Valentine Gold Project: Fish and Fish Habitat Follow-up Monitoring Program

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Abbreviations

AEP	annual exceedance probability
BIC	benthic invertebrate community
CEAA	*Canadian Environmental Assessment Act*
CoA	Certificate of Approval
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	environmental assessment
ECCC	Environment and Climate Change Canada
EEM	environmental effects monitoring
EIS	Environmental Impact Statement
EPP	Environmental Protection Plan
ESMS	Environmental and Social Management System
FDP	final discharge point
HADD	Harmful Alteration, Disruption and Destruction
IAAC	Impact Assessment Agency of Canada
IR	Information Requirements
LAA	Local Assessment Area
MDMER	*Metal and Diamond Mining Effluent Regulations*
MeHg	methyl mercury
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador *Endangered Species Act*
NLDECC	Newfoundland and Labrador of Environment and Climate Change
NLDECCM	Newfoundland and Labrador Department of Environment, Climate Change and Municipalities
QAQC	Quality Assurance and Quality Control
RAA	Regional Assessment Area
SAR	Species at Risk
SARA	*Species at Risk Act*
TG	Technical Guidance
TMF	tailings management facility
YOY	Young of the Year

1.0 INTRODUCTION

An Environmental Impact Statement (EIS) for the Valentine Gold Project (the Project) was submitted 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 30, 2020 by Marathon Gold Corporation (Marathon). The Project has been approved with conditions by IAAC and NLDECC.

The purpose of the Fish and Fish Habitat Follow-up Monitoring Program is to outline the follow-up and monitoring activities that will be undertaken 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 is a living document that will be reviewed on a regular basis and updated and improved based on policy and technology changes as the Project progresses through the EA and permitting phases.

The construction and operation of the Project will be governed by an Environmental and Social Management System (ESMS) based on Marathon's overarching environmental objectives to work to prevent or mitigate environmental impacts, meet or exceed regulatory requirements, and strive to continually improve environmental practices and performance. The ESMS includes tools such as the corporate environmental and social policies, construction, and operational environmental protection plans (EPPs), environmental management plans, and monitoring plans. These documents will be updated as needed throughout the life of the Project. A draft EPP for the construction phase of the Project has been prepared. This EPP outlines protection and response measures associated with potential environmental effects related to Project construction activities. The Construction EPP provides 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 monitoring programs as it describes practical procedures required 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). Additionally, communications and reporting requirements are provided in Section 5 of the AMPRP as well as Appendix A with respect to communication specific to Indigenous groups.

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 (TMF) 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 following spatial boundaries are associated with the assessment of potential Project effects on fish and fish habitat for the purposes of the EIS (Monitoring Sections 4.1, 4.2 and 4.4):

- The **Project Area** encompasses the mine site, including Project infrastructure, and the existing access road plus a 20 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.
- 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 wildlife-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, as well as the communities of Millertown, Buchans, and Buchans Junction. The RAA informed the assessment of cumulative effects.

1.2 GOALS AND OBJECTIVES

The intent of the Follow-up Monitoring Program is to verify the accuracy of the EA predictions and assess the effectiveness of mitigation measures for planned and routine Project activities. In the event of a regulatory exceedance, accident or malfunction, the Accidents and Malfunctions Prevention and Response Plan describes the immediate response and monitoring associated with these types of unplanned events.

This document has been developed and prepared using currently available information. This monitoring program will require updates based on applicable conditions that may be part of the regulatory approval, when further details regarding Project design, sequencing, and methods become available, and to incorporate any changes identified through the proposed monitoring and subsequent adaptive management.

1.2.1 Purpose

The purpose of this Fish and Fish Habitat Follow-up Monitoring Program is to:

- Identify the regulatory requirements and standards relevant to fish and fish habitat
- Identify and describe the existing conditions for fish and fish habitat
- Describe the management and mitigation measures that will be used to reduce the potential effects on fish and fish habitat from Project construction and operation
- Describe the monitoring of fish and fish habitat that will be conducted during Project construction and operation to meet regulatory requirements and verify predicted Project effects made in the EIS for planned and routine Project activities.

1.2.2 Objectives

The goals of the monitoring program link the predicted Project effects to mitigation, mitigation objectives to monitoring, and monitoring results to adaptive management actions. The Fish and Fish Habitat Follow-up Monitoring Program goals and measurable objectives are as follows:

1. Monitor the effectiveness of mitigation and management measures designed to reduce effects to fish habitat and fish health and survival
    a. Monitor the implementation and effectiveness of mitigation and management measures to reduce effects to fish habitat and fish health and survival associated with the Project
    b. Adapt mitigation and management measures, to reduce fish habitat loss and reduce effects to fish health and survival associated with the Project
2. Monitor to confirm the predictions of harmful alteration, disruption and destruction (HADD) and death of fish associated with the Project
    a. Monitor the change in fish habitat quantity
    b. Offset additional fish habitat if the amount of fish habitat loss is greater than predicted
3. Monitor to confirm the offsetting plan counterbalances the residual death of fish and/or HADD of fish habitat
    a. Monitor to confirm a net gain in fish habitat quality and quantity for salmonids
    b. Implement contingency measures if the quality and quantity of the offsetting does not counterbalance the residual death of fish and/or HADD of fish habitat

4. Complete biological monitoring studies to evaluate the effects of mine effluent discharged from the Valentine Gold Mine final discharge point (FDP) on the fish and benthic invertebrate populations present in the receiving environment
    a. Monitor whether mine effluent is influencing growth, reproduction (energy use), condition (energy storage), or survival of local resident fish species
    b. Monitor whether mine effluent is resulting in higher concentrations of total mercury or selenium in fish tissue
    c. Monitor the effects of the mine effluent on the density, taxa richness, evenness and similarity of the benthic invertebrate community
    d. Adapt mitigation and management measures relating to effluent quality, as required, based on monitoring outcomes
5. Monitor the diversity and relative abundance of fish species (or morphos of those species) in Victoria Lake Reservoir and Valentine Lake in the event that there are unforeseen effects of the Project

1.3 REGULATORY SETTING

1.3.1 Federal Regulatory Requirements

1.3.1.1 Fisheries Act

The federal *Fisheries Act* is administered primarily by Fisheries and Oceans Canada (DFO) with some provisions administered by Environment and Climate Change Canada (ECCC). The *Fisheries Act* protects fish and fish habitat and addresses national interests in marine and fresh waters with the goal of protecting the long-term sustainability of aquatic resources. The *Fisheries Act* includes prohibitions against works, undertakings or activities that result in the harmful alteration, disruption or destruction (HADD) of fish habitat (section 35(1) of the *Fisheries Act*). Works can be approved by and carried on in accordance with conditions established by the Minister of Fisheries, Oceans and the Canadian Coast Guard (Fisheries Minister) (section 35(2)(b) of the *Fisheries Act*). Any such work requires an authorization with an appropriate offsetting of residual adverse effects after avoidance and mitigation steps have been taken.

HADD of fish habitat is defined under the *Fisheries Act* and associated policies as “any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat’s capacity to support one or more life processes of fish.”

The *Fisheries Act* also prohibits the carrying out of a work, undertaking or activity, other than fishing, that results in the death of fish (section 34.4(1) of the *Fisheries Act*), subject to certain exemptions including an authorization from the Fisheries Minister (section 34.4(2)(b) of the *Fisheries Act*). Additionally, section 34.3(2) of the *Fisheries Act* provides provisions for maintaining adequate flow and fish passage.

DFO's Fisheries Protection Policy Statement (DFO 2019) provides guidance on fish and fish habitat protection provisions. The Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada (DFO 2013) provides guidance on the management of flows required to maintain the ecological functions that sustain fisheries in streams and rivers potentially affected by water withdrawals.

Sections 36(3) and (4) of the federal *Fisheries Act* prohibits the deposition of deleterious substances into waters frequented by fish in Canada unless authorized by regulation. The *Metal and Diamond Mining Effluent Regulations* (MDMER) under the *Fisheries Act* regulate the deposit of deleterious mine effluents, tailings, and waste rock into waters frequented by fish, as authorized by ECCC. The MDMER applies to metal and diamond mines with an effluent flow rate (cumulative from each FDP) of greater than 50 m^3/day. Also pursuant to the MDMER, mines and recognized closed mines are required to conduct acute lethality testing of final effluent, effluent characterization, and Environmental Effects Monitoring (EEM) in the downstream receiving environment (see Section 4.4).

1.3.1.2 Species at Risk Act

The federal *Species at Risk Act* (SARA) provides protection for species at risk (SAR) in Canada. 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. SAR and their habitats listed on Schedule 1 of SARA are protected, which prohibits: 1) the killing, harming, or harassing of endangered or threatened SAR (Sections 32 and 36 of SARA), and 2) the destruction of critical habitat of an endangered or threatened SAR (Sections 58, 60 and 61 of SARA). No aquatic species on Schedule 1 with the potential to occur have been identified in the Project Area

1.3.2 Provincial Regulatory Requirements

1.3.2.1 Newfoundland and Labrador Environmental Protection Act

A Certificate of Approval (CoA) under the *Newfoundland and Labrador Environmental Protection Act* will be required from the NL Department of Environment, Climate Change and Municipalities (NLDECCM). The CoA sets concentration limits for specific parameters in the discharge effluent. These limits are typically in line with those provided in the MDMER and in the *NL Environmental Control Water and Sewer Regulations*, 2003. The *Environmental Protection Act* also guides the NL Environmental Assessment process. The Valentine Gold Project provincial conditions of EA release included the requirement for Marathon to "submit a Fish Data Collection Plan for the approval of the FFA - Wildlife Division by May 1, 2022"; this was submitted to FFA-Wildlife Division on April 28, 2022.

1.3.2.2 Newfoundland and Labrador Water Resources Act

The *NL Water Resources Act* gives the Water Resource Management Division of the NLDECCM the responsibility and legislative power for the management of water resources in the province. The *NL Water Resources Act* includes the *Environmental Control Water and Sewage Regulations*, which provides regulations surrounding the discharge of sewage and other effluent. Schedule C of the regulation specifies that the metal mining industry shall comply with the MDMER (formerly the *Metal Mining Effluent Regulations*).

1.3.2.3 Newfoundland and Labrador Endangered Species Act

The *Newfoundland and Labrador Endangered Species Act* (NL ESA) provides protection for plant and animal species considered to be Endangered, Threatened or Vulnerable. The NL ESA applies to species, sub-species, and populations that are native to NL, however not to marine fishes. The designation under the NL ESA follows the recommendations of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species Status Advisory Committee.

2.0 BASELINE INFORMATION

This section provides a description of the physical and biological characteristics of fish and fish habitats in the vicinity of the Project.

2.1 FISH SPECIES

Fish species identified in the vicinity of the Project include salmonids (Atlantic salmon / ouananiche (*Salmo salar*), Arctic char (*Salvelinus alpinus*), and brook trout (*Salvelinus fontinalis*)) and threespine stickleback (*Gasterosteus aculeatus*).

Victoria Lake Reservoir is not accessible to sea-run Atlantic salmon. Atlantic salmon in the LAA are primarily landlocked (i.e., ouananiche) due to numerous dams within the upper Exploits River and White Bear watersheds.

