

**HARDROCK PROJECT
Final Environmental Impact
Statement / Environmental
Assessment:
Summary of Environmental
Effects within Federal
Jurisdiction**

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FINAL ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL ASSESSMENT:
SUMMARY OF ENVIRONMENTAL EFFECTS WITHIN FEDERAL JURISDICTION**

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1.0 SUMMARY OF ENVIRONMENTAL EFFECTS WITHIN FEDERAL JURISDICTION

This report provides a summary of environmental effects within federal jurisdiction, pursuant to Section 5 of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This report is intended to complement the information provided in the Final Environmental Impact Statement/Environmental Assessment (Final EIS/EA) for the Hardrock Project, prepared by Stantec Consulting Ltd. (Stantec) on behalf of Greenstone Gold Mines G.P. Inc. (GGM), dated June 2017 (Stantec 2017).

Section 5 of CEAA 2012 describes specific categories of direct and indirect environmental effects that must be considered in the environmental assessment. These include:

- changes to components of the environment within federal jurisdiction [Section 5(1)(a) of CEAA 2012];
- changes to the environment that would occur on federal or transboundary lands [Section 5(1)(b) of CEAA 2012];
- effects of changes to the environment on Aboriginal peoples [Section 5(1)(c) of CEAA 2012]; and
- changes to the environment that are directly linked or necessarily incidental to federal decisions, and the effects of those changes in the human environment [Section 5(2) of CEAA 2012].

A summary of federal areas of interest under CEAA 2012, and the associated potential changes to the environment, is provided in Table 1-1.

Table 1-1: Summary of Federal Areas of Interest under the *Canadian Environmental Assessment Act, 2012*

Federal Area of Concern	Potential Changes to the Environment
Changes to Components of the Environment within Federal Jurisdiction [CEAA 2012, Section 5(1)(a)]	
Fish and Fish Habitat	<ul style="list-style-type: none"> • Lethal and Sub-lethal Effects on Fish • Permanent Alteration of Fish Habitat • Loss of Fish Habitat
Aquatic Species at Risk (SAR)	<ul style="list-style-type: none"> • Aquatic SAR are included as part of the Fish and Fish Habitat VC, above
Migratory Birds	<ul style="list-style-type: none"> • Change in Habitat

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Table 1-1: Summary of Federal Areas of Interest under the *Canadian Environmental Assessment Act, 2012*

Federal Area of Concern	Potential Changes to the Environment
(subcomponent of Wildlife VC)	<ul style="list-style-type: none"> • Change in Mortality Risk • Change in Movement
Changes to the Environment that Would Occur on Federal or Transboundary Lands [CEAA 2012, Section 5(1)(b)]	
Changes on Federal Lands	<ul style="list-style-type: none"> • None
Changes on Transboundary Lands	<ul style="list-style-type: none"> • None
Changes to the Environment on Aboriginal Peoples [CEAA 2012, Section 5(1)(c)]	
Health and Socio-economic Conditions	<ul style="list-style-type: none"> • Change in Air Quality • Change in Quality and Availability of Country Foods • Change in Drinking Water Quality or Quantity • Change in Noise or Vibration Exposure
Physical and Cultural Heritage (including any structure, site or thing that is of historical, archaeological, palentological, or architectural significance)	<ul style="list-style-type: none"> • Change in Physical or Cultural Heritage
Current use of lands and resources for traditional purposes	<ul style="list-style-type: none"> • Change in Current Use
Changes to the Environment that are Directly Linked or Necessarily Incidental to Federal Decisions, and Effects of those Changes [CEAA 2012, Section 5(2)] (Required Federal Permits as Listed in Table 1-1 of the Final EIS/EA)	
<i>Fisheries Act section 35(2) authorization</i>	<ul style="list-style-type: none"> • Change in fish populations – an authorization under Section 35(2) of the <i>Fisheries Act</i> will authorize serious harm to fish by allowing fish habitat to be altered or destroyed to enable the Project to be carried out. Residual environmental effects would be offset in concert with this authorization.
<i>Metal Mining Effluent Regulations (MMER)</i>	<ul style="list-style-type: none"> • Change in fish populations – an authorization under MMER will authorize the use of fish bearing waters to deposit mine effluent, waste rock, and tailings. An environmental effects monitoring program would be required with this authorization and residual environmental effects would be mitigated.
<i>Navigation Protection Act (NPA)</i>	<ul style="list-style-type: none"> • Change in navigation - approval under the NPA would authorize interference with the public right of navigation by allowing construction of any structure in, over, under or through navigable water (e.g., a bridge, boom, pipeline, outfall, diffuser or dam).
<i>Explosives Act</i>	<ul style="list-style-type: none"> • Authorization under the <i>Explosives Regulations, 2013</i> authorizes the manufacturing, transportation, use, and storage of blasting explosives.

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Table 1-1: Summary of Federal Areas of Interest under the *Canadian Environmental Assessment Act, 2012*

Federal Area of Concern	Potential Changes to the Environment
<i>Transportation of Dangerous Goods Act (TDGA)</i>	<ul style="list-style-type: none"> Requirements under the <i>TDGA</i> are intended to minimize environmental effects from the transportation of hazardous materials.

1.1 CHANGES TO COMPONENTS OF THE ENVIRONMENT WITHIN FEDERAL JURISDICTION

Pursuant to Section 5(1)(a) of CEAA 2012, the components of the environment within the legislative authority of Parliament are:

- fish as defined in Section 2 of the *Fisheries Act* and fish habitat as defined in subsection 34(1) of that Act;
- aquatic SAR as defined in subsection 2(1) of the *Species at Risk Act* (SARA);
- migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994* (MBCA); and
- any other component of the environment that is set out in Schedule 2 of CEAA 2012.

A summary of changes to these components as a result of the Project are described below by first discussing potential effects pathways, followed by applicable mitigation to avoid or minimize effects, followed by discussion of residual effects.

1.1.1 Fish and Fish Habitat

Environmental effects on fish and fish habitat were assessed in Chapter 11 of the Final EIS/EA, entitled "Assessment of Potential Environmental Effects on Fish and Fish Habitat". A high-level summary of the environmental effects assessment as it relates to fish and fish habitat, as detailed in Chapter 11 of the Final EIS/EA, is provided below.

1.1.1.1 Potential Environmental Effects Pathways Prior to Mitigation

Potential effects pathways were identified as: lethal and sub-lethal effects on fish, permanent alteration of fish habitat, and loss of fish habitat.

Lethal and Sub-Lethal Effects on Fish

As described in Section 11.4.2.1 of the Final EIS/EA, potential pathways for lethal and sub-lethal effects on fish that have the potential to occur without the application of mitigation are categorized by Project phase.

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During construction, potential pathways for lethal and sub-lethal effects on fish are listed below:

- Mobilization and transport of sediment into fish habitat (e.g., while working near water during excavation, grading, channel construction, vegetation clearing, culvert installation and culvert removal) that results in mortality of fish eggs caused by sedimentation, or disruption of biological processes caused by high total suspended solids (TSS) (e.g., gill inflammation and limited foraging ability).
- Change in timing, duration, and frequency of flow, which can lead to change in fish mortality by displacing or stranding fish or by preventing access to spawning areas.
- Dewatering work areas, which has the potential to strand, entrain, and impinge fish.
- Destruction of fish eggs by equipment during instream work.
- Stranding of fish within a work area during isolation activities.
- Entry of deleterious materials into fish habitat through point and non-point sources.
- Use of explosives in or near water, which produces shock waves that can damage fish swim bladders and rupture internal organs and vibrations that may kill or damage eggs or larvae.

During operation, potential pathways for lethal and sub-lethal effects on fish are as follows:

- Entrainment and impingement of fish on the freshwater intake structure in Kenogamisis Lake.
- Use of explosives in or near water, which produces shock waves that can damage fish swim bladders and rupture internal organs and vibrations that may kill or damage eggs or larvae.
- Entry of deleterious materials into fish habitat through minor spills or leaks from vehicles, equipment, storage containers/facilities. Major spills are covered in Chapter 22.0 of the Final EIS/EA (potential accidents and malfunctions).
- Entry of deleterious materials into fish habitat through point and non-point sources.
- Maintenance or replacement of in-water structures (e.g., culvert replacement, maintenance of water intake structures).

During active closure, some construction activities and heavy equipment use will be required. Activities include site grading, and removal of culverts and in-water Project infrastructure (e.g., water intake and treated effluent discharge pipelines) where necessary. Although these activities will be on a smaller scale than for the construction phase, the same potential pathways will exist (except for blasting, which is not anticipated to occur during closure).

After active closure, TMF surface runoff will flow passively via a closure spillway to the Goldfield Creek diversion. Once the water level in the open pit reaches approximately 331.0 m above mean sea level (amsl) elevation, water from the pit lake will drain passively via a closure spillway into the Southwest Arm of Kenogamisis Lake.

Permanent Alteration of Fish Habitat

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As described in Section 11.4.3.1 of the Final EIS/EA, potential effects pathways for the permanent alteration of fish habitat are categorized by Project phase, and have the potential to occur without the application of mitigation or offsetting.

The following construction activities have the potential for permanent alteration of fish habitat in the absence of mitigation:

- Discharge of treated effluent, or groundwater discharge originating from the waste rock storage areas (WRSAs) and tailings management facility (TMF) into the Southwest Arm of Kenogamisis Lake could lead to permanent alteration of fish habitat by causing; a change in water temperature, a change in dissolved oxygen (DO), a change in nutrient concentrations leading to eutrophication, a change in water chemistry, a change in sediment chemistry such that ecological functions of sediments are impaired, effects on aquatic biota (phytoplankton, zooplankton, benthic invertebrates) that provide or support food sources for fish, effects on aquatic plants that provide in-water structure, cover and feeding habitat, and/or deposition of suspended sediment from treated effluent, altering the ecological function and condition of lake sediments.
- Planting riparian vegetation can lead to the permanent alteration of fish habitat through: disruption of bank material, which may lead to a change in sediment concentrations, altering canopy cover, which may change water temperature and/or altering riparian vegetation, which may result in a change in habitat structure, cover, and food and nutrient supply.
- Use of explosives in and adjacent to fish habitat can lead to the permanent alteration of fish habitat by altering shoreline and bank habitat, which may lead to a change in sediment concentrations and infilling of sediment interstitial spaces.
- Use of heavy equipment in and adjacent to fish habitat can lead to permanent alteration of fish habitat by altering bank stability and increasing erosion potential, leading to change in sediment levels.
- Use of heavy equipment in water can lead to permanent alteration of fish habitat by direct disruption/compression of substrates and in-stream cover and increasing erosion potential by disruption of natural substrates.
- Vegetation clearing can lead to the permanent alteration of fish habitat by causing: a change in habitat structure and cover, a change in sediment concentrations and/or a change in food supply.
- Altering the volume, timing, duration or frequency of flow can lead to the permanent alteration of fish habitat by: altering food supply (e.g., reduction in nutrients supporting lower trophic levels), altering bank vegetation and shoreline/bank habitat and cover, scouring of channel beds and eroding banks, leading to a change in habitat structure and cover and/or mobilization and deposition of sediment through shoreline/bank erosion.
- Dredging may be required to bury the freshwater intake and treated effluent discharge pipes in the near shore area of Kenogamisis Lake, and can lead to permanent alteration of fish habitat by causing: mobilization and deposition of sediments and/or a change in habitat structure and cover (e.g., aquatic vegetation and substrate characteristics).

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- Placement of material or structures in water (e.g., culverts, water intake pipe and treated effluent discharge pipe) can lead to the permanent alteration of fish habitat by replacing existing habitat or altering flow regimes.
- Removal of non-natural in-water structures such as existing culverts (e.g., at Goldfield Creek and at watercourse WC-L) can lead to mobilization of sediment or alter flow regimes, causing a change in habitat structure and cover.
- TMF reclaim pipeline crossings of the Goldfield Creek diversion could lead to a change in bank structure and cover or mobilization and deposition of sediment.

The following activities during operation may result in permanent alteration of fish habitat:

- Discharge of treated effluent, or groundwater discharge originating from the WRSAs and TMF into the Southwest Arm of Kenogamisis Lake could lead to permanent alteration of fish habitat by causing; a change in water temperature, a change in DO, a change in nutrient concentrations leading to eutrophication, a change in water chemistry, a change in sediment chemistry such that ecological functions of sediments are impaired, effects on aquatic biota (phytoplankton, zooplankton, benthic invertebrates) that provide or support food sources for fish, effects on aquatic plants that provide in-water structure, cover and feeding habitat, and/or deposition of suspended sediment from treated effluent, altering the ecological function and condition of lake sediments
- Water extraction (e.g., pit dewatering) can lead to the permanent alteration of fish habitat through water table drawdown effects.
- Maintenance of roads, work areas, water crossings and water intake can lead to sedimentation of watercourses.
- Use of explosives in and adjacent to fish habitat can lead to the permanent alteration of fish habitat by altering shoreline and bank habitat, which may lead to a change in sediment concentrations and infilling of sediment interstitial spaces.

The following activities during closure may lead to permanent alteration to fish habitat, including:

- continued input of nutrients to Southwest Arm of Kenogamisis Lake from the TMF, WRSA and, once the pit lake has filled, natural drainage from the pit lake area
- erosion and sedimentation caused from the removal of culverts, water intake, and other infrastructure.

Loss of Fish Habitat

As discussed in Section 11.4.4.1 of the Final EIS/EA, potential effects pathways that, unmitigated, would result in loss of fish habitat include the placement of material or structures in water can lead to loss of fish habitat by direct overprinting. Table 11-3 of the Final EIS/EA provides a description of potential effects pathways for the loss of fish habitat for individual watercourses. No Project activities that result in loss of fish habitat have been identified during operation or closure because any loss of fish habitat would have occurred during the construction phase.

