost

The Project is located in an area of continuous permafrost that extends to a depth of between 400 and 500 mbgs (SRK, 2012). Beneath the permafrost, the regional groundwater is suspected to be saline. As such, it is likely that the Umwelt Underground Mine will penetrate through the permafrost and into the saline groundwater. This is discussed further in Section 4, Permanent Closure and Reclamation.

1.5.4 Acid Rock Drainage/Metal Leaching Potential

A preliminary geochemical characterization of the waste rock was completed by Rescan and results were presented in an acid rock drainage (ARD)/Metal Leaching (ML) baseline report (Rescan, 2013). Static geochemical tests were completed on samples of drill core selected to represent the major and minor waste rock and tailings lithologies from the Project. The three (3) major lithologies include greywacke, banded iron formation (BIF), and mudstone. Other minor units within the waste rock include dykes and other intrusives. Table 1.5-1 provides the ARD potential and proportion of PAG and nPAG waste rock by lithology and deposit for the deposits at the Goose site. Table 1.5-2 provides equivalent information for the deposits at the George site.

Goose Site Waste Rock

Goose Property mine workings and waste rock represent a moderate ML/ARD potential. Low to moderate bulk neutralizing potential (NP) contents could result in acidic drainage after a lag time. Interaction with the deposit material and air/water could result in result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MMER limits. The two lithologies that will comprise the majority of the mine workings and waste rock are greywacke and iron formation. Approximately 30% of greywacke and iron formation samples are currently classified as uncertain acid generating potential (uPAG). For mine planning purposes, Sabina has used the precautionary approach and assumed that all uPAG waste rock is PAG waste rock.

George Site Waste Rock

George Property mine workings and waste rock represent a moderate to high ML/ARD potential. Low to moderate bulk NP contents combined with low to moderate sulphur contents could result in acidic drainage after a lag time. Interaction with the deposit material and air/water could result in result in runoff/drainage exhibiting concentrations of arsenic and copper greater than MMER limits. As with the Goose site, sizing of the separate PAG and nPAG piles at the George site are based on the assumption that uPAG waste rock is PAG waste rock.

Development of Segregation Criteria for Mine Operation

Continued kinetic test results will be used to develop a site-specific ARD criterion. Management plans will incorporate testing that will allow segregation of mine workings and waste rock.

Tailings Geochemistry

The bulk tailings that will be stored in the TIA will have a high ML/ARD potential. Some parameters in the supernatant ageing tests were above MMER limits and all samples were classified as PAG. During operations if tailings material that forms the TIA beaches is not buried under fresh material before the lag time is exceeded then ARD will develop. The TIA will be constructed to be a zero discharge facility during operation. At closure, nPAG waste rock will be used to cover tailings material to minimize infiltration and development of ML/ARD.

1.6 REGULATORY CONTEXT

1.6.1 Current Permits and Approvals

Table 1.6-1 lists the current permits and approvals that govern exploration activities at the Back River Project. Surface rights for Inuit Owned Land (IOL) are vested in the Kitikmeot Inuit Association (KIA) which administers the access and management of the lands for the benefit of the Inuit of that region. Access to and use of surface lands requires an Inuit Land Use permit, licence, or commercial lease issued by the KIA. The Goose and George properties are mostly located on surface and subsurface IOL (Figure 1.3-1).

Table 1.5-1. Summary of Goose Mine Site Waste Rock Geochemistry

	Main				Llama				Umwelt			
Lithology	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG
Greywacke	Al, As, Cu, Se	5.4%	32.4%	62.2%	Al, As, Se	17.6%	37.1%	45.2%	Al, As, Cd, Se	17.9%	30.8%	51.3%
Iron Formation	Al, As, Cd, Se	5.6%	16.7%	77.8%	Al, As, Cd, Cu, Fe, Se	33.0%	34.9%	32.1%	Al, As, Cd, Se	14.3%	42.9%	42.9%
Mudstone	Al, As, Cd, Cu, Se	5.3%	26.3%	68.4%	Al, Se	38.9%	13.9%	47.2%	Al, As, Se	25.0%	6.3%	68.8%
Felsic Dykes	Al	0%	0.0%	100%	Al, As, Se	14.3%	32.1%	53.6%	Al, As[3], Cd, Se	28.6%	0.0%	71.4%
Vein	As	0%	0.0%	100%	As, Cu, Pb	100%	0.0%	0.0%	n/a	0.0%	100%	0.0%
Gabbro	Al, As, Cu, Se	0%	12.5%	87.5%	Al, Cu, Fe, Se	2%	20.4%	77.6%	Al, As, Cu, Fe, Se	0.0%	6.3%	93.8%

[1] *Source: Rescan, 2013.*
[2] *ML Potential - Metal Leaching Potential, as indicated by either Shake Flask Extraction (SFE) or Field Leach Barrel (FLB) testing, and in comparison to CCME Water Quality Guidelines for the protection of freshwater aquatic life (CCME, 2013). Typically, the SFE testing identified metal leaching potential that was not indicated by the FLB testing. See Rescan (2013).*
[3] *SFE and/or FLB testing indicated metal leaching potential above MMER schedule 4 discharge limits.*

Table 1.5-2. Summary of George Mine Site Waste Rock Geochemistry

	LCP North				Locale 1				Locale 2			
Lithology	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG	ML Potential[2]	PAG	uPAG	nPAG
Greywacke	n/a	61.5%	15.4%	23.1%	n/a	54.5%	27.3%	18.2%	As, Cd, Cu	38.9%	44.4%	16.7%
Iron Formation	n/a	100%	0%	0%	n/a	7.1%	21.4%	71.4%	As, Cd, Cu, Ag	10.0%	30.0%	60.0%
Mudstone	n/a	100%	0%	0%	n/a	33.3%	33.3%	33.3%	n/a	42.9%	14.3%	42.9%
Felsic Dykes	n/a	0%	100%	0%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vein	n/a	50%	0%	50%	n/a	50%	0%	50%	n/a	n/a	n/a	n/a
Gabbro	n/a	0%	0%	100%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1] *Source: Rescan, 2013.*
[2] *ML Potential - Metal Leaching Potential, as indicated by Field Leach Barrel (FLB) testing, and in comparison to CCME Water Quality Guidelines for the protection of freshwater aquatic life (CCME, 2013). See Rescan (2013).*

Table 1.6-1. Summary of Current Exploration Permits

Permit No.	Expiry	Agency	Description
N2011F0029	2013-12-13	AANDC	Winter Road connecting Goose-George-Wishbone
N2010F0017	2013-09-16	AANDC	Winter Road Bathurst Inlet - Back River Project
N2009F0015	2013-03-01	AANDC	Winter road connecting Hackett and George Camps
KTL304F049 - Amended	2013-12-13	KIA	Winter Road Bathurst Inlet - Back River Project
KTL304F012	2013-12-13	KIA	Winter road connecting Hackett and George Camps
N2010C0016	2013-10-31	AANDC	Exploration activities
KTL304C017 - Amended	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road, all-weather airstrip and road (Goose)
KTL204C012 - Amended	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), geophysical survey, gridding and drilling (Boulder)
KTL304C018 - Amended	2013-12-13	KIA	Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road (George)
KTL204C020 - Amended	2013-12-13	KIA	Exploration (air/ground geophysics), staking, prospecting, fly/survival camp and drilling (Boot)
2BE-GEO1015	2015-06-15	NWB	Water use and waste disposal for exploration and clean-up activities (175 m^3/d max)
2BE-GOO1015	2015-03-31	NWB	Industrial water use and waste disposal, bulk sample and exploration (297 m^3/d max)
KTP11Q001	2013-12-13	KIA	Goose rock quarry
KTP12Q001	2013-12-13	KIA	Goose airstrip borrow quarry
KTP12Q002	2013-12-13	KIA	George borrow quarry

As of March 31, 2013.

Surface rights on Crown Land are vested in the federal government and in the Aboriginal Affairs and Northern Development Canada (AANDC; formerly Indian and Northern Affairs Canada, INAC). Access to and use of these surface lands requires a land use permit, license or commercial lease issued by the AANDC.

Use of water resources as well as waste disposal in Nunavut is regulated by the Nunavut Water Board (NWB). Sabina's MCRP will require approval under a Type A Water Licence for mine development, pursuant to the *Nunavut Waters Act*.

1.6.2 Legislation Applicable to Mine Closure

The following legislation is applicable to mine closure planning in Nunavut.

Federal Legislation

- *Nunavut Land Claim Agreement* (NLCA; Canada, 1993).
- *Territorial Lands Act* (Canada, 1985c) and *Regulations* (Canada, n.d.).
- *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (Canada, 2002) and *Regulations* (Canada, 2002).
- *Fisheries Act* (Canada, 1985b) and applicable regulations.
- *Arctic Waters Pollution Prevention Act* (Canada, 1985a) and *Regulations* (Canada, n.d.).

- *Transportation of Dangerous Goods Act* (Canada, 1992) and *Regulations* (Canada, 2001).

Territorial (Nunavut) Legislation

- *Environmental Protection Act* (Nunavut, 1988a) and *Regulations*.
- *Environmental Rights Act* (Nunavut, 1988b) and *Regulations*.
- *Mine Health and Safety Act* (Nunavut, 1994) and *Regulations* (Nunavut, 1995).

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 AANDC for water-related closure costs and to the landowner(s) for land-based reclamation activities.

The majority of the Project, including the Goose and George Sites, is located on either surface rights or surface and subsurface rights IOL administered by the KIA. The MLA and a portion of the connecting winter road are located on Crown Land. Land ownership in relation to the Project is shown on Figure 1.3-1. Sabina anticipates that the majority of financial security posted for mine closure will likely be held by the KIA.

1.6.3 Permits and Approvals Required for Mine Development

Similar to the exploration, a number of permits and authorizations will be required for mine development. These permits are identified in Table 1.6-2.

Table 1.6-2. Permits and Approvals Required for Mine Development

Permit / Approval Legislation	Administering Agency
FEDERAL	
Project Certificate Nunavut Land Claims Agreement (Article 12)	Nunavut Impact Review Board
Inuit Impact and Benefits Agreement *Nunavut Land Claims Agreement (Article 26)*	Kitikmeot Inuit Association
Mineral Lease Canadian Mining Regulations	Aboriginal Affairs and Northern Development Canada
Water Licence Nunavut Land Claims Agreement (Article 13) *Nunavut Waters and Nunavut Surface Rights Tribunal Act* Northwest Territories Water Regulations	Nunavut Water Board
Archaeology Permit *Nunavut Act*	Government of Nunavut - Department of Culture Language and Youth
Inuit Owned Land - Commercial Land Use Lease Nunavut Land Claims Agreement	Kitikmeot Inuit Association
Inuit Owned Land - Quarry Concession Permits Nunavut Land Claims Agreement	Kitikmeot Inuit Association
Crown Land - Class A Land Use Permit(s) *Territorial Lands Act* Territorial Land Use Regulations	Aboriginal Affairs and Northern Development Canada
Crown Land - Land Lease and Waterlot Lease *Territorial Lands Act* Territorial Land Use Regulations	Aboriginal Affairs and Northern Development Canada

(continued)

Table 1.6-2. Permits and Approvals Required for Mine Development (completed)

Permit / Approval Legislation	Administering Agency
FEDERAL (cont'd)	
Crown Land - Quarry Lease/ Permit *Territorial Lands Act* Territorial Land Use Regulations Territorial Quarrying Regulations	Aboriginal Affairs and Northern Development Canada
Approval and/or Exemption *Navigable Waters Protection Act*	Transport Canada
Fisheries Authorization for Harmful Alteration Disruption or Destruction (HADD) of Fish or Fish Habitat *Fisheries Act*, Section 35(2)	Department of Fisheries and Oceans
License for a Factory and Magazine *Explosives Act* and Regulations	Natural Resources Canada
TERRITORIAL	
Permit to Store Detonators *Explosives Use Act* *Mine Health and Safety Act* and Regulations	Mine Health and Safety, Workers Compensation Board
Explosive Use Permit *Explosives Use Act* *Mine Health and Safety Act and Regulations*	Mine Health and Safety, Workers Compensation Board
Spill Contingency Plan Approval *Environmental Protection Act* *Spill Contingency Planning and Reporting Regulations*	Department of Environment

1.6.4 Applicable Guidelines

Planning for mine closure in Nunavut is guided by the following:

- Mine Site Reclamation Policy for Nunavut (AANDC, 2002).
- Mine Site Reclamation Guidelines for the Northwest Territories (AANDC, 2007).

