

Monitoring Program

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Abbreviations

AFMP	Avifauna Follow-up Monitoring Program
ARU	autonomous recording unit
CEAA	<i>Canadian Environmental Assessment Act</i>
COPC	chemicals of potential concern
CWS	Canadian Wildlife Service
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
ELCA	Ecological Land Classification Area
EPP	Environmental Protection Plan
ESMS	Environment and Social Management System
IAAC	Impact Assessment Agency of Canada
IR	Information Requests
km	kilometre
LAA	Local Assessment Area
m	metre
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador <i>Endangered Species Act</i>
NLDECC	Newfoundland and Labrador of Environment and Climate Change
NLDFFA	Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture
NL Hydro	Newfoundland and Labrador Hydro
RAA	Regional Assessment Area
SAR	Species at Risk
SARA	<i>Species at Risk Act</i>
SOCC	Species of Conservation Concern
SWFMP	Surface Water Follow-up Monitoring Plan
TMF	Tailings Management Facility
Tpd	tonnes per day

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1.0 INTRODUCTION

Marathon Gold Corporation (Marathon) submitted an Environmental Impact Statement (EIS; Marathon Gold 2020) for the Valentine Gold Project (the Project) to the Impact Assessment Agency of Canada (IAAC) on September 29, 2020 and to the Environmental Assessment (EA) Division of the Newfoundland and Labrador of Environment and Climate Change (NLDECC) on November 3, 2020. The Project was released from the provincial and federal EA processes, with conditions, on March 17, 2022 and August 24, 2022, respectively.

The purpose of the Avifauna Follow-up Monitoring Program (AFMP) is to verify predictions and address commitments made in the EIS (Marathon 2020) as well as those developed through Information Requirements (IR) received as part of the regulatory review process. This document describes follow-up and monitoring activities for the construction, operation, and decommissioning/closure phases of the Project, based on regulatory compliance requirements and Project approvals and authorizations. This is a living document that will be reviewed, updated and improved upon based on policy and technology changes as the Project progresses through permitting, construction, operation and decommissioning of the Project. For the EIS and this AFMP, the term “avifauna” encompasses bird species, including species at risk (SAR) and species of conservation concern (SOCC). Avifauna habitats are defined as areas where avifauna species live, selected by individual species to meet their nutritional, reproductive, and shelter requirements.

The construction and operation of the Project are governed by an Environmental and Social Management System, which includes tools such as the corporate environmental and social policies, construction and operational environmental protection plans (EPPs), environmental management plans, and follow-up and monitoring programs, which will be updated as applicable throughout the life of the Project. An EPP for the construction phase of the Project has been approved by the NL Minister of Environment and Climate Change. The Construction EPP outlines protection and response measures associated with potential environmental effects related to Project construction activities, providing general environmental protection procedures related to Project construction activities and infrastructure such as air and greenhouse gas emissions, erosion and sedimentation control, rock and soils management, and traffic management, as well as specific protection procedures for caribou, avifauna, and other wildlife including bats and American marten; fish and fish habitat; historic resources; and the Victoria Dam.

The EPP is closely linked to the follow-up monitoring programs as it describes practical procedures to reduce or eliminate potential adverse environmental effects, as well as instructions for addressing planned and unplanned activities/events associated with Project construction. A process for the communication to Indigenous groups of potential adverse effects of planned Project activities upon the use of land and resources by Indigenous persons (including hunting, trapping, fishing, and gathering, and access to lands and resources) is provided in the Current Use of Lands and Resources for Traditional Purposes Indigenous Communications Plan. Response measures in the event of an accidental event are described in Section 4 of the Accidents and Malfunctions Prevention and Response Plan (AMPRP).

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Additionally, communications and reporting requirements are provided in the Section 5 of the AMPRP as well as Appendix A with respect to communication specific to Indigenous groups.

Marathon has developed a grievance mechanism to afford a process for addressing grievances on the part of non-Indigenous and Indigenous groups or Indigenous persons resulting from the effects of the Project to these users, such as effects to land and resource use, health, socio-economic conditions and heritage resources. In the event that grievances are received, these will be logged and investigated.

The follow-up monitoring program presented herein will be implemented throughout Project construction and operation and has been developed to meet the associated requirements identified during the environmental assessment process. The monitoring program is subject to refinements based on consultation with regulators, Indigenous groups, and conditions of authorization.

1.1 PROJECT OVERVIEW

Marathon is developing the Valentine Gold Project (the Project), an open pit gold mine to be located in the west-central region of the Island of Newfoundland (NL), near Valentine Lake. The Project will use standard surface mining techniques to mine gold ore from the Leprechaun and Marathon open pits. Ore material will initially be mined and processed at a nominal rate of 6,850 tonnes per day (tpd), increasing to 10,960 tpd in Year 4. Current estimates are for a total Project mine excavation of 453 million tonnes of combined ore and waste material. The total ore to be mined from the open pits is estimated to be approximately 41 million tonnes.

Ore will be processed through the mill, where it will be crushed, milled and put through flotation and cyanidation processes to recover the gold. Separate stockpiles will be established for high-grade ore for priority processing and low-grade ore for processing later in the mine life. Tailings will be treated in the process plant area to remove the cyanide and subsequently deposited in an engineered tailings management facility in Years 1 to 9, then pumped to the exhausted Leprechaun open pit in Years 10 through 12. Gold will be formed into doré bars, which will be shipped from site to refiners in secured trucks.

The construction of the Project is expected to take place over a period of approximately 20 months, followed by an estimated mine operation life of 12 years. The Project will operate 24 hours a day, seven days a week on a 12-hour shift basis. Upon cessation of mining, the operation will be closed, and the site components will be rehabilitated and monitored in accordance with applicable regulations at the time of closure.

The following spatial boundaries are associated with the analysis of avifauna:

- The **Project Area** encompasses the mine site, including all Project infrastructure, and the existing access road plus a 20 metre (m) wide buffer on either side (Figure 1-1). The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation, and closure of the Project.

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- The **Local Assessment Area (LAA)** includes a 1 kilometre (km) buffer surrounding the mine site, and a 500 m buffer around the access road (Figure 1-1). The LAA was established to reflect the area within which avifauna-specific Project effects are most likely to occur including indirect habitat loss due to sensory disturbance (i.e., displacement or avoidance).
- The **Regional Assessment Area (RAA)** includes the Project Area, LAA and a 35 km buffer around the Project Area encompassing Victoria River and Red Indian Lake, and the communities of Millertown, Buchans, and Buchans Junction. The RAA is used in the assessment of cumulative effects.
- The **Ecological Land Classification Area (ELCA)** is the area within which detailed habitat data have been collected (Figure 1-1) and is used to quantify effects on habitat (i.e., the magnitude of residual effects has been characterized in relationship to the ELCA).

