# HARDROCK PROJECT
# CONCEPTUAL BIODIVERSITY MANAGEMENT AND MONITORING PLAN

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# 1.0 INTRODUCTION AND ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN OVERVIEW

Greenstone Gold Mines (GGM) is committed to minimizing environmental effects through the implementation of mitigation measures, monitoring and adaptive management for the Hardrock Project (the Project) within Environment Management and Monitoring Plans (EMMPs) for construction and operation. Through the EMMPs, the Project's environmental risks and opportunities are addressed in a comprehensive, systematic, planned and documented manner to meet the following objectives:

- The Project is carried out in compliance with existing legislation, consistent with Federal and Provincial guidelines, best practices and GGM corporate policies;
- Measures to mitigate environmental effects are documented;
- Benefits from the Project are enhanced; and
- Reporting is structured to inform adaptive management and continual improvement.

The EMMPs guide environmental management for the Project and are progressively developed as the Project moves through the EIS/EA, permitting, and construction, and updated based on continual improvement during operations through adaptive management.

EMMP development begins during the EIS/EA stage with the preparation of Conceptual Environmental Management Plans. These EMMPs are broad in their level of detail, commitment-based and focused on the construction and operation phases of the Project. They include input received from consultation during the Draft EIS/EA stage. The closure phase is addressed in the Conceptual Closure Plan. The level of detail in the EMMPs advance as the Project moves through more detailed engineering and planning and as permit/regulatory requirements are available.

## 1.1 Environmental Management and Monitoring Plans

The Project's Environmental Management System, includes a comprehensive set of management and monitoring plans collectively referred to as Environmental Management and Monitoring Plans (EMMPs). The EMMPs outline environmental protection measures to mitigate potential environmental effects.

The EMMPs include:

- Water Management and Monitoring Plan;
- Conceptual Waste Rock Management Plan;
- Conceptual Emergency Response Plan;
- Conceptual Waste Management Plan;
- Conceptual Erosion and Sediment Control Plan;
- Conceptual Greenhouse Gas Management and Monitoring Plan;
- Conceptual Air Quality Management and Monitoring Plan;

- Conceptual Spill Prevention and Response Plan;
- Conceptual Soil Management Plan;
- Conceptual Noise and Vibration Management and Monitoring Plan;
- Conceptual Explosives and Blasting Management Plan;
- Conceptual Aquatic Management and Monitoring Plan;
- Conceptual Biodiversity Management and Monitoring Plan; and
- Conceptual Archaeology and Heritage Resource Management Plan.

These Plans are considered "living" documents and will be updated as needed in support of environmental management activities during future permitting, development and operation phases.

## 2.0 PROJECT SUMMARY

Mining of the Hardrock deposit has been designed as an open pit. The process plant will operate 365 days per year with a Life of Mine (LOM) of approximately 15 years. The mill throughput ranges from 24,000 tonnes per day (tpd) for approximately the first two years of operation (i.e., Mill Phase 1), increasing to 30,000 tpd for the balance of operation (i.e,. Mill Phase 2). The overall Project development schedule will consist of the following main phases, during which various Project activities will be completed:

- Construction: Years -3 to -1 with early ore stockpiling commencing after the first year of construction.
- Operation: Years 1 to 15, with the first year representing a partial year as the Project transitions from construction to operation.
- Closure:
  - Active Closure: Years 16 to 20, corresponding to the period when primary decommissioning and rehabilitation activities are carried out.
  - Post-Closure: Years 21 to 36, corresponding to a semi-passive period when the Project is monitored and the open pit is allowed to fill with water creating a pit lake.

The key components of the Project are as follows:

- open pit
- waste rock storage areas (WRSAs) (designated as WRSA A, WRSA B, WRSA C and WRSA D)
- topsoil and overburden storage areas
- ore stockpile
- crushing plants and mill feed ore storage area
- process plant
- tailings management facility (TMF)

- water management facilities for contact water including collection ditches and ponds
- power plant and associated infrastructure
- liquefied natural gas plant
- explosives facility
- buildings and supporting infrastructure
- water supply and associated infrastructure
- sewage treatment plant
- effluent treatment plant
- lighting and security
- site roads and parking areas
- watercourse crossings and habitat compensation/offsets
- Goldfield Creek diversion
- onsite pipelines
- fuel and hazardous materials
- aggregate sources
- temporary camp

Project activities include the relocation of existing infrastructure currently located within the PDA, including a portion of Highway 11, a Ministry of Transportation (MTO) Patrol Yard, and Hydro One Networks Inc. (Hydro One) facilities.

# 3.0 MANAGEMENT AND MONITORING PLAN PURPOSE

## 3.1 Purpose

The purpose of the GGM Hardrock Project Conceptual Biodiversity Management and Monitoring Plan is to:

- Outline mitigation approaches for reducing effects on vegetation and wildlife; and
- Outline vegetation and wildlife monitoring program for Construction and Operation Phases to confirm effectiveness of mitigation measures and verify EA conclusions.

The Conceptual Biodiversity Management and Monitoring Plan addresses planning, management and/or monitoring activities related to vegetation and wildlife during construction and operations, including protection measures intended to support the achievement of the eventual end land-use objective as provided in the Conceptual Closure Plan. The Conceptual Closure Plan further outlines the measures associated with vegetation and wildlife during the closure and post-closure phases.

### 3.2 Performance Objectives

Objectives and targets are established to drive continuous improvement in environmental performance and are consistent with the overall strategic goals of the Project. Objectives are measurable (where possible), monitored, communicated, and updated as appropriate.