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. In Nunavut, a preliminary MCRP is produced during the planning and permitting stage of a project (AANDC, 2007). At start-up and through the operation phase, various iterations of an Interim MCRP are produced with a Final MCRP being produced before permanent closure. According to the AANDC (2007), a preliminary MCRP is expected to emphasize the following:

- *"Statements of reclamation objectives for the general site and major mine components.*
- *Realistic descriptions of activities related to temporary or indefinite closure.*
- *Conceptual descriptions and assessments of possible reclamation activities.*
- *Initiate a reclamation research plan to flesh out suitable reclamation activities and to help form a northern information database (include quality assurance and quality control procedures, management for engineering plans and drawings, baseline studies, aboriginal involvement strategies, accounts of new or evolving reclamation technologies, reviews of similar case studies, and other appropriate research or study plans).*

- *Credible evidence that the stated reclamation objectives can be achieved through the described activities.*
- *Photographs depicting what the site looked like before operations began.*
- *Identify any likely post-closure monitoring requirements and responsibilities for the described activities.*
- *Conceptual projections of the likely post-reclamation risks to human and wildlife health and the environment (risk assessment).*
- *Reclamation liability costs and financial security estimates to a level of detail relevant to the information available".*

1.6.5 Environmental Assessment Requirements

This Preliminary MCRP is expected to accompany a Draft EIS prepared for the Project, which is subject to a Part 5 environmental review by the Nunavut Impact Review Board (NIRB). NIRB (2013) issued EIS Guidelines to Sabina in April 2013.

Review of the Draft EIS through the NIRB review process will evaluate how well the Preliminary MCRP has incorporated closure into the mine design and if the effects of the Project during mine closure and post-closure have been adequately minimized.

1.7 CLOSURE OBJECTIVES AND CRITERIA

Closure Objectives

This Preliminary MCRP is based on the following objectives.

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 AANDC (2007) 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; the mining company; 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. Active revegetation of the site 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.

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: 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-mine closure.
- Local community values and culturally significant or unique attributes of the land.
- Level and scale of environmental impact.

Criteria

Thresholds identified in the Draft EIS will be adopted and applied to this and future iterations of the MCRP.

The Metal Mining Effluent Regulations (MMER) under the federal *Fisheries Act* will apply to the Project irrespective of Draft EIS thresholds. The MMER requires that mine effluents discharging from the Project including discharges from open pits/pit lakes, the TIA and WRSAs meet MMER effluent quality requirements following closure.

1.8 FUTURE ITERATIONS OF THIS MCRP

The MCRP is a living document that reflects both the level of current detail available for the Project and the current closure standards and techniques. Future updates to the MCRP will reflect project modifications, provide additional details and closure costs, and account for potential changes in technology, standards or legislation.

AANDC (2007) outlines the phases of closure planning through the life stages of a mine. This includes:

- Preliminary MCRP - Prepared during the planning and permitting stages of the Project.

- Interim MCRP - Produced at the start of construction and revised through the operating phase of the Project.
- Final MCRP - Produced and approved for execution prior to the start of the mine closure and reclamation phase.

The current plan is a preliminary MCRP and further iterations of this MCRP may be an outcome of the NIRB review and water licensing processes. It is expected that formal approval of the first interim MCRP will be granted to Sabina by the Nunavut Water Board under a future Type A Water Licence.

1.9 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 NWT Mine Closure Guideline (AANDC, 2002). It is also a key element of the NIRB environmental review and the NWB water licensing processes.

In the short term, community perspectives are expected to be gathered during the permitting phase through the public environmental review and water licensing processes. Beyond the permitting phase, communities and workers will become more familiar with the Project through the construction and operation 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 interim MCRPs (part of water licence implementation and renewal).

2. Care and Maintenance Plan for Temporary Mine Closure

2.1 DEFINITION OF TEMPORARY CLOSURE

Temporary closure 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 (AADNC, 2007). 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 MCRP to be filed with the NWB, or a notification to the NWB that the company intends to execute the latest Interim MCRP as its Final MCRP. Following any required NWB approval, the final closure and reclamation measures described in Section 4 would be executed.

2.2 TEMPORARY CLOSURE PRINCIPLES AND GOALS

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 operation 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 monthly physical and chemical inspections. Additional details are provided in the following sections.

2.3 TEMPORARY CLOSURE MANAGEMENT AND ACCOUNTABILITY STRUCTURE

Temporary closure activities will be managed by a core team of Sabina site personnel, which will maintain a small full-time presence on-site. Site caretakers will also be responsible for maintaining site security throughout the period of temporary closure. The site caretakers will report to Sabina management or the mine manager (as appropriate).

It is expected that the only site access during temporary closure will be by air and that no winter roads will be constructed.

2.4 TEMPORARY CLOSURE ACTIVITIES

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

- **Access and Security:** Access to all buildings and facilities will be secured and restricted to authorized personnel only. 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 period. 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 pit(s) and other mine openings. Mine openings without a gatehouse will be guarded or barricaded.
- **Monitoring Programs:** Routine site monitoring and inspections will be continued throughout the period of temporary closure. The TIA and associated infrastructure will be monitored for physical stability during temporary closure.
- **Hazardous Materials:** An inventory of hazardous materials will be completed, including process chemicals and reagents and petroleum products. Hazardous materials and other chemicals will be properly stored or removed from site when the winter road is operational.
- **Bulk Fuel Storage:** Fluid levels in all fuel tanks will be recorded and routinely inspected for leaks or potential hazards.
- **Explosives:** Explosives will be relocated to the main magazine and secured, disposed of or removed from site.
- **Stockpiles:** WRSAs and ore stockpiles will be maintained such that they are physically stable. Storage areas and stockpiles will be routinely inspected to ensure their stability or to implement any required contingency measures.
- **Water Management:** Surface water management measures 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. It will be necessary to monitor water levels in the TIA as there will be a net accumulation of water in the TIA if water is not being reclaimed for processing. If temporary closure is prolonged (i.e., more than a year) then it may be necessary to treat and decant the tailings supernatant to maintain safe water levels. The need for treating and decanting the tailings supernatant is a function of the

duration of temporary closure as well as how much spare capacity remains in the TIA (i.e., if the embankment was recently raised there will be more capacity than if the TIA is soon due for another embankment raise).

- **Infrastructure:** Access roads will be maintained, including plowing snow from roads and airstrips, 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 and maintained.

The level of effort involved in maintaining the site in a state of temporary closure will depend upon the Project stage. If mine development at the George site has not started, then only the Goose and MLA sites would be in a state of temporary closure.

2.5 MONITORNG AND REPORTING DURING TEMPORARY CLOSURE

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

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

- Daily recording of pond water levels and pumping volumes.
- Daily recordings of meteorological and hydrological data.
- Weekly physical inspections of TIA embankments, pipelines, intake structures and progressively reclaimed areas.
- Ongoing water quality monitoring (as prescribed in the Type A Water Licence and other applicable approvals).
- Monthly site inspections by the Environmental Superintendent or designate for potential issues.
- Annual dam safety inspections of the TIA 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 TIA is being operated in accordance with the design intent.
- Ongoing maintenance of access roads as well as enforcement of security and access protocols.
- Monthly detailed site inspections by the Environmental, Health and Safety (EHS) Coordinator to assess any less obvious signs of potential problems.
- Detailed site inspections by the Environmental Superintendent or designate during and 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. Monthly and annual 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 such time as the Project changes status by either resuming operation or advancing to final closure.

2.6 TEMPORARY CLOSURE SCHEDULE

The initial temporary closure activities in Section 2.4 will be carried out immediately following the stoppage of operations. It is expected that approximately two weeks will be required to complete the temporary closure activities following a decision to shut down operations and prepare the site for an indefinite period of care and maintenance.

3. Progressive Reclamation

3.1 DEFINITION OF PROGRESSIVE RECLAMATION

Progressive reclamation is defined as the opportunistic reclamation activities completed during the operational phase of a project (AANDC, 2007). 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 the final closure costs as well as the duration of closure and reclamation activities.

3.2 CANDIDATE FACILITIES/AREAS AND RECLAMATION ACTIVITIES

Progressive reclamation activities can take place during either the construction or the operation phases. At both mine sites, reclamation efforts will be focused on any final earthworks opportunities that present themselves, including:

Open Pits

- Establish partial or full boulder fences around open pits and TIA.
- Install proper signage around mine openings and TIA.
- Construct open pit spillways.

WRSAs

- Progressively cap PAG waste rock within the WRSAs using nPAG waste rock derived from adjacent or nearby active pit operations.

Application of a final cover over PAG waste rock using nPAG waste rock from active pit operations represents the most substantial progressive reclamation effort proposed. This is described further in Section 4.5, which includes a detailed waste rock disposal schedule and the final cover plan to be executed as part of both progressive and final reclamation.

Buildings and Infrastructure

- As buildings and infrastructure become unnecessary during the life of the mine, they will be removed and the sites will be reclaimed as much as practicable.

Contaminated Materials and Waste Disposal

- Materials (soil, snow, ice) that may become contaminated during construction and operation due to fuel or other spills will be cleaned up immediately following the spill. Soil will be remediated onsite in lined containment areas and final disposal will be in a WRSA once the soil meets Nunavut Site Remediation criteria for industrial land use. Water, snow or ice will be collected in a lined containment area and treated using an oil-water separator during the summer months. Discharge to land (not directly to surface waters) is possible provided that the treated water meets Water Licence discharge limits for oily waste water.

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

<u>Reclamation Studies</u>

Several areas of study have been identified as part of the preliminary MCRP. Several of these can be addressed during the feasibility study and development of the Final EIS, while others will take longer to conclude. The reclamation studies and proposed implementation schedule are summarized in Table 3.2-1.

Table 3.2-1. Proposed Reclamation Studies

Study No.	Description	Completion Timeframe
1	Confirm the available water for pit filling at the Goose site from Goose, Propeller and other lakes.	Feasibility Study and Final EIS
2	Evaluate the potential to backfill any of the pits with waste rock, and the additional option to backfill one of the Goose site pits with tailings (particularly Llama and Umwelt, located close to and downgradient from the process plant and TIA).	Feasibility Study and Final EIS
3	Bathymetric survey of Lower Long Lake to confirm available water for filling of the LCP North pit.	Feasibility Study and Final EIS
4	Additional geochemical characterization and integration of geological block model to characterize the ARD/ML potential of the pit walls that will be above the final pit lake elevations.	2014-2019 (5 years)
5	Community perspectives on closure – to be obtained during the NIRB environmental review and the NWB Type A Water Licence Application processes.	Permitting through life of Project
6	Evaluate the potential for thicker lifts of PAG waste rock, allowing for higher WRSAs with less surface area. If the WRSA footprints can be reduced, the costs to cover the piles may be reduced.	Feasibility Study and Final EIS
7	Confirm cover designs are appropriate through further modelling and monitoring of temperatures, permafrost aggregation, active layer thaw in waste rock stockpiles, etc.	Life of Project

3.3 PROGRESSIVE RECLAMATION SCHEDULE

Progressive reclamation activities at the open pits can be completed as material becomes available to construct boulder fences and spillways. Use of nPAG waste rock as a final cover (as described in Table 3.2-1) closely follows the mine plan and waste rock production schedules.