Ouananiche, Arctic char, brook trout and threespine stickleback were confirmed present in large lakes within the RAA including Victoria Lake Reservoir, Valentine Lake and Red Indian Lake (Stantec unpublished data). Brook trout and threespine stickleback were commonly observed in ponds and streams, except for ValP1, ValP2, VicP1, VicP2 and streams 17, 18, 19 and 20, because of barriers to fish passage (Figure 2.1). Ouananiche were found mainly in lakes and large ponds (i.e., Victoria Lake Reservoir, Valentine Lake, ValP3, Red Indian Lake), their connecting streams and the Victoria River (i.e., streams 1, 9, 11, 16 and 21) (Figure 2.1). All life stages of each fish species are present in the vicinity of the Project.

There are no aquatic SAR known to occur in the Project Area (Marathon 2020). Although not confirmed present during baseline surveys, there is potential for American eel (*Anguilla rostrata*), listed as Threatened by COSEWIC (COSEWIC 2012), to occur in the general region of the Project, American eel has the potential to occur within the RAA and LAA along the access road on the south side of Red Indian Lake, however, is not known to occur in Victoria Lake Reservoir or Valentine Lake.

2.2 LAKES, PONDS, AND BOG HOLES

A summary of fish habitat in lakes, ponds, and bog holes potentially affected by the Project are provided in Figure 2.1.

The surface area of Victoria Lake Reservoir is 16,660 ha (Reid and Cole 1972). Prior to the development of the Victoria Lake Reservoir water depths ranged from 26 m in the northeastern section, 30 m in the eastern section, 70 m in the western section, and 117 m at its deepest point (Pippy 1966). Currently, water depths in the Victoria Lake reservoir are likely 35 m higher than pre-dam depths. Prior to the construction of the Victoria Lake Dam in 1969, Victoria Lake was part of the Exploits River watershed and flowed to Red Indian Lake via the Victoria River. Victoria Lake Reservoir is now part of the White Bear Watershed and flows through the Victoria Canal to the south of the Project (Marathon 2020).

Shorelines drop steeply throughout Victoria Lake Reservoir, limiting the extent of the littoral (shallow) zone (BSA.4, Attachment 4-C in Marathon 2020). Existing shoreline substrates consist mainly of rock with some areas of sand. In the eastern section of Victoria Lake, shallow wind-sheltered bays contained bark and wood chips (Pippy 1966) or sand substrates (BSA.4, Attachment 4-C in Marathon 2020). Depositional sediments were observed at depths of 12.5 m during benthic invertebrate community (BIC) sampling and the reservoir is naturally devoid of aquatic vegetation, likely resulting from the abundance of coarse substrates, prevailing winds, water fluctuations and steep slopes (BSA.4, Attachment 4-C in Marathon 2020).

Valentine Lake is 820 ha in extent and drains into the Victoria River, which flows northeast to Red Indian Lake, through the Millertown Dam, and into the Exploits River. Valentine Lake is part of the Exploits River Watershed. For Valentine Lake the maximum water depth is 25.4 m and is found along the southeast shoreline of the lake (BSA.3, Attachment 3-E in Marathon 2020). Substrates in the littoral zone are mainly medium and coarse in grain size (e.g., rubble and boulder), and a number of cobble/rubble shoals are present adjacent to islands or ascending from depths. Sand and finer sediments are present within sheltered bays. Substrates in the profundal (deep) zone consist of clumps of fines (BSA.4, Attachment 4-C in Marathon 2020).

Ponds within the Project Area are small, with surface areas ranging from 0.5 to 26 ha. They typically have a maximum depth of 2 m and contain a high proportion of fines and low amounts of aquatic vegetation. Where aquatic vegetation is present, it is often immediately adjacent to shore or sparsely distributed through the pond. The ponds surveyed contain littoral habitat only and no profundal habitat. Photos of each pond and representative habitats are provided in BSA.4 (Attachments 4-A and 4-C) in Marathon 2020.

The 27 bog holes surveyed within the Project Area were deemed to be fishless and are not fish habitat.

Salmonids were confirmed or are likely to be present in most lakes and ponds, except for VicP1, VicP2, ValP1 and ValP2 (BSA.4, Attachment 4-A in Marathon 2020). Extensive fishing effort demonstrated that salmonids are absent from these ponds and are only present downstream of substantial waterfalls located in the Val (P1 and P2) and Vic (P1 and P2) sub-watersheds. In lakes and ponds, ouananiche are only found in larger waterbodies (i.e., Valentine Lake and Victoria Lake Reservoir, and pond ValP3), whereas brook trout are confirmed or assumed to be present in all ponds with connectivity to downstream streams or ponds. Threespine stickleback are confirmed or assumed to be present in all lakes and ponds. Bog holes in the Project Area are determined to be fishless.

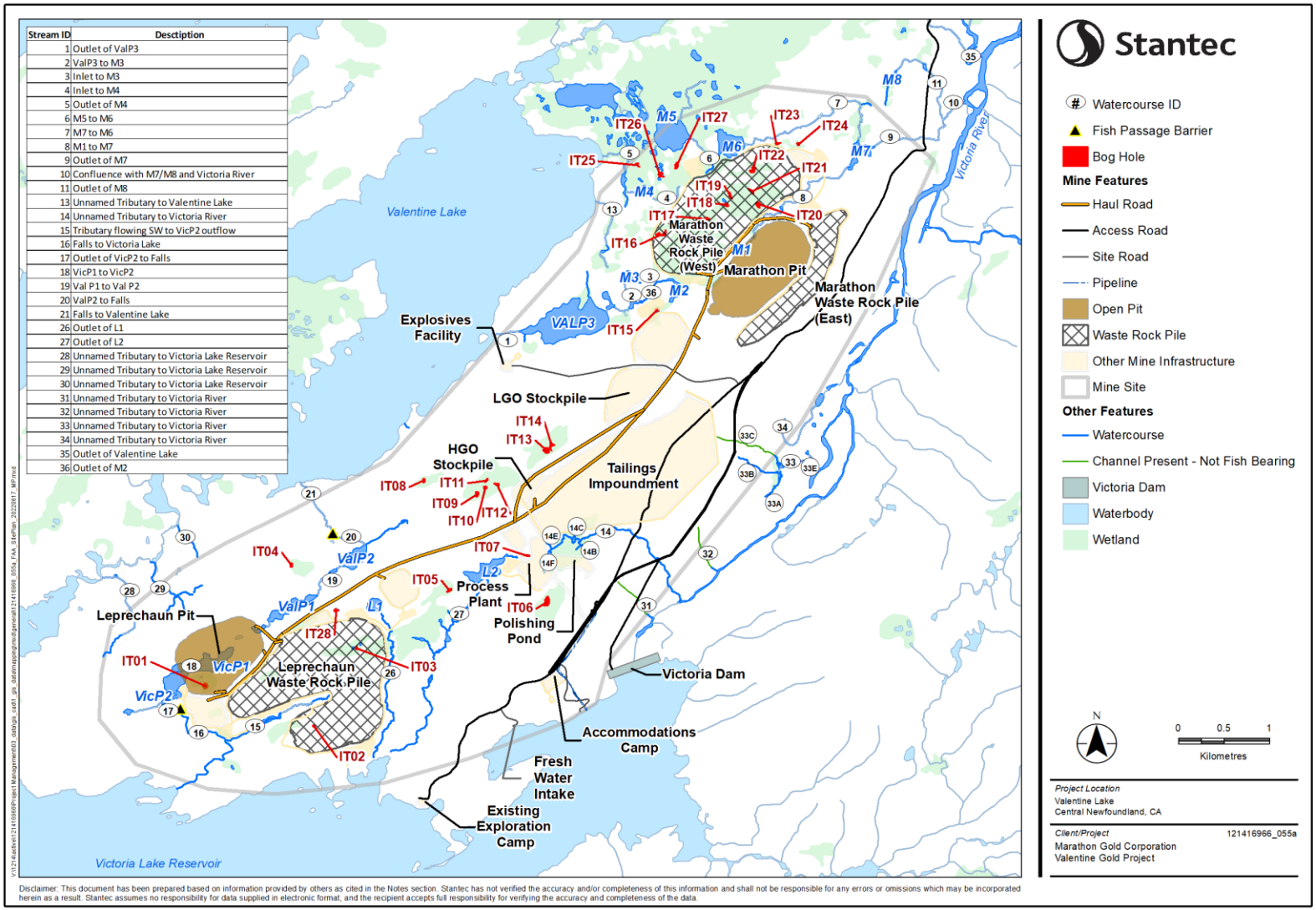

Figure 2.1 Lakes, Ponds, Streams and Bog Holes in the Project Area

2.3 STREAMS AND RIVERS

A summary of fish habitat in streams and rivers potentially affected by the Project is provided in Figure 2.1 and planned stream crossing locations are provided in Figure 2.2.

The streams that were surveyed within the immediate Project Area were generally small (<5 m), shallow (<0.5 m), and slow flowing (<0.2 m/s). First order, low gradient streams that flowed through bog or wetland habitats were generally characterized by shallow flats with an undefined thalweg, slow/negligible velocities, and fine grain substrates. The upper reaches of some streams (i.e., 1, 3, 16) had intermittent flow, particularly during the summer low flow period in August to early September. The lower reaches of streams were generally more riffle/run habitat, associated with increased gradient and velocities, coarser substrates, well-defined channels and generally permanent flow characteristics.

Victoria River is a part of the Exploits River watershed and formerly drained Victoria Lake prior to the construction of the Victoria Dam and the creation of the Victoria Lake Reservoir. As a result of a decrease in flow from Victoria Lake Reservoir after the construction of the Victoria Dam, Victoria River has narrowed, and shrubs dominate the riparian area within the former riverbanks in lower lying areas. Aerial imagery (Maxar 2016) of the first 5 km immediately downstream of Victoria Dam shows that the river is relatively narrow (from 10 m to 40 m) and beaver dams are abundant. Based on professional expertise in similar habitats and field observations in Victoria River, substrates in this area are a mixture of fines and coarser materials (Marathon 2020, unpublished in-field observations).

Farther downstream in Victoria River, the gradient increases, and riffles/runs and pools can be observed. The river width in this section (5 km to 11 km downstream of Victoria Dam) ranges from 20 m to 100 m. Based on aerial imagery, field surveys and literature review of the area, substrates are likely to be primarily medium and coarse (e.g., cobble to boulder) (Pippy 1966; unpublished in-field observations).

Sixty-two potential stream crossing locations associated with the proposed on-site access and haul roads, and off-site access roads have been surveyed (Marathon 2020, BSA.4; Stantec 2021). Two of the potential stream crossings (i.e., C0022 and C0043) were not crossed by the off-site access road but the streams were located within the 20 m right-of-way. Surveys conducted at the remaining 60 locations indicated that 37 stream crossings are located in fish habitat and 23 are located in areas that do not constitute fish habitat (BSA.4, Attachment 4-A; BSA.4, Attachment 4-B; BSA.4, Attachment 4-C; Stantec 2021). Streams that constituted fish habitat had a mean stream width ranging from 1.5 to 24.7 m. Habitat types were primarily riffle-run with some flat or pool habitats. Stream crossings determined to not constitute fish habitat included streams that had no visible channel, were ephemeral/intermittent, or had no connectivity to fish bearing waters (i.e., isolated channels or small pools of standing water).

Habitat quality in streams and rivers was highly variable. Small order streams that drain wetlands were generally poor for spawning, young of the year (YOY), juvenile and adult life stages of brook trout and Atlantic salmon (ouaninache), due to the large quantity of fine grain substrates, while providing excellent habitat for threespine stickleback. Rocky reaches of streams containing localized areas or reaches of flowing water containing sand, gravel and cobble, provided good to excellent habitat for spawning and rearing habitat for YOY, juvenile and adult life stages of brook trout. Higher order streams within flowing stream habitat and gravel and cobble substrates provided spawning habitat and rearing habitat for YOY and juvenile Atlantic salmon (Marathon 2020).

