BACK RIVER PROJECT
Road Management Plan

Type B Development Works Water Licence

April 2018

Version 2.0

BACK RIVER PROJECT
ROAD MANAGEMENT PLAN

Table of Contents

List of Figures

FIGURE **PAGE**

List of Tables

TABLE **PAGE**

List of Appendices

Acronyms

DFO	Department of Fisheries and Oceans
FEIS	Final Environmental Impact Statement
GPR	Ground Penetrating Radar
INAC	Indigenous and Northern Affairs Canada
KIA	Kitikmeot Inuit Association
MLA	Marine Laydown Area
NWB	Nunavut Water Board
Project	Back River Project
RCMP	Royal Canadian Mounted Police
RMP or Plan	Road Management Plan
ROQ	run of quarry
Sabina	Sabina Gold & Silver Corp.
WIR	Winter Ice Road

1. Introduction

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

The Project is comprised of two main areas with interconnecting winter ice roads (WIR): Goose Property (Appendix A of the MASD, base Figure 2) and the Marine Laydown Area (MLA) (Appendix A of the MASD, base Figure 3) situated along the western shore of southern Bathurst Inlet. The majority of annual resupply will be completed using the MLA, and an approximately 160 km long WIR will interconnect these sites.

The Road Management Plan (RMP or Plan) outlines the approach for construction, operations, and reclamation of transportation infrastructure, such as all-weather roads and WIRs. This plan includes provisions for the MLA and the Goose Property. The RMP is intended to support the Type B Water Licence Application for the Project.

The Plan was prepared following the requirements of:

- the Supplementary Information Guidelines (SIG) for Mining and Milling MM3 and Water Works M1, issued by Nunavut Water Board (NWB 2010 a, b);
- the Environmental Impact Statement Guidelines issued by the Nunavut Impact Review Board to Sabina (NIRB 2013); and
- in accordance with best management practices and in conformance with current Federal and Territorial statutory requirements.

The information presented herein is current as of August, 2017.

2. Scope and Objectives

This Road Management Plan has been written to meet requirements of a Type B Water Licence and entails the construction, operation, and management of all-weather service roads and WIRs in relation to the site preparation and development work activities as described in Table 2-1. The Plan is supported by a suite of Project-specific mitigation, monitoring, and/or management plans that set out the Project's standards and requirements for particular areas of environmental management, including the:

- Comprehensive Spill Contingency Plan (August 2017);
- Fuel Management Plan (August 2017);
- Road Management Plan (August 2017);
- Quarry Management Plan (August 2017);
- Oil Pollution Emergency Plan (August 2017);
- Environmental Management and Protection Plan (August 2017); and
- Interim Closure and Reclamation Plan and cost estimate (August 2017) specific to development works.

Included within the plans are monitoring with adaptive management measures to confirm that the Project is executed as planned, that mitigation is successful, and potential adverse effects are minimized.

Table 2-1. List of Activities

GOOSE PROPERTY
Goose Exploration Camp Operation
Ice Airstrip Construction and Operation
Mobilize Fuel, Equipment, and Supplies
Winter Ice Road Construction and Operation
Operate Airstrip Quarry
Operate Umwelt Quarry
Locate Temporary Fuel Storage
Construct All-weather Service Roads and Water Crossings
Construct Goose Plant Site and Fuel Storage Area Pad
Airstrip Extension
Rascal Stream Re-alignment
Relocate Explosives Storage Area
Water Intake Installation
MARINE LAYDOWN AREA
Ice Airstrip Construction and Operation
Mobilize Fuel, Equipment, and Supplies (Air)
Upgrade Temporary Exploration Camp
Operate MLA Quarry
Construct All-weather Service Roads, Laydown Areas, and Fuel Storage Area
Mobilize Additional Fuel, Equipment, and Supplies (Vessels)
Install One Steel Bulk Fuel Tank
Water Intake/Discharge Installation

3. Applicable Legislation and Guidelines

The RMP 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 are provided in Appendix A.

Water use and waste disposal in Nunavut is regulated by the NWB through the water licensing process.

In addition, the following guidance documents have been used to inform the design and management decisions presented in the Plan:

- Northern Land Use Guidelines Access: Roads and Trails (INAC 2010);
- Geometric Guidelines (Roads and Transportation 1986);
- Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010);
- Environmental Guidelines for the Construction, Maintenance and Closure of Winter Roads in the Northwest Territories (GNWT DoT 1993); and
- Guidelines for Safe Ice Construction (GNWT DoT 2015).