Progressive reclamation measures will be considered successful if they are completed as described in this section and monitoring confirms that the completed work is physically and chemically stable (i.e., there are no signs of erosion or settlement, and downstream water quality meets criteria).

4. Permanent Closure and Reclamation

4.1 DECISION TO CLOSE

Permanent mine closure will occur when either all mineable and economic mineral reserves have been exhausted or if gold prices become severely depressed for a sustained period of time. Under these conditions the mine would not be expected to be economic or operate for the foreseeable future.

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

4.2 OVERVIEW AND SCHEDULE

Mine closure is expected to take 10 years and consist of three phases:

- Phase 1 - Approximately two (2) years of active reclamation and active filling of the open pits with lake water.
- Phase 2 - Up to seven (7) years of additional active filling of the open pits at the Goose site.
- Phase 3 - A final demobilization at the beginning of Year 10.

A minimum of five (5) years of post-closure monitoring will follow the above phases of mine closure.

Achieving chemical stability will be a key focus of mine closure. This will include encapsulation of mine wastes (PAG waste rock and tailings) with nPAG waste rock and active filling of open pits with water.

WSRAs and the TIA will be covered with nPAG to promote the aggregation of permafrost to encapsulate PAG materials. WRSAs containing PAG will be constructed during operations so that the waste rock stockpiled is allowed to freeze. This is expected to reduce the generation of adverse water quality runoff. The nPAG cap will raise the height of the active layer in the permafrost to ensure that the PAG waste rock remains permanently frozen.

A portion of the walls of the open pits will be comprised of materials expected to generate acid and leach metals. Passive filling times of the pits through runoff and direct precipitation range from approximately 14 to 176 years. Once filled, the water in the pits will seasonally overflow and runoff to nearby surface waters. If the pits were left to fill passively, it is expected that ARD will have progressed and the resultant water quality will not meet effluent limits specified in the MMER. In this case, it would be necessary to treat the pit waters before discharging to local receiving waters.

In order to avoid water treatment, the open pits will be actively filled with lake water to reduce the generation of acid and the leaching of metals. This is expected to limit acid generation and metal leaching so that the pit water will meet applicable discharge criteria and can be passively discharged to nearby watercourses. The length of time required to fill the Goose site pits will be based on a water take that protects fish and fish habitat in the nearby lakes.

Prior to actively filling the Umwelt pit, the underground portal at the bottom of the Umwelt pit will be sealed with a concrete plug. Saline groundwater beneath the permafrost has a static water level just below ground surface. The plug will prevent the saline groundwater from filling the Umwelt pit.

Industry standard reclamation methods will be employed to close out the remaining three sites (Goose, George and the MLA). Hazardous materials will be collected for off-site disposal including hazardous components of vehicles and equipment (i.e., fuel tanks, gear boxes and hydraulic oil). Equipment stripped of hazardous components will be disposed of in an open pit or within a closure landfill constructed in one of the WRSAs. Buildings will be demolished and disposed of in the same closure landfill. Culverts will be removed from roads and the natural drainage restored, but the roads will otherwise remain intact. The asphalt surfacing will be removed from the Goose site airstrip, but the airstrips will remain functional with a gravel surface to support ongoing closure and post-closure monitoring activities.

Equipment and materials at the MLA will be disposed of on-site following the same decontamination procedures. Rockfill used to create the laydown area will be used to create an on-site landfill at the MLA.

The winter roads associated with the Project, including the road between the George and Goose Sites, to the MLA, and the Tibbitt-to-Contwoyto winter road connector are not expected to require any reclamation, but will be inspected prior to completion of the active closure phase to identify any areas of potential physical instability (i.e., erosion).

Logistics is an important consideration in the closure and reclamation of the Project. Due to the relatively high cost to construct and operate the Project's winter roads, the closure strategy involves minimizing winter road use during active closure to the extent possible. Equipment and materials required for mine closure, including the fuel required for the first two years (during which the bulk of earthworks will be carried out), will be brought to site by winter road during the final year of operations or at the start of the closure phase. Sabina will not look to bring salvageable equipment off-site for re-sale, as it is expected that the cost of removal will exceed salvage value, when the cost of removing the equipment from site is considered. Instead, equipment and materials will be landfilled on-site.

In Year 4 of closure, once reclamation (including pit filling) is completed at the George site and major closure activities (i.e., earthworks) have been completed at the Goose site, a "CAT train" will be operated during the winter to remove any materials and equipment (including hazardous wastes) to the MLA. A sealift will visit the MLA the following summer to remove any hazardous materials and other wastes that have been CAT-trained to the MLA.

From this point (i.e., Closure Year 4 to Closure Year 9), a smaller crew will occupy a small camp at the Goose site to oversee seasonal pit filling. This camp will be supported entirely by airlifts, including the delivery of fuel. At Year 10 when pit filling has been completed, it will be necessary to dispose of the pumping equipment, pipelines, the small fleet of mobile equipment, and the small camp. Any contractor equipment requiring removal from site will be CAT-trained to the MLA for subsequent sealift off-site.

4.3 OPEN PITS

Closure of the open pits will consist of:

- Placement of boulder fencing around the pit perimeters (mostly completed during operations as progressive reclamation).
- Removal of select equipment and materials from within the pits.
- Plugging of underground portals (Umwelt pit only; see next heading).

- Actively filling of the open pits using freshwater from nearby lakes.

The open pits will be actively filled with lake water to restrict the generation of acid and the leaching of metals. This is expected to ensure that the pit water will meet applicable discharge criteria such that the water can be passively discharged to nearby watercourses. Each pit will take between 1 to 4 years to fill with pit filling occurring on a seasonal basis from June through October.

The amount of water available in nearby lakes for pit filling defines the schedule for active mine closure. The three pits at the Goose site will be filled sequentially over a period of 9 years by drawing water from Goose Lake which will be supplemented with water from Propeller Lake. At the Goose site, active pit filling will be sequenced according to the relative ARD potential, starting with the Llama pit followed by the Umwelt pit and lastly the Goose pit. Runoff from the Llama/Umwelt WRSA will be directed to the Llama pit to supplement pit filling. Treated tailings supernatant will also be discharged to the Llama open pit via the Llama/Umwelt WRSA collection ditches/berms.

The length of time required to fill the pits is based on a water take that is protective of fish and fish habitat from Goose, Propeller and possibly other lakes.

The three open pits at the George site can be filled over a period of 2 to 4 years by drawing water concurrently from Lower Long Lake and George Lake, allowing the George site to be closed out in Year 4 of closure.

The assumptions made in preparing the plan and cost estimate for pit filling include:

- An annual water take of 4 Mm^3 from Goose, Propeller and possibly other lakes at the Goose site, as required.
- A minimum of 3.7 Mm^3 of treated tailings supernatant will be available to assist in the filling of the Llama pit.
- Annual water takes of 950,000 to 1.9 Mm^3 from Long Lake and 250,000 to 500,000 m^3 from George Lake.
- The quality of water discharged from the open pits, once filled, will be suitable for discharge without treatment. This strategy will be evaluated and validated by water quality modelling in the Final EIS.
- Overburden slopes around pit perimeters will be developed for long-term stability during pit development so that additional reclamation work will not be required at closure.
- Diverted waterways around the Goose pit and at Llama and Umwelt pits will not be re-established to their original flow paths.

Monitoring of the water quality in the pit lakes will be important prior to the end of the pit filling period in order to establish that the water to be passively discharged from the filled pits will meet discharge criteria. In the unlikely event that the water in any of the pit lakes is not suitable for discharge, the pit lake could be batch treated to address any remaining water quality impairments.

4.4 UMWELT UNDERGROUND MINE WORKINGS

The underground mine within the Umwelt pit will be closed out as follows:

- All hazardous wastes will be removed from the underground along with any equipment to be used during the active closure phase.

- A concrete plug will be constructed to seal the portal at the base of the Umwelt pit.
- Underground workings will flood naturally via groundwater seepage and the pre-mining permafrost conditions will be re-established.
- The Umwelt pit will be filled with freshwater and is expected to be acceptable for passive discharge.

4.5 WASTE ROCK STOCKPILES

Waste rock stockpiles will be constructed with 2V:1H side slopes and are expected to be stable over the long-term. PAG and nPAG waste rock will have been stockpiled separately during operations. Preliminary geochemical evaluations suggest that runoff from PAG stockpiles during operations may exceed MMER Schedule 4 limits for arsenic and copper (Section 1.5.4; Rescan, 2013). During operations, runoff from the WRSAs at the Goose site will be pumped back to the TIA and runoff from the WRSAs at the George site will be collected in ponds and treated prior to discharge.

Closure of the waste rock stockpiles involves covering the PAG waste rock stockpiles with a 4 m thick cap of nPAG. 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 encapsulated in permafrost, water quality is expected to improve to acceptable limits for discharge. 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 coming directly from the pits. This approach will minimize the amount of dedicated capping that will be required during operations (as progressive reclamation) and at final closure. Overburden will have been co-disposed in the nPAG stockpiles and will also be used for capping the PAG waste rock.

The waste rock disposal schedule is presented on Table 4.5-1. The majority of nPAG waste rock used as final cover will be sourced directly from adjacent pit operations, with the balance derived from other nearby active pit operations or from stockpiled nPAG waste rock. The nPAG stockpiles will be re-graded where rock has been extracted to cover the adjacent PAG pile.

The quantities of nPAG waste rock to be derived from adjacent active mining operations or nearby nPAG waste rock piles is summarized below.

Umwelt/Llama WRSA

- Approximately 2.6 Mm^3 of nPAG waste rock will be transported in Years 4 and 5 from the active Goose pit operation to the Umwelt/Llama WRSA.
- The Umwelt/Llama WRSA will be capped with approximately 2.4 Mm^3 of stockpiled nPAG waste rock during the operation phase.

Goose WRSA

- Most of the nPAG cover will be derived from the Goose pit operation.
- Final capping of the Goose WRSA will be completed with approximately 2.4 Mm^3 of stockpiled nPAG waste rock during the operation phase.