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1.1.1.2 Mitigation Measures

A number of key design features have been incorporated in the design of the Project, as listed in Section 1.5 of the Final EIS/EA. For water quality and fish and fish habitat, these include, among others, relocating a portion of the historical MacLeod and Hardrock tailings to the new TMF, and implementing an enhanced cover, stability measures and seepage collection for the remaining historical MacLeod tailings to reduce seepage, provide safety and long-term stability of structures, thereby substantially reducing environmental effects to groundwater and surface water quality from these historical tailings during operation through post closure.

In addition to the key design features of the Project that are summarized in Section 1.5 of the Final EIS/EA, the mitigation measures listed in Table 1-2 below (which reproduces Table 11-9 of the Final EIS/EA) will be used to protect fish from lethal and sub-lethal effects and mitigate the permanent alteration or loss of fish habitat due to potential Project-related effects.

Table 1-2: Mitigation Measures for Fish and Fish Habitat

Mitigation Category	Mitigation Number	Mitigation Measure	Potential Project Effect		
			Lethal and Sub-lethal effects	Permanent Alteration of Fish Habitat	Loss of Fish Habitat
Project Planning (Timing)	1	Limit duration of in-water work.	✓	-	-
	2	Conduct instream work during periods of low flow (e.g., summer, fall, or winter) to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.	✓	-	-
	3	Within the construction timing window, schedule in-water work to avoid wet, windy, and rainy periods that may increase erosion and sedimentation.	✓	-	-
	4	Design and plan activities and works in waterbodies such that loss or disturbance to aquatic habitat is limited and sensitive habitats are avoided.	✓	✓	-
	5	Comply with spring timing window for in-water work. The timing window for Northwestern Ontario restricts in-water work from April 1 to June 20 for spring spawning species (e.g., Northern Pike and Walleye). This timing restriction would apply to work within and adjacent to water (i.e. within 30 m of water) for the entire Project development area (PDA). Where a timing window exemption may be required, work with MNRF and Fisheries and Oceans Canada (DFO) to seek an exemption and avoid adverse effects on fish.	✓	-	-
	6	Comply with coldwater timing window for in-water work. The timing window for Northwestern Ontario restricts in-water work between September 1 and May 31 for fall spawning species present in the LAA (e.g., Cisco and Lake Whitefish). This timing restriction would will apply to work within and adjacent to Kenogamisis Lake (i.e. within 30 m) and other work areas with the potential to affect Cisco and Lake Whitefish spawning activity. Work in Kenogamisis Lake would will follow both the spring and fall avoidance periods, unless approved beforehand by the Ministry of Natural Resources and Forestry (MNRF) and DFO, resulting in an in-water construction window of June 21	✓	-	-

Table 1-2: Mitigation Measures for Fish and Fish Habitat

Mitigation Category	Mitigation Number	Mitigation Measure	Potential Project Effect		
			Lethal and Sub-lethal effects	Permanent Alteration of Fish Habitat	Loss of Fish Habitat
		to August 30. Where a timing window exemption may be required, work with MNRF and DFO to seek an exemption and avoid adverse effects on fish.			
Project Planning (Containment and Spill Management)	7	Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals do not enter the watercourse.	✓	-	-
	8	Treat and handle building material used in water in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.	✓	-	-
	9	Follow the "Hardrock Project Conceptual Water Management and Monitoring Plan" (Conceptual WMMP; Appendix M1 of the Final EIS/EA), which been developed to divert noncontact water around Project components and to collect and manage contact water.	✓	✓	✓
	10	Implement a Spill Prevention and Response Plan immediately in the event of a sediment release or spill of a deleterious substance and an emergency spill kit will be kept onsite.	✓	✓	✓
Shoreline Revegetation and Stabilization	11	Keep clearing of riparian vegetation to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting.	-	✓	-
	12	Limit the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.	-	✓	-
	13	Design and construct approaches to waterbodies such that they are perpendicular to the watercourse to reduce loss or disturbance to riparian vegetation.	✓	✓	-

Table 1-2: Mitigation Measures for Fish and Fish Habitat

Mitigation Category	Mitigation Number	Mitigation Measure	Potential Project Effect		
			Lethal and Sub-lethal effects	Permanent Alteration of Fish Habitat	Loss of Fish Habitat
	14	Promptly stabilize shoreline or banks disturbed by activities associated with the Project to prevent erosion and/or sedimentation, preferably through revegetation with native species appropriate for the site.	✓	✓	-
	15	Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage would be restored.	-	✓	-
	16	Where replacement rock reinforcement or armouring is required to stabilize eroding or exposed areas, use appropriately-sized, clean rock, and install rock at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.	-	✓	-
	17	Remove all construction materials from site upon Project completion.	-	✓	-

1.1.1.3 Residual Environmental Effects

Lethal and Sub-Lethal Effects on Fish

As summarized in Section 11.4.2.3 of the Final EIS/EA, concentrations of parameters of potential concern (PoPCs) in the mixing zone will not be acutely lethal to fish. The magnitude of sub-lethal effects is considered low because, due to the geographic range of fish, long-term exposure is not anticipated, especially given the overall predictions of generally improved water quality on a lake-wide basis. Conservative modelling of a worst-case scenario for arsenic concentrations suggests they will be below the PWQO (100 µg/L) in treated effluent and decrease to 20 µg/L within 30 m of the treated effluent discharge location and to the CWQG-FAL and Interim PWQO (5 µg/L) within 2 km of the treated effluent discharge location. Removal of portions of the historical MacLeod and Hardrock tailings to the TMF will result in an approximately 60% decrease in arsenic concentrations in Barton Bay, Central Basin, and Outlet Basin during operation, compared to baseline, resulting in overall improvement of water quality in Kenogamisis Lake. Furthermore, baseline data from Barton Bay, where concentrations of arsenic are currently higher than those predicted for all other basins as a result of the Project, do not indicate adverse effects on fish or other aquatic species tested. The sustainability and productivity of commercial, recreational, or Aboriginal (CRA) fisheries will not be affected.

Permanent Alteration of Fish Habitat

As summarized in Section 11.4.3.3 of the Final EIS/EA, the alteration to fish habitat is predicted to be less than applicable guidelines, legislated requirements and/or federal and provincial management objectives. As noted above, predicted concentrations of arsenic at the discharge location and within 30 m of the treated effluent discharge location are lower than the Interim provincial water quality objectives (PWQO), and the trophic status, as defined in the *Lakeshore Capacity Assessment Handbook* will be maintained. Effects on sustainability and productivity of CRA fish populations within the LAA are not anticipated.

Loss of Fish Habitat

As discussed in Section 11.4.4.3 of the Final EIS/EA, with implementation of the Fisheries Offset Plan (Appendix F10 of the Final EIS/EA) including most notably the Goldfield Creek diversion that will replace some marginal habitat affected by the Project, no residual effects on fish habitat will occur as a result of loss of fish habitat. The majority of habitat loss will occur during the construction phase and the offsetting strategy will also be implemented during this time period. No further habitat losses are identified for the operation and closure phases beyond those that will occur during construction.

1.1.1.4 Summary for Fish and Fish Habitat

In summary, as was concluded in Section 11.4.5 of the Final EIS/EA, significant residual environmental effects (i.e., serious harm to fish) are those that affect the productivity and

sustainability of a CRA fishery. Through avoidance, mitigation and offsetting, the residual effects of the Project on fish and fish habitat during all phases are considered not significant. Changes to fish sustainability and productivity are not anticipated.

1.1.2 Aquatic Species at Risk

Aquatic SAR were addressed in Chapter 11 of the Final EIS/EA, Fish and Fish Habitat. As discussed in Section 11.2.2.2 of the Final EIS/EA, field studies conducted within the local assessment area (LAA) by Stantec between September 2013 and September 2016 resulted in capture of more than 6,000 fish, consisting of 25 species (as listed in Table 11-6 of the Final EIS/EA). No species identified in these or in previous studies were listed as federal or provincial SAR, nor are aquatic SAR expected to occur in the LAA.

As such, no aquatic SAR listed under the *Species at Risk Act* are known to have the potential to be affected by the Project.

1.1.3 Migratory Birds

Environmental effects on migratory birds were assessed in Chapter 13 of the Final EIS/EA, entitled "Assessment of Potential Environmental Effects on Wildlife and Wildlife Habitat". A high-level summary of the environmental effects assessment as it relates to migratory birds, as detailed in Chapter 13 of the Final EIS/EA, is provided below.

1.1.3.1 Potential Environmental Effects Pathways Prior to Mitigation

Potential key effects were identified as: change in habitat, change in mortality risk, and change in movement.

Change in Habitat

As described in Section 13.4.2.1 of the Final EIS/EA, the Project will result in the direct loss of 111 ha of confirmed and 1,742 ha of potential Canada warbler breeding habitat (Table 13-10, Figure 13-8 of the Final EIS/EA). Canada warbler is a SAR and is listed as "threatened" on Schedule 1 of SARA. An additional 620 ha is considered lost through indirect effects, though Project-specific predictions for noise suggest this estimate may be conservative. Habitat to support Canada warbler (forest and treed wetland) is common in a regional context and, through direct and indirect effects, the Project will result in an estimated loss of 1.9% of the potential Canada warbler breeding habitat within the regional assessment area (RAA).

The Project will result in the direct loss of 8 ha of confirmed and 320 ha of potential eastern wood-pewee breeding habitat (Table 13-10, Figure 13-8 of the Final EIS/EA). Eastern wood-pewee is a species of conservation concern (SOCC) and is listed as "special concern" on Schedule 1 of SARA. An additional 169 ha is conservatively considered lost through indirect effects, though Project-specific predictions for noise suggest this estimate may be conservative.

Through direct and indirect effects, the Project will result in an estimated loss of 1.7% of the potential eastern wood-pewee breeding habitat within the RAA.

The Project will result in the direct loss of barn swallow nesting habitat; two buildings that support 15 active nests will be removed (Table 13-10, Figure 13-7 of the Final EIS/EA). Barn swallow is a SAR and is listed as “threatened” under Schedule 1 of SARA. Buildings suitable to support barn swallow nesting occur in Geraldton and throughout the RAA, though the number of active nests within the RAA is unknown. The Project will also result in the direct loss of 8 ha and an indirect loss of 5 ha of Category 3 (foraging habitat) associated with the open lands surrounding the existing MTO Patrol Yard. No additional Category 1, 2 or 3 habitat for barn swallow is expected to be lost through indirect effects as the third building where barn swallow nesting was confirmed is more than 200 m from the PDA. The implementation of mitigation measures such as the creation of replacement habitat for the damage or destruction of existing structures that provide nesting habitat will reduce adverse effects to barn swallow habitat and result in no measurable change to barn swallow nesting habitat availability in the LAA.

The Project will result in the direct loss of 321 ha of common nighthawk breeding habitat within the PDA during construction (Table 13-10, Figure 13-7 of the Final EIS/EA). Common nighthawk is a SAR and is listed as “threatened” on Schedule 1 of SARA. An additional 52 ha is considered lost through indirect effects, though Project-specific predictions for noise suggest this estimate may be conservative. Through indirect and direct effects, the Project will result in an estimated loss of 20% of the potential common nighthawk breeding habitat within the RAA. However, the abundance and distribution in the RAA of the open habitat that is required by common nighthawk will fluctuate over time with the creation and regeneration of forested areas as the result of human activities (e.g., logging) and natural events (e.g., fire).

The Project will result in the direct loss of 87 ha of potential breeding habitat for non-treed wetland birds (Table 13-10, Figure 13-7 of the Final EIS/EA). An additional 77 ha is considered lost through indirect effects, though Project-specific predictions for noise suggest this estimate may be conservative. There are 7,571 ha of non-treed wetland within the RAA. Through direct and indirect effects, the Project will result in a loss of 2.2% of the potential breeding habitat for non-treed wetland birds within the RAA.

The Project will result in the direct loss of 208 ha of significant wildlife habitat for waterfowl nesting with an additional 87 ha considered lost through indirect effects. Through direct and indirect effects, the Project will result in a loss of 2.9% of the potential waterfowl nesting habitat within the RAA.

Although Project activities will result in the direct loss or alteration of migratory bird habitat through vegetation clearing, regionally these habitats are common and the percent loss of migratory bird habitat is low. Sensory disturbance to migratory birds is expected to be minimal and habitat conservatively considered lost as a result of sensory disturbance will be regained following the cessation of operations and the completion of active closure activities. Loss of

habitat and sensory disturbance is not expected to affect the long-term persistence or viability of migratory bird populations.

No new areas will experience ground disturbance as a result of operation activities, therefore no new direct loss of wildlife habitat is predicted for the operation phase.

The indirect effects (e.g., sensory disturbance), discussed above are expected to continue and be more pronounced during operation as some species might exhibit habitat avoidance because of noise and artificial lights.

During active closure, Project infrastructure, equipment, and ancillary facilities will be removed and areas directly affected by the Project will be rehabilitated. Some permanent infrastructure will remain. Once decommissioning and active rehabilitation activities are completed, most areas will become accessible again and wildlife is expected to return to the LAA and PDA. Some species (i.e., common nighthawk) may return to the PDA soon after active closure to use recently rehabilitated areas, while other species that require mature forest stands (i.e., woodland forest migratory breeding birds, including Canada warbler and eastern wood-pewee) may not return to the PDA for several years to decades following closure.

Change in Mortality Risk

As described in Section 13.4.3.1 of the Final EIS/EA, for the construction phase, vegetation and overburden clearing (including timber harvesting) is the primary effect mechanism for the change in mortality risk followed by traffic, and adverse human-wildlife encounters. These effects pathways may result in the direct mortality of migratory birds in the absence of mitigation. A similar level of onsite human activity can be conservatively assumed for the closure phase.

