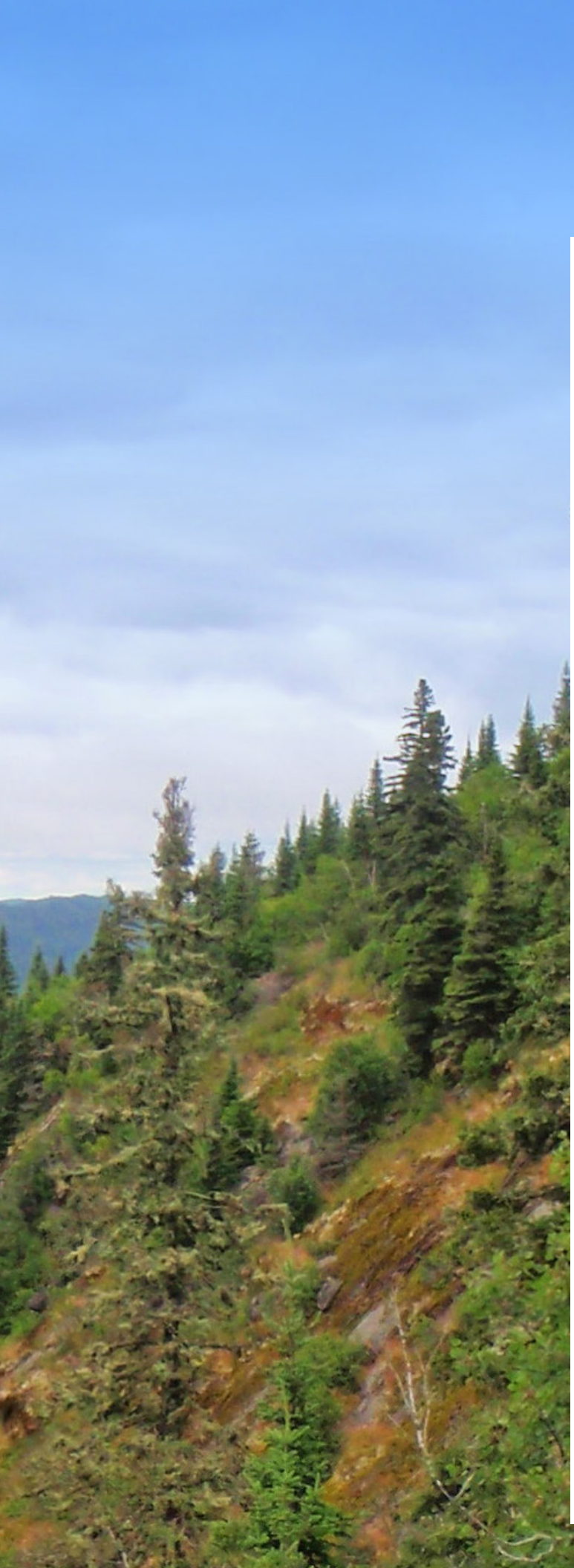

Marathon Palladium Project Environmental Impact Statement Addendum

VOLUME 2 OF 2

6.3 Accidents and Malfunctions
6.4 Effects of the Environment on the Project
6.5 Capacity of Renewable Resources
6.6 Cumulative Effects Analysis
6.7 Summary of Environmental Effects Assessment

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Abbreviations

%HA	percent highly annoyed
AAC	annual allowable cut
AOC	Area of Concern
BN	Biigtigong Nishnaabeg (formerly Pic River First Nation)
CCME	Canadian Council of the Ministers of the Environment
CEAA	Canadian Environmental Assessment Agency
CIAR	Canadian Impact Assessment Registry
CN	Canadian National
CoPC	Contaminants of Potential Concern
CP	Canadian Pacific
CWFIS;	Canadian Wildland Fire Information System
dB	decibel
EDS	Environmental Design Storm
EIS	Environmental Impact Statement
EPRP	Emergency Preparedness and Response Plan
FMU	Pic Forest Management Unit
GenPGM	Generation PGM Inc.
GHG	Greenhouse Gas
ha	hectares
HADD	harmful alteration, disruption or destruction
HDPE	High Density Polyethylene

HH	Human Health
IDF	Inflow Design Flood
IR	Information Request
km	kilometre
L_d	Daytime equivalent sound level
L_{dn}	day-night average sound level
L_{eq}	equivalent continuous sound level
L_{max}	Maximum sound level
L_n	Nighttime equivalent sound level
LRI Act	Lakes and Rivers Improvement Act
LSA	Local Study Area
LSCR	Lake Superior Coastal Range
LSNMCA	Lake Superior National Marine Conservation Area
MNRF	Ministry of Natural Resources and Forestry
MRSA	Mine Rock Storage Area
MRSA	Mine Rock Storage Area
MTO	Ministry of Transportation
MW	Megawatt
NFPA	National Fire Protection Association
non-PAG	non-potentially acid generating
NSR	noise-sensitive receptor
OCIP	Jackfish Métis of the Ontario Coalition of Indigenous Peoples
OMNRF	Ontario Ministry of Natural Resources and Forestry

PIL	Project Inclusion List
PMFN	Pic Mobert First Nation/Netmizaaggamig Nishnaabeg
PMP	Probable Maximum Precipitation
PSMF	Process Solids Management Facility
PWQO	Provincial Water Quality Objective
RSA	Regional Study Area
RSMIN	Red Sky Métis Independent Nation
SAR	Species at Risk
SID	Supporting Information Document
SIR	Supplemental Information Request
SME	Site Mixed Emulsion
SSA	Site Study Area
TK	Traditional knowledge
UV	ultra violet
VEC	Valued Ecosystem Component
WMP	water management pond
WQO	water quality objective
WTP	Water Treatment Plant

6.3 ACCIDENTS AND MALFUNCTIONS

6.3.1 Scope of the Assessment of Accidents and Malfunctions

Section 6.3 of the original EIS (2012) considered accident and malfunction scenarios that had the potential to adversely affect the environment, understanding that such scenarios could occur during any phase of the Project. Additional information with respect to select potential scenarios were discussed in responses to IRs 18.1 (MRSA slope stability, pit wall stability) and 18.3 (explosives).

Potential accidents and malfunctions were identified based on experience with other similar projects, internal (i.e., Project Team) risk assessment discussions, the EIS Guidelines, and comments received from Indigenous and public consultation sessions. For each accident and malfunction scenario identified, consideration was given to:

- its nature, mechanism and magnitude
- its probability (high, medium, low, remote)
- its consequence(s)
- mitigation (i.e., design, management, safeguards, capabilities, resources and equipment available to safely respond to a scenario)
- contingency and emergency response procedures

The probability of an accident or malfunction occurring was characterized based on the following:

- High - events are those that have been deemed as likely to occur during Project life
- Medium - events are those that may occur during Project life
- Low - events are those that that have been deemed as unlikely to occur, but their occurrence cannot be reasonably disregarded
- Remote - events are those that have been deemed as highly unlikely to occur during the life of the Project

6.3.2 Accident and Malfunction Scenarios

A description of potential accident and malfunction scenarios, including the nature, mechanism, magnitude, and probability of each scenario, is presented in Section 6.3 of the original EIS (2012). The following potential accident and malfunction scenarios were assessed in the original EIS (2012) and have been considered here based on updated information pertaining to the Project, baseline conditions and regulations, as appropriate:

- fuel release during transport to the site
- fuel release from on-site storage facilities

- fuel release during on-site dispensing
- propane handling incident
- concentrate haul incident
- concentrate load-out incident
- chemical incident during transport to the site
- chemical incident within mine-related facilities
- controlled release of water to the environment from the PSMF
- controlled release of water to the environment from the MRSA
- PSMF and/or Reclaim Water pipeline failure
- water treatment plant incident
- unanticipated seepage from the PSMF
- unanticipated drainage quality issues from the MRSA
- Project-related fires
- pit slope failure
- MRSA slope failure
- PSMF slope failure
- explosives accident
- premature closure of the mine

With few exceptions, as noted in Section 1.6 of the EIS Addendum (Vol 1) (CIAR #727), the Project will be implemented in a similar manner as originally proposed. GenPGM has reviewed the information provided in the original accidents and malfunctions assessment, including the original EIS and responses to information requests, and minor updates to the assessment are highlighted below.

As part of the review of the original EIS (2012) and related documentation, it is noted that no new accident and malfunction scenarios have been identified. Consistent with the original Project proposal, implementation of appropriate procedures and staff training, and mine design remain key factors related to both mitigating the likelihood of occurrence of potential accidents and malfunctions that could occur on the mine site, as well as containment and control in the event that they have occurred.

A summary of the assessment of the above-referenced accident and malfunction scenarios, including the nature, mechanism, magnitude and probability of each scenario, updated as appropriate with new project-related information, is provided in Table 6.3-2. In many cases, and consistent with the Project being implemented in principally the same manner as originally proposed, the assessment of the scenarios that have been identified is fundamentally unchanged. In these cases, summary level information is provided. Where appropriate, highlights of new information that is relevant to the assessment, in particular in consideration of new mine design considerations, is provided below.

6.3.2.1 Fuel Release During Transport

There is fundamentally no change in the assessment of a fuel release during transport to the site.

Fuel will be delivered by qualified, licensed third-party contractors and they would be responsible for first-level response and reporting.

6.3.2.2 Fuel Release from On-site Storage Facilities

There is fundamentally no change in the assessment of a fuel release from an on-site storage facility.

As originally proposed, fuel will be stored in the Fuel Farm, near the Truck Shop, in above-ground storge tanks in quantities ranging from 75,000L to 500,000L. These storage tanks will be outfitted with secondary containment and provided with protection to guard against possible vehicular collisions. The storage and distribution areas will include lined aprons and or will be fitted with catchments to contain fuel that might inadvertently be released. Portable double-walled temporary storage tanks (or “day tanks”) will be located at strategic locations on site in consideration of appropriate setbacks to support construction and mining activities. All fuel storage and dispensing equipment will comply with applicable legislation, including the *Technical Standards and Safety Act* (2000) and National Fire Protection Agency standards and STI-F-921 requirements.

6.3.2.3 Fuel Release during On-site Dispensing

There is fundamentally no change in the assessment of a fuel release during on site dispensing.

A fuel release in an on-site dispensing area, the Fuel Farm or at day tank locations, could occur as a potential result of a malfunction in the fuel transfer process and/or human error. In this case, any affected soils or gravels will be excavated and relocated to an appropriately HDPE lined soil remediation area. Operational procedures relevant to dispensing locations that are likely to mitigate the probability of a release during dispensing will be developed and all staff involved will have appropriate training. All fuel dispensing equipment will comply with applicable legislation, including the *Technical Standards and Safety Act* (2000), and the applicable regulations thereunder.

6.3.2.4 Propane Handling Incident

There is fundamentally no change in the assessment of a propane handling incident.

Propane will be stored on site in a dedicated area and distributed to site infrastructure through low pressure HDPE piping that will be protected from inadvertent interactions. A propane handling incident could result in a fire, which is more likely to be associated with worker health and safety, rather than environmental, issues. Potential environmental impacts however in the event of a fire include localized terrestrial habitat loss and short-term air quality effects. All relevant regulatory legislation and standards relating to propane handling, in particular the *Technical Standards and Safety Act* and its regulations will be adhered to. Only licensed suppliers will be able to provide delivery to the site. Emergency response

procedures will be established in the Emergency Preparedness and Response Plan (EPRP), consistent with federal and provincial requirements.

6.3.2.5 Concentrate Haul Incident

There is fundamentally no change in the assessment of a concentrate haul incident.

While the specific potential concentrate products beyond PGMs envisioned by the current Project design differ from the original EIS (2012), the concentrate shipping assumptions remain largely unchanged (8 to 50 trucks per day depending on market conditions). A concentrate incident during transport could happen as the result of collisions, accidents related to poor weather conditions, or other mishaps. As much as a full truck load of concentrate could be released, with the most plausible result being a loss to ground. Various mitigation and response procedures will be put into place including:

- Ensuring haul truck drivers will have appropriate licensing and training
- Retaining only properly licensed trucking contractors for any long distance transport of concentrate
- Posting and monitoring speed limits along site-associated roads
- Establishing emergency response procedures for concentrate haul incidents in the EPRP.

6.3.2.6 Concentrate Load-out Incident

There is fundamentally no change in the assessment of a concentrate load-out incident.

Consistent with the original EIS (2012), concentrate loading into trucks will occur at the mine site in preparation for transport to a remote third-party processing facility or to a rail load-out facility. At the mine site, the load-out area will be located on the ground floor of the Process Plant and will be a truck drive-through facility. Loading will only occur after the area is isolated. After filling, the trucks will be covered for transport. If the concentrate is moved to a rail load-out facility, the facility will be enclosed and constructed on a concrete floor slab. The rail load-out facility will include a dust collection system to ensure dust emissions are appropriately controlled and a floor collection sump. In both scenarios, releases of concentrate that do occur during load-out will be confined to the inside of the respective facilities and therefore, a release to the environment as a result or an accident or malfunction is not anticipated.

6.3.2.7 Chemical Incident during Transport

There is fundamentally no change in the assessment of a chemical incident during transport.

The severity of a release of any chemicals being transported to the mine site would depend on several factors, including the nature of the material, the location, the time of year and the volume. The largest amounts of chemicals transported to the site will be the mill reagents, which will arrive at the facility in both dry and liquid form. A full transport truck can carry as much as 40 tonnes of mill reagents. Smaller amounts of other chemicals in both dry and liquid, including assay lab chemicals, will also delivered to the

facility. Deliveries of chemicals to the site may occur multiple times a week. Chemicals will be delivered by qualified, licensed third-party contractors and they would be responsible for first-level response and reporting.

6.3.2.8 Chemical Release within the Mine Site

There is fundamentally no change in the assessment of a chemical release within the mine site.

Chemicals that pose a potential risk to the environment, including mill reagents and processing chemicals, effluent treatment plant reagents, lubricants, glycol and cleaning solvents will be stored and used within contained areas. These areas (buildings or facilities) will incorporate the spill storage capacity necessary to contain the volume of spilled material (e.g., sealed floors and/or drains and/or sumps). Some transport of chemicals between mine-related facilities will occur, and loss of chemicals to ground during transport is possible. Such losses are likely to occur at the local scale and in areas of the mine site that have been previously developed. In this case any affected soils or gravels will be excavated and relocated to an appropriately HDPE lined soil remediation area. Local transport routes will be developed in consideration of setbacks form sensitive areas, all staff handling chemicals will have appropriate training as to their storage, handling and use and response procedures associated with chemical spills on the mine site will be set out in the EPRP.

6.3.2.9 Controlled Release of Water to the Environment from the PSMF

Conceptually there is no change in the assessment of a controlled release of water to the environment from the PSMF, despite changes to the site water management plan since the basis of the design and operational philosophy are unchanged.

The PSMF will continue to operate with sufficient free board to store operational water needs plus volumes derived from natural run-off and snow-melt, the PSMF Environmental Design Storm (EDS; that is, the 1 in 100-year 24-hour precipitation event and 30 day-spring snowmelt (408 mm of equivalent precipitation) and wave run-up related to the 1 in 1,000 year wind event. Additional freeboard will also be provided to manage the Inflow Design Flood (IDF) (Probable Maximum Precipitation (PMP); 328 mm)). This additional freeboard will provide temporary containment and allow for the rise in water level while the IDF is passed to the environment in a controlled fashion via a spillway. In the highly unlikely event that the IDF was to occur in combination with spring run-off, the EDS and a controlled release of water from the PSMF to Hare Lake via the Hare Lake Pipeline and to Stream 6 via the Emergency Spillway. The estimate peak discharge rate from the PSMF during this highly unlikely event is approximately 14,000 m^3/hr assuming the PSMF is at its maximum filling level and there is no additional surge capacity within the PSMF.

Updated water quality predictions associated with the PSMF discharge have been provided and are discussed in Section 6.2.3 of this EIS Addendum (Vol 2) and the Surface Water Quality Effects Assessment Update (Appendix D11 of this EIS Addendum [Vol 2]). No exceedances of acute effects thresholds are predicted in the untreated PSMF overflow and therefore no acute toxicity is anticipated in the aquatic receiving environment aquatic receptors (fish, benthic invertebrates). Concentrations of some

COPCs in the PSMF overflow may exceed relevant chronic exposure-based water quality objective (WQO) levels, which may translate into marginal, short-term exceedances of these WQOs for these COPCs. Exceedances of PWQOs of the magnitude that may be observed and in consideration of the likely duration of a controlled water release resulting from the IDS would not negatively affect aquatic biota. The assimilative capacity of the receiving environment during such a storm event would also increase reducing the concentration of the COPCs. There may be some limited swamping of bottom habitats with settled suspended material associated with the release, but this effect will be limited to the vicinity of the spillway. A controlled release of water from the PSMF does not threaten the Town of Marathon, Indigenous communities, or local residential potable water supply.

As describe above, because of the design factors associated with the PSMF the likelihood of a controlled release of water to the environment from the PSMF can be characterized as remote. Nevertheless, response procedures associated with a controlled release of water from the PSMF during the IDF will be set out in the EPRP.

6.3.2.10 Controlled Release of Water to the Environment from the MRSA

Conceptually there is no change in the assessment of a controlled release of water to the environment from the MRSA, despite changes to the site water management plan and footprint of the MRSA, since the basis of the design and operational philosophy are unchanged.

Contact water draining from the MRSA will be collected via a series of collection ditches and Catch Basins. The MRSA Catch Basins have been sized to manage water volumes derived from the EDS consisting of a 1 in 25-year 24-hour precipitation event without pumping. Pumping systems will be included to transfer water to WMP. The pumping systems have been sized (750 m^3/hr) to convey the 1 in 25-year 24 hour precipitation event and longer (30-day) precipitation events including a 1 in 5-year spring freshet event. The MRSA catch basin include overflow spillways that are sized to convey the 1 in 100 year 24-hour precipitation event. During 1 in 100 year 30-day rainfall event it is estimated that the peak discharge from the Stream 2 and Stream Catch Basins would be approximately 540 and 350 m^3/hr, respectively.

Updated water quality predictions associated with the MRSA have been provided and are discussed in Section 6.2.3 of this EIS Addendum (Vol 2) and the Surface Water Quality Effects Assessment Update (Appendix D11 of this EIS Addendum [Vol 2]). No exceedances of acute effects thresholds are predicted in the untreated MRSA overflow and therefore no acute toxicity is anticipated in the aquatic receiving environment aquatic receptors (fish, benthic invertebrates). Concentrations of some COPCs in the MRSA overflow may exceed relevant chronic exposure-based WQO levels but would not necessarily result in similar conditions in the Pic River. A mass balance based prediction of the potential influence of the controlled release on water quality in the Pic River is provided as an example to help demonstrate the expected consequence of the event. For example, in this event, the MRSA drainage is released to the Pic River at the rate described above (910 m^3/hr combined) as undiluted drainage from the catch basins. Assuming average flow rates in the Pic River (180,000 m^3/hr, annual average flow) and background water quality, resulting constituent concentrations downstream of the release are shown in Table 6.3-1, along with background water quality and relevant water quality objectives. The resultant constituent

concentrations shown have no influence, or only a small incremental increase relative to background concentrations and are below chronic exposure-based water quality objectives in all cases. Water quality would continue to be protective of aquatic biota downstream. There may be some limited swamping of bottom habitats with settled suspended material associated with the release, but this effect will be limited to the vicinity of the spillway. A controlled release of water from the MRSA does not threaten the Town of Marathon, Indigenous communities, or local residential potable water supply.

It is noted that the analysis is viewed as being conservative in nature, since undiluted MRSA drainage concentrations and average Pic River flows conditions have been used. The constituent concentrations in MRSA drainage would likely be less in this scenario, and the Pic River flows higher, because of the event conditions.

As describe above, because of the design factors associated with the MRSA, the likelihood of a controlled release of water to the environment from the MRSA can be characterized as low. Nevertheless, response procedures associated with a controlled release of water from the MRSA during the EDS will be set out in the EPRP.

Table 6.3-1: Predictions of Constituent Concentrations in the Pic River Following a Controlled Release of Water from the MRSA

Constituent	Background Conc. (mg/L)	Stormwater mixing in Pic River (300m from release) Conc. D/S (mg/L)	Water Quality Objective
Aluminum	0.11	0.11	[1]
Arsenic	0.001	0.001	0.005 (PWQO & CCME))
Cadmium	0.0001	0.0001	0.0005 (PWQO) / 0.0002(CCME)
Cobalt	0.0005	0.0005	0.0005 (PWQO)
Copper	0.002	0.002	0.005 (PWQO) / 0.003 (CCME)
Iron	0.91	0.91	[2]
Molybdenum	0.001	0.001	0.04 (PWQO) / 0.073 (CCME)
Nickel	0.002	0.002	0.025 (PWQO) / 0.12 (CCME)
Lead	0.001	0.001	0.005 (PWQO) / 0.005 (CCME)
Selenium	0.0004	0.0005	0.1 (PWQO) / 0.001 (CCME)
Uranium	0.005	0.005	0.005 (PWQO) / 0.005 (CCME)
Zinc	0.004	0.005	0.02 (PWQO) / 0.04 (CCME)
Total Ammonia-N	0.02	0.07	0.86 (CCME)
Nitrate	0.03	0.4607	3.0 (CCME)

Notes:
[1] The aluminum water quality objective is for a filtered sample and the concentrations shown are total concentrations.
[2] The PWQO and CCME iron water quality objectives are 0.3 mg/L. Where the ambient concentration is greater than the water quality objective the background concentration serves as the water quality objective.

6.3.2.11 PSMF and/or Reclaim Water Pipeline Failure

Conceptually there is no change in the assessment of a PSMF and/or reclaim water pipeline failure, despite changes to the rate of process solids production, site water management plan and footprint of the mill site since the basis of the design and operational philosophy are unchanged.

Process solids will be transported as slurry from the Process Plant to the PSMF in two streams, Type 1 and Type 2 material. Later in mine life, Type 2 material will be deposited in the Central Pit. Reclaim water will be returned to the Process Plant from the PSMF via the WMP to support ore processing. Both Type 1 and Type 2 material, as well as reclaim water will be transported using HDPE and/or carbon steel pipelines. For process solids, pipeline lengths will vary depending on the location to where the solids are being deposited, but will be in the order of 1 to 3 km. The process water reclaim line will be in the order of 2 km in length. A PSMF or reclaim water pipeline failure could occur as the result of a mechanical failure or a rupture due to equipment or vehicular impact. Such an event is viewed as a very low probability occurrence.

The release scenario considered herein for the PSMF pipeline is based on a complete rupture of the Type 1 and Type 2 process solids delivery pipelines, a process rate of about 1,050 tonnes per hour (25,200 tonnes per day) and release duration of one hour. Neither of the Type 1 or the Type 2 pipelines will cross an existing watercourse. The most likely scenario would see the process solids released to ground and be contained within the mine site, with some of the liquid fraction of the slurry flowing towards the WMP or Stormwater Management Pond or alternatively towards the open pits during the period when Type 2 process solids are being deposited to the Central Pit.

The release scenario considered herein for the reclaim water line would result in the release of approximately 1,300 m^3 of water to the environment. The scenario is based on a complete pipeline rupture, a pumping rate based on a mill throughput of 25,200 tonnes per day and release duration of one hour. The most likely scenario would see the reclaim water released to ground and flow towards the WMP or Stormwater Management Pond.

A pipeline failure would affect the area in the immediate vicinity of the failure, spreading from its release point outwards. The spatial extent of any effect would be directly related to the amount of material released and the topography of the area in which the release occurred. Generally, the more material released the bigger the area that would be impacted. The slurry, and in particular the liquid component of the slurry, or reclaim water would flow naturally to areas of low relief. In this case any affected soils or gravels will be excavated and relocated to the PSMF.

Owing to the nature of the local and deposit geology the metal levels in the solid fraction of the Type 1 material slurry (see CIAR #231) would not be so high as to be a concern from a toxicological point of view. Moreover, these metals would generally not be considered to be bioavailable. The Type 2 material slurry would have higher metal levels, as the sulphides that have not gone to the concentrate would be concentrated in this stream purposefully. Again, this material is not of concern from a toxicological perspective as the metals in it would not be bioavailable. The metal levels in the liquid fraction of the

process solids slurry or the reclaim water would be relatively low (well below acute toxicity thresholds), as this liquid is essentially mill process water.

Proper design will reduce the risk of pipeline failure, and will take into consideration increased pressures resulting from the PSMF embankment crest raises during later stages of mine operations. Beyond the design and location features described above, additional mitigation will be provided by including multiple visual inspections every 12 hours to lessen the potential severity of a pipeline-related release. The pipelines will be routed away from existing water courses and any man-made surface water drainage features to reduce the probability of a release going to water. Where pipes are not within a contained drainage areas or close to surface water features, emergency containment berms (or similar) will be positioned at appropriate locations along the route to prevent any released solids or water from entering natural or man-made drainage features in the event of a line breach, or leak, and to allow drainage of the line to facilitate repairs, if needed. The pipelines will be positioned along the crest of the PSMF dams to the extent practicable such that if there were to be a major pipeline failure, drainage would be to inside of the PSMF. The active pipelines will be inspected on a regular basis, with monitoring and a written record of inspections and frequency under the guidance of Operations, Maintenance and Surveillance Manual. Response procedures associated with a pipeline failure will be set out in the EPRP.

6.3.2.12 Water Treatment Plant (WTP) Incident

There is fundamentally no change in the assessment of a water treatment plant (WTP) incident. As described previously, contingency to construct and operate a water treatment plant to ensure the protection of water quality downstream is included in the proposed Project.

The assumed maximum potential accidental upset scenario from the facility would comprise a release of up to six hours. In that scenario, approximately of 2,000 to 3,000 m^3 of water would be released to Hare Lake. Depending on the nature of the treatment plant failure, and consequently the stage of treatment achieved, the water released could exceed applicable quality limits during that time. In any event, no exceedances of acute effects thresholds are predicted based on updated information respecting MRSA and PSMF water and therefore no acute toxicity is anticipated in the aquatic receiving environment aquatic receptors (fish, benthic invertebrates). Short-term exceedances of chronic exposure based WQOs for a short duration is possible but would likely be limited to the effluent mixing zone and would not likely negatively affect aquatic biota. A release of that magnitude represents a comparatively small volume of water relative to Hare lake. An accidental release associated with a treatment plant failure would not threaten the Town of Marathon, Indigenous communities or local residential potable water supply. A response procedure associated with a treatment plant failure will be set out in the EPRP.

6.3.2.13 Unanticipated Seepage from the PSMF

There is no fundamental change in the assessment of unanticipated seepage from the PSMF, despite updated information being presented herein with respect to seepage rates, seepage quality and consequently seepage loading rates. The updated analysis does not materially change potential water quality effects, if they were to occur, that would likely be associated with Subwatersheds 106 and 105 as

that is where seepage from the PSMF embankments would report. The groundwater supply users along Highway 17 are located topographically higher than the PSMF and are in Subwatershed 109.

In addition, the current Project design incorporates a PSMF seepage collection system comprised of a network of connected seepage collection ditches and ponds around the perimeter of the PSMF embankments. Run-off from the outer face of the embankment as well as shallow seepage will be intercepted and pumped back to the site (ultimately to the WMP) for management purposes. This system will be operated into the closure phase of the Project, primarily as a means to collect shallow PSMF seepage, until water quality meets requirements for discharge to the receiving environment.

A surface water and groundwater monitoring program will be implemented that will include monitoring locations located upgradient, downgradient, and cross gradient of the PSMF. The monitoring program will have an adaptive management component with a series of trigger thresholds that will alert to changing conditions with an associated response plan and potential mitigation measures. In addition, a water well survey will be completed within and adjacent to the SSA to confirm the presence of groundwater supply users prior to construction. Data generated from these monitoring programs will be used to assess potential risks to water quality and contingencies developed to mitigate such risks.

6.3.2.14 Unanticipated Drainage Quality Issues from the MRSA

There is no fundamental change in the assessment of unanticipated drainage quality issues from the MRSA, despite updated information being presented in this EIS Addendum with respect to mine deposition and tonnages and MRSA-related geochemical source terms and water quality.

This accident and malfunction scenario assumes loss of control of segregation of Type 1 and Type 2 materials such that a substantially greater amount of Type 2 mine rock would be deposited in the MRSA than planned. In this scenario, constituent loadings associated with drainage from the MRSA would be higher than have been predicted and direct release to the Pic River could adversely affect water quality.

Tight controls on rock segregation are key to ensuring such a scenario does not unfold. MRSA drainage will be monitored both in the short- and long-terms to assess the validity of EIS Addendum predictions. In the instance that drainage quality deviates from the EIS Addendum predictions, suggesting that proactive management of MRSA drainage was needed, the existing drainage management plan would be reviewed and revised as appropriate to determine the most appropriate management strategy(s) for managing drainage from the MRSA. The most obvious approach is the continued collection of the MRSA drainage post-closure and its subsequent treatment for as long as it was necessary to protect surface water quality in the Pic River.

6.3.2.15 Project-related Fires

There is fundamentally no change in the assessment of an incident related to the premature closure of the mine.

A fire could occur on or around the Project site as the result of various causes. The most probable scenario includes a fire in a building, or a fire associated with fixed or mobile mine-related equipment (e.g., conveyors, trucks). A major fire at the site could cause localized property damage and operations interruptions. Given the planned clearing associated with the development of Project infrastructure, it is anticipated that the site itself will act as a fire-break and on-site fires would be localized and contained on-site. Various means will be used to mitigate fire related issues and the basis for the fire protection system for the Project will be the applicable National Fire Protection Association (NFPA) codes. Response procedures associated with a Project site fire will be set out in the EPRP.

6.3.2.16 Pit Slope Failure

There is no fundamental change in the assessment of the potential for a pit slope failure to occur.

The original EIS (2012) concluded that the pit walls would be table based on the proposed pit design and existing geological conditions. Further consideration of pit design by GenPGM has increased minimum safety factors for the pit walls to 1.3:1 from 1.2:1 in the original design. Beyond design considerations, GenPGM will monitor pit wall stability continuously during pit excavation, under the supervision of qualified geotechnical engineers. If deemed necessary, surface monitors will be installed at strategic locations to monitor any ground movement. Response procedures associated with a pit slope failure will be set out in the EPRP.

6.3.2.17 MRSA Slope Failure

There is no fundamental change in the assessment of the potential for an MRSA slope failure to occur.

The original EIS (2012) assessed the probability of a major slope failure as “remote” based on proposed design criteria that were described in detail in response to IR 18.1 (CIAR #379). Minor slumping at the individual bench scale was considered a more likely occurrence, but still characterized as a relatively low probability event. The current MRSA design adheres to the same design principals as in the original design proposal, despite there being less rock and the MRSA occupying a smaller footprint. The MRSA is located outside of the Pic River flood plain. The majority of the MRSA foundation will consist of bedrock, some localized foundation areas may consist of competent overburden. The proposed MRSA slope geometry, foundation conditions and topography and frictional strength properties (coarse grained, free draining and angular in shape) of the Mine Rock result in high Factors of Safety against slope instability

6.3.2.18 PSMF Slope Failure

There is no fundamental change in the assessment of the potential for a PSMF slope failure to occur, despite physical changes to the PSMF layout to accommodate increased mine production, improve water management and storage of Type 2 mine rock. This is the case since the basis of the design and the operational philosophy of the PSMF are unchanged. Specifically, as it concerns the design, the PSMF embankments includes the construction of massive rockfill structures that exceed the prescribed short-term, long-term and pseudo-static minimum factor of safety stability requirements.

Based on the design and configuration of the PSMF, a worst-case scenario is characterized as a slope failure resulting in a partial breach of a PSMF embankment. A partial slope failure could lead to a release of solids and associated waters to the west from Cells 1 and 2B, to the north from Cells 2B and 2A, to the east from Cell 2A and WMP, and to the south from Cell 1. For each of these potential scenarios, the release due to a slope failure is assumed to include process water and the upper process solids surface. The primary mitigation strategies associated with prevention of a PSMF slope failure is a rigorous design with safeguards incorporated. Also as described above, dam construction will include technical oversight and implementation of quality assurance and quality control programs by qualified geotechnical engineers. An Operations, Maintenance and Surveillance Manual (or an equivalent document) will be prepared for the PSMF and employed to confirm that the facilities are operated consistent with the design principles. Emergency response procedures will be contained in the EPRP.

6.3.2.19 Explosives Accident

Site Mixed Emulsion (SME) technology is currently proposed for the Project. The SME technology eliminates the need for a conventional emulsion manufacturing facility through the use of specially designed bulk delivery vehicles, which provide mobile emulsion manufacturing capability. This allows the emulsion to be manufactured in the pits (on the bench) and delivered directly to the blastholes, eliminating the need to store finished product at the facility. The separation of detonators, magazines and components reduces the risk of explosive accidents and isolates risks of explosives accidents to the pits, where manufacturing occurs and products are brought together. An explosives incident in the pit would have limited environmental impact, with great risk to personnel and property. Standard operating procedures, and the EPRP will be developed to reduce risk and manage an incident in the unlikely event that one was to occur.