Table 4.5-1. Waste Rock Disposal Schedule

Site	Storage Area	Mine	Waste	Year of Operation -2	-1	1	2	3	4	5	6	7	8	9
GOOSE	WRSA 1 (UMWELT/LLAMA)	Umwelt Open Pit	Overburden (m^3)	887,605	0	0	0	0	0	0	0	0	0	0
			NAG (m^3)	1,362,174	3,102,992	2,785,264	519,394	0	0	0	0	0	0	0
			PAG (m^3)	1,541,630	3,655,638	3,479,231	654,465	0	0	0	0	0	0	0
		Umwelt Underground	NAG (m^3)	0	0	0	38,186	39,377	36,635	3,184	0	0	0	0
			PAG (m^3)	0	0	0	32,529	33,543	31,208	2,712	0	0	0	0
		Llama Open Pit	Overburden (m^3)	0	0	747,376	1,257	0	0	0	0	0	0	0
			NAG (m^3)	0	0	1,328,358	3,522,447	1,837,694	452,787	0	0	0	0	0
			PAG (m^3)	0	0	1,908,716	5,727,784	3,065,993	731,962	0	0	0	0	0
		NAG from MRSA 2 (m^3)		0	0	0	0	0	528,138	2,094,412	0	0	0	0
		NAG + Overburden (m^3)		2,249,779	3,102,992	4,860,999	4,081,284	1,191,447	0	0	-1,017,560	0	0	0
		PAG (m^3)		1,541,630	3,655,638	5,387,946	6,414,779	3,099,537	763,170	2,712	0	0	0	0
		PAG Area to Cover (m^2)		513,877	1,204,585	1,204,585	1,204,585	1,033,179	778,789	254,390	0	0	0	0
	WRSA 2 (GOOSE)	Goose Open Pit	Overburden (m^3)	0	0	0	1,091,504	1,520,085	0	0	0	0	0	0
			NAG (m^3)	0	0	0	84,959	3,181,692	6,568,740	3,157,555	78,129	0	0	0
			PAG (m^3)	0	0	0	470,253	2,037,189	2,622,348	1,217,562	31,794	0	0	0
		NAG to MRSA 1 (m^3)		0	0	0	0	0	528,138	2,094,412	0	0	0	0
		NAG + Overburden (m^3)		0	0	0	1,176,464	4,701,777	5,823,031	626,763	-770,187	-1,623,416	0	0
		PAG Area to Cover (m^2)		0	0	0	156,751	781,421	727,028	617,933	405,854	0	0	0

(continued)

Table 4.5-1. Waste Rock Disposal Schedule (completed)

Site	Storage Area	Mine	Waste	-2	-1	1	2	3	4	5	6	7	8	9
				Year of Operation										
GEORGE	WRSA-3 (LONE COW PINE)	LCP N Open Pit	NAG (m^3)	0	0	0	0	0	0	0	373,632	865,921	162,022	0
			PAG (m^3)	0	0	0	0	0	0	0	388,882	901,265	168,636	0
		NAG to Locale 1 (m^3)		0	0	0	0	0	0	0	0	174,039	0	0
		NAG from Locale 2 (m^3)		0	0	0	0	0	0	0	0	0	220,870	0
		NAG (m^3)		0	0	0	0	0	0	0	373,632	691,882	0	-398,184
		PAG Area to Cover (m^2)		0	0	0	0	0	0	0	129,627	195,269	99,546	0
	WRSA-4 (LOCALE 1)	Locale 1 Open Pit	NAG (m^3)	0	0	0	0	0	0	0	938,308	398,191	0	0
			PAG (m^3)	0	0	0	0	0	0	0	976,606	414,444	0	0
		NAG from LCP N (m^3)		0	0	0	0	0	0	0	0	174,039	0	0
		NAG from Locale 2 (m^3)		0	0	0	0	0	0	0	0	0	139,288	0
		NAG (m^3)		0	0	0	0	0	0	0	938,308	0	-97,470	0
		PAG Area to Cover (m^2)		0	0	0	0	0	0	0	202,247	59,189	0	0
	WRSA-5 (LOCALE 2)	Locale 2 Open Pit	NAG (m^3)	0	0	0	0	0	0	0	0	346,416	401,803	0
			PAG (m^3)	0	0	0	0	0	0	0	0	360,556	418,203	0
		NAG to LCP N (m^3)		0	0	0	0	0	0	0	0	0	220,870	0
		NAG to Locale 1 (m^3)		0	0	0	0	0	0	0	0	0	139,288	0
		NAG (m^3)		0	0	0	0	0	0	0	0	346,416	0	-397,451
		PAG Area to Cover (m^2)		0	0	0	0	0	0	0	0	109,774	99,363	0

[1] *Waste rock production schedule from waste and water management pre-feasibility study (Knight Piesold, 2013)*
[2] *Calculations assume the following approximate densities: Overburden = 1.5 t/m^3, waste rock = 2 t/m^3*
[3] *MRSA footprints are as follows: MRSA 1 (Umwelt and Llama) = 1,204,585 m^2, MRSA 2 (Goose) = 781,421 m^2, Lone Cow Pine North = 195,269 m^2, Locale 1 = 202,247 m^2, Locale 2 = 109,774 m^2*
[4] *PAG is placed in 3 m lifts; NAG is placed in 4 m lifts over final PAG waste rock*
[5] *bolded numbers are the quantities of NAG waste rock to be extracted from NAG stockpile to provide final CAP to PAG waste rock*

LCP-North WRSA

- A portion of the nPAG cover will be derived from the LCP-North pit operation.
- Approximately 221,000 m^3 of nPAG waste rock will be transported in Year 8 from the active Locale 2 pit operation to the LCP-North WRSA.
- Approximately 400,000 Mm^3 of stockpiled nPAG waste rock will be used to complete the nPAG cover of the LCP-North WRSA at final closure.

Locale 1 WRSA

- A portion of the nPAG cover will be derived from the Locale 1 pit operation.
- Approximately 175,000 m^3 of nPAG waste rock will be transported in Year 7 from the active LCP pit operation to the Locale 1 WRSA.
- Approximately 100,000 Mm^3 of stockpiled nPAG waste rock will be used to complete the nPAG cover of the Locale 1 WRSA at final closure.

Locale 2 WRSA

- A portion of the nPAG cover will be derived from the Locale 2 pit operation.
- Approximately 400,000 Mm^3 of stockpiled nPAG waste rock will be used to complete the nPAG cover of the Locale 2 WRSA at final closure.

It is expected that WRSA runoff, once capped, will be suitable for discharge without treatment. This assumption will be validated by water quality modeling to be provided in the FEIS. On this basis, active management of runoff is planned for the first two years of active closure. At the Goose site, runoff from the Umwelt/Llama WRSA will be directed to the Llama open pit without treatment, and runoff from the Goose WRSA will be discharged to the Goose pit without treatment.

At the George sites, treatment systems established during operations will continue to operate and treat WRSA runoff for two years, or until the effluent meets discharge criteria.

4.6 TAILINGS IMPOUNDMENT AREA

The TIA will be closed out by draining off and treating tailings supernatant, constructing a closure spillway and capping the TIA with a 2 m cover of nPAG waste rock. Specific activities include:

- Operate the tailings beach in later years so that the tailings will slope to a future closure spillway along the west embankment.
- Remove tailings discharge infrastructure.
- Treat approximately 3.7 to 6 Mm^3 of tailings supernatant to meet MMER requirements. Treated supernatant will be pumped to the Llama open pit.
- Cap the TIA with a 2 m thick cap of nPAG waste rock.
- Construct a closure spillway along the west embankment so runoff from the TIA will report to collection ditch through the Llama/Umwelt WRSA and report to the Llama open pit.

4.7 BUILDINGS AND EQUIPMENT

The salvage value of equipment and machinery is expected to be limited due to the remoteness of the site. As such, all buildings, machinery and equipment will be disposed of in an on-site landfill after any hazardous material has been removed. Equipment containing hydrocarbons that cannot be readily cleaned will be removed from site for recycling or disposal at a licensed facility. Above grade concrete structures will be broken and reduced to near grade. Rebar will be cut so that it is flush with the surface of the concrete. Concrete structures will be infilled with nPAG waste rock, if needed.

Developed areas at each of the sites will be re-graded and contoured to remove uneven ground for public safety, minimize the potential for erosion, and to blend with the surrounding landscape.

4.8 ROADS AND AIRSTRIPS

Culverts will be removed from roads and the natural drainage restored. Roads will otherwise remain intact to facilitate long-term site access for monitoring and inspection.

Asphalt surfacing, if any, will be removed from the Goose site airstrip, but otherwise all airstrips (Goose, George, MLA) will remain functional with a gravel surface for use during post-closure monitoring.

4.9 PIPELINES AND POWER DISTRIBUTION LINES

Pipelines (such as tailings, freshwater and effluent) will be purged, dismantled, and disposed of in an open pit or a landfill within a waste rock stockpile. On-site power lines and associated materials will be dismantled and deposited in the closure landfill once power is no longer required for reclamation activities including pumping. Decommissioning of pipelines and distribution lines used for active pit filling at the Goose site will not be completed until the final year of closure.

Other power equipment and materials including oil-filled transformers will be drained and disposed of on-site, with the oil removed for off-site disposal with other hazardous wastes (Section 4.10).

4.10 WASTE MANAGEMENT SITES

Inert landfills will be established within waste rock stockpiles at each of the Goose and George Sites during the construction and operation phases. These landfills will be used as closure landfills if they have adequate capacity. Additional closure landfills could be established within other waste rock stockpiles, if an alternative location is more suitable or if the operation phase landfills reach capacity. The landfills will be closed by applying a 2 m cover of nPAG waste rock as a final cover.

The closure schedule will allow for substantial closure of landfills and removal of most hazardous materials off site during Year 4 of closure. The Project will continue, for another 5 years as a smaller care and maintenance operation while the Goose Site open pits are filled. After all pits have been actively filled, a final decommissioning and demobilization operation will be required in Year 10. The final camp, mobile equipment, pipelines and pumping systems will require landfilling and any remaining fuel and hazardous wastes will require removal from site by air.

4.11 WATER MANAGEMENT SYSTEMS

4.11.1 Goose Site Water Management during Closure

Water management will be an important element of the active closure phase at the Goose Site. Water management systems associated with the TIA will be decommissioned in the first year of closure as described in Section 4.6. The tailings supernatant pond is expected to be high in arsenic and possibly other metals, and will contain residual concentrations of cyanide. A water treatment plant will be established at the TIA to treat the tailings supernatant water in the first year of closure prior to discharge to the Llama pit.

The preliminary closure phase measures for the Goose mine site is shown on Figure 4.11-1. The plan to actively fill the open pits is described in Section 4.3. Active pit filling operations will utilize existing water management systems to the extent possible, with dedicated water management facilities constructed to facilitate active pit filling.

To accomplish the pit filling plan described in Section 4.3, the following water management measures and systems will be implemented during active closure at the Goose mine site:

- The pump and pipeline system established during the operation phase to transfer water from Propeller Lake to Goose Lake will remain active until pit filling is complete at the end of Year 9.
- The freshwater intake in Goose Lake and a portion of the water supply pipeline to the process plant will be used with a pipeline extension to fill the Llama and Umwelt pits.
- A dedicated pump/pontoon system and pipeline will be established on Goose Lake near to the Goose pit in Year 6 to facilitate active filling of the Goose pit in Years 7 to 9.
- Collection ponds at the Umwelt/Llama WRSA will be decommissioned early in the closure phase once a spillway has been constructed to allow runoff from the TIA and WRSA to report to the Llama pit.
- Runoff from the Goose WRSA collection pond will be monitored and transferred by pipeline or truck to the Goose pit until the runoff meets effluent discharge criteria. Once the runoff consistently meets discharge criteria, the pond will be decommissioned and the runoff will be allowed to discharge to the nearby watercourse.
- Runoff from the plant site area, including the former ore stockpiles, will be monitored and transferred by pipeline or truck to the Umwelt pit until the runoff meets effluent discharge criteria. Once the runoff consistently meets effluent discharge criteria, the pond will be decommissioned and the runoff will be allowed to discharge over land.

Once pit filling is completed at the Llama pit at the end of Year 3, a portion of the pipeline will be dismantled and flow will be redirected to the Umwelt pit. In Year 7, the pipeline and pumping systems can be dismantled and disposed of in the closure landfill. The intake will be decommissioned by removing piping systems and backfilling with nPAG waste rock (as required).