In support of GGM's overarching environmental objective (to work to prevent or mitigate any environmental impacts, meet or exceed regulatory requirements and strive to continually improve our environmental practices and performance), GGM has established the following performance objectives for the management of biodiversity that considers key Project interactions and compliance obligations:

- Eliminate Project-related wildlife mortality (e.g vehicle collisions);
- Minimize Project-related disturbance to vegetation and wildlife;
- Maintain long-term viability of vegetation communities;
- Protect species, and critical habitat of species, listed on Schedule 1 of SARA or listed as threatened or endangered under the ESA or a species of conservation concern; and
- Minimize effects to provincially significant wildlife habitat type and adverse effect on the sustainability of a wildlife population.

## 4.0 SCOPE

The scope of the Conceptual Biodiversity Management and Monitoring Plan applies to the area of the Project that will undergo changes through construction and/or operation to accommodate the advancement of Project and associated monitoring. The Conceptual Biodiversity Management and Monitoring Plan applies to the construction and operation phases of the Project with closure phase included in the Conceptual Closure Plan.

The Conceptual Biodiversity Management and Monitoring Plan applies to individuals working for or on behalf of GGM, including employees and contractors, which have a role and/or accountability for the development, implementation and maintenance of this EMMP.

GGM will make reasonable efforts that suitably qualified (licenced where applicable) contractors are used for the transport of materials, supplies and waste materials, and that contractors have appropriate controls and management plans in place to reduce the likelihood of incidents during transport. Similarly, Project components under the management and maintenance by third parties are outside the scope of this EMMP. The scope of the Conceptual Biodiversity Management and Monitoring Plan applies to Project infrastructure and management under the care and maintenance of GGM.

# 5.0 PLANNING

## 5.1 Organizational Roles and Responsibilities

All persons working for or on behalf of GGM, including employees and contractors, have a role in the successful implementation and maintenance of the Conceptual Biodiversity Management and Monitoring Plan. Table 5-1 outlines roles and responsibilities for activities under this Plan:

**Table 5-1. Conceptual Roles and Responsibilities**

| Role | Responsibility |
|---|---|
| Construction Manager (for construction phase)<br><br>Mine Manager (for operation phase) | Collaborate with the Environment Manager to plan soil handling activities in regards to invasive plant management.<br>Collaborate with the Environmental Manager to plan the development and construction of compensation areas.<br>Collaborate with the Environmental Manager to provide wildlife awareness and safety training to Project personnel and contractors. |
| Environment Manager | Collaborate with the Construction Manager and Mine Manager, as described above.<br>Collaborate with the Construction Manager and Mine Manager to communicate compliance obligations and provide training to employees and contractors related to EMMP.<br>Identify, document, track, and maintain up-to-date compliance obligations related to EMMP goals. |
| Environment Specialist/Environment Technician | Collaborate with Construction Management to delineate areas of disturbance for construction activities.<br>Supervise clearing and grubbing activities to minimize ground disturbance.<br>Monitor disturbed areas for invasive plants.<br>Monitor ecosystems to determine effect of construction and operation activities.<br>Supervise development of ecosystem compensation areas; carry out visual examination and provide guidance to employees and contractors as necessary.<br>Monitor implementation and success of compensation activities. |
| Equipment Operator | Complete applicable training in clearing activities, soil salvage, soil handling, and erosion and sediment control.<br>Conduct clearing/grubbing and soil salvage/handling activities according to defined procedures. |
| Qualified Terrestrial Biologist(s) | Conduct bird nest searches prior to vegetation clearing undertaken during the breeding period for migratory birds (May 1 to August 31).<br>Review potential bat habitat trees to make a determination on occupancy before removal during the maternity roosting period (June 1 to July 31, or as defined by local MNRF office).<br>Conduct follow-up vegetation and wildlife monitoring as developed in the Follow-up Monitoring Program. |

| | |
|---|---|
| Employees / Contractors | Be aware of risks associated with wildlife which may be present at or near to the Project site.<br>Follow outlined compliance obligations related to EMMP, including wildlife and wildlife habitat reporting requirements. |

## 5.2 Compliance Obligations

The Conceptual Biodiversity Management and Monitoring Plan is developed and implemented to comply with applicable legislative, regulatory, permit and other relevant obligations, outlined in the following sections.

### 5.2.1 Environmental Assessment Process Requirements

#### 5.2.1.1 Provincial Terms of Reference

As described in the Approved Terms of Reference, the EA includes a variety of environmental protection and management measures to guide the planning, design, construction, operation and closure of the Project (section 4.1.4) and identification of a monitoring framework related to compliance and effects monitoring (section 8.2).

#### 5.2.1.2 Federal Environmental Impact Statement Guidelines

The EIS Guidelines for the Hardrock Project include development and implementation of follow-up and monitoring programs (section 8.0). The follow-up program verifies the accuracy of the effects assessment and the effectiveness of the measures implemented to mitigate the adverse effects of the Project. The goal of a monitoring program is to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of the Project and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety.

#### 5.2.1.3 Draft EIS/EA Report

Section 24 of the Draft EIS/EA includes a listing of proposed Follow-up Monitoring and Environmental Management Plans, which included a commitment to produce a Conceptual Biodiversity Management and Monitoring Plan. This Plan is intended to address the biodiversity needs and enhancement opportunities of natural areas and species located in the PDA. The plan will describe measures to limit adverse effects to the natural environment during construction and operation. The Biodiversity Management Plan will consist of a Vegetation and Wildlife Management Plan and Monitoring Program.