3.1 LAND TENURE

All-weather service roads and WIRs for development works will be located on Inuit Owned Lands 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 Agreement came into effect. Land and environmental management in this area are governed by the provisions of the Nunavut Agreement.

Refer to Section 2.4 of the Main Application Supporting Document for clarification of land tenure status.

3.2 PERMITTING REGIME

Table 3.2-1 outlines the current licenses and permits held by Sabina as of August, 2017.

Table 3.2-1. Current Authorizations and Permits (as of August, 2017)

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

4. Planning and Implementation

4.1 ALL-WEATHER SERVICE ROADS

The MLA and Goose Property will require the construction of all-weather service roads to facilitate development works, as well as ongoing exploration and environmental monitoring programs. Goose Property will have 7.4 km of service roads to connect the existing Airstrip Quarry, Explosives Storage Area spur road, the new Umwelt Quarry, the Goose Plant Site pad, and the existing Goose Exploration Camp (Appendix A of the MASD, base Figure 2). The MLA will have less than 2 km of service roads which will connect the camp, laydown area pads, explosives storage and the fuel storage area with the barge landing area (Appendix A of the MASD, base Figure 3).

Preliminary typical cross-sections of all-weather service roads and watercourse crossings are shown in Figure 4.1-1. Sabina confirms they will submit to the NWB for review 30 days prior to construction, construction drawings stamped by an Engineer for any engineered facilities proposed for development works. Final as-built drawings will be provided 90 days following construction in accordance with NWB requirements.

Figure 4.1-1. All-Weather Road and Watercourse Crossing Typical Cross Sections

SRK: 1CS020.011_RMP_FIGURE_A-02.dwg

11x17” landscape

4.1.1 Design Criteria for All-weather Service Roads

The following design criteria will be used for the development works service roads:

- Minimum width of travelling surface: up to 4.5 m for single-lane or 8 m for double-lane;
- Design speed: 50 km/h;
- Side slopes: 2H:1V;
- Maximum grade: 10%;
- Safety berms for fills greater than 3 m in height: 0.55 m; and
- Drainage: major culverts to be designed to a 1-in-100-year event.

4.1.2 Construction of All-weather Service Roads

All-weather service roads will be constructed with run of mine or run of quarry (ROQ) rock placed directly onto the tundra to preserve the permafrost. A layer of graded surfacing material will be placed to provide a protective trafficking layer. Construction materials will consist of geochemically and geotechnically suitable rock sourced from the existing Airstrip Quarry and/or the new Umwelt Quarry.

4.1.2.1 Geotechnical Recommendations

Ground conditions for design and engineering have been informed by four geotechnical investigations from 2010 to 2015 including test pits, drill holes, thermistor installations, and a variety of laboratory and in-situ testing. Geotechnical design is also supported by ERM Rescan's 2014 Cumulative Permafrost Baseline Data Report, which includes observations on active layer freeze-thaw cycle and active layer depth from 2007 to 2014. Refer to the Site-Wide Geotechnical Properties Report (FEIS Volume 2, Appendix V2-7C) for more detail.

The following road preparation recommendations specific to all-weather service roads were prepared by SRK as a result of geotechnical investigations and thermal modelling:

- 1.0 m compacted ROQ rock-fill pad (or geochemically suitable waste rock) on top of undisturbed grade for service roads;
  - maximum rock size limited to 0.9 m.
- Rock shatter required where roads cross over rock highs that impact road grade; and
- 150 mm of 2" minus topping directly on top of rock-fill pad for trafficability (no need for intermediate 6" minus layer).

4.1.3 Water Crossings

There are three culvert crossing locations planned for development works, all of which are situated on the Goose Property (Appendix A of the MASD, base Figure 2).

Two types of culverts are considered for the all-weather service roads:

- non-fish-bearing crossings; and
- fish-bearing crossings.

The non-fish-bearing crossings will consist of corrugated steel pipe and are currently designed with a diameter of either 1.2 m or 2.5 m, depending on the required flow. The fish-bearing crossings will be sized to keep maximum water velocities below 1.5 m/s such that they do not present a velocity barrier to migrating fish, more specifically Arctic Grayling. In addition, fish-bearing culverts will be embedded to a depth of 0.4 m and filled with streambed material to promote fish passage and habitat suitability. Culverts will be designed to, and conform with, Fisheries and Oceans Canada (DFO) Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013).