Explosives supply and handling will be provided by a qualified and certified contractor as a in-the-hole service. GenPGM will provide design and technical supervision only for the end use of explosives. The explosives vendor will supply mobile mixing units, support equipment, ammonium nitrate silos, emulsion silos if required, and container type magazines for accessories, boosters and ancillaries that are compliant with Canadian mining laws and regulations. A well secured facility, involving limited and restricted access, with a high level of diligence by both the explosives contractor and GenPGM will limit and mitigate associated risk to a very low and unlikely probability of occurrence.

6.3.2.20 Premature Closure of the Mine

There is fundamentally no change in the assessment of an incident related to the premature closure of the mine.

Mine development could conceivably be interrupted during any phase of mine life and therefore a wide range of possible scenarios can be envisioned, the most material from an environmental consequence point of view likely being related to result in a loss of control of equipment or material on site, and/or a loss of control of the overall management of the site. The primary means of mitigation associated with the premature closing of the site during any mine phase is the Project Closure Plan and the financial

assurance that is required to be submitted based on the costs associated with implementing the plan. Response procedures associated with the premature closure of the mine will be incorporated into the EPRP.

6.3.3 Contingency Plan

An EPRP will be prepared to provide site personal and emergency responders clear direction, roles and responsibilities in the event of an accident or malfunction's. The EPRP will determine the equipment, resources and training requirements necessary to safely respond to accidents and malfunctions along with the contingency measures necessary to contain, clean up and restore affected areas. The plan will also include elements on communication and warning protocol. The EPRP is further discussed in Section 7 of this EIS Addendum (Vol 2).

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures

Fuel release during transport
• Updated Information
  ○ Annual diesel fuel consumption will be up to 25 M L (compared to 27 to 29 M L).
  ○ Gasoline will be used on site to power vehicles and light duty equipment, with usage expected to up to 100,000 L per year (compared to 120,000 to 135,000 L per year).
  ○ There will be up to approximately 830 fuel deliveries made to the site annually (compared to 450 to 850).
	• A release (diesel or gasoline) could result from a collision or another accident.
	• Most likely scenario is a fuel release to ground, though a release to a watercourse or waterbody is possible.
	• Tanker design suggests that a partial release is more likely than a full release, with the exception of a catastrophic incident. Tanker capacity is in the range of 34,000 L to 63,000 L.
		Low	• Loss of fuel (diesel, gasoline) to ground and possibly to water
			• Contamination of terrestrial habitat in the immediate area of release with toxicity to soil dwelling invertebrates and local vegetation
			• Contamination of aquatic habitat (water, sediments) with toxicity to aquatic biota (fish, benthic invertebrates)
				• Only licensed companies permitted to deliver to site
				• Third- party contractors will be required to have active service agreements with licensed release response contractors
				• All drivers to have appropriate training, including release response training
				• All trucks to have appropriate communications capabilities
				• Speed limits posted and monitored on site access road and GENPGM to follow-up with any reports of excess speed
					• Third-party contractors will operate under their own emergency procedures and will be responsible for first-level release response and reporting.

Fuel release from on–site storage facilities
• Updated Information
  ○ The Fuel Farm location in the current site configuration is slightly west of the original location but the storge capacity is the same, as are design and operational safeguards and response procedures that will be in place.
	• A release from storage facility could result from vehicular collisions, malfunctioning equipment or human error.
	• Most likely scenario for a release is during the fuel transfer process with the release going to ground.
	• The maximum theoretical release would be one full storage tank volume.
		Medium	• The probability of potential environmental issues is low, as fuel storage locations are in built-up areas and are isolated from sensitive features
			• A loss of containment could result in the contamination of land in the storage area and the immediate vicinity
				• Minimum setbacks of 100 m from sensitive environmental features to be maintained
				• Fuel storage equipment to comply with applicable legislative requirements
				• Tanks to have secondary containment and/or will be double-walled and collision protection
				• Main Fuel Farm to have lined aprons and collection catchments
				• Release response equipment to be maintained on site
				• Detailed operational procedures will be posted at all storage facilities
					• Emergency response procedures will be set out in the EPRP
					• Consistent with provincial emergency planning requirements the goals of the emergency response plan, relative to potential fuel releases, will be to:
					  ○ assess health and safety risks;
					  ○ isolate sources of ignition;
					  ○ stop leak;
					  ○ notify appropriate authorities (municipal, provincial and federal authorities);
					  ○ contain release; and,
					  ○ restore the environment.
					• Required documentation will be prepared.
					• GenPGM will retain a third-party release response contractor to aid in response

Fuel release during on–site dispensing
• Updated Information
  ○ Design and operational safeguards, as well as response procedures, as originally proposed will be in place.
	• A release could result from an equipment malfunction during dispensing or via human error.
	• Most likely scenario involves a minor release during refueling with the release going to ground.
	• The maximum theoretical release would be the full volume of fuel carried by the dispensing equipment, but a probable event volume would be much less.
		Medium	• The probability of potential environmental issues is low, as on-site dispensing will occur in built-up areas and not in the immediate vicinity of sensitive features
			• A loss of containment could result in the contamination of adjacent land
				• Fuel dispensing equipment to comply with applicable legislative requirements
				• Minimum setbacks of 50 m from sensitive environmental features to be maintained for portable dispensing equipment
				• Release response equipment to be maintained on site
				• Detailed operational procedures will be developed and provided to relevant employees
					• Emergency response procedures will be set out in the EPRP
					• Consistent with provincial emergency planning requirements the goals of the emergency response plan, relative to potential fuel releases, will be to:
					  ○ assess health and safety risks;
					  ○ isolate sources of ignition;
					  ○ stop leak;
					  ○ relocate contaminated soil and gravel to a lined remediation area
					  ○ notify appropriate authorities (municipal, provincial and federal authorities);
					  ○ contain release; and
					  ○ restore the environment.

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures
					• GenPGM will retain a third- party release response contractor to aid in response
Propane Handling Incident • Updated Information ○ Storage capacity and the distribution system are the same, as are design and operational safeguards that will be in place.	• The most common propane accident that could occur on-site is associated with “pull away” • Propane leakage from the storage tank or from the delivery truck could ignite if an ignition source were present.	Low	• A propane handling incident could result in a fire, which is more likely to be associated with worker health and safety issues, rather than an environmental one. • Potential environmental impacts would include localized terrestrial habitat loss and short-term air quality effects.	• Propane handling and storage is tightly regulated and as such adherence to the appropriate regulations both in terms of transport and storage and handling mitigates the probability of a propane incident occurring • Only licensed suppliers will be able to provide delivery to the site	• Emergency response procedures will be set out in the EPRP • All personnel will be evacuated to a minimum safe distance • Any possible on-site ignition sources will be removed from the area • Off-site emergency response resources will be mobilized, as identified in the EPRP
Concentrate haul incident • Updated Information ○ While the specific potential concentrate products beyond PGMs envisioned by the current project differ from the original EIS, the concentrate shipping assumptions remain largely unchanged (8 to 50 trucks per day depending on market conditions).	• A concentrate release along the haul route could result from a collision or another accident. • Most likely scenario involves a haul truck going off the road and concentrate being released to ground. • As much as a full load could be released.	Low	• Concentrate loss will smother the ground in the immediate vicinity of the release (both the loss and its subsequent clean-up will disturb the release area)	• Drivers to have appropriate licensing and training, including release response • Trucks will have covers • Trucks will have means of communicating with their own dispatch and the Project site • Speed limits posted and monitored on site access road and GenPGM to follow-up with any reports of excess speed • GenPGM to have response capacity on site	• In cases where third-party contractors are used, they will operate under their own emergency procedures and will be responsible for first-level release response and reporting • In case where GenPGM is responsible for transport response procedures to be developed as part of the EPRP as part of the EMS.
Concentrate load-out release • Updated Information ○ While some operational differences in load out procedures are planned particularly at the mine site based on design changes to the Process Plant and operational safeguards will be in place to limit releases of concentrate to the inside of the facilities. Therefore, no scenario is envisaged where there is the potential for a substantial environmental issue.	• A concentrate release during load out at the mine site or alternatively at the proposed concentrate handling facility in Marathon could occur as a result of equipment malfunction or human error.	Medium to High	• None envisaged – any loss would occur within an enclosed and contained area	• Load-out facility design makes a release to the environment implausible • Concentrate handling procedures to be defined • Personnel to have appropriate training, including release response • Trucks and rail cars to be inspected to ensure no concentrate leaves facility outside of containment	• Response procedures to be developed as part of the concentrate handling procedures
Chemical Release during transport • Updated Information ○ Design and operational safeguards, as well as response procedures, as originally proposed will be in place.	• The severity of a release would depend on several factors, including the nature of the material, the location, the time of year and the volume. • Largest volume event related to transport of mill process chemicals.	Low	• The potential environmental issues surrounding a chemical release during transport to the site would depend on the nature of the material, the location of the release, the time of year and the volume of material released	• Only licensed companies permitted to deliver to site • Third-party contractors will be required to have active service agreements with licensed release response contractors • All drivers to have appropriate training, including release response training • All trucks to have appropriate communications capabilities • Speed limits posted and monitored on site access road and GenPGM to follow-up with any reports of excess speed • GenPGM to have response capacity on site	• Third-party contractors will operate under their own emergency procedures and will be responsible for first-level release response and reporting

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures

Chemical release within SSA
• Updated Information
  ○ Design and operational safeguards, as well as response procedures, as originally proposed will be in place.
	• A chemical release in a mine facility (building) could occur as the result of malfunctioning equipment, human error or some other mishap.
	• A chemical release could occur in a contained structure or building.
	• A chemical releases could occur outside of a contained structure or building.
		High (within a confined facility)
		Medium (outside a confined facility)
			• No potential for substantial environmental issues envisioned
			• Releases within contained facilities will not reach the environment
			• Releases outside of contained facilities are most likely to occur in developed or built-up parts of the site that themselves are within contained drainage areas
				• Building or structure design to include sealed floors and sumps or drains to contain any material released to ground
				• Local on-site transport routes to be established with consideration of appropriate setbacks from sensitive features
				• All chemicals to be stored and handled as appropriate according to MSDS information
				• All personnel handling chemicals will have appropriate training (e.g., WHMIS)
					• Emergency response procedures will be set out in the EPRP, consistent with MSDS information
					• Consistent with provincial emergency planning requirements the goals of the emergency response plan, relative to potential fuel releases, will be to:
					  ○ assess health and safety risks
					  ○ isolate sources of ignition
					  ○ stop release
					  ○ notify appropriate authorities (municipal, provincial and federal authorities)
					  ○ contain release
					  ○ restore the environment.
					• GenPGM will retain a third-party release response contractor to aid in response

Controlled release of water to the environment from the PSMF • Updated Information ○ Despite changes to the site water management plan, no substantial change in the assessment outcome is indicated since the basis of the design and operational philosophy for the PSMF are unchanged. Design and operational safeguards, as well as response procedures, as originally proposed will be in place.	• The PSMF is designed to convey a controlled release of water (untreated process water and run-off) from the PSMF over a spillway to Hare Lake for the Inflow Design Flood condition (1 in 10,000 year 24 hour event). • Approximately 1 M m^3 of water could be discharged over 1 to 2 days	Remote	• No acute toxicity to aquatic biota expected based on predicted water quality • Certain metals may be above chronic threshold effect levels but only for a relatively short period of time therefore no chronic effects anticipated • The settling of suspended solids associated with the release may cause limited swamping of bottom habitats in proximity of spillway	• PSMF design - the conditions precipitating a controlled release from the PSMF have extremely low probability and are highly unlikely to occur over the life of the mine	• Response procedures to be developed as part of the EPRP, largely focusing on event monitoring • An incident report would be prepared for review with relevant regulatory authorities and Indigenous groups
Controlled release of water to the environment from the MRSA • Updated Information ○ Despite changes to the site water management plan and footprint of the MRSA, no substantial change in the assessment outcome is indicated since the basis of the design and operational philosophy for the MRSA are unchanged. Design and operational safeguards, as well as response procedures, as originally proposed will be in place.	• The MRSA is designed to convey a controlled release of water (untreated run-off) from the MRSA to the Pic River in the event that the MRSA EDS occurred during the height of the spring run-off. • The peak discharge would be approximately 540 and 350 m^3/hr from Catch Basins 2 and 3, respectively.	Low	• No acute toxicity to aquatic biota expected based on predicted water quality • Certain metals may be above chronic threshold effect levels but only for a relatively short period of time therefore no chronic effects anticipated • The settling of suspended solids associated with the release may cause limited swamping of bottom habitats in proximity of spillway	• MRSA design - the conditions precipitating a controlled release from the PSMF have low probability and are highly unlikely to occur over the life of the mine	• Response procedures to be developed as part of the EPRP, largely focusing on event monitoring • An incident report would be prepared for review with relevant regulatory authorities and Indigenous groups

PSMF or reclaim water pipeline failure
• Updated Information
  ○ Despite changes to the rate of process solids production, site
	• A pipeline failure could occur as the result of mechanical failure or a rupture due to severe impact.	Low	• For Type 1 process solids
			  ○ Solid fraction would swamp area in vicinity of pipeline failure affecting terrestrial habitat by swamping, but no
				• Pipeline constructed in consideration of appropriate design factors	• Response procedures to be developed as part of the EPRP, focusing on:
					  ○ Shutting the pipeline down

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures
water management plan and footprint of the Process Plant site, no substantial change in the assessment outcome is indicated since the basis of the design and operational philosophy are unchanged. Design and operational safeguards, as well as response procedures, as originally proposed will be in place.	• The PSMF pipeline release scenario includes the release of about 1,050 tonnes of process solids. • The reclaim water pipeline release scenario includes about 1,300 m^3 of water. The releases would see the materials go to ground, though some of the water or reclaim water may report to a surface water feature.		toxicological related concerns due to solids chemistry ○ Liquid fraction may drain into existing surface water feature – metal levels below acute thresholds but above chronic thresholds – given short duration of exposure no negative effects predicted • For Type 2 process solids ○ Solid fraction would swamp area in vicinity of pipeline failure affecting terrestrial habitat by swamping – metals not in bioavailable form ○ Liquid fraction may drain into existing surface water feature – metal levels below acute thresholds but above chronic thresholds – given short duration of exposure no negative effects predicted • For liquid phase of process solids ○ Liquid fraction may drain into existing surface water feature – metal levels below acute thresholds but above chronic thresholds – given short duration of exposure no negative effects predicted • For reclaim water ○ may drain into existing surface water feature – metal levels below acute thresholds but above chronic thresholds – given short duration of exposure no negative effects predicted	• Pipelines routed adjacent to the PSMF access road to facilitate access and inspection • Pipelines positioned along the crest of PSMF dams where possible to direct a release resulting from a failure into the PSMF • Pipelines routed away from sensitive environmental features where practical • Emergency catchment features (e.g., berms) will be installed to lessen probability of a failure resulting in the release of material to a surface water feature • Pipeline inspection will occur regularly	○ Inspection/investigation to identify reason for failure ○ Containment of released material ○ Clean-up of released material for relocation to the PSMF
WTP Failure • Updated Information ○ No substantial changes to the scenario are indicated. Contingency to construct and operate water treatment plant(s) to ensure the protection of water quality in downstream continues to be included in the proposed project.	• Possible causes of a water treatment plant system failure could include: ○ chemical feed failure ○ mechanical failure (agitator, pump) ○ instrumentation error operator error.	Low	• No acute toxicity to aquatic biota expected based on predicted water quality • Certain metals may be above chronic threshold effect levels but only for a relatively short period of time therefore no chronic effects anticipated	• Mitigation strategies include both are design and operational safeguards	• Response procedure will be set out in the EPRP. • The procedure will focus on halting the flow of water from the plant to the environment, identifying the issues(s) associated with the failure and subsequently rectifying the issue(s) so that the plant can be brought back on-line. • GenPGM will contact appropriate government agencies, local Indigenous groups and communities
Unanticipated seepage from the PSMF • Updated Information ○ Despite updated information being presented herein with respect to seepage rates, seepage quality and consequently seepage loading rates, the updated analysis does not materially change the	• Unanticipated seepage from the PSMF (quality, quantity) could occur in the event that seepage rates have been underestimated • The seepage would report to a surface water feature (Stream 6 catchment) relatively quickly.	Low	• For a water quality issue, degradation of water quality in Stream 6 downstream of the PSMF, such that aquatic biota could be negatively affected • For a water quantity issue increased base flows in the Stream 6 Subwatershed	• PSMF design includes HDPE liner keyed into bedrock and foundation grouting where appropriate • Conservatism in the determination of seepage water quantity and quality to the extent that an underestimate of either is unlikely	• PSMF dam seepage to be monitored directly and via the groundwater monitoring program • Seepage management plan developed and implemented in consultation with appropriate government agencies

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures
assessment outcome as it concerns potential water quality effects if they were to occur.	• It is assumed that the unanticipated seepage would require some form of management.			• Process solids management strategy aimed at preventing potentially reactive Type 2 material from oxidizing • Progressive rehabilitation to limit infiltration that may become seepage	
Unanticipated drainage from the MRSA • Updated Information ○ There is no material change in the assessment of unanticipated drainage quality issues from the MRSA, despite updated information being presented in this report with respect to mine deposition and tonnages and MRSA-related geochemical source terms and water quality. There is no change in the operational philosophy of mine rock management.	• Unanticipated drainage from the MRSA could result if substantially more Type 2 material than has been assumed is stored in the MRSA.	Low	• Limited as water quality issues that would arise in this scenario would be managed through treatment as long as was necessary	• Grade control program in the pits to segregate mine rock streams • Conservatism has been incorporated into water quality modeling for the MRSA • The mine plan includes the collection of waters draining the MRSA and treating them if necessary to protect water quality in the Pic River over the long term	• MRSA drainage to be monitored to assess EIS Addendum predictions • MRSA drainage management plan developed and implemented in consultation with appropriate government agencies
Project-related fires • Updated Information ○ Design and operational safeguards, as well as response procedures, as originally proposed will be in place.	• A fire at the Project site could result from a variety of causes. • The most likely scenario for a fire involves an isolated fire in a Project-related building or structure.	Medium to High	• Local habitat loss through burning and short-term air quality concerns	• Fire detection and alarm system, with back-up • Co-ordination with local emergency response services • Fire protection system to be designed consistent with applicable codes and regulations • Remote buildings equipped with portable extinguishers • Pumper truck on-site and equipped with a foam generation system • Regular fire drills • The site itself will act as a fire break to limit spreading beyond the site	• Response procedures to be developed as part of the EPRP with co-ordination with local emergency response services, focusing on: ○ Protecting worker safety ○ Protecting Project facilities ○ Ensuring that the fire does not spread ○ Protecting the surrounding environment
Pit slope failure • Updated Information ○ Design and operational safeguards, as well as response procedures, as originally proposed will be in place. ○ Increased minimum safety factors for the pit walls to 1.3:1 from 1.2:1 in the original design are proposed.	• A pit slope failure could result from improper design or operation of the pits. • A slope failure could result in the expansion of the pit perimeter and the loss of some terrestrial habitat.	Low	• Loss of some terrestrial habitat and features due to expansion of pit perimeter	• Pit design and operations optimized for slope stability with appropriately conservative safety factors • Pit wall stability to be monitored during excavation • Surface monitors installed as appropriate to monitor ground movement	• Response procedures to be developed as part of the EPRP

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures

MRSA slope failure
• Updated Information
  ○ The current MRSA design adheres to the same design principals as in the original project proposal, despite there being less rock and the MRSA occupying a smaller footprint.
	• Slumping of the MRSA to the east or to the west could occur as the result of not adhering to the proposed design, an event occurring outside the limits of the proposed design, the loss of structural integrity in the foundation, or the build-up of hydrostatic pressure.
	• The most likely accident scenario involves slumping at the individual bench scale, rather than the rock pile as a whole
		Remote (for a large scale event)
		Low (for minor bench-isolated slumping)
			• A minor slope failure (at the bench scale) would be contained within the MRSA and there are no environmental concerns
			• A major slope failure would likely be contained within the MRSA drainage collection basins but could possibly result in some localized habitat disturbance in Pic River flood plain
			• No large scale movement of material into the Pic River envisaged
				• Design and design safeguards including:
				  ○ Incorporation of appropriate safety factors
				  ○ Adequate setback from the Pic River
					• Response procedures to be developed as part of the EPRP including:
					  ○ Cessation of mine rock disposal in the affected area
					  ○ Preliminary safety and damage inspection
					  ○ Ensure structural integrity and contain immediate threats to the environment (short term)
					  ○ Develop medium and long term action plan as appropriate in consultation with appropriate regulatory agencies
					  ○ Government agency personnel, local Indigenous groups and communities would be notified

PSMF slope failure
• Updated Information
  ○ Despite physical changes to the PSMF layout to accommodate increased mine production, improve water management and storage of Type 2 mine rock. This is the case since the basis of the design and the operational philosophy of the PSMF are unchanged. Specifically, as it concerns the design, the PSMF embankments includes the construction of massive rockfill structures that exceed the prescribed short-term, long-term and pseudo-static minimum factor of safety stability requirements.
	• A PSMF slope or dam failure could result from a loss of structural integrity of a dam (or portion of a dam) cause by either prolonged or sudden force acting on the dam.
	• Based on the design and configuration of the PSMF, a worst-case scenario is characterized as a slope failure resulting in a partial breach of a PSMF embankment. A partial slope failure could lead to a release of solids and associated to the west from Cells 1 and 2B, to the north from Cells 2B and 2A, to the east from Cell 2A and to the south from Cell 1. For each of these potential scenarios, the release due to a slope failure is assumed to include process water and the upper process solids surface.
		Remote	• Loss of containment of solid fraction resulting in swampy of previously undisturbed terrestrial habitat
			  ○ Liquid fraction could drain to natural surface water features (Hare Lake tributary, Stream 6, Shack Lake tributary) negatively affecting water quality
			  ○ COPC levels below acute thresholds but may be above chronic thresholds – no toxicity related effects are likely given the duration over which release to water would occur.
			  ○ Settling of solids transported with liquid fraction as suspended particulates would settle in local water courses smothering bottom habitat and potentially negatively affecting sediment chemistry.
				• Suitably conservative design and design safeguards including:
				  ○ Design exceeds dam safety guideline requirements
				  ○ Dam raises will be completed under the supervision of qualified persons
				  ○ Spillway design to allow controlled release of the IDF during all development stages
				  ○ There will be no free standing water adjacent to dam structures at closure
				  ○ Dam safety inspections will occur over the long term
				• Milling process is at high pH therefore the levels of pH-sensitive metals will be relatively low in the liquid fraction of the process solids
					• Response procedures to be developed as part of the EPRP including:
					  ○ Cessation of process solids deposition in the affected area
					  ○ Preliminary safety and damage inspection
					  ○ Ensure structural integrity and contain immediate threats to the environment (short term)
					  ○ Develop medium and long term action plan as appropriate
					  ○ Government agency personnel, local Indigenous groups and communities would be notified
					• GenPGM will retain a third-party release response contractor to aid in response

Explosives accident
• Updated Information
  ○ SME technology is now proposed for the Project, which eliminates the need for a conventional emulsion manufacturing facility through the use of specially designed bulk delivery vehicles, which provide mobile emulsion manufacturing capability.
  ○ Emulsion will be manufactured in the pits (on the bench) and delivered directly to the blastholes, eliminating the need to store finished product at the facility.
	• An explosives accident could result from improper handling of explosive materials, faulty equipment, improper blast notification and or guarding practices or because of an overuse of blasting agent producing abnormal amounts of fly rock
	• The most likely accident scenario would involve bodily harm or building damage rather than significant environmental impacts.
		Low	• Direct damage limited to the blast zone
			• Primary concerns related to an explosives accident are worker health and safety related
				• Follow appropriate regulatory requirements
				• Employ a licensed third-party contractor to supply and handle explosives
				• Follow good housekeeping practices
				• Develop explosives storage and handling and blasting procedures and train personnel
				• Provide suitable protection for above ground fuel tanks used in the explosives manufacturing process in accordance with Subsection 4.3.7 of the National Fire Code of Canada (2005)
				• Communication of EPRP with appropriate local and regional authorities
					• Response procedures to be developed as part of the EPRP
					• EPRP will be consistent with CAN/CSA-Z731-95

Table 6.3-2: Summary of Potential Environmental Issues, Mitigation and Response Procedures for Accidents and Malfunctions

Accident and Malfunction Scenario	Nature, Mechanism and Magnitude	Probability	Potential Environmental Issues	Design and Direct Mitigation	Response Procedures
○ The separation of detonators, magazines and components reduces the risk of explosive accidents and isolates risks of explosives accidents to the pits.					
Premature closure of the mine • Updated Information ○ There is fundamentally no change in the assessment of an incident related to the premature closure of the mine.	• Premature closure of the mine could occur during any mine life phase. • Environmental concerns would be related to the loss of control of material and/or equipment on the site or a loss of control of the management of the site as a whole	Low (due to changes in Project economics) Remote (due to corporate insolvency)	• A variety of specific events could occur resulting in environmental issues; conceptually the concern is related to loss of control of material and equipment on site and/or a loss of control of overall management of the site • Most likely scenarios would be local in nature and minor in scope	• A robust economic analysis of the Project provides confidence that the Project will remain economically feasible over its projected life • The risk of corporate insolvency is remote as Project risks are shared • The Site Closure Plan (and the actions outlined therein), and the final assurance associated with the Closure Plan	• Response procedures to be developed as part of the of the EMS and conceptually to include: ○ Inventorying all materials, chemicals and equipment on site and developing appropriate control plans ○ Implementing activities so as to maintain control of materials, chemicals and equipment on site, as well as overall site management ○ Implementation of Closure Plan activities (if closure deemed permanent)

6.4 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

6.4.1 Climate Change

Climate change considerations were described in the original EIS (2012) and the supporting greenhouse gas and climate change assessment [SID 8] (CIAR #227) with respect to long-term regional implications for the climate of northwestern Ontario, including the Marathon area, greenhouse gas (GHG) emissions from an industry and project-specific basis, and the potential effects of climate change on the Project. Additional information on the implication of GHG emissions and potential effects of climate change on the Project was provided in responses to the following IRS:

- Response to IR19 (CIAR #460)
- Response to IR22.2 (CIAR #447)
- Response to SIR 6 (CIAR #574)
- Response to AIR 12 (CIAR #657)

Much of the information presented in the original EIS and IR responses remains relevant, in particular as it pertains to long-term regional implications for the climate of the Project area that can be summarized generally as follow:

- Temperature - higher maximum temperatures, greater frequency of hot days, higher average seasonal temperatures, increased minimum temperatures, fewer cold days and frost days
- Precipitation - decreased total amount of precipitation, greater frequency of higher intensity precipitation events
- Lake Superior - surface water temperature increase, water level decrease
- Surface waters – lower base flows, increased temperature
- Groundwater – decreased flow
- Soil Conditions – decreased soil moisture levels
- Vegetation and Wildlife – general retreat of cold adapted species north, advance of warm adapted species north

Project-specific considerations are revisited below in light of the Project design and implementation changes that are proposed, as are the potential effects of climate change on the Project

6.4.1.1 Potential Effects of Climate Change on the Project

The original EIS (2012) screened Project phases and associated activities for potential climate change related sensitivities and then considered such sensitives more fully. The assessment has been reconsidered in light of the new project plan and no new specific project sensitivities have been identified. The primary sensitivities that were raised are related to mine closure activities and are listed below:

- The reclamation and restoration of landscape (including water bodies) to productive capacity
- The management of flooded pits to submerge Type 2 material and to protect groundwater and surface water quality during flooding and pit overflow
- The proposed PSMF closure design for the long-term management of Type 2 materials and stability of the facility

No new project-related sensitives have been identified. Further consideration of the potential issues identified above are provided as follows.

As it pertains to the reclamation and restoration of landscape (including water bodies) to productive capacity post-closure, the following is noted and is generally unchanged from the original EIS (2012). Restoration and reclamation activities will occur for both terrestrial and aquatic habitats post mine closure. Terrestrial habitats will largely be reclaimed via re-vegetation. Aquatic habitats will be restored/created via the creation of new surface water features (streams, ponds, a pit lake), as well as the enhancement of existing surface water features. These activities will be completed as part of fish habitat offset works. In recognition of the climate change predictions for the Marathon area, which suggest a warmer drier climate, the future climate of the area will be factored into the decision-making and detailed design processes for site closure and reclamation activities, among the myriad of other factors that will be considered. The nature of the climate conditions post-closure will factor into the success of the reclamation measures that are implemented. For example, over the long-term vegetation that is more suited to drier conditions that currently exist or are drought-adapted may be a more suitable reclamation option. As it pertains to new stream channel design and fish habitat compensation works, consideration of things such as the potential need to maintain fish passage under lower base flow conditions that currently exist or the need to incorporate low flow refuge areas will be part of the detail design process.

As it pertains to the management of flooded pits to protect groundwater and surface water quality during flooding and pit overflow the following is noted, and is generally unchanged from the original EIS (2012). Over the long-term the open pit complex will fill with water, as the results of natural groundwater inflows and surface water runoff. It has been estimated that the North Pit will take approximately 30 to 40 years to fill. A warmer and drier climate in the future in the Marathon area could result in the North Pit taking a longer time period to fill. In this scenario, the rock faces along the pit perimeter will be exposed to the atmosphere for a longer period of time potentially increasing concentrations of constituents of potential concern in water contained in the pit. As a result, pit water quality could have higher constituent concentrations than is currently anticipated. In this instance, surface water quality in areas in which the pit water will eventually overflow could be negatively affected if water quality in the pit was not managed. Potential pit water quality issues, like the one described above, are manageable and a strategy for managing pit water quality can be developed as needed if pit water quality monitoring data collected

during the closure phases show a trend of decreasing quality. In situ treatment (e.g., lime addition) has been used effectively in similar circumstances. With this in mind no adverse effects on surface water quality as the result of a decreased rate of pit filling (and a resulting increase in acid and metal loading rates to pit water) would be anticipated.

As it pertains the long-term strategy for management of the Type 2 materials the following is noted. A detailed response to questions arising regarding this strategy, specifically related to an analysis of the effectiveness of the strategy under varying climate conditions, was developed as part of IR 21.2 (CIAR #461). This analysis indicated that the key criteria of the PSMF conceptual closure plan, including maintaining the Type 2 material in a saturated state, would be achieved under such varying conditions. The potential for drying of the upper Type 1 (non-PAG) process solids under dry and extreme dry precipitation conditions and under extreme dry conditions colonizing vegetation on the PSMF cover could also be stressed; however, it was concluded that neither of these conditions should result in unsaturated storage conditions in the Type 2 (PAG) process solids. This analysis was updated in consideration of the optimized PSMF arrangement to confirm the Type 2 process solids storage/management strategy under varying climate conditions (see Appendix D12 of the EIS Addendum [Vol 2]). The results of the analysis confirmed that the Type 2 materials will remain saturated, supporting the long-term management strategy.

6.4.2 Extreme Weather

6.4.2.1 Precipitation

Per the original EIS (2012), the principal concern with precipitation remains the potential for a future with increased frequency and magnitude of events and the need therefore to manage water quantity to minimize adverse effects from unplanned releases from the site.

In the case of the PSMF and MRSA the environmental risks associated with having to manage increased run-off volumes over shorter durations have been mitigated by the water management measures include in the design of the facilities. The PSMF will, at all times, have sufficient capacity to store operational water needs plus volumes derived from natural run-off and snow-melt resulting from Environmental Design Storm (EDS; 1 in 100-year 24-hour precipitation and 30-day spring snowmelt (408 mm). Additional freeboard and spillways have been included in the PSMF to manage storm events greater than the EDS. The PSMF spillways have be sized to convey the peak flow resulting from the Inflow Design Flood (IDF) which consists of the 24-hour Probable Maximum Precipitation (PMP, 328 mm) occurring over and above the EDS. A dry freeboard allowance is included above the IDF level to contain wave run-up resulting from a 1 in 1,000 year wind event. The MRSA Catch Basins have been sized to contain an EDS consisting of a 1 in 25-year 24-hour precipitation event. The overflow spillways on the MRSA Catch Basin dams have been sized to convey the 1 in 100-year 24-hour precipitation event. A pumping system will be installed in the MRSA Catch Basins to transfer water to the WMP at the PSMF to minimize stormwater discharge to the Pic River. The pumping system has been sized to manage the EDS and longer duration precipitation events including a 1 in 5-year freshet with snowmelt. The MRSA Catch Basin will be maintained in an empty condition during regular operating conditions. Discharge to the Pic River

would occur via the overflow spillways in the event that inflow exceed the capacity of the Catch Basins and water transfer system.

Management of higher run-off volumes associated with greater intensity events will also need to be considered, among various other design factors, within the context of the detailed design process for water management infrastructure, such as the stormwater collection system and culverts, as well as stream channels and aquatic habitat that will be developed as part of fish habitat compensation measures. Similarly, design of mine closure related water management infrastructure will need to consider these same principals.

6.4.2.2 Wind

High-velocity winds could damage buildings and/or power lines. In the PSMF, large waves could develop in areas inundated with process water, and, alternatively, fugitive dust emissions could emanate from beach areas. Mitigations associated with the possible occurrences are design-related and include the following in keeping with design elements associated with the original EIS (2012).