Subsequent to the draft EIS/EA submission, comments were raised by several parties requesting additional clarification on the vegetation clearing and management, revegetation, and wildlife losses due to clearing, wildlife-vehicle interactions. Available information has been incorporated to develop this Conceptual Biodiversity Management and Monitoring Plan.

### 5.2.2 Regulatory Requirements

#### 5.2.2.1 Federal Regulatory Requirements

##### 5.2.2.1.1. Federal Species at Risk Act

The federal *Species at Risk Act* (SARA) became law in June 2003 and protects federally listed species at risk (SAR) and designated critical habitats. SARA applies to federal lands and is administered throughout Canada by the ECCC. The purposes of SARA are to provide for the recovery of wildlife species that are extirpated (no longer exist in the wild in Canada), endangered, or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened.

SARA includes prohibitions against killing, harming, harassing, capturing or taking individuals of SAR, damaging or destroying residences or critical habitats, and can impose restrictions on development and construction projects which could affect SAR.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), an independent body of experts, assesses wildlife according to a broad range of scientific data. The committee meets annually to review status reports on species suspected of being at risk and provides assessments to government and the public. The federal Cabinet then decides whether those species should get legal protection under SARA. These decisions are made after consultation with affected stakeholders and other groups.

SARA is implemented by the Government of Canada to protect SAR in Canada and it applies to wildlife listed in Schedule 1 of SARA and their critical habitat.

The Project is not located on federal lands. On lands under provincial jurisdiction, SARA goals are typically implemented through provincial legislation, policy, and guidelines. Therefore, SARA does not directly apply to the Project. The effective Species at Risk policy for this Project is the provincial policy, the Ontario Endangered Species Act 2007 (ESA).

##### 5.2.2.1.2. Federal Recovery Strategies

Federal Recovery Strategies are developed for species designated as extirpated, endangered, or threatened under Schedule 1 of SARA, and include the identification of critical habitat.

There are three recovery strategies (boreal caribou, Environment Canada 2012; Canada warbler, Environment Canada 2016a; common nighthawk, Environment Canada 2016b) and one proposed recovery strategy (little brown myotis and northern myotis, Environment Canada 2015) applicable to the Project. The recovery strategies for boreal caribou, little brown myotis, and northern myotis identify critical habitat and are considered for the Hardrock Project.

##### 5.2.2.1.3. Federal Migratory Birds Convention Act

The *Migratory Birds Convention Act* pertains to migratory birds and their habitat, as defined in Article 1 of the Act[1]. It prohibits the harming, killing, disturbance or destruction of migratory birds, nests and eggs (Section 6) and also prohibits depositing oil, oily waters, or other substances harmful to migratory birds in areas that they may inhabit (Section 5[1]).

[1] Birds not addressed under the *Migratory Birds Convention Act* are grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, kingfishers, and some species of blackbirds

#### 5.2.2.2 Provincial Regulatory Requirements

##### 5.2.2.2.1. Provincial Endangered Species Act

The *Ontario Endangered Species Act, 2007* (ESA) protects species that are listed as threatened or endangered on the Species at Risk in Ontario (SARO) List. The SARO list is developed by the Committee on the Status of Species at Risk in Ontario (COSSARO), which is a committee of scientists and individuals. COSSARO classifies species according to their degree of risk based on the best available scientific information, community knowledge and Aboriginal traditional knowledge.

The ESA protects individuals of the listed species from harm or harassment and their habitats from damage or destruction. Threatened and endangered species on the SARO list receive immediate general habitat protection; general habitat is defined as areas on which the species depends, directly or indirectly, to carry out its life processes. Regulated habitat is scheduled to be defined within two (endangered) or three (threatened) years of a species being added to the SARO list. Regulated habitat is species-specific and is more precisely defined than general habitat to include specific habitat features and geographic boundaries.

Under certain circumstances, different types of permits may be issued under the ESA to allow activities that would otherwise be prohibited by the Act. The permit type that would likely be most relevant to the Project would be issued under Section 17(2)(c) of the ESA. Commonly referred to as an overall benefit permit, requirements include: demonstration that reasonable alternatives were considered; documentation of steps taken to limit residual effects on the species; and, commitment to measures to be undertaken that will achieve an overall benefit to the species.

Ontario Regulation 242/08 provides specific exemptions from the provisions of the ESA under certain conditions. Exemptions and conditions vary by species, type of activity, the date the species was listed and the date the activity commenced.

Protection under the ESA extends to both public and private lands and is administered by the Ministry of Natural Resources and Forestry (MNRF). When COSSARO classifies a SARO, the classification applies throughout Ontario, unless COSSARO indicates that the classification applies only to a specified geographic area in Ontario.

##### 5.2.2.2.2. Ontario's Woodland Caribou Conservation Plan

The Woodland Caribou Conservation Plan (MNR 2009) provides policy direction for the management and recovery of woodland caribou (forest-dwelling boreal population).

Habitat is identified in accordance with the *General Habitat Description for the Forest-dwelling Woodland Caribou* (MNR 2013c) and the Recovery Strategy for Woodland Caribou (*Rangifer tarandus caribou*) (Environment Canada 2012). In Ontario, protected (critical) habitat for woodland caribou is categorized as: Category 1 – nursery areas, winter use areas, travel corridors; Category 2 – seasonal ranges; and, Category 3 – remaining areas within the range (MNR 2013c). The Project is not in an area identified as critical habitat for woodland caribou (Environment Canada 2012).

#### 5.2.2.2.3. Provincial Fish and Wildlife Conservation Act

The *Fish and Wildlife Conservation Act* is administered by the MNRF for planning, wildlife management and wildlife enforcement. This Act provides protection for wildlife and wildlife residences, such as dens and nests.