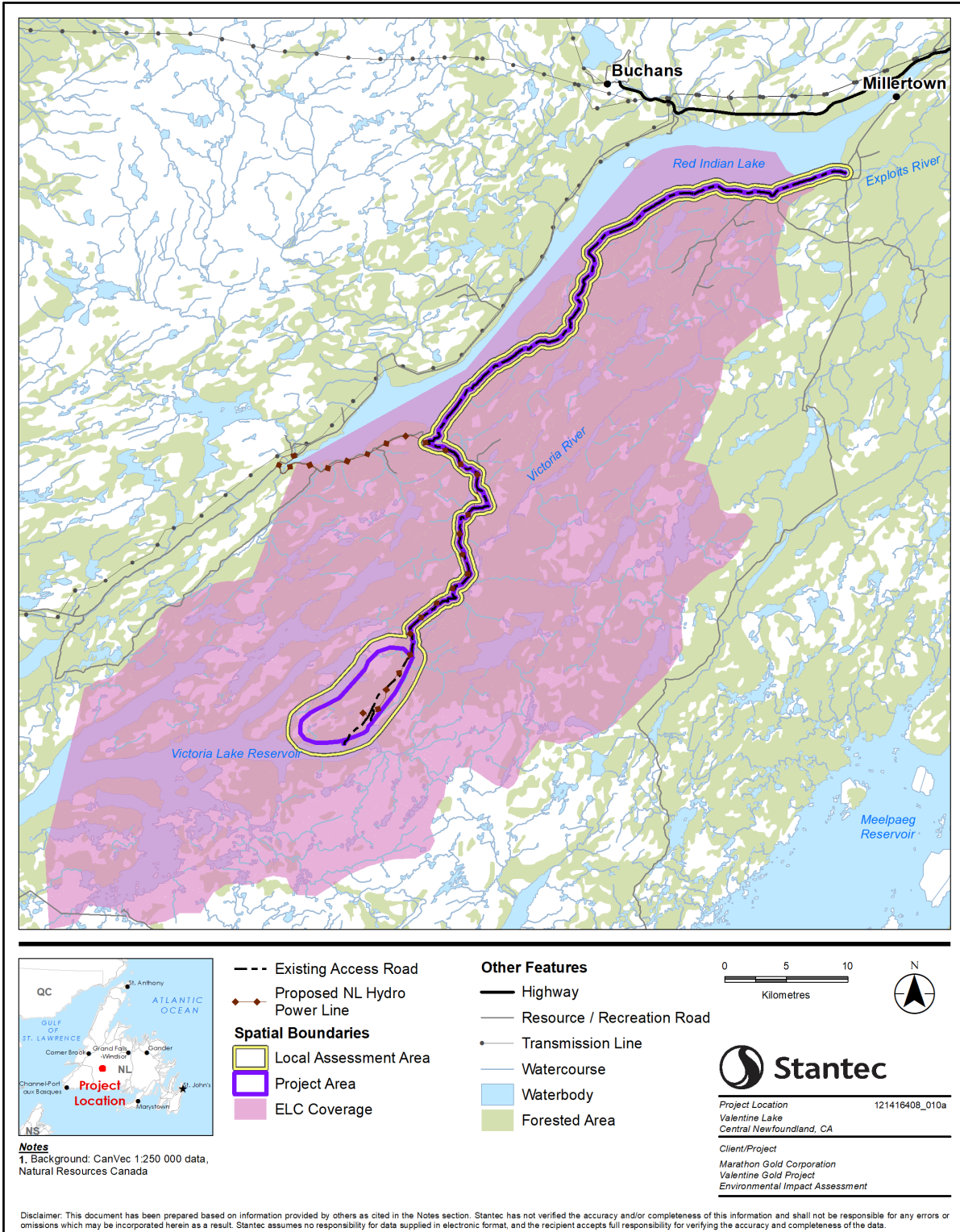


Figure 1-1 Project Location and Spatial Boundaries for the Assessment of Avifauna

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1.2 GOALS AND OBJECTIVES

This document has been developed and prepared using currently available information. This monitoring program may require further updates based further details regarding Project design, sequencing, and methods become available. It is anticipated that this plan will be updated during the permitting stage of Project planning (i.e., following regulatory review) and will be completed prior to the start of the monitoring program.

1.2.1 Purpose

The purpose of the AFMP is to describe the monitoring activities that will be undertaken to address follow-up requirements identified in Section 10.9 of the Project EIS. Follow-up requirements are actions implemented to verify key environmental assessment predictions, to reduce potential adverse effects on wildlife and their habitat(s), and to confirm compliance with regulatory requirements. For the avifauna valued component, monitoring will be carried out during the construction and operation phases of the Project.

The avifauna assessment identified potential changes to avifauna habitat and mortality risk during construction and operation of the Project. As indicated, this AFMP will be implemented as part of the overarching ESMS that prescribes measures and practices to avoid or reduce adverse environmental effects on avifauna (e.g., clearing outside of the primary nesting period for migratory birds, use of buffers for sensitive habitat features). This AFMP provides details on how predicted changes to habitat and mortality risk will be verified and how the effectiveness of mitigation strategies will be evaluated.

In summary, this document describes:

- Regulatory requirements
- Baseline conditions and Project effects
- Project-specific avifauna mitigation
- Monitoring activities
- Reporting protocols

1.2.2 Objectives

The monitoring criteria established for the AFMP were informed by concerns raised through the Project EIS review and subsequent information requests received from federal and provincial regulators, Indigenous groups, and stakeholders. Thus, the monitoring criteria reflect measurable and meaningful parameters to verify key Project EIS predictions and to evaluate the effectiveness of mitigation measures. The objectives of the AFMP are to:

- Verify Project EIS predictions and evaluate the effectiveness of mitigation strategies for the environmental effects on avifauna and avifauna habitat (i.e., change in habitat and mortality risk), particularly as they relate to uncertainty in the assessment.

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- Establish a framework for adaptive management that can be used to modify or enhance mitigation strategies for wildlife and wildlife habitat.

1.3 REGULATORY AND POLICY SETTING

The Project EIS has been submitted to IAAC, pursuant to the *Canadian Environmental Assessment Act* (CEAA), 2012, and to NLDECC pursuant to the *Environment Protection Act*. The relevant federal and provincial regulatory requirements are described below.