As it concerns buildings and power lines, this infrastructure will incorporate appropriate standards in recognition of site conditions in the design and construction processes.

As it concerns the PSMF, storage capacity has been incorporated in the PSMF design to contain wave run-up associated with the 1 in 1,000 year wind event. Water sprays and/or additives to the process solids slurry will be utilized to minimize fugitive dust emissions during operations. At closure, wind breaks will be installed and the final process solids surface will be vegetated to lessen the likelihood of fugitive dust emissions resulting from strong winds.

6.4.3 Forest Fires

Updated information with respect to the incidence of forest fires in the study area is provided below. There are no records of a fire on the Project site for the period of record available. This is consistent with the vegetation data for the site that indicates forested areas are more than 100 years old.

The Canadian Wildland Fire Information System (CWFIS; https://cwfis.cfs.nrcan.gc.ca/home) reports that Canada experiences more than 8,000 reported wildfires annually, burning approximately 2.1 million hectares of forest. Figure 6.4-1 shows forest fires greater than 200 hectares, from 1980 to 2019 on a national scale. The data indicate some frequency of fires regionally in the area of interest over that period, though fore activity in the immediate vicinity of the project site is appears limited.

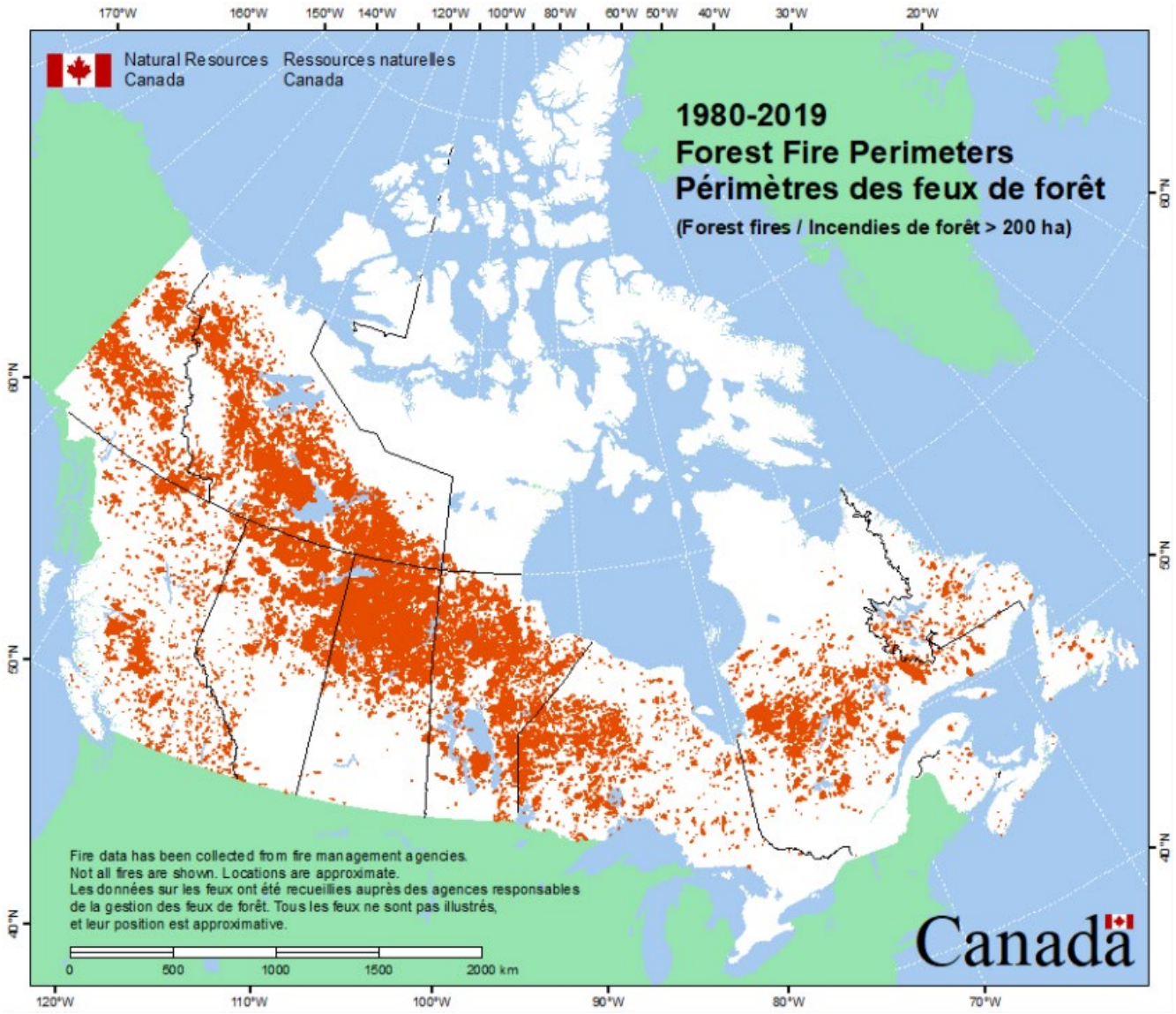
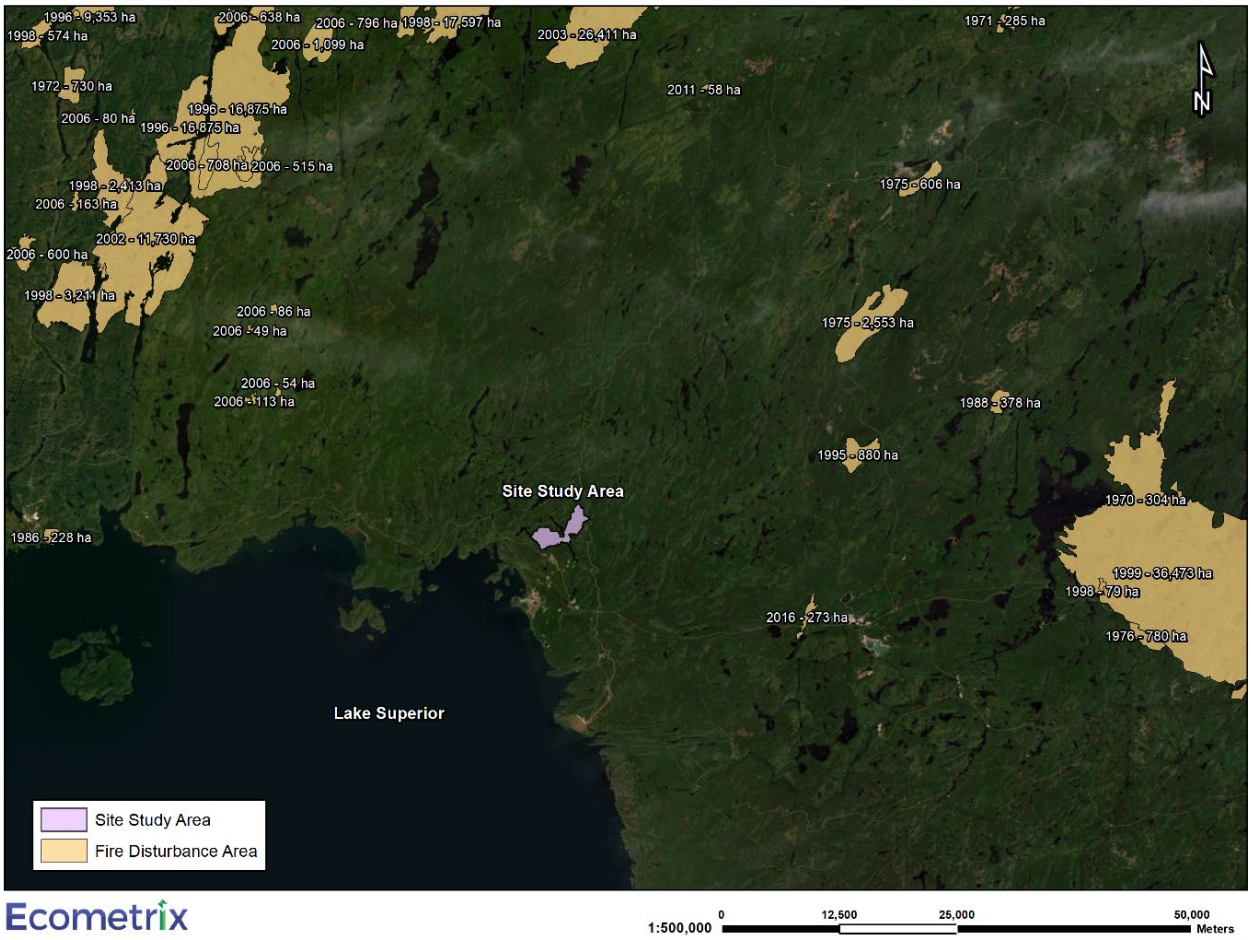


Figure 6.4-1: Incidence of Canadian Forest Fires Greater than 200 hectares (1980-2019)

Figure 6.4-2 shows forest fires that have occurred within a ~ 50 km distance of the project site, from data available from the Government of Ontario[1]. Several large fires have occurred within this area, though not in the immediate vicinity of the project site. Not shown in the map is a small fire (0.2 ha) that was reported in May of 2020, 5 km north of Marathon south of Highway 17.

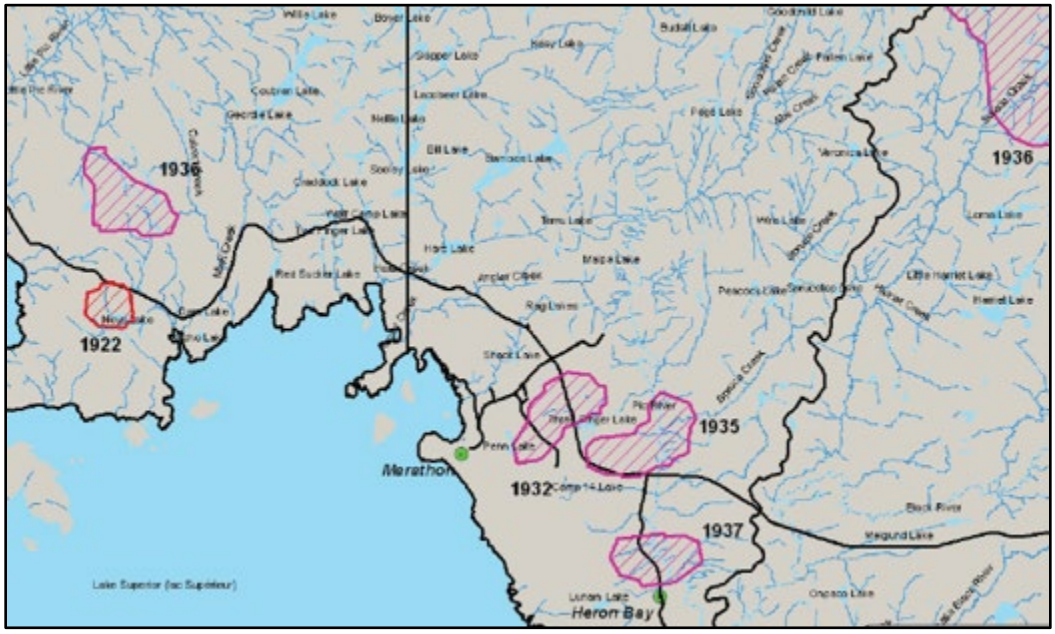


Source: https://www.lioapplications.lrc.gov.on.ca/ForestFireInformationMap/index.html?viewer=FFIM.FFIM

Figure 6.4-2: Incidence of Forest Fires as Reported by the Government of Ontario

[1] https://www.lioapplications.lrc.gov.on.ca/ForestFireInformationMap/index.html?viewer=FFIM.FFIM

For reference, additional historical forest fire occurrence data are provided in Figure 6.4-3 that show fires that occurred in the 1920s and 1930s proximate to the SSA, as provided by OMNRF Nipigon District. These data show two relatively large fires (greater than 500 hectares) occurred in the immediate vicinity of the Town of Marathon in 1932 and 1935. Three other fires occurred in the area in that same general time period near Heron Bay (1937), to the west of the SSA southwest of Geordie Lake (1936) and to the northeast of the SSA, north of Lorna Lake. A fire occurred at Neys Lake in 1922.



Source: OMNRF Nipigon District

Figure 6.4-3: Incidence of Forest Fires Greater than 200 hectares (1920's-1930's)

A major fire at the site could cause property damage and the interruption of operation. Given the planned clearing associated with the development of the mine infrastructure, it is anticipated that the site itself will act as a fire-break and that this may limit the extent to which a large-scale fire would result in extensive on-site damage.

GenPGM will develop a response procedure within its Emergency Preparedness and Response Plan (EPRP) that considers a large-scale forest fire in the vicinity of the Project site. In the event of such a fire GenPGM would work closely with local and regional emergency services personnel to ensure worker safety and the site. The level of on-site response would depend on the level of perceived risk to site personnel and infrastructure. In a worst-case scenario, the mine operations could have to be shut down temporarily. There will be fire-fighting capacity on the Project site but this capacity is geared towards dealing with smaller scale on-site fires, and not a large-scale, regional forest fire.

6.4.4 Seismic Activity

The Geologic Survey of Canada identifies the Project area as being within a region of relatively low seismicity. There have been no significant earthquakes in the vicinity of the project site and there are no significant geological faults in the area.

The primary concerns from a seismic event perspective would be the failure of a man-made structure on the Project site, such as the failure of the MRSA slope, a failure of a PSMF embankment or a pit slope failure. The damage potential of an earthquake is determined by how the ground moves (the peak ground acceleration) and how the buildings within the affected region are constructed. The PSMF design has considered, as a minimum, the peak ground acceleration corresponding to the 1 in 2,475 year event as required by the *Lakes and Rivers Improvement Act* (LRI Act) and its associated regulations, and the Canadian Dam Safety Guidelines (CDA, 2019). This criteria was also adopted for the MRSA. Similarly, pit slopes have been designed with appropriate safety factors.

The current MRSA design adheres to the same design principals as in the original EIS (2012), despite there being less rock and the MRSA occupying a smaller footprint. The MRSA will be constructed with overall slope angles in the order of 2.2H:1V. Individual bench slopes will be approximately 2.0H:1V. The proposed slope angles exceed the natural angle of repose for mine rock and. The proposed MRSA geometry provides a high degree of stability. In addition, the majority of the MRSA will be founded directly on bedrock and most of the volume of the mine rock in the MRSA is located within a north-south trending valley. This configuration further enhances the stability of the MRSA, specifically as it pertains to a large-scale movement of mine rock to the east or west.

The design of the PSMF perimeter embankments and the footprint of the PSMF are unchanged from the original Project design. The PSMF water management and process solids deposition strategy have been optimized to enhance the site water management and provide storage for Type 2 mine rock within the PSMF. The proposed Cell 2 embankments have been raised from crest El. 375 m to 380 m to accommodate the Type 2 mine rock. The PSMF perimeter embankments will be constructed as zoned rockfill embankments using the downstream construction method with an embankment stability that exceeds the minimum Factor of Safety (FoS) requirements specified in the *LRI Act* (MNR, 2011) for End of Construction (FoS>1.3), Long-Term Steady-State (FoS>1.5), IDF (FoS>1.3), Rapid Drawdown (FoS>1.2) and Pseudo-static (FoS>1.0) loading conditions.

As it concerns the pit walls, design and operational safe guards, as well as response procedures, as originally proposed will be in place. Increased minimum safety factors for the pit walls to 1.3:1 from 1.2:1 in the original design are proposed.

GenPGM is committed to adhering to the designs proposed for its infrastructure. This will be achieved by completing regular as-built slope and stability surveys during construction and throughout mine operations. In the instance that any deviations from the proposed design are noted a plan would be developed and implemented in consultation with government agencies as appropriate to address the issue. Based on the above, GenPGM judges the probability of an environmental issue arising as the result of a seismic event as highly unlikely.

6.5 CAPACITY OF RENEWABLE RESOURCES

The Project is not expected to result in significant adverse environmental effects, and as such, renewable resources are not likely to be significantly affected by the Project.

The integrity, carrying capacity, and resilience of the affected ecosystems to respond to internal and external changes would not be significantly affected by the Project. The productive capacity of renewable resources in the area, such as air (clean air for breathing), surface water (drinking water source), groundwater (drinking water source), aquatic resources (fish as food source) and terrestrial resources (wildlife as a food source, timber) would not be significantly affected. The assimilative capacity of the ecosystem, including the Pic River and Hare Lake / Hare Creek systems, would accommodate any discharge from the Project without resulting in significant adverse effects. The resilience of the affected ecosystems to respond to internal and external changes would not be significantly affected.

In regard to these renewable resources, the Project is also not expected to result in significant cumulative adverse environmental effects, when considered in combination with other past, present and reasonably foreseeable projects or physical activities, and as such, the capacity of renewable resources are not likely to be significantly affected by the Project.

6.6 CUMULATIVE EFFECTS ANALYSIS

6.6.1 Assessment Context

Section 6.6 of the original Environment Impact Statement (EIS) (2012) provided an assessment of cumulative environmental effects that were likely to result from the Project in combination with other physical activities that had been, or were anticipated to be, carried out. The original assessment was carried out using guidance provided in the document *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act* (CEAA, 2007) and the *Cumulative Effects Assessment Practitioners Guide* (CEAA, 1999). Additional information on the assessment of cumulative effects was provided by way of responses to information requests from the Panel, as follows:

- Responses to IRs 5.3 and 5.4 – Noise Cumulative Effects (CIAR # 421)
- Responses to IR20.1 – Assessment of Cumulative Effects (CIAR # 479)
- Responses to IR20.2 – Sources of Cumulative Effects (CIAR # 479)
- Responses to IR20.3 – Existing and Future Projects in the Region (CIAR # 482)
- Responses to IR20.4 – Transparency of Conclusions (CIAR # 479)
- Responses to SIR 11 – Cumulative Effects Assessment (CIAR # 586)

An updated cumulative effects assessment is provided herein. The cumulative effects assessment update identifies and assesses Project residual adverse environmental effects that are likely to interact

cumulatively with residual adverse environmental effects from other physical activities (past, present, and reasonably foreseeable). The Project's contribution to the cumulative effect is then assessed.

The approach used for conducting the updated cumulative effects assessment for the Project is informed by the *Operational Policy Statement for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* (CEAA 2016), *Interim Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* (CEAA 2018), and the EIS Guidelines.

The effects of past and current projects contribute to baseline conditions upon which Project effects are assessed. Cumulative effects are described as those resulting from residual adverse effects from the Project combined with the effects of certain and reasonably foreseeable future projects and activities. Future projects that are reasonably foreseeable are those that (a) have obtained the necessary authorizations to proceed or are in the process of obtaining the required authorizations, or (b) have been publicly announced with the intention to seek the necessary authorizations to proceed. Note that other such projects or physical activities do not have to be located within the Regional Study Area (RSA), but their effects have to interact cumulatively with those of the Project.

Two conditions must be met to initiate an assessment of cumulative effects on a Valued Ecosystem Component (VEC), including:

- the project has residual effects on the VEC, regardless of whether those residual environmental effects are predicted to be significant or not, and
- the residual effects are likely to act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities.

If either condition is not met, further assessment of cumulative effects is not warranted because the project does not interact cumulatively with other projects or activities.

An updated project and activity inclusion list (Section 6.6.4 of this report) provides known past, present and reasonably foreseeable future projects and physical activities that could act cumulatively with the Project's residual environmental effects. Section 6.6.6 evaluates residual environmental effects of the Project in the context of residual effects from past, present and certain or reasonably foreseeable future physical activities (i.e., projects or activities) to determine the potential for cumulative effects.

For cumulative environmental effects, the determination of significance is made using the same VEC thresholds as for Project environmental effects. The assessment of significance of cumulative environmental effects includes an analysis of the Project's contribution to identified cumulative effects.

6.6.1.1 Regional Historical Overview

The following provides a brief, general regional historic overview of the landscape of the Project area and, in particular, how it has changed in the recent, post-European colonization period.

The Project site is located in Canada's boreal forest, a vast region comprising almost 60% of the country's land area that emerged following the last glaciation. The Canadian boreal region spans the landscape from the most easterly part of the province of Newfoundland and Labrador to the border between the far northern Yukon and Alaska. Approximately 5,000 years ago, the Canadian boreal forest began to resemble what it is today in terms of species composition and biodiversity. The area is dominated by coniferous forests, particularly spruce, interspersed with vast wetlands, mostly bogs and fens. A dominant characteristic of the boreal forest is that much of it consists of a patchwork of large, even-aged stands due to a cycle of natural disturbances like forest fires or cyclical pest outbreaks (e.g. spruce budworm) that kill large tracts of forest.

First Nations peoples have inhabited the Project area since the retreat of the glaciers, sustainably using resources from the lands and waters. The land and resource use activities that would have occurred in this period were likely not of the scale to induce change noticeable at the landscape scale.

Starting around the turn of the 17th century, and for the next two hundred years, the post-European colonization period landscape was one primarily focused on exploration and the fur trade. At that time, the Pic River was an important canoe route that linked the Lake Superior coast with the interior, and trading posts were established at various locations.

6.6.1.1.1 Forestry, Mining and other Industrial Interests

By the mid-19th century, the fur trade was giving way to mineral exploration, mining and logging. Such activities were hastened by the development of rail access to the area. In the 1880s, the main line of the Canadian Pacific (CP) Railroad was built across the southern end of the area proximate to the Lake Superior shoreline. Construction of the main line of the Canadian National (CN) Railway commenced shortly after the First World War, crossing the northern section of the area. Many of the settlements in the area that would become future towns and municipal centres initially started as rail labour camps. It is noted that road access to the area from the east and west along the Lake Superior shoreline was relatively slow to develop due to the ruggedness of the terrain. The initial east to west corridor along a northern route (Highway 11) from Nipigon to Hearst was completed during the Second World War. The southern route along Lake Superior (Highway 17) between Schreiber and Sault Ste. Marie was not completed until 1960.

Timber harvesting occurred more or less continuously in the area on varying scales over the past 100 years and has had an extensive impact on the nature of the landscape in the area. Forestry has largely been the most consistent and significant resource-based industry of the local and regional economies since the First World War. The history of logging in the area and its impact on the landscape is reviewed in detail by Arnup (2016).

The pulp and paper industry has played an important role in the development of the area as an end user of the timber harvest supply. In 1944, Marathon Corp. built a pulp mill, and the community of Marathon was created as a company town. Terrace Bay was settled in the 1940s when a pulp and paper mill was established there. The pulp and paper industry has been in decline in Canada, including northwestern

Ontario, for the past 20 years. The Marathon mill closed in 2009. Despite periodic shutdowns, the Terrace Bay mill continues to operate.

Mineral exploration and mining have had some influence on the regional landscape, but not to the same extent as has historically been seen in northeastern Ontario along the Abitibi-Greenstone Belt and in the Sudbury area. Perhaps the most significant mining activity in the area is associated with the Hemlo Gold Camp near White River. The three Hemlo mines (Williams, Golden Giant, and David Bell) have produced approximately 24 million ounces of gold since 1985. The Williams Mine, operated by the Barrick Gold Corporation under the Williams Operating Corporation, is the only producing mine in the Pic Forest Management Unit (FMU). The former Geco and Willroy mines are located just north of Manitouwadge. The mines mainly produced base metals over a combined operating life that lasted from the late-1950s to the mid-1990s. The Winston Lake Mine, located north of Schreiber, was operated intermittently between the 1960s and the late 1990s.

More recently, power generation projects have been developed or proposed in the area, including both hydroelectric power on the White River and Black River east of Marathon (existing and proposed) and wind power (proposed). Local Indigenous communities have taken a particular interest in such developments and both Biigtigong Nishnaabeg (BN) and Pic Mobert First Nation are partners in both operating and planned future facilities.

6.6.1.1.2 Municipalities

Several small municipal centres are located in the area in relation to the Project site, the primary ones being Marathon (the community closest to the Project site), Terrace Bay to the west, White River to the east, and Manitouwadge to the north. Peninsula or Peninsula Harbour (now known as Marathon) was established in 1883 to house construction workers for the Canadian Pacific Railway line. At its peak, Peninsula was said to have had a population of 12,000 but, when railway construction was completed, the population significantly depleted. In 1944, Marathon Corp. constructed a pulp mill in Peninsula and the community of Marathon was created thereafter.

Terrace Bay was settled in the 1940s when a pulp and paper mill was established there. Terrace Bay was incorporated as a municipal township in 1959. The Town of White River was initially settled as a CP work camp in 1885 and had grown to include 42 families by 1906. A lumber mill was established in the community in the 1950s and the community was connected to the TransCanada Highway in the early 1960s. The Town of Manitouwadge was founded by General Engineering Co. Limited after staking claims in 1953 to support development of a copper mine. From 1954 to 1974, Manitouwadge was classified as an Improvement District. The community became an incorporated township in 1975.

6.6.1.1.3 Local Indigenous Communities

As described above, Indigenous peoples have a long history in the area, with BN in particular claiming to exclusive territory in a large portion of the RSA. Indigenous history and use of the region is discussed in detail in Section 5.0 and 6.2.12 of this EIS Addendum (Vol 2). The three nearest Indigenous communities to the Project site include Biigtigong Nishnaabeg (~10 km south), Pic Mobert First Nation (~20 km

southeast), and Pays Plat First Nation/Pawgwasheeng First Nation (~125 km west). In addition, three unique Métis communities with an interest in the Project include the Red Sky Métis Independent Nation (RSMIN) (no land base, signatories to the Robinson-Superior Treaty), the Superior North Shore Métis - Métis Nation of Ontario (no land base), and the Jackfish Métis of the Ontario Coalition of Indigenous Peoples (OCIP) (no land base).

6.6.1.1.4 Establishments of Parks, Conservation Areas and Preserves

The area hosts a number of provincial parks and protected areas (the closest to the Project being Red Sucker Point Provincial Park, Neys Provincial Park, and Craig's Pit Provincial Park), as well as one national park (Pukaskwa National Park) and the Lake Superior National Marine Conservation Area (LSNMCA). These parks and protected areas represent natural areas that are protected from substantial disruption. Combined, the provincial parks and protected areas comprise on the order of 50,000 ha of land. Pukaskwa National Park alone encompasses an area almost 190,000 ha in size. The LSNMCA is the largest freshwater protected area in the world, with a water-based area of approximately 11,000 km^2 in size that is bounded by the northern shoreline of Lake Superior, the Canada/United States border, Thunder Cape near Thunder Bay to the west, and Bottle Point between Terrace Bay and Marathon to the east.

6.6.1.1.5 Natural Process of Landscape Change in the Area

The condition of the landscape of the area, past and current, is a product of not only anthropogenically-derived change but also the result of large-scale natural disturbance. Within the boreal forest in general, and the Project area specifically, the two major sources of natural disturbance arise from forest fires and windthrow, with some stand damage caused by insects. Fire in particular plays the main role in maintaining the typical even-aged structure in intolerant boreal species.

Beginning in 1921, the Fire Protection Branch of Lands and Forests began to actively map forest fires on an annual basis; however, it is likely that fires in more remote areas were not recorded in the early years, since the widespread use of aircraft for monitoring fires did not begin until the late 1920s. Also, there is good evidence to suggest that there were a number of very large fires prior to settlement and record-keeping.

Arnup (2016) provides an overview of the fire history of the Pic River and Big Pic Forests (now the Pic FMU), and some of the key details of that overview are provided as follows:

- The area has an extensive fire history and evidence of major fire occurrences can be traced back to the 1780s; however, due to the sporadic nature of forest fires, and because of the absence of relatively large fires since the mid-1930s, there is a high proportion of stands in the mature and over-mature age classes.
- Most of the virgin forests in the areas originated from fires and became established as a result of generally large burns that occurred during cyclic periods of drought.

- The incidence of large-scale fire has diminished in recent decades, certainly the result of active forest management practices. For example, between 1982 and 1987, the mean burn area per year for a five-year period was approximately 25% of what it was in the late 1940s. The decrease in fire scope has affected tree age class distribution in that older age classes have not been renewed by forest fire, and logging operations have not kept up to the levels necessary to maintain a natural age class distribution. In addition, the absence of fire has resulted in change from the natural forest composition, with a decrease in jack pines (which requires fire to regenerate) and an increase in fire-intolerant species such as balsam fir, a fire-intolerant species (increasing future risk of spruce budworm outbreaks).

6.6.2 Summary of Residual Effects

The updated assessment of cumulative effects is based on the results of the effects assessment of the Project where potential residual adverse effects on VECs were identified in Section 6.2 of this EIS Addendum (Vol 2). Table 6.6-1 summarizes the potential adverse effects resulting from Project activities.

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
Atmospheric Environment (previously included under physical environment)	Components of the atmospheric environment, including:		
	• Air Quality	Yes	Change in air quality – Emissions of CoPCs will increase as a result of Project-related activities
	• Dustfall	Yes	Change in dustfall – Project-related activities will result in an increase in dustfall
	• Ambient Light Levels	Yes	Change in ambient light levels – Project-related activities will result in a localized change in ambient light levels
	• Climate Change (Greenhouse Gas [GHG])	Yes	Change in GHG levels - GHG emissions are associated with the Project
Acoustic Environment (previously included under physical environment)	Components of the acoustic environment, including:		
	• Noise	Yes	Change in noise levels - Project-related activities will result in an increase in local noise levels
	• Blasting/Vibration	Yes	Change in vibration – Project-related blasting will increase vibration levels
Water Quality and Quantity (previously included under physical environment)	Components of water quality and quantity, including:		
	• Groundwater Quantity	Yes	Change in groundwater quantity – Project-related activities will result in the lowering of water table levels during operations and closure due to pit dewatering and final lake pit elevations, as well as localized groundwater mounding in relation to the Process Solids Management Facility (PSMF) and Mine Rock Storage Area (MRSA)
	• Groundwater Quality	Yes	Change in groundwater quality – Concentration of select constituents in groundwater will increase as a result of Project-related activities

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
	• Surface Water Quantity	Yes	Change in surface water quantity – Through the development of Project infrastructure, including the water management system, removal of several watercourses and the contributing drainage areas for subwatersheds within the Local Study Area (LSA) will occur
	• Surface Water Quality	Yes	Change in water quality – Incremental change in concentrations of constituents relative to baseline conditions
Fish and Fish Habitat (previously described as Aquatic Resources)	Components of fish and fish habitat, including:		
	• Fish Habitat	Yes	Lethal effects to fish – The loss of approximately 8.5 ha of fish-bearing habitat may result in mortality to fish Change resulting in direct physical harmful alteration, disruption or destruction (HADD) – Loss of approximately 14.5 ha of aquatic habitat, with an offset of approximately 8.5 ha, resulting in a net loss of 6 ha Change in water quantity – Indirect HADD due to redirection of water from upper portions of subwatersheds in the Site Study Area (SSA), specifically in subwatersheds 101 and 106. Flows in these subwatersheds are anticipated to return to normal post-closure. Change in water quality – Incremental change in concentrations of constituents relative to baseline conditions
	• Benthic Invertebrates	Yes	Change in benthic invertebrate communities – Direct loss and indirect impairment of benthic communities through the loss of habitat (e.g. HADD), and indirect loss due to changes in water quantity, changes to concentrations of constituents in sediments

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
Terrain and Soil (previously included under Physical Environment)	Components of ground conditions, including:		
	• Terrain and Soils	Yes	Change in soil and overburden quantity – Soil disturbance as a result of site preparation and construction including the potential for soil loss due to erosion
		Yes	Change in soil quality – Potential incremental increase in soil constituent concentrations as a result of Project-related fugitive air emissions
Vegetation	Vegetation communities and species, including:		
	• Forest Cover	Yes	Change in forest cover - Direct loss of approximately 1,081 ha of forest and potential indirect change or impairment of approximately 842 ha of forest cover
	• Non-forest cover, including wetlands and rock barrens	Yes	Change in non-forest cover – Direct loss or indirect impairment of approximately 6.1 ha of non-forested wetlands and non-forested upland communities
	• Regionally Rare Species	Yes	Change to regionally rare plant species – Transplantation of two occurrences of Oakes' pondweed
	• Provincially Rare Species	Yes	Change to provincially rare plant species – Transplantation of one occurrence of algae pondweed and one occurrence of alpine woodsia
	• Plant Species of Interest to Indigenous Communities	No	Change to Plant Species of Interest to Indigenous Communities - Removal of habitat that supports plant and fungus species of interest to Indigenous communities from the SSA

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
Wildlife	Wildlife and wildlife habitat, including:		
	• Furbearers • Moose • Grey Wolf • Black Bear • Migratory Birds (songbirds and waterfowl)	Yes	Change to habitat quantity – Displacement (temporary or permanent) of furbearers from the SSA Change in habitat quality – Potential effects from elevated sound, vibration, light, smells, dustfall, as well as possible changes as a result of invasive species, groundwater and surface hydrology, or edge effects Change in wildlife survival – Potential increase in collisions with Project vehicles and other infrastructure Change in habitat fragmentation & movement – Potential effects from habitat clearing, collisions with Project vehicles and infrastructure, and waste-related interactions Change to wildlife of interest to Indigenous communities – Residual changes to wildlife habitat quantity and quality, wildlife survival, and wildlife habitat fragmentation and movement also apply to changes to wildlife of interest to Indigenous communities
Species at Risk	Species at Risk and associated habitat, including:		
	• Woodland Caribou	Yes	Change to woodland caribou or their habitat - loss of approximately 107 ha of potential caribou winter habitat in the SSA (albeit only 2.9 ha are currently undisturbed) and an additional 45 ha of disturbed habitat in the LSA.
	• Little brown myotis/ Northern myotis	Yes	Change to little brown myotis / northern brown myotis or their habitat - loss of approximately 1,000 ha of possible bat foraging and day roost habitat in the SSA, as well as the loss of an estimated 39 ha of potential bat maternity roost habitat.