#### 5.2.2.2.4. Provincial Policy Statement (Vegetation Communities and Habitat)

The Provincial Policy Statement (PPS) (MMAH, 2014) informs land use planning decisions under the *Planning Act* in Ontario. While EAs are not subject to *Planning Act* approval the policy guidance and practice developed to support the Provincial Policy Statement provides a framework for assessing the functions and sensitivities of natural features. This framework was considered in evaluating potential environmental effects and the identification of mitigation measures that will reduce or eliminate the environmental effect.

Policy 2.1 of the PPS establishes a provincial interest in the protection of natural heritage features. The natural heritage features identified in the PPS that are considered in this chapter include habitat of endangered and threatened species and significant wildlife habitat (SWH). Guidance to help identify and evaluate natural heritage features is provided in the Natural Heritage Reference Manual (MNR, 2010), the Significant Wildlife Habitat Technical Guide (MNR, 2000) and the Eco-Region Criteria Schedules (MNRF 2015a) for significant wildlife habitat.

The PPS recommends criteria for determining the significance of natural heritage features. While some significant features may already be identified and mapped by MNRF, the significance of others can only be determined after field verified evaluation. While specifically developed for decisions under the *Planning Act,* the PPS and guidance documents can also be used as tools for identifying important natural features for consideration under the environmental assessment.

It should be noted that “significance” under the PPS is not associated with the term “significant” as it relates to the assessment of residual adverse environmental effects.

Development and site alteration will not be permitted in habitat of endangered species and threatened species, or in fish habitat, except in accordance with provincial and federal requirements. Endangered or threatened species have not been encountered during the baseline studies for the Project.

# 6.0 SUPPORT

## 6.1 Identification of Vegetation, Wetland and Wildlife Resources

### 6.1.1 Upland Vegetation and Wetlands

The Project development area (PDA) is located in the boreal forest, and upland vegetation and wetland ecosites are typical in this part of northern Ontario. These included coniferous forests and hardwood forests. No provincially rare or specialized habitat for upland vegetation communities were identified and there are no designated natural heritage or protected areas (i.e., provincial or national parks) within the PDA.

Wetland ecosite types are present including coniferous swamp and fen community types. These are common community types across the region, and throughout northern Ontario more broadly, and the Project assessment has determined that the functional integrity of the system will be

maintained. One sensitive, but not provincially designated as rare, wetland community was identified and has been avoided through Project design.

In total, 245 species of vascular plants were recorded with no plant SAR or SOCC identified during field investigations.

### 6.1.2 Wildlife Resources

A total of 184 wildlife species were recorded during the baseline surveys. Of the SAR and SOCC considered to be potentially occurring, six were confirmed to be either resident or breeding: Canada warbler, eastern wood-pewee, common nighthawk, northern myotis, little brown myotis, and taiga alpine butterfly. No amphibian or reptile SAR or SOCC were recorded.

Woodland caribou were not recorded and their presence is unlikely; however, the Project does occur within their historical range. As one of the goals of the provincial Caribou Conservation Plan is to develop a management strategy for the discontinuous distribution area, to enhance connectivity between the northern continuous ranges and the Coast Range (MNR 2009), the species was considered further in the Draft EIS/EA. The Project is not in an area identified as critical habitat for woodland caribou (Environment Canada 2012) and using the criteria outlined by MNRF, the area (4120.9 ha) would be classified as Category 3 habitat (remaining areas within the range; MNR 2013a).

Five provincially SWH were identified within the Project area, including: moose late winter cover; waterfowl stopover and staging habitat (aquatic); turtle wintering area; taiga alpine butterfly habitat; and waterfowl nesting habitat.

## 6.2 Competence, Training and Awareness

GGM requires that persons working under its management, including employees and contractors, have the knowledge, understanding, skills and abilities to complete work in a manner that safeguards the environment. The following actions will be established to provide worker competency, training and awareness:

- Provide wildlife awareness and safety training to Project personnel and contractors;
- Develop timing windows for vegetation clearing to avoid the breeding bird season (May 1 to August 31) and bat maternity roost period (June 1 to July 31, or as defined by local MNRF office);
- Construction manager, mine manager, environmental manager, environmental specialist/technicians, and equipment operators will undertake environmental training relevant to their roles to ensure mitigation measures are successfully implemented (see Section 5.0 for conceptual roles and responsibilities);
- Only a qualified biologist will undertake bird nest searches prior to vegetation clearing undertaken during the breeding period for migratory birds (May 1 to August 31), and to review potential bat habitat trees to make a determination on occupancy before removal during the maternity roosting period (June 1 to July 31, or as defined by local MNRF office).

# 7.0 IMPLEMENTATION OF MITIGATION MEASURES

The Conceptual Biodiversity Management and Monitoring Plan addresses planning, management and/or monitoring activities, over the mine life cycle, of vegetation and wildlife conservation and protection measures necessary to achieve an appropriate end land-use objective. The end land-use objective is outlined in the Conceptual Closure Plan and in order to meet this objective, vegetation and wildlife mitigation and management measures are implemented during Project construction and operation phases.

## 7.1 General Approach

Project planning and design and the application of mitigation measures will be used to avoid or limit environmental effects on vegetation and wildlife. Standard practices and general environmental protection measures for mining projects will address Project-related effects.

Environmental effects on upland vegetation and wetlands will result from vegetation removal in upland habitats and wetland habitats. However, following the implementation of mitigation measures described below, the Project will not alter or remove an upland vegetation community type resulting in the loss of long-term viability of that vegetation community type, and will not result in effects on a species listed on Schedule 1 of SARA or listed as threatened or endangered under the ESA. Also, the Project will not alter a wetland community type such that the long-term viability of that community type is compromised. Mitigation measures for vegetation and wetlands include those to limit adverse effects on the abundance of vegetation species of interest, overall vegetation communities, and wetland function.