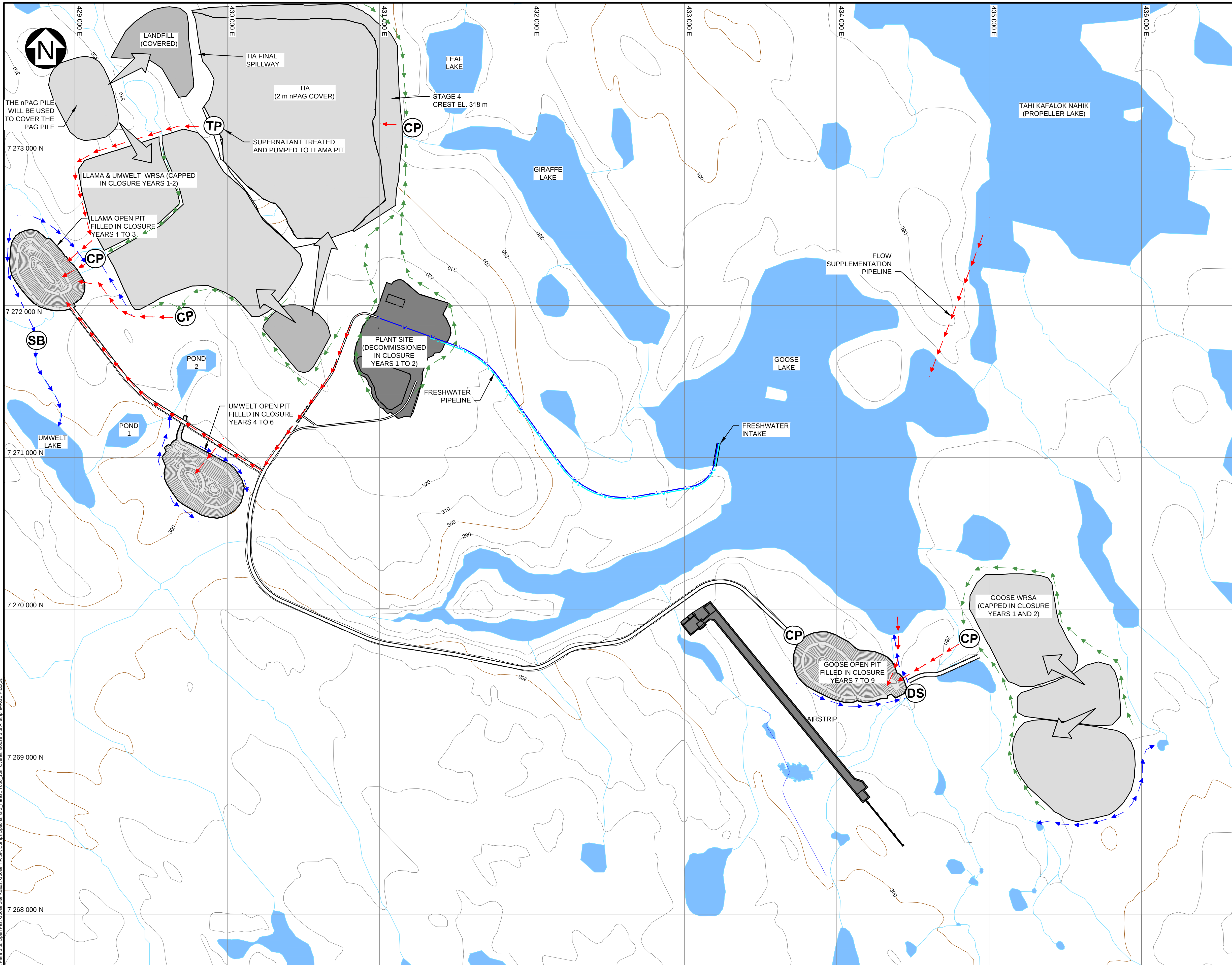
From Years 7 to 9, closure activities will be limited to the active filling of the Goose pit during the warmer months and the ongoing post-closure monitoring of closed-out facilities. Once the Goose pit has been filled, the dedicated piping, pump and pontoon system will be dismantled and disposed of in the landfill. The Propeller Lake to Goose Lake supplementation pumping system can also be dismantled and landfilled.

Ditches and berms will remain in place to continue to direct runoff to the identified receiving environment during the post-closure period. However, collection ponds will have been breached, liners removed and landfilled, and the areas recontoured and armoured (if necessary) to allow for passive runoff. Goose mine site conditions and final discharge locations in post-closure are presented on Figure 4.11-2.

4.11.2 George Site Water Management during Closure

The active closure phase concept for the George Site is shown on Figure 4.11-3. The following water management measures and systems will be implemented during active closure at the George Site in order to accomplish the pit filling plan described in Section 4.3.

- The collection ponds and water treatment plants will continue to collect and treat runoff from the WRSAs until the effluent quality meets discharge requirements. This is expected to occur once the WRSAs have been capped. Alternatively, the collection ponds could be pumped into the open pits.



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1	08NOV'13	ISSUED WITH REPORT	RAC	AS	RAC	SRA
0	21OCT'13	ISSUED WITH REPORT	RAC	AS	RDW	RAM

LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERMS
- SB SEDIMENT BASINS
- CP COLLECTION POND
- DS DIVERSION STRUCTURE
- PLACEMENT OF nPAG WASTE ROCK AS FINAL COVER ON PAG STOCKPILES

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. AIRSTRIP LAYOUT AND ROAD ALIGNMENTS PROVIDED BY EBA.
6. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

SCALE A 250 125 0 250 500 750 1000 1250 m

SABINA GOLD & SILVER CORP.

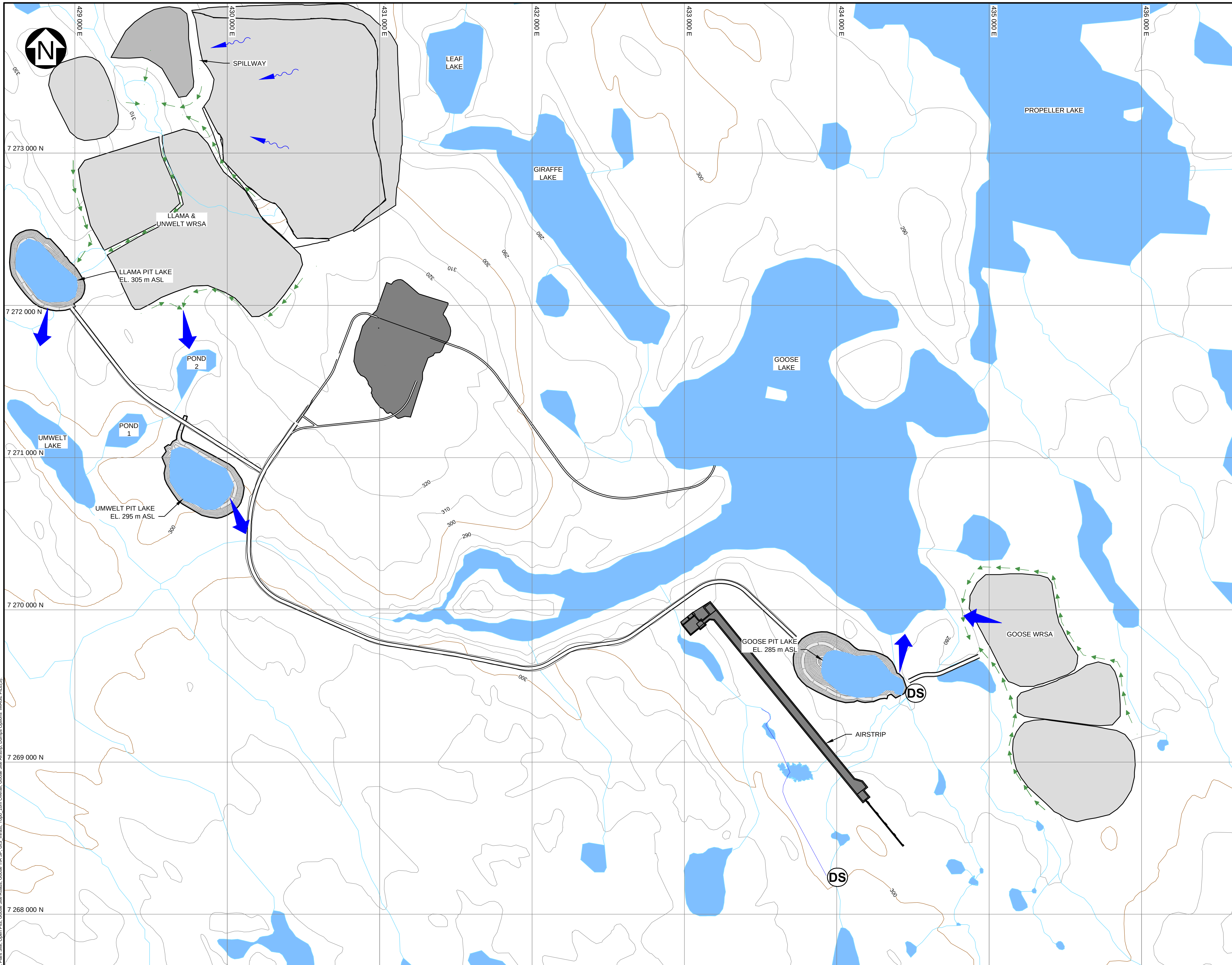
BACK RIVER PROJECT

GOOSE MINE SITE
ACTIVE CLOSURE MEASURES

Knight Piésold CONSULTING

P/A NO. VA101-517/2 | REF NO. 4

FIGURE 4.11-1 | REV 1



LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERMS
- DS DIVERSION STRUCTURE
- FINAL DISCHARGE OF MINE EFFLUENT
- WATER MOVEMENT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. TOPOGRAPHY FROM LIDAR PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL PIT OUTLINES ARE ULTIMATE PIT OUTLINES.
5. AIRSTRIP LAYOUT AND ROAD ALIGNMENTS PROVIDED BY EBA.
6. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
7. PLANT SITE LAYOUT PROVIDED BY TETRATECH.

SCALE A 250 125 0 250 500 750 1000 1250 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GOOSE MINE SITE
POST-CLOSURE CONDITIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-517/2	4

FIGURE 4.11-2 REV 1

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
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0	21OCT'13	ISSUED WITH REPORT	RAC	AS	RDW	RAM