4.1.4 Water Use for All-weather Service Roads

Under the development works water licence Sabina has requested a total volume of 297 m^3 per day for WIR construction, maintenance, and dust suppression for all-weather service roads.

4.1.5 Measures to Protect Fish and Fish Habitat

Sabina is committed to ensure that serious harm to fish is avoided where possible in compliance with the *Fisheries Act* when undertaking construction or operating near water. The presence of fish in potentially affected habitats was confirmed through the multi-year baseline fish sampling programs performed for the Environmental Assessment of the Project. For example, baseline sampling suggests that most waterbodies and watercourses have the potential to support small-bodied fish species, such as Ninespine Stickleback, for at least part of the open water season; whereas only deeper waterbodies have the potential to support large-bodied species, such as Lake Trout during the winter (assuming water depths exceed the maximum ice thickness). Watershed position is also a consideration in the classification of fish-bearing status and distribution of species. Streams and ponds, including ephemeral streams and ponds, that connect two fish-bearing waterbodies with confirmed fish presence have a high likelihood of supporting fish for at least part of the open water season (e.g., spring freshet). Refer to Tables 6.3-1 and 6.3-2 of the Conceptual Fish Offsetting Plan of the Back River Project FEIS for a list of all waterbodies and watercourses with total or partial habitat losses that were either confirmed to support fish or identified as being highly likely to support fish.

Where possible, Sabina is committed to deploy all applicable recommended measures as per DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013), including those related to Project planning, erosion and sediment control, shoreline re-vegetation and stabilization, fish protection, and the operation of machinery. The below information re-iterates what is provided within the assessment of watercourse crossings and water intake/discharge pipes (re. WIR construction and maintenance) in the FEIS (FEIS Volumes 6 and 10).

Watercourse Crossings

For the fish bearing crossing at Gander Outflow, effects related to the installation of the culvert were assessed in the Project FEIS (FEIS Volume 10, Chapter 21, Section 6.3.3). Within the implementation of DFO's recommended measures, the fish-bearing crossing will continue to serve as a migration corridor, between Goose and Rascal lakes. For example, the culvert will be sized to keep maximum water velocities below 1.5 m/s such that it does not present a velocity barrier to migrating fish (Arctic Grayling). In addition, the culvert will be embedded to a depth of 0.4 m and filled with streambed material to promote fish passage and habitat suitability. Timing of in-water construction activities will conform, when possible, to Nunavut timing windows for the protection of fish and their habitat.

It is important to re-iterate that the construction and maintenance of all stream crossings and roads will follow DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat. These include the following mitigation measures to guide these processes and to ensure that fish and aquatic habitat is not adversely affected by development (FEIS Volume 6, Chapter 7, Section 7.5.3):

- Design and plan in-water activities and works such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided.
- Where possible, approaches will be designed to be perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
- Instream activities will be undertaken in isolation of open or flowing water, or when frozen, to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.
- Effective erosion and sediment control measures will be installed before starting work to prevent sediment from entering the waterbody.
- Site isolation measures (e.g., silt boom or silt curtain) will be used to contain suspended sediment where in-water work is required.
- Regular inspection and maintenance of erosion and sediment control measures and structures will be conducted during the course of construction.
- Repairs to erosion and sediment control measures and structures will be promptly completed if damage occurs.
- Removal of non-biodegradable erosion and sediment control materials will be completed once site is stabilized.
- Clearing of riparian vegetation will be kept to a minimum to avoid disturbance to the riparian vegetation and prevent soil compaction.
- If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, appropriately-sized, clean rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
- All construction equipment and supplies will be removed from the construction-site upon Project completion.
- Machinery will be in a clean condition and maintained free of fluid leaks, invasive species, and noxious weeds.
- Whenever possible, machinery will be operated on land above the high-water mark or on ice in a manner that minimizes disturbance to the banks and bed of the waterbody.
- Whenever possible, machine fording of a watercourse will be limited to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, a temporary crossing structure will be constructed.
- Service machinery will be washed, refuelled, and fuel and other materials for the machinery stored, in such a way to prevent any deleterious substances from entering the water.
- Screens will be used on all water intake hoses and pumps to prevent fish entrapment.

Disposal of excavated material will be in a location 31 m above the high water mark to ensure that this material does not enter the watercourse. Efforts will be made to minimize the duration of any in-stream works and minimize disturbance at stream crossings. This practice will 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. All in-stream works for waterbodies frequented by fish will be completed in accordance with the relevant DFO Guidelines.