One notable wetland feature was identified that partially overlaps with the Project. This sensitive wetland feature is comprised of 3 wetland ecosites (Sparse Treed Fen (B136), Intermediate Conifer Swamp (B128) and Rich Conifer Swamp (B129). The fen portion of the wetland occupies a shallow basin that covers about 40 ha and supports habitat for a SOCC butterfly (taiga alpine butterfly [*Erebia mancinus*]; provincially ranked as S3). Although the Sparse Treed Fen ecosite (B136) is not listed as provincially rare, this fen and adjacent wetland community types are considered a sensitive feature due to its size, potential habitat for the butterfly SOCC, dependence on nutrient-rich groundwater, and general wetland functions. The Project has been designed to avoid direct impacts to the sparse treed fen (B136) community. There will be no construction or vegetation removal inside the fen (B136) and it will also be protected by a buffer of upland forest and treed wetland (B034, B035, B040 and B120).

The Project will result in the loss of habitat for Canada warbler, common nighthawk, eastern wood peewee; and SWH for waterfowl nesting, stopover and staging, for moose late winter cover, for turtle wintering and for taiga alpine butterfly. Other potential effects on wildlife include mortality due to site clearing and vehicle collisions, change in wildlife movement due to sensory disturbance and Project components which may act as physical barriers. Mitigation measures for wildlife and wildlife habitat include those to limit adverse effects to wildlife habitat, wildlife mortality risk, wildlife movement, and wildlife health.

### 7.1.1 Vegetation and Wetlands

The following measures will be implemented to mitigate the direct and indirect effects of the Project on vegetation and wetlands during all Project phases:

- Exclusion of Sparse treed fen (B136) from development;
- Marking off (with flagging) sensitive areas to be avoided, daily meetings with site clearing crew to review workplans including areas to be avoided, avoid tire rutting, and limiting the overall Project footprint.
- Mechanical and/or manual vegetation removal practices will be employed when possible. If chemical application methods are needed, they will use low toxicity sprays, and subject to the following best management practices:
  - Spray when winds are light and moving away from sensitive receptors;
  - Avoid spraying when no wind is present (spray can remain suspended and move off target when wind changes;
  - Avoid spraying when relative humidity is <40% and air temperature is >25 deg Celsius (conditions that lead to rapid evaporation);
  - Maintain minimally-effective nozzle to target distance;
  - Change sprayer settings and nozzle depending on weather conditions (fine droplets are prone to evaporation and drift); regularly calibrate equipment;
  - Use drift reducing additives compatible with herbicide such as soybean oil;
- Implement erosion and sedimentation control measures;
- Installation of truck wheel washing stations to avoid tracking of mud; and
- Use of dust suppressants (e.g., water) on roadways during situations that have an increase potential to generate airborne dust.

### 7.1.2 Invasive Species

Invasive and exotic (non-native) plant species can displace native vegetation. In total, 253 species of vascular plants were recorded in the PDA and LAA, of which 91% (230 species) were native species to Ontario and 9% (23 species) were not native species. As the Project already hosts invasive and non-native species, mitigation will be focussed on reducing or eliminating potential effects on vegetation communities from the spread of these invasive species. This will include:

- using clean, coarse fill material for grading to reduce the potential for introducing or spreading non-native, or invasive plant species
- Selecting native species for revegetation and assess presence of invasive species and target removal through manual, mechanical and/or chemical methods and proper disposal.

### 7.1.3 Wildlife

The following measures will be implemented to mitigate the direct and indirect effects of the Project on wildlife and wildlife habitat during all Project phases:

- Incorporate Best Management Practices for Mineral Exploration and Development Activities and Woodland Caribou in Ontario (MNR 2013b) as feasible.
- Address incidental take of migratory birds. GGM recognizes that scheduling vegetation clearing and site preparation activities outside the breeding period for migratory birds is the best way to reduce the risk of incidental take. If activities that could result in incidental take cannot be avoided, GGM will prepare a Bird Nest Mitigation Plan that outlines how risk of incidental take will be managed in accordance with Environment and Climate Change Canada guidance.
- If an active bald eagle nest occurs within 800 m of Project construction or operation activities, develop protection measures.
- Retain actual or potential wildlife trees (e.g., cavity trees or snags) in areas where it is safe to do so.
- Consult with MNRF on the direction provided in *Ontario's White-nose Syndrome Response Plan* (MNRF 2015) and its applicability to the Project.
- Carry out the removal of structures supporting barn swallow nesting outside of the active nesting season (approximately May to August; O.Reg. 242/08, s.23.5).
- Carry out the removal of mature deciduous and mixed forest communities or buildings outside the core maternity roosting season for bats (May to August), to the extent practical. Additional mitigation may be required for occupied features or activities between May and August. This measure will also reduce the risk to other species that use trees for denning or shelter (e.g., marten).
- Implement management practices for helicopter activity around wildlife including low level flying restriction where safe to do so
- Restrict project vehicles to designated areas and limit off road use by Project personnel.
- Provide wildlife awareness and safety training to Project personnel and contractors
- Maintain the Project site, through proper handling and storage of industrial materials and debris, in a manner that reduces the risk that wildlife will encounter potential hazards, such as ropes, wires and holes
- To reduce use of the ponds by waterfowl for foraging or breeding, no vegetation will be planted on the embankments of the TMF or the water management collection ponds. Vegetation that naturally regenerates around seepage and water collection ponds and the TMF will be removed as required.
- Implement road safety measures (e.g., speed limits and signage) to reduce wildlife road mortality at potential wildlife crossings during the construction and operation phases of the Project

- Upon discovery of injured wildlife at the Project site or on Project roads take measures to protect the individual from further harm and do not perform any work in the immediate location of the injured species that would subject it to further harm. Implement required actions (e.g., contact MNRF, and if feasible assist in the capture and relocation of an injured species to a safe area and/or an appropriate care facility by the qualified person).