For the operation phase, in the absence of mitigation, traffic is the primary effect mechanism which may result in the direct mortality of wildlife as well as potential wildlife interactions with the TMF. Common nighthawk may be particularly susceptible to road mortality.

Change in Movement

The components of the Project will be crossable and are not considered to present an impermeable barrier for species that can fly, including migratory birds.

1.1.3.2 Mitigation Measures

Project planning and design and the application of proven mitigation measures will be used to reduce adverse effects on migratory birds.

Change in Habitat

As were listed in Section 13.4.2.2 of the Final EIS/EA, mitigation measures for a change in habitat include:

- Mitigation for potential effects from lighting in Chapter 7.0 of the Final EIS/EA (atmospheric environment valued component (VC)).
- Mitigation for potential effects from noise and vibration described in Chapter 8.0 of the Final EIS/EA (acoustic environment VC).
- Mitigation measures related to vegetation described in Chapter 12.0 of the Final EIS/EA (vegetation communities VC).
- Implement measures detailed in the Conceptual Closure Plan (see Appendix I of the Final EIS/EA) including the revegetation plan.
- Obtain proper authorizations under the Ontario *Endangered Species Act* (ESA), including Ontario Regulation 242/08 (as applicable) for damage or destruction of habitat protected under the ESA and implement measures required by the authorization.
- Prior to construction flag environmentally sensitive areas adjacent to work areas (e.g., key habitat features such as stick nests) prior to clearing and construction, and evaluate the features for additional mitigation measures (e.g., timing windows and/or setbacks).
- Retain actual or potential wildlife trees (e.g., cavity trees or snags) in areas where it is safe to do so.
- Managing vegetation cover along the boundaries of high activity areas (e.g., access roads) where adjacent to wildlife habitat to reduce sensory (noise and visual) disturbance.
- Avoid use of herbicides where feasible or practical.
- Progressive rehabilitation of disturbed areas used during construction.
- Use of directional light fixtures to avoid the transmission of light outside of the PDA.

Change in Mortality Risk

As discussed in Section 13.4.3.2 of the Final EIS/EA, mitigation measures for a change in mortality risk include:

- Implementation of a Biodiversity Management and Monitoring Plan (BMMP).
- Implement mitigation measures in the Conceptual Explosives and Blasting Management Plan, Conceptual Spill Prevention and Contingency Plan, and Conceptual Waste Management Plan.
- Report the discovery of active nests during all Project phases to the Project Environmental Department who will refer to the BMMP for direction on follow-up actions.
- Maintain the Project site in a manner that reduces the risk that wildlife will encounter potential hazards, such as ropes, wires and holes.
- Avoid situations that can lead to the creation of problem wildlife. Although food wastes are the typical wildlife attractant implicated in the creation of problem wildlife, there are other attractants that may be a concern, specifically roadside wildlife carcasses and vegetation. Project personnel and contractors will be required to report roadside wildlife sightings or interactions to the Project Environmental Department for initiation of follow-up actions to address these concerns.

- Report wildlife-vehicle collisions, near misses or observations of a wildlife road mortality on Project roads to the Environmental Department. Implement adaptive management measures where high frequency locations of wildlife-vehicle interactions are identified.
- Require Project personnel and contractors to report wildlife incidents and encounters related to garbage or other attractants to the Environmental Department so that corrective action can be initiated.
- Require 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).
- Implement road safety measures (e.g., speed limits and signage) and yield the right of way to wildlife on Project roads to reduce wildlife road mortality.
- 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 Environment and Climate Change Canada (ECCC) guidance.
- Carry out the removal of structures supporting barn swallow nesting outside of the active nesting season (approximately May- August; O.Reg. 242/08, s.23.5).
- Clear area of wildlife before blasting.
- 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.
- Monitor wildlife use (primarily targeting waterfowl) and water quality of the TMF, open aquatic areas and other key Project locations and implement adaptive management measures (e.g., deterrents and/or exclusionary measures) as required.

Change in Movement

There are no specific mitigation measures listed in Section 13.4.4.2 of the Final EIS/EA in relation to mitigating effects to migratory birds arising from a change in movement; however, mitigation measures above for change in habitat and change in mortality risk may also serve to mitigate effects arising from a change in movement.

1.1.3.3 Residual Environmental Effects

Change in Habitat

As discussed in Section 13.4.2.3 of the Final EIS/EA, it is predicted that vegetation clearing and sensory disturbance will result in habitat loss or alteration or a reduction in habitat patch size for the wildlife habitats assessed. For barn swallow breeding habitat, there will be no net loss of habitat, and common nighthawk breeding habitat is expected to increase upon closure. The loss of habitat is unlikely to affect the long-term persistence or viability of migratory birds in the RAA. It is expected that effects on all migratory bird habitats will be partially reversed following

the cessation of operation when migratory bird habitat considered lost as a result of avoidance due to sensory disturbance will be regained. Some migratory bird habitat will also be restored through the implementation of the Closure Plan (a Conceptual Closure Plan is provided in Appendix I of the Final EIS/EA), however, other migratory bird habitats, particularly those that are associated with wetlands and forest habitats will have some irreversible loss of habitat. Habitat conservatively considered lost as a result of sensory disturbance will be regained following the cessation of operations and the completion of active closure activities.

Change in Mortality Risk

As discussed in Section 13.4.3.3 of the Final EIS/EA, throughout construction, operation and active closure, an increased risk of mortality to migratory birds within the LAA as a result of Project activities is anticipated. Mitigation measures are expected to limit the effects on migratory bird mortality and the residual adverse effect on mortality is predicted to be within the normal variability of baseline conditions and is not expected to affect the long-term persistence or viability of migratory birds within the RAA.

No measurable residual effect resulting in direct loss and harm to migratory birds, their eggs and nests is expected following the implementation of a Bird Nest Mitigation Plan. The Bird Nest Mitigation Plan will be prepared in accordance with ECCC guidance and will include mitigation measures to minimize the risk of incidental take and to help maintain sustainable populations of migratory birds.

Change in Movement

For species that can fly (e.g., migratory birds), Project components are not expected to create an impermeable barrier and their movement is not expected to be disrupted as a result of the Project. No adverse effect on migratory bird movement is expected.

1.1.3.4 Summary for Migratory Birds

In summary, as was concluded in Section 13.4.5 of the Final EIS/EA, the residual environmental effects from the Project on migratory birds were determined to be not significant because they do not threaten the long-term persistence or viability of a migratory bird species within the RAA. Evidence to support this determination is as follows:

- No critical habitat as defined by SARA is present within the LAA; therefore, the Project does not result in loss of critical habitat for a SARA listed species.
- Canada warbler (SAR) and common nighthawk (SAR) are ranked S4B (apparently secure – uncommon, not rare) in Ontario (Table 13-6 of the Final EIS/EA) and suitable breeding habitat is common within the RAA. Birds displaced by the Project are likely to find breeding habitat elsewhere within the LAA or RAA. Potential habitat for common nighthawk is expected to increase upon closure.

- With the implementation of mitigation measures, there is no measurable effect of the Project on barn swallow (SAR) breeding habitat.
- Eastern wood-pewee (SOCC) is ranked S4B (apparently secure – uncommon, not rare) in Ontario (Table 13-6 of the Final EIS/EA) and suitable breeding habitat is common within the RAA. Birds displaced by the development are likely to find breeding habitat elsewhere within the LAA or RAA. The percentage of potential habitat lost in the RAA upon closure is 0.6%.
- The irreversible loss of bird significant wildlife habitat as a result of the Project is estimated as 42 ha (non-treed wetland bird breeding habitat) and 163 ha (waterfowl nesting habitat) and is 0.6% and 2%, respectively, of the potential habitat available within the RAA.
- The wildlife habitat types within the LAA are common within a regional context (RAA) with the loss of habitat within the RAA ranging from 0.1-2.7%. This is supported by the findings of the vegetation communities assessment regarding the ecosite types identified within the LAA (Chapter 12.0 of the Final EIS/EA; vegetation communities VC).
- Rehabilitation (which will be progressive throughout operation) will restore some wildlife habitat value to the PDA over time.
- Increased mortality risk as the result of the Project is primarily confined to the construction phase, and this risk is highest for nesting birds. Mortality risk will return to baseline levels upon closure. The actual incidence of direct mortality as the result of the Project is expected to be reduced through implementation of a suite of mitigation measures (as outlined above), in particular the implementation of timing windows for vegetation clearing and the development of a Bird Nest Mitigation Plan.

1.2 CHANGES TO THE ENVIRONMENT THAT WOULD OCCUR ON FEDERAL OR TRANSBOUNDARY LANDS

Pursuant to Section 5(1)(b) of CEAA 2012, a federal EA must consider a change that may be caused to the environment that would occur on federal lands, in a province or territory other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or outside Canada.

No effects to federal lands or other provincial or territorial lands outside of Ontario are predicted for the Project. No transboundary changes are therefore predicted for the Project.

1.3 EFFECTS OF CHANGES TO THE ENVIRONMENT ON ABORIGINAL PEOPLES

Pursuant to Section 5(1)(c) of CEAA 2012, a federal EA must consider, with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on:

- health and socio-economic conditions;
- physical and cultural heritage;
- the current use of lands and resources for traditional purposes; and

- any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

These effects are assessed in updated Appendix O of the Final EIS/EA entitled “Hardrock Project – Effects of Changes to the Environment on Aboriginal Peoples – In Accordance with Section 6.3.4 of the EIS Guidelines issued by the CEA Agency – February 2018 Update” (Stantec 2018). Further, the current use of lands and resources for traditional purposes is assessed in Chapter 18.0 of the Final EIS/EA.

The assessment of effects of changes to the environment on Aboriginal peoples is complex and difficult to summarize at a high level without providing the explicit context and information that leads the reader to the overall conclusions of that assessment. Rather than to attempt to summarize those effects here (which would be difficult to achieve in a concise manner for the purposes of this document), the reader is referred to the updated version of Appendix O of the Final EIS/EA (February 2018) for a discussion and significance conclusions of the effects of changes to the environment on Aboriginal peoples. As concluded in the updated Appendix O of the Final EIS/EA (February 2018), the effects of changes to the environment on Aboriginal health conditions, Aboriginal socio-economic conditions, Aboriginal physical and cultural heritage (including any structure, site of thing that is of historical, archaeological, paleontological, or architectural significance), and current use of lands and resources for traditional purposes were determined to be not significant.

1.4 CHANGES TO THE ENVIRONMENT THAT ARE DIRECTLY LINKED OR NECESSARILY INCIDENTAL TO FEDERAL DECISIONS

Pursuant to Section 5(2)(a) of CEAA 2012, a federal EA must evaluate changes to the environment that are directly linked or necessarily incidental to federal decisions as a result of the Project.

In addition to federal EA requirements, key federal permits and approvals potentially required for the Project and the associated consultation requirements are listed in Table 1-3 below (as reproduced from Table 1-1 of the Final EIS/EA).

Table 1-3: Key Federal Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project	Permit-Specific Consultation Requirements	Potentially Affected Valued Components
<p>Authorization for Works Affecting Fish Habitat</p> <ul style="list-style-type: none"> • Legislation: <i>Fisheries Act</i> • Responsible Agency: DFO (with some provisions administered by ECCC) 	<ul style="list-style-type: none"> • Site Preparation (removal of existing buildings infrastructure and tailings vegetation clearing, earthworks, overburden and topsoil stockpiling) 	<ul style="list-style-type: none"> • Applicants are encouraged to engage with DFO early in the planning process. • Consultation with Aboriginal communities required when the activity has 	<ul style="list-style-type: none"> • Fish and Fish Habitat • Atmospheric Environment • Acoustic Environment • Groundwater • Surface Water • Vegetation Communities

Table 1-3: Key Federal Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project	Permit-Specific Consultation Requirements	Potentially Affected Valued Components
	<ul style="list-style-type: none"> • Watercourse Crossings and Realignments • Mine Components (open pit, waste rock storage areas, water management and treatment facilities, tailings management facility [TMF]) • Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer substation, fuel supply, storage and distribution), Highway 11 realignment) • Open Pit Mining (drilling, blasting, loading and hauling of ore, waste rock, historic tailings and overburden) • Water Management (contact water collection system, process water supply) • Release of contact water and treated effluent to Kenogamisis Lake • Decommissioning • Water Management • Rehabilitation (progressive rehabilitation, active closure) 	<p>the potential to adversely affect Aboriginal or treaty rights.</p>	<ul style="list-style-type: none"> • Wildlife and Wildlife Habitat • Land and Resource Use • Heritage Resources • Traditional Land and Resource Use
<p>Metal Mining Effluent Regulations (MMER)</p>	<ul style="list-style-type: none"> • Site Preparation (removal of existing 	<ul style="list-style-type: none"> • Consultation on the MMER amendment is 	<ul style="list-style-type: none"> • Fish and Fish Habitat

Table 1-3: Key Federal Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project	Permit-Specific Consultation Requirements	Potentially Affected Valued Components
<ul style="list-style-type: none"> • Legislation: <i>Fisheries Act</i> • Responsible Agency: ECCC 	<ul style="list-style-type: none"> • buildings infrastructure and tailings vegetation clearing, earthworks, overburden and topsoil stockpiling) • Pre-Production Mining and Development of Mine Components (open pit, waste rock storage areas, ore stockpile, water management facilities, Phase 1 of TMF) • Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer substation, fuel supply, storage and distribution), Highway 11 realignment • Waste Rock Disposal • Water Management (contact water collection system, process water supply) • Release of contact water and treated effluent to Kenogamisis Lake • Tailings Management (including excavation and removal of historical tailings <i>Closure</i>) • Rehabilitation (progressive rehabilitation, active) 	<ul style="list-style-type: none"> • conducted during the EA process in order to be considered for exemption from pre-publication in Canada Gazette, Part I. • The regulatory amendment and the regulatory impact analysis statement are published in Part II of the Canada Gazette. 	<ul style="list-style-type: none"> • Atmospheric Environment • Acoustic Environment • Groundwater • Surface Water • Vegetation Communities • Wildlife and Wildlife Habitat • Land and Resource Use • Traditional Land and Resource Use

Table 1-3: Key Federal Environmental Permits / Approvals

Permits / Approvals	Activities Associated with the Project	Permit-Specific Consultation Requirements	Potentially Affected Valued Components
	closure) Environmental effects monitoring program.		
Approval of Works in Navigable Waters <ul style="list-style-type: none"> • Legislation: <i>Navigation Protection Act</i> • Responsible Agency: Transport Canada 	<ul style="list-style-type: none"> • Although none anticipated, potential interference of navigability to non-scheduled waterbodies. 	<ul style="list-style-type: none"> • Requirement for environmental review and consultation is determined by the Navigation Protection Program Officer. 	<ul style="list-style-type: none"> • Land and Resource Use • Traditional Land and Resource Use
Explosives Regulations <ul style="list-style-type: none"> • Legislation: <i>Explosives Act</i> • Responsible Agency: NRCan 	<ul style="list-style-type: none"> • Manufacturing, use/storage of blasting explosives. 	<ul style="list-style-type: none"> • Explosives permits are typically carried by specialist contractors, who would confirm consultation requirements. 	<ul style="list-style-type: none"> • Atmospheric Environment • Acoustic Environment • Surface Water • Wildlife and Wildlife Habitat • Land and Resource Use • Traditional Land and Resource Use
Transportation of Dangerous Goods <ul style="list-style-type: none"> • Legislation: <i>Transportation of Dangerous Goods Act</i> • Responsible Agency: Transport Canada 	<ul style="list-style-type: none"> • Transportation of hazardous materials. 	<ul style="list-style-type: none"> • Permits for the transportation of dangerous goods are typically carried by specialist contractors, who would confirm consultation requirements are met. 	<ul style="list-style-type: none"> • None applicable.