Sediment loading in runoff will be minimized by the application of measures to intercept Total Suspended Solids before it reaches the freshwater environment. Sediment control measures could 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; or
- Locating stockpiles well away from watercourses.

4.1.6 Measures to Prevent Permafrost Degradation

Roads have been designed, and will be constructed, to reduce the potential for permafrost degradation. Thermal modelling confirms that a ROQ (or geochemically suitable waste rock) service road thickness of 1.0-m is acceptable. During summer, some thaw is expected; however, once the active layer is re-established, which would likely be achieved within one or two seasons, no further settlement is expected. Where possible, development work service roads will be constructed in winter months, when soils are frozen, to prevent permafrost degradation and limit differential settlement. More detail can be found in the Site-Wide Geotechnical Properties Report (FEIS Volume 2, Appendix V2-7C).

Other mitigation and environmental design features to reduce the potential for permafrost degradation include:

- Avoiding ice-rich, poorly-drained, frost-susceptible soil conditions where possible, favouring higher, more competent, well-drained ground;
- Placing road fill directly over overburden soil limiting cuts that can lead to thaw degradation;
- Removing accumulated snow before placing fill;
- Increasing road fill thickness in areas with thaw susceptible soils where necessary; and
- Construct roads in winter months when possible over frozen ground conditions.

4.2 WINTER ICE ROADS

Winter ice roads, totaling approximately 9 km in length, will be required to connect and access the proposed quarries at the Goose Property. These WIRs will allow development works to commence in the winter season, reducing potential environmental effects by avoiding any potential overland rutting or gouging. Short land based portages may be developed to support winter ice road development, Sabina will confirm all appropriate land use permits are in place prior to construction. For additional information related to environmental baseline and effects refer to Section 5 of the Main Application Supporting Document. Efforts will be made to limit distances developed by utilizing one WIR to access multiple locations, or by utilizing other infrastructure (i.e., the permanent airstrip) to shorten distances. The WIRs would be used to temporarily connect three key areas (base Figure 2):

1. Goose Exploration Camp to Airstrip Quarry (Winter Ice Road 1): This WIR will provide continued access to the existing quarry and source material needed for development works. Construction and operation of this WIR is currently a permitted activity under water licence 2BE-GOO1520, and all planned activities will be consistent with activities undertaken in previous years. No additional water usage is currently anticipated.

2. Goose Exploration Camp to Umwelt Quarry/Goose Plant Site (Winter Ice Road 2a/2b): This WIR will provide new access to Umwelt Quarry/Goose Plant Site and source material needed for development works.
3. Goose Exploration Camp (or other WIR) to Explosives Storage (Winter Ice Road 3).

4.2.1 Winter Ice Road Construction and Use

Consistent with WIR construction under 2BE-GOO1520, all WIRs will be constructed using the Government of Northwest Territories published Northern Land Use Guidelines (GNWT 2015). For overland construction, equipment with low ground bearing pressure is initially used to travel the route to clear excess snow from the alignment if required and to build an initial cover of ice and snow on top of the tundra; this creates a frozen road base upon which heavier equipment can travel without affecting the natural ground surface. Once this frozen road base is established, equipment is used to build up the road base into a smooth-running ice surface using consecutive thin layers of snow and water as fill. Where feasible, the road base is built up to a level that is above the grade of the surrounding tundra. Constructing this elevated road base will greatly assist in subsequent maintenance by preventing loose, blowing snow from accumulating on the roadway. The Land Use Guidelines (GNWT 2015) require a minimum of 10 cm compacted ice and snow coverage on the winter road travel way to adequately protect the tundra.

Construction on ice involves three main steps. The first step is the initial measurement (profiling) of ice thickness. This profiling should be carried out using Ground Penetrating Radar ice profiling. Based on the ice thickness measured, load calculations are conducted to ensure that the ice will support the weight of the snow clearing and construction equipment. Depending on the equipment to be used, normally a minimum ice thickness of 40 to 50 cm is required to begin construction. Sufficient width also assists in preventing the travel way from being “blown in” with snow during storms and high wind events, thereby reducing repeated snow clearing efforts and operational delays for freight traffic. Once the ice has been cleared of snow along the route, the ice thickness will increase naturally at an enhanced rate due to direct exposure to cold ambient air temperatures. The rate of ice growth can also be enhanced by flooding the ice sheet. Regular ice profiling will be conducted throughout the WIR construction and operations to monitor ice growth and to maximize the safe loading capacity of the ice.