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
	• Canada Warbler	Yes	Change to Canada warbler or their habitat – loss of approximately 1071 ha of potential Canadian warbler habitat and potential sensory disturbance of an additional 444 ha within the LSA
	• Rusty Blackbird	Yes	Change to rusty blackbird or their habitat – loss of approximately 17.7 ha of potential rusty blackbird habitat
	• Bald Eagle	No	-
	• Olive-sided Flycatcher, evening grosbeak, eastern wood-pewee	No	-
	• Common nighthawk	Yes	Change to common nighthawk or their habitat – loss of approximately 48 ha of potential common nighthawk habitat
	• Eastern whip-poor-will	Yes	Change to eastern whip-poor-will or their habitat - loss of approximately 48 ha of potential whip-poor-will habitat
	• Peregrine falcon	No	-
	• Yellow-banded bumble bee	Yes	Change to yellow-banded bumble bee or their habitat – loss of approximately 1,116 ha of potential yellow-banded bumble bee habitat
	• Monarch	Yes	Change to monarch or their habitat – loss of approximately 1,116 ha of potential monarch habitat
	• Lake Sturgeon	No	-
Socio-economic Environment (Compilation of Social Environment, Economic Environment, and Land, Water and Resource Use)	Economy and employment, including:		
	• Employment and Income	Yes	Change in employment and income – loss of employment and Project-related income when project transitions from operations to closure

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
	• Government Revenue	Yes	Change in government revenue – loss of revenue once the Project transitions from operations to closure
	• Economic and Business Development (including commercial fisheries)	Yes	Change in economic and business development – reduction/loss of revenue and opportunities once the Project transitions from operations to closure
	Infrastructure and services, including:		
	• Accommodations	Yes	Change in accommodations – Increase in demand for housing and short-term accommodations (estimate of 240 persons for short-term accommodations), including BN members who may choose to move back to the community
	• Community Services and Infrastructure	Yes	Change in community infrastructure use – Potential increased demand on infrastructure and community services as a result of Project-related population growth.
	• Transportation Infrastructure	Yes	Change in transportation infrastructure - Project-related activities and transportation of workers will place increased demands on local transportation infrastructure.
	Land and resource uses, including:		
	• Recreation and Tourism (including recreational fisheries)	Yes	Change in land and resource use - loss of, or restricted access to, the SSA, sensory disturbances (i.e., noise and dust) from Project activities, and the reduction in overall user experience from the Project presence
	• Forestry	Yes	Change in land and resource use - removal of forest land from the commercial forest area could affect the determination of annual allowable cut (AAC) levels.
	• Agriculture	No	-

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
	• Navigable Waters	No	-
Human Health (HH) (previously included under Social Environment)	Components of human health, including:		
	• Air Quality	Yes	Change in HH exposure to air – Incremental changes in air quality are predicted and therefore an incremental risk is perceived though no specific HH risks are expected
	• Noise	Yes	Change in HH exposure to noise – Incremental changes in noise are predicted and therefore an incremental risk is perceived though no specific HH risks are expected
	• Drinking Water	Yes	Change in HH exposure to water – Incremental changes in water quality are predicted and therefore an incremental risk is perceived though no specific HH risks are expected
	• Country Foods	Yes	Change in HH exposure to country foods – Incremental changes in country foods are predicted and therefore an incremental risk is perceived though no specific HH risks are expected
Physical and Cultural Heritage	Components of the physical and cultural heritage, including:		
	• Built and Cultural Heritage	No	-
	• Archaeological Resources	No	-
Indigenous Considerations	Considerations of Indigenous interests and rights, including:		
	• Traditional Land and Resource Uses	Yes	Change to harvesting – loss of area for hunting and harvesting of fish, plants and materials Change to Indigenous plant species of interest – Loss of habitat that supports plants and fungus species of interest to Indigenous communities

Table 6.6-1: Summary of Potential Adverse Effects Resulting from the Proposed Project

Valued Environmental Component	Scope of VEC	Residual Adverse Effect Identified?	Nature of Effect
			Change of access to BN Community Trapline – loss of 1116 ha of trapline area and altered access to remaining area
	• Heritage and Archaeological Resources	Yes	Change to trap lines – loss of access to the BN Community Trapline and altered access to remaining area
	• Indigenous Health	Yes	Change to drinking water - Project-related activities will result in decreased surface water quality Change to country foods - Project-related effects on the air, water, and sediment quality are expected to result in changes to CoPC concentrations in plants and animals in the country food diet

6.6.3 Spatial and Temporal Boundaries

The spatial and temporal boundaries associated with the cumulative effects assessment are the same as those identified for each of the VECs in Section 6.2 of this EIS Addendum (Vol 2) with respect to the assessment of project-related effects.

As it pertains to temporal boundaries, the cumulative effects assessment includes all project phases, site preparation and construction (18 to 24 months), operations (~12.7 years) and decommissioning and closure (2 years plus 45 years, respectively).

As it pertains to spatial boundaries, the cumulative effects assessment is completed at the RSA level. The RSA is the area within which residual environmental effects from Project activities and components may interact cumulatively with the residual environmental effects of other past, present and future (i.e., certain or reasonably foreseeable) physical activities. The RSA is based on the potential for interactions between the Project and other existing or future potential projects. An RSA has been established for each VEC based on the regional conditions that are associated with that VEC. The various RSAs for VECs are depicted on the LSA/RSA figures specific to each corresponding VEC and additional information regarding the RSAs for each VEC is provided in the subsections to Section 6.2 of this EIS Addendum (Vol 2).

6.6.4 Other Projects and Activities Considered

Table 6.6-1, referred to as the Project Inclusion List (PIL), identifies projects and activities, including those that are certain and reasonably foreseeable, that may interact cumulatively with the proposed Project. The projects listed were identified from public sources of information, such as the Environmental Registry of Ontario, Ontario's highway programs on-line project information database, the Ministry of Energy, Northern Development and Mines Canadian Impact Assessment Registry, discussions with representatives of local Indigenous communities and interested parties, as well as the project team's local and regional knowledge of ongoing and planned activities. The projects and activities are identified on Figure 6.6-1.

The PIL is conservative relative to the VEC RSAs to be more, rather than less, inclusive of potential projects and activities that could have the potential to act cumulatively with the proposed Project.

Table 6.6-2: Summary of Projects and Activities included in Cumulative Effects Assessment

Project	Description
Past and Existing Projects / Activities	
Major Settlements and Communities	Within the combined Project components RSAs, there are several larger and smaller communities, typically proximate to the local highway network. The larger communities include White River, Marathon, Terrace Bay and Schreiber along Highway 17 and Manitouwadge along Hwy 614. Indigenous communities include Netmizaaggamig Nishnaabeg (Pic Mobert First Nation), Biigtigong Nishnaabeg (BN), Pays Plat First Nation/Pawgwasheeng First Nation, and Michipicoten First Nation.
Protected Areas and Parks	There are national and provincial parks in the combined Project VEC RSAs, as well as protected areas. Federal parks include Pukaskwa National Park and the Lake Superior National Marine Conservation Area. Provincial Parks include Steel River, Slate Islands, Prairie River Mouth, Neys, Red Sucker Point, Pan Lake Fen, Craig's Pit, White Lake, White Lake Peatlands, Pokei Lake/White River Wetlands, Nagagamisis, Pukaskwa River, Obatanga, Nimoosh, Michipicoten, Lake Superior, and Michipicoten Island. Provincial Conservation Reserves include Gravel River, Three Mile Narrows, Long Lake, Fishnet Lake, Lake Superior North Shore, Killala Lake, Isko Dewabo Lake Complex, Kwinkwaga Ground Moraine Uplands, Widgeon Lake Moraine, Kakakiwibik Esker, Strickland River Mixed Forest Wetland, Magpie River Terraces, and South Michipicoten River Superior Shoreline Conservation Reserve.
Major Transportation Networks and Hubs	Highway 17 traverses the southern extent of the combined Project VEC RSAs generally following the Lake Superior shoreline. Highway 11 is located within the northern extent of the combined Project VEC RSAs. Highway 614 extends north from Highway 17 east of White River to Manitouwadge. The CP corridor extends through the combined Project VEC RSAs following Highway 17 and the Lake Superior Shoreline. Regional airports that are no longer serviced by regularly scheduled flights are found in Marathon, Manitouwadge and Terrace Bay.
Major Commercial / Industrial Enterprises	Commercial / industrial interests that are not specifically identified include the former Pulp and Paper Mill in Marathon (Marathon Pulp) that closed several years ago with the property now in the ownership of the Town of Marathon. The Geco and Willroy mines are former base metal mines located just north of Manitouwadge. No mining occurs but the sites remain in long-term care and maintenance. The former Winston Lake Mine is located north of Schreiber and may be subject to redevelopment (see below). There are dozens of small aggregate pits (mostly inactive) in the combined Project VEC RSAs. Relatively large areas of the combined Project VEC RSAs would have been subject to past mining claims and, as described below, there are dozens of mineral exploration permits for the area.
General Recreational and Land Use Activities	This would include general land and resource pursuits such as recreation and tourism (including recreational fisheries) and non-commercial forestry.
Indigenous Land and Resource Use Activities	This would include traditional land and resource pursuits, including the collection of country foods and the Indigenous fishery. This includes traplines managed by individuals and Indigenous communities.
Hemlo Gold Mine Camp	The Hemlo Gold Mine Camp comprises three mine properties: the Golden Giant Mine, the David Bell Mine, and the Williams Mine are located approximately 30 km

Table 6.6-2: Summary of Projects and Activities included in Cumulative Effects Assessment

Project	Description
	southeast of the SSA. The Williams Mine is currently an underground mining operation only. Treated surface water discharge enters the Black River, a tributary of the Pic River, and enters the Pic River approximately 18 km downstream of the SSA.
Harte Gold Sugar Zone Mine	The Sugar Zone Mine entered commercial production in 2019 and has an anticipated mine life of approximately 13 years at current production levels. The mine is located 30 km northeast of White River.
Wesdome Gold Mines Ltd.	Wesdome's Eagle River Complex is located ~100 km southeast of Marathon. It consists of two operating gold mines which have been developed using common infrastructure and feeding the same mill. The complex includes the Eagle River Underground Mine (producing since 1995) and the Mishi Open Pit Mine (started production in 2002).
Peninsula Harbour Sediment Remediation Project at Jellicoe Cove, Peninsula Harbour Area of Concern	The Peninsula Harbour Sediment Remediation Project at Jellicoe Cove was conducted in the summer of 2013. The remediation project included covering contaminated sediments with 15 to 20 cm of clean sand over a total area of 25.6 ha. Monitoring for cap effectiveness will take place periodically over approximately 20 years. The Peninsula Harbour remains classified as an Area of Concern (AOC).
Jackfish Bay Area of Concern	Jackfish Bay was designated an Area of Concern (AOC) because a review of available data indicated that water quality and environmental health were severely degraded. Effluents from the pulp and paper mill in Terrace Bay, which began operations in 1948, resulted in poor water quality, contamination of sediment, and fish and fish habitat destruction, along with impairment of populations of sediment-dwelling organisms in Jackfish Bay on Lake Superior. A natural recovery plan and long-term monitoring are in place for the Jackfish Bay AOC in Recovery. While the environment has improved significantly, more time is needed to continue natural recovery.
BN Hydroelectric Facilities (Umbata Falls, Twin Falls, Wawatay Falls)	Currently, BN owns and operates three hydroelectric facilities: Umbata Falls, Twin Falls, and Wawatay Falls. Umbata Falls, a 23 MW facility, was commissioned in early November 2008, and is located on the White River, approximately 30 km southeast of the Marathon Palladium Project site. Twin Falls, a 4.9 MW facility, was commissioned in 2000, but BN did not assume full ownership of the facility until 2009. Twin Falls is located on the Kagiano River, approximately 50 km north of the SSA. Wawatay, a 13.5 MW facility, was commissioned in 1992, and is located on the Black River, approximately 65 km north of the SSA.
Highway 17 Improvements	According to the MTO, the following activities are underway/planned on Highway 17 between White River and Terrace Bay over the next two years: • Resurfacing – Approximately 78 km of shoulder paving between Marathon and Terrace Bay; Approximately 21 km of shoulder paving west of White River. • Bridge Rehabilitation – Bertrand Creek Bridge, West White River Bridge, White Lake Narrows Bridge, Wabikoba Creek Bridge, Little Pic River Bridge, Aguassabon River Bridge • Bridge Replacement – White River Bridge • Culvert Rehabilitation – McKellar and Ripple Creeks • Culvert Replacement – Hare Creek, Mink Creek In addition, the Pic River bridge over Highway 627 will be replaced.
Pic Mobert Hydroelectric Facility	PMFN is involved in hydroelectric generation with Regional Power Inc., specifically the Gitchi Animki (Big Thunder) Hydroelectric Project located on the White River approximately 50 km south of the Town of White River. The project consists of two developments located on the White River: Gitchi Animki Bezhig (Upper Site), an 8.9

Table 6.6-2: Summary of Projects and Activities included in Cumulative Effects Assessment

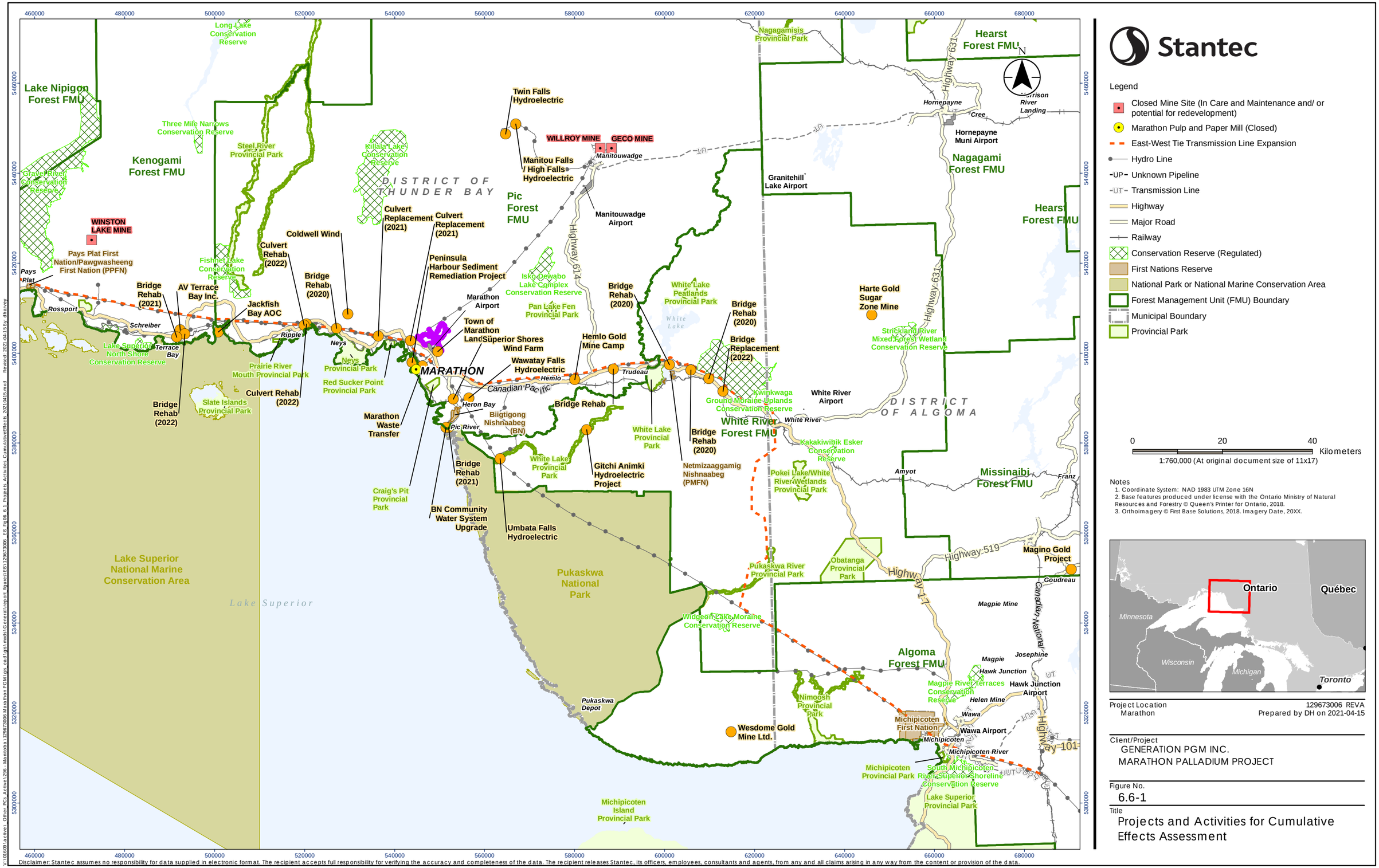
Project	Description
	MW site; and Gitchi Animki Niizh (Lower Site), a10 MW site located approximately 16 km south of the Gitchi Animki Bezhig. The facilities were opened in 2016.
Timber Harvesting	The SSA is located within the Pic River FMU; however, a number of additional FMUs are located within the RSA. These include the Kenogami Forest and the White River Forest. Combined, hundreds of thousands of hectares of forest would have been subject to timber harvesting and re-planting activities within these FMUs in the past. The total area of the Pic River FMU is ~1.1 million ha; approximately 17,514 ha of forest is scheduled to be harvested in the Pic Forest FMU in 2020-2021 and the planned harvest from 2021 to 2031 is on the order of 100,000 ha. The total area of the Kenogami Forest is 1,977,684 ha, and the planned harvest from 2011 to 2021 is ~150,00 ha, with ~ 75,000 ha of regeneration planned. The Kenogami Forest is located north and west of the Project site. The White River Forest is located southeast and east of Marathon and the Pic Forest. The planned harvest from 2018 to 2028 is ~62,00 ha, with ~ 18,500 ha of regeneration planned. It is noted that coincident with timber harvesting activities under the appropriate FMUs, an extensive network of forestry roads has been developed.
Bell Communication Towers	There are as many as 22 cellular towers located along the corridor, and in the communities along the corridor between White River and Terrace Bay.
AV Terrace Bay Inc.	In July 2012, the Aditya Birla Group purchased the former Terrace Bay Pulp Mill and restored pulp mill production in the late fall of 2012. The pulp mill is located in Terrace Bay approximately 100 km west of the SSA. The pulp mill operates as AV Terrace Bay Inc., producing dissolving pulp. Treated effluent from the mill discharges to Blackbird Creek that enters Lake Superior in Jackfish Bay (identified as an AOC above).
East-West Tie Transmission Line Expansion	The East-West Tie transmission project is a 450 km double-circuit 230 kV transmission line connecting the Lakehead Transformer Station in the Municipality of Shuniah near the City of Thunder Bay to the Wawa Transfer Station located east of the Municipality of Wawa. It will also connect to the Marathon Transformer Station. Construction of the project began in September 2019 and is expected to be complete by the end of the first quarter of 2022. The right-of-way is on the order of 70 m wide.
Town of Marathon Landfill	A new regional landfill was commissioned in 2015 by the Town of Marathon on the site of a closed pulp mill landfill along the Camp 19 Road, about 1 km east of the Highway 17 intersection. The site has projected capacity for more than 100 years of waste disposal.
Town of Marathon Waste Transfer Station	The Waste Transfer Station is the site of the former town landfill, located within the town limits on Penn Lake Road. The landfill was closed in 2015.
Future (Certain and Reasonably Foreseeable) Projects/Activities	
BN Community Water System Upgrade	A Feasibility Study (July 2019) for a water system upgrade for BN has been completed. The federal and provincial governments have announced funding to support the initiative (December 2020). The Feasibility Study recommended the following: • an infiltration gallery along the shores of Lake Superior as the new water supply source, a water transmission line to connect the water source to the plant, a new water treatment plant with conventional filtration, both UV and chlorination as primary disinfection, a new below-grade reservoir under the new water treatment plant, extension of existing water distribution system to new development for the Holistic Healing Centre, replacing high lift pumps and installing appropriate disinfection system

Table 6.6-2: Summary of Projects and Activities included in Cumulative Effects Assessment

Project	Description
	Once implemented, the new water system will meet the requirements for drinking water systems in Ontario and will provide a multi-barrier approach, as required by the Ontario SDWA and in guidance with the Ten State Standards, 2012, including fire protection; and meet all current and future water demands with a 20-year planning period. The new WTP will be built out of the Regional Flood Zone.
Magino Gold Project	Prodigy Gold Incorporated, a wholly-owned subsidiary of Argonaut Gold Incorporated, is undertaking the construction, operation, decommissioning and abandonment of an open-pit gold mine and metal mill at the site of a former underground mine located 14 km southeast of Dubreuilville, Ontario, about 145 km southeast of the SSA. Mining will occur over 10 years with an ore production capacity of 45,200 tonnes per day. The on-site metal mill will have an ore input capacity of 35,000 tonnes per day and will operate for approximately 12 to 15 years. Construction (tree clearing) has commenced, consistent with a recent press release indicating construction would begin early in 2021.
Mineral Exploration	There are several dozens of mining exploration permits that have been granted within a 100 km radius of the SSA, which may give rise to exploration activities in the next 5 to 10 years. Of note, Rudolph Wahl Exploration has numerous sites in relatively close proximity to the SSA. GenPGM is engaged in exploration activities north and west of the SSA. The Ontario Mining Association cites one property in the advanced exploration stage: • Superior Lake Resources' Superior Lake Zinc Project is located at the historic Winston Lake site ~ 75 km northwest of Marathon.
BN Hydroelectric Facilities	BN is proposing to construct hydroelectric facilities at Manitou Falls and High Falls, located on the Pic River approximately 70 and 85 km upstream from Lake Superior (50 and 65 km north of the SSA), respectively. The facility at Manitou Falls would have a generating capacity of 2.8 MW and would consist of an overflow weir with an intake canal leading to the powerhouse, located on the east side of the river, adjacent to the downstream end of the falls. The facility at High Falls would have a generating capacity of 3.2 MW and would consist of a short overflow weir with two sluices and an adjacent intake structure at the head of the falls, with a penstock leading to the powerhouse at the base of the falls. The facilities will convey power from their switchyards to an interconnection point on the existing 48-kV distribution line running from the Twin Falls GS on the Kagiano River south of the proposed facilities. BN is proposing to construct a hydroelectric facility at the Aguasabon River, approximately 16 km north of Terrace Bay. It is a joint venture partnership with the Pays Plat First Nation and contemplates construction of a 10 MW run-of-river hydroelectric facility. Chigamiwinigum Falls is on the White River within Parks Canada's Pukaskwa National Park. A concept for a 20-30 MW facility has been developed. BN has not secured the rights to develop the site at this time.
BN Wind Energy Projects	The Superior Shores Wind Farm is a joint venture between BN and Innergex of Quebec. This 24 MW wind energy project would be located approximately 12 km southeast of the SSA. Coldwell Wind Farm is a joint project between the Pic River First Nation and Brookfield Power. Approval to build the Coldwell Wind Energy Project has been granted. The project is situated approximately 20 km northwest of Marathon. The wind energy project as described would have a total capacity of up to 100 MW utilizing 66 wind turbine generators (WTGs) each with a generating capacity of

Table 6.6-2: Summary of Projects and Activities included in Cumulative Effects Assessment

Project	Description
	1.5 MW. The specific timeline for this project is dependent, among other things, on the East-West Tie transmission line expansion.
Pic River Road Rehabilitation	Infrastructure Canada must determine whether the proposed Pic River Roads Rehabilitation project, located within the BN reserve, is likely to cause significant adverse environmental effects. This project will rehabilitate and widen approximately 4 km of Access Road and 1.7 km of Pic River Road including re-pavement, drainage and culvert replacement, traffic calming devices, improved sidewalks/walking trails along the road and a bus pull-over.



Stantec

Legend

- Closed Mine Site (In Care and Maintenance and/ or potential for redevelopment)
- Marathon Pulp and Paper Mill (Closed)
- East-West Tie Transmission Line Expansion
- Hydro Line
- Unknown Pipeline
- Transmission Line
- Highway
- Major Road
- Railway
- Conservation Reserve (Regulated)
- First Nations Reserve
- National Park or National Marine Conservation Area
- Forest Management Unit (FMU) Boundary
- Municipal Boundary
- Provincial Park

0 20 40 Kilometers

1:760,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © First Base Solutions, 2018. Imagery Date, 20XX.

Project Location
Marathon

129673006 REVA
Prepared by DH on 2021-04-15

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
6.6-1

Title
Projects and Activities for Cumulative Effects Assessment

6.6.5 Project Residual Effects Likely to Interact Cumulatively

Table 6.6-3 presents a summary of projects and activities from the PIL together with project-related residual effects, indicating where an interaction between the two may lead to a cumulative effect (✓) or not (-). Where an interaction is indicated, it is possible for the residual effects from the project to act cumulatively with residual effects from other projects and physical activities, and a cumulative effects assessment is done. Alternatively, where no interaction is indicated, it has been deemed that the residual effects from the project will not act cumulatively with residual effects from the other projects and physical activities. In this case, a cumulative effects assessment is not done.

Project residual effects were identified for each VEC (Table 6.6-1) with the exception of Physical and Cultural Heritage. As such, potential cumulative effects that may be associated with these Project residual effects as a result of potential interactions with the residual effects of other projects and activities identified in the PIL are considered in Section 6.6.6 of this report.

The effects of past and present projects contribute to baseline conditions upon which Project effects are assessed. As such, the cumulative effects of these past and present projects and physical activities are inherently considered, as relevant and appropriate, in the assessment of Project effects presented in Section 6.2 of this EIS Addendum (Vol 2). As such, the cumulative effects assessment largely focusses on the potential for the residual effects of the Project to act in combination with the residual effects of future projects and activities. Exceptions to this are highlighted below, in Section 6.6.6, where appropriate.

Table 6.6-3: Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Effects	Effects											
	Atmospheric Environment	Noise	Water Quality and Quantity	Fish and Fish Habitat	Terrain and Soils	Vegetation	Wildlife	SAR	Socio-economic Environment	Human Health	Physical and Cultural Heritage	Indigenous Considerations
Past and Present Projects and Physical Activities												
Major Settlements and Communities	–	–	–	–	–	–	–	–	✓	–	–	✓
Protected Areas and Parks	–	–	–	–	–	–	–	–	✓	–	–	✓
Major Transportation Networks and Hubs	–	–	–	–	–	–	–	–	✓	–	–	✓
Major Commercial / Industrial Enterprises	–	–	–	–	–	–	–	–	✓	–	–	✓
General Recreational and Land Use Activities	–	–	–	–	–	–	–	–	✓	–	–	✓
Indigenous Land and Resource Use Activities	–	–	–	–	–	–	–	–	✓	–	–	✓
Hemlo Gold Mine Camp	–	–	–	–	–	–	–	–	✓	–	–	✓
Harte Gold Sugar Zone Mine	–	–	–	–	–	–	–	–	✓	–	–	✓
Wesdome Gold Mines Ltd.	–	–	–	–	–	–	–	–	✓	–	–	✓
Peninsula Harbour Sediment Remediation Project at Jellicoe Cove, Peninsula Harbour	✓	–	–	–	–	–	–	–	✓	–	–	✓
Jackfish Bay Area of Concern	–	–	–	–	–	–	–	–	✓	–	–	✓

Table 6.6-3: Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Effects	Effects											
	Atmospheric Environment	Noise	Water Quality and Quantity	Fish and Fish Habitat	Terrain and Soils	Vegetation	Wildlife	SAR	Socio-economic Environment	Human Health	Physical and Cultural Heritage	Indigenous Considerations
BN Hydroelectric Facilities (Umbata Falls, Twin Falls, Wawatay Falls)	–	–	–	–	–	–	–	–	✓	–	–	✓
Highway 17 Improvements	–	–	–	–	–	–	–	–	–	–	–	–
Pic Mobert Hydroelectric Facility	–	–	–	–	–	–	–	–	✓	–	–	✓
Timber Harvesting	–	–	–	–	–	✓	✓	✓	✓	–	–	✓
Bell Communication Towers	–	–	–	–	–	✓	✓	✓	✓	–	–	✓
AV Terrace Bay Inc.	–	–	–	–	–	✓	✓	✓	–	–	–	✓
East-West Tie Transmission Line Expansion	–	–	–	–	–	✓	✓	✓	✓	–	–	✓
Town of Marathon Landfill	✓	✓	✓	–	–	✓	✓	✓		–		✓
Town of Marathon Waste Transfer Station	✓	✓	✓	–	–	✓	✓	✓	–	–		✓
Future (Reasonably Foreseeable) Physical Activities												
BN Community Water System Upgrade	–	–	–	–	–	–	–	–	✓			✓
Magino Gold Project	–	–	–	–	–	✓	✓	✓	✓	–	–	✓
Mineral Exploration	–	–	–	–	–	–	–	–	–	–		✓
BN Hydroelectric Facilities	–	–	–	–	–	✓	✓	✓	✓			✓
BN Wind Energy Projects	–	–	–	–	–	✓	✓	✓	✓			✓

Table 6.6-3: Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Effects	Effects											
	Atmospheric Environment	Noise	Water Quality and Quantity	Fish and Fish Habitat	Terrain and Soils	Vegetation	Wildlife	SAR	Socio-economic Environment	Human Health	Physical and Cultural Heritage	Indigenous Considerations
BN Water System Upgrade												
General land and resource use	–	–	–	–	–	✓	✓	✓	✓	–	–	✓
Traditional land and resource use	–	–	–	–	–	✓	✓	✓	✓	–	–	✓

The assessment of Project-residual effects determined that there would be no residual effects on Physical and Cultural Heritage. Because of this, there can be no cumulative effect of the Project in combination with the effects of other projects or physical activities.

6.6.6 Assessment of Cumulative Effects

6.6.6.1 Atmospheric Environment

Project residual effects on the atmospheric environment are associated with changes in air quality, (including dustfall), increased ambient light levels, and emissions of GHGs.

In consideration of the PIL, the likelihood of cumulative effects on air quality is low. As described in Section 6.2.1 of this EIS Addendum (Vol 2), although project-related incremental increases in constituent levels in air are noted, air quality assessment benchmarks are not exceeded at the LSA boundary. Land use activities that may occur within the Project air LSA, such as traditional and general land and resources uses (e.g., hunting, outfitting, trapping, fishing, and recreation activities) have negligible air emissions that would not be distinguishable from baseline and, therefore, do not warrant further consideration from a cumulative effects perspective. Other proposed activities, including hydroelectric and wind power projects and projects in or by the BN community, occur well outside the zone of influence of the Marathon Palladium Project, and themselves would be expected to be associated with relatively minor air emissions. Mining operations, existing or proposed, are located farther from the LSA, with only the Hemlo Mine closer than 100 km from the Project site. In consideration of the above, cumulative effects on air quality are not expected.

In consideration of the PIL, the likelihood of cumulative effects on ambient light levels is low. As described in Section 6.2.1 of this EIS Addendum (Vol 2), low to no levels of light trespass are expected beyond the SSA due to the lack of line of sight between the SSA and off-site receivers. Activities that may occur within the Project LSA, such as traditional and general land and resources uses (e.g., hunting, outfitting, trapping, fishing, and recreation activities) do not contribute meaningfully to light emissions that would not be distinguishable from baseline and, therefore, do not warrant further consideration from a cumulative effects perspective. Other proposed activities, including proposed hydroelectric and wind power projects that would be expected to generate light emissions, are at sufficient distance from the Project that an overlap in effects is unlikely. Similarly, construction activities associated with BN community-related activities (road, water management infrastructure), and the Magino Gold Project, fall well outside the zone of influence of the Marathon Palladium Project.

While GHG emissions from a single project are negligible compared to national and global emissions, they do contribute to national and global emissions, which are responsible for causing climate change. The primary source of project-related GHG emissions will be derived from the combustion of fuels. During construction, total annual CO_{2e} emissions are predicted to range from 5.9 to 24.3 kt. During operations, total annual CO_{2e} emissions are predicted to average 61.6 kt, ranging from 33.1 to 81.9 kt. Canada's total GHG emissions in 2018 were 729 megatonnes of CO_{2e}. Using the upper range values, the Project's contribution to national GHG emissions would be anticipated to be ~0.003% and ~0.01% of national

emissions for construction and operations, respectively. Though the GHG emissions from the Project are expected to be a small fraction of Canada's total emissions, the Project-related GHG emissions do represent an incremental increase in emissions and, therefore, could affect Canada's ability to meet its commitments with respect to climate change. In this context, a cumulative residual effect can conservatively be identified. This effect in consideration of proposed mitigations can be characterized as: adverse (since Project emissions contribute to national emissions); of negligible magnitude (the incremental contribution is very low); of high geographical extent (GHG emissions are considered on a global scale), of medium duration (occurs during constriction and operations); of high frequency (occurs continuously during constriction and operations); reversible (emissions will cease when the Project ceases); and, of high value (due to the importance of climate change within Canada). With the proposed mitigation and environmental protection measures (outlined in this section), the adverse cumulative residual environmental effect on GHGs is predicted to be not significant. Any incremental contribution of the cumulative emission of GHGs is predicted to be negligible.