## 7.2 Construction

### 7.2.1 Vegetation and Wetlands

The following measures will be implemented to mitigate the direct and indirect effects of the Project on vegetation and wetlands during construction:

- Providing opportunities to Aboriginal communities for harvest of food and medicinal plants prior to construction
- Commemoration will be considered for areas of traditional vegetation to be removed. These ceremonies would be developed as per the Conceptual Archaeology and Heritage Resource Plan
- General site clearing activities will be restricted to the construction location/footprint;
- Employing mechanical vegetation removal practices when possible
- Using dust suppressants (e.g., water) on roadways during situations that have an increased potential to generate airborne dust
- Implementing erosion and sedimentation control measures
- Culverts will be installed at key locations to maintain drainage and limit potential effects down gradient.
- Discuss with the MNRF and the enhanced Forest Resource Licence holder the establishment of a forested buffer along the alignment of the Goldfield Creek diversion to the Southwest Arm Tributary and wetland B136.

### 7.2.2 Wildlife

The following measures will be implemented to mitigate the direct and indirect effects of the Project on wildlife and wildlife habitat during construction:

- Implement mitigation for the potential effects from lighting on wildlife habitat including:
  - Construction lighting will be specified to use only as much lighting as is necessary for safe and efficient construction activities
  - Use down-lighting, a technique of directing night lighting downward, to reduce potential light effects on wildlife
- Prior to construction flag environmentally sensitive areas adjacent to work areas (e.g., key habitat features such as dens, roosts, stick nests, beaver dams, hibernacula) prior to clearing and construction, and evaluate the features for additional mitigation measures (e.g., timing windows and/or setbacks)

- To the extent feasible, recover and relocate turtles and amphibians encountered during fish salvage/rescues.

## 7.3 Operation

### 7.3.1 Vegetation and Wetlands

The following measures will be implemented to mitigate the direct and indirect effects of the Project on vegetation and wetlands during operation:

- Use of dust collection/control systems to reduce potential dust emissions during ore crushing and grinding activities; and
- Enclosure of dust sources such as the mill feed ore storage area.
- Applying water sprays, chemical suppression, and application, to control fugitive dust emission from road ways
- Using dust suppressants (e.g., water) on roadways during situations that have an increased potential to generate airborne dust
- Implementation of a progressive reclamation program for facilities as possible in Project planning as per the Conceptual Closure Plan incorporating plant species of interest to Aboriginal communities where appropriate and technically feasible

Mitigation for wetland functional changes include measures proposed to reduce Project-related effects on surface water quality and groundwater. Mitigation measures are outlined in the Water Management and Monitoring Plan.

### 7.3.2 Wildlife

The following measures will be implemented to mitigate the direct and indirect effects of the Project on wildlife and wildlife habitat during operation:

- Implement road safety measures (e.g., speed limits and signage) and yield the right of way to wildlife on Project roads
- Where project site roads occur through forest or treed wetland communities, a regular vegetation cutting regime will occur along the edges of project site roads both to increase driver visibility and to reduce the attractiveness of the area for moose to browse (Tanner and Leroux, 2015)
- Implementation of a progressive reclamation program for facilities as possible in Project planning as per the Conceptual Closure Plan

## 7.4 Closure

The following measures will be implemented to mitigate the direct and indirect effects of the Project on wildlife and wildlife habitat during closure:

- Close mine shafts so that the potential for bat hibernacula is considered and the site is closed in compliance with the ESA, 2007.
- The potential for closure activities to contravene the ESA will be evaluated prior to closure and closure activities will either be conducted in ways to avoid adverse effects on a SAR or its habitat, or if that is not possible, GGM will work with MNRF to obtain required authorizations.

### 7.5 Pilot Revegetation Studies

Rehabilitation studies that may occur during operation as part of progressive rehabilitation activities are outlined in the Conceptual Closure Plan (Appendix I).

### 7.6 Revegetation

The objectives of the revegetation program is to stabilize surface materials from wind and water erosion, improve aesthetics, and establish self-sustainable vegetation growth. Specifically, the goals of the revegetation program will be:

- The surface of the TMF will be revegetated, primarily with grasses.
- The WRSA benches and plateaus will be revegetated seeding primarily with grasses and legumes, but may also include planting of conifer trees in linear islands along the benches and on the plateaus to provide seed stock as part of the long term successional development strategy.
- Disturbed ground in other areas will be revegetated based on the local ecosite, but should allow for the establishment of adjacent vegetation communities to reclaim these areas.
- The borrow source areas will be revegetated in accordance with the MNRF Best Management Practices for Aggregate Activities in Caribou Habitat where feasible.

Revegetation will occur as needed to promote erosion protection and as soon as practical after Project components are no longer actively used. Prior to revegetation, the ground surface will be prepared through scarification or ripping of compact surfaces, contouring the ground surface, placing overburden, adding soil amendments to support vegetative growth, and implementing erosion protection measures to protect the soil cover until vegetation is established.

Details of the seed mixture, mulching and fertilization requirements will be established through the progressive reclamation testing to be aligned with end landuse objectives of the Closure Plan.