Winter ice road construction will adhere to the following guidelines based on DFO Operational Statements:

- Use existing trails or WIRs wherever possible as access routes to limit unnecessary clearing of additional vegetation and prevent soil compaction.
- Construct approaches and crossings perpendicular to the watercourse wherever possible.
- Construct ice bridge and snow fill approaches using clean, compacted snow and ice to a sufficient depth to protect the banks of the lake, river, or stream.
- Install sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and decommissioning activities and make all necessary repairs if any damage occurs.
- Operate machinery on land or on ice, and in a manner that minimizes disturbance to the banks of the lake, river, or stream.
- Ensure that the intakes are sized and adequately screened to prevent debris blockage and fish entrapment.
- Crossings do not impede water flow at any time of the year.

- When the crossing season is over, and where it is safe to do so, create a v-notch in the centre of the ice bridge to allow it to melt from the centre, and also to prevent blocking fish passage, channel erosion and flooding. Compacted snow should be removed from snow fills prior to the spring freshet.
- Stabilize any waste materials removed from the work site to prevent them from entering the lake, river, or stream. This could include covering spoil piles with biodegradable mats or tarps.
- The site should be stabilized using effective sediment and erosion control measures. In areas with permafrost, care should be exercised to ensure these measures do not cause thawing or frost heave.

4.2.2 Water Use for Winter Ice Road Construction and Maintenance

For the purpose of development works, the expected water use for the construction and maintenance of the WIRs is estimated to be up to 297 m^3/day. All water will be sourced from Goose Lake and Lakes proximal to the MLA.

Consistent with water usage under Sabina's existing 2BE-GOO1520, water withdrawal will adhere to the following guidelines from DFO's Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010):

- In one ice-covered season, total water withdrawal from a single waterbody will not exceed 10% of the available water volume calculated using the appropriate maximum expected ice thickness.
- In cases where there are multiple users withdrawing water from a single waterbody, the total combined withdrawal volume will not exceed 10% of the available water volume.

Sabina will equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained, and will withdraw water a rate such that fish do not become impinged on the screen.

4.3 ALL-WEATHER AIRSTRIP EXTENSION

The Goose Property currently has a 914-m all-weather gravel airstrip that can be used year-round, and during the winter months, January to May, a 2,000-m (6,564 ft.) ice airstrip can be established on Goose Lake. The current airstrip will be extended to allow for servicing passenger and cargo aircraft in support of ongoing year-round exploration and development works. This airstrip will serve as the main air access to the Goose Property throughout the life of the Project. The all-weather airstrip will be designed to Transport Canada standard TP 312 Aerodrome Standards and Recommended Practices (2015). The airstrip will be extended to be approximately 1,524 m long and 45 m wide. Preliminary typical cross-sections of the all-weather airstrip extension are shown in Figure 4.3-1.

4.3.1 Construction of All-weather Airstrip

Due to the continuous permafrost and possible thaw degradation on the Goose Property, the airstrip extension, if completed, will be constructed with embankment fills of approximately 2 m thick. The fill material will be geochemically suitable quarried rock or waste rock. This will be topped by an approximately 0.3-m thick compacted granular base trafficable layer. The airstrip will be equipped with lights, communications equipment, and instrumentation in accordance with appropriate Federal regulations. Environmental considerations are incorporated into design and routing. Wind direction and speeds, in addition to existing terrain and ground conditions, determined the optimal airstrip orientation.

Figure 4.3-1. Typical Section – Airstrip, Road and Culvert Sections

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, is responsible for monitoring the effective implementation of this plan.

6. Inspection, Maintenance, and Monitoring of Roads

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.

6.1 ALL-WEATHER SERVICE ROADS AND AIRSTRIP INSPECTION AND MAINTENANCE

Sabina recognizes that a good inspection program will lead to the early identification of areas of the road and airstrip where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the infrastructure.

The airstrip and all-weather service 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 geochemically and geotechnically suitable granular material and/or crushed rock.

The all-weather service 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.

In fall, winter, and spring, maintenance will be adjusted according to the weather conditions. Snow clearing along the roads and airstrip will be completed 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 complications 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 a 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 (including removing accumulated ice) when and where required to prevent wash outs; and
- 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.

See Section 6.1.2 for additional details on the inspection and maintenance of water crossings.