6.6.6.2 Acoustic Environment

Project residual effects on the acoustic environment are associated with changes in noise levels and ground vibration relative to background during construction and operations. In each case, the magnitude of the residual effect has been characterized as low, due to the small incremental change in sound levels that are predicted. For example, community annoyance analysis for construction indicates the incremental changes in sound levels from background at noise-sensitive receptor (NSR) locations are predicted to be <3% and <1% for steady-state and traffic related sound levels, respectively. Community annoyance analysis for operations indicates the incremental changes in sound levels from background at NSR locations are predicted to be on the same order. In all cases, the predicted sound levels (i.e., L_{max}, L_{eq} 16-hour, L_d, L_e, L_n and L_{dn}) and subsequent analysis (i.e., air blast setback distances and %HA) at representative NSRs from Project construction and operation activities are expected to be below applicable provincial and federal criteria.

Noise and vibration effects from future projects or physical activities may overlap with the residual effects of the Project if similar emissions from a future project or activity overlaps temporally and spatially with those of the Project. Activities that may occur within the Project LSA, such as traditional and general land and resources uses (e.g., hunting, outfitting, trapping, fishing, and recreation activities), do not contribute meaningfully to noise and ground vibration that would not be distinguishable from baseline and, therefore, do not warrant further consideration from a cumulative effects perspective. Other proposed activities, including hydroelectric and wind power projects that would be expected to generate sound emissions and be associated with ground vibration, are at sufficient distance from the Project that an overlap in effects is unlikely. Similarly, construction activities that are associated with BN (road, water management infrastructure), fall well outside the zone of influence of the Marathon Palladium Project on noise and ground vibration. The Magino Gold Project is more than 100 km from the Project site. In consideration of the above, cumulative effects on noise levels and ground vibration are not expected.

6.6.6.3 Water Quality and Quantity

6.6.6.3.1 Groundwater Quantity

Project residual effects on groundwater quantity relate to the lowering of the groundwater table level, most notably during operations. This spatial extent of the effect is limited to the LSA. Based on the projects and activities identified in the PIL, no spatial overlap between these projects and activities and the residual Project effect are anticipated. As such, cumulative residual effects on groundwater quantity are not expected.

6.6.6.3.2 Groundwater Quality

Project residual effects on groundwater quality relate to changes (increases) in constituent concentrations that are related to proposed mine components such as the PSMF and MRSA. The spatial extent of the effect is largely limited to the SSA, but does extend into the LSA/RSA (the LSA and RSA for the groundwater VEC are the same). Based on the projects and activities identified in the PIL, no spatial overlap between these projects and activities and the residual Project effects are anticipated. With this in mind, cumulative residual effects on groundwater quantity are not expected.

6.6.6.3.3 Surface Water Quantity

Project residual effects on surface water quantity relate to the overprinting and diversion of several watercourses in the SSA that, in-turn, will reduce contributing drainage areas within local subwatersheds. The spatial extent of the effects is limited to the LSA. Incremental changes in surface water quantity that may result from Project activities within the context of larger watershed boundaries, such as the Pic River, are negligible. Based on the projects and activities identified in the PIL, no spatial overlap between these projects and activities and the residual Project effects are anticipated. With this in mind, cumulative residual effects on surface water quantity are not anticipated.

6.6.6.3.4 Surface Water Quality

Project residual effects on surface water quality relate to changes (increases) in constituent concentrations that are related to the controlled discharge of site waters into local receiving environments during all mine phases. Such changes are predicted to be negligible to low in magnitude and limited to the LSA. For example, during construction, no discharge from the site is planned. During operations, treated effluent will be discharged to Hare Lake. The Hare Lake discharge will be the only routine discharge location during operations. Water quality in Hare Lake and, by extension water quality downstream of Hare Lake, will meet appropriate benchmarks for the protection of aquatic life in consideration of a small mixing zone in the lake. Following mine closure and the restoration of drainage patterns that are similar to pre-mining conditions, water quality is expected to meet appropriate benchmarks for the protection of aquatic life in those drainages. This includes the Pic River into which drainage from the MRSA and, ultimately over the long-term the open pit complex, will drain. Beyond a small mixing zone, water quality in the Pic River in close proximity to the site, and therefore in more

downstream areas including the BN Reserve, will meet appropriate benchmarks for the protection of aquatic life. Based on the projects and activities identified in the PIL, there is no spatial overlap between these projects and activities and the residual Project effects.

It is noted that new water-related infrastructure is planned within the BN community at the mouth of the Pic River. This planned project is well outside the predicted zone of influence of the Project, though the likely timing of the two projects will overlap. It is referenced herein specifically because of the importance of the water infrastructure project to BN, if only to emphasize that there will be no spatial overlap. Based on the above, cumulative residual effects on surface water quality are not anticipated.

6.6.6.4 Fish and Fish Habitat

Project residual effects on fish and fish habitat are primarily related to the loss of habitat through direct (overprinting) and indirect (loss of flow) means, and through changes in benthic invertebrate communities. Such effects will be addressed through offsetting where avoidance and mitigation cannot be accommodated; nevertheless, a conservative interpretation of Project interactions resulted in carrying forward the Project-residual effect to the cumulative effects assessment. Other identified residual Project effects on fish and fish habitat were related to potential mortality of fish and potential effects on fish (and, in general, aquatic biota) due to changes in water quality. The spatial extent of the residual Project effects is largely limited to the SSA (direct habitat effects, mortality, changes in benthic invertebrates), but does extend into the LSA (loss of flow, change in water quality).

6.6.6.4.1 Change in Fish Habitat

Based on the above and on the Project effects assessment described in Section 6.4 of this EIS Addendum (Vol 2), cumulative residual effects could accrue within the RSA where future projects/activities would also involve loss of fish habitat. Generally, the projects and activities identified in the PIL are not expected to contribute to fish habitat losses. For example, traditional and general land and resources uses (e.g., hunting, outfitting, trapping, fishing, and recreation activities) will not affect fish habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, mineral exploration activities as well as infrastructure-related projects planned within the BN community that may occur in the RSA are envisioned to be relatively minor in terms of intensity and footprint and would not be expected to be an issue from a cumulative effects perspective. The Magino Gold Project is well outside the RSA. Other proposed activities as identified in the PIL, are considered as follows:

- Wind energy projects (Superior Shores, Coldwell) would not be expected to be associated with loss of fish habitat, assuming that minor interactions with fish habitat that might be expected (e.g., water crossings) would be implemented by way of best practices and, therefore, do not warrant further consideration from a cumulative effects perspective.
- Proposed hydroelectric power projects well upstream of the Project site would not be anticipated to adversely affect fish and fish habitat given the nature of the proposed conceptual designs and the requirement to address effects, if any, that cannot be addressed through avoidance and

mitigation by offsetting and, therefore, do not warrant further consideration from a cumulative effects perspective.

- Extensive timber harvesting activities have occurred and are planned in the RSA. Such activities, including ancillary activities like forest road development, have the potential to affect fish habitat in a variety of ways including, but not limited to, the following:
    - enhancement of erosion and increased delivery of sediment loads
    - changes in water quality
    - changes in hydrology and hydrological linkages between surface water and groundwater
    - changes in thermal regime through loss of canopy
    - loss in hydraulic connectivity.

  Timber harvesting in the RSA is largely completed under the Pic Forest Management Plan (Nawiinginokiima Forest Management Corporation, 2021). The plan is inclusive of measures and practices to mitigate such effects. The plan does not attempt to characterize the significance of the effects on fish habitat; however, applying the assessment framework used to assess Project effects, it is reasonable to assume that residual effects to fish and fish habitat for timber harvesting activities are possible, if not likely. These effects will overlap with the Project temporally (harvesting is planned over the duration of the Project) and spatially (harvesting will occur in the RSA).

In consideration of the potential additive nature of the effects of the Project and PIL project/activities in the RSA, in particular timber harvesting, a cumulative residual effect on fish and fish habitat can conservatively be assumed to occur.

The cumulative residual effect in consideration of proposed mitigations can be characterized as follows: adverse (since there will be a potential cumulative effect on fish habitat); of low magnitude (the combined contribution is minor within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level), of high duration (effects will extend beyond the life of the individual projects/activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will be reclaimed and offsets implemented over time); and, of medium value (fish habitat has high value but it relatively abundant in the RSA). Overall, and consideration of the characterization of the cumulative residual effect on fish habitat, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on fish habitat is predicted to be negligible.

6.6.6.4.2 Fish Mortality

As described in Section 6.4 of this EIS Addendum (Vol 2), Project-associated lethal effects on fish in the SSA could result from overprinting of fish habitat. Though fish salvage activities will be undertaken, some losses are likely unavoidable, however minor. As such, cumulative residual effects could accrue within the

RSA where future projects / activities could result in fish mortality. It is noted that in this context, fish mortality would be through means that are not permitted as opposed to those that are, such as recreational/traditional fishing. Generally, the projects and activities identified in the PIL are not expected to contribute to fish mortality that is not otherwise permitted. For example, traditional and general land and resources uses will not affect fish mortality and, therefore, do not warrant further consideration from a cumulative effects perspective. Wind energy projects (Superior Shores, Coldwell) would not be expected to be associated with fish mortality, assuming that minor interactions with fish that might be expected (e.g., water crossings) would be implemented by way of best practices and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, mineral exploration activities as well as infrastructure-related projects planned within the BN community that may occur in the RSA are envisioned to be relatively minor in terms of intensity and footprint and would not be expected to be an issue from a cumulative effects perspective. While planned timber harvesting activities have the potential to affect fish habitat as described above, direct fish mortality, though possible, is generally unlikely on the scale that would warrant further consideration from a cumulative effects perspective. Other proposed activities, as identified in the PIL, are considered as follows:

- Proposed run-of-river hydroelectric power projects in the RSA are likely to have some level of fish mortality associated with them as the result of (1) fish passage through the facility during downstream migration for migratory fish; (2) the entrainment of resident fish; and (3) the impingement of fish against screens/trash racks. With implementation of best design and operations practices, losses can be minimized, but some level of mortality would be expected.

In consideration of the potential additive nature of the effects of the Project and PIL project/activities in the RSA, a cumulative residual effect on fish mortality can conservatively be assumed to occur. The cumulative residual effect in consideration of proposed mitigations can be characterized as follows: adverse (since there will be a potential cumulative effect on fish mortality); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of medium duration (effects will be associated with the construction and operations phases of the projects/activities); of high frequency (occurs continuously during construction and operations); of high reversibility (the effect will cease once the projects/activities cease); and, of medium value (fish have high value but are relatively abundant in the RSA). Overall, and in consideration of the characterization of the cumulative residual effect on fish mortality, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects of fish mortality is predicted to be negligible.

6.6.6.4.3 Change in Water Quality in Association with Fish

As described in Section 6.4 of this EIS Addendum (Vol 2), Project-associated effects on fish could result due to changes in water quality related to Project-related discharges. Predicted Project-related changes in water quality do not result in exceedances of assessment benchmarks in the LSA during any phase of the Project and, therefore, no effects on aquatic biota, including fish, are expected.

In the context of the cumulative effects assessment, a cumulative residual effect on fish related to changes in water quality could result if there was temporal / spatial overlap of the effects on individual

projects / activities that, in combination, result in changes (increases) in constituent concentrations above assessment benchmark levels. As noted above in Section 6.6.6.3, based on the PIL, there is no temporal / spatial overlap between these projects and activities and the residual Project effects – that is, there are no projects / activities that will result in the release of constituents of interest within the Project LSA. Based on the above, cumulative residual effects on fish due to changes in surface water quality are not anticipated.

6.6.6.5 Terrain and Soils

Project residual effects on terrain and soils relate to potential changes to soil quantity and soil quality. For soil quantity, effects were restricted to the SSA and largely reversible since excavated soils will be used for site rehabilitation. It is also noted that the soils affected by the Project in the SSA do not represent soil types that have been identified as unique or regionally rare. For soil quality, effects were restricted to the LSA and are expected to be low in magnitude.

Based on the projects and activities identified in the PIL, no spatial overlap between these projects and activities and the residual Project effects related to soil quantity are anticipated. Accordingly, cumulative effects on soil quantity are not expected.

In consideration of the PIL, there are no future projects and activities whose spatial influence is expected to overlap with those of the Project from a soil quality perspective; rather, as is the case for the Marathon Palladium Project, effects from other projects and activities would be expected to be limited to a localized area surrounding those other specific projects and activities. Accordingly, cumulative effects on soil quality are not anticipated.

Overall, the Project is not predicted to result in cumulative residual effects on the terrain and soils VEC.

6.6.6.6 Vegetation

Project residual effects on vegetation were associated with loss / impairment of forest cover-type vegetation, non-forest cover-type vegetation, two provincially rare plant species, and plant species of interest to Indigenous communities. Project residual effects were primarily restricted to the SSA where land will be cleared to facilitate development of Project-related infrastructure, with indirect effects extending into the LSA.

6.6.6.6.1 Change in Forest Cover

The forest cover VEC comprises numerous forest ecosites that are common and widespread in the RSA (see Section 6.2.6.6.1 of this EIS Addendum [Vol 2]). Per Section 6.2.6.6.1, residual effects of the Project will arise from the loss of approximately 1,081 ha of forest in the SSA and potential indirect effects on 842 ha in the adjacent LSA. The forest cover RSA is defined by the boundaries of the Pic Forest Management Unit (FMU), since the predominant vegetation community in the LSA is forest which are managed at the FMU level. This RSA encompasses over 1.1 million ha and includes both the SSA and LSA.

Based on the PIL, the following is noted with respect to change in forest cover within the forest cover RSA. Traditional and general land and resource uses and the infrastructure-related projects planned in the BN community would not be associated with similar types of effects on forest cover-type vegetation and, therefore, do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is outside the forest cover RSA and, therefore, does not warrant further consideration from a cumulative effects perspective. Incremental loss of forest-type vegetation is possible, given that at least some of the projects/activities (e.g., wind and hydro power developments, mineral exploration) would be associated with land clearing activities. Assuming the forest-type vegetation is widely distributed across the local landscape and the RSA, such land clearing would also involve removal of forest-type vegetation. Incremental losses of forest-type vegetation from proposed hydro facilities and mineral exploration activities are likely relatively small in nature, each from several to tens of hectares in size. Land clearing associated with the development of wind farms to establish the wind turbines and associated road network is expected to be larger in scale. Hatch (2008) estimated land clearing would occur on about 188 ha of the ~2,400 ha Coldwell project site, including white birch, black spruce and balsam fir mixedwood stands. No specific information could be located on the specific spatial extent of clearing that might be needed to support the Superior Shores project; however, because the Superior Shores project is approximately 25% of the generating capacity of the Coldwell site, it would be reasonable to assume the amount of clearing required would be proportionate (i.e. 25% of the clearing required for the Coldwell project site, or approximately 47 ha).

Timber harvesting in the RSA has the greatest capacity for direct and indirect disturbance of forest cover. As noted above, the Pic Forest FMU spans an area greater than 1.1 million ha in size, much of which (<95%) contains merchantable timber. As discussed in Section 6.2.6.6.1 of this EIS Addendum (Vol 2), 17,514 ha of forest is scheduled to be harvested within the Pic Forest FMU between 2020 and 2021 and, during the life of the mine, the area cleared for commercial forestry in the Pic Forest FMU (and subsequently regenerated) will be at least two orders of magnitude (or 100 times) larger than the footprint of the SSA. It is noted that the level of disturbance associated with timber harvesting as presented in the Forest Management Plan is considered sustainable by the provincial government.

Based on the above, and in consideration of the potential additive incremental losses of forest that is associated with the Project and the other projects/activities on PIL that are in the forest cover RSA, a cumulative residual effect can be identified. This overall cumulative effect can be characterized as follows:

- adverse - since there will be a cumulative loss of forest-type vegetation
- low in terms of magnitude - commercial harvesting rates in the RSA are deemed sustainable and contributions from other projects / activities, including the Marathon Palladium Project, are a small fraction of these rates and, therefore, the magnitude can be considered low within the context of the RSA
- high in terms of geographical extent – the cumulative effect is considered at the RSA level
- high in terms of duration – the cumulative effect will extend beyond the life of the individual projects/activities

- high in terms of frequency – the cumulative effect will occur continuously during construction and operations
- medium in terms of reversibility – the forest cover community will regenerate, at least in part, over time
- medium in terms of value – forest cover is abundant in the RSA

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on forest-type vegetation is predicted to be not significant. This conclusion is drawn largely on the basis that the cumulative change in forest cover in consideration of all projects and activities is not materially different than that represented by commercial timber harvesting alone. Such rates of harvesting have been deemed sustainable. Any small increment in harvesting that is associated with other activities does not affect this conclusion, particularly given that commercial forestry within the RSA has routinely been cutting much less of its allocated harvest, leaving ample additional area that could still be cleared sustainably by other industrial activities, including this Project. It is noted that the Project's contribution to the overall cumulative effect, therefore, is deemed to be negligible. As noted above, the area affected by the project (direct and indirect effects) is only a small fraction (< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.

6.6.6.6.2 Change in Non-forest Cover

Per Section 6.2.6.6.2 of this EIS Addendum (Vol 2), residual effects of the Project will arise from the loss of non-forested wetlands (including 21.4 ha of open wetlands and 9.8 ha of sparsely vegetated open water habitat), and of non-forested upland (approximately 6.8 ha) through the development of the site. For the purposes of the cumulative effects section, the RSA for this indicator includes Ecodistrict 3W-5, which encompasses the SSA and LSA and comprises approximately 735,000 hectares along the north shore of Lake Superior.

Based on the PIL, the following is noted where spatial overlap with PIL projects and activities and the non-forest cover RSA occurs. Traditional and general land and resource uses and the infrastructure-related projects planned in the BN community would not be associated with similar types of effects on non-forest cover type vegetation; therefore, they do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective. Incremental losses of forest-type vegetation from proposed hydro facilities and mineral exploration activities are likely relatively small in nature, each amounting from a few hectares to tens of hectares in size. Land clearing associated with the development of wind farms to establish the wind turbines and associated road network is expected to be larger in scale. Hatch (2008) estimated land clearing would occur on about 188 ha of the ~2,400 ha Coldwell project site – of this a relatively small proportion is expected to be non-forest cover type vegetation. No specific information could be located on the specific spatial extent of clearing that might be needed to support the Superior Shores project, but it is estimated that approximately 47 ha (approximately 25% of the clearing required for the Coldwell site) would be appropriate, given that the generating capacity of the Superior Shores project is 25% of that of the Coldwell project. Again, it is

expected that a relatively small proportion of the areas that would be cleared are expected to be non-forest cover type vegetation. It is noted that, although the non-forest cover RSA and the Pic Forest FMU share some area, planned future timber harvest areas in the Pic Forest FMU do not overlap with the non-forest cover RSA and, therefore, do not warrant further consideration from a cumulative effects perspective.

Based on the above, and in consideration of the potential additive incremental losses of non-forest type vegetation that is associated with the Project and the other projects/activities on PIL that are in the non-forest cover RSA, a cumulative residual effect can be identified. This overall cumulative effect can be characterized as follows:

- adverse - since there will be a cumulative loss of non-forest type vegetation
- low in terms of magnitude - the combined contribution is likely low within the context of the RSA
- high in terms of geographical extent – the cumulative effect is considered at the RSA level
- high in terms of duration – the cumulative effect will extend beyond the life of the individual projects/activities
- high in terms of frequency – the cumulative effect will occur continuously during construction and operations
- medium in terms of reversibility – the non-forest cover community will regenerate, at least in part, over time
- medium in terms of value – non-forest cover is abundant in the RSA

Further to the magnitude of the cumulative residual effect, the following is noted. Based on professional judgement, the combined effects of the Project and other PIL projects/activities on non-forest cover type vegetation is expected to be low in magnitude. As described in Section 6.2.6.6.2 of this EIS Addendum (Vol 2), non-forest vegetation types on the Project site represent very small percentages (< 1%) of those same ecosites found within Ecodistrict 3W-5 and, therefore, the contribution of the Project to the overall effect is likely small. Additional incremental losses that may result from projects/activities in the PIL are not expected to contribute to the overall losses.

With proposed mitigation and environmental protection measures that will be implemented with the Project, the cumulative residual adverse environmental effect on non-forest type vegetation is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on non-forest type vegetation is predicted to be negligible.

6.6.6.6.3 Change in Rare Plant Species

Per Section 6.6.2.16 of this EIS Addendum (Vol 2), residual project effects on rare plants includes the permanent loss of habitat for one occurrence of the provincially-rare alga pondweed and two adjacent occurrences of the regionally rare Oakes' pondweed, as well as the permanent loss of one occurrence of

the provincially rare alpine woodsia. The RSA for this indicator is Ecodistrict 3W-5, which encompasses the SSA and LSA and comprises approximately 735,000 hectares along the north shore of Lake Superior.

There is one additional record of algal pondweed in Ecodistrict 3W-5 beyond those reported during baseline surveying on the Project site. Previously unknown from the Thunder Bay District, six locations of Oakes' pondweed were discovered during fieldwork for this Project, two of which will be impacted. There has been minimal botanical surveying completed in Ecodistrict 3W-5; as such, the occurrences of these species are currently likely underrepresented. As noted in Section 6.2.6.6.3 of this EIS Addendum (Vol 2), there are 8,500 mapped waterbodies <10 ha in size that encompass more than 10,000 ha in total in Ecodistrict 3W-5 RSA. Moreover, within 5 km of the LSA, there are 367 waterbodies less than 10 ha in size representing a total area of 252 ha. These lakes occur on a landscape with similar bedrock and soils, similar post-glacial history, and similar physical environment to that of the Project site. For example, for the pondweed, at least some of the 8,500 small (<10 ha) waterbodies in the RSA collectively represent more than 10,000 ha of potentially suitable habitat. In consideration of the available information, it is apparent that there are no specific records of the occurrences of pondweed species that are associated with those projects/activities identified in the PIL.

The SSA occurrence of alpine woodsia is one of approximately 10 known occurrences of this species in the RSA (Argus and White 1982-1987; Cody and Britton 1989; iNaturalist 2020; NHIC unpublished data); however, as noted above, there has been very minimal botanical survey work completed in Ecodistrict 3W-5. In consideration of the available information, it is apparent that there are no specific records of the occurrences of alpine woodsia that are associated with those projects / activities identified in the PIL.

Overall, the Project is not predicted to result in cumulative residual effects on rare plants.

6.6.6.6.4 Change in Plant Species of Interest to Indigenous Communities

As described in Section 6.2.6.6.4 of this EIS Addendum (Vol 2), residual Project effects on plant and fungus species of interest to Indigenous communities are expected based on the removal of habitats that support such species in the SSA.

The consideration of cumulative effects on plant and fungus species of interest to Indigenous communities is discussed within the wider context of the Indigenous Considerations VEC in Section 6.6.6.11.

6.6.6.7 Wildlife

Project residual effects on wildlife species, including furbearers, moose, grey wolf, black bear and migratory birds, were similar and associated with both direct and indirect changes to habitat, changes to wildlife passage and movement patterns, changes in wildlife mortality, and changes to wildlife of interest to Indigenous communities. Losses of habitat and mortality are primarily restricted to the SSA where land will be cleared to facilitate development of Project-related infrastructure and the effects of Project-related activity will occur during operations, extending into the wildlife LSA. Changes to wildlife passage and

movement patterns are also associated with the wildlife RSA. Changes to wildlife of interest to Indigenous communities are associated with the SSA, and wildlife LSA and RSA.

6.6.6.7.1 Changes in Wildlife Habitat - Direct

Direct residual project effects on wildlife habitat are considered in Section 6.2.7.6.1 of this EIS Addendum (Vol 2). Site development and construction will result in the loss of approximately 1,081 ha of forested habitat in the SSA, 21 ha of wetland, and less than 1 ha of rock barren/talus habitat. These habitats and ecosites are common and widespread in the RSA (see Vegetation Section 6.2.6 of this EIS Addendum [Vol 2]).

Based on the PIL, the following is noted. Traditional and general land and resource uses are not considered measurably contributing as they are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in the BN community are generally associated with previously built-up areas and, therefore, do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is well outside the RSA and, for this reason, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project in terms of direct loss of habitat in the RSA could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). Direct loss of wildlife habitat is likely to be relatively small in the case of the hydro power developments and mineral exploration, possibly on the order of several hectares to tens of hectares. Direct wildlife habitat losses associated with development of proposed wind farms (Coldwell, Superior Shores) would be more substantial in nature given their relative spatial footprints. As indicated above in Section 6.6.6.6, direct wildlife habitat loss associated with the Coldwell project is anticipated to be approximately 188 ha. Based on a proportionate loss of wildlife habitat in consideration of the size (generating capacity) of the project, direct wildlife habitat loss for the Superior Shores project could be on the order of approximately 47 ha. Timber harvesting in the RSA will be the largest contributor to the direct loss of wildlife habitat based on planned cutovers. As discussed in Section 6.2.6.6.1 of this EIS Addendum (Vol 2), approximately 17,514 ha of forest is scheduled to be harvested in the Pic Forest between 2020 and 2021, and the area cleared for commercial forestry in the Pic Forest during the life of the mine will be at least two orders of magnitude (or 100 times) larger than the footprint of the SSA. It is noted that forest regeneration activities will be completed following harvesting, and such activities will restore the landscape. This is a long-term process, however, that will be ongoing for several decades and will, at least in part, be dependent upon the mode of regeneration and the targeted regeneration species.

Based on the above, and in consideration of the potential additive incremental direct losses of wildlife habitat that are associated with the Project and the other projects/activities on the PIL that are in the RSA, a cumulative residual effect can be identified. The relative contributions from the Project and other proposed projects / activities can be viewed from the perspective of the footprints associated with the specific activities. In this context, the cumulative residual effect associated with timber harvesting will

likely be the most substantial and the relative contributions of the Project and other activities will be relatively minor in comparison.

This overall cumulative effect can be characterized as follows:

- adverse - since there will be a cumulative loss of wildlife habitat
- low in terms of magnitude - the combined contribution is likely low within the context of the RSA
- high in terms of geographical extent – the cumulative effect is considered at the RSA level
- high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities
- high in terms of frequency – the cumulative effect will occur continuously during construction and operations
- medium in terms of reversibility – wildlife habitat will regenerate, at least in part, over time
- medium in terms of value – wildlife habitat is abundant in the RSA

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife habitat is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible. This conclusion is drawn largely on the basis that the cumulative change in wildlife habitat in consideration of all projects and activities is not materially different than that represented by commercial timber harvesting alone. Although cleared areas are regenerated after commercial harvesting, it takes approximately 70 to 80 years before mature forest returns to harvested areas. Given this time lag and that more than 105,000 ha are planned to be logged on the Pic Forest FMU during the 2021 to 2031 period, commercial forestry will have a much more profound impact on the availability of mature forest in the RSA than the Project. Such rates of harvesting have been deemed sustainable from a wildlife habitat perspective. Any small increment in the change of wildlife habitat that is associated with the Project and other activities do not affect this conclusion.

6.6.6.7.2 Changes in Wildlife Habitat - Indirect

Indirect residual project effects on wildlife habitat are considered in Section 6.2.7.6.2 of this EIS Addendum (Vol 2). During site development, construction and operations, effects could result from a variety of factors including sensory disturbance (e.g., dustfall, light pollution, and noise and vibration), encroachment of invasive plant species, and changes to local hydrological and hydrogeological conditions.

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, they do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN would not be relevant as they are generally associated with previously built-up areas and would not warrant further consideration from a cumulative effects

perspective. The Magino Gold Project is well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of indirect effects on wildlife habitat in the RSA, could be expected to be associated with land clearing activities, development, and subsequent operation of site-related infrastructure, vehicles, and equipment. Generically, such indirect effects would be associated with some life-cycle phase of the wind and hydro power developments, mineral exploration activities, and timber harvesting activities identified in the PIL. For example, hydro power developments could involve land clearing resulting in dusting and encroachment of invasive species, construction activities would be associated with noise and vibrations (where blasting is involved), and light trespass could be associated with equipment use and operational infrastructure. Wind power developments involve land clearing resulting in dusting and encroachment of invasive species, construction activities would be associated with noise and vibrations (where blasting is involved), light trespass could be associated with equipment use and operational infrastructure, and noise and vibrations would be associated with turbine operations. Timber harvesting would involve land clearing resulting in dusting and encroachment of invasive species, and would also be associated with noise, vibration and light trespass from equipment and machinery use. In each case, the indirect effects of the aforementioned activities are likely to be spatially confined to a localized area in the vicinity of the project / activity, not extending to a more regional scale. Given the combined footprints of the Project and other projects / activities in comparison to the RSA, the combined effect is expected to be relatively small in magnitude.

Based on the above, and in consideration of the potential additive indirect losses, wildlife habitat associated with the Project, and the other projects/activities in the PIL that are in the RSA, a cumulative residual effect can be identified. The relative contributions from the Project and other proposed projects / activities can be viewed from the perspective of the footprints associated with the specific activities. In this context, the cumulative residual effect associated with timber harvesting will be the most substantial and the relative contributions of the Project and other activities will be minor within the RSA landscape.

This overall cumulative effect can be characterized as follows:

- adverse - since there will be a cumulative loss of wildlife habitat
- low in terms of magnitude - the combined contribution is likely low within the context of the RSA
- high in terms of geographical extent – the cumulative effect is considered at the RSA level
- high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities
- high in terms of frequency – the cumulative effect will occur continuously during construction and operations
- medium in terms of reversibility – wildlife habitat will regenerate, at least in part, over time
- medium in terms of value – wildlife habitat is abundant in the RSA

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife habitat is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible. This conclusion of drawn largely on the basis that the cumulative indirect changes in habitat in consideration of all projects and activities will be minor within the RSA landscape.

6.6.6.7.3 Changes in Wildlife Passage and Movement Patterns

Project residual effects on wildlife passage and movement patterns are discussed in Section 6.2.7.6.4 (of this EIS Addendum [Vol 2]) and could result from habitat fragmentation associated with forest clearing and development of linear corridors, such as roads and the transmission lines. Forest clearing for the Project will fragment wildlife habitat along the boundary of the SSA. Landscape texture and patch size analyses (Appendix D8.6 of this EIS Addendum [Vol 2]) indicate that forest clearing in the SSA will have little effect on fragmentation at the RSA level, and that the fragmentation at the SSA / LSA level will not substantially alter the broad-scale landscape connectivity in the RSA.

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat; therefore, they do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. Finally, the Magino Gold Project is well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of wildlife movement, could be expected where some habitat fragmentation will result from land clearing activities and / or where development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). Habitat fragmentation and the associated effects on wildlife movement are likely to be relatively small in magnitude in the case of the hydro power developments and mineral exploration, given the relatively small level of disturbance that would be expected. Fragmentation and effects on movement associated with development of proposed wind farms (Coldwell, Superior Shores) would be more substantial in nature given their relative spatial footprints, although the areas affected (direct wildlife habitat loss associated with the Coldwell project is anticipated to be approximately 188 ha and, based on a proportionate loss of wildlife habitat in consideration of the size (generating capacity), direct wildlife habitat loss for the Superior Shores project could be on the order of 47 ha. Timber harvesting in the RSA will be the largest contributor to habitat fragmentation based on planned cutovers. As discussed in Section 6.2.6.6.1 of this EIS Addendum (Vol 2), 17,514 ha of forest is scheduled to be harvested (and eventually regenerated) in the Pic Forest FMU between 2020 and 2021. The area cleared for commercial forestry, and subsequently regenerated, in the Pic Forest FMU during the life of the mine will be at least two orders of magnitude (100 times) larger than the footprint of the SSA.

Based on the above, and in consideration of the potential additive incremental direct losses of wildlife habitat associated with the Project and the other projects/activities in the PIL that are in the RSA, a

cumulative residual effect can be identified. The relative contributions from the Project and other proposed projects / activities can be viewed from the perspective of the footprints associated with the specific activities. In this context, the cumulative residual effect associated with timber harvesting will be the most substantial and the relative contributions of the Project and other activities are expected to be relatively minor in comparison.

This overall cumulative effect can be characterized as follows:

- adverse - since there will be a cumulative increase in habitat fragmentation in the RSA and resulting reduction in the potential for wildlife movement
- low in terms of magnitude - the combined contribution is likely low within the context of the RSA
- high in terms of geographical extent – the cumulative effect is considered at the RSA level
- high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities
- high in terms of frequency – the cumulative effect will occur continuously during construction and operations
- medium in terms of reversibility – wildlife habitat will regenerate, at least in part and, therefore, connectivity will be restored over time
- medium in terms of value – wildlife movement corridors are not limiting in the RSA

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife passage and movement is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible. This conclusion is drawn on the basis that the cumulative change in habitat fragmentation in consideration of all projects and activities is not materially different than that represented by commercial timber harvesting. Such rates of harvesting have been deemed sustainable from a wildlife habitat perspective, including connectivity. Any small increment in the change of habitat fragmentation that is associated with the Project and other activities does not affect this conclusion.