# 8.0 MONITORING, EVALUATION AND REPORTING

## 8.1 Monitoring, Measurement, Analysis and Evaluation

The purpose of the Biodiversity Management Plan monitoring is to evaluate and document performance objectives as described in Section 3.2. As such, monitoring is expected to fulfil the following objectives:

- Verification of the accuracy of the effects assessment for the Project with respect to wildlife and vegetation;
- Determination of the effectiveness of measures taken to mitigate adverse effects of the Project;
- Confirm compliance with environmental approvals, permits and authorizations;

### 8.1.1 Vegetation and Wetlands

In order to confirm the effectiveness of mitigation and to verify the conclusions of the EIS/EA for upland vegetation and wetlands, a Monitoring Program will be conducted to assess potential disturbance to upland vegetation and wetlands during construction and operation, and will include:

- Project footprint tracking through construction and operation:
  - Monitoring of the limits of clearing will occur. A visual examination will occur to ensure limits are clearly marked and that the clearing works stay within demarcated areas.
  - Annual spatial mapping of the actual Project footprint using GIS with comparison to plan.
- Assess presence of invasive species and target removal through manual, mechanical and/or chemical methods and proper disposal.
- Verification of wetland effects:
  - Programs to monitor surface water and groundwater during operation of the site will be undertaken (detailed in Water Management and Monitoring Plan). This program will confirm predicted effects of the Project with respect to ground and surface water quality, changes in drainage patterns and surface water flow.
  - If this program indicates additional mitigation measures are required for water management as part of adaptive management, monitoring of the vegetation communities within the Project development area may be implemented to determine indirect effects during construction and operation phases due to: groundwater drawdown and/or changes in surface water. This program would focus on the protected fen area and may include an assessment of vegetation composition, wildlife use, ecosite type, and surface water and hydrogeology.

Monitoring to determine the success and stability of the areas that are rehabilitated will also be conducted. This program is described in the Conceptual Closure Plan.

### 8.1.2 Wildlife and Wildlife Habitat

In order to confirm the effectiveness of mitigation and to verify the conclusions of the EIS/EA for wildlife, monitoring will be conducted to assess potential effects to wildlife and wildlife habitat, and will include:

- Recording Project-related wildlife-vehicle collisions or near misses:
  - Drivers of Project-related vehicles will be encouraged to report wildlife-vehicle collisions, near misses or observations of a wildlife road mortality including details such as the circumstances of collision (date, time, road conditions, lighting, weather); characteristics of the animal(s) struck by the vehicle (species, number, injury severity); and location (detailed description of the location of incident, the surrounding habitat, UTM if possible).
- Maintaining a wildlife observation log for the Project and associated infrastructure (e.g., access roads):
  - Project personnel and contractors will be encouraged to report sightings of wildlife on and around the Project during construction and operation. In particular, discovery of occupied habitat features (e.g., active dens, beaver dams) for direction on follow-up actions.
  - Project personnel and contractors working in active zones (e.g., mine site) to relay wildlife sightings to other workers as soon as possible (e.g., by radio)
  - Project personnel and contractors to report wildlife incidents and encounters related to garbage or other attractants so that corrective action can be initiated
  - Report SAR occurrences at the Project site to the MNRF
- Monitoring wildlife use of the TMF, open aquatic areas and other key Project locations:
  - During operation of the mine, use of open aquatic areas associated with the Project such as the tailings management pond and collection ponds will be monitored for use by wildlife, with an emphasis on waterfowl and large mammals such as moose. Wildlife observed will be recorded (species, number, behaviour)
  - Through consultation, GGM recognizes that Aboriginal communities are interested in participating in a moose health (i.e. tissue sampling) monitoring study in the region. Given the large ranges of these animals and mandate of the MNRF, GGM will participate in an MNRF led study with local Aboriginal groups during Project operations.
- Monitoring wildlife use:
  - Wildlife use surveys will include periodic monitoring of breeding birds. Migratory bird populations are considered to be an appropriate biodiversity indicator. Post-construction monitoring follows the same protocols as baseline surveys, so that data will be comparable. Surveys to assess breeding bird populations during the life of the mine will be conducted following the methods used during the baseline field data collection program (Stantec, 2014; 2015; 2016, and in accordance with Environment Canada's *Updated Survey Requirements for Mining Projects* [Environment Canada, 2014]) which recommend monitoring take place at three-year intervals following the same protocols as baseline surveys. Although surveys will target breeding birds, wildlife (or signs of wildlife such as tracks, scat etc.) observed during surveys will recorded.

- Monitoring of small mammals:
  - Small mammal surveys and soil/vegetation sampling are used to model baseline concentrations and inclusion of these surveys confirm the assumptions and conclusions of the health risk assessment. This survey was completed as part of baseline work and may be undertaken again during operations.
- Monitoring compensation habitat for Barn Swallow
  - In accordance with the regulatory requirements of O. Regulation 242/08 s.23.5, compensation habitat that is required for Barn Swallow will be surveyed annually for three years to document nesting activity and structure use. Surveys will include an examination of the interior of the compensation structure, recording the number, description and location of active nests and an estimate of the number of Barn Swallows using the structure.

### 8.2 Reporting

The form and frequency of follow-up reporting will be determined as the Project progresses through EA and permitting, however, it is anticipated that those elements relevant to the Conceptual Biodiversity Management and Monitoring Plan will be assembled into a formal summary report and provided to interested parties on an annual basis during construction and operation and during closure in years when monitoring is carried out. The reporting will be used to inform adaptive management reviews. Receiving, documenting and responding to communication from external interested parties, including complaints, will also form part of reporting under this Plan.