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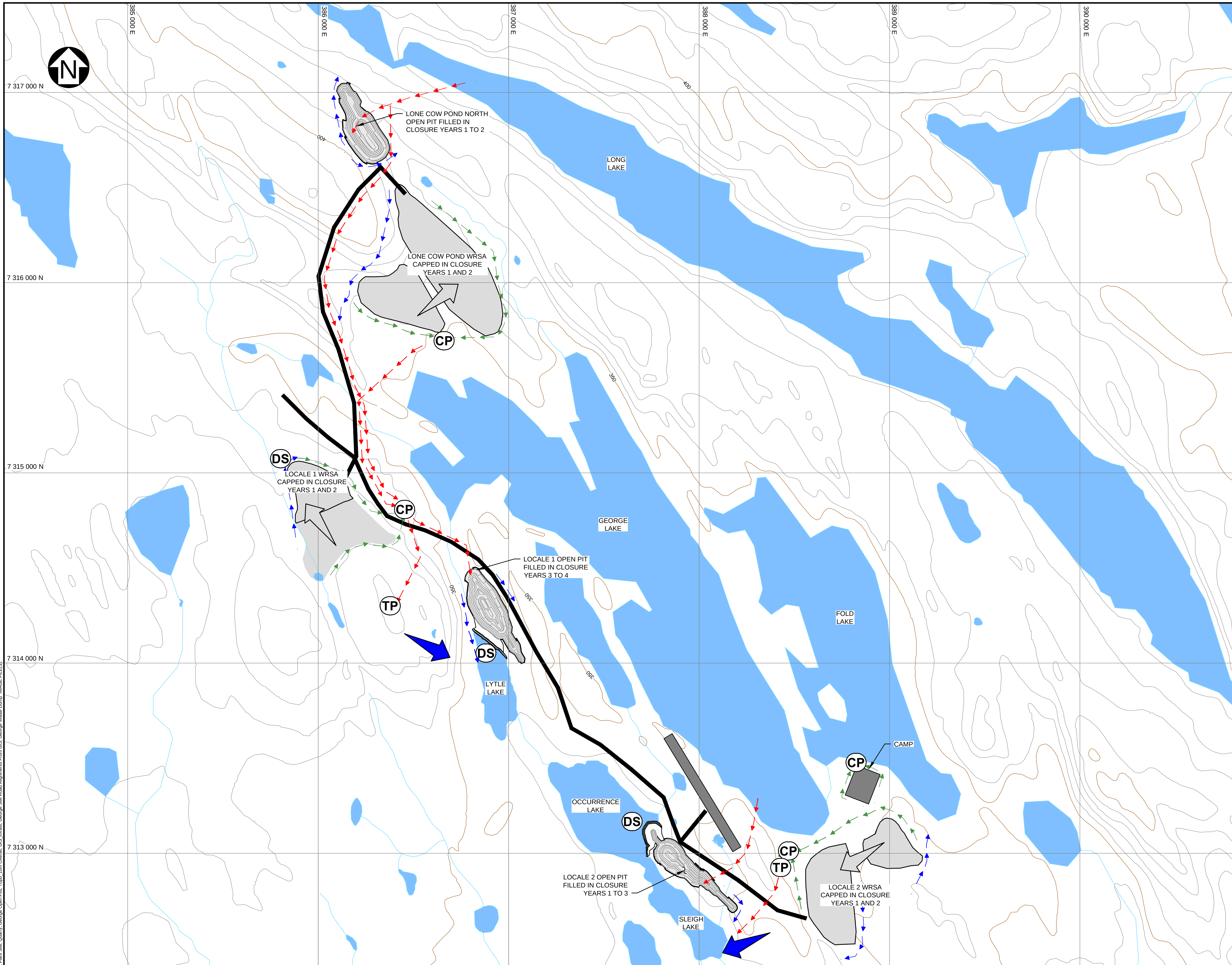

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
1	08NOV'13	ISSUED WITH REPORT	RAC	AS	RAC	SRA
0	21OCT'13	ISSUED WITH REPORT	RAC	AS	RDW	RAM

LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE
- ROAD

WATER MANAGEMENT FACILITY COMPONENTS

- WATER TRANSFER VIA PIPELINE / TRUCK
- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERM
- CP COLLECTION POND
- DS DIVERSION STRUCTURE
- TP TREATMENT PLANT
- FINAL DISCHARGE OF MINE EFFLUENT
- PLACEMENT OF nPAG WASTE ROCK AS FINAL COVER ON PAG STOCKPILES

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. LIDAR / TOPOGRAPHY BASED ON INFORMATION PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL OPEN PIT OUTLINES ARE ULTIMATE OPEN PITS.
5. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
6. ROAD ALIGNMENTS PROVIDED BY EBA.

SCALE A: 200 100 0 200 400 600 800 1000 m

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GEORGE MINE SITE
ACTIVE CLOSURE MEASURES

Knight Piésold CONSULTING

P/A NO. VA101-517/2 | REF NO. 4

FIGURE 4.11-3 REV 1

- The water intake for the camp at George Lake will be used to actively fill Locale 2 pit over a period of three (3) years.
- A dedicated pump/pontoon system and pipeline will be established on Long Lake near to the LCP-North pit to facilitate active filling of both the LCP-North and Locale 1 pits over a period of four (4) years.
- Once the Locale 1 and Locale 2 pits have filled, the dykes will be breached during winter to allow for the connection of the pit lakes with the adjacent lakes.
- If runoff meets effluent discharge criteria, all pumping systems and collection ponds will be dismantled at the same time as the camp and will be disposed of in the landfill. Ditches and berms will remain in place and continue to direct runoff to the identified receiving environment during the post-closure period. However, collection ponds will have been breached, liners removed and landfilled, and the areas recontoured and armoured (if necessary) to allow for passive runoff.

George mine site conditions and final discharge locations in post-closure are presented on Figure 4.11-4.

4.12 CHEMICALS AND EXPLOSIVES

Hazardous materials will be collected for off-site disposal. Hazardous material will include: unused chemical reagents, unused explosives, unused fuel, used oil, used glycol, and the hazardous components of vehicles and related equipment (i.e., fuel tanks, gear boxes and hydraulic oil).

All petroleum products and chemicals will be removed from the site and transported to a licensed facility for disposal. Fuel tanks will be steam cleaned, cut up and will be landfilled in a pit or waste rock stockpile. The rinse water will be treated before disposal.

4.13 CONTAMINATED SOIL

Soil found to exceed applicable Nunavut Site Remediation criteria will be bioremediated on site within landfarms at the Goose site and MLA. These landfarms will be established during the construction and operation phases. A site investigation will be undertaken during the closure phase to locate any previously unidentified hydrocarbon contaminated materials. Soil will be bioremediated in the landfarms and water (snow and ice) will be treated through an oil-water separator to meet oily water discharge criteria identified in the water licence. The length of time it will take to bioremediate and treat is dependent on the final quantity of contaminated materials at closure.

4.14 PERMANENT CLOSURE AND RECLAMATION SCHEDULE

4.14.1 Schedule Assuming Successful Progressive Reclamation

The schedule for active closure of the Project is driven by the time to actively fill the open pits on site. This is expected to take up to four (4) years at the George site and nine (9) years at the Goose site, with final demobilization occurring early in the final year of closure (Year 10). It is expected that capping of the WRSAs and TIA and demolition and disposal of buildings and infrastructure will take place over the first two years of active closure.

This schedule assumes that progressive capping of the PAG waste rock piles with nPAG derived material will take place during the operation phase. The placement of the remaining final cap is expected to occur during the first two years of closure.

4.14.2 Schedule Assuming No Progressive Reclamation

Should the progressive capping of the WRSAs not occur during the operation phase, all capping of the WRSAs would need to occur during the closure phase. This is expected to extend the time to cap the WRSAs from less than two (2) years to up to six (6) years. The overall closure schedule would remain unchanged.

4.15 EXPECTED CONDITIONS POST-CLOSURE

The final landscape at the Goose, George and MLA Sites is expected to consist of a disturbed project footprint that is physically and chemically stable in the long term. The final site configuration post closure is shown on Figure 4.11-2 and Figure 4.11-4. Waste rock stockpiles and flooded pit lakes will be the most prominent features at both mine sites. Runoff from these areas is expected to meet effluent discharge criteria as well as receiving water quality criteria. In the unlikely event that contact water does not meet these performance criteria, Sabina will provide water treatment as required.

Roads with culverts removed will remain as well as all airstrips. Development areas (i.e., plant site, laydown areas) will be contoured to blend with the surrounding landscape.

As previously stated, the Project is located in a remote area in Nunavut with no development and little human activity. As such, the post-reclamation risks to human and environmental health are expected to be minimal.

5. Monitoring

5.1 MONITORING DURING THE CLOSURE PHASE

Monitoring will be carried out during the active closure phase to confirm that:

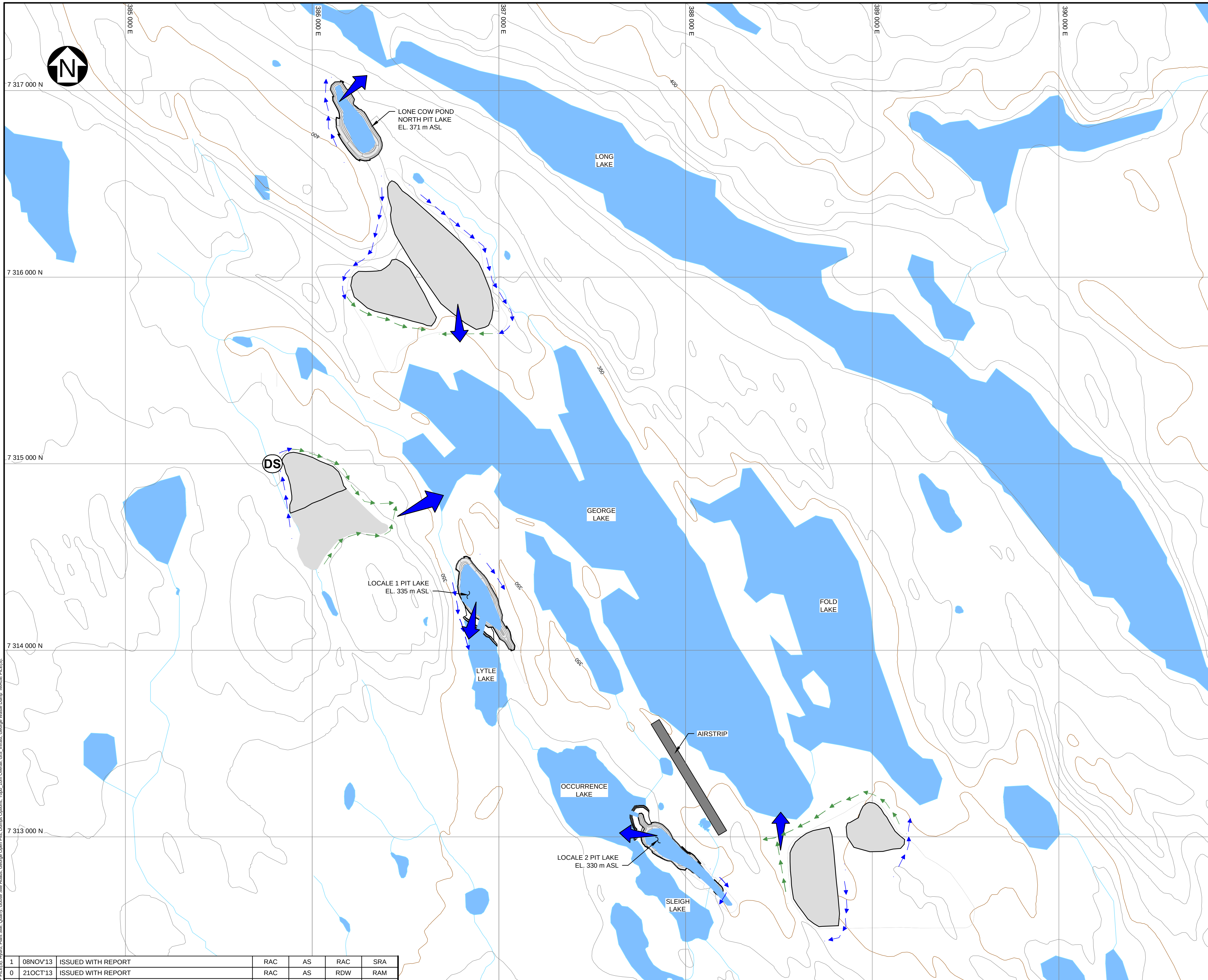
- Closure activities are being undertaken as identified in the final approved MCRP.
- Temperatures within the waste rock stockpiles (as measured by thermistors) confirm that the piles are frozen throughout except for the predicted active layer.
- Embankments, stockpiles and other structures are physically stable.
- Water quality being discharged from pits, the TIA and the WRSAs all meet water quality objectives.

Due to the relatively long closure phase, there will be sufficient opportunities to conduct post-closure monitoring of the closed-out project features. The George mine site and the TIA, WRSAs and Llama pit at the Goose mine site will be closed out by Closure Year 4, allowing for a number of years of post-closure monitoring during the active closure phase. Closure phase monitoring at receiving waters will be measured against water quality objectives.