6.6.6.7.4 Changes in Wildlife Mortality

Project residual effects on wildlife mortality are discussed in Section 6.2.7.6.3 of this EIS Addendum (Vol 2) and could result from collisions with vehicles, collisions with infrastructure, and human-wildlife interactions.

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is

located well outside of the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected where some land clearing activities and / or development of site-related infrastructure is needed, and where operation of vehicles and equipment occurs (wind and hydro power developments, mineral exploration, timber harvesting). Wildlife mortality risk is likely to be relatively small in the case of mineral exploration activities, but could be associated with minor land clearing activities and the operation of vehicles and equipment. Similarly, wildlife mortality risk associated with hydro power developments is also likely expected to be minor, but could be associated with minor land clearing activities, the operation of vehicles and equipment, and bird strikes with “permanent” infrastructure such as buildings. Wildlife mortality risk associated with the development of proposed wind farms (Coldwell, Superior Shores) would likely be associated with land clearing activities, the operation of vehicles and equipment, bird/bat strikes with “permanent” infrastructure such as buildings, bird/bat strikes with wind turbines, and bird/bat strikes with overhead cabling. Timber harvesting in the RSA could change the mortality risk of land clearing activities and the operation of vehicles and equipment.

Based on the above, and in consideration of the potential additive incremental change in risks to wildlife mortality that is associated with the Project and the other projects/activities in the PIL that are in the RSA, a cumulative residual effect can be identified. Considerations of the relative contributions from the Project and other proposed projects / activities are as follows. Mortality risk on wildlife from land clearing is generally low for all projects / activities in consideration of appropriate mitigations and, therefore, relative risk can be inferred based on the amount of land that will be cleared. From this perspective, timber harvesting would pose the greatest mortality risk and all other projects / activities would be minor in comparison. Though mortality risks associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects / activities, when viewed cumulatively in a larger context, the risks of mortality associated with these sources are expected to be low in magnitude. For example, as mentioned in Section 6.2.7.6 of this EIS Addendum (Vol 2), on average, an estimated 1,167 birds are killed annually per 100 km of road in Canada (Bishop and Brogan, 2013), although the effects are expected to be much less on secondary roads due to lower speeds and traffic volumes (e.g., Kline and Swann, 1998). An estimated 2.5 million to 25.6 million birds die annually in Canada from collision with transmission lines (Rioux et al., 2013).

This cumulative effect can be characterized as follows:

- adverse - since there will be a cumulative increase in mortality risk
- low in terms of magnitude - the combined contribution is likely low within the context of the RSA and will not likely rise to population level effects
- high in terms of geographical extent – the cumulative effect is considered at the RSA level
- high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities
- high in terms of frequency – the cumulative effect will occur continuously during construction and operations

- high in terms of reversibility – wildlife mortality associated with the projects / activities will cease when projects / activities cease
- medium in terms of value – wildlife habitat is abundant in the RSA

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife mortality risk is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible. This conclusion is drawn on the basis that the cumulative change in wildlife mortality risk in consideration of all projects and activities is incrementally small when considered in the context of wildlife mortality risk from existing sources.

6.6.6.7.5 Changes in Wildlife of Interest to Indigenous Communities

As described in Section 6.2.7.6.5 of this EIS Addendum (Vol 2), residual Project effects on wildlife species of interest to Indigenous communities are expected to be similar to those described above and based on changes in habitat, passage and movement, and mortality.

6.6.6.8 Species at Risk (SAR)

Project residual effects on SAR, including woodland caribou, little brown myotis, northern myotis, Canada warbler, rusty blackbird, olive-sided flycatcher, eastern wood-pewee, evening grosbeak, common nighthawk, eastern whip-poor-will, yellow-banded bumble bee, and monarch, were similar and associated with direct and indirect habitat loss, restricted/modified movement [passage], and direct mortality. Direct losses of habitat and decreased survival were primarily restricted to the SSA where land will be cleared to facilitate development of Project-related infrastructure, extending into the LSA.

For reference, the RSA for caribou is the Lake Superior Coastal Range (LSCR) plus a 10 km buffer into the zone of discontinuous distribution (Lake Superior Uplands Linkage). The RSA for little brown myotis, northern myotis, Canada warbler, rusty blackbird, olive-sided flycatcher, eastern wood-pewee, evening grosbeak, common nighthawk, eastern whip-poor-will, yellow-banded bumble bee, and monarch is represented by the Pic Forest FMU.

It is noted that since no Project residual effects were identified for bald eagle, peregrine falcon, or lake sturgeon, the discussion below does not include consideration of cumulative effects on these species.

6.6.6.8.1 Woodland Caribou

Potential Project effects on woodland caribou have been assessed in detail at the RSA level for caribou in Section 6.2.8.1.9 of this EIS Addendum (Vol 2). The residual effects of the Project arise from the loss of approximately 107 ha of potential caribou winter habitat in the SSA (albeit only 2.9 ha are currently characterized as undisturbed) and an additional 45 ha of modelled disturbance. Even after site

rehabilitation activities have been completed, the 4 to 6 km wide SSA could potentially impair movement of caribou, although they are highly mobile.

Change in Habitat (Direct Loss)

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located outside of the woodland caribou RSA, although it is in relatively close proximity to the southern limit of the RSA. It is noted that historical surveys demonstrate woodland caribou was evident in the area, and that recovery of woodland caribou has been identified as a high priority by the Michipicoten First Nation. Because the Magino Gold Project site is not in the woodland caribou RSA meaning there is no spatial overlap in this regard with the Project, it does not warrant further consideration from a cumulative effects perspective. GenPGM has, and will continue to, engage with the Michipicoten First Nation on issues related to woodland caribou.

Proposed wind and hydro power developments and mineral exploration activities would be reasonably foreseeable activities in the woodland caribou RSA that would be associated with land disturbance. Timber harvesting is quite extensive in the area; however, according to the Pic Forest FMU, harvesting in much of the caribou RSA has been deferred from harvest through to 2039.

At the woodland caribou RSA level, Project-related disturbance would increase the percentage disturbance from 28.06% to 28.07%. The incremental increases in disturbance associated with projects / activities in the PIL are expected to be minor and smaller than those associated with the Project, since the footprint of those other activities would be smaller than the Project. In consideration of the other projects envisioned in the RSA where further disturbance is likely, any incremental increase in the level of disturbance will be as small or smaller and, cumulatively, will remain well below the 35% maximum disturbance threshold above which caribou populations are less likely to be self-sustaining over the long-term.

A cumulative residual effect can be assumed for woodland caribou as it concerns change in habitat, since there will be incremental disturbance in woodland caribou habitat in the RSA. The cumulative residual effect on woodland caribou in the RSA in consideration of proposed mitigation can be characterized as follows: adverse (since there will be a potential cumulative effect on woodland caribou); of low magnitude (the combined contribution is very low within the context of the RSA and below established disturbance thresholds); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of individual projects / activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (woodland caribou are a protected species).

Off-site mitigation consisting of the rehabilitation of logging roads and other degraded habitats to improved caribou habitat within the coastal range and adjacent discontinuous range is being proposed

(CIAR #671) to result in an overall benefit to caribou as a result of the Project. Given off-site mitigation and the characterization of the cumulative residual effect on woodland caribou as it concerns changes in habitat in the RSA, the cumulative residual effect is predicted to be not significant.

Change in Mobility

Based on the PIL, the following is noted. Proposed wind and hydro power developments and mineral exploration activities would be reasonably foreseeable activities in the woodland caribou RSA that would be associated with land disturbance and, therefore, could effect a change in caribou mobility. Timber harvesting is quite extensive in the area; however, according to the Pic Forest FMU, harvesting in the woodland caribou RSA has been deferred from harvest through to 2039. Nevertheless, harvesting during the next 10-year window (2021 to 2031) will occur elsewhere in the coastal and discontinuous range. Some of these activities, particularly commercial forestry, could potentially have an effect on broad-scale movements of woodland caribou in the RSA.

The cumulative residual effect on woodland caribou mobility in the RSA in consideration of proposed mitigations can be characterized as follows: adverse (since there will be a potential cumulative effect on woodland caribou mobility); of low magnitude (the combined contribution is very small within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of individual projects / activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats and, therefore, potential mobility will regenerate naturally, or by way of active targeted rehabilitation, over time); and, of high value (woodland caribou are a protected species).

Off-site mitigation consisting of the rehabilitation of logging roads and other degraded habitats to improve caribou habitat within the coastal range and adjacent discontinuous range is being proposed (CIAR #671) to result in an overall benefit to caribou as a result of the Project. Given off-site mitigation and the above characterization of the cumulative residual effect on caribou movement, the cumulative residual effect is predicted to be not significant.

6.6.6.8.2 Little Brown Myotis and Northern Myotis

Potential Project effects on little brown myotis and northern myotis are described in Section 6.2.8.1.10 of this EIS Addendum (Vol 2). The main residual effects of the Project arise from the loss of approximately 1,000 ha of possible bat foraging and day roost habitat in the SSA during the development and operation of the mine, as well as the loss of an estimated 39 ha of potential bat maternity roost habitat.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on little brown myotis and northern myotis within the Pic Forest FMU could be expected where some land clearing activities and / or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as potentially the most spatially extensive activity in the RSA.

Traditional and general land and resource uses and the infrastructure-related projects planned in BN would not be associated with similar types of effects on little brown myotis and northern myotis and, therefore, do not warrant further consideration from a cumulative effects perspective. In the former instance, traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat. In the latter instance, the infrastructure-related projects planned in BN are generally associated with previously built-up areas. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with little brown myotis and northern myotis in the Pic Forest FMU would be affected by PIL projects / activities, the potential additive nature of the effects of the Project and PIL projects / activities in the RSA would constitute a cumulative residual effect.

Consideration of the potential cumulative spatial scale of the cumulative residual effect is provided as follows. The cumulative extent of habitat disturbance in the RSA is largely associated with planned timber harvesting in the RSA. As reported in Section 6.2.8.1.10 of this EIS Addendum (Vol 2), forest operations under an approved FMP (such as on the Pic Forest) are exempt from Ontario's *Endangered Species Act* since the province considers that the *Crown Forest Sustainability Act* forest policy framework sufficiently protects species at risk. By extension, the planned level of annual forest harvest in the Pic Forest is considered to not adversely affect the sustainability of SAR bat populations in the RSA. Given that actual harvest on the Pic Forest typically achieves much less than the planned (sustainable) harvest, the additional clearing of approximately 1,000 ha of forest in the Project's SSA plus other clearing that is contemplated by other projects / activities in the PIL is likely well within levels considered sustainable by MNRF.

The cumulative residual effect on little brown myotis and northern myotis in the RSA can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of individual projects / activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (although habitat is abundant in the RSA, the species and its habitat are afforded protection).

Off-site mitigation consisting of the installation of bat boxes to replace potential loss of maternity roosts in the LSA is being proposed (see Section 6.2.8.1.10 of this EIS Addendum [Vol 2]) to result in an overall benefit to SAR bats as a result of the Project. Given off-site mitigation and the above characterization of the cumulative residual effect on little brown myotis and northern myotis in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on little brown myotis and northern myotis is predicted to be negligible.

6.6.6.8.3 Canada Warbler

Potential Project effects on Canada warbler are described in Section 6.2.8.1.11 of this EIS Addendum (Vol 2). The main residual effects of the Project arise from habitat loss in the SSA, particularly of the shrub-rich mixedwoods with abundant coarse woody debris type, change in habitat quality in the LSA resulting from sensory disturbance, and mortality in the SSA due to collisions with Project infrastructure or vehicles.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on Canada warbler within the Pic Forest FMU could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as potentially the most spatially extensive activity in the RSA as it relates to direct habitat loss. As explained in Section 6.6.6.8.2 of this EIS Addendum (Vol 2), the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. It is noted that, habitat modelling completed as part of this EIS Addendum (see Appendix D9.5 of this EIS Addendum ([Vol 2]), indicates there is an abundance of potentially suitable habitat in the RSA, with over 443,000 ha of preferred habitat and an additional 302,000 ha of used habitat.

Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with Canada warbler in the Pic Forest FMU would be affected by PIL projects / activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) in the RSA would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of individual projects / activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (though habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall and in consideration of the characterization of the cumulative residual effect on Canada warbler in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on Canada warbler habitat is predicted to be negligible.

Change in Habitat (Sensory Disturbance)

Sensory disturbance, particularly in the form of noise where noise levels exceed 50 dB, could affect Canada warbler.

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA, and does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of noise-induced sensory effects on Canada warbler, could be expected to be associated with land clearing activities, development and subsequent operation of site-related infrastructure, and operation of vehicles and equipment. Generically, such noise-related effects would be associated with some life-cycle phases of proposed projects / activities identified in the PIL: hydro power developments (e.g., land clearing, construction activities, blasting, vehicle use, equipment and machinery use); wind power developments (e.g., land clearing, construction activities, blasting, vehicle use, equipment and machinery use, turbine operations); mineral exploration activities (e.g., land clearing, vehicle use, equipment and machinery use); and timber harvesting activities (e.g., land clearing, construction activities, blasting, vehicle use, equipment and machinery use). In each case, the indirect effects of the aforementioned activities are likely to be spatially confined to the local area in the vicinity of the project / activity, not extending to a more regional scale. Given the combined footprints of the Project and other projects / activities in comparison to the RSA, the combined effect is expected to be relatively small in magnitude.

Based on the above, and in consideration of the potential additive effects related to sensory disturbance on Canada warbler that may be associated with the Project and the other projects / activities in the PIL that are in the RSA, a cumulative residual effect can be identified. The relative contributions from the Project and other proposed projects / activities can be viewed from the perspective of the footprints associated with the specific activities, considering that the effects of each are thought to be local in scale.

This cumulative effect can be characterized as follows: adverse - since there will be a cumulative sensory disturbance of Canada warbler in the RSA; low in terms of magnitude - the combined contribution is likely low within the context of the RSA; high in terms of geographical extent – the cumulative effect is considered at the RSA level; high in terms of duration – the cumulative effect will extend beyond the life of the individual projects/activities; high in terms of frequency – the cumulative effect will occur continuously during construction and operations; high in terms of reversibility – the sensory disturbance will be removed when the activities cease; and, medium in terms of value – potential forest habitat for this species is abundant and widespread in the RSA.

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on Canada Warbler related to sensory disturbance is predicted to be not significant.

This conclusion is drawn on the basis that the cumulative indirect changes in habitat in consideration of all projects and activities will be minor within the RSA landscape. Any incremental contribution of the Project to the cumulative effects of sensory disturbance on Canada warbler habitat is predicted to be negligible.

Change in Mortality Risk

Project residual effects on Canada warbler mortality are discussed in Section 6.2.8.1.11 of this EIS Addendum (Vol 2) and could result from collisions with vehicles and/or collisions with infrastructure.

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected where development of site-related infrastructure is needed, and where operation of vehicles and equipment will occur (wind and hydro power developments, mineral exploration, timber harvesting). Mortality risk is likely to be relatively small in the case of mineral exploration activities given the typical intensity of such activities, but could be associated with the operation of vehicles and equipment. Similarly, mortality risk associated with hydro power developments is also likely expected to be minor, but could be associated with the operation of vehicles and equipment, and strikes with “permanent” infrastructure such as buildings. Mortality risk associated with development of proposed wind farms (Coldwell, Superior Shores) would likely be associated with the operation of vehicles and equipment, strikes with “permanent” infrastructure such as buildings, strikes with wind turbines, and strikes with overhead cabling. Timber harvesting in the RSA could change mortality risk from the operation of vehicles and equipment.

Based on the above, and in consideration of the potential additive incremental change in risks to mortality that are associated with the Project and the other projects / activities in the PIL that are in the RSA, a cumulative residual effect can be identified. Considerations of the relative contributions from the Project and other proposed projects / activities are as follows. Mortality risk on Canada warbler associated with interactions with vehicles, equipment, and infrastructure are expected to differ somewhat for the different projects / activities; however, when viewed cumulatively in a larger context, the risks of mortality associated with these sources are expected to be low in magnitude. For example, as mentioned in Section 6.2.7.6 of this EIS Addendum (Vol 2), on average an estimated 1,167 birds are killed annually per 100 km of road in Canada (Bishop and Brogan, 2013), although the effects are expected to be much lower on secondary roads due to lower speeds and traffic volumes (e.g., Kline and Swann, 1998). An estimated 2.5 million to 25.6 million birds die annually in Canada from collision with transmission lines (Rioux et al., 2013).

This cumulative effect can be characterized as follows: adverse - since there will be a cumulative increase in mortality risk; low in terms of magnitude - the combined contribution is likely low within the context of the RSA and will not likely rise to population level effects; high in terms of geographical extent – the cumulative effect is considered at the RSA level; high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities; high in terms of frequency – the cumulative effect will occur continuously during construction and operations; high in terms of reversibility – mortality will cease when the activities cease; and high in terms of value – Canada warbler is a protected species.

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on mortality risk is predicted to be not significant. This conclusion is drawn on the basis that the cumulative change in mortality risk in consideration of all projects and activities is incrementally small when considered in the context of wildlife mortality risk from existing sources. Any incremental contribution of the Project to the cumulative effects of Canada warbler mortality is predicted to be negligible.

6.6.6.8.4 Rusty Blackbird

Potential Project effects on rusty blackbird are described in Section 6.2.8.1.12 of this EIS Addendum (Vol 2). The main residual effects of the Project arise from potential breeding habitat loss, particularly small waterbodies with adjacent conifer forest.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on rusty blackbird within the RSA could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat lost. As explained in Section 6.6.6.8.2 of this EIS Addendum (Vol 2), the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting in the RSA, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. It is noted that rusty blackbird breeding habitat is likely not limiting in the RSA, and that this habitat type collectively covers an area of 11,409 ha in the RSA.

Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with rusty blackbird in the RSA would be affected by PIL project/activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) in the RSA would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of the individual projects/activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (though habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall and in consideration of the characterization of the cumulative residual effect on rusty blackbird in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on rusty blackbird habitat is predicted to be negligible.

6.6.6.8.5 Olive-sided Flycatcher, Eastern Wood-Pewee, and Evening Grosbeak

Potential Project effects on these SAR songbirds are described in Section 6.2.8.1.13 of this EIS Addendum (Vol 2). Project pathways are generally similar for each of these songbird species and, therefore, they are considered together. Potential loss of forest habitat in the SSA is the primary effect pathway.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on these SAR songbirds within the RSA could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat loss. As explained in Section 6.6.6.8.5, the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting in the RSA, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. It is noted that potential suitable mixedwood forest habitat for these species is abundant and widespread in the RSA.

Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with these species in the Pic Forest FMU would be affected by PIL projects / activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) in the RSA would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of the individual projects / activities); of high frequency (occurs continuously

during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (though habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall and in consideration of the characterization of the cumulative residual effect on these species in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on habitat of these bird species is predicted to be negligible.

6.6.6.8.6 Common Nighthawk

Potential Project effects on common nighthawk are described in Section 6.2.8.1.15 of this EIS Addendum (Vol 2). Potential Project effects are related to the loss of suitable habitat in the SSA. Although there is no current use of the LSA by this species, they could potentially use the LSA in the future and could be susceptible to increased mortality via vehicle collisions (change in mortality).

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on common nighthawk within the RSA could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat loss. As explained in Section 6.6.6.8.6, the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting in the RSA, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. It is noted that potential suitable common nighthawk habitat is abundant and widespread in the RSA – more than 52,000 ha of suitable habitat is available.

Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with common nighthawk in the Pic Forest FMU, would be affected by PIL project/activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) in the RSA would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of the individual projects/activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (although habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall and in consideration of the characterization of the cumulative residual effect on common nighthawk in the

RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on common nighthawk habitat is predicted to be negligible.

Change in Mortality Risk

Project residual effects on common nighthawk mortality are discussed in Section 6.2.8.1.15 of this EIS Addendum (Vol 2) and could result from collisions with vehicles since they may sit on gravel roads to while foraging and/or to dusk-bathe (Sandilands 2010).

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is situated well outside of the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected to occur principally through operation of vehicles and equipment on roads (wind and hydro power developments, mineral exploration, timber harvesting). In all cases, mortality risk is perceived to be low based on the relative low numbers of common nighthawk in the RSA. Nevertheless, in consideration of the potential additive incremental change in risks to wildlife mortality that is associated with the Project and the other projects / activities in the PIL that are in the RSA, a cumulative residual effect can be identified. It is difficult to comment on the relative contributions from the Project and other proposed projects/activities since the common nighthawk is not common in the RSA; interactions of this sort are likely to be rare regardless of the project / activity.

This cumulative effect can be characterized as follows: adverse - since there will be a cumulative increase in mortality risk; low in terms of magnitude - the combined contribution is likely low within the context of the RSA and will not likely rise to population level effects; high in terms of geographical extent – the cumulative effect is considered at the RSA level; high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities; high in terms of frequency – the cumulative effect will occur continuously during construction and operations; high in terms of reversibility – mortality will cease when the activities cease; and high in terms of value – common nighthawk is a protected species.

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on mortality risk is predicted to be not significant. This conclusion is drawn on the basis that the cumulative change in mortality risk in consideration of all projects and activities is incrementally small when considered in the context of mortality risk from existing sources. Any incremental contribution of the Project to the cumulative effects of common nighthawk mortality is predicted to be negligible.

6.6.6.8.7 Eastern Whip-poor-will

Potential Project effects on eastern whip-poor-will are described in Section 6.2.8.1.15 of this EIS Addendum (Vol 2). Although there is no current use of the LSA by this species, they could potentially use the Project LSA in the future and could be susceptible to increased mortality via vehicle collisions (change in mortality). Potential Project effects are related to the loss of open and semi-treed habitat suitable for nesting and foraging in the SSA.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on eastern whip-poor-will within the RSA could be expected where some land clearing activities and / or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as the most spatially extensive activity in the RSA as it concerns direct habitat lost. As explained in Section 6.6.6.8.7, the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting in the RSA, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. It is noted that potential habitat for eastern whip-poor-will is abundant and widespread in the RSA – more than 52,000 ha of potentially suitable habitat is available.

Traditional and general land and resource uses are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, they do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is situated well outside the RSA, and does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with eastern whip-poor-will in the RSA would be affected by PIL projects / activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of the individual projects/activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (though habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall and in consideration of the characterization of the cumulative residual effect on eastern whip-poor-will in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on eastern whip-poor-will habitat is predicted to be negligible.

Change in Mortality Risk

Project residual effects on eastern whip-poor-will mortality are discussed in Section 6.2.8.1.15 of this EIS Addendum (Vol 2) and could result from collisions with vehicles since they may sit on gravel roads to dusk-bathe and/or while foraging (Sandilands 2010).

Based on the PIL, the following is noted. Traditional and general land and resource uses would not be relevant as they are low intensity activities and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN would not be relevant as they are generally associated with already disturbed areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected to occur principally through operation of vehicles and equipment on roads (wind and hydro power developments, mineral exploration, timber harvesting). In all cases, mortality risk is perceived to be low based on the relative low numbers of eastern whip-poor-will in the RSA. Nevertheless, in consideration of the potential additive incremental change in risks to wildlife mortality that is associated with the Project and the other projects / activities in the PIL that are in the RSA, a cumulative residual effect can be identified. It is difficult to comment on the relative contributions from the Project and other proposed projects / activities since the eastern whip-poor-will is not common in the RSA; interactions of this sort are likely to be rare regardless of the project / activity.

This cumulative effect can be characterized as follows: adverse - since there will be a cumulative increase in mortality risk; low in terms of magnitude - the combined contribution is likely low within the context of the RSA and will not likely rise to population level effects; high in terms of geographical extent – the cumulative effect is considered at the RSA level; high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities; high in terms of frequency – the cumulative effect will occur continuously during construction and operations; high in terms of reversibility – mortality will cease when the activities cease; and high in terms of value – eastern whip-poor-will is a protected species.

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on mortality risk is predicted to be not significant. This conclusion is drawn on the basis that the cumulative change in mortality risk in consideration of all projects and activities is incrementally small when considered in the context of mortality risk from existing sources. Any incremental contribution of the Project to the cumulative effects on eastern whip-poor-will mortality is predicted to be negligible.

6.6.6.8.8 Monarch Butterfly

Potential Project effects on monarch butterfly are described in Section 6.2.8.1.15 of this EIS Addendum (Vol 2). Potential Project effects are related to the loss of adult foraging habitat in the SSA and mortality in the SSA due to collisions with Project infrastructure or vehicles.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on monarch butterfly within the Pic Forest FMU could be expected where some land clearing activities and/or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). These activities may reduce the amount of roadside nectar sources for adult monarchs, at least in the short term. No impacts are expected on the larval host plant, milkweed, which does not occur in the Project LSA. There are no natural occurrences of milkweed in the RSA either; where occurrences do occur, they are of anthropogenic origin. No cumulative impacts are expected on larval habitat.

Traditional and general land and resource uses and the infrastructure-related projects planned in BN would not be associated with similar types of effects on these species and, therefore, do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with monarch butterfly in the Pic Forest FMU, would be affected by PIL projects / activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) in the RSA would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level), of high duration (effects will extend beyond the life of the individual projects/activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (although habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall and in consideration of the characterization of the cumulative residual effect on monarch butterfly in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on Monarch habitat is predicted to be negligible.

Change in Mortality Risk

Project residual effects on monarch butterfly mortality are discussed in Section 6.2.8.1.16 of this EIS Addendum (Vol 2) and could result from collisions with vehicles and/or collisions with infrastructure.

Based on the PIL, the following is noted. Traditional and general land and resource uses would not be relevant as they are low intensity activities and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN would not be relevant as they are generally associated with already disturbed areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected where development of site-related infrastructure is needed and operation of vehicles and equipment will

occur (wind and hydro power developments, mineral exploration, timber harvesting). Mortality risk is likely to be relatively small in the case of mineral exploration activities, but could be associated with the operation of vehicles and equipment. Similarly, mortality risk associated with hydro power developments is also likely expected to be minor, but could be associated with the operation of vehicles and equipment and strikes with “permanent” infrastructure such as buildings. Mortality risk associated with development of proposed wind farms (Coldwell, Superior Shores) would likely be associated with the operation of vehicles and equipment, strikes with “permanent” infrastructure such as buildings, strikes with wind turbines, and strikes with overhead cabling. Timber harvesting in the RSA could change mortality risk from the operation of vehicles and equipment.

Based on the above, and in consideration of the potential additive incremental change in risks to mortality that are associated with the Project and the other projects / activities in the PIL that are in the RSA, a cumulative residual effect can be identified. Considerations of the relative contributions from the Project and other proposed projects / activities are as follows. Mortality risk on monarch butterfly associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects / activities; however, when viewed in a larger context, cumulatively the risks of mortality associated with these sources are expected to be low in magnitude.

This cumulative effect can be characterized as follows: adverse - since there will be a cumulative increase in mortality risk; low in terms of magnitude - the combined contribution is likely low within the context of the RSA and will not likely rise to population level effects; high in terms of geographical extent – the cumulative effect is considered at the RSA level; high in terms of duration – the cumulative effect will extend beyond the life of the individual projects / activities; high in terms of frequency – the cumulative effect will occur continuously during construction and operations; high in terms of reversibility – mortality will cease when the activities cease; and high in terms of value – monarch butterfly is a protected species.

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on mortality risk is predicted to be not significant. This conclusion is drawn on the basis that the cumulative change in mortality risk in consideration of all projects and activities is incrementally small when considered in the context of mortality risk from existing sources. Any incremental contribution of the Project to the cumulative effects on Monarch mortality is predicted to be negligible.

6.6.6.8.9 Yellow-banded Bumble Bee

Potential Project effects on yellow-banded bumble bee are described in Section 6.2.8.1.15 of this EIS Addendum (Vol 2). Potential Project effects are related to the loss foraging habitat in the SSA and mortality in the SSA due to collisions with Project infrastructure or vehicles.

Change in Habitat (Direct Loss)

Based on the PIL, cumulative effects on yellow-banded bumble bee within the Pic Forest FMU could be expected where some land clearing activities and / or development of site-related infrastructure is needed (wind and hydro power developments, mineral exploration). In particular, timber harvesting activities are seen as potentially the most significant activity in the RSA as it concerns direct habitat loss (i.e., potential loss of nesting habitat). As explained in Section 6.6.6.8.9, the cumulative extent of habitat disturbance in the RSA will largely be associated with planned timber harvesting in the RSA, and the combined disturbance associated with the Project and PIL activities and projects are expected to be minor in comparison. It is noted that potential suitable yellow-banded bumble bee habitat is abundant and widespread in the RSA.

Traditional and general land and resource uses and the infrastructure-related projects planned in BN would not be associated with similar types of effects on these species and, therefore, do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is situated well outside the RSA, and does not warrant further consideration from a cumulative effects perspective.

In consideration of the above, and the assumption that habitat associated with yellow-banded bumble bee in the Pic Forest FMU would be affected by PIL projects / activities, the potential additive nature of the effects of the Project and PIL projects / activities on habitat change (direct) in the RSA would constitute a cumulative residual effect.

This cumulative residual effect can be characterized as follows: adverse (since there will be a potential cumulative effect); of low magnitude (the combined contribution is low within the context of the RSA); of high geographical extent (cumulative effects are considered at the RSA level); of high duration (effects will extend beyond the life of the individual projects/activities); of high frequency (occurs continuously during construction and operations); of medium reversibility (habitats will regenerate naturally, or by way of active targeted rehabilitation over time and provide opportunities for recolonization); and, of high value (though habitat is abundant in the RSA, the species and its habitat are afforded protection). Overall, and in consideration of the characterization of the cumulative residual effect on yellow-banded bumble bee in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on Yellow-banded bumble bee habitat is predicted to be negligible.

Change in Mortality Risk

Project residual effects on yellow-banded bumble bee mortality are discussed in Section 6.2.8.1.16 of this EIS Addendum (Vol 2) and could result from collisions with vehicles and/or collisions with infrastructure.

Based on the PIL, the following is noted. Traditional and general land and resource uses are low intensity activities dispersed across the landscape with no typically measurable effects on habitat and, therefore, do not warrant further consideration from a cumulative effects perspective. Similarly, the infrastructure-related projects planned in BN are generally associated with previously built-up areas and do not warrant further consideration from a cumulative effects perspective. The Magino Gold Project is located well outside the RSA and, therefore, does not warrant further consideration from a cumulative effects perspective.

Effects that would mirror those of the Project, in terms of mortality risk in the RSA, could be expected to occur where development of site-related infrastructure is needed, and operation of vehicles and equipment will occur (wind and hydro power developments, mineral exploration, timber harvesting). Mortality risk is likely to be relatively small in the case of mineral exploration activities, but could be associated with the operation of vehicles and equipment. Similarly, mortality risk associated with hydro power developments is also likely expected to be minor, but could be associated with the operation of vehicles and equipment and strikes with “permanent” infrastructure such as buildings. Mortality risk associated with development of proposed wind farms (Coldwell, Superior Shores) would likely be associated with the operation of vehicles and equipment, strikes with “permanent” infrastructure such as buildings, strikes with wind turbines and strikes with overhead cabling. Timber harvesting in the RSA could change mortality risk from the operation of vehicles and equipment.

Based on the above, and in consideration of the potential additive incremental change in risks to mortality that are associated with the Project and the other projects / activities in the PIL that are in the RSA, a cumulative residual effect can be identified. Considerations of the relative contributions from the Project and other proposed projects / activities are as follows. Mortality risk on yellow-banded bumble bee associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects / activities; however, when viewed in a larger context, cumulatively the risks of mortality associated with these sources are expected to be low in magnitude.

This cumulative effect can be characterized as follows: adverse - since there will be a cumulative increase in mortality risk; low in terms of magnitude - the combined contribution is likely low within the context of the RSA and will not likely rise to population level effects; high in terms of geographical extent – the cumulative effect is considered at the RSA level; high in terms of duration – the cumulative effect will extend beyond the life of the individual projects/activities; high in terms of frequency – the cumulative effect will occur continuously during construction and operations; high in terms of reversibility – mortality will cease when the activities cease; and high in terms of value – yellow-banded bumble bee is a protected species.

With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on mortality risk is predicted to be not significant. This conclusion is drawn largely on the basis that the cumulative change in mortality risk in consideration of all projects and activities is incrementally small when considered in the context of mortality risk from existing sources. Any incremental contribution of the Project to the cumulative effects on Yellow-banded bumble bee mortality is predicted to be negligible.