6.1.1 Dust Management

The amount of dust generated along the service roads and airstrip is dependent on the dryness of the surface, the number of vehicles, weight and speed, and maintenance of the driving surface.

Water remains the most readily available means of controlling dust in Nunavut. It is common at mine sites worldwide to apply water through fantail sprayers or spray bars attached to a haul truck or equivalent fitted with a large tank. Sabina recognises that water is only a temporary measure, and reapplications could be necessary to achieve the desired dust control efficiency. The control efficiency of water applications is dependent on the amount of water applied, the time between re-applications, penetration depth of the water into the road surface, the traffic volume, prevailing weather conditions, and the state of the road surface (e.g., excessive fines over coarse material). All these variables need to be considered before selecting water to control dust from roads and other mine areas.

Watering the roads is only possible during frost-free days. In late spring, significant sublimation can be expected when the temperatures remain below freezing, which can lead to dry roads and significant dust potential. If water is applied while the temperature is below freezing, it will turn to ice on the road and pose a safety hazard for travel. Dust suppression using water or chemicals will not be possible under these conditions.

Sabina is requesting that the 297 m^3/day of water required to build and maintain the WIRs during winter be available for dust suppression and compaction of placed construction materials during the open water season.

6.1.2 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.

Culverts will be sized for each stream crossing to accommodate normal summer flows, as well as spring freshet and heavy rainfall flows.

Visual monitoring will be conducted on a regular basis to ensure drainage and erosion controls are effective per the following guidelines:

- Culvert maintenance will be conducted following DFO's "Measures to Avoid Causing Harm to Fish and Fish Habitat" (DFO 2013).
- Instream work will be conducted during approved timing windows presented in DFO's "Measures to Avoid Causing Harm to Fish and Fish Habitat" (DFO 2013).

Starting during the freshet period (mid-May through June), crossing inspections will be performed during the ice-free period prior to fall freeze-up which typically occurs in October of each year. These activities for each watercourse crossing will consist of visual inspection to:

- Identify defects, cracks, or any other risks to structural integrity of the infrastructure. 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 or the upstream and downstream channel. Any erosion concerns will be addressed as soon as possible.

Particular attention will also be paid to potential sources of sediment transport at the crossing. Inspection results will be recorded to help track changes in conditions over time. Maintenance operations will consist of undertaking remediation of any detected problems and repairing damage as soon as possible.

Routine spring snow management will include the safe removal of any snow and ice that accumulates at both end of the culverts so that water at freshet can move freely through the culverts and waterway. Proper technique will be used to ensure that no ground disturbance if limited during snow and ice removal. Culverts and stream crossings will be inspected just prior to and during the spring freshet to ensure that the culverts and stream crossings are sufficiently clear to accommodate the rapid spring thaw and that action will be initiated (including removing accumulated ice) where required. Prior to Freshet, water crossings will have snow removed from ice surface on the up and downstream side of the crossing to allow free flow of water. Where culvert ice blockage is identified during inspection and if watercourse crossings can't accommodate the spring freshet, culvert thawing (steaming) will be considered as a maintenance measure.

6.2 WINTER ICE ROADS INSPECTION AND MAINTENANCE

During WIR operations, the roads will be inspected and maintained in accordance with the "*Guidelines for Safe Ice Construction*" (GNWT DoT 2015). These regulations state that ice thickness testing inspections should be done once a week on snow roads, twice a week on WIRs, and daily on ice bridges. Test hole spacing and frequency as recommended in the field guide are presented below for each WIR construction phase in Table 6.2-1.

Table 6.2-1. Field Guide for Ice Construction Safety Recommended Ice Testing

	Preconstruction	**Construction**	**Operation and Maintenance**
	Initial test run	From start of construction until road is opened to traffic	This may overlap with construction activities at lower load levels
Rivers	If GPR is used, test holes are only required for calibration and for mapping of thin areas 30 m between test holes along centre line	If GPR is used, test holes are only required for calibration and for mapping of thin areas 30 m between test holes along alternate edges	If GPR is used, test holes are only required for calibration and for mapping of thin areas 30 m between test holes along alternate edges Look for thin areas caused by river current

Lakes	If GPR is used, test holes are only required for calibration If within 250 m of shore: 30 m between test holes along centre line If more than 250 m from shore: 250 m between test holes along centre line	If GPR is used, test holes are only required for calibration If within 250 m of shore: 30 m between test holes along alternate edges If more than 250 m from shore: 250 m between test holes along alternate edges	If GPR is used, test holes are only required for calibration and for mapping of thin areas 250 m between test holes along alternate edges
Mackenzie Delta	If GPR is used, test holes are only required for calibration 250 m between test holes along centre line	If GPR is used, test holes are only required for calibration 250 m between test holes along alternate edges	If GPR is used, test holes are only required for calibration and for mapping of thin areas

Source: Northwest Territories Department of Transportation. "Guidelines for Safe Ice Construction" 2015.