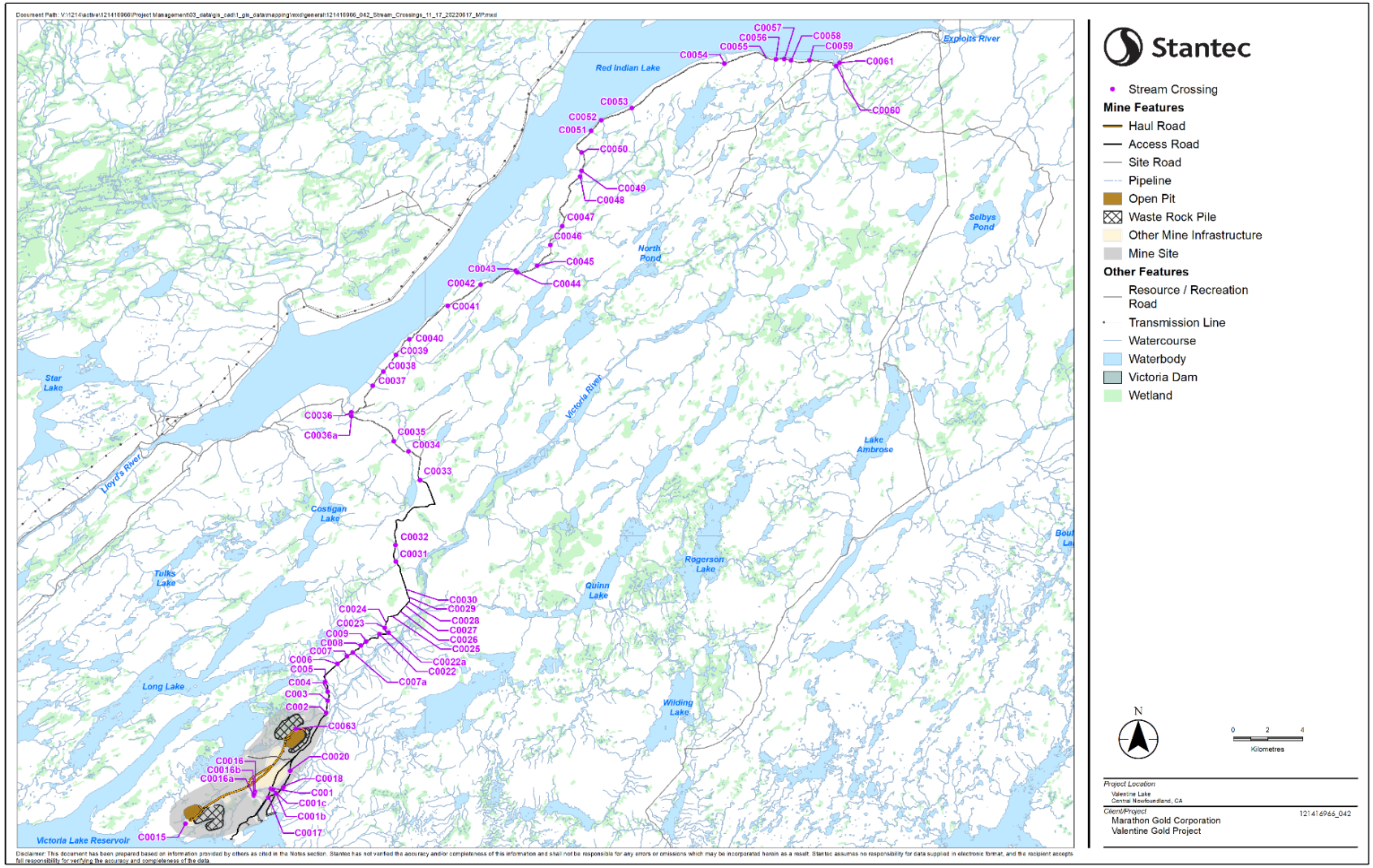

Figure 2.2 Overview of Planned Stream Crossing Locations

3.0 PROPOSED MITIGATION AND MANAGEMENT MEASURES

Mitigation measures for fish and fish habitat are presented in Chapter 8 of the EIS (Marathon 2020) under Section 8.4 “Mitigation and Management Measures”. Project planning and design and the application of proven mitigation measures will be used to reduce adverse effects to fish and fish habitat. The mitigation and standard practices will be implemented to reduce the potential for environmental effects of the Project on fish habitat, and fish health and survival. Additional mitigation specific to ground and surface waters can be found in Section 6.4 and Section 7.4 of the EIS (Marathon 2020). The mitigation measures below have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures for sediment and erosion control, incorporate DFO standards and best management practices, and consider regulations and guidelines that govern fish and fish habitat protection. More specifically, mitigation measures for fish and fish habitat address the following key categories:

- Limit the project footprint and in-water work areas (i.e., the amount of direct and indirect habitat loss) to the extent practicable
- Prevent the death of fish (e.g., fish relocations, timing of in-water work, fish screens)
- Proper sediment and erosion control
- Site water and tailings management and treatment
- Manage wastes and materials to prevent the entry of deleterious substances to water
- Maintain fish passage
- Offset residual effects to fish and fish habitat

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 measures and best management practices are detailed in the Construction EPP, and the Water Management Plan (Marathon 2020; Appendix B). The Water Management Plan includes such measures as criteria for surface and groundwater quality and quantity, water management design and water quality treatment.

4.0 MONITORING PROGRAM

4.1 CONSTRUCTION MONITORING

Construction monitoring will be required to confirm that the applied mitigation is performing as intended to protect fish and fish habitat.

Monitoring requirements for water quality specified in the *Fisheries Act* Authorization or through letter(s) of advice or other approvals issued for the Project will be included in the Surface Water Quality Management Plan. In the event of a regulatory exceedance, accident or malfunction, the Accidents and Malfunctions Prevention and Response Plan describes the immediate response and monitoring associated with these types of unplanned events.

4.1.1 Objectives

The objectives of the construction monitoring are to determine that mitigation and management measures which have been developed to mitigate the effects of the Project during construction are performing as intended.

4.1.2 Measurable Parameters and Thresholds

Fish habitat indicators and performance targets will be used to confirm that the mitigation and management measures during construction are performing and being implemented as intended, as required through letter(s) of advice and *Fisheries Act* Authorizations or other approvals issued for the Project.

A table of indicators, measurable parameters and performance targets for the construction monitoring are provided in Table 4.1.

Table 4.1 Measurable Parameters for Fish and Fish Habitat

Indicator	Measurable Parameter	Performance Target
Timing of in-water works	Date of in-water work Amount of rainfall during in-water work	In-water work is conducted during timing windows, as specified through letter(s) of advice and *Fisheries Act* Authorizations issued for the Project, unless otherwise permitted by Fisheries and Oceans Canada In-water work is scheduled to avoid wet, windy, and rainy periods that may increase erosion and sedimentation
Maintain an appropriate depth and flow through culverts	Water depth Countersink depth Culvert diameter	A minimum water depth of 200 mm is maintained in culverts Culverts up to 2000 mm in diameter should be countersunk to a depth of 300 mm below the streambed elevation Culverts having a diameter equal to or exceeding 2000 mm should be countersunk a minimum of 15% of the diameter below the streambed elevation Culverts are appropriately sized for existing and future flow scenarios
Maintenance of Fish Passage	Unrestricted flow Acceptable velocities for fish passage	Maintain fish passage
Riparian Vegetation	% Cover	Limit access to banks or areas adjacent to waterbodies Limit grubbing on watercourse banks to the area required for the footprint of the activity Revegetate disturbed areas using plant species native to the regional assessment area
Coffer Dam and Diversion Channels	Number of sandbags and diversion materials removed Height of coffer dams Water clarity or turbidity	Clean, sediment-free materials used as fill Sandbags and diversion materials removed when work is completed Cofferdams installed to an appropriate height to prevent overtopping Water released from the isolated work area has low turbidity concentrations
Sediment and Erosion Control	Water turbidity Effectiveness of erosion and sediment control measures – photographs Frequency of fording Frequency of machinery in-water	Erosion and sediment control measures are installed prior to beginning work Erosion and sediment control structures are inspected, maintained and functioning Fording of watercourses is limited Operate machinery on land in dry stable areas
Use of poured concrete	Frequency of seepage or spillage of concrete	No seepage or spillage of concrete or concrete residues into water

Table 4.1 Measurable Parameters for Fish and Fish Habitat

Indicator	Measurable Parameter	Performance Target
Use of explosives	Frequency and size of explosive charges used near water	Explosive use near-water follows the DFO blasting guidelines
Disposal of demolished material	Visual assessment of waste type	Disposal of waste material in the proper location
Restoration of stream geomorphology	Visual assessment	Stream geomorphology similar to baseline condition
Inspections of fish screens or other barriers at water withdrawal intakes	Number and size of breaks in screens or barriers	No breaks in screens or barriers, which could result in the death of fish
Fish relocations	Abundance of fish relocated	Fish will be relocated to undisturbed areas to avoid “the death of fish” as specified through letter(s) of advice and *Fisheries Act* Authorizations issued for the Project.

4.1.3 Locations and Timing

The locations and timing of in-water work and explosive use will be determined following detailed design and will be based on the construction schedule. Inspections of fish screens or other fish barriers will take place at water withdrawal intakes following a set maintenance schedule, at least annually, or more frequently if required.

Fish will be relocated from areas of in-water works prior to construction as required through letter(s) of advice and *Fisheries Act* Authorizations issued for the Project. Fish relocation will occur during the open-water season to other undisturbed areas with suitable habitat. These fish relocations will potentially take place in the areas of direct loss associated with:

- Construction of open pits (i.e., M1, Stream 8)
- Within watercourses and waterbodies, at the confluence with the engineered spillway channel for the sedimentation ponds (i.e., Streams 2, 6, 8, 16, 26 and Ponds L2, M2)
- Footprint of the Process Plant Complex (i.e., Stream 14)
- Placing stream crossing structures in areas of fish habitat

Areas experiencing indirect loss will be monitored for potential fish stranding following diversion of flow to water management features. Stranded fish will be relocated as required as per the Fish Rescue Plan.

The area of the fish stranding monitoring and potential relocations associated with the indirect loss are Streams 4, 5, 8, 9, 10, 14, 15, 16, 26, 32, 33 and outlet of Valentine Lake (35; during pit filling).

4.1.4 Methods

The monitoring of in-water works will confirm that in-water works are conducted during DFO timing windows, as specified through letter(s) of advice and *Fisheries Act* Authorizations issued for the Project, unless otherwise permitted by DFO.

Water depth and the countersunk depth will be measured following the installation of access road and mine site culverts. Where water depth does not exceed 200 mm as an existing condition (in existing culverts or streams), the criteria may not be met.

Fish passage will be monitored at culvert crossings by visual assessment to confirm unrestricted flow around the work area and an absence of barriers to fish passage.

The percent cover of riparian vegetation will be assessed visually at stream crossings within a 10 m buffer along the stream bank during and following the installation of the access road and mine site culverts. Photographs will be taken to document the conditions.

When cofferdams or diversion channels are used to isolate in-water work areas, the structures should be monitored to confirm that the water is clear and contains low concentrations of particles, the height of the coffer dams are sufficient to impound flow and that the sandbags and diversion materials are removed. Photographs will be taken to document that targets were met.