6.6.6.9 Socio-economic Environment

6.6.6.9.1 Economy and Employment

With the implementation of mitigation and enhancement measures, the Project is anticipated to result in both positive (all project phases) and adverse effects (as the project transitions from operation through decommissioning and closure / post-closure) on economy and employment. Positive effects are not

carried through to the cumulative effects assessment; however, the economic benefits of the Project are recognized in the area through employment opportunities, income for workers, and tax revenues. Adverse effects are predicted to occur as the Project transitions from operation through to decommissioning and closure / post-closure with the loss of employment and expenditures.

It is not possible to predict the exact cumulative effects of Project closure on labour in the RSA because this will depend on labour conditions, especially for the mining industry, at the time of closure, approximately 12.7 years into the future. If other mines and resource projects in the RSA are closing at the same time, the adverse cumulative effects of Project closure could be large. However, if new mines begin operating in the RSA at the same time the Project is ceasing operation, some of the adverse cumulative effects could be offset because former Project workers could be employed by the new mines. The magnitude of potential adverse cumulative effects would further be reduced to the extent that skills and experience acquired by Project workers are transferable to other projects and they are able to find employment in other sectors.

While Project closure will have an adverse effect on municipal government revenues, the tax assessment base provided by the other future projects will provide municipalities in the RSA with increased flexibility in terms of how it can manage its collection of revenues to buffer the effects of the loss of Project revenues. To manage these effects, municipal governments have various mechanisms by which they can balance revenues and costs.

The economic benefits of the Project for the area are recognized through employment opportunities, income for workers, and tax revenues. With the proposed mitigation and environmental protection measures, any adverse cumulative residual environmental effect on economy and employment is predicted to be not significant. The Project is viewed as a benefit to the economy of the area and is anticipated to increase employment for a population that is in decline due to an absence of employment opportunities. Any incremental contribution of the Project to cumulative effects on economy and employment during the transition from operation to closure is predicted to be negligible.

6.6.6.9.2 Infrastructure and Services

The residual adverse effects of the Project on infrastructure and services are expected to occur in the RSA mainly during construction and operation as a result of demands created by the Project labour force. The application of mitigation and enhancement measures, including the use of an Accommodations Complex and development of Project-specific management plans such as those for waste and transportation, the residual adverse effects on infrastructure and services are expected to be not significant. The magnitude of residual adverse effects has been characterized as high due to the additional demands that may be placed on community infrastructure and services in BN should members return to the community for Project employment.

As explained in Section 6.6.5, the assessment of cumulative effects will focus on residual effects of the Project in combination with the residual effects of reasonably foreseeable future projects and activities. Therefore, projects that are most likely to act cumulatively with local services and infrastructure include mineral exploration within the RSA and BN hydroelectric facilities, wind energy projects, and water system

upgrades. Where community service and infrastructure improvements, such as power projects and water system upgrades, are made, projects and users generally benefit as these projects will increase capacity of local services and infrastructure.

The presence of the Project labour force may overlap temporally with that of the Hemlo mine; however, with the Hemlo labour force about to be reduced to approximately 300 persons, many former Hemlo employees may find work on the Project. Future mineral exploration and development may have large workforces that may place additional demands on local services and infrastructure; however, they will only act cumulatively with the Project if they overlap temporally. Future resource projects that provide opportunities for employment by members of BN who currently live off-Reserve and wish to return to their home community will create additional demands in that community where housing, education, health care, and utilities are already near or at capacity.

The Project Accommodations Complex will provide some services, including catering and opportunities for recreation, which will reduce the need for Project workers to go into RSA communities. Project workers will be encouraged to carpool and will be bussed from the camp to the mine site during construction and operation. These measures will reduce Project contributions to cumulative effects on transportation services and infrastructure (e.g., traffic congestion). GenPGM will provide some emergency response services capable to respond to emergency situations at the mine. First aid facilities and personnel will be available on site during construction and operation. These measures will reduce the likelihood of cumulative effects on local health, safety, and emergency services and infrastructure.

It is also expected that current and reasonably foreseeable future projects and physical activities will be required to apply standard mitigation and other management measures to avoid or reduce their effect on infrastructure and services (e.g., emergency response plans) and comply with applicable regulatory requirements.

In addition, GenPGM will continue to communicate with local communities and service providers with respect to scheduling so they may prepare for potential increased demands local services and infrastructure. Cumulative effects on infrastructure and services are predicted to be adverse in the RSA during construction and operation and medium in magnitude.

Any adverse cumulative residual environmental effect on infrastructure and community services is predicted to be not significant. With the proposed mitigation measures, any incremental contribution of the Project to cumulative effects on infrastructure and community services is predicted to be negligible.

6.6.6.9.3 Land and Resource Use

The Project is expected to have residual adverse effects on land and resource use in the SSA (direct loss of area) and the LSA (sensory disturbances), but the magnitude of these effects is predicted to be low to negligible. Conceptually, the residual effects of future use of resources in the RSA (e.g., mineral exploration) have the potential to interact cumulatively with the residual effects of the Project where those activities are planned to occur within or adjacent to resource areas. Cumulative effects arising from future mineral exploration activities potentially have similar pathways as effects arising from the Project, including degradation and disturbance effects on resource use activities (e.g., hunting and trapping) due

to noise disturbance, damage to areas and sites, visual aesthetics, as well as change in access and loss of wildlife habitat. Activities that can affect resource use activities include developments that involve land clearing (e.g., mineral claim staking).

The exact areas for future hunting, outfitting, and trapping activities are unknown at this time. Future projects and activities would have the effect of removing areas from the resource base such that they would no longer be available for hunting, outfitting, and trapping to occur. As a result, these activities would be displaced to other locations. However, it is anticipated that there is sufficient area within the RSA for these activities to occur in the future.

Project presence will remove 1,116 ha of area from resource and recreational use and will overlap with waterbodies used for sport fishing. The potential for cumulative interactions is limited given the lack of defined future projects or activities. The exact areas for future resource activities are currently unknown. Future projects and activities would have the effect of removing areas from the resource base such that these areas would no longer be available for recreational activities, such as sport fishing to occur. As a result, these activities would be displaced to other locations. However, it is anticipated that there is sufficient area within the RSA for these activities to occur in the future.

Future mineral exploration activity within the RSA can cause degradation and disturbance effects during site development. New exploration activity would continue to cause disturbance effects for during exploration activities. The Project is anticipated to have minimal cumulative effects on land and resource use. With mitigation measures, the cumulative effects are anticipated to be of low magnitude, long-term, and occur in a disturbed socio-economic context.

Any incremental contribution of the Project to cumulative effects on land and resource use is predicted to be negligible. With the proposed mitigation and environmental protection measures cumulative residual environmental effect on land and resource use is predicted to be not significant because the Project in combination with past, present, and reasonably foreseeable projects will not restrict or degrade present land use capabilities to a point where land use activities cannot continue at or near current level. It is assumed that any future projects or activities will be required to implement various mitigation measures and to comply with regulatory requirements, thereby also reducing cumulative effects.

6.6.6.10 Human Health

Project residual effects on human health are associated with Project-related emissions and discharges that result in changes (increases) in constituent concentrations in environmental media (e.g., air, water). Such changes in constituent concentrations in environmental media were predicted in the SSAs and LSAs corresponding to the individual technical disciplines (e.g. air quality, noise, water, etc.) that support the assessment of potential human health effects. Potential risks to human health are generally calculated mathematically as a ratio of an exposure concentration to a benchmark value; therefore, an incremental change in an exposure concentration will necessarily change the mathematical expression of risk. Since Project emissions and discharges are predicted to increase constituent concentrations in related media above background levels in their respective SSAs and LSAs, risks to human health that are related to these emissions will increase; however, commensurate with the relatively small change in

media concentrations above background levels, increased risk to human health as the result of the Project is small in magnitude and no actual risk (i.e., hazard quotients > 1) to human health has been predicted. Potential cumulative effects to human health associated with changes in air quality, changes in water quality, changes in country foods, and changes in noise are discussed below.

6.6.6.10.1 Human Health - Changes in Air Quality

Concentrations of CoPCs in ambient air are expected to increase above baseline conditions in the air LSA during Project construction, operations and decommissioning. Residual effects on human health from changes in air quality are not expected to be significant during any phase of mine life. Although some short-term benchmark exceedances are predicted, they do not occur at locations of potentially susceptible receptors, or the predicted exposure ratios and cancer risk estimates are below target benchmarks set by Health Canada.

In consideration of the PIL, there are no future projects and activities whose spatial influence is expected to overlap with that of the air RSA from a human health perspective. Accordingly, the Project is not predicted to result in cumulative effects on human health due to changes in air quality in the RSA.

6.6.6.10.2 Human Health - Changes in Water Quality

Discharges to surface water during all mine phases are not expected to increase concentrations of CoPCs in surface water in excess of water quality benchmarks at the surface water LSA; therefore, no adverse effects on human health are expected during any phase of the Project. Similarly, no adverse effects on human health are expected from groundwater affected by Project-related changes to groundwater quality in the groundwater LSA/RSA because no groundwater users are located in the areas where groundwater quality is predicted to exceed provincial and/or federal drinking water standards.

In consideration of the PIL, there are no future projects and activities whose spatial influence is expected to overlap with those of the surface water and groundwater RSAs from a human health perspective. Accordingly, the Project is not predicted to result in cumulative effects on human health due to changes in water quality in these RSAs are not anticipated.

6.6.6.10.3 Human Health - Changes in Country Foods

Relatively small incremental Project-related changes are predicted in constituent concentrations in the environment and, consequently, such changes would result in equally small changes to constituent concentrations in country foods in the air and water LSAs and RSAs, respectively, where country foods are likely to be harvested. Therefore, adverse effects on human health from country foods consumption are not expected from Project-related air emissions and discharges to water.

While the projects / activities in the PIL could affect harvesting activities in the land and resource use RSA from a spatial perspective, the projects / activities are not likely be associated with air emissions and discharges to water that would affect country food exposure pathways. Accordingly, the Project is not

predicted to result in cumulative effects on human health due to changes to country food in the Project RSA.

6.6.6.10.4 Human Health - Changes in Noise

Acoustic modelling was completed following provincial and federal guidance to predict sounds levels at representative noise-sensitive receptors due to Project activities during construction and operations. Noise impacts at representative noise-sensitive receptors from construction and operational activities within the SSA, traffic noise, and the rail load out facility were predicted and compared to Health Canada (2017) noise level thresholds for assessing community annoyance and sleep disturbance. Residual effects on human health from noise generated by Project activities during the construction, operation and decommissioning phases of the Project do not exceed guidelines for community annoyance and sleep disturbance.

In consideration of the PIL, there are no future projects and activities whose spatial influence is expected to overlap with those of the noise RSA from a human health perspective. Accordingly, the Project is not predicted to result in cumulative effects on human health due to changes in noise in the Project RSA are not anticipated.

6.6.6.11 Indigenous Considerations

Project residual effects on Indigenous considerations are associated with a change to wildlife, plant and material harvesting, change in access to the BN Community Trapline and travel routes, and a change to drinking water and country foods relative to baseline conditions. These effects are primarily related to the physical disturbance of and/or restricted access to the SSA throughout all Project phases, as well as effects from Project activities (i.e., equipment operations, water management). Such effects are generally anticipated throughout the duration of the Project, commencing during site preparation and continuing until the mine site is closed, restored, and deemed safe for access. In each case, the effects were rated as low to medium for geographic extent as the predicted effects will be primarily limited to the SSA or within close proximity in the LSA. In the case of the BN Community Trapline, the geographic extent of effects extends beyond the SSA where normal access and travel routes along the extent of the Camp 19 Road that normally occurs through the SSA would be restricted, although alternate access via alternate modes of transportation would remain.

6.6.6.11.1 Change to Traditional Land and Resource Use

In the case of wildlife, plant, and material harvesting, such activities would be restricted within the SSA throughout the life of the Project, but would continue in the LSA and RSA. It is anticipated that wildlife displaced from the SSA will seek similar suitable habitat in surrounding areas of the LSA. Extensive areas exist in the LSA and RSA where traditional wildlife harvesting (beaver, moose, wolf, black bear, marten, waterfowl, shorebirds) is currently practiced that will continue to be available to Indigenous communities. Fish harvesting is not known to occur within the SSA; however, residual effects on the ability to fish within the LSA (i.e., Pic River, Bamoos Lake, Hare Lake) are anticipated to be low.

In the case of the BN Community Trapline, similar effects to wildlife in terms of displacement from the SSA to similar habitats in the LSA are expected. However, due to access restrictions created by the Project, the geographic extent of effects extends beyond the SSA where normal access and travel routes will be restricted along the extent of Camp 19 Road through the SSA. Although alternate access via alternate modes of transportation would remain, the magnitude of residual effects on the BN Community Trapline are anticipated to be medium throughout the life of the Project.

In consideration of the PIL, traditional and general land and resource uses themselves are low intensity activities dispersed across the landscape with typically no measurable effects on habitat and, therefore, they do not warrant further consideration from a cumulative effects perspective. Other projects and activities involving the clearing of existing vegetation and construction of structures that would result in the loss of habitat and/or access to the areas used for traditional land and resource uses include the East-West Tie Transmission Line Expansion. Other projects are anticipated in the wildlife RSA; however, these are generally associated with previously built-up areas (i.e., infrastructure-related projects planned in the BN community). As such, in consideration of residual adverse effects from the Project, the overall adverse cumulative residual environmental effect on traditional land and resource use is predicted to be not significant.

6.6.6.11.2 Change to Indigenous Heritage and Archaeological Resources

There are no Project-related residual adverse effects on archaeological resources or built and cultural heritage resources, including spiritual and habitation sites, due to the absence of such features within the SSA. However, as a result of access restrictions to the SSA, portions of existing access and travel routes that are associated with cultural, societal, and spiritual connections to the land will be restricted. Alternate access routes will remain in the area (i.e., Camp 19 Road to Pic River, Hare Creek / Hare Lake north to Bamoos Lake), although the existing access will be affected throughout the Project. Although substantial effort has been made to design and plan the site with community input and minimize disturbance, ultimately the deposit location and supporting infrastructure will have an impact on the BN Community Trapline, which is recognized to contribute to the health, spirituality, sense of community, TK, and BN's ability to live off the land.

In consideration of the PIL, there are no future projects and activities whose spatial influence is expected to affect the ability to access the BN Community Trapline. As noted above, traditional and general land and resource uses themselves are low intensity activities dispersed across the landscape with typically no measurable effects on habitat. No other projects or activities have been identified that may adversely affect access to the BN Trapline or its associated heritage attributes and, therefore, do not warrant further consideration from a cumulative effects perspective.

Accordingly, in consideration of residual adverse effects from the Project, the overall adverse cumulative residual environmental effect on Indigenous heritage is predicted to be not significant.

6.6.6.11.3 Change to Indigenous Health

Discharges to surface water during all mine phases are not expected to increase concentrations of CoPCs in surface water in excess of water quality benchmarks at the surface water LSA level. Therefore, no adverse effects on human health are expected during any phase of the Project. Similarly, no adverse effects on human health are expected from groundwater affected by Project-related changes to groundwater quality in the groundwater LSA/RSA because no groundwater users are located in the areas where groundwater quality is predicted to exceed provincial and/or federal drinking water standards.

In consideration of the PIL, there are no future projects and activities whose spatial influence is expected to overlap with those of the surface water and groundwater RSAs from a human health perspective. Accordingly, cumulative effects on human health due to changes in water quality in these RSAs are not anticipated.

Relatively small incremental Project-related changes are predicted in constituent concentrations in the environment and, consequently, such changes would result in equally small changes to constituent concentrations in country foods in the air and water LSAs and RSAs, respectively, where country foods are likely to be harvested. Therefore, adverse effects on human health from country foods consumption are not expected from Project-related air emissions and discharges to water.

While the projects / activities in the PIL could affect harvesting activities in the land and resource use RSA from a spatial perspective, the projects / activities are not likely associated with air emissions and discharges to water that would affect country food exposure pathways. Accordingly, cumulative effects on human health due to country foods in the Project RSA are not anticipated.

6.6.6.11.4 Indigenous Considerations

Notwithstanding the above discussion, the effects of past and present projects and activities have altered the landscape of the area and have influenced the environmental characteristics reflected in the baseline conditions. Present day environmental (baseline) conditions reflect the outcome of past projects and activities through whatever changes (effects) those projects and activities had (whether they remain visible on the landscape or not). What is important in any assessment is the current state of the VEC (influenced by the past) and what the condition of the VEC will be if development of the Project and other certain and reasonably foreseeable projects and activities occur.

Prior to European settlement, the environment remained relatively undisturbed. The boreal forest, within which the Project is located, remains a relatively remote and undisturbed area on the landscape today, although it has been changed due to forestry, mining, transportation, parks, municipalities, and other activities that continue today. It is also subject to natural disturbances due to forest fires that reshape the environment. Both anthropogenic and natural disturbances have shaped the condition of the biological, physical, and social environment within which the Project is proposed.

BN, as with other Indigenous communities, have expressed concerns with the adverse effects of past and present projects and activities within their traditional territories and the implication on their interests and rights. BN has prepared and provided a presentation on the historic alienation of their traditional territory

by past decisions and activities, a copy of which is included with permission from BN in the Record of Consultation (Appendix C of the EIS Addendum [Vol. 2]). As expressed by BN to GenPGM, BN is of the position that significant cumulative effects have occurred as a result of the past and present projects and activities within their traditional territory. However, it should be acknowledged that such effects will have occurred and are likely to occur independent of the Project (i.e., whether or not the Project proceeds). BN have identified additional mitigation measures that they propose are required from the federal and provincial governments to address existing conditions and historical effects on Indigenous communities.

With respect to Project contributions to cumulative effects within their traditional territories, Project residual effects (even small changes) are anticipated for all VECs (except archaeology and built and cultural heritage) and have the potential to contribute to cumulative effects. In each case where residual cumulative adverse effects have been identified, the residual cumulative adverse effect has been characterized as not significant. GenPGM has committed to implementing mitigation and environmental protection measures to address Project-specific effects on all VECs, in consultation with Indigenous communities, such that the contribution of effects from the Project to cumulative effects would be negligible.

6.6.7 Cumulative Effects Without the Project

In consideration of projects / activities identified in the PIL, cumulative residual effects have been identified as not significant for the atmospheric environment (change in GHGs), fish and fish habitat (change in fish habitat, change in fish mortality), vegetation (change in forest cover, change in non-forest cover), wildlife (change in habitat – direct and indirect, change in wildlife movement / passage, change in wildlife mortality), SAR (change in habitat - direct, change in habitat – sensory disturbance, change in mortality) and socio-economic (economy and employment, infrastructure and community services, land and resource use) and Indigenous considerations (traditional land and resource use, Indigenous heritage, Indigenous health). In each case, the cumulative residual effect is likely to occur with or without the implementation of the Project.

For GHGs, any projects / activities that are associated with GHG emissions, however minor the source, contribute to overall emissions of GHGs that are associated with the RSA, as well as nationally and globally. In this broad context, any source of GHG emissions that represent an incremental increase in emissions could affect Canada's ability to meet its commitments with respect to climate change.

As it concerns fish and fish habitat, the cumulative residual effects that have been identified (change in habitat, change in mortality) may be associated with other projects / activities that have been identified in the PIL. As such, they add cumulatively to the Project residual effects and, in this context, the cumulative residual effect that has been identified is likely to occur with or without the implementation of the Project.

As it concerns vegetation, since the cumulative residual effects that have been identified all primarily relate to loss and / or disturbance of forest cover and non-forest cover vegetation types, any projects / activities that are associated with similar types of effects (i.e., land clearing and land disturbance) add cumulatively to habitat loss / disturbance in the RSAs. In this context, the cumulative residual effect that has been identified is likely to occur with or without the implementation of the Project.

As it concerns wildlife, the cumulative residual effects that have been identified (change in habitat – direct and indirect, change in wildlife movement / passage, change in wildlife mortality) may be associated with other projects / activities that have been identified in the PIL. As such, they add cumulatively to the Project residual effects and, in this context, the cumulative residual effect that has been identified is likely to occur with or without the implementation of the Project.

As it concerns SAR, the cumulative residual effects that have been identified (change in habitat – direct and indirect or sensory disturbance, change in movement / passage, change in mortality) may be associated with other projects / activities that have been identified in the PIL. As such, they add cumulatively to the Project residual effects and, in this context, the cumulative residual effect that has been identified is likely to occur with or without the implementation of the Project.

As it concerns socio-economic conditions, the Project is viewed as a benefit to the economy of the area and is anticipated to increase employment for a population that is in decline due to an absence of employment opportunities. The positive benefits of the Project would not occur without the Project. Cumulative residual effects that have been identified (change in infrastructure and community services, change in land and resource use) may be associated with other projects / activities that have been identified in the PIL. As such, they add cumulatively to the Project residual effects and, in this context, the cumulative residual effect that has been identified is likely to occur with or without the implementation of the Project. However, the contribution of the Project to this determination is considered negligible.

As expressed by BN to GenPGM, BN is of the position that significant cumulative effects have occurred as a result of the past and present projects and activities within their traditional territory. However, it should be acknowledged that such effects will have occurred and are likely to occur independent of the Project (i.e., whether or not the Project proceeds). BN have identified additional mitigation measures that they propose are required from the federal and provincial governments to address existing conditions and historical effects on Indigenous communities. As such, in this context, the cumulative residual effect that has been identified is likely to occur with or without the implementation of the Project. However, the contribution of the Project to this determination is considered negligible.

Project residual effects that were carried forward to the cumulative effects assessment but for which no cumulative residual effects were identified include the following: changes in air quality, changes in light levels, changes in noise and vibration, changes in water quality and quantity, changes in soil and terrain, changes in human health (air quality, water quality, country foods, noise), and changes in Indigenous health (drinking water, country foods).

6.6.8 Summary of Cumulative Effects

Table 6.6-4 provides a summary of the characterization of the significance of cumulative residual effects that have been identified. The summary includes consideration of cumulative effects “with” and “without” incremental contribution of the Project to cumulative effects, and includes a statement regarding the contribution from the Project to the residual cumulative effect.

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Residual Cumulative Effect – Atmospheric Environment – Change in GHGs									
With the Project	A	N	H	NS	H	H	H	H	NS
Without the Project	A	N	H	NS	H	H	H	H	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to national emissions would be anticipated to be ~0.003% and ~0.01% of national emissions, for construction and operations, respectively.								
Residual Cumulative Effect – Fish and Fish Habitat – Change in Fish Habitat									
With the Project	A	L	H	MS	H	M	M	H	NS
Without the Project	A	L	H	MS	H	M	M	H	NS
Contribution from the Project to the Residual Cumulative Effect	The contribution of the Project, as well as the other projects and activities, will necessarily be similar once offsets, as required by the *Fisheries Act*, are implemented.								
Residual Cumulative Effect – Fish and Fish Habitat – Fish Mortality									
With the Project	A	L	H	NS	M	H	H	H	NS
Without the Project	A	L	H	NS	M	H	H	H	NS
Contribution from the Project to the Residual Cumulative Effect	The Project-specific contribution to fish mortality is expected to be minor. Fish salvage and relocation will be done to avoid mortality in areas where project infrastructure will interact with fish-bearing waters. Mortality as the result of blasting overpressure is not expected as required setback distances will be respected. Given the prohibitions against causing the death of fish by means other than fishing, as well as habitat protection provisions, that are in the *Fisheries Act*, it is expected that fish mortality associated with the other projects / activities will also be minor in consideration of mitigations.								
Residual Cumulative Effect – Vegetation – Change in Forest Cover									
With the Project	A	L	H	NS	H	H	M	L	NS
Without the Project	A	L	H	NS	H	H	M	L	NS

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – Vegetation – Change in Non-forest Cover									
With the Project	A	L	H	NS	H	H	M	L	NS
Without the Project	A	L	H	NS	H	H	M	L	NS
Contribution from the Project to the Residual Cumulative Effect	Non-forest vegetation types on the Project site represent very small percentages (< 1%) of those same ecotypes that are found within Ecodistrict 3W-5 and, therefore, the contribution of the Project to the likely cumulative effect is small.								
Residual Cumulative Effect – Wildlife – Change in Wildlife Habitat (Direct)									
With the Project	A	L	H	MS	H	H	M	L	NS
Without the Project	A	L	H	MS	H	H	M	L	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – Wildlife – Change in Wildlife Habitat (Indirect)									
With the Project	A	L	H	MS	H	H	M	L	NS
Without the Project	A	L	H	MS	H	H	M	L	NS
Contribution from the Project to the Residual Cumulative Effect	The relative contributions from the Project and other proposed projects / activities can be viewed from the perspective of the footprints associated with the specific activities. In this context, the cumulative residual effect associated with timber harvesting will be the most substantial and the relative contributions of the Project and other activities will be minor within the RSA landscape.								

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Residual Cumulative Effect – Wildlife – Change in Passage / Movement									
With the Project	A	L	H	MS	H	H	M	L	NS
Without the Project	A	L	H	MS	H	H	M	L	NS
Contribution from the Project to the Residual Cumulative Effect	The relative contributions from the Project and other proposed projects / activities that may cause habitat fragmentation and, therefore, changes in passage and movement can be viewed from the perspective of the footprints associated with the specific activities. In this context, the cumulative residual effect associated with timber harvesting will be the most substantial and the relative contributions of the Project and other activities will be minor within the RSA landscape.								
Residual Cumulative Effect – Wildlife – Change in Mortality									
With the Project	A	L	H	HS	H	H	H	L	NS
Without the Project	A	L	H	HS	H	H	H	L	NS
Contribution from the Project to the Residual Cumulative Effect	Mortality risk on wildlife from land clearing is generally low for all projects / activities in consideration of appropriate mitigations and, therefore, relative risk can be inferred based on the amount of land that will be cleared. From this perspective, timber harvesting would pose the greatest mortality risk and all other projects / activities would be minor in comparison. Although mortality risks associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects / activities, when viewed in a larger context, cumulatively the risks of mortality associated with these sources are expected to be low in magnitude.								
Residual Cumulative Effect – SAR – woodland caribou – Change in Habitat (Direct)									
With the Project	A	L	H	LS	H	H	M	M	NS
Without the Project	A	L	H	LS	H	H	M	M	NS
Contribution from the Project to the Residual Cumulative Effect	Project-related disturbance would increase the percentage disturbance from 28.06% to 28.07% in the RSA. The incremental increases in disturbance associated with projects / activities in the PIL are expected to be minor and smaller than those associated with the Project, since the footprint of those other activities would be smaller than that of the Project. In consideration of the other projects envisioned in the RSA where further disturbance is likely, any incremental increase in the level of disturbance will be as small, or smaller, and cumulatively will remain below the 35% maximum disturbance threshold. It is noted that timber harvesting during the next 10-year window (2021 to 2031) will occur in the discontinuous range and continuous range, outside the RSA.								
Residual Cumulative Effect – SAR – woodland caribou – Change in Mortality									
With the Project	A	L	H	LS	H	H	M	M	NS

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Without the Project	A	L	H	LS	H	H	M	M	NS
Contribution from the Project to the Residual Cumulative Effect	While direct mortality is acknowledged as a possibility as the result of the Project and other projects / activities in the RSA, the effect is likely so low in magnitude as to make it difficult to characterize the respective relative contributions.								
Residual Cumulative Effect – SAR – little brown Myotis and northern Myotis – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	L	NS
Without the Project	A	L	H	NS	H	H	M	L	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – Canada warbler – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	L	NS
Without the Project	A	L	H	NS	H	H	M	L	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – Canada warbler – Change in Habitat (Sensory Disturbance)									
With the Project	A	L	H	NS	H	H	H	L	NS
Without the Project	A	L	H	NS	H	H	H	L	NS
Contribution from the Project to the Residual Cumulative Effect	For the Project, as well as other projects / activities, sensory disturbance effects are likely to be spatially confined to the local area in the vicinity of the project / activity, not extending to a more regional scale. Given the combined footprints of the Project and other projects / activities in comparison to the RSA, the combined effect is expected to be relatively small in magnitude.								

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Residual Cumulative Effect – SAR – Canada warbler – Change in Mortality									
With the Project	A	L	H	NS	H	H	H	L	NS
Without the Project	A	L	H	NS	H	H	H	L	NS
Contribution from the Project to the Residual Cumulative Effect	Mortality risk on Canada warbler associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects/activities; however, when viewed in a larger context, cumulatively the risks of mortality associated with all sources, including the Project, are expected to be low in magnitude.								
Residual Cumulative Effect – SAR – rusty blackbird – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	N	NS
Without the Project	A	L	H	NS	H	H	M	N	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the Project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – olive-sided flycatcher, eastern wood-pewee, and evening grosbeak – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	N	NS
Without the Project	A	L	H	NS	H	H	M	N	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the Project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – common nighthawk – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	N	NS
Without the Project	A	L	H	NS	H	H	M	N	NS

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the Project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – common nighthawk – Change in Mortality									
With the Project	A	L	H	NS	H	H	H	N	NS
Without the Project	A	L	H	NS	H	H	H	N	NS
Contribution from the Project to the Residual Cumulative Effect	Mortality risk is perceived to be low based on the relative low numbers of common nighthawk in the RSA. It is difficult to comment on the relative contributions from the Project and other proposed projects / activities since the common nighthawk is not common in the RSA; interactions of this sort are likely to be rare regardless of the project / activity.								
Residual Cumulative Effect – SAR – eastern whip-poor-will – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	N	NS
Without the Project	A	L	H	NS	H	H	M	N	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the Project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – eastern whip-poor-will – Change in Mortality									
With the Project	A	L	H	NS	H	H	H	N	NS
Without the Project	A	L	H	NS	H	H	H	N	NS
Contribution from the Project to the Residual Cumulative Effect	Mortality risk is perceived to be low based on the relative low numbers of eastern whip-poor-will in the RSA. It is difficult to comment on the relative contributions from the Project and other proposed projects / activities since the eastern whip-poor-will is not common in the RSA; interactions of this sort are likely to be rare regardless of the project / activity.								

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Residual Cumulative Effect – SAR – monarch – Change in Habitat (Direct)									
With the Project	A	L	H	NS	H	H	M	N	NS
Without the Project	A	L	H	NS	H	H	M	N	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the Project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – monarch – Change in Mortality									
With the Project	A	L	H	NS	H	H	H	N	NS
Without the Project	A	L	H	NS	H	H	H	N	NS
Contribution from the Project to the Residual Cumulative Effect	Mortality risk on monarch butterfly associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects / activities; however, when viewed in a larger context, cumulatively the risks of mortality associated with these sources are expected to be low in magnitude. The Project's contribution to the overall cumulative effect is deemed to be small.								
Residual Cumulative Effect – SAR – yellow-banded bumble bee – Change in Habitat (Direct)									
With the Project	A	L	H	LS	H	H	M	N	NS
Without the Project	A	L	H	LS	H	H	M	N	NS
Contribution from the Project to the Residual Cumulative Effect	The Project's contribution to the overall cumulative effect is deemed to be small. The area affected by the Project is only a small fraction (<< 1%) of the area in which commercial forestry will occur in the RSA during the life of the mine.								
Residual Cumulative Effect – SAR – yellow-banded bumble bee – Change in Mortality									
With the Project	A	L	H	LS	H	H	H	N	NS
Without the Project	A	L	H	LS	H	H	H	N	NS
Contribution from the	Mortality risk on yellow-banded bumble bee associated with interactions with vehicles, equipment and infrastructure are expected to differ somewhat for the different projects/activities; however,								

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Project to the Residual Cumulative Effect	when viewed in a larger context, cumulatively the risks of mortality associated with these sources are expected to be low in magnitude. The Project's contribution to the overall cumulative effect is deemed to be small.								
Residual Cumulative Effect – Socio-Economic Environment – Infrastructure and Services									
With the Project	A	M	L	HS	H	M	H	H	NS
Without the Project	A	M	L	HS	H	M	H	H	NS
Contribution from the Project to the Residual Cumulative Effect	While residual adverse effects for infrastructure and services in the Town of Marathon are expected to be largely mitigated due to construction of an Accommodations Complex and capacity for modest growth, the contribution of the Project to the cumulative impact is small.								
Residual Cumulative Effect – Socio-Economic Environment – Land and Resource Use									
With the Project	A	L	L	MS	H	H	N	M	HS
Without the Project	A	L	L	NS	L	L	L	M	HS
Contribution from the Project to the Residual Cumulative Effect	Residual adverse effects result from the removal of 1,116 ha of land from resource and recreational use will occur. There is sufficient area within the RSA for recreational uses to occur in the future. Following rehabilitation, use of the land on the site to a certain degree can resume in the future. The Project's contribution to the overall cumulative effect is deemed to be small.								
Residual Cumulative Effect – Indigenous Consideration – Changes to Traditional Land and Resource Use									
With the Project	A	M	M	MS	M	M	M	H	NS
Without the Project	A	L	M	MS	M	M	M	H	NS
Contribution from the Project to the Residual Cumulative Effect	Wildlife harvesting opportunities will continue to exist in the LSA and RSA. Residual effects on fish harvesting are anticipated to be low. Displacement of the BN Community Trapline will occur. Overall, the adverse residual environmental effect is predicted to be low.								