6.3 SNOW CLEARING

The Project is expected to experience snow drifts due to strong winds and snow accumulation over the winter season. Roads will be cleared of snow drifts as needed to ensure a safe running surface is maintained. Snow banks will be maintained at a height low enough to ensure the safe passage of terrestrial mammals.

6.4 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 Comprehensive Spill Contingency Plan and Sabina's Emergency Response 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, or antifreeze.
- 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 stranded 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 authority; this may include the KIA, Mines Inspector, RCMP, NWB, Nunavut Spill Line, Environment and Climate Change Canada, Government of Nunavut Department of Environment, and DFO.

The following actions are to be taken in the event of an accident on the roads involving other vehicles (including all-terrain vehicles), 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 (e.g., medical help, environmental cleanup, fire, and/or mechanical help).
- Secure the accident site so that any 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, logistics will initiate the emergency response procedure passing along the information to the Operations Manager. The Operations Manager will then call out the required emergency response personnel to assist at the accident site.

In the event of an incident involving contact with wildlife, the road dispatch will notify the Operations Manager and the environmental representatives. The Environmental Department will ensure that appropriate reporting of such incidents is made on a timely basis to the KIA, relevant Hunters and Trappers Organization(s), and the Government of Nunavut Wildlife Officers.

7. Wildlife Protection Measures

Wildlife may occasionally be observed near the all-weather service roads. This section describes the measures to ensure that wildlife are protected, including:

- Roles and responsibilities;
- Mitigation measures that will apply at all times;
- Management measures should wildlife be observed near all-weather roads, the WIR, and the airstrip; and
- Management of wildlife incidents.

Measures to protect fish and fish habitat are described in Section 4.1.5.

More information on the protection of wildlife is available in the Wildlife Mitigation and Monitoring Program Plan (Version 7, submitted with FEIS Addendum February 2017).

7.1 ROLES AND RESPONSIBILITIES

The protection measures described in this section apply to all Project personnel, contractors, and visitors to site who use Project roads or the airstrip. In cases of operational challenges (e.g., groups of caribou), the Environmental Manager and environmental personnel on-site will manage the situation. The Project personnel will be notified by radio if any wildlife is observed on the road according to current communication procedures.

7.2 MITIGATION DURING ROAD CONSTRUCTION

- The all-weather service roads will be constructed to avoid active wildlife residences, such as dens or active bird nests. More information is available in the Wildlife Mitigation and Monitoring Program Plan (Version 7, submitted with FEIS Addendum February 2017).
- The WIR will be constructed each winter such that it is not a barrier to movement for caribou; the height of snowbanks will be limited to approximately 1 m and snow plowing will be conducted in such a way as to limit the angle and vertical height of the snowbank edge.

7.3 MITIGATION MEASURES FOR ALL ROADS

The following protocol will be implemented on the road and airstrip for the protection of wildlife:

- Traffic on all roads will be managed and monitored through a central dispatch.
- Observations of caribou and other large mammals will be reported to the Environmental Department.
- Roads will be closed to the public and to all foot traffic. Road use will be restricted only to persons required for Project activities.
- Vehicle speeds on the all-weather and WIR will be limited to 60 km/hr.
- It will be strictly forbidden for any individual to feed wildlife, litter, or harvest wildlife while on-site.

- Appropriate mitigation strategies (e.g., signage) will be developed for areas with higher frequency of encounters with wildlife.

7.4 MANAGEMENT FOR THE ALL-WEATHER ROADS

- If a driver observes a caribou, 10 muskox, or other large mammal (e.g., grizzly bear, wolves, or wolverine) within 500 m of any road, the driver will slow to 40 km/hr, alert other drivers, and proceed with caution.
- If a driver on an all-weather road observes that caribou (or muskox, grizzly bear, wolves or wolverine) are on the road or within 50 m of the road and moving towards the road with the intention to cross the road, then the vehicle will stop, the driver will alert the Environment Department, and will proceed when the animals have crossed the road and moved off, or may then proceed slowly after a wait of 20 minutes.
- If a driver on the all-weather road observes caribou on the road, they will stop the vehicle until the caribou move off. If other wildlife are standing on the road, then the driver will stop for up to 20 minutes, then proceed slowly to encourage the wildlife to move off the road.