1.3.1 Federal Regulatory Requirements

As defined under the CEAA 2012, monitoring and follow-up is required to verify the accuracy of the environmental assessment of a project and determine the effectiveness of measures taken to mitigate potential adverse environmental effects (CEAA 2012). Additionally, the Project is subject to the following federal legislation and guidance.

The *Species at Risk Act* (SARA) provides protection for Species at Risk (SAR) in Canada that are listed on Schedule 1 of SARA (Government of Canada 2002). The legislation provides a framework to facilitate recovery of species listed as threatened, endangered, or extirpated and to prevent species listed as special concern from becoming threatened or endangered. SARA provides protection for both SAR and their critical habitat or residences by prohibiting: 1) the killing, harming, or harassing of endangered or threatened SAR (sections 32 and 36); 2) the destruction of critical habitat of an endangered or threatened SAR (sections 58, 60, and 61); and 3) damage or destruction of residence of SAR (section 33 of SARA). Residence descriptions, where defined, may afford additional protections to migratory birds that are not afforded under the Migratory Bird Regulations.

The *Migratory Birds Convention Act* s.5(a) prohibits the possession of a migratory bird or nest and s.5.1(1) prohibits the deposition of a substance that is harmful to migratory birds into waters, or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area. Further, s.5 (1) and s.6 (a) of the Migratory Birds Regulations prohibit respectively the hunting of a migratory bird without a permit, and the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird. Under the Migratory Bird Regulations, it is prohibited to disturb or destroy the nest of a migratory bird when the nest contains a bird or viable egg, or for the corresponding number of months if the nest is of a species that is identified in a table in Schedule C of the regulation for which the number of months is prescribed. The protection of birds under the *Migratory Birds Convention Act* and its regulations is afforded to all native bird species except pelicans, cormorants, upland gamebirds, raptors, belted kingfisher, owls, corvids, and icterid blackbirds, which are protected under provincial legislation.

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1.3.2 Provincial Regulatory Requirements

The NL *Endangered Species Act* (NL ESA) provides protection to Endangered, Threatened or Vulnerable plant and animal species in NL. The Act facilitates the development of management plans and recovery strategies for Vulnerable, Threatened, Endangered, and Extirpated or Extinct species to prevent further declines and promote recovery.

The NL *Wild Life Act*, RSNL 1990, c W-8, Wild Life Regulations, NLR 1156/1996 and associated orders afford protection of wildlife (including avifauna species) and prohibits the hunting, taking or killing of wildlife or classes of wildlife, whether in particular places or at particular times or by particular methods, except under license or permit. It allows for the management and the regulation of activities relating to the taking and trading of wildlife, primarily game animals and furbearer species.

2.0 BASELINE INFORMATION

2.1 BASELINE CONDITIONS

The Project is situated in the Red Indian Lake Subregion of the Central Newfoundland Forest Ecoregion, which is characterized by a mainly coniferous boreal forest, domed bogs, and a rolling landscape, with elevations within the Project Area ranging from approximately 160 to 430 m above sea level.

Field studies on wildlife in the Project Area and surrounding areas between 2011 and 2021 included a baseline waterfowl and waterfowl habitat study (Stantec 2014a), aerial waterfowl spring breeding and fall staging surveys (Stantec 2017), forest songbird survey (Stantec 2014b, 2019, 2021), and common nighthawk survey (Stantec 2019). Findings from these surveys, combined with records publicly available databases, identified 98 species of birds that have the potential to occur in or the Project LAA.

Several avifauna SAR have been documented, or have potential to occur within the RAA and olive-sided flycatcher (*Contopus cooperi*) and rusty blackbird (*Euphagus carolinus*) were used as representative avifauna SAR in the EIS and were identified during baseline survey surveys:

Olive-sided flycatcher

- Detected at 6 of 45 sites in 2011
- Detected at 8 of 45 sites in 2019: 5 of 8 within the Study Area and 3 of 8 within the access road LAA.
- Detected at 20 of 67 sites and 10 of 10 ARU sites in 2021

Rusty blackbird

- Detected incidentally within the LAA in 2011 near the Victoria Dam
- Detected incidentally within the LAA along the access road approximately 5.5 km northeast of the Project Area
- Not detected at any of the 64 forest songbird survey sites but detected incidentally at a single location near the Leprechaun Pit in 2021

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Other notable avifauna SAR observations included a single incidental detection of common nighthawk (*Chordeiles minor*) within the Project Area during field activities in 2011. The species was not detected in 2019 during the targeted common nighthawk survey or the forest songbird survey, nor in the 2021 during the forest songbird survey.

2.2 PROJECT RESIDUAL EFFECTS

Representative species from each of the five avifauna main groups (i.e., landbirds, waterfowl, raptors, upland gamebirds, SAR) were selected for the assessment of potential Project-effects on a change in habitat and change in mortality risk. The components and activities that may interact with avifauna and avifauna habitat during construction and operations include:

- Access road construction and road upgrades
- Project-related transportation
- Mine site preparation and the construction and installation of Project infrastructure
- Open pit mining and associated topsoil, overburden and rock management, milling and processing, tailings management, and water management
- Maintenance activities (e.g., vehicle, snow clearing)
- General emissions, discharges, and wastes (e.g., noise and air emissions, hazardous and non-hazardous wastes)

2.2.1 Change in Habitat

The Project will result in a variety of changes to habitat, which will have both direct and indirect effects on avifauna, including SAR. Direct effects occur when habitat or important habitat features (e.g., nests) are lost or destroyed through vegetation clearing. Direct effects on habitat also include the fragmentation of wildlife habitat and edge effects. Indirect effects on a change in avifauna habitat are associated with sensory disturbances that result from construction, operation, or decommissioning activities (e.g., noise, light, and dust).

Residual effects on a change in habitat from the Project are predicted to be adverse and, for most representative avifauna species, the changes in habitat for non-SAR species are anticipated to be low in magnitude. This includes a direct and indirect loss of up to 6.8% in the ELCA for landbirds, 1.9% for waterfowl, 4.8% for raptors, 8.5% for upland gamebirds (Section 10.5.1.2, Table 10.19 of the EIS).

Change in habitat for representative avifauna SAR is predicted to be moderate in magnitude, with Project-related direct and indirect effects combined resulting in an estimated loss of 4.3% of high and moderate value habitat for olive-sided flycatcher and 5.2% of high and moderate value habitat for rusty blackbird in the ELCA (Section 10.5.1.2, Table 10.19 of the EIS).

The assessment of direct habitat loss assumed that all habitat in the Project Area would be lost, and the amounts of Project-related habitat loss are considered conservative. For example, there will be localized areas within the Project Area where vegetated areas will be retained, and mitigation measures will be applied to reduce areas of Project disturbance to the extent practicable.

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2.2.2 Change in Mortality Risk

The Project will result in changes to mortality risk during the construction and operation phases. The primary pathways for change in mortality risk are through vegetation clearing and earthworks and collisions or interactions with Project infrastructure (e.g., sedimentation ponds, powerlines) and vehicles.

With the application of mitigation measures, the change in mortality risk resulting from the Project is expected to be low in magnitude for all phases of the Project. The access road already exists and has likely altered avifauna mortality risk through vehicle-avifauna collisions. Like other avifauna species, the magnitude of these effects is also anticipated to be low for SAR.

3.0 MITIGATION AND MANAGEMENT MEASURES

Mitigation measures for avifauna are presented in Chapter 10, Section 10.4 of the EIS (Marathon Gold 2020) under Section 10.4 “Mitigation and Management Measures” and additional mitigation measures have been identified during the IR process. The objectives of the mitigation measures are to avoid or reduce potential effects on avifauna / avifauna SAR, and their habitats. More specifically, mitigation measures for avifauna address the following key categories:

- Limiting the Project footprint (i.e., the amount of habitat lost or altered) to the extent practicable
- Reducing sensory disturbances (e.g., light, noise, dust)
- Reducing emissions
- Reducing the risk of collisions with Project vehicles and infrastructure
- Managing wastes and the risk of interactions with potentially hazardous materials
- Identifying sensitive areas prior to construction and establish buffers
- Training environmental monitoring personnel to recognize SAR/SOCC

A list of mitigation measures that will be implemented during the construction and operation phases is provided in Appendix A. Most of the measures implemented during construction will be carried forward during Project operations, with several measures related to operations specifically that have been identified. Additional mitigation measures identified as part of the Project approval and permitting will be incorporated in this document in subsequent updates.

Additionally, environmental protection procedures and best management practices are detailed in the Construction EPP, including an Avifauna Management Plan. The Avifauna Management Plan includes such measures as conducting pre-clearing surveys for active migratory bird nests during the breeding bird season, and buffer / set-back distances from active nests.

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4.0 MONITORING PROGRAM

As described in Section 1.2, the AFMP will be used to verify Project EIS predictions and evaluate the effectiveness of mitigation strategies for the key environmental effects. A detailed description for each of the proposed monitoring criteria, as they relate to change in habitat and mortality risk, is provided in the subsequent sub-sections.

Marathon will continue to engage ECCC-Canadian Wildlife Service (ECCC-CWS) and the Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture (NLDFFA) - Wildlife Division in planning and undertaking these monitoring activities prior to Project construction. An adaptive management process (Section 5.0) will be used to adjust mitigation measures and to modify plans on an ongoing basis, if required.

4.1 BREEDING BIRD MONITORING

4.1.1 Rationale

Predictions in the EIS concluded that following the implementation of mitigation and environmental protection measures, residual effects from the Project on change in habitat for avifauna will be not significant (i.e., not expected to threaten the long-term persistence, viability, or recovery of an avifauna species [including SAR/SOCC] in the RAA). However, some uncertainty remains as to how habitat loss and/or alteration will affect the breeding bird community (i.e., passerines), including for SAR such as olive-sided flycatcher and rusty blackbird. Breeding bird monitoring program will be used to verify these EIS predictions.

4.1.2 Objective

The objective of the breeding bird monitoring program is to establish an understanding of the distribution and relative abundance of the breeding songbird and SAR community in habitats potentially affected (i.e., within the Study Area and LAA) and unaffected (i.e., within the ELCA and RAA) by the Project.

4.1.3 Measurable Parameters

The measurable parameters for the breeding bird monitoring program are: 1) breeding songbird density and species richness; and 2) habitat occupancy by SAR (i.e., olive-sided flycatcher and rusty blackbird used as representative species in the EIS).

4.1.4 Design

Baseline breeding bird surveys were undertaken in 2011, 2019, and 2021 (Section 2.1), primarily within the Project Area and LAA, with several sites outside of the LAA being added in 2021. The breeding bird monitoring program will modify the previous approach by incorporating a design that supports before-

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after-control-impact (BACI) analyses. Each survey site will be designated as either a control or an impacted treatment and surveying before and after construction will be used to evaluate change over time and by treatment to evaluate project effects; both are used to account for confounding factors such as natural environmental variability.

A breeding bird survey will be used to evaluate breeding songbird density and species richness. Approximately 60 long-term monitoring stations will be established in representative habitats in the Project Area outside of where mine infrastructure is proposed, in the LAA adjacent to the mine site and access road, and in the ELCA at control / reference sites.

An autonomous recording unit (ARU) survey will be used to evaluate SAR habitat occupancy. Approximately 20 long-term monitoring stations will be established in habitats likely to support olive-sided flycatcher and rusty blackbird in the Project Area outside of where mine infrastructure is proposed, in the LAA adjacent to the mine site and access road, and in the ELCA at control / reference sites.

4.1.5 Methods

4.1.5.1 Breeding Bird Surveys

A single survey will be completed in mid-June using a standardized 10-minute point count survey protocol (Ralph et al. 1995) starting at sunrise and ending no later than 4.5 hr after sunrise (Bibby et al. 2000). A single biologist will detect, and recorded birds heard or observed within a 100-m radius (hereafter, plot). The centre of each plot will be spaced a minimum of 300 m apart. Key information to be collected includes species and direction and distance of bird from the observer and habitat attribute data. Birds detected outside of the 10-minute listening period, beyond 100 m, or flying over the plot, are recorded as incidental observations. Surveys will be undertaken during suitable weather (i.e., clear visibility, wind ≤ 20 km/h, temperature $> 0^{\circ}\text{C}$, and precipitation not exceeding a light, intermittent drizzle).

Bird densities will be estimated relative to treatment type by employing a hierarchical model that uses spatially replicated count data (i.e., point count data; Royle 2004). Baseline data from 2011, 2019, and 2021 will be analyzed in the same fashion to provide a suitable comparison. This approach allows covariate data to be included to account for differences in breeding densities between parameters of interest (e.g., habitat type) while accounting for variations in detection probability. Breeding densities will be evaluated over time and by treatment using an appropriate BACI analysis once adequate post-construction data has been collected (i.e., three years).

Mean species richness will be summarized by major habitat type and treatment and evaluated over time.

4.1.5.2 ARU Surveys

The ARUs will be deployed in late-May and programmed to record 10 minutes of audio each morning at sunrise for a period of approximately 4 weeks. ARUs will be mounted in a tree, approximately 2 m above the ground, and surrounding vegetation removed to reduce interference.

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Audio recordings will be analyzed using automated software to process large audio datasets that can identify specific acoustic signals (i.e., bird calls) which will be reviewed by a qualified biologist for false positive/negative detections. A survey site is assumed to be occupied by a breeding individual if target SAR are positively detected on one or more of the audio recordings. Data will be summarized by survey site and treatment and evaluated over time.

4.1.6 Frequency

Surveys will be completed once per year starting in 2023 and continue for three years, at which point the frequency of additional monitoring will be determined based on the results of the analyses and in consultation with ECCC-CWS.

4.1.7 Decision Triggers / Thresholds for Action

Post-construction breeding bird densities, species richness, or SAR habitat occupancy are below baseline and/or control values:

- *Action: Consider additional mitigation measures that may reduce direct and indirect habitat loss in the Project Area. Reported annual results to ECCC-CWS and NLDFFA-Wildlife Division. Additional mitigation measures will be determined based on consultation with regulators and through the adaptive management framework.*

4.2 SURFACE WATER MONITORING

4.2.1 Rationale

On-site water management facilities, including the tailings management facility (TMF) and sedimentation ponds, have been designed and will be constructed and maintained to reduce attractiveness to avifauna. While the Project-specific ecological risk assessment concluded that water management facilities are not expected to pose a threat to avian health, there remains increased mortality risk for avifauna using these facilities. Surface water quality monitoring will be undertaken as per the Surface Water Follow-up Monitoring Plan (SWFMP) and results will be reviewed and linked back to the AFMP (see the SWFMP for monitoring details).

4.2.2 Objectives

The objectives of the surface water monitoring are to evaluate the effectiveness of mitigation measures identified in the EIS and to implement additional mitigation measures through the adaptive management framework if unexpected or regular use of the water management facilities by avifauna is observed.

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4.2.3 Measurable Parameters

The measurable parameters for the surface water monitoring are the presence of avifauna in the TMF and sedimentation ponds, and exceedances of chemicals of potential concern (COPC) that may result in a risk to avian health.

4.2.4 Methods

Avifauna use of the water management facilities (i.e., TMF and sedimentation ponds) will be monitored during the spring and fall migration seasons and the breeding bird season (i.e., between April 15 to November 31). A visual scan of the facilities will be completed using binoculars in the morning once per day during peak times of the migration and breeding season; however, monitoring may occur less frequently when the risk to avifauna are reduced, as determined by the on-site environmental monitor(s) (e.g., once every two to three days under frozen conditions). Observations of avifauna using either the embankments or waterbodies will be recorded, including the location, number of individuals, and species and photographs will be collected to aid in species identification, as necessary.

4.2.5 Frequency

Surface water monitoring will occur continuously throughout the spring and fall migration seasons and the breeding bird season (i.e., between April 15 to November 31) for the first three years of the operation phase of the Project. The frequency of additional monitoring will be determined based on the monitoring results and in consultation with ECCC-CWS.

4.2.6 Decision Triggers / Threshold for Action

Unexpected or regular use of water management facilities by avifauna is observed that may result in increased avifauna mortality risk:

- *Action: inspect for potential attractants (e.g., vegetation growing on embankments) and modify maintenance procedures as necessary.*
- *Action: consider implementing exclusionary measures (such as the use of bird deterrent floating balls or the installation of bird netting over ponds) and/or deterrents following discussion with ECCC-CWS.*

Water quality parameters of the water management facilities are exceeding COPC concentration guidelines presented in the SWFMP:

- *Action: Follow action items outlined in the SWFMP.*
- *Action: consider implementing exclusionary measures (such as the use of bird deterrent floating balls or the installation of bird netting over ponds) and/or deterrents following discussion with ECCC-CWS.*

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4.3 MORTALITY MONITORING

4.3.1 Rationale

The Project has the potential to increase avifauna mortality risk through site preparation activities (e.g., vegetation clearing, dewatering) and traffic-related mortality. All on-site staff and/or contractors will receive mandatory site orientation that includes wildlife-related topics (e.g., wildlife awareness training). All staff will report wildlife mortality events and additional mitigation will be considered, through the adaptive management process, at locations or times of the year where mortality risk is elevated.

4.3.2 Objectives

The objective of mortality monitoring is to evaluate the effectiveness of mitigation measures identified in the EIS and to implement additional mitigation measures through the adaptive management framework if an increase in mortality rates is observed.

4.3.3 Measurable Parameters

Measurable parameters for mortality monitoring are wildlife mortality events or wildlife incidents, such as habituated black bears, associated with Project construction or operation.

4.3.4 Methods

Mortality monitoring will be implemented using a self-reporting program operated by Marathon. When wildlife mortality events occur or are discovered, or wildlife incidents occur, the information will be reported to Marathon using the Wildlife Incident Report Form.

4.3.5 Frequency

Mortality monitoring will occur continuously throughout the Project.

4.3.6 Decision Triggers / Thresholds for Action

Avifauna mortalities are reported in the Project Area from vehicle collisions or interactions with Project infrastructure (e.g., sedimentation ponds, powerlines, windows), or avifauna continue to use sedimentation ponds following initial mitigation (i.e., design and maintenance such as vegetation-free embankments).

- Action: Examine locations of incidents and the circumstances surrounding their occurrences to identify high-risk zones. Mark high-risk zones with signage and/or implement speed restrictions or other measures, as required. Consider additional mitigation measures through adaptive management and consultation with ECCC-CWS, such as the use of exclusionary measures, or visual (e.g., scarecrows, falcon effigies, kites, or eye-safe lasers, power line markers with reflective and/or glow in the dark components) and/or auditory (e.g., cannons or wailers) deterrents.*

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Water quality parameters of the water management facilities are exceeding concentration guidelines presented in the SWFMP:

- *Action: Follow action items outlined in the SWFMP.*
- *Action: consider implementing exclusionary measures (such as the use of bird deterrent floating balls or the installation of bird netting over ponds) and/or deterrents following discussion with ECCC-CWS.*

5.0 ADAPTIVE MANAGEMENT

Adaptive management is a planned process for responding to uncertainty or to an unanticipated or underestimated Project effect. Information learned from monitoring actual Project effects is applied and compared to predicted effects. Where a variance between the actual and predicted effects occurs, a determination is made as to whether modifications or other actions are necessary to revise the existing mitigation measures.

Results from monitoring will be used through an adaptive management process to adjust mitigation measures and to modify plans on an ongoing basis, if required.

6.0 REPORTING

A report detailing the monitoring results, including information for each monitoring program component, will be provided annually. The information included in the report will contribute to adaptive management strategies to address the effectiveness of mitigation to reduce potential Project effects on a change in avifauna habitat and mortality risk.

7.0 RELATED DOCUMENTS

Other environmental management plans and monitoring programs related to this follow-up monitoring program are described in Table 7.1.

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Table 7.1 Related Other Management Plans and Monitoring Programs

Plan/Program	Details
Construction EPP	<p>The Construction EPP provides general environmental protection procedures related to Project construction activities and infrastructure such as air and greenhouse gas emissions management; erosion and sedimentation control; rock and soils management; and traffic management. Also included are protection procedures specific to caribou, avifauna, and other wildlife (including bats and American marten); fish and fish habitat; historic resources; and the Victoria Dam. The Construction EPP also includes contingency plans for fuel and hazardous materials spills, failure of erosion and sediment control measures and/or dams, and forest fires.</p>
Accidents and Malfunctions Prevention and Response Plan	<p>The Accidents and Malfunctions Prevention and Response Plan outlines the mitigation measures and response measures for potential accidents and malfunctions. The Plan provides direction for communication and reporting requirements following an accident or malfunction. Potential accidents or malfunctions addressed include tailings management facility malfunction, stockpile slope failure, fuel and hazardous materials spill, unplanned release of contact water, fire/explosion, and vehicle accidents.</p>
Surface Water Follow-up Monitoring Program	<p>The Surface Water Follow-up Monitoring Program to confirm compliance with regulatory requirements, support predictions of effects of the Project on water quality, identify changes in drainage patterns and surface water flow, and determine if additional mitigation or response measures are required. The AFMP will consider surface water monitoring results to assist with identifying the need for further mitigation and adaptive management measures.</p>
Water Management Plan	<p>The Water Management Plan describes the water management design for the Project, which has been developed to reduce operational risks and environmental effects of the Project. Objectives of the Plan include reducing water inventory requiring management through perimeter berms (to divert external noncontact runoff; reducing the number of final discharge points (FDPs) through grading of ditches and construction of diversion channels to combine discharge points water management ponds); maintaining flow to fish bearing streams and wetlands by maintaining pre-development catchments to the extent feasible; and reducing pumping requirements during operation through grading and gravitational drainage.</p> <p>The plan includes a summary of surface water monitoring activities for the Project that are outlined in this program.</p>

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8.0 REFERENCES

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APPENDIX A

Mitigation Measures

Table A.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Avifauna and their Habitat

Category	Mitigation Objective	Mitigation	Measurable Parameter – Performance Target
Change in Habitat	Reduce direct habitat loss, including residences (i.e., nests) from vegetation clearing	<ul style="list-style-type: none"> Project footprint and disturbed areas will be limited to the extent practicable. Existing riparian vegetation will be maintained to the extent practicable. Sensitive areas (e.g., wetlands) will be identified prior to construction and appropriate buffers will be flagged and maintained around these areas, where feasible. The disturbance of wetlands will be avoided outside the work area. If required to cross or disturb wetlands appropriate permits/approvals will be in place. Trees that provide actual or potential habitat will be retained where safe to do so and technically feasible. Removal activities, where required, will be scheduled to the extent practicable, outside the migratory bird breeding season. If tree clearing is required during the migratory bird breeding season, experienced environmental monitors will inspect the trees to assess occupancy before tree removal. 	<ul style="list-style-type: none"> Comparison of detailed engineering design to construction Project footprint. On-site verification of Project design. <p>Performance Target</p> <ul style="list-style-type: none"> Clearing or disturbance is consistent with design features and planned clearing limits (CM001).
		<ul style="list-style-type: none"> Environmental personnel responsible for site monitoring during construction will receive training to recognize SAR/SOCC that may be present in Project Area. 	<ul style="list-style-type: none"> Records of EPP training and distribution. Recording of SAR/SOCC observations on-site (number, timing, frequency, locations).
		<ul style="list-style-type: none"> Where practicable, clearing and grubbing will be avoided during the migratory bird breeding season (April 15 to August 15; ECCC 2018). Where this timeframe cannot be avoided, the following measures will be implemented: <ul style="list-style-type: none"> Conduct a survey (by a qualified environmental monitor) for migratory and resident bird nests and birds displaying nesting behaviours, not more than five days prior to clearing and grubbing during the nesting season. Survey for sensitive habitat that typically supports nests. Establish an appropriate buffer zone around identified active nests or areas of active nesting behaviours until fledging has occurred. Employ on-site support of qualified biologists during construction, as required. The discovery of nests by staff will be reported to the Marathon environmental manager at site and appropriate action or follow-up will be guided by the Avifauna Management Plan. Buffers / set back distances will be established as outlined in the EPP. 	<ul style="list-style-type: none"> Periodic spot checks (audits) during the breeding season to confirm nest searches are conducted prior to any clearing or grubbing activities. <p>Performance Target</p> <ul style="list-style-type: none"> Scheduled clearing outside and within Breeding Bird Window are available from construction plans and records. Overall compliance with protocols with the Avifauna Management Plan.
		<ul style="list-style-type: none"> An Avifauna Management Plan will be developed and implemented for the Project (within the EPP) and will include such measures as conducting pre-clearing surveys for active migratory bird nests during the breeding bird season and buffer / set-back distances from active nests. 	<ul style="list-style-type: none"> Periodic spot checks (audits) to confirm protocols in the Avifauna Management Plan are followed. <p>Performance Target</p> <ul style="list-style-type: none"> Overall compliance with protocols with the Avifauna Management Plan.
		<ul style="list-style-type: none"> Marathon will observe changes in species status prior to and during Project commencement and consider potential implications to the Project, including whether additional mitigation may be necessary to protect the species and its residence. 	<ul style="list-style-type: none"> Periodic audits (e.g., following species updates) to confirm mitigation measures have been updated, as necessary. <p>Performance Target</p> <ul style="list-style-type: none"> Mitigation measures updated to reflect changes in species status as outline in the updated Avifauna Management Plan.
		Reduce indirect habitat loss from sensory disturbance	
<ul style="list-style-type: none"> All vehicles and generators will have exhaust systems regularly inspected and mufflers will be operating properly. Enclosures will be used where feasible to further muffle stationary equipment. Vehicles and heavy equipment will be maintained in good working order and will be equipped with appropriate mufflers to reduce noise. 	<ul style="list-style-type: none"> Maintenance will be documented, and records retained for all heavy equipment through the Traffic Management Plan. Spot checks to audit conformance with policy. Noise monitoring program to be developed as part of the Air Quality Management Plan. <p>Performance Target</p> <ul style="list-style-type: none"> Approved and up to date noise monitoring plan. 		

Table A.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Avifauna and their Habitat

Category	Mitigation Objective	Mitigation	Measurable Parameter – Performance Target
		<ul style="list-style-type: none"> Marathon will implement traffic control measures to restrict public access to the mine site, which may include gating approaches, placing large boulders and/or gated fencing. Vehicles will use existing roads / trails while operating at the mine site. All-terrain vehicles used by Marathon personnel will also be restricted to existing roads, trails and corridors to the extent possible. 	<ul style="list-style-type: none"> Monitoring of traffic (addressed in the Traffic Management Plan). Performance Target <ul style="list-style-type: none"> Approved and up to date Traffic Management Plan.
		<ul style="list-style-type: none"> Project vehicles will be required to comply with posted speed limits on the access road, site roads and haul roads to limit fugitive dust from vehicle travel on unpaved roads. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads). Dust from construction activities will be controlled using water 	<ul style="list-style-type: none"> Monitoring of traffic (addressed in the Traffic Management Plan). Dust monitoring program to be developed as part of the Air Quality Management Plan. Performance Target <ul style="list-style-type: none"> Approved and up to date Traffic Management Plan and the Air Quality monitoring Plan.
		<ul style="list-style-type: none"> Project lighting will be limited to that which is necessary for safe and efficient Project activities. Lighting design guidelines will be followed, such as the Commission Internationale de L'Éclairage, International Dark Sky Association, Illuminating Engineering Society, and the lighting requirements for workspaces, as applicable. Mobile and permanent lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside of the Project Area, to the extent practicable. Only the amount of lighting required for safe construction and operation activities will be installed; exterior lights will be shielded from above where required. Lights will be designed to avoid excessive use of mobile flood lighting units and will be turned off when they are not required. Full cut-off luminaires will be used wherever practicable to reduce glare, light trespass, and sky glow from Project lighting. Where practicable high activity areas, trees and other vegetation will be left in place or encouraged to grow to act as a buffer to reduce sensory (light and noise). 	<ul style="list-style-type: none"> Monitoring of Project lighting (addressed in the Air Quality Management Program). On-site verification of Project design. Periodic spot checks (audits). Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the Air Quality monitoring Plan.
		<ul style="list-style-type: none"> Best practices from Blaster's Handbook (ISEE 2011) and Environmental Code of Practice for Metal Mines (ECCC 2009) will be followed to reduce and monitor noise emissions during blasting. During bird breeding season (April 15 to August 15; ECCC 2018), blasting will occur outside of the prominent bird singing/calling and activity period (i.e., sunrise to approximately 9:30 am) 	<ul style="list-style-type: none"> Periodic spot checks (audits) for adherence with best practices). Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the EPP – Blasting and Avifauna Management Plan.
		<ul style="list-style-type: none"> As waterfowl species are particularly sensitive to disturbance during critical breeding and brood-raising periods (from May to mid-July), personnel will be made aware of the importance of the surrounding wetlands to waterfowl and efforts will be made to reduce impacts on them during Project activities, such as adherence to wetland buffers (30 m for construction activities, 100 m when active nesting). 	<ul style="list-style-type: none"> Periodic spot checks (audits) to confirm protocols in the Avifauna Management Plan are followed. Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with induction, training, and documentation requirements for employees and contractors
Change in Mortality Risk	Reduce change in mortality risk of avifauna and avifauna SAR	<ul style="list-style-type: none"> Environmental personnel responsible for site monitoring during construction will receive training to recognize SAR/SOCC that may be present in Project Area. An Avifauna Management Plan will be developed and implemented for the Project and will include such measures as conducting pre-clearing surveys for active migratory bird nests during the breeding bird season and buffer / set-back distances from active nests. Where practicable, clearing and grubbing during the breeding season will be avoided. The Avifauna Management and Monitoring Plans to be implemented for this Project outline the adaptive management strategies to be employed and thresholds for triggering adaptive measures, which may include deterrents and exclusionary measures. Bird deterrents may include visual deterrents such as scarecrows, falcon effigies, kites or eye-safe lasers, and auditory deterrents such as noise cannons, wailers, or other noise makers A Wildlife Response Plan (WRP) will be developed and implemented as part of the Project's Environmental Protection Plan (EPP). The WRP will be developed through liaison with ECCC-CWS and in consideration of guidelines for effective wildlife response plans, and will include protocols for 	<ul style="list-style-type: none"> Records of EPP training and distribution. Performance Indicator <ul style="list-style-type: none"> Tracking and audits show compliance with EPP including induction, training, and documentation requirements for employees and contractors. Periodic spot checks (audits) to confirm protocols in the Avifauna Management Plan are followed. Performance Indicator <ul style="list-style-type: none"> Tracking and audits show compliance with the Avifauna Management and Monitoring Plans. Periodic spot checks (audits) to confirm protocols in the WRP are followed. Recording of Project-related mortalities on-site (number, timing, frequency, locations).

Table A.1 Key Mitigation Measures During Construction to Reduce Potential Effects on Avifauna and their Habitat

Category	Mitigation Objective	Mitigation	Measurable Parameter – Performance Target
		<ul style="list-style-type: none"> scenarios, such as should frequent bird interactions occur at the site or a migratory bird be found stranded at site The Project will have full-time On-Site Environmental Monitors (OSEMs) who will inspect worksites and activities for conformance with the EPP. The OSEMs will be notified if birds are found injured or dead at the site and will inform regulators (e.g., ECCC-CWS), if applicable 	<p>Performance Target</p> <ul style="list-style-type: none"> Tracking and audits show compliance with the EPP Avifauna Monitoring Plan.
		<ul style="list-style-type: none"> Employees and contractors will be instructed to report any active nests discovered in the Project Area to on-site environmental staff, and appropriate action or follow-up will adhere to the Avifauna Management Plan The discovery of nests by staff will be reported to the Marathon environmental manager at site and appropriate action or follow-up will be guided by the Avifauna Management Plan. If active nests are found, appropriate buffers/setback distances from nests will be established and remain in place until fledging has occurred Bank swallows are known to construct nesting burrows in soil stockpiles with steep faces, particularly in light soils amenable to burrowing. Soil stockpiles will be constructed and maintained in lifts to achieve flatter slopes and to permit terracing, thereby reducing erosion and maintaining moisture within the topsoil. This structure and composition will make the stockpiles less attractive to these birds, particularly during the breeding season. In addition, if soil has been removed from a stockpile during the breeding season, resulting in a vertical or near-vertical face, the vertical face will be knocked down with an excavator to make it unattractive to swallows If a nest is found during soil stockpile development, this area (plus buffer) of the stockpile will be avoided until fledging has occurred; drawing down of soil stockpiles for progressive and ultimate rehabilitation will occur outside of breeding bird season, to the extent practicable 	<ul style="list-style-type: none"> Records of EPP training and distribution. Recording of any nests and observations of SAR/SOCC on-site (number, timing, frequency, locations). Periodic spot checks (audits) to confirm protocols in the Avifauna Management Plan are followed. On-site verification and periodic spot checks (audits). <p>Performance Target</p> <ul style="list-style-type: none"> Tracking and audits show compliance with the EPP and Avifauna Monitoring Plan.
		<ul style="list-style-type: none"> Embankments of the TMF and of sedimentation ponds will be maintained free of vegetation. This will limit the attraction of waterfowl and/or wildlife to these ponds for foraging or breeding. Avifauna use of the TMF ponds, open aquatic areas and other key Project locations will be monitored (primarily targeting waterfowl but also other wildlife species). If problematic avifauna use occurs, adaptive management measures (e.g., exclusionary measures and/or deterrents) will be implemented 	<ul style="list-style-type: none"> Records of EPP training and distribution. Records of observations of waterfowl and other species. Periodic spot checks (audits) to confirm protocols in the Avifauna Management Plan are followed. On-site verification and periodic spot checks (audits). <p>Performance Target</p> <ul style="list-style-type: none"> Tracking and audits show compliance with the EPP and Avifauna Monitoring Plan.
		<ul style="list-style-type: none"> Environmental monitors will be notified if birds are found injured or dead at the site and will inform regulators, if applicable If a bird stranding incident occurs, or if an injured bird is located, ECCC-CWS will be notified. In this instance, the proponent will adhere to procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada (which may be modified for use onshore, through consultation with ECCC-CWS). Workers will be required to notify the Environmental Technicians if/when a bird is found injured or dead at the site and Marathon will inform ECCC-CWS. If frequent bird interactions with Project lighting are observed (which may include the discovery of dead or injured birds), further mitigation will be implemented. Any wildlife (e.g., birds and bats) collisions with Project infrastructure or equipment will be reported to the Environmental Technician and the Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture - Wildlife Division. 	<ul style="list-style-type: none"> Recording of Project-related mortalities on-site (number, timing, frequency, locations). <p>Performance Target</p> <ul style="list-style-type: none"> Tracking and audits show compliance with the Avifauna Monitoring Plan and the EPP.
		<ul style="list-style-type: none"> Mitigation measures will be implemented for on-site distribution powerlines, at locations that are determined, during the course of operations, to be high risk areas for avifauna. Mitigation measures may include the implementation of avoidance devices, such as power line markers with reflective and/or glow in the dark components. If power line markers are used, monitoring will occur after installation to evaluate their efficacy. 	<ul style="list-style-type: none"> Recording of Project-related mortalities on-site (number, timing, frequency, locations). <p>Performance Target</p> <ul style="list-style-type: none"> Tracking and audits show compliance with the Avifauna Monitoring Plan and EPP.

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Category	Mitigation Objective	Mitigation	Measurable Parameter – Performance Target
		<ul style="list-style-type: none"> Marathon will develop and implement a Traffic Management Plan to manage transportation of workers and materials to site, product leaving site, the number of vehicles accessing the site, and to reduce traffic delays. 	<ul style="list-style-type: none"> Monitoring of traffic (addressed in the Traffic Management Plan). Recording of direct Project-related mortalities. Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the Traffic Management Plan. Tracking and audits show compliance with mortality record keeping and reporting as indicated in the Avifauna Monitoring Plans and employee training as indicated in EPP.
		<ul style="list-style-type: none"> Work areas will be kept clear of waste and litter to reduce the potential for attracting wildlife (including avifauna) and reducing potential interactions with wildlife. Waste that may attract animals (i.e., food) will be stored in covered, wildlife-proof containers. A Project-specific Waste Management Plan will be developed to address the collection, storage and transportation of hazardous and non-hazardous wastes generated from the Project. 	<ul style="list-style-type: none"> Periodic spot checks (audits). Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the EPP.
		<ul style="list-style-type: none"> The requirement for a bird handling permit will be determined in consultation with ECCC-CWS and, if required, obtained prior to Project initiation. 	<ul style="list-style-type: none"> Records of permits obtained and compared with recorded incidents. Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the Avifauna Management Plan.
		<ul style="list-style-type: none"> Marathon will observe changes in species status prior to and during Project commencement and consider potential implications to the Project, including whether additional mitigation may be necessary to protect the species and its residence. 	<ul style="list-style-type: none"> Periodic audits (e.g., following species updates) to confirm mitigation measures have been updated, as necessary. Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the Avifauna Management Plan.

Table A.2 Additional Key Mitigation Measures During Operations to Reduce Potential Effects on Avifauna and their Habitat

Category	Mitigation Objective	Mitigation	Approach to Monitoring
Change in Habitat	Reduce indirect habitat loss from sensory disturbance	<ul style="list-style-type: none"> Project facilities and infrastructure will be designed to limit noise emissions. To the extent feasible without affecting safe mine operations, exterior lighting will be reduced and/or have limited time of operation during sensitive wildlife periods, such as migration. 	<ul style="list-style-type: none"> On-site verification of Project design. Periodic spot checks (audits). Monitoring of light (addressed in the Air Quality Management Plan). Performance Target <ul style="list-style-type: none"> Tracking and audits show compliance with the Air Quality Monitoring Plan.
Change in Mortality Risk	Reduce change in mortality risk (daily or seasonal)	<ul style="list-style-type: none"> Cyanide detoxification within the mill using the sulphur dioxide / air oxidation process will result in the degradation of cyanide and precipitation of metals prior to discharge to the TMF. 	<ul style="list-style-type: none"> Periodic spot checks (audits) for adherence with best practices. Performance Targets <ul style="list-style-type: none"> Tracking and audits show compliance with best practices. TMF water quality monitoring indicates levels within expected ranges as indicated in the EIS.