Table 6.6-4: Residual Cumulative Effects

Residual Cumulative Effect	Residual Cumulative Effects Characterization								
	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination
Residual Cumulative Effect – Indigenous Consideration – Changes to Indigenous Heritage									
With the Project	A	L	M	HS	L	H	L	M	NS
Without the Project	A	L	L	HS	L	M	L	M	NS
Contribution from the Project to the Residual Cumulative Effect	No Project-related residual adverse effects on archaeological resources or built and cultural heritage were identified. Access to portions of the SSA, existing access and travel routes will be restricted. The Project will have an impact on the BN Community Trapline, but the overall adverse cumulative residual environmental effect is predicted to be not significant.								

KEY

See Section 2.5 of EIS Addendum (Vol 1) as well as relevant definitions for individual VECs

Project Phase:

C: Site Preparation / Construction

O: Operation

D: Decommissioning

Direction:

P: Positive

A: Adverse

Magnitude:

N: Negligible

L: Low

M: Medium

H: High

N/A: Not applicable

Geographic Extent:

N: Negligible

L: Low

M: Medium

H: High

Timing:

NS: No sensitivity

MS: Medium sensitivity

HS: High sensitivity

Duration:

N: Negligible

L: Low

M: Medium

H: High

Significance Determination

S: Significant

NS: Not Significant

Frequency:

N: Negligible

L: Low

M: Medium

H: High

Reversibility:

N: Negligible

L: Low

M: Medium

H: High

Ecological / Societal Value:

N: Negligible

L: Low

M: Medium

H: High

6.6.9 Significance of Cumulative Effects

In each case where a Project-related residual cumulative effect has been identified as shown in Table 6.6-4, the residual cumulative effect has been characterized as not significant. This includes the following:

- Atmospheric - change in GHGs

- Fish and Fish Habitat - change in fish habitat, change in fish mortality
- Vegetation - change in forest over, change in non-forest cover
- Wildlife - change in habitat (direct and indirect), change in wildlife movement / passage, change in wildlife mortality
- SAR - change in habitat – change in habitat (direct), change in habitat (sensory disturbance), change in mortality
- Socio-economic – infrastructure and community services, land and resource use
- Indigenous considerations – traditional land and resource use, Indigenous heritage

6.7 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

A detailed evaluation of the VECs selected for the Project, including the potential environmental effects, proposed mitigation measures, and the potential for residual effects for each of the VECs, is provided in Section 6.2 of this EIS Addendum (Vol 2). The purpose of this section is to provide a summary of the following key information:

- potential environmental effects
- proposed mitigation measures to address the effects identified in Chapter 6 of this EIS Addendum (Vol 2)
- potential residual effects and the significance of the residual environmental effects

The details and discussion regarding the environment effects of the Project are presented above. Table 6.7-1 has been prepared to provide a summary of the effects assessment for the twelve VECs identified for the Project, as follows:

- Atmospheric Environment, including air quality, greenhouse gas and light
- Acoustic Environment
- Water Quality and Quantity, including surface water and groundwater
- Fish and Fish Habitat
- Terrain and Soils
- Vegetation
- Wildlife
- Species at Risk
- Socio-economics, including economics, community infrastructure and services, and land and resource use

- Human Health, including air quality, water quality, country foods and noise
- Physical and Cultural Heritage Resources
- Indigenous Considerations, including traditional land and resource use, Indigenous heritage and archaeological resources, and Indigenous health

Based on project components and activities, existing baseline conditions and anticipated changes to the environment, with the implementation of the proposed mitigation measures and environmental protection measures, it is predicted that residual adverse environmental effects of the Project can be characterized as not significant for all VECs. A summary of key mitigation measures and commitments essential to ensure that the Project will not result in significant adverse environmental effects is presented in Table 6.7-1. A complete list of mitigation measures and Project commitments is provided in Section 8 of this EIS Addendum (Vol 2).

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
Atmospheric Environment	Change in Air Quality and Dustfall	C, O, D	A	M-H	M	NS	M	N-L	N	L	NS	• Use of dust suppression techniques • Implementation of dust collection system and baghouses • Equipment to meet applicable emissions standards and to be maintained regularly	The Project is not predicted to result in cumulative effects on air quality.
	Change in Greenhouse Gases	C, O, D	A	L	H	NS	M	M	H	H	NS	• Mine design optimization • Employ energy efficient equipment • Proactive site reclamation • Management of fuel use • Co_2 capture	With the proposed mitigation and environmental protection measures (outlined in this section), the adverse cumulative residual environmental effect on GHGs is predicted to be not significant. Any incremental contribution of the cumulative emission of GHGs is predicted to be negligible.
	Change in Ambient Light	C, O, D	A	L	L	A	M	M	N	N	NS	• Optimization of lighting design (including mounting lights as low as possible) • Use of directional lighting	The Project is not predicted to result in cumulative effects ambient light.
Acoustic Environment	Change in Noise Levels	C, O, D	A	L - M	L - M	N/A	L - M	L - H	N	N	NS	• Purchase of vehicles and equipment that meet applicable noise suppression regulations • Schedule concentrate delivery to reduce complaints, whenever possible • Implement an overpressure and vibration monitoring program on-site	The Project is not predicted to result in cumulative effects on noise levels.
	Change in Ground Vibration	C, O, D	A	L	L	N/A	L – M	M	N	N	NS	• Purchase of vehicles and equipment that meet applicable noise suppression regulations • Implement an overpressure and vibration monitoring program on-site	The Project is not predicted to result in cumulative effects on ground vibration.
Water Quality and Quantity	Change in groundwater quantity related to construction	C	A	L	L	N/A	L	L	N	N/A	NS	• Limit construction footprint (i.e., SSA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the SSA • Use standard management and construction practices throughout the Project • Install contact water and seepage collection ditches around the perimeter of the MRSA and ore stockpile to mitigate the migration of seepage • Consider accelerating open pit filling at closure to return groundwater levels to post closure steady-state conditions in a shorter timeframe • Completion of a water well survey within and adjacent to the SSA to confirm the presence of nearby water supply wells	The Project is not predicted to result in cumulative effects on groundwater quantity.
	Change in groundwater quantity related to open pits	O	A	H	M	N/A	M	H	M	L	NS		
		D	A	L	M	N/A	H	H	H	L	NS		
	Change in groundwater quantity related to PSMF	O	P	L	M	N/A	H	H	H	L	NS		
		D	P	L	M	N/A	H	H	H	L	NS		

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in groundwater quality	O, D	A	H	LSA	N/A	H	H	H	H	NS	• Limit construction footprint (i.e., SSA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the SSA. • Use standard management and construction practices throughout the Project • Design of the MRSA to increase the amount of runoff and reduce the amount of infiltration through the MRSA, thereby reducing the recharge and loading to groundwater. • Install contact water and seepage collection ditches around the perimeter of the MRSA and ore stockpile to mitigate the migration of seepage. • Implementation of progressive rehabilitation (placement of vegetated soil cover) to reduce infiltration into the MRSA and PSMF, thereby reducing the amount of water and loading to groundwater and improvements to groundwater quality. • Consider accelerating open pit filling at closure to return groundwater levels to post closure steady-state conditions in a shorter timeframe. • Completion of a water well survey within and adjacent to the SSA to confirm the presence of nearby water supply wells.	The Project is not predicted to result in cumulative effects on groundwater quality.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in surface water quantity	C, O, D	A	H	M	MS	H	H	H	H	NS	• Limit and stage construction footprint (SSA) 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 • Maintain access roads by periodically regrading and ditching to improve water flow, reduce erosion, and manage vegetation growth • Attenuate peak discharges and augment baseflows to the environment through use of Project water storage features (i.e., catch basins, collection ponds, SWM ponds) • Collection of runoff and groundwater seepage from the open pits and run-of-mine stockpile within Collection Pond 1 • Excess water pumped from Collection Pond 1 to the WMP for treatment and discharge to Hare Lake • Recycling of contact water for use as process water • Construction and use of existing subwatershed boundaries to divert fresh water away from Project components • assessment of the downstream watercourse in subwatershed 103 and 112 to implement erosion control measures to reduce the potential for scour and erosion to occur, as needed	The Project is not predicted to result in cumulative effects on surface water quantity.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in surface water quality	C, O, D	A	L	M	N/A	M	H	H	H	NS	• Develop and implement a site-wide water management plan that provides an integrated framework to manage water quality that includes provision for water management practices for each of the primary site aspects, as well as areas of the site where there is contact water • Develop and implement a mine waste management plan that is keeping with the principals of the mine waste management strategy that has been presented in the original EIS based on the geochemical characterization on the mine waste materials. • For operations, develop and implement appropriate operating practices for explosives and blasting operations to reduce nitrogen residuals in mine water • For operations, collect surface water drainage associated with the MRSA and management of these waters so that there will not be a routine discharge to the Pic River • Maintain the water management system in place during the closure phase of the Project until such time that water quality is suitable to release to the environment • Monitor and manage effluent, including contingency for effluent treatment as may be required, so that water discharge objectives are achieved as defined in applicable provincial and federal regulatory instruments • Develop and implement focused monitoring programs on waterbodies such as the Pic River extending downstream of the SSA to the mouth of Lake Superior, the outlet of Hare Creek at Port Munro and Stream 6 (Angler Creek) and the outlet at Sturdee Cove that have significance to Indigenous communities • Work with the associated communities to develop and implement the program and develop a framework to share the results for the purpose of assessing the performance of the water management system.	The Project is not predicted to result in cumulative effects on surface water quality.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in sediment quality	C, O, D	A	N to L	M	N/A	M	H	H	M	NS	• Reduce the level of interaction between aquatic habitat features and Project infrastructure • Comply with water discharge requirements as defined in the Metal and Diamond Mining Effluent Regulations (MDMER) and Environmental Compliance Approval (provincial) • Employ standard management practices for erosion control such as: o Isolating disturbed areas with sediment fences or similar structures o Maintaining appropriate work area setbacks from surface water features o Grading and/or covering surfaces to reduce erosion potential o Controlling runoff from erosion-sensitive features o Providing settling ponds or basins in which solids can be collected (i.e., WMP and SWM Pond)	The Project is not predicted to result in cumulative effects on sediment quality.
Fish and Fish Habitat	Lethal Effects to Fish	C, O	A	H	L	MS	M	M	L	H	NS	• Fish habitat/ HADD offsetting • Avoid waterbodies of importance to local land users and Indigenous communities, to extent practical • Avoid use of explosives near water and when near water comply with DFO *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* • Planning in-water work to respect applicable fish timing windows • Conduct in-water works during low flow periods • Prepare and executive a fish salvage plan prior to in-water works • Design intake and discharge infrastructure to prevent entrainment or impingement of fish • Implement an Erosion and Sediment Control Plan	The cumulative residual effect in consideration of proposed mitigations is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects of fish mortality is predicted to be negligible.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change resulting in direct physical HADD	C, O	A	H	L	MS	M	H	M	H	NS	• HADD offsetting • Mine design optimization • Avoid waterbodies of importance to local land users and Indigenous communities, to extent practical • Avoidance of more sensitive habitats to the extent practicable • Design infrastructure including pipeline crossings and outfalls, and road crossings using best management practices to minimize disturbance to the existing watercourses • Adherence, as applicable, to the Interim Code of Practice for fish protection screens, cofferdams, diversion channels, and temporary stream crossings	Overall, and in consideration of the proposed mitigation, the cumulative residual effect on fish habitat is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on fish habitat is predicted to be negligible.
	Change in Water Quantity	C, O, D	A	H	L	MS	M	M	M	H	NS	• Design, install and maintain culverts in accordance with DFO and MNR operational statements, guidelines and protocols *See also Change in Water Quantity in Water VEC	The Project is not predicted to result in cumulative effects on fish due to changes in water quantity.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in Water Quality	C, O, D	A	L	M	HS	M	H	L	H	NS	• Avoid waterbodies of importance to local land users and Indigenous communities, to extent practical • Plan activities near water such that deleterious materials do not enter watercourse • Implement a Spill Prevention and Response Plan (SPRP) • Whenever possible, operate machinery on land above the high-water mark, on ice, or from a floating barge in a manner that limits disturbance to the banks and bed of the waterbody • Limit access to waterbodies and banks to protect riparian vegetation and limit bank erosion • Promptly stabilize shoreline or banks disturbed by activities associated with the Project to prevent erosion and/or sedimentation • Implementation of an Erosion and Sediment Control Plan (ESCP) • Follow the DFO interim code of practice for temporary stream crossing, culvert maintenance and the waster rock management plan. • Implement Follow-up Monitoring and Environmental Management Plans. *See also Lethal Effects to fish, Change in Water Quality in Water VEC, and soils VEC.	The Project is not predicted to result in cumulative effects on fish due to changes in water quality
	Change in Benthic Invertebrate Community	C, O, D	A	H	M	HS	M	H	M	H	NS	• Implementation of an Erosion and Sediment Control Plan (ESCP) • Maintaining appropriate work area setbacks from surface water features • Avoid use of explosives near water and when near water comply with DFO *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* • controlling run-off from erosion-sensitive features • providing settling ponds or basins in which solids can be collected *See also Lethal Effects to fish and HADD.	The Project is not predicted to result in cumulative effects on benthic invertebrate communities.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
Terrain & Soils	Change to soils and overburden (quantity)	C, O, D	A	M	N	NS	M	M	M	L	NS	• Mine design optimization • Committing to stockpiling soil and overburden materials for later use in site rehabilitation activities. • Ensuring that soil/overburden stockpiles that are created to facilitate development of the site have appropriate slopes, and maintaining the piles to prevent erosion and slide hazard. • Limiting potential erosion of disturbed areas and / or soil stockpiles by implementing appropriate erosion and sediment control measures (i.e., seeding) to stabilize these areas • Implement Follow-up Monitoring and Environmental Management Plans.	The Project is not predicted to result in cumulative effects on fish due to changes in soils and overburden quantity.
	Change to soils and overburden (quality)	C, O, D	A	N	M	NS	M	N	M	L	NS	• Limiting fugitive dust emissions on the PSMF and MRSA by incorporating design features such as wind breaks. • Limiting fugitive emissions by watering construction areas in development, as well as roads and throughways used by mobile equipment and trucks. • Limiting fugitive dust emissions by progressively rehabilitating disturbed areas of the project site as quickly as is practical. • Implement Follow-up Monitoring and Environmental Management Plans.	The Project is not predicted to result in cumulative effects on fish due to changes in soils and overburden quality.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization											
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination	Key Mitigation / Compensation Measures	Cumulative Residual Effect
Vegetation	Change in forest cover	C, O, D	A	N	N	N/A	H	M	H	L	NS	• Mine design optimization • Implement standard construction best practices to reduce interactions with vegetation • For Transmission corridor: ○ No grading or stripping ○ Vegetated buffer zones (slope-dependent) will be left between the line and sensitive habitats ○ Lower vegetation and brush will be left in place ○ Disturbed soil will be stabilized to assist vegetation regrowth and to control erosion ○ Hand-clearing of vegetation will be used at sensitive stream crossings and within erosion control zones to reduce soil disturbance • Progressively rehabilitating disturbed areas of the Project site as quickly as is practical with seed and non-invasive vegetation • Implement invasive species awareness and control program *See also Change in Airy Quality and Dustfall,	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on forest-type vegetation is predicted to be not significant. the Project's contribution to the overall cumulative effect is deemed to be negligible.
	Change in non-forest cover	C, O, D	A	N	N	N/A	H	M	H	L	NS	*See Change in forest cover	With proposed mitigation and environmental protection measures that will be implemented with the Project, the cumulative residual adverse environmental effect on non-forest type vegetation is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on non-forest type vegetation is predicted to be negligible.
	Change to regionally and provincially rare species	C, O, D	A	N	N	N/A	H	M	L	M	NS	• Transfer reproductive structures of rare plant species within the SSA to suitable locations *See also Change in forest cover	The Project is not predicted to result in cumulative effects on regionally and provincially rare plant species.
	Change to protected species	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NS	N/A	N/A
	Change to plant species of interest to Indigenous and Métis communities	N/A	A	N	N	N/A	H	M	H	L	NS	*See Change in forest cover	*See Indigenous Considerations

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
Wildlife	Change in Wildlife Habitat Quantity	C, O, D	A	N	N	MS	M	M	L	L	NS	• Mine design optimization • Implement standard construction best practices to reduce interactions with vegetation • Progressively rehabilitating disturbed areas of the Project site as quickly as is practical with seed and non-invasive vegetation • Implement waste control measures • Implement a policy and training program for wildlife interactions and practices to reduce wildlife potential in SSA (e.g. no feeding) *See also Change in Air Quality and Dustfall, Changes to Ambient Light, Change in Noise, Change in Forest and Non-forest Cover, Change in Water Quantity (Surface and Groundwater)	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife habitat is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible.
	Change in Wildlife Habitat Quality	C, O, D	A	N	N	MS	M	M	L	L	NS	• Mine design optimization • Implement waste control measures • Implement a policy and training program for wildlife interactions and practices to reduce wildlife potential in SSA (e.g. no feeding) *See also Change in Air Quality and Dustfall, Changes to Ambient Light, Change in Noise, Change in Forest and Non-forest Cover, Change in Water Quantity (Surface and Groundwater)	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife habitat is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change to Wildlife Survival	C, O, D	A	N	N	HS	M	M	L	L	NS	• Where possible, forest clearing will be conducted to avoid bat-occupied maternatiy trees and bird nests in accordance with provincial and federal guidelines. When clearing must occur outside of prescribed windows surveys and protection measures will be employed • Clear ROWs to provide adequate lines of sight to give advance warning of wildlife, particularly on corners • Post speed limits and wildlife crossing signs • Driver training to reduce risk of collision • Removal of roadkill to reduce the risk to scavenging birds and mammals • Plowing practices that provide gaps where mammals can easily exit the road • Using directional lighting to reduce potential disorientation and collision with windows by migratory birds • Install Luminescent and/or reflective markers on transmission lines over Canoe Lake • Clear vegetation within 50 m of building windows to reduce potential bird abundance and strikes. • If monitoring indicates elevated window strikes at the Project site (e.g., >50 bird deaths/year), additional mitigation measures will be employed as necessary (e.g., non-reflective films on problematic windows). • Implement a policy and training program for wildlife interactions and practices to reduce wildlife potential in SSA (e.g. no feeding)	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife mortality risk is predicted to be not significant.
	Change in Wildlife Habitat Fragmentation and Wildlife Movement	C, O, D	A	N	N	MS	M	M	L	L	NS	• Mine design optimization • Progressively rehabilitating disturbed areas of the Project site as quickly as is practical with seed and non-invasive vegetation	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on wildlife passage and movement is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife habitat is predicted to be negligible.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change to Wildlife of Interest to Indigenous Communities	C, O, D	A	N	N	MS	M	M	L	L	NS	*See Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	Project effects on wildlife species of interest to Indigenous communities are expected to be similar to those described above and based on changes in habitat, fragmentation, passage and movement, and survival. With proposed mitigation and environmental protection measures, the overall adverse cumulative residual environmental effect on wildlife of interest to Indigenous communities is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on wildlife of interest to Indigenous communities is predicted to be negligible.
Species at Risk	Change to woodland caribou habitat and their habitat	C, O, D	A/P	N	L	LS	M	M	L	M	NS	• Suspended construction activities if individual caribou are observed during construction until caribou have left the area and the observation reported to the MNRF • Prohibit hunting by the Proponent's employees and subcontractors on Project site • Provide SAR awareness training for all construction and operations employees, agents, and contractors so that they can recognize woodland caribou and are aware of the proper procedures to follow if caribou are observed • Plow escape routes through snowbanks every 1 km • Prohibit recreational snowmobile and ATV/UTV use at the Project site • Post and maintain education signage on potential presence of caribou • Where possible, Pits and trenches will be backfilled or contoured to a stable angle of repose and, if greater than 3 m deep, will provide at least one sloped ramp as a point of egress for caribou. Where egress is not feasible the area will be fenced • Disturbed bedrock will be stockpiled on site in a safe and stable manner • Non-merchantable timber and slash will be piled at appropriate locations along trails and roads to reduce predator sight lines and foraging efficiency. Trails will be otherwise left for natural regeneration	Given off-site mitigation and the characterization of the cumulative residual effect on woodland caribou as it concerns movement and changes in habitat in the RSA, the cumulative residual effect is predicted to be not significant.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
												• Other disturbed areas will be stabilized and revegetated using native seed mixes or natural regeneration as appropriate • Where possible, habitat that was disturbed by mineral exploration activities (including roads and landings) will be rehabilitated and restored in a progressive manner. • To reduce potential increase in forage for alternate prey which could subsequently attract predators, the use of non-native, invasive, and/or high productivity plant species for erosion control will be avoided. For example, use of clovers (Trifolium spp.) which are palatable to bears, will be avoided *See also Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	
	Change to little brown myotis, northern myotis, and their habitat	C, O, D	A/P	N	N	NS	M	N	M	L	NS	• Avoid clearing of trees in the SSA during the maternity period (i.e., May 15th through August 31). If limited clearing must be done during this window, bat maternity surveys using the current MECP protocol would be used and appropriate protection measures applied. • Install bat boxes and bat rocket boxes *See also Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	Given off-site mitigation and the characterization of the cumulative residual effect on little brown myotis and northern myotis in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on little brown myotis and northern myotis is predicted to be negligible.
	Change to Canada warbler and their habitat	C, O, D	A	N	L	NS	M	M	M	L	NS	• stockpiling of non-merchantable coarse woody debris during site clearing for use during future rehabilitation efforts *See also Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on Canada Warbler is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on Canada warbler habitat is predicted to be negligible.
	Change to Rusty blackbird and their habitat	C, O, D	A	N	N	NS	M	M	M	N	NS	*See Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	In consideration of the characterization of the cumulative residual effect on rusty blackbird in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on rusty blackbird habitat is predicted to be negligible.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization											
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination	Key Mitigation / Compensation Measures	Cumulative Residual Effect
	Change to olive-sided flycatcher, east wood-pewee, evening grosbeak and their habitat	C, O, D	A	N	N	NS	M	M	M	N	NS	*See Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	In consideration of the characterization of the cumulative residual effect on these species in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on habitat of these bird species is predicted to be negligible.
	Change to common nighthawk, eastern whip-poor-will, and their habitat	C, O, D	A/P	N	N	NS	M	M	H	N	NS	*See Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	Overall and in consideration of the characterization of the cumulative residual effect on these species in the RSA, the cumulative residual effect is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on these species habitat is predicted to be negligible.
	Change to bald eagle, peregrine falcon, and their habitat	C, O, D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NS	*See Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	The Project is not predicted to result in cumulative effects on these species
	Change to monarch and their habitat	C, O, D	A/P	N	N	NS	N	N	N	N	NS	• Inclusion of selected wildflower species in the seed mixes to provide additional nectar sources throughout the growing season *See also Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect on monarch is predicted to be not significant. This conclusion is drawn on the basis that the cumulative change in consideration of all projects and activities is incrementally small when considered in the context of mortality risk from existing sources. Any incremental contribution of the Project to the cumulative effects on Monarch mortality and habitat is predicted to be negligible.
	Change to yellow-banded bumble bee and their habitat	C, O, D	A/P	N	N	LS	N	N	N	N	NS	• Inclusion of selected wildflower species in the seed mixes to provide additional nectar sources throughout the growing season *See also Change to Wildlife Habitat Quantity, Quality, Fragmentation and Wildlife Survival.	With proposed mitigation and environmental protection measures that will be implemented with the Project, and other projects / activities identified in the PIL, the overall adverse cumulative residual environmental effect the species is predicted to be not significant. Any incremental contribution of the Project to the cumulative effects on Yellow-banded bumble bee habitat is predicted to be negligible.
	Change to lake sturgeon habitat	C, O, D	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NS	*See Change in Air Quality and Dustfall and Change in Water Quantity (Surface and Groundwater)	The Project is not predicted to result in cumulative effects on lake sturgeon habitat

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VEC	Residual Effect	Residual Effects Characterization											
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination	Key Mitigation / Compensation Measures	Cumulative Residual Effect
Socio- Economic Environment	Change in economy and employment	C, O, D	P/A	M	H	NS	L	H	L	H	NS	• Establishing measures to encourage and recruit employees from the existing populations in local communities • Providing opportunities for training to facilitate employment by residents of the LSA and RSA and supporting initiatives to train local youth and members of Indigenous groups • During decommissioning, implementing strategies to help transition the workforce • Work with economic development groups to increase contracting opportunities for local businesses	With the proposed mitigation and environmental protection measures, any adverse cumulative residual environmental effect on economy and employment is predicted to be not significant. The Project is viewed as a benefit to the economy of the area and is anticipated to increase employment for a population that is in decline due to an absence of employment opportunities. Any incremental contribution of the Project to cumulative effects on economy and employment during the transition from operation to closure is predicted to be negligible.

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VEC	Residual Effect	Residual Effects Characterization											
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination	Key Mitigation / Compensation Measures	Cumulative Residual Effect
	Change in infrastructure and services	C, O, D	A	L	H	NS	L	M	L	H	NS	• Implementation of a worker housing strategy, which entails the use of an Accommodations Complex in or near Marathon during construction and operation • Implementing rotational work arrangements. • Establishing measures to encourage and recruit employees from the existing populations in local communities. • Providing opportunities for training to facilitate employment by residents of the LSA and RSA and supporting initiatives to train local youth and members of Indigenous groups. • Mandatory cultural sensitivity training for all Project employees. • Engaging with municipal authorities to coordinate planning of infrastructure development or upgrades that may be needed to ensure that they do not negatively affect the local communities. • Providing support to fund key community services or organizations and provide fitness and recreational programs for workers within the existing facilities. • Providing Project employees with health services (physical, mental and social health), including Employee Assistance Programs (EAP) and on-site emergency service infrastructure, including fire-fighting equipment. • GenPGM will co-ordinate its Emergency Preparedness and Response Plan (EPRP) with the Town of Marathon emergency services department. • Implementing a Waste Management Plan. • Implementing a Traffic Management Plan, which will include encouraging car-pooling and providing bus transport to and from the Project site and requiring all Project drivers and employees to observe speed limits and take safety precautions. • Scheduling shift changes and truck movements to avoid peak traffic hours and school bus pick-up and drop-off times. • Commitment to on-going monitoring of socio-economic effects on the BN community.	Any adverse cumulative residual environmental effect on infrastructure and community services is predicted to be not significant. With the proposed mitigation measures, any incremental contribution of the Project to cumulative effects on infrastructure and community services is predicted to be negligible.

Table 6.7-1: Summary of Environmental Effects Assessment

VEC	Residual Effect	Residual Effects Characterization										Key Mitigation / Compensation Measures	Cumulative Residual Effect
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in land and resource use	C, O, D	A	N-L	M	NS	M	H	N	M	NS	• Site clearing and disturbed areas will be limited to the extent practicable and only as required to accommodate the Project. • To the extent possible, clearing and wood utilization will follow the requirements contained in the Forest Management Plan. This may include a commercial market for the harvested wood from the Project site or may be used for firewood for the general public. Un-merchantable wood, as defined by the *Crown Forest Sustainability Act*, may be left scattered throughout the harvested area to serve as coarse woody debris. • GenPGM will engage with the Town of Marathon and provincial Crown lands permit holders to address potential disturbance to or access restrictions to municipal and Crown land areas. • Harvester Training Fund. An endowment fund where interest supports annual harvester and trapline training programs. • Signage will be installed around the SSA to alert the public and land users of the presence of the Project and its facilities. • Hunting / fishing / harvesting of wildlife will be strictly prohibited on the site. Workers will not be permitted to hunt / fish / harvest and will not be permitted to bring firearms or angling gear to site. • Project activities, locations, and timing will continue to be communicated to Indigenous groups, affected land and resource users, environmental non-government organizations, the provincial government, and local authorities throughout the life of the Project. • Desired land and resource end-uses will be considered in the preparation of the Closure Plan.	With the proposed mitigation and environmental protection measures, any adverse cumulative residual environmental effect on land and resource use is predicted to be not significant. It is assumed that any future projects or activities will be required to implement various mitigation measures and to comply with regulatory requirements, thereby also reducing cumulative effects. Any incremental contribution of the Project to cumulative effects on land and resource use is predicted to be negligible.
Human Health	Change in air quality	C, O, D	A	L-M	M	NS	M	N-L	N	L	NS	*See Change in Air Quality and Dustfall	The Project is not predicted to result in cumulative effects on human health due to changes in air quality in the RSA.

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		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
	Change in water quality	O, D	A	L	M	NS	M	H	M	H	NS	• For safety reasons, public access to the SSA will be prohibited during the construction, operations and decommissioning phases of the Project. *See Change in Surface Water and Ground Water Quality	The Project is not predicted to result in cumulative effects on human health due to changes in water quality in these RSAs are not anticipated.
	Change in country foods	C, O, D	A	L	M	NS	M	H	M	H	NS	• For safety reasons, public access to the SSA will be prohibited during the construction, operations and decommissioning phases of the Project. • Implement a country food monitoring program *See Change in Air Quality, Surface Water and Ground Water	The Project is not predicted to result in cumulative effects on human health due to changes to country food in the Project RSA.
	Change in noise	C, O, D	A	L	M	NS	M	H	N	N	NS	*See Change in Noise Levels and ground vibrations	The Project is not predicted to result in cumulative effects on human health due to changes in noise in the Project RSA are not anticipated.
Physical & Cultural Heritage	Change to archaeological resources	N/A	-	-	-	-	-	-	-	-	-	• An additional area of Stage 2 AA may be undertaken prior to construction, if the final alignment of the discharge pipeline remains in close proximity to the area of high archaeological potential on Hare Lake, however avoidance of this area is the preferred mitigation measure	No residual effects on Physical and Cultural Heritage were identified, as such, there can be no cumulative effect of the Project in combination with the effects of other projects or physical activities.
	Change to Built and Cultural Heritage Resources	N/A	-	-	-	-	-	-	-	-	-	• No built cultural heritage resources will be effected by the Project	

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		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination		
Indigenous Considerations	Change to traditional land and resource use	C, O, D	A	M	M	MS	M	M	M	H	NS	• Planning and design of the Project was informed through consultation with local land users and Indigenous communities to identify existing uses and avoid waterbodies considered important to those communities and individuals • Provide limited access to areas of the SSA that are outside of the primary areas of mining activity for Indigenous communities, to the extent possible • Develop a protocol for use of the initial portion of the Camp 19 Road from which there is access to the Pic River and other travel corridors used to access areas for traditional wildlife, fish and plant harvesting. • Compensation for the loss of access, economic benefits of trapping, and use of a portion of BN Community Trapline within the SSA • Where practicable, design site and place buildings situated in topographically low areas, blended with surrounding height of land and vegetative buffers with forested areas to break lines of sight to reduce visibility of site infrastructure from viewpoints in LSA. • Consult with Indigenous peoples and in particular BN to discuss the concepts developed for closure and seek further information, opinion, and guidance. • Implement Follow-up Monitoring and Environmental Management Plans on that have significance to Indigenous communities. *See Change to Wildlife, Fish, Vegetation, and Land and Resource Uses	In consideration of residual adverse effects from the Project, the overall adverse cumulative residual environmental effect on traditional land and resource use is predicted to be not significant.
	Change or alteration to indigenous heritage resources	C, O, D	A	L	M	HS	L	H	L	M	NS	• An additional area of Stage 2 AA may be undertaken prior to construction, if the final alignment of the discharge pipeline remains in close proximity to the area of high archaeological potential on Hare Lake, however avoidance of this area is the preferred mitigation measure • Implementation of an archaeological and heritage resource follow-up and monitoring program	In consideration of residual adverse effects from the Project, the overall adverse cumulative residual environmental effect on Indigenous heritage is predicted to be not significant.

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VEC	Residual Effect	Residual Effects Characterization											
		Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological/ Societal Value	Significance Determination	Key Mitigation / Compensation Measures	Cumulative Residual Effect
	Change to Indigenous Health	C, O, D	A	L	M	NS	M	H	M	H	NS	• For safety reasons, public access to the SSA will be prohibited during the construction, operations, and decommissioning phases of the Project. *See Change in Water Quality and Air Quality	While the projects / activities in the PIL could affect harvesting activities in the land and resource use RSA from a spatial perspective, the projects / activities are not likely associated with air emissions and discharges to water that would affect country food exposure pathways. Accordingly, cumulative effects on human health due to country foods in the Project RSA are not anticipated.

KEY

See Section 2.5 of EIS Addendum (Vol 1) and Section 6.1.3 and VEC-specific definitions of this EIS Addendum (Vol 2) for detailed definitions

Project Phase:
C: Site Preparation / Construction
O: Operation
D: Decommissioning

Direction:
P: Positive
A: Adverse

Magnitude:
N: Negligible
L: Low
M: Medium
H: High

N/A: Not applicable

Geographic Extent:
N: Negligible
L: Low
M: Medium
H: High

Timing:
NS: No sensitivity
MS: Medium sensitivity
HS: High sensitivity

Duration:
N: Negligible
L: Low
M: Medium
H: High

Frequency:
N: Negligible
L: Low
M: Medium
H: High

Reversibility:
N: Negligible
L: Low
M: Medium
H: High

Ecological / Societal Value:
N: Negligible
L: Low
M: Medium
H: High

Significance Determination
S: Significant
NS: Not Significant

6.8 REFERENCES

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