Sediment and erosion control measures should be monitored to confirm that there are no visual signs of turbidity. If visual signs of turbidity are apparent the level of turbidity can be monitored by collecting and submitting a water sample to an analytical lab or by use of a handheld turbidity meter. Photographs will be taken to document the effectiveness of erosion and sediment control structures and ford sites, particularly during rainfall events. Any machinery which is required to work in-water will be documented and photographed.

If poured concrete is used any seepage or spillage will be documented and photographs will be taken.

The monitoring of explosive use near-water will consist of confirming that the frequency and charge of explosives fall within the DFO blasting guidelines.

The locations of demolished material will be documented to confirm it was disposed of properly.

Photographs will be taken to document that the stream geomorphology following construction is similar to baseline conditions.

The inspection of fish screens or other fish barriers will be a visual inspection documented by photographs. The frequency of inspections will vary depending on site activities and will be determined in consultation with DFO.

The fish rescue will be performed by qualified personnel. Fishing will be conducted under a scientific collection permit obtained from DFO, NL Region.

Ponds will be isolated from its outlet channel prior to conducting a fish rescue to prevent new fish from entering the pond during and after the fish rescue. The objective of the fish rescue will be to remove as many fish as reasonably possible and transfer them to suitable unaffected habitat nearby. A secondary objective will be to collect biological data from the fish captured (i.e., species, number, length, weight). Fish will be rescued using a combination of gear types suitable for the habitat conditions and fish species in the ponds. This may include active methods such as backpack electrofishing or beach seining if wading conditions allow. It may also include passive methods such as small-mesh (¼”) trap nets and baited minnow traps. Short-set gill nets may be used if other methods do not result in the desired number of fish being removed. The fish relocation will be deemed complete when a declining catch per unit effort has been demonstrated, in consultation with DFO.

For stream crossings, fish removal areas will be isolated using barrier nets and fish will be removed from the isolated areas of in-water works using a backpack electro-fisher and/or baited minnow/fyke traps, as required. For the backpack electrofisher, a multi-pass removal effort will be completed, with a minimum of three sweeps. Sweeps of the isolated area will continue until the fish have been successfully removed or

there is a noticeable depletion in catch and the number of fish remaining is deemed negligible. If minnow/fyke traps are used, traps will be set over multiple nights until no fish are captured or the number of fish remaining is deemed negligible. Minnow traps will be checked daily to retrieve, identify and count captured fish. Fish will be relocated downstream of the existing culvert or spillway connection.

For each capture method, deployment and retrieval times or fishing effort (e.g., seconds of electrofishing, trap hours) and location will be recorded. The barrier nets will be removed following the completion of the instream works.

4.1.5 Reporting

Electronic data reports will be provided to DFO (or other applicable regulators) as required through letter(s) of advice and *Fisheries Act* Authorizations or other approvals issued for the Project. An environmental inspection checklist will be developed to facilitate this reporting to regulators.

An electronic data report summary will be provided to DFO following the fish relocations. The report will include catch, summaries of field data collected and relevant photographs.

For repairs, upgrades, and placement of culverts and/or bridges along access and haul Roads, the following reporting activities should be undertaken during the active period of the proposed work to document that avoidance and mitigation measures are installed, maintained, and functioning as designed. The documentation and reporting should include photographs of installed mitigations, any work directly contacting water or other relevant information. A brief monitoring report should be provided to Fisheries and Oceans Canada Fish and Fish Habitat Protection Program (DFO FFHPP; Ryan.Pugh@dfo-mpo-gc.ca) on 14-day intervals, or more often if problems with mitigation measures are encountered.

4.2 *FISHERIES ACT* AUTHORIZATION MONITORING

The *Fisheries Act* Authorization is required to conduct in-water work which results in the residual death of fish and/or HADD of fish habitat.

4.2.1 Objectives

The objective of the *Fisheries Act* Authorization monitoring is to confirm the predictions of HADD and death of fish following Project development (i.e., post-construction) as described in the *Fisheries Act* Authorization application.

4.2.2 Measurable Parameters and Thresholds

Fish habitat indicators and performance targets will be used to monitor the predictions of HADD and death of fish following Project development (i.e., post-construction) as outlined in the *Fisheries Act* Authorization application.

A table of physical habitat indicators, measurable parameters and performance targets for the *Fisheries Act* Authorization monitoring are provided in Table 4.2.

Table 4.2 Measurable Parameter for Fish Habitat

Indicator	Measurable Parameter	Performance Target
Change in fish habitat quantity	Area (m^2) of lost habitat	Change in fish habitat quantity meets or is below the area specified in the *Fisheries Act* Authorization

4.2.3 Sampling Locations and Timing

Following construction, an as-built survey will be completed in areas of direct loss to verify the area of fish habitat lost as a result of construction of the Project.

The sampling locations include:

- Area of direct loss associated with the Marathon pit (i.e., M1 and Stream 8)
- Within watercourses, at the confluence with the engineered spillway channel for the sedimentation ponds (i.e., Stream 2, 6, 8, 16, 26, Ponds M2 and L2 and Victoria Lake Reservoir)

Area of direct loss associated with water crossing structures on site and access roads. To confirm the predictions of indirect habitat loss resulting from the Project, a before-after study design will be conducted on Streams 5, 8, 9, 14, 15, 16, 33 and outlet of Valentine Lake (Stream 35) to monitor flow levels and the loss in wetted perimeter. The locations of the surface water quantity monitoring sites to assess indirect loss are provided in Appendix B of the Valentine Gold Project: Surface Water Follow-up Monitoring Program.

4.2.4 Methods

To assess the area of direct loss, an as-built survey will be completed post-construction to verify the area of fish habitat lost as a result of construction of the Project.

To assess the area of indirect habitat loss, flow stations will be installed on Streams 5, 8, 9, 14, 15, 16, 26, 33 and outlet of Valentine Lake (Stream 35) to monitor flows. The change in wetted perimeter will be determined for each corresponding stream based on the observed flow reduction and compared to the pre-development prediction from loss in wetted perimeter.

4.2.5 Reporting

A report documenting the post-Project area of direct and indirect loss will be provided to DFO.

4.3 OFFSETTING MONITORING

An Offsetting Plan (which includes monitoring) is required to counterbalance the residual death of fish and/or HADD of fish habitat resulting from works, undertakings or activities authorized under the *Fisheries Act*. The Offsetting Plan for the Project in intended to counterbalance effects to loss or alteration of fish habitat though the removal of submerged pulpwood from two areas along the banks of Victoria River Steady No. 5, which resulted from historic log driving practices. Victoria River Steady No. 5 is located in the RAA. The quantity of pulpwood (varying from 25 to 100% cover) has resulted in coarser substrates being covered and fine substrates accumulating in the interstitial spaces of coarser substrates and the pulpwood. This has reduced access to coarser preferred substrates which salmonids require to carry out their life processes. The intent of the Offsetting Plan is to increase the quantity of coarser preferred substrates for salmonids which would have been present prior to the accumulation of pulpwood.

4.3.1 Objectives

The objective of the offsetting plan is to confirm that the offsetting project is counterbalancing the residual death of fish and/or HADD of fish habitat resulting from the Project, as intended.

4.3.2 Measurable Parameters and Thresholds

Restoration of the Victoria Steady No. 5 submerged pulpwood will increase the quality or area of overall habitat for brook trout and ouananiche based on the species-specific habitat suitability indices and habitat equivalency units from the baseline condition to offset for residual adverse impacts to fish and fish habitat that has resulted from the Project.

Fish and fish habitat indicators and performance targets will be used to monitor the effectiveness of the offsetting project in achieving its intended benefits to fisheries productivity in the Exploits River watershed, and in fulfilling the requirements of the *Fisheries Act* Authorization for the Project.

The offsetting plan proposes to offset the HADD of fish habitat resulting from the Project (17,953 m^2), through the restoration of up to of 20,661 m^2 of habitat equivalent units (HEU) of salmonid habitat in Victoria River Steady No. 5 via the removal of submerged pulpwood. The quantifiable habitat target by which offsetting will be evaluated is HEU prior to restoration compared to HEU post-restoration, with biological monitoring supporting the habitat targets to document fish use of the habitat. Existing habitat equivalency and suitability metrics for brook trout and ouananiche in Newfoundland and Labrador (i.e., McCarthy et al. 2007, Grand and Lee 2004) will be used to assess the performance of the offsetting project restoration activities on fish habitat by comparing the HEU for various life stages of salmonids prior to restoration and post-restoration. The habitat suitability index (HSI) will be calculated using the percentage of submerged pulpwood and substrate. The HSI value will then be multiplied by the area of restoration to determine HEU.

Fish populations within the area of restoration in Victoria River Steady No. 5 will be monitored to assess the performance of the offsetting project restoration activities. The monitoring of fish populations will include redd surveys to document salmonid spawning activity, as well as electrofishing and/or fyke trapping, to provide estimates of relative abundance or population estimates for various life stages of fish.

A table of physical habitat indicators, fish abundance indicators, measurable parameters and performance targets for the stream restoration activities are provided in Table 4.3.

Table 4.3 Measurable Parameter and Performance Targets for the Offsetting Opportunity

Indicator	Measurable Parameter	Performance Target
Substrate	Percentage of fines (e.g., silt, clay, muck), sand, gravel, cobble, rubble, boulder, and bedrock	Reduction in fine substrates; increase in sand, gravel, cobble, rubble, and boulder
Submerged Pulpwood	Percentage of natural substrate covered by submerged pulpwood	Reduction in percent cover of submerged pulpwood
Habitat Equivalency	Habitat suitability/equivalency for brook trout and ouananiche	Increase in suitable habitat area (m^2) for brook trout or ouananiche
Adult Reproduction (Salmonids)	Number of redds	Increase in the number of redds and use of habitat for spawning
Fish Abundance (Salmonids)	Catch per unit effort, or relative abundance (if fyke trapping or qualitative electrofishing methods are used) Density (# fish per m^2) of young of the year, juvenile and adult life stages (if quantitative electrofishing methods are used)	Increase in the number of young of the year, juvenile, or adult life stages and use of habitat for life processes

4.3.3 Sampling Locations and Timing

The monitoring locations include the area of restoration in Victoria River Steady No. 5 and a reference area. The area of restoration is located on Victoria River Steady No. 5. The reference area will be located on Victoria River, upstream or downstream of the area of restoration.

Habitat monitoring within the area of restoration will be conducted prior to the habitat restoration taking place, to document baseline conditions and following the habitat restoration to document habitat improvements over time. The monitoring will take place during the low-flow season so that the river bottom can be visually assessed more effectively.

Fish abundance monitoring will be completed during the summer low flow period in conjunction with the habitat monitoring and will consist of backpack electrofishing and/or fyke netting. Redd surveys will be conducted during the fall (October or November).

4.3.4 Methods

The proposed monitoring plan is a before-after study for the habitat monitoring and a before-after-control-impact (BACI) study for the biological monitoring.

4.3.4.1 Habitat Monitoring

The study will assess physical stream parameters including water depth, substrate, submerged pulpwood, aquatic vegetation composition, water velocity and riparian vegetation composition to inform changes in fish habitat quality. There are no anticipated changes in flow or channel morphology, however water level, stream velocity and water temperature will be monitored to assess environmental conditions which may affect fish populations.

The baseline and post-restoration monitoring areas will include two areas located on both the left and right sides of the river. A minimum of ten transects will be established across Victoria River Steady No. 5 within the area of restoration (spaced approximately 30 m apart). Along each transect sampling quadrats will be spaced every 10 m within the proposed area of restoration. It is anticipated that approximately 100 sampling quadrats will be assessed (Figure 4.1). The same locations will be monitored for the baseline and post-construction monitoring to make accurate before and after comparisons.