5.2 POST-CLOSURE MONITORING

Post-closure monitoring is expected to be required for five (5) years after completion of active closure activities in Closure Year 10. This is in line with mine reclamation at other northern sites and is believed to be a reasonable monitoring period given the amount of post-closure verification monitoring that can be carried out during the closure phase. Post-closure monitoring is expected to include:

- Annual geotechnical inspections of the TIA embankments, waste rock piles, pit walls and other areas for physical stability and to ensure that permafrost encapsulation of PAG waste rock and tailings is performing effectively.



LEGEND:

- WATER
- OPEN PIT
- WASTE ROCK STORAGE AREA
- PLANT SITE

WATER MANAGEMENT FACILITY COMPONENTS

- DIVERSION DITCHES / BERMS
- COLLECTION DITCHES / BERM
- DS DIVERSION STRUCTURE
- FINAL DISCHARGE OF MINE EFFLUENT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 13N.
2. LIDAR / TOPOGRAPHY BASED ON INFORMATION PROVIDED BY SABINA GOLD & SILVER CORP.
3. CONTOUR INTERVAL IS 10 METRES.
4. ALL OPEN PIT OUTLINES ARE ULTIMATE OPEN PITS.
5. WASTE DUMP AND OPEN PIT OUTLINES PROVIDED BY AMC.
6. ROAD ALIGNMENTS PROVIDED BY EBA.

SCALE A 200 100 0 200 400 600 800 1000 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
1	08NOV'13	ISSUED WITH REPORT	RAC	AS	RAC	SRA
0	21OCT'13	ISSUED WITH REPORT	RAC	AS	RDW	RAM

SAVED: I:\1\01\00517\02\A\Acad\FIGS\B14_r1 (Report 4), 11/7/2013 9:00:21 AM , ASIMPSON PRINTED: 11/7/2013 9:01:53 AM, Report 4, ASIMPSON

SABINA GOLD & SILVER CORP.

BACK RIVER PROJECT

GEORGE MINE SITE POST-CLOSURE CONDITIONS

Knight Piésold CONSULTING

P/A NO. VA101-517/2 | REF NO. 4

FIGURE 4.11-4 | REV 1

- 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 as a recognized closed mine from Environment Canada.

Post-closure phase final discharge locations are shown on Figures 4.2 and 4.4. Post-closure monitoring of vegetation and wildlife has not been identified in this plan and may be identified in the Wildlife Monitoring and Mitigation Plan.

5.3 ADAPTIVE MANAGEMENT

Adaptive management is proposed throughout this preliminary MCRP. This includes:

- Carrying out post-closure monitoring beyond the stated 5-year post-closure monitoring period if closure objectives have not been met
- Water treatment if effluent discharges from WRSAs and pit lakes do not meet the identified criteria
- Modifications to the MCRP as a result of the findings of the reclamation studies identified in Table 3.2-1

6. Estimated Closure and Reclamation Costs

Closure and reclamation costs will be presented in a future version of the report.

7. Glossary of Terms, Acronyms, or Abbreviations

7.1 GLOSSARY OF TERMS

Abandonment: The permanent dismantlement of a facility so it is permanently incapable of its intended use. This includes the removal of associated equipment and structures.

Active layer: The layer of ground above the permafrost which thaws and freezes annually.

Backfill: Material excavated from a site and reused for filling the surface or underground void created by mining.

Dyke: A mound or wall, usually of earth, used to retain substances or to prevent substances from entering an area.

Bioremediation: The use of microorganisms or vegetation to reduce contaminant levels in soil or water.

Care and Maintenance: A term to describe the status of a mine when it undergoes a temporary closure.

Closure: When a mine ceases operations without the intent to resume mining activities in the future.

Closure Criteria: Detail to set precise measures of when the objective has been satisfied.

Contaminant: Any physical, chemical, biological or radiological substance in the air, soil or water that has an adverse effect. Any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.

Contouring: The process of shaping the land surface to fit the form of the surrounding land.

Decommissioning: The process of permanently closing a site; removing equipment, buildings and structures. Rehabilitation and plans for future maintenance of affected land and water are also included.

Disposal: The relocation, containment, treatment or processing of unwanted materials. This may involve the removal of contaminants or their conversion to less harmful forms.

Drainage: The removal of excess surface water or groundwater from land by natural runoff and permeation, or by surface or subsurface drains.

Effluent: Treated or untreated liquid waste material that is discharged into the environment from a structure such as a settling pond or a treatment plant.

Erosion: The wearing away of rock, soil or other surface material by water, rain, waves, wind or ice; the process may be accelerated by human activities.

Groundwater: All subsurface water that occurs beneath the water table in rocks and geologic formations that are fully saturated.

Hydrology: The science that deals with water, its properties, distribution and circulation over the Earth's surface.

Landfill: An engineered waste management facility at which waste is disposed by placing it on or in land in a manner that minimizes adverse human health and environmental effects.

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.

Mitigation: The process of rectifying an impact by repairing, rehabilitating or restoring the affected environment, or the process of compensating for the impact by replacing or providing substitute resources or environments.

Monitoring: Observing the change in geophysical, hydrogeological or geochemical measurements over time.

Objectives: Objectives describe what the reclamation activities are aiming to achieve. The goal of mine closure is to achieve the long-term objectives that are selected for the site.

Permafrost: Ground that remains at or below zero degrees Celsius for a minimum of two consecutive years.

Permafrost Aggradation: A naturally or artificially caused increase in the thickness and/or area extent of permafrost.

Permeability: The ease with which gases, liquids, or plant toots penetrate or pass through soil or a layer of soil. The rate of permeability depends upon the composition of the soil.

Progressive Reclamation: Actions that can be taken during mining operations before permanent closure, to take advantage of cost and operating efficiencies by using the resources available from mine operations to reduce the overall reclamation costs incurred. It enhances environmental protection and shortens the timeframe for achieving the reclamation objectives and goals.

Reclamation: The process of returning a disturbed site to its natural state or one for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety

Rehabilitation: Activities to ensure that the land will be returned to a form and productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.

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.

Restoration: The renewing, repairing, cleaning-up, remediation or other management of soil, groundwater or sediment so that its functions and qualities are comparable to those of its original, unaltered state.

Revegetation: Replacing original ground cover following a disturbance to the land.

Runoff: Water that is not absorbed by soil and drains off the land into bodies of water. Scarification: Seedbed preparation to make a site more amenable to plant growth. Security Deposit: Funds held by the Crown 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.

Sediment: Solid material, both mineral and organic, that has been moved by air, water, gravity, or ice and has come to rest on the earth’s surface either above or below sea level.

Supernatant: The clear liquid that floats about the sediment or precipitate.

Surface Water: Natural water bodies such as river, streams, brooks, ponds and lakes, as well as artificial watercourses, such as irrigation, industrial and navigational canals, in direct contact with the atmosphere.

Tailings: Material rejected from a mill after most of the recoverable valuable minerals have been extracted.

Temporary Closure: When a mine ceases operations with the intent to resume mining activities in the future. Temporary closures can last for a period of weeks, or for several years, based on economical, environmental, political, or social factors.

Waste Rock: All rock materials, except ore and tailings that are produced as a result of mining operations.

Watershed: A region or area bordered by ridges of higher ground that drains into a particular watercourse or body of water.

Water Table: The level below where the ground is saturated with water.

7.2 ACRONYMS AND ABBREVIATIONS

AANDC .... Aboriginal Affairs and Northern Development Canada
ARD .... Acid Rock Drainage
BIF .... Banded Iron Formation
EHS .... Environmental, Health and Safety
EEM .... Environmental Effects Monitoring
EIS .... Environmental Impact Statement
INAC .... Indian and Northern Affairs Canada
IOL .... Inuit Owned Land
KIA .... Kitikmeot Inuit Association
LCP .... Lone Cow Pond
ML .... Metal Leaching
MLA .... Marine Laydown Area
MMER .... Metal Mining Effluent Regulations
MCRP .... Mine Closure and Reclamation Plan
NLCA .... Nunavut Land Claims Agreement
NIRB .... Nunavut Impact Review Board
nPAG .... Non-potentially Acid Generating
NWB .... Nunavut Water Board
PAG .... Potentially Acid Generation
Sabina .... Sabina Gold & Silver Corp.
the Project/Property .... Back River Project/Property
TIA .... Tailings Impoundment Area
TSM .... Towards Sustainable Mining
uPAG .... Uncertain Potentially Acid Generating
WRSA .... Waste Rock Storage Area

8. Certification

This report was prepared, reviewed and approved by the undersigned.

Prepared:

Richard Cook, P.Geo. (Ltd.)
Senior Scientist

Reviewed:

Steve Aiken, P.Eng.
Manager - Environmental Services

Approved:

Robert Mercer, Ph.D., P.Eng.
Managing Principal, North Bay

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Appendix A
TSM Mine Closure Framework

Towards Sustainable Mining
Mine Closure Framework

Mine Closure

The Mining Association of Canada (MAC) recognizes that access to land and a company's social license to operate depend upon responsible environmental, social and economic practices. MAC members support comprehensive engagement with communities of interest (COI) throughout the mining life cycle, as a cornerstone to building long term community support for mining operations. MAC members believe that when mining is conducted in consultation with COI, the needs and priorities of affected stakeholders can be identified and taken into account.

Managing mine closure is an integral part of MAC's Towards Sustainable Mining (TSM) Guiding Principles. MAC members commit to the following:

1. MAC members will develop and maintain mine closure plans, including post-closure activities as required, for new and existing projects ("Plans") in accordance with the following;

    - Plans (including cost and timeline estimates) will be initiated during the design phase of new projects and will be updated regularly through the mining life cycle; and,
    - Closure planning will be at a level of detail appropriate to the stage of project development and current level of understanding of site conditions.