A discussion of potential changes to the environment that are directly linked or necessarily incidental to these federal decisions is provided in the following subsections.

1.4.1 Fisheries Act

The *Fisheries Act* administered by DFO includes prohibitions against causing “serious harm” to fish that are part of or support a commercial, recreational, or Aboriginal (CRA) fishery (Section 35) in addition to provisions for flow (Section 20), fish passage (Section 21), and deleterious substances (Section 36). Section 36 is administered by ECCC. When serious harm to fish cannot be avoided or mitigated, a subsection 35(2) authorization with appropriate offsetting of residual adverse effects is required. Section 6 of the *Fisheries Act* lists the factors taken into account by the Minister when considering the approval of an authorization, which are:

- (a) contribution of the relevant fish to the ongoing productivity of a CRA fisheries
- (b) fisheries management objectives
- (c) whether there are measures and standards to avoid, mitigate or offset serious harm to fish that are part of a CRA fishery, or that support such a fishery
- (d) the public interest.

The purpose of Section 35 and other provisions identified in Section 6 of the *Fisheries Act* relates to the sustainability and ongoing productivity of CRA fisheries. The *Fisheries Act* defines “serious harm to fish” as “the death of fish or any permanent alteration to, or destruction of, fish habitat”. These are further defined in the *Fisheries Act* as follows:

- death of fish
- permanent alteration to fish habitat of a spatial scale, duration or intensity that limits or diminishes the ability of fish to use such habitats as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes
- destruction of fish habitat of a spatial scale, duration, or intensity that fish can no longer rely upon such habitats for use as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes. For the purpose of the Final EIS/EA, destruction of fish habitat is referred to as loss of fish habitat.

Serious harm to fish that cannot be avoided can be offset, if approved by the Minister of Fisheries and Oceans, through the restoration and creation of fish habitat or other means that will replace the loss to fisheries productivity.

In order for the Project to proceed, DFO will need to issue an authorization to the Project under Section 35(2) of the *Fisheries Act* due to serious harm to fish that will be caused by the loss of fish habitat in order to make way for the construction and operation of certain components of the Project. Potential for serious harm to fish is anticipated due to the permanent alteration and/or loss of habitat in Goldfield Creek, Golf Course Pond 2, Golf Course Pond 3, WC-C, WC-D, WC-F, WC-G, WC-I, WC-M, WC-O, and WC-Z (see Table 11-13 in the Final EIS/EA). Project activities that are associated with these changes include:

- Site Preparation (removal of existing buildings infrastructure and tailings vegetation clearing, earthworks, overburden and topsoil stockpiling)
- Watercourse Crossings and Realignments
- Mine Components (open pit, waste rock storage areas, water management and treatment facilities, tailings management facility [TMF])
- Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer substation, fuel supply, storage and distribution), Highway 11 realignment)
- Open Pit Mining (drilling, blasting, loading and hauling of ore, waste rock, historic tailings and overburden)

- Water Management (contact water collection system, process water supply)
- Release of contact water and treated effluent to Kenogamisis Lake
- Decommissioning
- Water Management
- Rehabilitation (progressive rehabilitation, active closure)

Tables 11-12 and 11-14 of the Final EIS/EA provide a detailed description of how the activities listed above relate to lethal and sub-lethal effects on fish and permanent alteration to fish habitat.

Environmental effects of the Project on fish and fish habitat, including those that cause serious harm to fish, will be avoided or reduced through the implementation of mitigation measures listed in Table 1-2 above. Residual effects that remain after the application of those mitigation measures will be offset through the development of the Goldfield Creek diversion, in accordance with the "Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting" (DFO 2013) such that there are no residual effects to fish and fish habitat resulting from the Project.

Table 1-5 summarizes the effects of changes to the environment, that are directly linked or necessarily incidental to federal decisions on the Project which are required under Section 35 of the Fisheries Act. Table 1-5 also summarizes the effects of changes to the environment on:

- Health and socio-economic conditions
- Physical and cultural heritage

Any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. Thus, by issuing an authorization under Section 35(2) of the *Fisheries Act* in consideration of the effects of the Project, mitigation to be implemented, and offsetting residual effects to the extent that they are not significant, DFO will be carrying out its legislated mandate in accordance with the requirements of the *Fisheries Act* and its offsetting policies as they were intended by legislation and policy and in such a manner that the changes to the environment arising from issuing this authorization are also not significant. As such, the federal decision to be made by DFO in relation to issuing an authorization under Section 35(2) of the *Fisheries Act* will not result in significant changes to the environment, either directly or indirectly, as a result of the Project.

1.4.2 Metal Mining Effluent Regulations

The *Metal Mining Effluent Regulations* (MMER), developed under Section 36 of the *Fisheries Act* and administered by ECCC, regulate the deposit of mine waste into natural waters frequented by fish (ECCC 2016).

Water features located within the footprint of the Project are under consideration by ECCC to determine Schedule 2 triggers under the MMER. If required, part of the process associated with adding a waterbody to Schedule 2 is the development of an alternatives assessment report and fish habitat compensation plan as per Section 27.1 of the MMER, to offset the loss of fish habitat resulting from the deposition of the deleterious substances into naturally occurring fish bearing waters. Normally, an offsetting plan and authorization issued pursuant to Section 35(2) of the *Fisheries Act* are also sufficient for the purpose of compensating for loss of fish habitat as a result of the MMER Schedule 2 amendment. Additional fisheries values affected by the Project due to works, undertakings or activities (e.g., dewatering, open pit development, creek diversion) other than mine waste deposition, have been identified by the DFO to likely result in serious harm to fish as per Section 35 of the *Fisheries Act*, and as such will also require compensatory measures through implementation of a fisheries offset plan (discussed in Section 1.4.1 above).

Offset ratios are determined by DFO and take into consideration the types of fisheries resources affected, the magnitude and extent of the impacts, the types of offsetting proposed and potential delays between impacts occurring and the implementation of offsetting measures. GGM intends to construct the realigned Goldfield Creek and fisheries offsets early in the project development, thereby minimising any delay between impacts and offsets. The proposed offsetting approach (Draft Offset Plan included as Appendix F10 to the Final EIS/EA) achieves a positive balance to replacing fish habitat that supports game and sustenance fish communities in Kenogamisis Lake. Discussions with ECCC and DFO have confirmed that GGM will work in cooperation with DFO to develop an acceptable combined fisheries offset plan that will include compensation fish habitat if required for Schedule 2 waterbody impacts, and fisheries offset measures for the effects arising from Section 35 authorization.

The regulations form the basis of the federal mine effluent standards by, among other requirements, defining authorized limits for releasing selected deleterious substances outlined in Schedule 4 of the Regulations (pH, total suspended solids, arsenic, copper, lead, nickel, zinc, radium-226, cyanide), from mining operations. The release of contact water and treated effluent to Kenogamisis Lake is subject to the MMER. Effluent will be treated to levels that are not acutely toxic to fish, and will be below MMER effluent criteria as described in Section 10.4.3.2 of Chapter 10.0 (surface water VC) of the Final EIS/EA for modelled effluent criteria for the effluent treatment plant (ETP). Therefore, mitigation will reduce the magnitude of effects, and no residual environmental effects are expected.

Table 8-1 of Appendix M12 of the Final EIS/EA provides a summary of conceptual monitoring activities that will be carried out in accordance with environmental effects monitoring (EEM) requirements.

Potential changes to the environment related to authorization under the *Metal Mining Effluent Regulations* (MMER), developed under Section 36 of the *Fisheries Act* would result from the following Project activities:

Construction

- Site Preparation (removal of existing buildings infrastructure and tailings vegetation clearing, earthworks, overburden and topsoil stockpiling)
- Pre-Production Mining and Development of Mine Components (open pit, waste rock storage areas, ore stockpile, water management facilities, Phase 1 of TMF)
- Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer substation, fuel supply, storage and distribution), Highway 11 realignment

Operation

- Waste Rock Disposal
- Water Management (contact water collection system, process water supply)
- Release of contact water and treated effluent to Kenogamisis Lake
- Tailings Management (including excavation and removal of historical tailings)

Closure

- Rehabilitation (progressive rehabilitation, active closure))

Table 1-5 summarizes the effects of changes to the environment, that are directly linked or necessarily incidental to federal decisions on the Project which are required under Section 36 of the Fisheries Act. Table 1-5 also summarizes the effects of changes to the environment on:

- Health and socio-economic conditions
- Physical and cultural heritage

Any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. These changes will be avoided or reduced through the implementation of mitigation measures identified in Table 1-5 as well as through offsetting for the residual effects associated with the loss of fish habitat through the Goldfield Creek diversion so that effects are not significant. EEM studies under Schedule 5 of the MMER and the application and enforcement of discharge limits under Schedule 4 of the MMER are routine operational and monitoring activities for mines that do not result in significant environmental effects as long as requirements are met.

1.4.3 Navigation Protection Act

Potential effects of Project activities on navigation are subject to the Common Law right to navigation. In addition, the *Navigation Protection Act* (NPA), administered by Transport Canada, applies to the construction of works that affect the navigability of waters. Approval from the Minister of Transport is required for construction of any structure in, over, under or through navigable water (e.g., a bridge, boom, pipeline, outfall, diffuser or dam) that would interfere with navigation.

In the local assessment area (LAA), navigation is reported to occur in conjunction with recreational boating, including canoeing, and the use of Aboriginal travelways. Navigation may be associated with other activities such as fishing, hunting, bait harvesting, trapping and guide outfitting. Although navigation may be carried out for commercial purposes such as harvesting there are no commercial navigation activities, such as ferry services or water transport operations, in the LAA. None of the watercourses in the RAA are listed on the NPA schedule of navigable waters. None of the watercourses in the PDA or LAA are listed on the NPA schedule of navigable waters. Navigation has not been confirmed within the PDA through consultation input, TK and TLRU studies or observations made during fieldwork (Table 16-7 of the Final EIS/EA). Transport Canada has reviewed the Final EIS/EA documents and confirmed that there are no waterways within the Project site that are listed on the Schedule to the NPA, and therefore regulatory authorization under the NPA is not required for works on navigable waterways. As such, given that no federal decision is required by the Minister of Transport under the NPA, no significant changes to the environment, either directly or indirectly, as a result of the Project are anticipated.

1.4.4 Explosives Act

Explosives needed for the Project will be prepared in a dedicated explosives manufacturing facility in which a licence will be required as per *Part 5* of the *Explosives Regulations, 2013* under the federal *Explosives Act*. The facility will be constructed and operated by an explosives contractor and will be sited in accordance with Natural Resources Canada (NRCan) requirements by the explosives contractor. The facility will store bulk ingredients required for producing the emulsion explosives used in blasting activities for the Project. It will be equipped to deal with spills of hazardous materials.

Specifications for the manufacturing plant and the explosives storage magazines and the locations of these facilities must adhere to the *Explosives Act* and regulations as published by the Explosives Regulatory Division of NRCan. The location of the manufacturing plant and the explosives magazines are determined by NRCan's Quantity-Distance Principles, which specify required distances to features such as roads and buildings. The location of the manufacturing plant and explosives magazines will be reviewed and approved by NRCan.

Magazines will be utilized in the PDA to store packaged explosive products and blasting accessories at the Project in which a magazine licence will be required as per *Part 6* of the *Explosives Regulations, 2013*. Magazines will be kept locked when an authorized person is not present. Clearly visible signage according to NRCan standards will be posted on the magazines and warning signs will be on the road approaching the storage areas. The magazines will be dedicated to storing blasting accessories such as boosters, delays, detonating cord and detonators, as well as a limited quantity of packaged explosives for specialty blasting purposes. The detonators and delays will be stored in a separate magazine as required by regulations.

Access to the magazines will be restricted by a locked gate to authorized personnel and logbooks will be kept in each magazine for tracking purposes. The magazines will be supplied by owner/operator and permitted in coordination with the contractor.