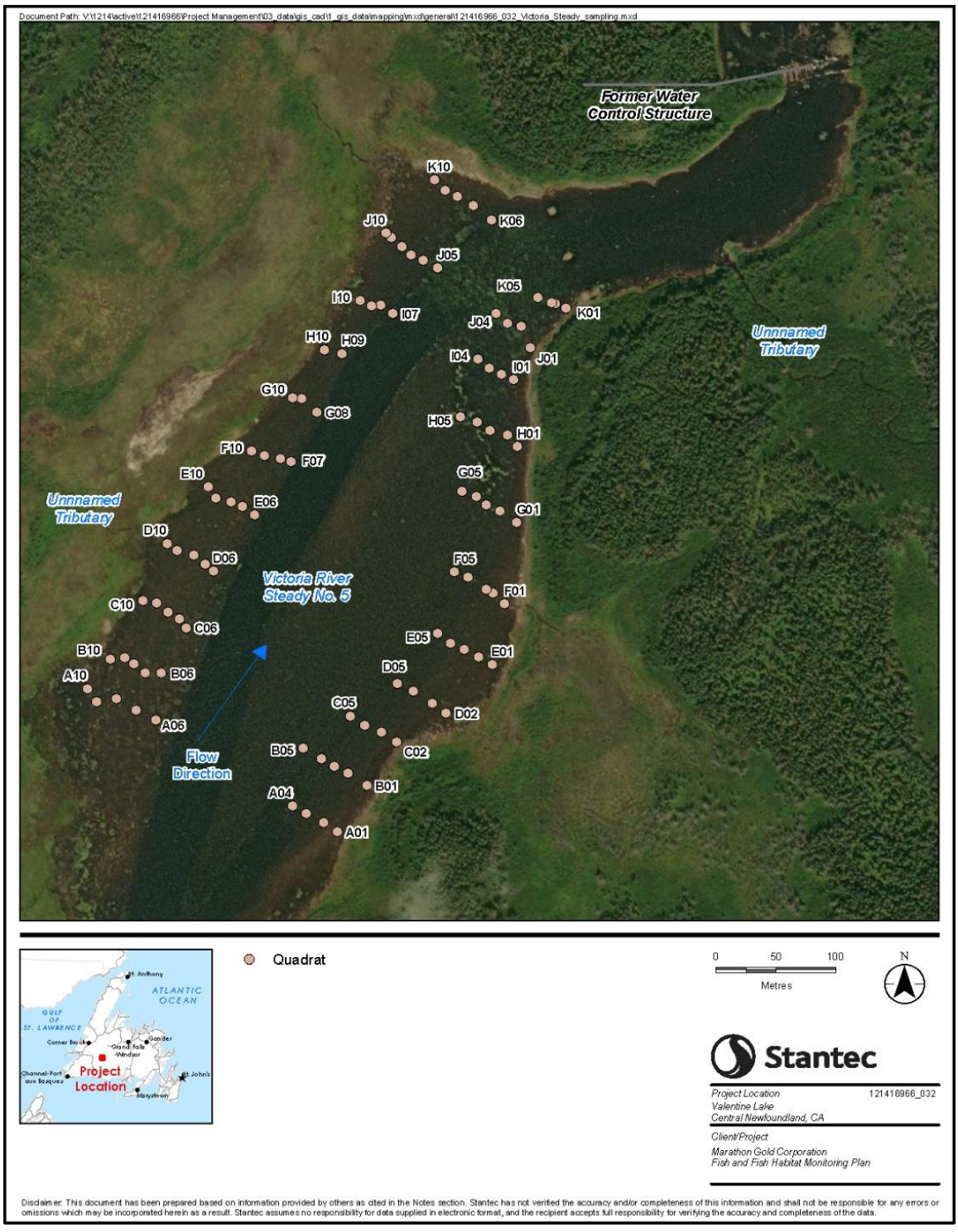

Figure 4.1 Habitat Monitoring Locations Within the Area of Restoration on Victoria River Steady No. 5

4.3.4.2 Biological Monitoring

Fish abundance monitoring for young of the year, juvenile, or adult life stages will consist of backpack electrofishing and/or fyke netting, while use of reproductive habitat will be assessed using redd surveys. Biological monitoring will be conducted within the area of restoration prior to restoration activities taking place, and at both the area of restoration and reference area, after restoration is completed.

Fyke netting, will consist of four fyke net sets, fished overnight and perpendicular to shore in shallow (<2 m) water. Fyke nets will be spaced approximately 200 m apart and in roughly the same locations during all monitoring events. The location and soak time of nets will be recorded. Ouananiche and brook trout will be measured, weighed, and released. Sticklebacks will be counted and weighed as a batch.

Quantitative electrofishing in the area of restoration will be conducted pre-restoration (if it can be conducted safely) and post-restoration. Barrier nets will be installed to isolate an area of approximately 200 m^2 within the steady (Sooley et al. 1998). A minimum of four passes will be completed and the effort and number of fish per pass will be recorded. Ouananiche and brook trout will be measured (fork length), weighed, and released outside the barricaded area. Sticklebacks will be counted and weighed as a batch. If quantitative electrofishing cannot be safely implemented pre-restoration (as a result of water depths, slippery logs or mucky substrates), qualitative electrofishing will be undertaken along the river margin at locations deemed safe to fish.

The redd surveys will be conducted during the fall (October or November) over one day, once the peak spawning period of brook trout and ouananiche, have occurred. The redd survey will be completed visually, by boat.

The approximate set locations of fyke nets, quantitative electrofishing and redd survey in the restoration area are shown on Figure 4.2.

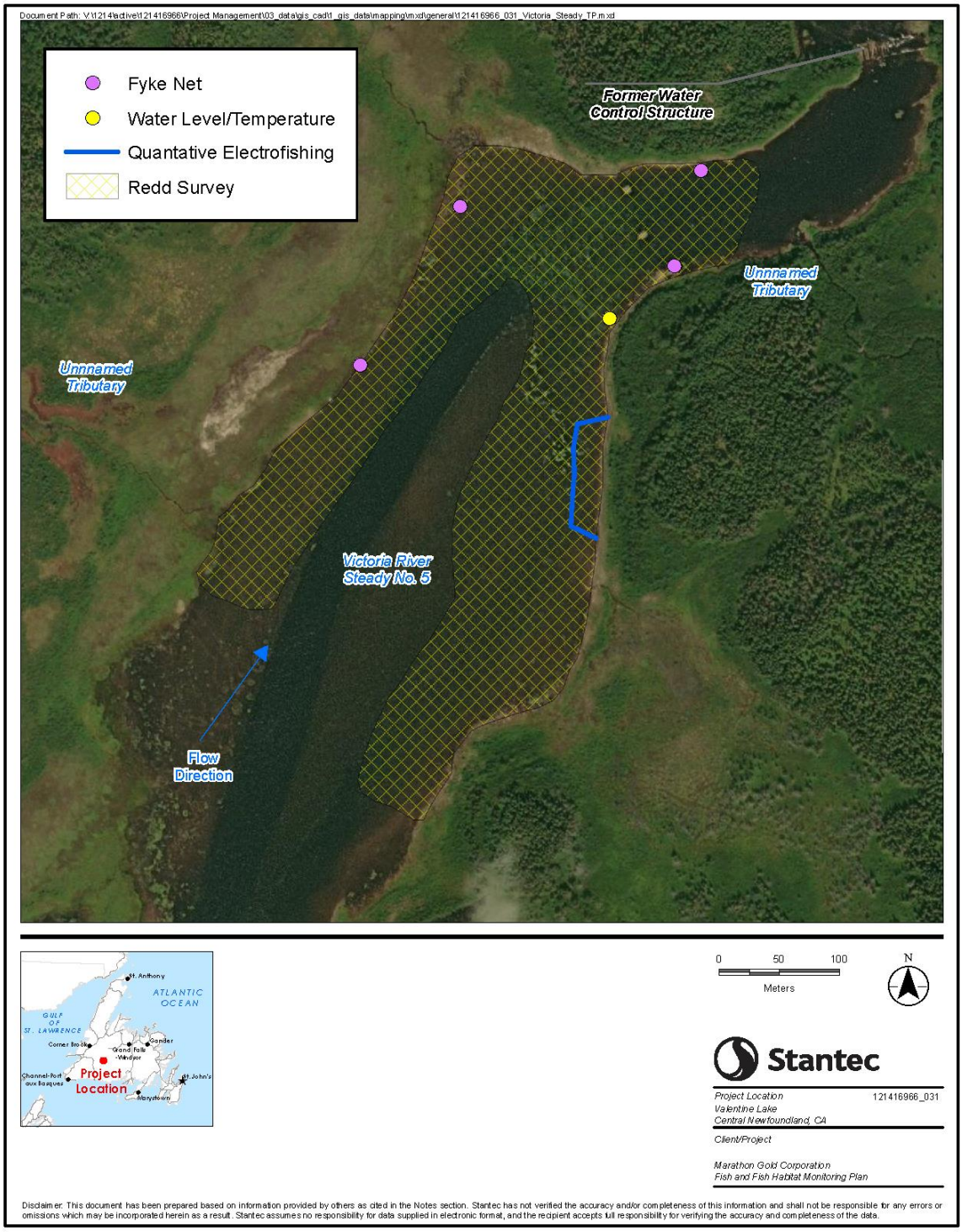

Figure 4.2 Proposed Biological Monitoring Locations Within the Area of Restoration on Victoria River Steady No. 5 Schedule

4.3.4.3 Schedule

The monitoring schedule is outlined in Table 4.4.

Table 4.4 Schedule of Restoration, Monitoring and Reporting Activities

Activity	Location	Year							
		Year -1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		2022	2023	2024	2025	2026	2027	2028	2029
Restoration/As-Built	Victoria River Steady No. 5	-	√	-	-	-	-	-	-
Habitat Monitoring	Victoria River Steady No. 5	Completed in 2021	-	√	√	√	-	√	√
	Reference Area*	-	-	-	-	-	-	-	-
Biological Monitoring	Victoria River Steady No. 5	√	-	√	√	√	-	√	√
	Reference Area	-	-	√	√	√	-	√	√
Reporting	Victoria River Steady No. 5 and Reference Area(s)	Dec 31	Dec 31	Dec 31	Dec 31	Dec 31	-	Dec 31	Dec 31

Note:

* Although no pre and post habitat monitoring using transects and quadrats are proposed at the reference area, a general habitat survey and supporting environmental measurements will be collected to assess fish habitat usage (i.e., biological parameters) in association with the biological monitoring.

The proposed schedule is intended to allow sufficient time for a measurable change in physical habitat and biological parameters and subsequent habitat quality and fish habitat utilization improvements.

4.3.5 Reporting

The results of the offsetting project will be documented through the following deliverables:

1. A baseline pre-restoration report documenting pre-restoration habitat conditions and existing habitat utilization within the area of restoration on Victoria River Steady No. 5. The report will include site layout maps, photos, quantification of baseline fish habitat indicators (e.g., physical parameters, habitat equivalency for both ouananiche and brook trout) and biological indicators (i.e., number of redds and estimates of fish abundance or density/biomass). An assessment of potential reference areas will also be included. Indicators may be modified following baseline data collection, with approval from DFO. The reports will be submitted to DFO by December 31, 2022.
2. A report documenting the submerged pulpwood removal activities within the area of restoration (Year 0). The report will contain an as-built drawing showing the area of restoration, quantity of submerged pulpwood removed, coordinates, and photos of the restoration. The report will be submitted to DFO by December 31, 2023.
3. Five post-restoration reports (Year 1, 2, 3, 5 and 6) documenting habitat conditions and fish habitat utilization within the area of restoration on Victoria River Steady No. 5 and a reference area. The report will include site maps, photos, quantification of fish habitat indicators (e.g., physical parameters and habitat equivalency) and biological indicators (i.e., number of redds or estimates of fish abundance or density/biomass). The post-restoration data will be compared to the pre-restoration and/or post-restoration data in the two monitoring areas over time, as applicable. The reports will be submitted to DFO by December 31 of the year field work is conducted.