7.5 MANAGEMENT FOR THE WINTER ICE ROAD

- If a driver observes a caribou (or other large mammal) within 500 m of any road, the driver will slow to 40 km/hr, alert other drivers, and proceed with caution.
- If a driver observes that caribou (or other large mammal) are within 50 m of the road and moving towards the road with the intention to cross it, then the vehicle will stop, the driver will alert the Environment Department, and will proceed when the animals have crossed the road and moved off; alternatively, after 20 minutes the driver may proceed slowly if animals have not made their road crossing.
- If caribou are resting on the road, then the driver will wait until the animals have moved off on their own.

7.6 MANAGEMENT OF WILDLIFE INCIDENTS

- All incidents between vehicles and wildlife must be reported to the Environmental Department whether they are:
  - near miss incidents;
  - collision with injury to the wildlife; or
  - wildlife mortality.
- 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.
- In the case of the accidental death of an animal, environment personnel will contact the Government of Nunavut Wildlife Officer, KIA Senior Lands Manager, and the Hunters and Trappers Organization office in Kugluktuk and Cambridge Bay to discuss what to do with the carcass. The default action will be to remove the carcass from the road and incinerate it to avoid attracting scavengers, such as wolves, grizzly bear, Arctic fox, and/or wolverine.

More information on wildlife protection measures can be found in the Wildlife Mitigation and Monitoring Program Plan (Version 7; submitted with FEIS Addendum February 2017).

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 all-weather road or WIR. The data will be aggregated and reported in the annual Wildlife Effects Monitoring Program Report. Additional details can be found in the Wildlife Mitigation and Monitoring Program Plan (Version 7; submitted with FEIS Addendum February 2017).

7.7 MANAGEMENT FOR THE AIRSTRIP

- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife on the airstrip. Small groups of wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and aircraft will not be approved to land until the airstrip is clear.
- If groups of greater than 25 caribou are observed on the airstrip then no action will be taken. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to another location.

8. Adaptive Management

The Plan will be reviewed, and if necessary, updated again prior to submission of the Type A Water Licence application. The Plan will be reviewed on a regular basis to incorporate any lessons learned, major changes to facility Operations or maintenance, and environmental monitoring results.

All employees will be informed of relevant updates and the updated RMP will be located in a designated area at each site.

Sabina will retain all raw data records and annual reporting for at least two years in digital format. The updated RMP, raw data, and annual reporting will be made available by Sabina at all times for review by the lands and waters inspectors, the NWB, and Environment and Climate Change Canada.

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

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.

9. Reclamation and Closure

Decommissioning of the roads will involve restoring natural drainage, which will be accomplished by removing all culverts, and other potential obstructions to drainage paths. Any slopes where there is potential for erosion will be stabilized. Stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened slopes using non acid generating material. Refer to the Interim Closure and Reclamation Plan for additional details on the closure of roads.

10. References

DFO (Fisheries and Oceans Canada). 2010. Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut. June 2010.

DFO. 2013. Measures to Avoid Causing Harm to Fish and Fish Habitat. http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html

GNWT (Government of the Northwest Territories). 2015. Northern Land Use Guidelines – Access: Road and Trails. Available at: www.lands.gov.nt.ca/sites/lands/files/resources/nlug_roadstrails_2015_english_16_sept_2015.pdf

GNWT DoT (Department of Transportation of Northwest Territories). 1993. Environmental Guidelines for the Construction, Maintenance and Closure of Winter Roads in the Northwest Territories. October 1993.

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INAC (Indigenous and Northern Affairs Canada). 2010. Northern Land Use Guidelines – Access: Road and Trails.

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

NWB (Nunavut Water Board). 2010a. Mining and Milling Supplemental Information Guideline (SIG) for Mine Development (MM3). February 2010.

NWB. 2010b. Miscellaneous Supplemental Information Guideline (SIG) for General Water Works (including crossings, flood control, diversions, and flow alterations) (M1). February 2010.

Roads and Transportation Association Canada. 1986. Manual of Geometric Design Standards for Canadian Roads.

Transport Canada. 2015. Aerodromes Standards and Recommended Practices (TP 312) 5th Edition. Revised July 2015.

Appendix A. Applicable Legislation