Table 1-5 summarizes the effects of changes to the environment, that are directly linked or necessarily incidental to federal decisions on the Project which are required under the *Explosives Act*. Table 1-5 also summarizes the effects of changes to the environment on:

- Health and socio-economic conditions
- Physical and cultural heritage

Any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. With the implementation of the above-noted mitigation measures, no residual environmental effects are expected from the issuance of licences under the *Explosives Regulations, 2013* and the *Explosives Act*. As such, the federal decision to be made by NRCan to issue an authorization to the Project under the *Explosives Act* and its regulations will not result in significant changes to the environment, either directly or indirectly, as a result of the Project.

1.4.5 Transportation of Dangerous Goods Act

It is expected that materials transported to the mine site will include various dangerous goods (e.g., mill reagents, fuel, explosives) which will be subject to the requirements of the TDGA and regulations. A description of fuel and hazardous materials transportation and storage is provided in Section 5.4.21 of the Final EIS/EA. The transportation of dangerous goods to the Project site will be undertaken by third party carriers according to applicable guidelines, acts and regulations.

Fuel storage and distribution infrastructure will be constructed to current engineering standards and in accordance with federal and provincial requirements including the Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME 2003) and the National Fire Code of Canada (National Research Council Canada 2015).

Mill reagents will be delivered to the Project in accordance with *Transportation of Dangerous Goods Regulations* and stored onsite in secure locations. Some reagents will be delivered in bulk, while other reagents will be delivered in super bags, tote bins or drums, depending on the application. Management of cyanide reagent will be in accordance with the recommendations and principles of the *International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold* (International Cyanide Management Institute 2002).

Table 1-5 summarizes the effects of changes to the environment, that are directly linked or necessarily incidental to federal decisions on the Project which are required under the *Transportation of Dangerous Goods Act*. Table 1-5 also summarizes the effects of changes to the environment on:

- Health and socio-economic conditions
- Physical and cultural heritage
- Any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

The transportation of dangerous goods occurs throughout Canada on a regular basis and the applicable regulations are well understood by carriers. No residual environmental effects are expected to occur from the transportation of dangerous goods for the Project, except in the unlikely event of an accident. Regardless, given these routine matters, the federal decision to subject the Project to, and monitor compliance with, the TDGA will not result in significant changes to the environment, either directly or indirectly, as a result of the Project.

1.4.6 Summary

As noted above, in order for the Project to proceed, federal actions are required in relation to the *Fisheries Act*, *Metal Mining Effluent Regulations*, *Navigation Protection Act*, *Explosives Act*, and *Transportation of Dangerous Goods Act*. In carrying out their legislated mandates under these Acts, the Government of Canada and its respective federal authorities would be basing their federal decisions to issue authorizations, and in view of the no significant adverse effects from the Project after mitigation or offsetting measures have been applied. In all cases, the environmental effects of the Project on the related valued components that are associated with those federal actions were determined to be not significant. It therefore follows that, any change to the environment that is directly linked or necessarily incidental to those federal decisions as a result of the Project, are also not significant. In fact, considering the key design features of the Project including relocating a portion of the historical tailings, and implementing an enhanced cover, stability measures and seepage collection for the remaining historical MacLeod tailings to reduce seepage, will substantially reduce environmental effects to water quality from these historical tailings and thus result in an overall improvement in water quality in Kenogamisis Lake, with reduced concentrations of many parameters on a lake-wide basis.

Overall, changes to the environment from the Project that are directly linked or necessarily incidental to a federal decision are not predicted to be significant.

1.4.7 Effects of a Change to the Environment

Pursuant to Section 5(2)(b) of CEEA 2012, a federal EA must evaluate changes to the environment that are directly linked or necessarily incidental to federal decisions as a result of the Project that result in an effect to health or socio-economic conditions, physical and cultural heritage, or any site or thing that is of historical, archaeological, paleontological or architectural significance.

Potential federal permits related to the Project were listed in Table 1-3 and include:

- Authorization for serious harm to fish under Section 35(2) of the *Fisheries Act*

- Amendment to Schedule 2 of the *Metal Mining Effluent Regulations* to include the TMF and WRSAs as approved disposal facilities
- Authorization under the *Navigation Protection Act* for effects on navigation
- Explosives permits under the *Explosives Act*
- Compliance with the *Transportation of Dangerous Goods Act*.

As summarized in Table 1-5, with mitigation, changes to the environment from the Project that are directly linked or necessarily incidental to a federal decision are not predicted to result in an effect to health or socio-economic conditions, physical and cultural heritage, or any site or thing that is of historical, archaeological, paleontological or architectural significance.

1.5 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

No Project-related significant adverse residual environmental effects were identified through the environmental effects assessment. As summarized in Tables 1-4 and 1-5 below, all Project-related environmental effects were determined to be not significant.

Table 1-4: Summary of Environmental Effects within Federal Jurisdiction

Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Components and Physical Activities	Mitigation	Residual Effect
Changes to Components of the Environment within Federal Jurisdiction [CEAA 2012, Section 5(1)(a)]					
Fish and Fish Habitat	s. 5(1)(a)(i)	Lethal and sub-lethal effects on fish	Mobilization and transport of sediment into fish habitat (e.g., while working near water during excavation, grading, channel construction, vegetation clearing, culvert installation and culvert removal) that results in mortality of fish eggs caused by sedimentation, or disruption of biological processes caused by high TSS (e.g., gill inflammation and limited foraging ability).	see Table 1-2	<p>Sub-lethal effects on fish due to PoPC inputs from treated effluent and non-point sources:</p> <ul style="list-style-type: none"> Concentrations of parameters of potential concern (PoPCs) in the mixing zone will not be acutely lethal to fish. The magnitude of sub-lethal effects is considered low because, due to the geographic range of fish, long-term exposure is not anticipated, especially given the overall predictions of generally improved water quality on a lake-wide basis. Removal of portions of the historical MacLeod and Hardrock tailings to the TMF will result in an approximately 60% decrease in arsenic concentrations in Barton Bay, Central Basin, and Outlet Basin during operation, compared to baseline, resulting in overall improvement of water quality in Kenogamisis Lake. Furthermore, baseline data from Barton Bay, where concentrations of arsenic are currently higher than those predicted for all other basins as a result of the Project, do not indicate adverse effects on fish or other aquatic species tested. The sustainability and productivity of commercial, recreational, or Aboriginal (CRA) fisheries will not be affected. Effects were determined to be not significant.
			Change in timing, duration, and frequency of flow, which can lead to change in fish mortality by displacing or stranding fish or by preventing access to spawning areas.		
			Dewatering work areas, which has the potential to strand, entrain, and impinge fish.		
			Destruction of fish eggs by equipment during instream work.		
			Stranding of fish within a work area during isolation activities.		
			Entry of deleterious materials into fish habitat through point and non-point sources.		
			Use of explosives in or near water, which produces shock waves that can damage fish swim bladders and rupture internal organs and vibrations that may kill or damage eggs or larvae.		
			Entrainment and impingement of fish on the freshwater intake structure in Kenogamisis Lake.		
			Entry of deleterious materials into fish habitat through minor spills or leaks from vehicles, equipment, storage containers/facilities.		
			Maintenance or replacement of in-water structures (e.g., culvert replacement, maintenance of water intake structures).		
		Permanent alteration of fish habitat	Discharge of treated effluent, or groundwater discharge originating from the WRSAs and TMF into the Southwest Arm of Kenogamisis Lake		<p>Permanent alteration of fish habitat due to nutrient inputs from treated effluent and non-point sources:</p> <ul style="list-style-type: none"> The alteration to fish habitat is predicted to be less than applicable guidelines, legislated requirements and/or federal and provincial management objectives. Predicted concentrations of arsenic at the discharge location and within 30 m of the treated effluent discharge location are lower than the Interim provincial water quality objectives (PWQO), and the trophic status, as defined in the <i>Lakeshore Capacity Assessment Handbook</i> will be maintained. Effects on sustainability and
			Planting riparian vegetation		
			Use of explosives in and adjacent to fish habitat		
			Use of heavy equipment in and adjacent to fish habitat		
			Use of heavy equipment in water		
			Vegetation clearing		
			Altering the volume, timing, duration or frequency of flow		
			Dredging which may be required to bury the freshwater intake and treated effluent discharge pipes in the near shore area of Kenogamisis Lake		
			Placement of material or structures in water (e.g., culverts, water intake pipe and treated effluent discharge pipe)		

Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Components and Physical Activities	Mitigation	Residual Effect	
Fish and Fish Habitat Cont.			Removal of non-natural in-water structures such as existing culverts (e.g., at Goldfield Creek and at WC-L) can lead to mobilization of sediment or alter flow regimes, causing a change in habitat structure and cover.		productivity of CRA fish populations within the LAA are not anticipated. Effects were determined to be not significant.	
			TMF reclaim pipeline crossings of the Goldfield Creek diversion could lead to a change in bank structure and cover or mobilization and deposition of sediment.			
	s. 5(1)(a)(i) Cont.	Permanent alteration of fish habitat Cont.	Water extraction (e.g., pit dewatering)			No residual effect expected. With implementation of the Fisheries Offset Plan (Appendix F10 of the Final EIS/EA) including most notably the Goldfield Creek diversion that will replace some marginal habitat affected by the Project, no residual effects on fish habitat will occur as a result of loss of fish habitat. The majority of habitat loss will occur during the construction phase and the offsetting strategy will also be implemented during this time period. No further habitat losses are identified for the operation and closure phases beyond those that will occur during construction.
			Maintenance of roads, work areas, water crossings and water intake			
			Continued input of nutrients to Southwest Arm of Kenogamisis Lake from the TMF, WRSA and, once the pit lake has filled, natural drainage from the pit lake area			
			Erosion and sedimentation caused from the removal of culverts, water intake, and other infrastructure.			
Loss of Fish Habitat	Placement of fill and structures in water can lead to the loss of fish habitat direct by directly overprinting.					
	Contact water collection system, process water supply					
Aquatic Species at Risk	s. 5(1)(a)(iii)	N/A - No aquatic SAR listed under the Species at Risk Act are known to have the potential to be affected by the Project	N/A	N/A	N/A	
Migratory Birds	s. 5(1)(a)(iii)	Change in habitat	Site Preparation (removal of existing buildings and associated infrastructure, timber harvesting, vegetation clearing, earthworks, overburden and topsoil stockpiling, temporary effluent treatment and discharge)	Table 1-2	Project activities will result in the direct loss or alteration of migratory bird habitat through vegetation clearing. <ul style="list-style-type: none"> For barn swallow breeding habitat and American white pelican stopover and foraging habitat there will be no net loss of habitat and common nighthawk breeding habitat is expected to increase upon closure. Regionally these habitats are common and the percent loss of migratory bird habitat is low and is not expected to affect the long-term persistence or viability of migratory bird populations. 	
			Watercourse Crossings and Goldfield Creek Diversion			
			Pre-Production Mining and Development of Mine Components (open pit, waste rock storage areas (WRSA), ore stockpile, water management facilities, Phase 1 of TMF)	see Section 1.1.3.2		
			Buildings and Supporting Infrastructure (process plant, temporary camp, STP, mine dry, administration building, truckshop, warehouse and offices, power plant)			
			Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer station, fuel supply, storage and distribution)			
			Highway 11 Realignment and MTO Patrol Yard Relocation			

Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Components and Physical Activities	Mitigation	Residual Effect
Migratory Birds Cont.			Aggregate Sources (excavation and dewatering related to aggregate source development and extraction)	see Section 1.1.3.2	<ul style="list-style-type: none"> Sensory disturbance to migratory birds is expected to be minimal and is not expected to affect the long-term persistence or viability of migratory bird populations.
			Open Pit Mining (drilling, blasting, loading and hauling of ore and waste rock)		
			Waste Rock Disposal		
		Change in habitat Cont.	Ore Processing (ore crushing and conveyance, ore milling)		<ul style="list-style-type: none"> Habitat conservatively considered lost as a result of sensory disturbance will be regained following the cessation of operations and the completion of active closure activities. Effects were determined to be not significant.
			Site Buildings, Linear Facilities and Associated Infrastructure (site roads, power plant, explosives facility, fuel supply, storage and distribution)		
			Active Closure (primary decommissioning and rehabilitation)		
			Post-Closure (pit filling and monitoring)		
		Change in Mortality Risk	Site Preparation (removal of existing buildings and associated infrastructure, timber harvesting, vegetation clearing, earthworks, overburden and topsoil stockpiling, temporary effluent treatment and discharge)		<p>Increase in mortality risk to migratory birds:</p> <ul style="list-style-type: none"> Throughout construction, operation and active closure, an increased risk of mortality to wildlife within the LAA as a result of Project activities is anticipated. With the implementation of the mitigation measures, the residual adverse effect on wildlife mortality is predicted to be within the normal variability of baseline conditions and is not expected to affect the long-term persistence or viability of wildlife within the RAA. Mitigation measures are expected to limit the effects on migratory bird mortality. No measurable residual effect resulting in direct loss and harm to migratory birds, their eggs and nests is expected following the implementation of a Bird Nest Mitigation Plan. The Bird Nest Mitigation Plan includes appropriate preventive and mitigation measures to minimize the risk of incidental take and to help maintain sustainable populations of migratory birds. Effects were determined to be not significant.
			Watercourse Crossings and Goldfield Creek Diversion		
			Pre-Production Mining and Development of Mine Components (open pit, waste rock storage areas (WRSAs), ore stockpile, water management facilities, Phase 1 of TMF)		
			Buildings and Supporting Infrastructure (process plant, temporary camp, STP, mine dry, administration building, truckshop, warehouse and offices, power plant)		
			Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer station, fuel supply, storage and distribution)		
			Highway 11 Realignment and MTO Patrol Yard Relocation		
Aggregate Sources (excavation and dewatering related to aggregate source development and extraction)					
Open Pit Mining (drilling, blasting, loading and hauling of ore and waste rock)					
Tailings Management (including excavation and removal of historical tailings)					
Site Buildings, Linear Facilities and Associated Infrastructure (site roads, power plant, explosives facility, fuel supply, storage and distribution)					
Active Closure (primary decommissioning and rehabilitation)					
Change in Movement	N/A	<p>No residual effect expected.</p> <p>For species that can fly (e.g., migratory birds), Project components are not expected to create an impermeable barrier and their movement is not expected to be disrupted as a result of the Project. No adverse effect on migratory bird movement is expected.</p>			

Table1-4: Summary of Environmental Effects within Federal Jurisdiction

Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Components and Physical Activities	Mitigation	Residual Effect
Changes to the Environment that Would Occur on Federal or Transboundary Lands [CEAA 2012, Section 5(1)(b)]					
Changes on Federal Lands	s. 5(1)(b)(i)	N/A	N/A. No Project components or physical activities will result in changes on federal lands.	N/A	No residual effect expected.
Changes on Transboundary Lands	s. 5(1)(b)(ii) s. 5(1)(b)(iii)	N/A	N/A. No Project components or physical activities will result in changes in another province or territory, or outside Canada.	N/A	No residual effect expected.
Changes to the Environment on Aboriginal Peoples [CEAA 2012, Section 5(1)(c)]					
Effects of Changes to the Environment on Aboriginal Peoples	s. 5(1)(c) (i) to (iv)	Aboriginal Health Conditions	Construction, Operation, and Closure of all Project components.	Please refer to the updated Appendix O.	Please refer to the updated Appendix O. Effects were determined to be not significant.
		Aboriginal Socio-economic Conditions			
		Aboriginal Physical and Cultural Heritage (including any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance)			
		Current Use of Lands and resources for Traditional Purposes by Aboriginal Peoples			
Environmental Effects under CEAA, 2012:					
5(1)					
(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:					
(i) fish as defined in section 2 of the <i>Fisheries Act</i> and fish habitat as defined in subsection 34(1) of that Act,					
(ii) aquatic species as defined in subsection 2(1) of the <i>Species at Risk Act</i> ,					
(iii) migratory birds as defined in subsection 2(1) of the <i>Migratory Birds Convention Act, 1994</i> , and					
(iv) any other component of the environment that is set out in Schedule 2 of [CEAA, 2012];					
(b) a change that may be caused to the environment that would occur					
(i) on federal lands,					
(ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or					
(iii) outside Canada; and					
(c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on					

Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Components and Physical Activities	Mitigation	Residual Effect
<p>(i) health and socio-economic conditions, (ii) physical and cultural heritage, (iii) the current use of lands and resources for traditional purposes, or (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.</p> <p>Certain additional environmental effects must be considered under section 5(2) of CEAA, 2012 where the carrying out of the physical activity, the designated project, or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA, 2012.</p> <p>5(2) (a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and (b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on (i) health and socio-economic conditions, (ii) physical and cultural heritage, or (iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.</p>					

Table 1-5: Changes to the Environment that are Directly Linked or Necessarily Incidental to Federal Decisions, and Effects of those Changes (CEAA 2012, 5(2))

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
			Health and Socio-Economic Conditions	Physical and Cultural Heritage and Any Structure, Site or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance	
<p>Authorization to carry out a proposed work, undertaking or activity causing serious harm to fish under section 35(2)(b) of the <i>Fisheries Act</i></p>	<p>The Project has potential to result in the following environmental effects due to:</p> <p><i>Construction</i></p> <ul style="list-style-type: none"> • Site Preparation (removal of existing buildings infrastructure and tailings vegetation clearing, earthworks, overburden and topsoil stockpiling) • Watercourse Crossings and Realignment • Mine Components (open pit, waste rock storage areas, water management and treatment facilities, tailings management facility [TMF]) • Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer substation, fuel supply, storage and distribution), Highway 11 realignment <p><i>Operation</i></p> <ul style="list-style-type: none"> • Open Pit Mining (drilling, blasting, loading and hauling of ore, waste rock, historic tailings and overburden) • Water Management (contact water collection system, process water supply) • Release of contact water and treated effluent to Kenogamisis Lake • Water Management <p><i>Closure</i></p> <ul style="list-style-type: none"> • Decommissioning • Rehabilitation (progressive rehabilitation, active closure) <p>Tables 11-12 and 11-14 of the Final EIS/EA provides a detailed description of how the activities listed above relate to lethal and sub-lethal effects on fish and permanent alteration to fish habitat.</p>				
	<p>VC: Fish and Fish Habitat (Chapter 11.0)</p> <ul style="list-style-type: none"> • Lethal and sub-lethal effects on fish • Permanent alteration to fish habitat • Loss of fish habitat 	<p>Refer to fish and fish habitat in Table 1-4: Summary of Environmental Effects within Federal Jurisdiction above.</p>	<p>Changes in fish and fish habitat due to Project activities is not predicted to have an effect on health because changes in total ingestion exposures to metals between Baseline Case and Future Case conditions represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).</p> <p>No effect on socio-economic conditions is anticipated because overall, there will be no net loss of areas for fishing as a result of the Project (Section 16.4.2.3 of the Final EIS/EA) and there are no Project-related effects on the sustainability and productivity of CRA fisheries within the LAA are anticipated as a result of the Project (Section 16.4.3.1 of the Final EIS/EA).</p>	<p>The evaluation of cultural heritage value or interest (CHVI) undertaken for the Baseline Report - Cultural Heritage (Appendix E13) and for the addendum contained in the HIA TDR (Appendix F11) identified 18 architectural and/or historical resources (referred to as cultural heritage resources [CHR]), within the PDA which may be affected by the Project (see Error! Reference source not found.).</p> <p>Since areas containing potential historical and/or architectural resources were investigated prior to the construction phase, it is unlikely that any undocumented architectural and/or historical resources will be affected during the operation phase.</p> <p>It is anticipated that the MacLeod and Hardrock townsites will be removed during the construction phase as will the MacLeod-Cockshutt Mining Headframe and the Discover Geraldton Interpretive Centre. The Kenogamisis Golf Club will undergo a change in land use as result of waste rock deposition. One identified Euro-Canadian architectural and/or historical resource, CHR 1 (the property</p>	<p>Conceptual Aquatic Management and Monitoring Plan (Appendix M12 of the Final EIS/EA)</p>
	<p>VC: Atmospheric Environment (Chapter 7.0)</p> <ul style="list-style-type: none"> • Change in ambient air quality 	<ul style="list-style-type: none"> • Implementation of Air Quality Management and Monitoring Plan including a best management plan (BMP) to control fugitive dust from the Project. • Use of dust suppressants (e.g., water) during situations that have an increased potential to generate airborne dust. • Limit vehicle speeds. • Effective and timely equipment maintenance to maintain mining equipment in good working condition. 	<p>No effect on health or socio-economic conditions predicted because overall, the increases in exposures that result from Project-related changes in air quality represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).</p>	<p>Conceptual Air Quality Management and Monitoring Plan (Appendix M7 of the Final EIS/EA)</p>	

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
			Health and Socio-Economic Conditions	Physical and Cultural Heritage and Any Structure, Site or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance	
<p>Authorization to carry out a proposed work, undertaking or activity causing serious harm to fish under section 35(2)(b) of the <i>Fisheries Act</i></p> <p>Contd</p>		<ul style="list-style-type: none"> Administrative controls, including a no idling policy to reduce mobile equipment and other-use vehicle emissions. 		located at 495 Hardrock Road), that is located outside of the PDA will be avoided. The landscape surrounding the residence is anticipated to change as the Project will encroach on the property. All other identified Euro-Canadian architectural and/or historical resources in the PDA will be subject to removal due to construction.	
	VC: Acoustic Environment (Chapter 8.0) <ul style="list-style-type: none"> Change in noise levels 	<ul style="list-style-type: none"> Noise mitigation measures (e.g., muffler systems) will be installed on construction and other mobile equipment and equipment will be properly maintained. Select equipment and/or design acoustical enclosures to limit overall noise emissions. 	Project noise emissions in the LAA will not exceed the applicable criteria for each Point of Reception during the construction phase (Section 8.4.2.3 of the Final EIS/EA) and therefore no effect on health and socio-economic conditions is anticipated.	There is no effect anticipated as effects on archaeological resources will be avoided since archaeological assessment programs will be conducted in areas of archaeological potential prior to ground disturbance activities (Section 17.4.2.2 of the Final EIS/EA)	Noise and Vibration Management and Monitoring Plan (a conceptual plan is included as Appendix M10)
	VC: Groundwater (Chapter 9.0) <ul style="list-style-type: none"> Change in groundwater quantity Change in groundwater quality 	N/A	Project activities list above have the potential to affect groundwater quality and quantity; however, there are no groundwater supply users or active groundwater Permit to Take Water holders identified within the PDA and therefore no effect on health or socio-economic conditions is anticipated.	No protected architectural or historical resources that could be affected by the Project were identified by MTCS and the Ontario Heritage Trust.	Water Management and Monitoring Plan (Appendix M1 of the Final EIS/EA)
	VC: Surface Water (Chapter 10.0) <ul style="list-style-type: none"> Change in surface water quantity Change in surface water quality 	<ul style="list-style-type: none"> Limit construction footprint (i.e., PDA) to the extent practicable. Maintain existing drainage patterns with the use of culverts. Inspect culverts periodically. Remove accumulated material and debris upstream and downstream of the culverts to prevent erosion, flooding, habitat damage, property damage and mobilization of sediment. Implement progressive erosion and sediment control measures during construction. Implement progressive water management over the life of the mine including development of drainage controls for areas only prior to the development and expansion of these features. 	<p>Project activities list above have the potential to affect surface water quality and quantity. A change in surface water quality may affect human receptors that use surface water from the Project area as a source of drinking water.</p> <p>The HHERA determined that with the implementation of mitigation measures for surface water, the potential increase in health risk as a result of the Project is negligible (Section 19.4.2.3 of the Final EIS/EA).</p> <p>No effect on socio-economic conditions is anticipated.</p>	Protocols to protect archaeological resources will be implemented in the event of a chance.	Water Management and Monitoring Plan (Appendix M1 of the Final EIS/EA)
	VC: Vegetation Communities (Chapter 12.0) <ul style="list-style-type: none"> Change in abundance or condition of vegetation communities Change in function, connectivity, and quality of vegetation communities Change in abundance of plant species of interest 	<ul style="list-style-type: none"> Restrict vegetation clearing activities to the PDA. Mechanical vegetation removal practices when possible. Standard forestry practices to remove all merchantable timber inside the PDA. 	The removal of vegetation and alteration of communities related to Project activities list above will not result in any significant residual effects on health or socio-economic conditions because the permanent loss of harvesting area in the PDA is considered not significant Section 16.4.3.3 of the Final EIS/EA).		<ul style="list-style-type: none"> Biodiversity Management and Monitoring Plan (a conceptual plan is included as Appendix M13)
	VC: Wildlife and Wildlife Habitat (Chapter 13.0) <ul style="list-style-type: none"> Change in habitat 	N/A	The effect of a change in habitat, mortality risk or movement will not have an effect on health because changes in		Biodiversity Management and Monitoring Plan (a

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
			Health and Socio-Economic Conditions	Physical and Cultural Heritage and Any Structure, Site or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance	
<p>Authorization to carry out a proposed work, undertaking or activity causing serious harm to fish under section 35(2)(b) of the <i>Fisheries Act</i></p> <p>Contd</p>	<ul style="list-style-type: none"> • Change in mortality risk • Change in movement 		<p>total ingestion exposures to metals between Baseline Case and Future Case conditions represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).</p> <p>There is no significant residual effect anticipated on socio-economic conditions because the activities list above do not threaten the long-term viability hunting, trapping and guide outfitting as a recreational or commercial land use activity (Section 16.5 of the Final EIS/EA).</p>		<p>conceptual plan is included as Appendix M13)</p>
	<p>VC: Heritage Resources (Chapter 17.0)</p> <ul style="list-style-type: none"> • Change in archaeological Resources • Change to architectural and/or historical resources 	<ul style="list-style-type: none"> • An agreement has been signed between the Municipality and GGM to support the Municipality's future plans and addresses effects on tourism resulting from removal of the MacLeod-Cockshutt Mining Headframe and the Discover Geraldton Interpretive Centre • With respect to the golf course, GGM has committed to avoid using the contingency waste rock storage area A/C to preserve the golf clubhouse and the front nine holes unless needed. 	<p>Changes in heritage resources are not anticipated to have an effect on health conditions.</p> <p>It is expected that site preparation activities during construction, particularly the removal of the MacLeod-Cockshutt Mining Headframe and the Discover Geraldton Interpretive Centre, and effects on the Kenogamisis Golf Club, will result in an adverse effect on the tourism industry however effects on tourism are predicted to be low in magnitude and short term, with GGM having addressed tourism infrastructure in the agreement with the municipality. (Section 14.5 of the Final EIS/EA).</p>		<p>Conceptual Archeology and Heritage Resources Management Plan (Appendix M14 of the Final EIS/EA)</p>
	<p>VC: Land and Resource Use (Chapter 16.0)</p> <ul style="list-style-type: none"> • Change in recreational land and resource use • Change in commercially-based land and resource use • Change in navigation 	<ul style="list-style-type: none"> • Provide in-kind support to assist Greenstone Snowmobile Club in improving the existing trail to Longlac. • Maintain access to mining claims located on the peninsula east of the PDA. • Maintain alternate access within the PDA to the Southwest Arm of Kenogamisis Lake during construction and operation. 	<p>No effect on health conditions is anticipated.</p> <p>The effect of a change in land and resources use may affect socio-economic conditions because areas used for land and resource use may be altered or removed; however, the effect is considered not significant because it does not affect the long-term viability of recreational or commercial land use activities (Section 16.5 of the Final EIS/EA).</p>		<ul style="list-style-type: none"> • GGM will continue to meet with affected tenure holders on a regular basis(i.e., semi-annually) to discuss issues and concerns and to provide Project updates. • Communicate Project activities, locations and timing throughout construction, operation and closure to affected trappers, guide outfitters, and bait harvesters leading up to construction and throughout the life of the Project.

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
			Health and Socio-Economic Conditions	Physical and Cultural Heritage and Any Structure, Site or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance	
<p>Authorization to carry out a proposed work, undertaking or activity causing serious harm to fish under section 35(2)(b) of the <i>Fisheries Act</i></p> <p>Contd</p>	<p>VC: Traditional Land and Resource Use (Chapter 18.0)</p> <ul style="list-style-type: none"> • Change to distribution of plant species and plant harvesting sites and activities • Change to distribution of fish species and fishing areas and activities • Change to distribution of hunted and trapped species and hunting and trapping areas and activities • Change in cultural or spiritual practices, sites or areas 	<ul style="list-style-type: none"> • Where there is interest, provide opportunities to local communities for harvesting of plants for traditional purposes prior to construction. • Maintain alternate access within the PDA to the Southwest Arm of Kenogamisis Lake during construction and operation 	<p>No effect on health conditions is anticipated.</p> <p>The effect of a change in traditional land and resources use is may affect socio-economic conditions because areas used for traditional land and resource use may be altered or removed; however, the effects are determined to be not significant because they do not result in the long-term loss of availability of traditional use resources or access to lands relied on for traditional use practices or the permanent loss of traditional use sites and areas in the LAA and RAA.</p>		<p>If new TK information is received, GGM will review the results of the Final EIS/EA, including related to key EA milestones such as baseline studies, alternatives assessment, environmental effects assessment including mitigation and monitoring, and other conclusions or commitments to confirm if refinements are required. However, based on the substantial information collected to date and the conservative approach used the overall conclusions of the Final EIS/EA are not expected to change.</p>
<p>Authorization to deposit mine effluent/waste into natural waters frequented by fish under the <i>Metal Mining Effluent Regulations</i> developed under Section 36 of the <i>Fisheries Act</i></p>	<p>The Project has potential to result in the following environmental effects due to:</p> <p><i>Construction</i></p> <ul style="list-style-type: none"> • Site Preparation (removal of existing buildings infrastructure and tailings vegetation clearing, earthworks, overburden and topsoil stockpiling, contact water collection and treatment) • Pre-Production Mining and Development of Mine Components (open pit, waste rock storage areas, ore stockpile, water management facilities, Phase 1 of TMF) • Linear and Ancillary Facilities (site roads and parking areas, onsite pipelines, power lines/transformer substation, fuel supply, storage and distribution), Highway 11 realignment <p><i>Operation</i></p> <ul style="list-style-type: none"> • Waste Rock Disposal • Water Management (contact water collection system, process water supply) • Release of contact water and treated effluent to Kenogamisis Lake • Tailings Management (including excavation and removal of historical tailings <i>Closure</i> <p>Rehabilitation (progressive rehabilitation, active closure)</p>				
	<p>VC: Fish and Fish Habitat (Chapter 11.0)</p> <ul style="list-style-type: none"> • Lethal and sub-lethal effects on fish • Permanent alteration to fish habitat Loss of fish habitat 	<p>Refer to fish and fish habitat in Table 1-4: Summary of Environmental Effects within Federal Jurisdiction above.</p>	<p>Changes in fish and fish habitat due to Project activities is not predicted to have an effect on health because changes in total ingestion exposures to metals between Baseline Case and Future Case conditions represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).</p> <p>No effect on socio-economic conditions is anticipated because overall, there will be no net loss of areas for fishing as a result of the Project (Section 16.4.2.3 of the Final EIS/EA) and there are no Project-related effects on the sustainability and</p>	<p>No effect anticipated as there are no known physical or cultural heritage sites within the footprint of the TMF (see Figure 17-6 of the Final EIS/EA) and effects on archaeological resources have been avoided since archaeological assessment programs will be conducted in areas of archaeological potential prior to ground disturbance activities (Section 17.4.2.2 of the Final EIS/EA).</p> <p>No protected architectural or historical resources that could be affected by the</p>	<p>Aquatic Management and Monitoring Plan (a conceptual plan is included as Appendix M12)</p>

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
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<p>Authorization to deposit mine effluent/waste into natural waters frequented by fish under the <i>Metal Mining Effluent Regulations</i> developed under Section 36 of the <i>Fisheries Act</i></p> <p>Contd</p>			productivity of CRA fisheries within the LAA are anticipated as a result of the Project (Section 16.4.3.1 of the Final EIS/EA).	Project were identified by MTCS and the Ontario Heritage Trust. Protocols to protect archaeological resources will be implemented in the event of a chance.	
	VC: Atmospheric Environment (Chapter 7.0) <ul style="list-style-type: none"> Change in ambient air quality 	<ul style="list-style-type: none"> Implementation of Air Quality Management and Monitoring Plan (Appendix M7 of the Final EIS/EA) including a best management plan (BMP) to control fugitive dust from the Project. Use of dust suppressants (e.g., water) during situations that have an increased potential to generate airborne dust. Limit vehicle speeds. Effective and timely equipment maintenance to maintain mining equipment in good working condition. Administrative controls, including a no idling policy to reduce mobile equipment and other-use vehicle emissions.	No effect on health or socio-economic conditions predicted because overall, the increases in exposures that result from Project-related changes in air quality represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).		Air Quality Management and Monitoring Plan (a conceptual plan is included as Appendix M7)
	VC: Acoustic Environment (Chapter 8.0) <ul style="list-style-type: none"> Change in noise levels 	<ul style="list-style-type: none"> Noise mitigation measures (e.g., muffler systems) will be installed on construction and other mobile equipment and equipment will be properly maintained. Select equipment and/or design acoustical enclosures to limit overall noise emissions. Limits on the overall noise emissions transferring through doors for building enclosures. 	Project noise emissions in the LAA will not exceed the applicable criteria for each Point of Reception during the construction phase (Section 8.4.2.3 of the Final EIS/EA) and therefore no effect on health and socio-economic conditions is anticipated.		Conceptual Noise and Vibration Monitoring and Management Plan (Appendix M10 of the Final EIS/EA)
	VC: Groundwater (Chapter 9.0) <ul style="list-style-type: none"> Change in groundwater quantity Change in groundwater quality 	<ul style="list-style-type: none"> Use standard construction methods, such as seepage cutoff collars, where trenches extend below the water table to mitigate preferential flow paths. Implementation of progressive rehabilitation (placement of a vegetated soil cover) to reduce infiltration into the WRSAs and TMF, thereby reducing the amount of water and loading to groundwater and improvements to groundwater quality. Implementation of cyanide detoxification technology to reduce cyanide concentrations and precipitate metals in the process plant, resulting in an improvement in water quality within the TMF. Installation of seepage collection ditches around the TMF to collect seepage from the TMF dam and groundwater recharge originating from the TMF. A conservative design depth of 1.5 m bgs was used in the modelling to predict seepage collection and the assessment of water quality effects. Seepage collection is an integral component of 	Project activities list above have the potential to affect groundwater quality and quantity; however, there are no groundwater supply users or active groundwater Permit to Take Water holders identified within the PDA and therefore no effect on health or socio-economic conditions is anticipated.		Water Management and Monitoring Plan (Appendix M1 of the Final EIS/EA)

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<p>Authorization to deposit mine effluent/waste into natural waters frequented by fish under the <i>Metal Mining Effluent Regulations</i> developed under Section 36 of the <i>Fisheries Act</i></p> <p>Contd</p>		the TMF design, and is therefore included in the effects assessment as mitigation.			
	<p>VC: Surface Water (Chapter 10.0)</p> <ul style="list-style-type: none"> • Change in surface water quantity • Change in surface water quality 	<ul style="list-style-type: none"> • Taking process water, in order of preference, from the TMF, pond M1, and excess water from the historical underground workings and open pit dewatering. • Construction and use of perimeter runoff and contact water collection ditches to collect overland flow, seepage, and intercept shallow groundwater flow, and divert freshwater away from Project components. • Contact water collection ditches with positive gradients to limit standing water, maintain positive flow and act as interception ditches for groundwater • Contact water collection ponds designed to provide onsite storage of local runoff with the size and residence times designed to provide sediment removal to meet the MMER effluent TSS criterion of 15 mg/L, with removal of particles down to the 5 micron (µ) in size. • TMF designed with two cells to allow progressive development and rehabilitation of the TMF during operation to reduce water management requirements. • TMF dam designed to maintain water storage to contain the Environmental Design Flood (EDF), a 100-year return hydrologic event (24-hour storm or freshet event) with no discharge through the spillway (Greenstone Gold Mines Tailings Management Facility Design Hardrock Feasibility Study; Appendix K1.2). To address extreme weather events, an emergency spillway will be maintained to safely pass the Inflow Design Flood while maintaining minimum freeboards requirements to protect the structural integrity of the dam. The Inflow Design Flood is taken as the PMF generated by the theoretical maximum precipitation that could fall in the area. The PMF is based on a precipitation event with nearly twice the rainfall depth (360.7 mm) of the Timmins Storm (193 mm). • Dam runoff and seepage captured in seepage collection ditches downstream of the dams and pumped back to the TMF via three seepage collection ponds (T1, T2 and T3, Figure 10-34). The normal operation levels in the seepage collection ponds are designed to be lower than those of the surrounding water table, creating a positive 	<p>Project activities list above have the potential to affect surface water quality and quantity. A change in surface water quality may affect human receptors that use surface water from the Project area as a source of drinking water.</p> <p>The HHERA determined that with the implementation of mitigation measures for surface water, the potential increase in health risk as a result of the Project is negligible (Section 19.4.2.3 of the Final EIS/EA).</p> <p>No effect on socio-economic conditions is anticipated.</p>		Water Management and Monitoring Plan (Appendix M1 of the Final EIS/EA)

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<p>Authorization to deposit mine effluent/waste into natural waters frequented by fish under the <i>Metal Mining Effluent Regulations</i> developed under Section 36 of the <i>Fisheries Act</i></p> <p>Contd</p>		<p>(reverse) hydraulic gradient such that minimal seepage will escape the collection system. The collection ponds have been sized to contain runoff from the EDF (a 1:100 year, 24-hour storm). The ponds and design pump capacity have been designed to store water for 14 days while water from the pond is pumped back to the TMF.</p> <ul style="list-style-type: none"> • Design and operate the TMF with no discharge to the environment during operation through reclaiming and recycling surplus water from the TMF to meet mill demand during operation. • Design and construction of the temporary ditch to divert runoff from Goldfield Creek watershed between the Goldfield Creek diversion dam and the TMF inner dam towards the upper drainage area of watercourse WC-O. The temporary diversion ditch is sized to convey the peak flow from the 1:100 year 24-hour storm and the regulatory storm event (Timmins Storm) without risk of substantial erosion. The temporary diversion ditch is also sized to convey the peak flow from the PMF without discharging flow through the low topographic saddle forming a part of the TMF containment system during early TMF operation. No additional hardening of WC-O is proposed to accommodate extreme flow bypass as flow velocities are estimated to be relatively low and the risk of extreme storm occurrence is low. • Design and construction of the Goldfield Creek diversion channel extending easterly from the north end of the TMF into the Southwest Arm Tributary to convey the peak flow from the EDF (the more severe of a 100 year 24-hour rainfall event and a 100 year 30-day freshet). The diversion channel floodplain has been sized to accommodate the flows from the TMF spillway and Goldfield Creek in events greater than the 100 year storm, and has the capacity to pass flows up to and including the PMF event. The diversion dam will be constructed on Goldfield Creek south of Lake GFP4 and north of the ultimate TMF dam. The diversion channel design accounts for the post-closure condition when runoff from the TMF will be directed (through the closure spillway) in to the diversion channel (Greenstone Gold Mines Tailings Management Facility Design Hardrock Feasibility Study; Appendix K1.2). 			

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<p>Authorization to deposit mine effluent/waste into natural waters frequented by fish under the <i>Metal Mining Effluent Regulations</i> developed under Section 36 of the <i>Fisheries Act</i></p> <p>Contd</p>	<p>VC: Vegetation Communities (Chapter 12.0)</p> <ul style="list-style-type: none"> • Change in abundance or condition of vegetation communities • Change in function, connectivity, and quality of vegetation communities • Change in abundance of plant species of interest 	<ul style="list-style-type: none"> • Restrict vegetation clearing activities to the PDA. • Mechanical vegetation removal practices when possible. • Standard forestry practices to remove all merchantable timber inside the PDA. 	<p>The removal of vegetation and alteration of communities related to Project activities list above will not result in any significant residual effects on health or socio-economic conditions because the permanent loss of harvesting area in the PDA is considered not significant Section 16.4.3.3 of the Final EIS/EA).</p>		<p>Biodiversity Management and Monitoring Plan (a conceptual plan is included as Appendix M13)</p>
	<p>VC: Wildlife and Wildlife Habitat (Chapter 13.0)</p> <ul style="list-style-type: none"> • Change in habitat • Change in mortality risk • Change in movement 	N/A	<p>The effect of a change in habitat, mortality risk or movement will not have an effect on health because changes in total ingestion exposures to metals between Baseline Case and Future Case conditions represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).</p> <p>There is no significant residual effect anticipated on socio-economic conditions because the activities list above do not threaten the long-term viability hunting, trapping and guide outfitting as a recreational or commercial land use activity (Section 16.5 of the Final EIS/EA).</p>		<p>Biodiversity Management and Monitoring Plan (a conceptual plan is included as Appendix M13)</p>
	<p>VC: Land and Resource Use (Chapter 16.0)</p> <ul style="list-style-type: none"> • Change in recreational land and resource use • Change in commercially-based land and resource use • Change in navigation 	<ul style="list-style-type: none"> • Provide in-kind support to assist Greenstone Snowmobile Club in improving the existing trail to Longlac. • Maintain access to mining claims located on the peninsula east of the PDA. • Maintain alternate access within the PDA to the Southwest Arm of Kenogamisis Lake during construction and operation. 	<p>Changes in heritage resources are not anticipated to have an effect on health conditions.</p> <p>It is expected that site preparation activities during construction, particularly the removal of the MacLeod-Cockshutt Mining Headframe and the Discover Geraldton Interpretive Centre, and effects on the Kenogamisis Golf Club, will result in an adverse effect on the tourism industry however effects on tourism are predicted to be low in magnitude and short term, with GGM having addressed tourism infrastructure in the agreement with the municipality. (Section 14.5 of the Final EIS/EA).</p>		<ul style="list-style-type: none"> • Archeology and Heritage Resources Management Plan (a conceptual plan is included as Appendix M14) • GGM will continue to meet with affected tenure holders on a regular basis (i.e., semi-annually) to discuss issues and concerns and to provide Project updates. • Communicate Project activities, locations and timing throughout construction, operation and closure to affected trappers, guide outfitters, and bait harvesters leading up to construction

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
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Authorization to deposit mine effluent/waste into natural waters frequented by fish under the <i>Metal Mining Effluent Regulations</i> developed under Section 36 of the <i>Fisheries Act</i> Contd					and throughout the life of the Project.
	VC: Heritage Resources (Chapter 17.0) <ul style="list-style-type: none"> • Change in archaeological Resources • Change to architectural and/or historical resources 	<ul style="list-style-type: none"> • An agreement has been signed between the Municipality and GGM to support the Municipality's future plans and addresses effects on tourism resulting from removal of the MacLeod-Cockshutt Mining Headframe and the Discover Geraldton Interpretive Centre • With respect to the golf course, GGM has committed to avoid using the contingency waste rock storage area A/C to preserve the golf clubhouse and the front nine holes unless needed. 	Changes in heritage resources are not anticipated to have an effect on health conditions. It is expected that site preparation activities during construction, particularly the removal of the MacLeod-Cockshutt Mining Headframe and the Discover Geraldton Interpretive Centre, and effects on the Kenogamisis Golf Club, will result in an adverse effect on the tourism industry however effects on tourism are predicted to be low in magnitude and short term, with GGM having addressed tourism infrastructure in the agreement with the municipality. (Section 14.5 of the Final EIS/EA).		Archeology and Heritage Resources Management Plan (a conceptual plan is included as Appendix M14)
	VC: Traditional Land and Resource Use (Chapter 18.0) <ul style="list-style-type: none"> • Change to distribution of plant species and plant harvesting sites and activities • Change to distribution of fish species and fishing areas and activities • Change to distribution of hunted and trapped species and hunting and trapping areas and activities • Change in cultural or spiritual practices, sites or areas 	<ul style="list-style-type: none"> • Where there is interest, provide opportunities to local communities for harvesting of plants for traditional purposes prior to construction. • Maintain alternate access within the PDA to the Southwest Arm of Kenogamisis Lake during construction and operation 	No effect on health conditions is anticipated. The effect of a change in traditional land and resources use is may affect socio-economic conditions because areas used for traditional land and resource use may be altered or removed; however, the effects are determined to be not significant because they do not result in the long-term loss of availability of traditional use resources or access to lands relied on for traditional use practices or the permanent loss of traditional use sites and areas in the LAA and RAA.		If new TK information is received, GGM will review the results of the Final EIS/EA, including related to key EA milestones such as baseline studies, alternatives assessment, environmental effects assessment including mitigation and monitoring, and other conclusions or commitments to confirm if refinements are required. However, based on the substantial information collected to date and the conservative approach used the overall conclusions of the Final EIS/EA are not expected to change.
Authorization under the <i>Explosives Regulations, 2013</i> to authorize the transportation, use, and storage of blasting explosives	The Project has potential to result in the following environmental effects due to the transportation, use, and storage of blasting explosives:				
	VC: Atmospheric Environment (Chapter 7.0) <ul style="list-style-type: none"> • Change in ambient air quality 	<ul style="list-style-type: none"> • Blast design to meet MOECC's criteria • Implement an Explosives Management Plan 	Blasting activities can result in an increase in particulates in ambient air. Overall, the increases in exposures that result from Project-related changes in air quality represent a negligible human health risk (Section 19.4.2.3 of the Final EIS/EA).	No effects anticipated on physical or cultural heritage sites from the transportation, use, and storage of blasting explosives. No effect anticipated as effects on archaeological resources will be avoided since archaeological assessment programs will be conducted in areas of	Explosives and Blasting Management Plan (a conceptual plan is included as Appendix M11) Air Quality Management and Monitoring Plan (a conceptual plan is included as Appendix M7)

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
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<p>Authorization under the <i>Explosives Regulations, 2013</i> to authorize the transportation, use, and storage of blasting explosives</p> <p>Contd</p>			No effect on socio-economic conditions is anticipated.	archaeological potential prior to ground disturbance activities (Section 17.4.2.2 of the Final EIS/EA).	
	<p>VC: Acoustic Environment (Chapter 8.0)</p> <ul style="list-style-type: none"> Change in noise levels Change in vibration levels 	<ul style="list-style-type: none"> Blast design to meet MOECC's criteria Advise nearby residents of planned blasting activities Where possible, GGM will conduct blasting primarily on weekdays, typically mid-day. GGM will also endeavor to avoid blasting on statutory holidays. Implement an Explosives Management Plan Each blasting event will be monitored in accordance with the MOECC requirements for the selected sound and vibration limits due to blasting. 	<p>The noise emission levels at Points of Reception will not exceed applicable criteria, and therefore no effect on health and socio-economic conditions is anticipated (Section 8.4.2.3 of the Final EIS/EA).</p> <p>The Project will result in an increase in noise emissions over baseline conditions due to blasting in the LAA throughout construction and operation; however, the blasting noise emission levels at PoRs will not exceed applicable criteria (Section 8.4.2.3 of the Final EIS/EA).</p>	<p>No protected architectural or historical resources that could be affected by the Project were identified by MTCS and the Ontario Heritage Trust.</p> <p>Protocols to protect archaeological resources will be implemented in the event of a chance.</p>	<p>Explosives and Blasting Management Plan (a conceptual plan is included as Appendix M11)</p> <p>Noise and Vibration Management and Monitoring Plan (a conceptual plan is included as Appendix M10)</p>
	<p>VC: Surface Water (Chapter 10.0)</p> <ul style="list-style-type: none"> Change in surface water quality 	<ul style="list-style-type: none"> The Water Management and Monitoring Plan (Appendix M1) is the key mitigation to maintain freshwater quality (through diversion channels and perimeter ditch design) and for collecting and managing contact water. Implement progressive water management over the life of the mine including development of drainage controls for areas only prior to the development and expansion of these features. Implement progressive water management over the life of the mine including development of drainage controls for areas only prior to the development and expansion of these features. Use site-distributed contact water collection ponds and historical underground workings to store runoff and provide initial sedimentation. 	<p>The use of explosives for blasting has the potential to affect surface water quality. A change in surface water quality may affect human receptors that use surface water from the Project area as a source of drinking water.</p> <p>The HHERA determined that with the implementation of mitigation measures for surface water, the potential increase in health risk as a result of the Project is negligible (Section 19.4.2.3 of the Final EIS/EA).</p> <p>No effect on socio-economic conditions is anticipated.</p>		<p>Water Management and Monitoring Plan (Appendix M1 of the Final EIS/EA)</p>
	<p>VC: Wildlife and Wildlife Habitat (Chapter 13.0)</p> <ul style="list-style-type: none"> Change in habitat 	<ul style="list-style-type: none"> Mitigation for potential effects from noise and vibration described in Chapter 8.0 (acoustic environment VC). Managing vegetation cover along the boundaries of high activity areas (e.g., access roads) where adjacent to wildlife habitat to reduce sensory disturbance. In order to avoid harassment of animals, the immediate area of the blast will be surveyed by Project environmental staff within a few hours prior to a blast, with blasting temporarily suspended should sensitive species (moose, bear) or Species at Risk be observed. Operation may continue once the animals have moved on from the area. Where possible, measures may be taken (such as noisemakers) to discourage animals from 	<p>Vibration due to blasting extends beyond the PDA and may be perceived by some wildlife depending on the species (Section 13.4.2.3 of the Final EIS/EA); however, the effect is not expected to affect the long-term persistence or viability of wildlife species within the RAA.</p>		<p>Explosives and Blasting Management Plan (a conceptual plan is included as Appendix M11)</p> <p>Biodiversity Management and Monitoring Plan (a conceptual plan is included as Appendix M13)</p>

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<p>Authorization under the <i>Explosives Regulations, 2013</i> to authorize the transportation, use, and storage of blasting explosives</p> <p>Contd</p>		occupying these areas during blast times. Only where a danger to wildlife exists will deterrents be used.			
	<p>VC: Land and Resource Use (Chapter 16.0)</p> <ul style="list-style-type: none"> Change in recreational land and resource use Change in commercially-based land and resource use 	<ul style="list-style-type: none"> Blast design to meet MOECC's criteria Advise nearby residents of planned blasting activities Where possible, GGM will conduct blasting primarily on weekdays, typically mid-day. GGM will also endeavor to avoid blasting on statutory holidays. Implement an Explosives Management Plan Each blasting event will be monitored in accordance with the MOECC requirements for the selected sound and vibration limits due to blasting. 	<p>No effect on health conditions is anticipated.</p> <p>No socio-economic effect anticipated because sensory disturbance to users due to Project-related emissions (e.g., dust, light, noise and vibration) in the LAA is not anticipated.</p>		<ul style="list-style-type: none"> Consideration of broadband backup alarms for select construction equipment to reduce potential for complaints (e.g., trucks operating at WRSA A). Consideration of refinements to construction methods for WRSA A to further reduce sound level disturbance to park users, if needed.
	<p>VC: Traditional Land and Resource Use (Chapter 18.0)</p> <ul style="list-style-type: none"> Change to distribution of plant species and plant harvesting sites and activities Change to distribution of fish species and fishing areas and activities Change to distribution of hunted and trapped species and hunting and trapping areas and activities Change in cultural or spiritual practices, sites or areas 	<ul style="list-style-type: none"> Blast design to meet MOECC's criteria Advise nearby residents of planned blasting activities Where possible, GGM will conduct blasting primarily on weekdays, typically mid-day. GGM will also endeavor to avoid blasting on statutory holidays. Implement an Explosives Management Plan Each blasting event will be monitored in accordance with the MOECC requirements for the selected sound and vibration limits due to blasting 	<p>No effect on health conditions is anticipated.</p> <p>The effect of a change in land and resources use is may affect socio-economic conditions because areas used for traditional land and resource use may be altered or removed.</p>		<p>If new TK information is received, GGM will review the results of the Final EIS/EA, including related to key EA milestones such as baseline studies, alternatives assessment, environmental effects assessment including mitigation and monitoring, and other conclusions or commitments to confirm if refinements are required. However, based on the substantial information collected to date and the conservative approach used the overall conclusions of the Final EIS/EA are not expected to change.</p>
<p>Requirements under the <i>TDGA</i> are intended to minimize environmental effects from the transportation of hazardous materials.</p>	N/A	<p>The Project is not expected to result in environmental effects due to the transportation of dangerous goods to and from the Project location because the transportation of dangerous goods occurs throughout Canada on a regular basis and the applicable regulations are well understood by carriers.</p>			<p>Emergency Response Plan (a conceptual plan is included as Appendix M3)</p> <p>Explosives and Blasting Management Plan (a conceptual plan is included as Appendix M11)</p> <p>Spill Prevention and Response Plan (a conceptual plan is included as Appendix M8)</p>

Federal authority's exercise of power that would permit the Project, or part of the Project, to proceed	A change, that may be caused to the environment and that is directly linked or necessarily incidental to the federal authority's exercise of power.	Mitigation	An effect of any change to the environment on		Follow-up and Monitoring
			Health and Socio-Economic Conditions	Physical and Cultural Heritage and Any Structure, Site or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance	
<p>Environmental Effects under CEAA, 2012:</p> <p>5(1)</p> <p>(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:</p> <ul style="list-style-type: none"> (v) fish as defined in section 2 of the <i>Fisheries Act</i> and fish habitat as defined in subsection 34(1) of that Act, (vi) aquatic species as defined in subsection 2(1) of the <i>Species at Risk Act</i>, (vii) migratory birds as defined in subsection 2(1) of the <i>Migratory Birds Convention Act, 1994</i>, and (viii) any other component of the environment that is set out in Schedule 2 of [CEAA, 2012]; <p>(b) a change that may be caused to the environment that would occur</p> <ul style="list-style-type: none"> (iv) on federal lands, (v) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or (vi) outside Canada; and <p>(c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on</p> <ul style="list-style-type: none"> (v) health and socio-economic conditions, (vi) physical and cultural heritage, (vii) the current use of lands and resources for traditional purposes, or (viii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. <p>Certain additional environmental effects must be considered under section 5(2) of CEAA, 2012 where the carrying out of the physical activity, the designated project, or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA, 2012.</p> <p>5(2)</p> <p>(a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and</p> <p>(b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on</p> <ul style="list-style-type: none"> (iv) health and socio-economic conditions, (v) physical and cultural heritage, or (vi) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. 					

1.6 CONCLUSION

The changes to the environment from the Project that are directly linked or necessarily incidental to a federal decision are not predicted to be significant. Overall, no Project-related significant adverse residual environmental effects were identified through the environmental effects assessment

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