4.4 BIOLOGICAL MONITORING STUDIES UNDER MDMER

Mines regulated under MDMER are required to conduct EEM studies as part of their authority to deposit effluent. Part 1 of MDMER outlines the requirements for mines to conduct compliance monitoring consisting of effluent characterization, sublethal toxicity testing of effluent, and acute lethality testing for FDPs as well as water quality monitoring of exposure and reference locations. Part 2 of MDMER outlines the requirements for the design, implementation and reporting requirements for biological monitoring studies. Biological monitoring studies may include a fish population study, a BIC study, and fish tissue studies for mercury and/or selenium, depending on if the associated triggers for these studies are met.

The effluent compliance monitoring (Schedule 4, MDMER), sublethal toxicity testing, acute lethality testing and water quality monitoring are described in the Surface Water Monitoring Plan. The locations of the surface water quantity monitoring sites for effluent compliance monitoring are provided in Appendix B of the Valentine Gold Project: Surface Water Follow-up Monitoring Program. In the event of a regulatory exceedance, the Accidents and Malfunctions Prevention and Response Plan describes the immediate response and monitoring associated with unplanned events. The Fish and Fish Habitat Follow-up Monitoring Program focuses on the biological monitoring under MDMER which assesses the effects of

mine effluent on the aquatic receiving environment. The locations of the biological monitoring studies under MDMER will be determined in consultation with ECCC.

The main components of the biological monitoring under MDMER Part 2 of Schedule 5 are:

- a study respecting the fish population
- a study respecting the BIC
- a study respecting mercury in fish tissue
- a study respecting selenium in fish tissue

The components of the biological monitoring vary depending on effluent deposition within the receiving environment.

A fish population study is required if, during a period in which there is effluent deposited, the highest concentration of effluent in the exposure area (i.e., receiving environment) is greater than 1% at any location that is 250 m downstream from a FDP.

A BIC study is required if, during a period in which there is effluent deposited, the highest concentration of effluent in the exposure area, is greater than 1% at any location that is 100 m downstream from a FDP.

A fish tissue study for mercury is required if effluent characterization reveals an annual mean concentration of total mercury in the effluent that is equal to or greater than 0.10 µg/L, based on a calendar year or at least two of four effluent samples in a calendar year is equal to or greater than 0.10 µg/L.

A fish tissue study for selenium is required if effluent characterization reveals an annual mean concentration of total selenium in the effluent that is equal to or greater than 10 µg/L, based on a calendar year or at least two of four effluent samples in a calendar year is equal to or greater than 5 µg/L.

4.4.1 Objectives

The objective of the Valentine Gold EEM biological monitoring is to evaluate the effects of mine effluent discharged from the Valentine Gold Mine FDP on the fish and benthic invertebrate populations present in the receiving environment. The specific objectives for each biological monitoring component are described below:

1. The objective of the fish population survey is to determine whether mine effluent is influencing growth, reproduction (energy use), condition (energy storage), or survival of local resident fish species via a lethal or non-lethal study design.
2. The objective of the fish tissue study is to determine whether mine effluent is resulting in higher concentrations of total mercury or selenium in fish tissue as compared to a reference area.
3. The objective of the BIC survey is to assess the effects of the mine effluent on the density, taxa richness, evenness and similarity of the BIC. An effect is defined as a statistically significant difference in required endpoints between the BIC in the exposure area as compared to reference area(s).

4.4.2 Measurable Parameters and Thresholds

The measurable parameters and thresholds for assessing effects for EEM biological monitoring are prescribed in Metal Mining Technical Guidance for EEM (TG) (EC 2012) and in MDMER. A high-level summary is provided below for each monitoring component.

Table 4.5 summarizes the effect indicators, effect indicator measurable parameters, associated supporting indicator measurable parameters and critical effect sizes (i.e., thresholds) for the lethal fish survey.

Table 4.5 Lethal Fish Survey Effect Indicators

Effect Indicator	Effect Indictor Measurable Parameter	Supporting Indictor Measurable Parameter	Critical Effect Size
Growth (Energy Use)	• Size-at-age (body weight against age)	• Body Weight • Length • Size-at-age	±25%
Reproduction (Energy Use)	• Relative gonad size (gonad size against body weight)	• Relative gonad size (gonad weight versus body weight) • Relative fecundity (# eggs per female versus body weight) • Relative fecundity (# eggs per female versus length) • Relative fecundity (# eggs per female versus age) • Relative egg size (mean egg weight versus age)	±25%
Condition (Energy Storage)	• Body weight relative to length • Relative liver size (liver size against body weight)	• Relative liver size (liver weight versus body weight) • Relative egg size (mean eggs weight versus body weight)	±10%
Survival	• Age	• Age	±25%

An effect of mine effluent on the fish population is defined as a statistically significant difference in effect indicators between fish population measurements taken in exposure and reference areas. If statistically significant differences are found between exposure and reference areas, the magnitude of the effect will be calculated and compared to the critical effect size for each effect indicator, as per MDMER. Effect indicators above the critical effect size may be indicative of higher risk to the environment.

Under MDMER, the measurable parameters for fish tissue studies are tissue concentrations of total mercury (wet weight) and total selenium (dry weight) in the fish tissue. An effect on fish tissue from mercury means measurements of concentrations of total mercury that exceed 0.5 µg/g wet weight in fish tissue taken in an exposure area and that are statistically different from and higher than the concentrations of total mercury in fish tissue taken in a reference area. Under MDMER there is no definition for an effect on fish tissue from selenium.

Table 4.6 summarizes the effect indicators, effect indicator measurable parameters and critical effect sizes (i.e., thresholds) for the BIC survey.

Table 4.6 Benthic Invertebrate Community Survey Effect Indicators

Effect Indicator	Effect Indicator Measurable Parameter	Critical Effect Size
Total Invertebrate Density	• Total number of individuals collected in a sample expressed per unit area	± 2SD
Taxonomic Richness (Family)	• Number of distinct taxa, at the family level	±2 SD
Simpson's Evenness Index	• Simpson's Evenness Index - the distribution of individuals among sampled taxa in a range from 0 to 1	±2 SD
Bray-Curtis Similarity Index	• Multivariate Mantel test using Bray-Curtis dissimilarity matrices (Legendre & Legendre 2012)	±2 SD

An effect on the BIC means a statistical difference between prescribed benthic invertebrate community effect endpoints taken in an exposure area and a reference area (e.g., control/impact design) or a statistical difference between effect endpoints taken at sampling areas in the exposure area that indicate gradually decreasing effluent concentrations (e.g., a gradient design). If statistically significant differences are found, the magnitude of the effect size will be calculated for each effect endpoint as a percentage of the reference mean and compared to the relevant critical effect size for the effect endpoint (Table 4.5), as per MDMER.

4.4.3 Sampling Locations and Timing

The EEM monitoring plan will use a control-impact study design, to assess the effects of mine effluent within the Victoria Lake Reservoir, as compared to one or two reference areas. Specific sampling locations (e.g., net sets or BIC stations within each lake) will be determined on site and in similar areas to the baseline EEM monitoring program.

EEM studies are required to be conducted in phases with one phase every three years. Phases can extend to six years if there are no effects detected in biological endpoints in the previous two phases.

The biological studies would be conducted in late August to September, which is a suitable time of year to measure gonad size and developing eggs (size and fecundity) of salmonids because since they are fall spawners. Sampling in the early fall will also provide more mature forms of benthic invertebrates for identification.

4.4.4 Methods

4.4.4.1 Fish Population Study

The proposed study will be a standard lethal survey that targets two local resident fish species at one Exposure Area (Victoria Lake Reservoir) and one or two reference locations. Following the TG (EC 2012), 20 mature males and 20 mature females of each of the two sentinel species will be targeted from each location for dissection. The baseline EEM monitoring program determined ouananiche, Arctic charr and potentially brook trout would be suitable sentinel species for Victoria Lake Reservoir.

As specified in the Metal Mining Technical Guidance Document (EC 2012) the lethal fish biological information collected will include:

- Length (fork or total or standard)
- Total body weight (fresh)
- Aging structure for age
- Sex
- Abnormalities (i.e., lesions, tumors, parasites, other)
- Gonad weight (if fish are sexually mature)
- Fecundity (if fish are sexually mature)
- Egg size (if fish are sexually mature)
- Liver Weight

4.4.4.2 Fish Tissue Mercury and Selenium

The fish tissue study for mercury and selenium will target one local resident fish species at one exposure area (Victoria Lake Reservoir) and one or two reference areas. Skinless, boneless muscle fillets will be removed and placed in appropriate plastic bags. Tissue samples will be submitted to a laboratory and analyzed for several parameters, including a complete scan for metals (including mercury), lipids (i.e., crude fat), and moisture.

Wet weight mercury and dry weight selenium concentrations in tissue will be reported as per the MDMER and the TG (EC 2012).

4.4.4.3 Benthic Invertebrate Community

Five replicate samples will be collected at each reference area and exposure area using a Petite Ponar (grab sampler). Replicate samples will be collected a minimum of 20 m apart in water of consistent depth. Each replicate sample will consist of three composited subsamples with each subsample collected a minimum of 5 m apart. Samples will be sieved and preserved as specified in the TG (EC 2012). Benthic invertebrates will be sorted, identified to the family level, and counted by a qualified benthic taxonomist.

The four effect endpoints total invertebrate density, family richness, Simpson's Evenness Index and Bray-Curtis Similarity Index will be calculated as per the MDMER, the TG (EC 2012) or additional guidance from ECCC.

4.4.4.4 Supporting Environmental Variables

A habitat survey will be conducted at each area to document and confirm aquatic habitat conditions.

In situ water quality information to be collected in each area includes dissolved oxygen (mg/L and %), pH, water temperature (°C), and conductivity (µs/cm) will be collected using a multi parameter probe.

Water samples will be collected from near surface and near bottom at one station within each sampling area. Water samples will be submitted for analysis and will include general chemistry, total metals, total mercury, total suspended solids, radium 226, and cyanide. Ten percent of samples will be submitted for quality assurance and quality control (QAQC), including one field duplicate, one field blank, and one trip blank.

Sediment samples will be collected at both the exposure and reference areas. One field duplicate will be submitted for QAQC purposes. Sediment samples will be analyzed for trace metal concentrations including mercury, particle size distribution and total organic carbon.

4.4.5 Reporting

The Phase 1 EEM Study Design is required to be submitted to ECCC within 12 months of the mine becoming subject to MDMER. Subsequent study designs must be submitted at least 6 months prior to the field program commencing.

The Phase 1 EEM Interpretive Report is required within 36 months of the mine becoming subject to MDMER. An interpretive report will be prepared and submitted to ECCC which provides the results of the biological monitoring studies, methods and results as prescribed under the Schedule 5, Part 2. Once finalized, biological data as well as supporting environmental variables will be entered in ECCC's Single Window Information Management system, as required by ECCC. Subsequent interpretive reports are required no later than 36 months after the day the previous interpretive report was submitted.