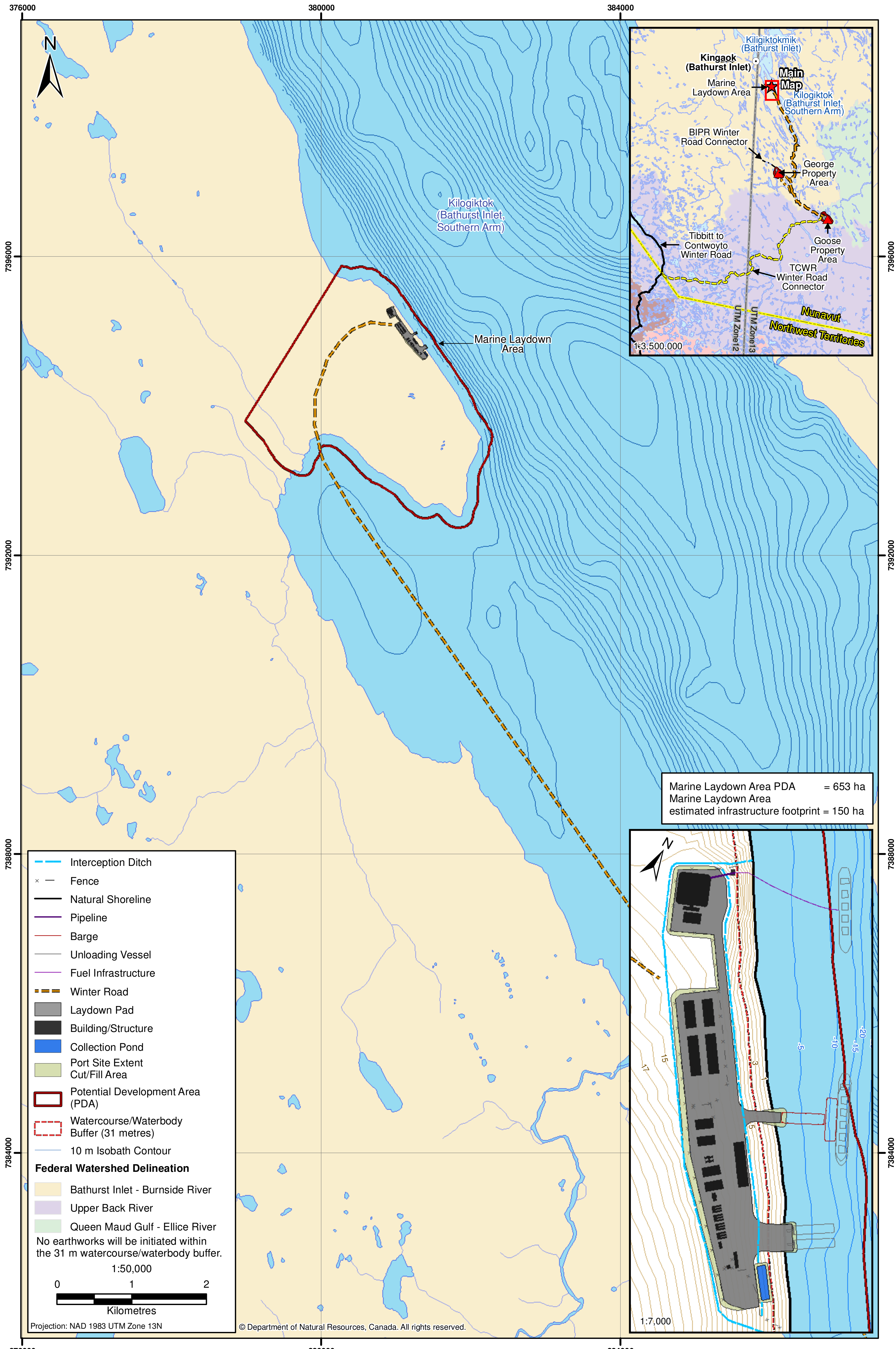
2. Through consultation with COI, MAC members will;

    - identify values that are important to COI and develop reclamation objectives that incorporate those values;
    - evaluate a variety of potential end land uses that address the needs of users; and,
    - establish, finance and implement comprehensive closure plans that, wherever practicable, return mine sites to viable and diverse ecosystems that will serve the needs of post-mining use, recognizing that mining can permanently alter landscapes.

3. MAC members will work with communities to develop the closure plan and strategies to mitigate the socio-economic impacts of mine closure and to help them develop plans for long-term economic development.
4. MAC members will establish financial assurance for closure in accordance with applicable laws. In the absence of such laws, financial assurance may be provided by bonds, letters of credit or other financial instruments, or by self-insurance or self-guarantee.
5. Closure plans will consider temporary closure scenarios for operations expected to reopen in the future. Such scenarios will include maintenance and surveillance programs for protection of health, safety and the environment as well as preservation of all necessary infrastructure.
6. Member companies are committed to continual improvement in their closure plans including regular reviews and updates, taking into consideration new technologies and closure techniques.
7. MAC members are committed to a culture of research and innovation based on identified risks to improve closure and monitoring technologies.
8. Monitoring programs, consistent with the Closure Plan objectives and based on assessment of human health and ecological risks, will be implemented during progressive reclamation, closure and/or post-closure to provide comprehensive information on reclamation progress and success.

Appendix B
Site Layouts

PROJECT # 0194096-0001 GIS # BAC-15-084b VERSION # T2.1 November 01 2013



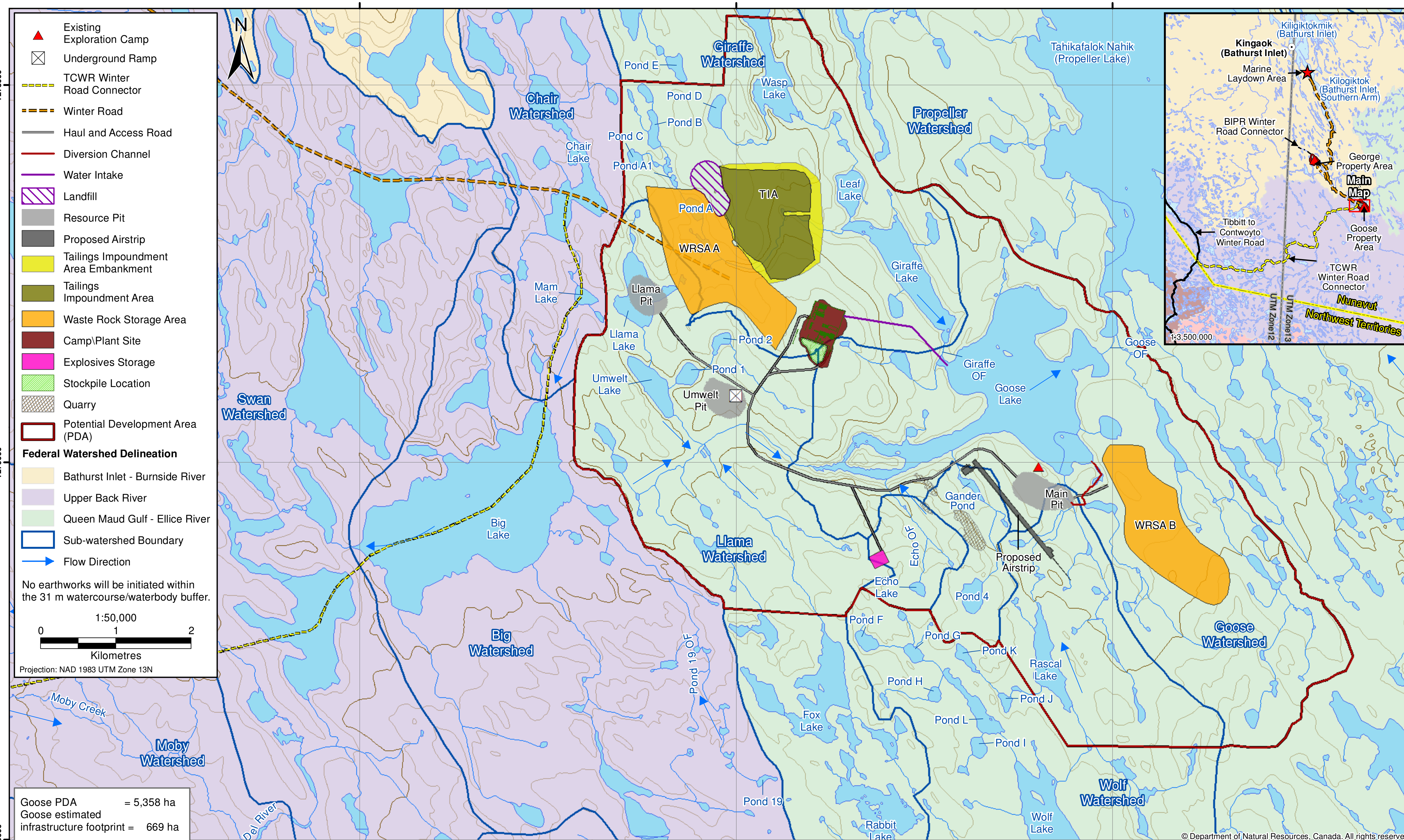
Appendix B-1

Sabina GOLD & SILVER CORP.

Project Development Area and Infrastructure Areas - Marine Laydown Area

Appendix B-1

Rescan an ERM company

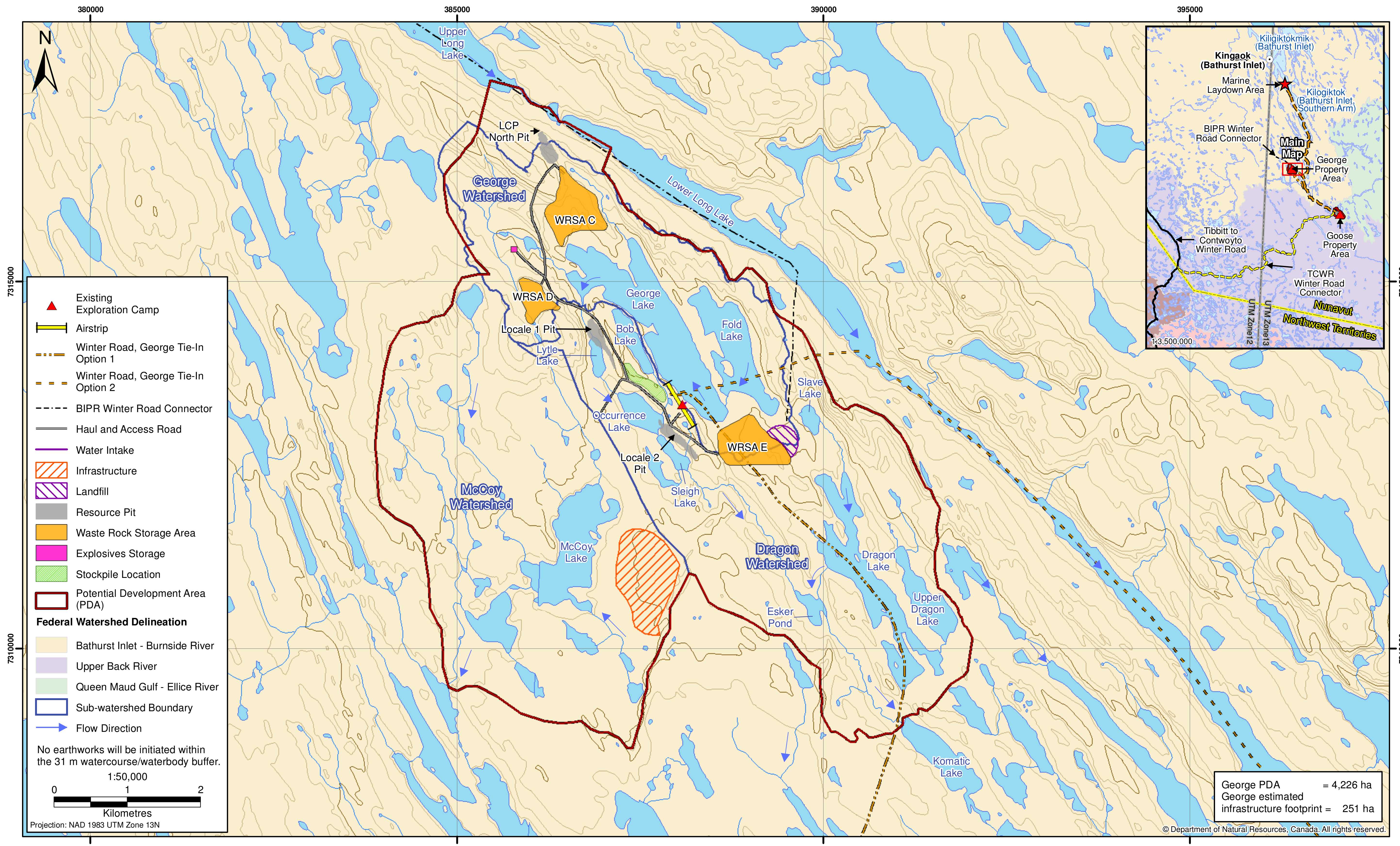


Sabina GOLD & SILVER CORP.

Rescan an ERM company

Appendix B-2

Project Development Area and Infrastructure Areas - Goose Property



Appendix B-3

Project Development Area and Infrastructure Areas - George Property