### 8.3 Continual Improvement

Adaptive management is a planned and systematic process for continuously improving environmental management practices by learning from their outcomes. Adaptive management provides the flexibility to address/accommodate new circumstances, to adjust monitoring, implement new mitigation measures or modify existing measures.

GGM will identify and correct incidents with appropriate and lasting measures aimed to prevent reoccurrence and/or similar occurrences. The Adaptive Management Framework (Figure 8-1), provides a formalized approach to:

- formally track and monitor activities;
- report and as needed investigate incidents, including non-conformance and non-compliance events;
- develop and implement corrective and preventive actions; and
- continue monitoring and update relevant EMMPs.

Corrective actions will be assigned as appropriate, including actions to prevent their reoccurrence. Corrective actions will vary according to the results of incident investigation and in consideration of other incidents related to biodiversity.

GGM is committed to the continual improvement of its environmental management and performance. As part of the GGM Adaptive Management Framework, the Conceptual Biodiversity

Management and Monitoring Plan will be assessed annually to verify implementation and the continued suitability, adequacy and effectiveness of the Plan. The review will identify elements of this EMMP in need of revision, and evaluate performance against established performance objectives.

Figure 8-2 presents the overall approach to developing and advancing the EMMPs from the final EIS/EA to the construction Phase of the Project. The first stage of EMMP development begins with preparation of Conceptual Environmental Management Plans as part of the final EA/EIS. These Conceptual EMMPs are commitment-based and broad in their level of detail. The EMMPs guide environmental management for the Project and are progressively developed as the Project moves through the EA/EIS, permitting, and construction, and updated based on continual improvement during operations through adaptive management.

## 9.0 REFERENCES

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# 10.0 FIGURES

**Figure 8-1: Hardrock Project Adaptive Management Framework**

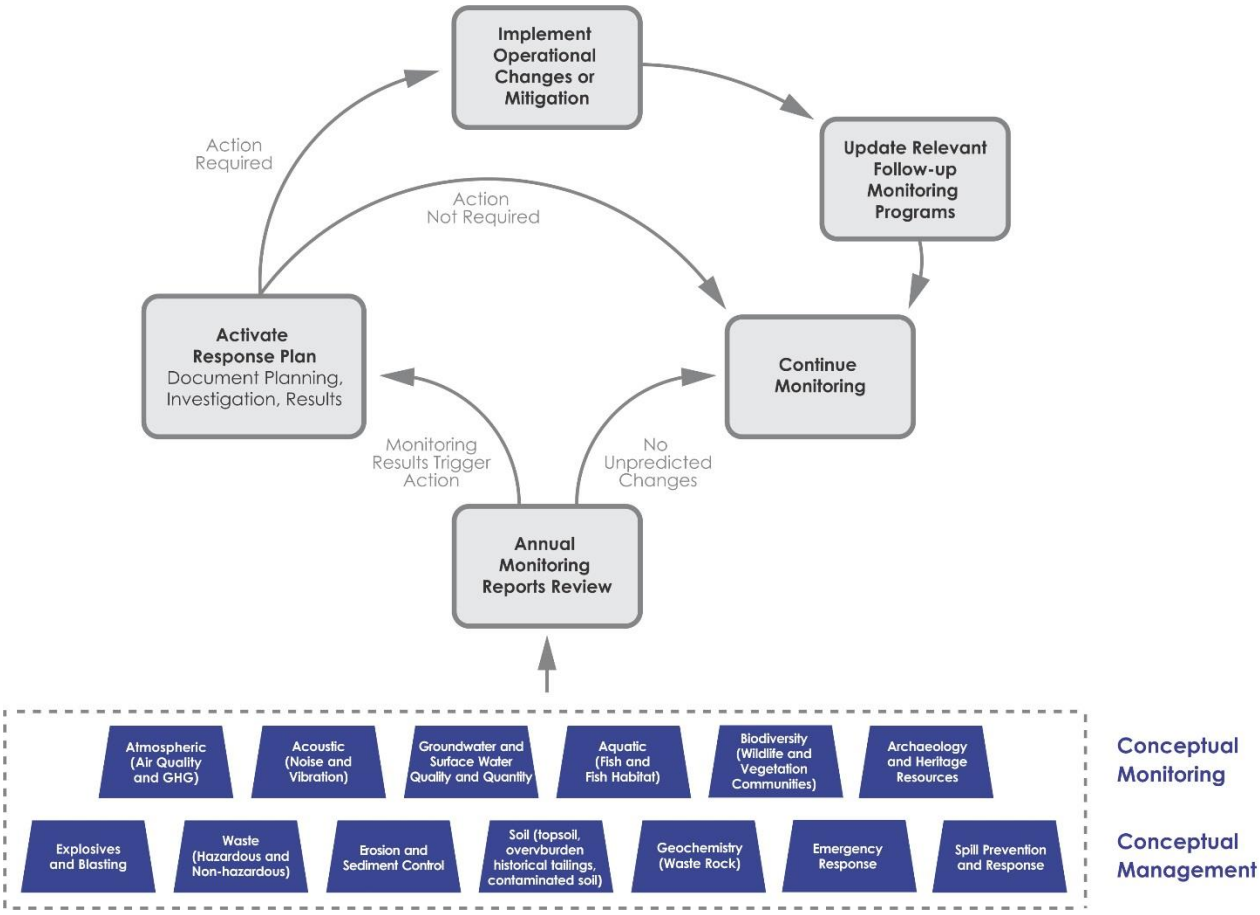

**Figure 8-2: Environmental Management and Monitoring Plan Development EA to Construction**