4.5 SPRING LITTORAL INDEX NETTING PROGRAM

The spring littoral index netting program (SLIN) was designed to fulfill the NL condition of EA release which requires that Marathon "submit a Fish Data Collection Plan for the approval of the FFA - Wildlife Division by May 1, 2022". The "Valentine Gold Baseline Spring Littoral Index Netting Program Study Design" was submitted to FFA on April 28, 2022.

4.5.1 Objectives

The objective of the SLIN program is to monitor the diversity and relative abundance of fish species (or morphos of those species) in Victoria Lake Reservoir and Valentine Lake in the event at there are unforeseen effects of the Project or an accident or malfunction.

4.5.2 Measurable Parameters and Thresholds

Table 4.7 Measurable Parameter and Performance Targets for the Offsetting Opportunity

Indicator	Measurable Parameter	Performance Target
Fish Diversity	Number of Species	Maintain species present in baseline fish community
Fish Abundance (Salmonids)	Catch per unit effort	Maintain baseline fish abundance
Length-frequency distribution	Proportion of population in each size class	Maintain baseline length-frequency distribution

4.5.3 Sampling Locations and Timing

Victoria Lake Reservoir and Valentine Lake are the sampling locations for the SLIN program (Figure 4.3 and 4.4). The program will take place spring (May or June), preferably prior to water temperatures reaching 13˚C. The monitoring frequency will be every three years or at an alternate frequency approved by the FFA – Wildlife Division.

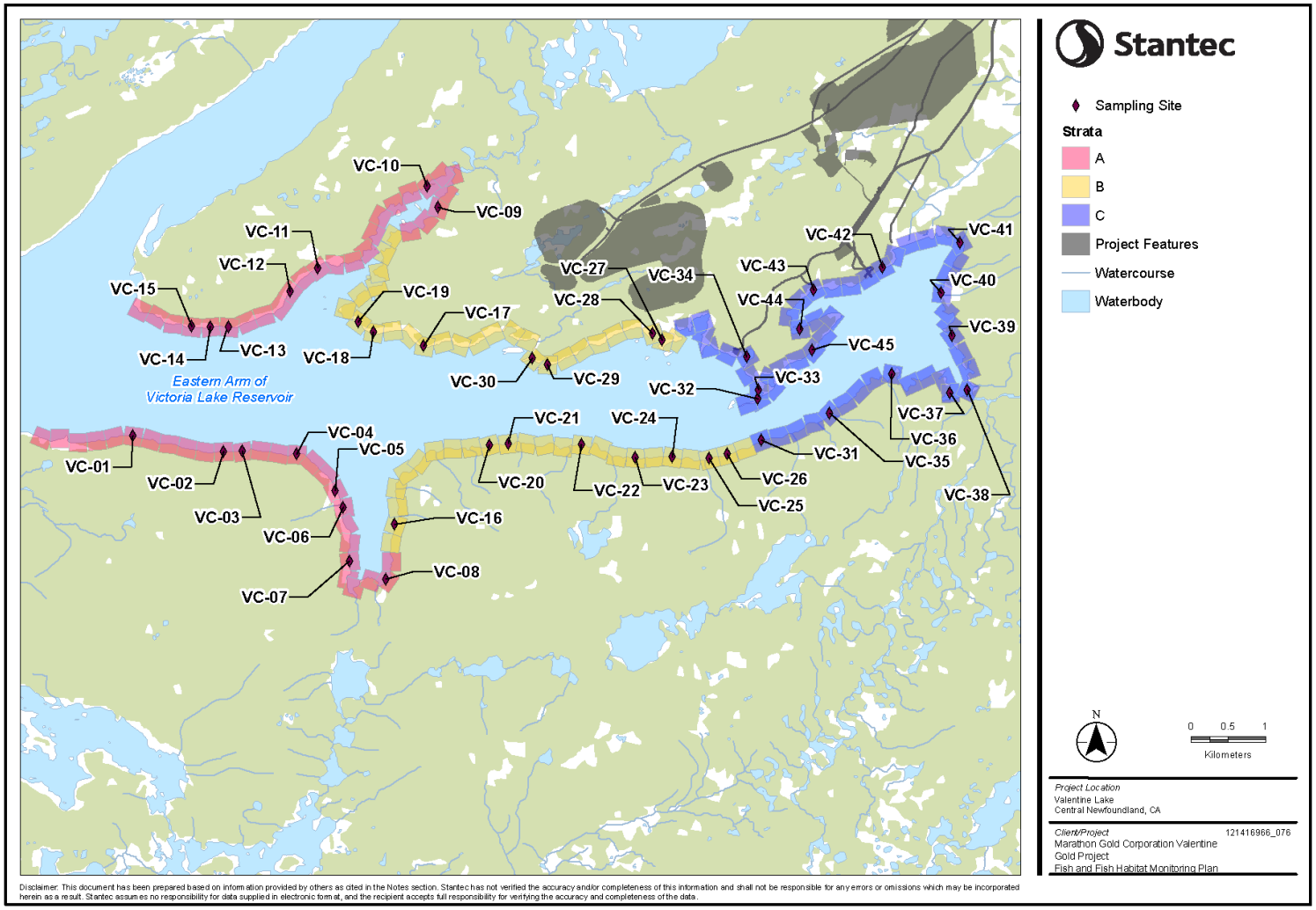

Figure 4.3 Sampling Strata and Randomized Sampling Sites on Victoria Lake Reservoir

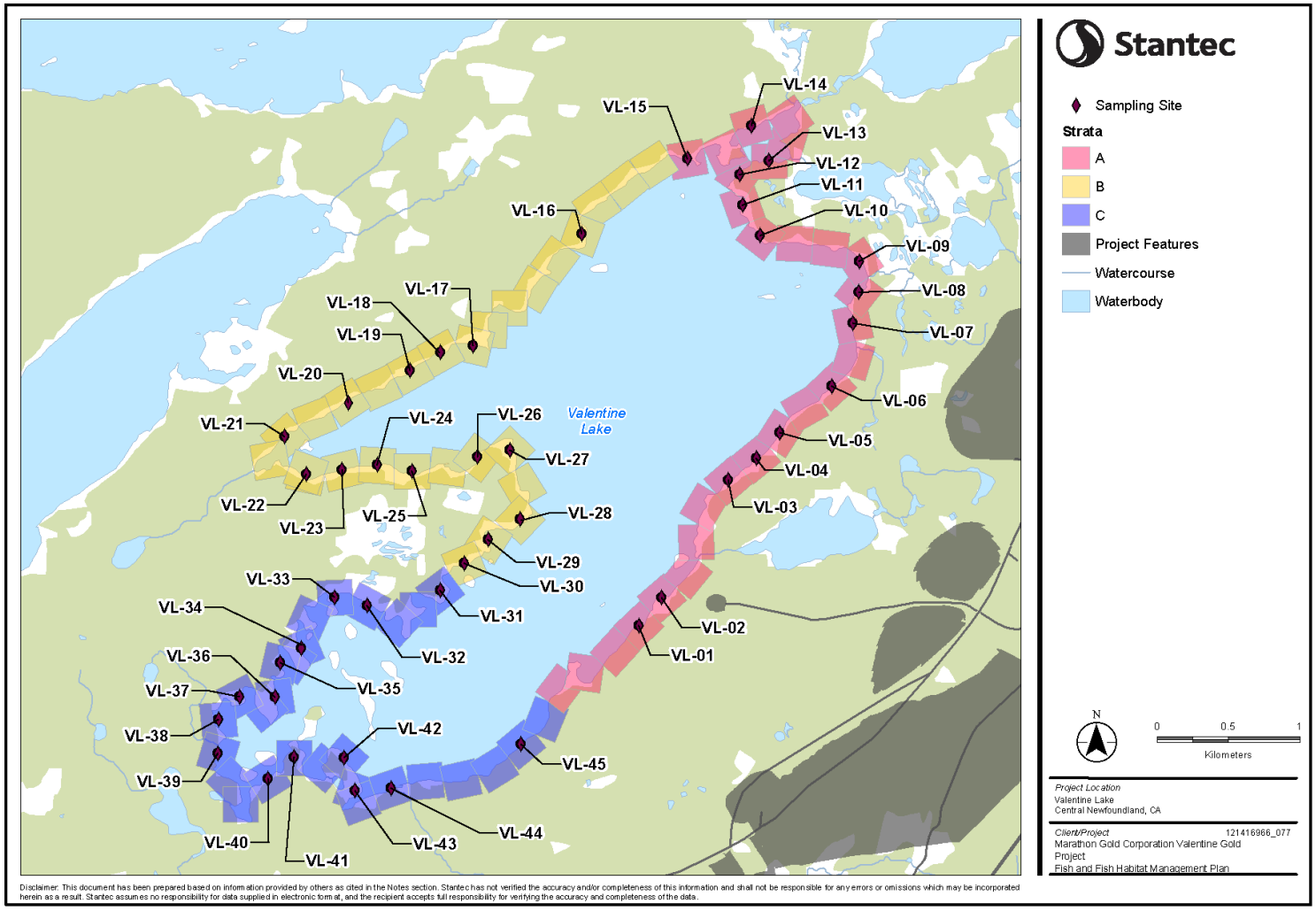

Figure 4.4 Sampling Strata and Randomized Sampling Sites on Valentine Lake

4.5.4 Methods

The sampling sites will be determined using a random sampling design to reduce bias in locating sites and setting gear (Stantec 2022). A maximum of 30 net sets will be completed in each lake. Gill nets will be set for 90 minutes during daylight hours after ice melt and preferably before the surface water temperatures reach 13˚C.

Gill net sets will consist of three types of six panel gangs as described below.

- 91.4 m (six 15.2 m x 2.4 m panels) of 38 mm stretched mesh
- 91.4 m (six 15.2 m x 2.4 m panels) of 51 mm stretched mesh
- 91.4 m (six 15.2 m x 2.4 m panels) of 64 mm stretched mesh

Fish will be removed from the gang as it is retrieved. Fish captured from the three nearshore panels will be placed in one tub filled with fresh lake water and fish furthest from shore will be held in a second holding tub with fresh lake water (Hicks 1999). For each fish the fork length, weight, and species will be recorded, and a scale sample will be collected. A target of 30 fish of each species will be lethally sampled from each lake for the collection of additional biological information (e.g., sex, gonad condition and observations of abnormalities, tumors, or lesions).

Up to 30 fish of each species will be targeted from each lake for a metal in fish tissue study. Samples will be submitted to a laboratory for analysis of trace metals (including total mercury), lipids and moisture content. Whole sample homogenates will be prepared for each sample.

4.5.5 Reporting

A technical data report outlining the methods and results of the 2022 SLIN Program will be submitted to NLDFFA by December 31, 2022. Subsequent reports will be provided to NLDFFA by December 31 of the survey year.

5.0 RELATED DOCUMENTS

Other environmental management plans and monitoring programs related to this follow-up monitoring program are described in Table 5.1.

Table 5.1 Related Management Plans and Monitoring Programs

Plan/Program	Details
Construction EPP	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.
Accidents and Malfunctions Prevention and Response Plan	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.
MDMER Emergency Response Plan	The MDMER Emergency Response Plan describes the measures to be taken to prevent any unauthorized deposit of a deleterious substance or to mitigate the effects of such a deposit. The MDMER Emergency Response Plan identifies potential unauthorized deposits that can reasonably be expected to occur at the mine that may result in damage or danger to fish habitat or fish or the use by man of fish. It provides a description of the measures to be used to prevent, prepare for, respond to, and recover from an unauthorized deposit. In addition, it provides the alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by an unauthorized deposit.
Surface Water Follow-up Monitoring Program	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 Fish and Fish Habitat Follow-up Monitoring Program will consider surface water monitoring results to assist with identifying the need for further mitigation and adaptive management measures.

Table 5.1 Related Management Plans and Monitoring Programs

Plan/Program	Details
Water Management Plan	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 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. The plan includes a summary of surface water monitoring activities for the Project that are outlined in this program.

6.0 REFERENCES

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APPENDIX A

Mitigation Measures: Fish and Fish Habitat

Table A.1 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Standard construction practices will be used, such as erosion and sediment control measures, placement and stabilization of excavated material, and seepage cutoff collars (pipes and culverts).	✓	-	-
	• Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Progressive erosion and sediment control measures will be implemented, as required.	✓	-	-
	• Where waste rock will be used for site earthworks and grading during construction and operational development, necessary test work will be conducted to avoid potentially acid generating materials from being used in construction.	✓	-	-
	• Cross drainage will be maintained to allow water to move freely from one side of the road to the other in areas of permanent or temporary access roads.	✓	✓	-
	• Movement of equipment / vehicles will be restricted to defined work areas and roads, and specified corridors between work areas.	✓	✓	✓
Soil Management	• Soil stockpiles will be easily accessible, on well-drained ground, and away from bodies of water (minimum of 30 metres) and standing timber. A working space of at least 5 metres will be maintained around soil stockpiles.	✓	✓	-
	• Sediment control fences will be installed in areas where topsoil is exposed to erosion and siltation, such as slopes and embankments and approaches to stream crossings or water bodies. Sediment control fences will be inspected and maintained over the course of the construction phase until the disturbed area has stabilized and natural revegetation has occurred. Non-biodegradable materials used for Sediment control fences will be removed following revegetation.	✓	✓	✓
Works In or Near Fish Habitat	• In-water work will be planned to respect DFO timing windows to protect fish in NL (DFO 2019), as required through any letter(s) of advice and *Fisheries Act* Authorizations issued for the Project.	✓	-	-
	• Siting of Project infrastructure will be designed to avoid fish habitat to the extent practicable. Where HADD of fish habitat cannot be avoided, the habitat will be offset, as required by the *Fisheries Act*, through the development and implementation of a Fish Habitat Offsetting Plan.	✓	-	-
	• Waste material (i.e., organic waste material, waste rock or construction debris) material will be stabilized or contained.	✓	✓	✓

Table A.1 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Works In or Near Fish Habitat	• Weather advisories will be followed, and work will be scheduled to avoid high precipitation and runoff events or periods, which could increase potential for erosion/sedimentation.	✓	-	✓
	• The duration of instream works will be minimized. In-water worksites will be isolated from flowing water (i.e., by using a cofferdam) to contain or reduce suspended sediment where possible. Clean, low permeability material and rockfill will be used to construct cofferdams. When possible, machinery will be operated above the high-water mark or inside of isolated areas.	✓	-	-
	• Minimum flows will be maintained in watercourses where practicable. Where HADD of fish habitat cannot be avoided, habitat alternation, disruption or destruction will be offset. New culverts will be sized appropriately and designed to be passable to fish to maintain fish passage.	✓	-	-
	• Use of explosives in or near water will be avoided, however, if required, will follow DFO blasting guidelines.	✓	-	-
	• Best efforts will be made by a qualified environmental professional to relocate fish from areas of in-water works or areas of water drawdown to an appropriate location in the same watershed, as required through any letter(s) of advice and *Fisheries Act* Authorizations issued for the Project.	✓	-	-
	• Fish screens and/or other barriers will be installed and maintained to prevent fish from entering water withdrawal intakes.	✓	✓	✓
Air Emissions	• An Air Quality Management Plan will be developed and implemented as part of the EPP. The Air Quality Management Plan will specify the mitigation measures for the management and reduction of air emissions (including fugitive dust) during Project construction and operation.	✓	✓	✓
Vehicles / Equipment / Roads	• Haul roads, site roads and the access road will be maintained in good condition. This will include periodic regrading and ditching to improve water flow, reduce erosion, and to manage vegetation growth.	✓	✓	✓
Site Water Management	• Marathon will implement a Water Management Plan for the site which will incorporate standard management practices, including drainage control, excavation and open pit dewatering which collectively comprise the water management infrastructure currently designed as part of the Project scope (Section 2.3.5). The Water Management Plan provides detail on runoff and seepage collection strategies and systems (e.g., local seepage collection ponds, berms, drainage ditches, pumps) to collect and contain surface water runoff and groundwater discharge from major Project components (open pit, waste rock piles, TMF, ore stockpile and overburden storage areas, process plant) during climate normal and extreme weather conditions.	ü	✓	✓

Table A.1 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Site Water Management	• Progressive water management will be implemented over the life of the mine. This includes construction of water management infrastructure as an area is developed and decommissioning / rehabilitation of water management infrastructure as an area is decommissioned.	✓	✓	✓
	• Existing drainage patterns will be maintained to the extent feasible with the use of culverts and bridges.	✓	✓	-
	• Project water storage features (i.e., sedimentation ponds) will be used to attenuate peak discharges to the environment.	✓	✓	✓
	• Precipitation runoff from waste rock piles and other developed areas of the site will be collected via ditches and channels and directed to downstream sedimentation ponds.	✓	✓	-
	• Site ditching will be designed to reduce erosion and sedimentation through use of rock check dams, silt fences, plunge pools, and grading as appropriate.	✓	✓	✓
	• Snow will be cleared from ditches prior to the spring thaw, as practicable, to maintain the designed capacity of ditches and ability to convey surface runoff.	✓	✓	-
	• Culverts will be inspected periodically to remove accumulated material and debris upstream and downstream of the culverts.	✓	✓	✓
	• Contact water collection ditches will be installed around the overburden stockpiles, ore stockpiles and waste rock piles to collect toe seepage. Contact water collection ditches will be designed to convey the 1:100-year storm event, and with positive gradients to limit standing water and maintain positive flow.	✓	✓	✓
	• Non-contact water will be diverted away from developed areas, where possible. Channels and berms will be constructed around the crest of the open pits or uphill of waste rock piles and other developed areas to divert natural precipitation and surface runoff away from contact with mining operations, where practicable.	✓	✓	✓
	• Runoff and groundwater seepage will be collected from the open pits, with water pumped to sedimentation ponds before being discharged to each pits' pre-development watershed area.	-	✓	-
	• Pond inlet and outlet structures will be configured to reduce inlet velocity and scour, and to meet sedimentation requirements. Pond outlets will be designed with subsurface inlets to mitigate against chemical stratification in ponds, thermal heating of discharge and ice blockage of outlets.	✓	✓	✓
	• Contact water sedimentation ponds will be designed to provide onsite storage of local runoff with the size and residence times designed to provide sediment removal to meet the MDMER effluent total suspended solids criterion of 15 mg/L (monthly mean concentration limit), with removal of particles down to 5 micron (µ) in size for up to the 1:10 Annual Exceedance Probability (AEP) flows.	✓	✓	✓

Table A.1 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Site Water Management	• Sedimentation ponds will be designed to contain (without discharge) runoff resulting from storm events up to the 1:100 year AEP with spring snowmelt event, including emergency spillways and maintaining minimum freeboard of 0.5 m. The emergency spillways will accommodate flows up to the 1:200 AEP flow.	✓	✓	✓
	• Sedimentation ponds will be designed with active water storage that considers ice thickness during winter. Under an extreme storm event, only the stormwater in excess of the available storage at that time will be discharged to the environment via the emergency spillway to protect the collection ponds.	✓	✓	✓
	• Effluent will be treated prior to discharge to the receiving water environment, as required, to meet regulatory effluent criteria as well as criteria developed through the receiving water Assimilative Capacity Assessment (Appendix 7C).	✓	✓	✓
	• Effluent discharge rates will be maintained to below the highest rate used in the Assimilative Capacity Assessment (Appendix 7C).	✓	✓	✓
Tailings Management	• The dams required for the tailings impoundment will be designed, constructed, operated, and closed in accordance with the Canadian Dam Association and Mining Association of Canada guidelines, Global Industry Standards on Tailings Management, as well as all applicable provincial requirements.	✓	✓	✓
	• Vegetation will be cleared within the TMF tailings containment zone prior to filling/flooding to reduce potential generation of methyl mercury (MeHg) water quality concerns.	✓	✓	✓
	• Shallow groundwater seepage from the TMF will be intercepted by seepage collection ditches and pumped back to the TMF via sump pumps.	✓	✓	✓
	• 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.	-	✓	-
	• A water treatment plant will receive discharge water from the tailings pond and use proven processes to treat the water to meet MDMER limits prior to discharge to the polishing pond and subsequent discharge to the environment.	-	✓	-
	• As required by MDMER, a tailings / effluent emergency response plan will be developed, which will outline how a failure or malfunction of the TMF resulting in a release of tailings or tailings effluent will be managed.	-	✓	-
Materials Handling and Waste Management	• Sewage effluent will be treated and monitored in accordance with the NL *Environmental Control Water and Sewage Regulations* prior to discharge to the environment. Sludge generated as a by-product of the treatment of sewage will be disposed off-site by a licensed contractor.	✓	✓	-
	• Temporary use of existing sanitary sewage system at the exploration camp will be supplemented with mobile sanitary sewage storage facilities until the mine site system is operational.	✓	-	-

Table A.1 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Materials Handling and Waste Management	• Reagents will be stored and handled within containment areas designed to hold more than the content of the largest tank, in the event of a leak or spill. Where required, each reagent system will be located within its own containment area to avoid mixing of incompatible reagents. Storage tanks will be equipped with level indicators, instrumentation, and alarms to prevent spills.	-	✓	-
	• Fuel will be obtained from a licensed contractor who will be required to comply with federal and provincial regulations including federal *Sulphur in Diesel Fuel Regulations*, and provincial *Storage and Handling of Gasoline and Associated Products Regulations.*	✓	✓	✓
	• Fuel and hazardous materials storage on site will be a minimum of 200 m from a salmon river or tributary and 100 m from other waterbodies.	✓	✓	✓
	• Disposal and handling of waste oils, fuels and hazardous waste will be as recommended by the suppliers and/or manufacturers in compliance with federal, provincial and municipal regulations.	✓	✓	✓
	• Fuels and lubricants will be stored according to regulated containment methods in designated areas. Refueling, servicing, and equipment and waste storage will not take place within 30 m of watercourses to reduce the likelihood that deleterious substances will enter watercourses. Spill kits will be maintained at locations on-site during all Project phases.	✓	✓	✓
Employment and Expenditures	• Hunting / fishing / harvesting of wildlife will be strictly prohibited on the mine site. Workers will not be permitted to hunt / fish / harvest while staying at the accommodations camp and will not be permitted to bring firearms or angling gear to site.	✓	✓	✓
Rehabilitation and Closure	• Marathon will develop a Rehabilitation and Closure Plan that meets the requirements of the NL Department of Industry, Energy and Technology, Department of Environment, Climate Change, and Municipalities, and Department of Fisheries, Forestry and Agriculture. The plan will be reviewed and updated regularly until implemented.	ü	✓	✓
Rehabilitation and Closure	• At closure, following water quality testing, sedimentation ponds will be breached to allow drainage to the surrounding areas. These features will then be graded, contoured to re-establish drainage patterns and revegetated as required.	-	-	✓
	• Pre-mining site drainage patterns will be re-established to the extent practicable.	-	-	✓
	• Passive water quality treatment technologies will be employed, where and if required, for closure / post-closure including engineered wetlands to treat site seepage and runoff, as practicable.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities