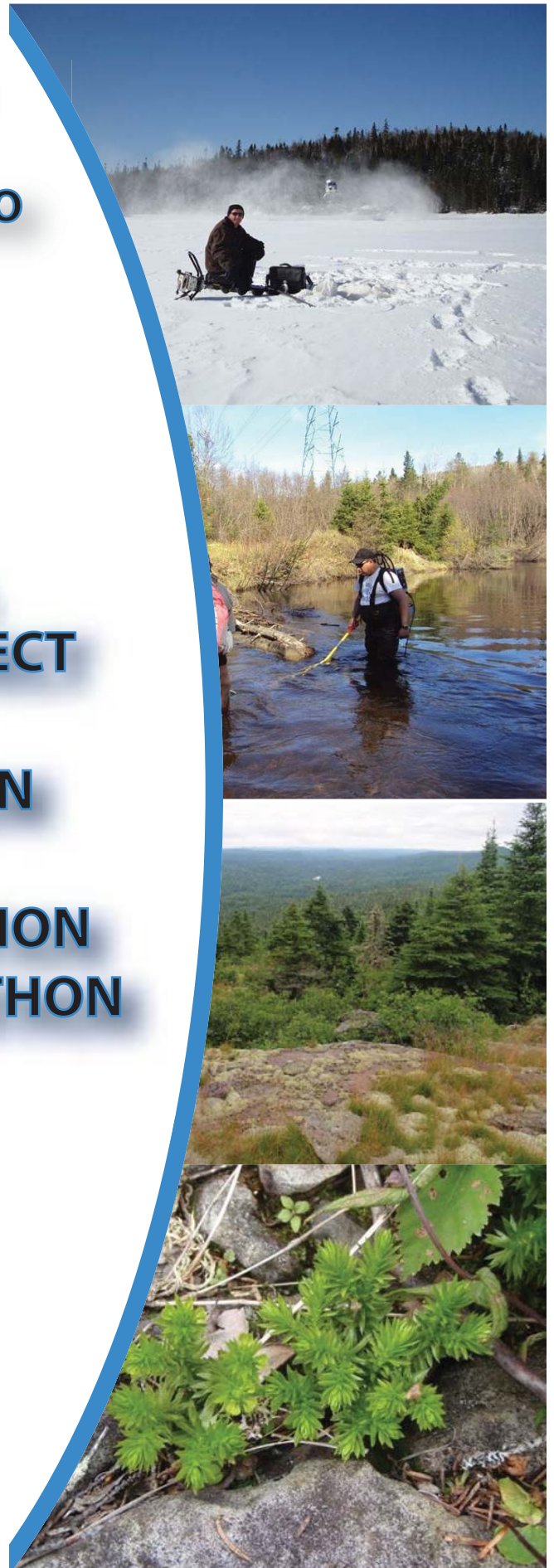


**ENVIRONMENTAL ASSESSMENT  
FOR THE MARATHON PGM-Cu  
PROJECT AT MARATHON, ONTARIO**

**STILLWATER CANADA INC.  
MARATHON PGM-Cu PROJECT**

**SUPPORTING INFORMATION  
DOCUMENT No. 7 -  
FISH HABITAT COMPENSATION  
STRATEGY FOR THE MARATHON  
PGM-Cu PROJECT**

**Prepared by:  
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## **PRELIMINARY FISH HABITAT COMPENSATION STRATEGY FOR THE MARATHON PGM- Cu PROJECT SITE**

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July 2012



## **PRELIMINARY FISH HABITAT COMPENSATION STRATEGY FOR THE MARATHON PGM- Cu PROJECT SITE**

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## EXECUTIVE SUMMARY

This document presents the preliminary Fish Habitat Compensation Strategy (FHCS) which addresses the predicted harmful alteration, disruption or destruction (HADD) to fish habitat associated with the development of Stillwater Canada Inc.'s proposed Marathon PGM-Cu Project (the Project). The Project is comprised of an open-pit copper, platinum group metals (PGMs) and possibly iron mining and milling operation with an estimated 11.5 year operating life.

The Project site is drained by six primary watersheds, four of which drain to the Pic River and two of which drain directly to Lake Superior. Water bodies and watercourses in the interior of the Project site include streams, ponds and small lakes. Many of the ponds and lakes are maintained by active or inactive beaver dams, or debris jams. The interior of the site is isolated from both the Pic River and Lake Superior by steep relief (i.e., topography) and therefore much of this area is fishless. In the instances where fish do occur, the community is most often limited to small-bodied (forage) fish.

The Project will interact both directly and indirectly with fish and fish habitat during all Project phases. Direct interactions relate to those associated with the Project development footprint. Indirect interactions relate to those where a watercourse or water body outside the Project footprint may be, for example, affected by reduced flow, as the result of water diversion on site. The primary effects of the project on fish habitat will result from the diversion of existing surface water features, removal of small lakes and streams, and the construction of road crossings.

The Project will affect approximately 9.3 hectares (ha) of aquatic habitat, of which only approximately 1.8 ha affords direct habitat (fish bearing) that will require compensation. Of this area approximately 0.35 ha affords direct habitat that will need to be compensated under section 35(2) of the *Fisheries Act*. Compensation for the additional 1.45 ha is also required under Section 27.1 of the *Metal Mining Effluent Regulations* due to loss of fish frequented habitat associated with the footprint of Process Solids Management Facility (PSMF), Mine Rock Storage Area (MRSA) and temporary mine rock stockpiles.

Fish habitat compensation opportunities include both the development of new fish habitat and enhancement of existing habitats. This conceptual fish habitat compensation strategy proposes the creation and rehabilitation of direct fish habitat of approximately 9.97 ha.



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## **1.0 INTRODUCTION**

Stillwater Canada Inc. (SCI) proposes to develop a platinum group metals (PGMs), copper (Cu) and possibly iron (Fe) open-pit mine and milling operation near Marathon, Ontario. A Notice of Commencement (NoC) of an environmental assessment (EA) in relation to the proposed Marathon PGM-Cu Project (the “Project”) was filed by the Canadian Environmental Assessment Agency (CEA Agency) under Section 5 of the Canadian Environmental Assessment Act on April 29, 2010 (updated July 19, 2010).

The EA was referred to an independent Review Panel by the Federal Minister of the Environment on October 7, 2010. On March 23, 2011 SCI entered into a Voluntary Agreement (VA) with the Province of Ontario to have the Project subject to the Ontario Environmental Assessment Act (OEA Act). This agreement was the instrument that permitted the provincial government to issue a Harmonization Order (HO) under Section 18(2) of the Canada-Ontario Agreement on Environmental Assessment Cooperation to establish a Joint Review Panel for the Project between the Minister of the Environment, Canada and the Minister of the Environment, Ontario.

The HO was issued on March 25, 2011. The Terms of Reference (ToR) for the Project Environmental Impact Statement (EIS) and the agreement establishing the Joint Review Panel (JRP) were issued on August 8, 2011.

The following provides an overview of the proposed development including its location, surrounding land uses, the exploration history of the site and the primary conceptual features of the mining and milling facilities. The information provided below, in the Environmental Impact Statement Report and supporting technical studies is based on the conceptual mine design for the Project. The conceptual design provides planning level information for the environmental assessment process. Final detailed design will commence following EA approval in concordance with the concepts presented herein.

### **1.1 Project Location**

The Project is located approximately 10 km north of the Town of Marathon, Ontario (Figure 1.1). The town, with a population of 3,353 (2011 Census), is situated adjacent to the Trans-Canada Highway 17 (Hwy 17) on the northeast shore of Lake Superior, about 300 km east and 400 km northwest (by highway) of Thunder Bay and Sault Ste. Marie, respectively.

The centre of the Project footprint sits at approximately 48° 47' N latitude and 86° 19' W longitude. The Project site is in an area characterized by relatively dense vegetation, comprised largely of a birch and, to a lesser extent, spruce-dominated mixed wood forest. The terrain is moderate to steep, with frequent bedrock outcrops and prominent east to west oriented valleys. The climate of this area is typical of northern areas within the Canadian Shield, with long winters and short, warm summers.



**Figure 1.1: Location of the Proposed Marathon PGM-Cu Project Site near Marathon, Ontario**



## 1.2 Surrounding Land Uses

The Project site lies partially within the municipal boundaries of the Town of Marathon, as well as partially within the unorganized townships of Pic, O'Neil and McCoy. The primary zoning designation within the Project Site is 'rural'.

In the immediate vicinity of the Project there are several authorized aggregate sites, including SCI's licensed aggregate site located to the northeast of Hwy 17 along the existing site access road (Camp 19 Road).

The Marathon Municipal Airport (CYSP), which operates as a Registered Airport (Aerodrome class) under the Canadian Aviation Regulations (CARs; Subsection 302), is adjacent to, and south of the Project site. The airport occupies a land area of approximately 219 hectares and is accessed from Hwy 17.

Several First Nations and Métis peoples claim the Project site as falling within their traditional land use boundaries. Based on Aboriginal accounts, prior to the construction of the forestry road, the land and water uses associated with (or close to) the site would have typically been limited to the Pic River corridor, the Bamooos Lake-Hare Lake-Lake Superior corridor and the Lake Superior shoreline and near-shore area, rather than the interior of the Project site. Traditional land and water uses (or rights conferred by Treaty) that can be ascribed to the site could include:

- Hunting;
- Trapping;
- Fishing; and,
- Plant harvesting for food, cultural and medicinal uses.

Primary industries supporting the Town of Marathon, as well as the region, have historically been forestry, pulp and paper, mining and tourism. The Project site is located within the Big Pic Forest Management Area. The Big Pic Forest includes Crown land east and north of Lake Superior and is generally north, south and west of the community of Manitouwadge and includes the communities of Marathon, Caramat and Hillsport.

Until July 2010 the forest was managed under the authority of a Sustainable Forest License (SFL), which was held by Marathon Pulp Inc. This SFL was revoked, with the forest reverting to the Crown as a Crown Forest. Until recently, Marathon Pulp Inc. (MPI) operated a kraft pulp mill in Marathon on the shore of Peninsula Harbour. The mill announced its indefinite shut down (effective at the end of February 2009) on February 11, 2009, and as a result there has been a significant downturn in the local economy. A second mill operated in Terrace Bay was temporarily closed in December 2011.

The Hemlo Mining Camp is located 30 km to the southeast. There are currently two mines in production at the Camp (David Bell Mine, Williams Mine), which are estimated to be in operations until 2025.

### **1.3 Exploration History of the Site**

Exploration for copper and nickel deposits on the Project site started in the 1920s and continued until the 1940s with the discovery of titaniferous magnetite and disseminated chalcopyrite occurrences. During the past four decades, the site has undergone several phases of exploration and economic evaluation, including geophysical surveys, prospecting, trenching, diamond drill programs, geological studies, resource estimates, metallurgical studies, mining studies, and economic analyses. These studies have successively enhanced the knowledge base of the deposit.

In 1963, Anaconda acquired the Marathon property and carried out systematic exploration work including diamond drilling of 36,531 m in 173 drill holes. This culminated in the discovery of a large copper-PGM deposit. Anaconda discontinued further work on the project in the early 1980s due to low metal prices at the time.

In 1985, Fleck purchased a 100% interest in the Marathon PGM-Cu Project with the objective of improving the project economics by focusing on the platinum group element (PGE) values of the deposit. The Fleck drilling totaled 3,615 m in 37 diamond drill holes. In 1986, H.A. Symons carried out a feasibility study for Fleck based on a 9,000 tonnes per day conventional flotation plant with marketing of copper concentrate and Kilborn Limited carried out a prefeasibility review for Fleck that included preliminary results from the Lakefield pilot plant tests (Kilborn Limited, 1987). The feasibility study indicated a low internal rate of return which was confirmed by Teck Corporation who concluded the project was uneconomic due to low metal prices at the time. On June 10, 1998, Fleck changed its name to PolyMet Mining Corp.

In 2000, Geomaque acquired certain rights to the Marathon PGM-Cu Project through an option agreement with Polymet. Geomaque and its consultants carried out a study of the economic potential of the Marathon PGM-Cu Project. The study included a review of the geology and drill hole database, interpretation of the mineralized zones, statistics and geostatistics, computerized block model, resource estimation, open pit design and optimization, metallurgy, process design, environmental aspects, capital and operating cost.

Marathon PGM Corp. acquired the Marathon PGM-Cu deposit from Polymet in December 2003. Marathon PGM Corp. funded programs of advanced exploration and diamond drilling on a continuous basis between June 2004 and 2009. Approximately 320 holes and 65,000 m were drilled from 2007 to 2009 to define and expand the resource and for condemnation holes outside of the pit area. A feasibility study was published in 2008 and updated in January 2010.

Stillwater Mining Company (SWC) and Marathon PGM entered into an agreement on September 7, 2010 pursuant to which SWC would acquire all of the outstanding shares of Marathon PGM. The acquisition agreement received ministerial approval under the Investment Canada Act on November 24, 2010 and the agreement closed on November

30, 2010. On December 31, 2010 Stillwater Mining Company formed a Canadian corporation, Stillwater Canada Inc. In March 2012, MC MINING LTD (MC) purchased 25% interest in Stillwater Canada Inc. who is the proponent of the Marathon PGM-Cu Project.

## **1.4 Project Overview**

The Project is based on the development of an open pit mining and milling operation. One primary pit and a satellite pit complex to the south (currently envisaged to be comprised of four satellite pits) are proposed to be mined. Ore will be processed (crushed, ground, concentrated) at an on-site processing facility. Final concentrates containing copper and platinum group metals will be transported off-site via road and/or rail to a smelter and refinery for subsequent metal extraction and separation. The total mineral reserve (proven and probable) is estimated to be approximately 91.5 million tonnes. It is possible that an iron concentrate may also be produced, depending upon the results of further metallurgical testing and market conditions at that time.

During the operations phase of the Project, ore will be fed to the mill at an average rate of approximately 22,000 tonnes per day. The operating life of the mine is estimated to be approximately 11.5 years. The construction workforce will average approximately 400 people and will be required for between 18 and 24 months. During operations the work force will comprise an estimated 365 workers. The mine workforce will reside in local and surrounding communities, as well as in an Accommodations Complex that will be constructed in the Town of Marathon.

Approximately 288 million tonnes of mine rock<sup>1</sup> will be excavated. It is estimated that between eighty five to ninety percent of this material is non-acid generating (NAG) and will be permanently stored in a purposefully built Mine Rock Storage Area (MRSA) located east of the primary pit. The NAG or so-called Type 1 mine rock will also be used in the construction of access roads, dams and other site infrastructure as needed. Drainage from the MRSA will be collected, stored, treated and discharged as necessary to the Pic River. During mine operations, about 20 million tonnes of mine rock could have the potential to generate acid if left exposed for extended periods of time. This mine rock is referred to as Type 2 mine rock or potentially acid generating (PAG). The Type 2 mine rock will be managed on surface during mine operations in temporary stock piles with drainage directed into the open pits. This material will be relocated to the bottom of the primary and satellite pits and covered with water to prevent potential acid generation and covered with Type 1 materials.

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<sup>1</sup> Mine rock is rock that has been excavated from active mining areas but does not have sufficient ore grades to process for mineral extraction.

Process solids<sup>2</sup> will be managed in the Process Solids Management Facility (PSMF), as well as in the satellite pit complex. The PSMF will be designed to hold approximately 61 million m<sup>3</sup> of material, and its creation will require the construction of dams. Two streams of process solids will be generated. An estimated 85 to 90% of the total amount of process solids produced will be non-acid generating, or so-called Type 1 process solids. The remaining ten to fifteen percent of the process solids could be potentially acid generating and referred to as Type 2 process solids. The Type 2 process solids will be stored below the water table in the PSMF or below water in the pits to mitigate potential acid generation and covered with Type 1 materials. Water collected within the PSMF, as well as water collected around the mine site other than from the MRSA will be managed in the PSMF for eventual reclamation in the milling process. Excess water not needed in the mill will be discharged, following treatment as is necessary, to Hare Lake.

Access to the Project site is currently provided by the Camp 19 Road, opposite Peninsula Road at Hwy 17. The existing road runs east towards the Pic River before turning north along the river to the Project site (approximately 8 km). The existing road will be upgraded and utilized from its junction with Hwy 17 for approximately 2.0 km. At this point a new road running north will be constructed to the future plant site. The primary rationale for developing the new road is to move traffic away from the Pic River. The new section of road will link two sections of forest access roads located on the site.

Power to the Project site will be provided via a new 115 kV transmission line that will be constructed from a junction point on the Terrace Bay-Manitouwadge transmission line (M2W Line) located to the northwest of the primary pit. The new transmission line will run approximately 4.1 km to a substation at the mill site. The width of the transmission corridor will be approximately 30 m.

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<sup>2</sup> Process solids are solids generated during the ore milling process following extraction of the ore (minerals) from the host material.

Disturbed areas of the Project footprint will be reclaimed in a progressive manner during all Project phases. Natural drainage patterns will be restored as much as possible. The ultimate goal of mine decommissioning will be to reclaim land within the Project footprint to permit future use by resident biota and as determined through consultation with the public, Aboriginal peoples and government. A certified Closure Plan for the Project will be prepared as required by Ontario Regulation (O.Reg.) 240/00 as amended by O.Reg.194/06 "Mine Development and Closure under Part VII of the Mining Act" and "Mine Rehabilitation Code of Ontario".

Maps showing the existing features and topography of the site, as well as the proposed conceptual development of the site are provided in Figures 1.2 and 1.3 below.

## **1.5 Purpose of Current Report**

This document presents the Preliminary Fish Habitat Compensation Strategy (FHCS) which addresses the predicted harmful alteration, disruption or destruction to fish habitat (HADD) losses associated with the proposed development of Stillwater Canada Inc.'s proposed Marathon PGM-Cu Project. The FHCS will be the basis of the development of the final fish habitat compensation plan for the Project. Public, stakeholder, government and Aboriginal input will be sought during the development of the final plan.



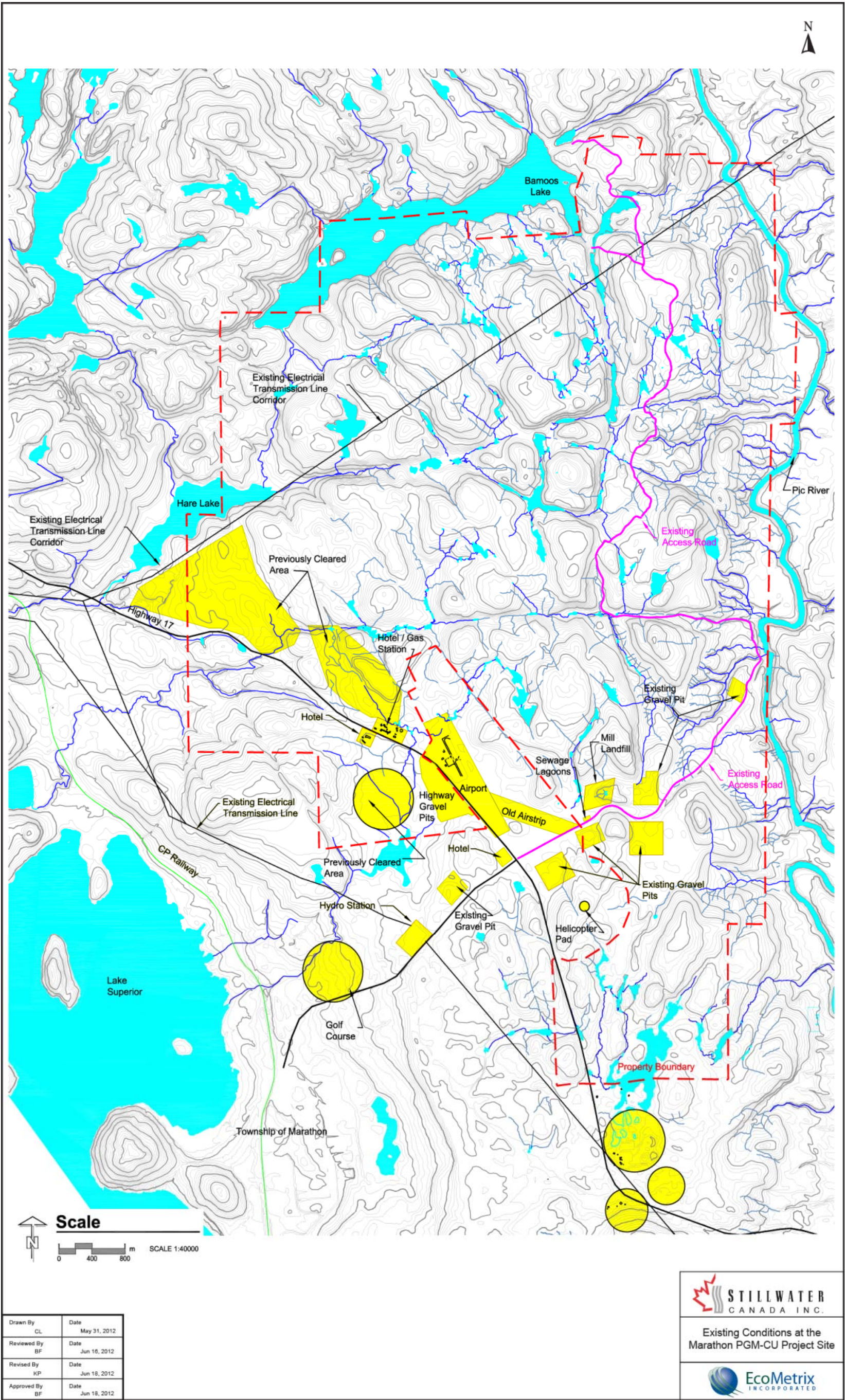
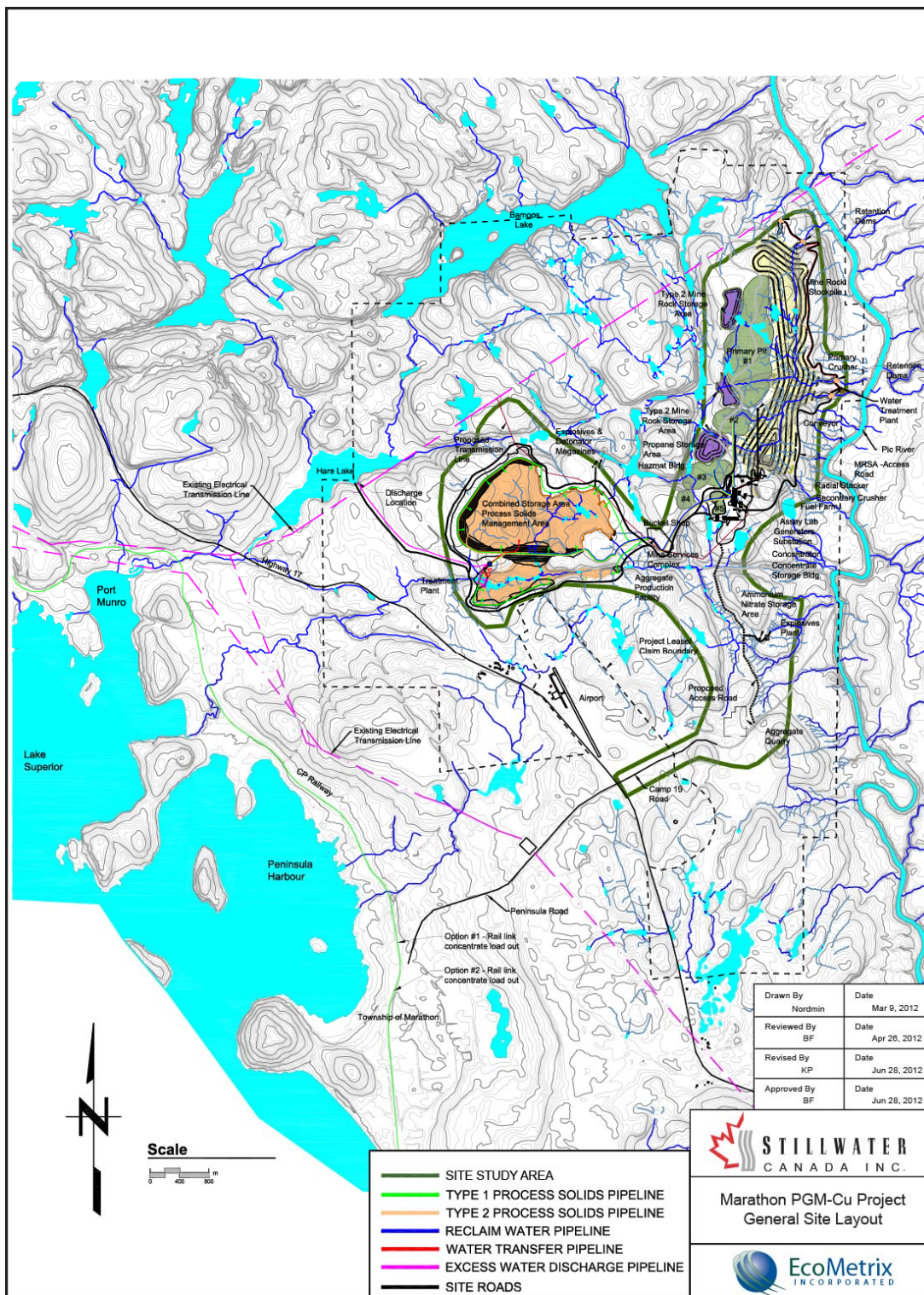


Figure 1.2: Existing Conditions at the Marathon PGM-Cu Project Site





**Figure 1.3: Marathon PGM-Cu Project Conceptual General Site Layout**

## 1.6 Overview of Project Area Fish and Fish Habitat

The Project site is drained by six primary watersheds; four of which drain to the Pic River and two which drain directly to Lake Superior (Figure 1.4). Water bodies and watercourses in the interior of the Project site include streams, ponds and small lakes. Many of the ponds and lakes are maintained by active or inactive beaver dams, or debris jams. The interior of the site is isolated from both the Pic River and Lake Superior by steep relief (i.e., topography) and therefore much of this area is fishless. In the instances where fish do occur, the community is most often limited to small-bodied (forage) fish.

Fish community and fish habitat characterization studies were conducted within the Project area and water bodies into which on-site watercourses drain (e.g., Pic River, Lake Superior) in 2006 (NAR, 2007), 2007 (Golder, 2009) and 2009 to 2011 (EcoMetrix, 2012).

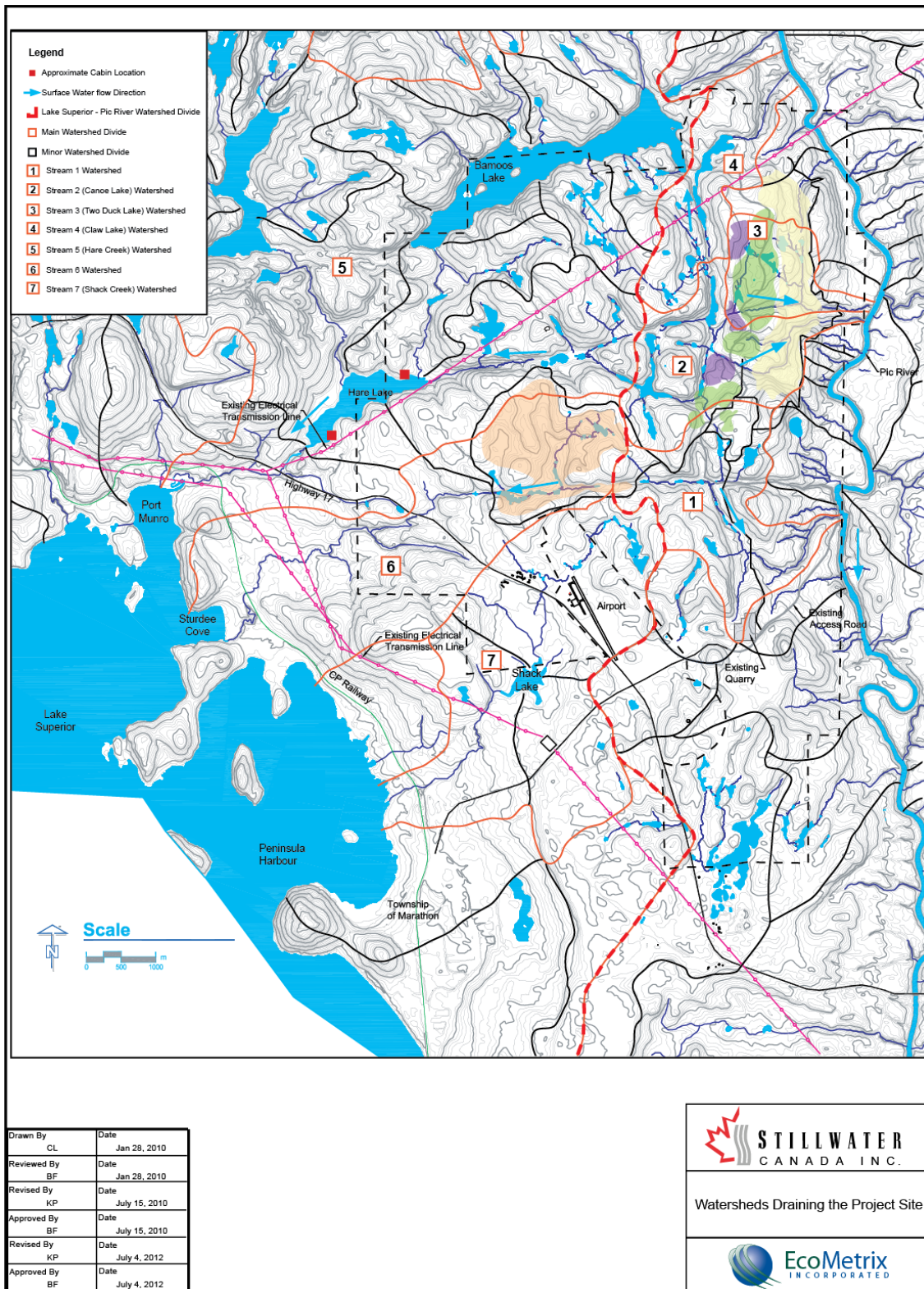
Significant effort has been expended within each of the water bodies (lakes, ponds, streams) within the Project footprint and was completed on a seasonal basis (where appropriate) to reflect potential differences in habitat utilization relating to high and low flow conditions, as well as seasonal differences in fish activity (e.g., spawning). The fish communities have been surveyed using a wide variety of gear types (trap nets, gill nets, minnow traps, electrofisher), as appropriate to the habitat characteristics and the expected species composition of the fish community. On-site data collected as part of field collections between 2006 and 2011 have been supplemented by records, where available, from local Ministry of Natural Resources (MNR) offices (Terrace Bay, Manitouwadge).

The distribution of fish across the study area is summarized in Figure 1.5. A summary of the results from the aquatic baseline studies are discussed below on a watershed basis. The sampling locations referred to below are shown on Figure 1.5. “S” stations denote sampling that occurred at stream or flowing water locations. “L” stations denote sampling that occurred at lentic (lake, pond) habitat locations.

### 1.6.1 Stream 1 Watershed

Multi-season passive and active fishing effort in the headwater lakes (i.e., L1, L2 and L29) within the Stream 1 watershed resulted in the capture of no fish. There are several possible reasons for the absence of fish within these lakes. There is likely limited overwintering habitat in these lakes and in L2 and L29 in particular. In addition, oxygen depletion in the hypolimnion of L1 during August 2009, suggests that suitable fish habitat may be limited to the littoral zone of the epilimnion during much of the summer months. All three lakes are situated at the top of fairly steep gradients, which impedes fish colonization from downstream source populations. Overall, it is probable that a lack overwintering habitat, combined with downstream barriers (to upstream fish movement) in the form of natural topography likely account for the absence of fish in these lakes.





**Figure 1.4: Watersheds Draining the Project Site**



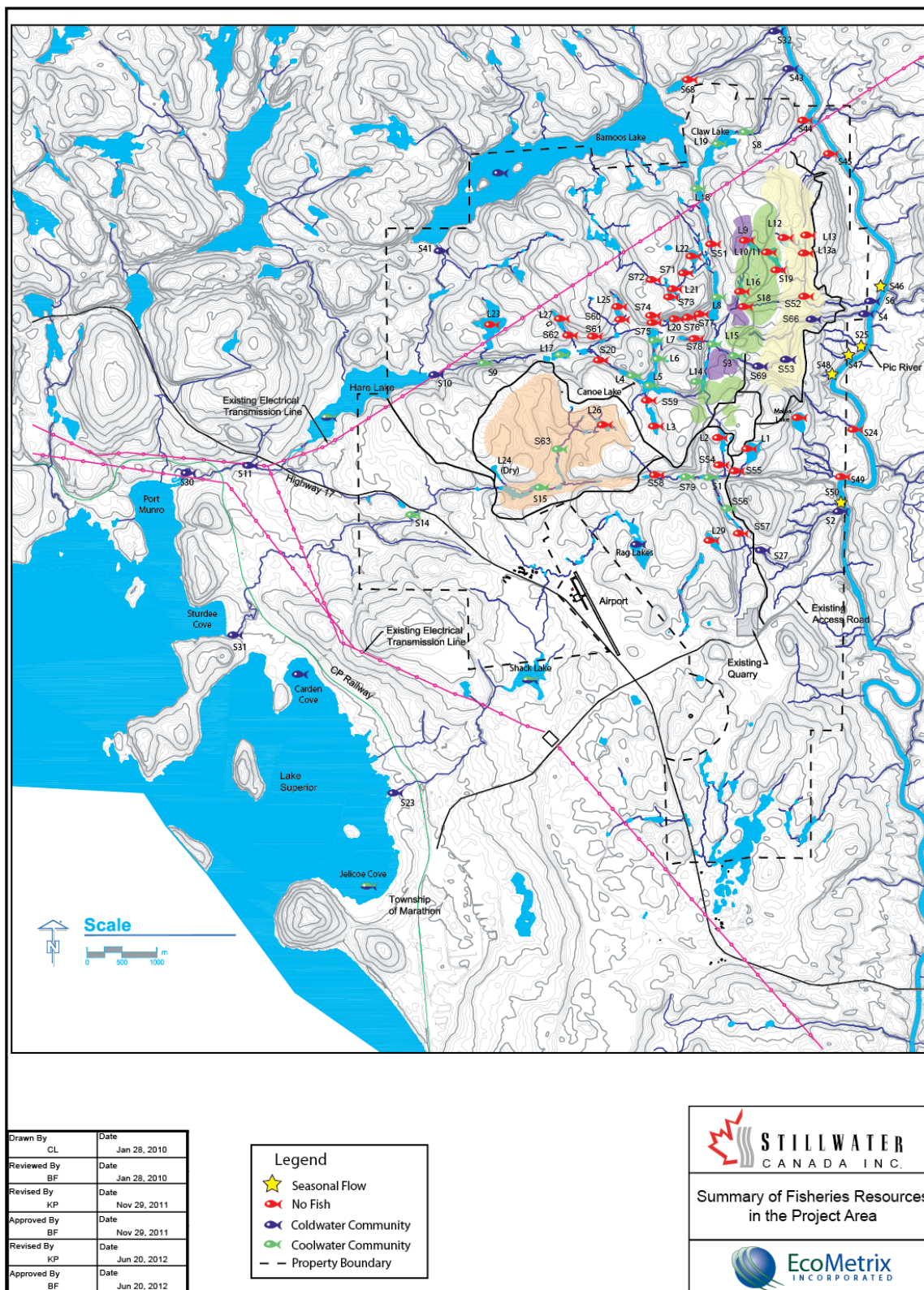


Figure 1.5: Summary of Fisheries Resources in the Project Area



No fish were collected within the most upstream reaches of Stream 1 (Stations S54, S55, and S58). Fish were captured at S1 and the extent of upstream fish inhabitation was documented in June 2011 (i.e., S79). At Station S79 and within the remaining upper 2nd order reaches small baitfish species were present. Progressing downstream within the watershed, viable habitat for resident coldwater salmonids (i.e., Brook Trout) occurred in the mid-reaches, while a more diverse coldwater community including both resident and migratory salmonids present within the lower reach. It is possible that natural barriers (e.g., low or intermittent flow, dams) to migration occur, which partition the fish communities within this watercourse, among the middle and upper, and lower and middle reaches. At the outlet of Stream 1 to the Pic River, there is a perched culvert that impedes the upstream movement of fish during non-freshet flows.

### **1.6.2 Stream 2 Watershed**

Two of the three headwater areas (i.e., Stations L3 and Terru Lake) within the Stream 2 watershed were fishless, whereas L7 contained a large number of Lake Chub. The pH in L3 and Terru Lake were relatively low (in the 4 to 5.5 range) in 2009, and may in part explain the absence of fish. Additional pH measures taken in 2011 confirmed the low pH in L3 but Terru Lake had an acceptable pH at that time. These lakes are relatively deep and may provide overwintering habitat, though reduced oxygen at depth and below winter ice was measured in both, which may indicate at least the possibility of winter-kill due to oxygen deprivation. Beaver activity, topography and low flows in connecting channels also likely impede upstream migration of fish into these water bodies.

In the middle portion of the watershed (i.e., Canoe Lake and Stations L6, L8, L14 and L15) only one or two species were captured at each water body. Canoe Lake and L6 appear to only support Lake Chub, whereas Stations L8 and L15 contained only Brook Stickleback. Both species were collected in L14; however only a single Lake Chub was captured suggesting that chub are likely only downstream migrants at that location.

All stream stations from L15 downstream supported fish. Station S3, the most upstream location, only contained Brook Stickleback. At the downstream end of this station (S3) there was a significant natural barrier to upstream migration in the form of a waterfall. This barrier, as well as other topographic barriers which occur downstream, likely contribute to the lack of species diversity encountered in the upstream reaches of the watershed compared to the downstream reaches. The middle reaches of Stream 2 (Station S53 and S69) support a resident coldwater fishery that includes Brook Trout (S53 and S69) and Slimy Sculpin (S53). The presence of Rainbow Trout at S53 indicates that this area has connectivity with the lower reaches and the Pic River. Within the lowest reaches, upstream of the confluence with the Pic River (S4), Stream 2 supports a diverse fishery. Three surveys (September 2007, May 2009, and August 2009) have occurred at this location and ten species of fish have been collected including Rainbow Trout, Chinook Salmon, Brook Trout, Lake Chub, Finescale Dace, Longnose Dace, White Sucker, Trout-perch, Brook Stickleback and Slimy Sculpin. This tributary affords potential spawning and nursery

habitats for resident species (i.e., Brook Trout, Slimy Sculpin), as well as migratory species (i.e., Rainbow Trout, Chinook Salmon).

### **1.6.3 Stream 3 Watershed**

Despite relatively intensive fish surveys, including increased efforts in 2009, 2010 and 2011, all streams, lakes and ponds surveyed within upper and mid-reaches of the Stream 3 watershed yielded no fish. The potential for re-population of this area from downstream reaches is unlikely due to topographic barriers afforded by the steep relief as the watershed drains to the east towards the Pic River

Within the lower reaches, upstream of the confluence with the Pic River, Stream 3 (Station S6) supports a few fish species. Three surveys (September 2007, May 2009, and August 2009) have occurred at this location and five species of fish have been collected including Rainbow Trout, Brook Trout, Longnose Dace, Slimy Sculpin and Johnny Darter. This lower reach of the tributary affords some nursery and potentially spawning habitat but the lower reach of Stream 3 sees intermittent flow during low flow periods.

### **1.6.4 Stream 4 Watershed**

No fish were captured upstream of a waterfall located at Station S51a (i.e., Stations S51, L21, L22 and all connecting tributaries). This could possibly be a result of low pH in some of the areas of the upper watershed (i.e., pH of 4.4 in L21). However, water quality was suitable in L22 at the time of the survey suggesting that a lack of overwintering habitat, combined with downstream barriers in the form of beaver dams and/or natural topography such as the waterfall at the downstream end of S51A likely account for the absence of fish. Stations L18 and L19 and the mid-reach of Stream 4 (S8) supported a variety of fish species including Blacknose Shiner, Finescale Dace, Fathead Minnow, Longnose Sucker, Brook Stickleback, Lake Chub, and Northern Redbelly Dace. The extremely steep cascades within the mid-reaches of Stream 4 may impede upstream migration of fish from the lower reaches.

Within the lower reaches, upstream of the confluence with the Pic River, Stream 4 (S43) supports a number of fish species. Two surveys (May 2009, August 2009) have resulted in the capture of nine species including Rainbow Trout, Brook Trout, Chinook Salmon, Finescale Dace, White Sucker, Trout-Perch, Brook Stickleback, Slimy Sculpin and Johnny Darter. This lower reach of the tributary affords potential spawning and nursery habitat for both migratory and resident salmonids, as well as other small (baitfish) species.

### **1.6.5 Stream 5 (Hare Creek) Watershed**

The small headwater basins within the Hare Lake watershed support no fish or sustain a very limited community. Station L4 and L17 contained Lake Chub and Brook Stickleback. Stations L23, L25 and L27 were fishless, as were their downstream tributaries (Stations S60, S61 and S62). These headwater areas and tributaries are probably fishless due to a

lack of overwintering habitat, combined with barriers in the form of beaver dams and steep gradients, which impede re-colonization from downstream. Within the mid-reach of Stream 5, only Brook Stickleback has been collected (i.e., S22 and S9). Within the lower reach (S10), just upstream of Hare Lake, a resident coldwater fishery existed including Brook Trout and Brook Stickleback. Bamooos Creek between Bamooos Lake and Hare Lake (S41) also supported a resident coldwater fish community including Slimy Sculpin and Brook Trout.

Bamooos Lake supports a diverse coldwater community. Twelve species were captured during the 2009 survey including Lake Trout, Brook Trout, Cisco, Slimy Sculpin, Longnose Sucker, White Sucker, Trout-perch, Brook Stickleback, Ninespine Stickleback, Lake Chub, Finescale Dace and Fathead Minnow. Two additional species, Lake Whitefish and Burbot are also reported for the lake according to OMNR records.

Hare Lake provides coldwater habitat; however the extensive 2009 and 2011 fish surveys indicated that the majority of the community is comprised of coolwater species. Fish species captured in 2009 included Northern Pike, Yellow Perch, Spottail Shiner, Logperch, Cisco and Burbot. In 2011, a single Lake Trout and low numbers of Trout-Perch, Spoonhead Sculpin and Longnose Sucker were also captured in Hare Lake increasing the total species captured to ten. The Lake Trout that was captured was a hatchery fish (fin-clipped) and its origin is unknown – it does not represent a population of Lake Trout in Hare Lake. Historic records also report Fathead Minnow inhabiting the lake. Walleye and Splake were stocked in the past but have not persisted. Extensive fishing efforts in 2009 and 2011 did not result in the capture of either of these two species.

Hare Creek downstream of Hare Lake was surveyed at two locations, below the Highway No. 17 crossing (S11) and upstream of the outlet to Lake Superior (S30). Both surveys indicated that the lower portions of Hare Creek support a relatively diverse coldwater fish community including both migratory and resident salmonid species. The fish community in lower Hare Creek included: Rainbow Trout, Chinook Salmon, Brook Trout, Brook Stickleback, Slimy Sculpin, Rainbow Smelt, Longnose Dace, Longnose Sucker, Ninespine Stickleback and Mottled Sculpin. The lower reaches of Hare Creek affords spawning and nursery habitat for both migratory and resident coldwater fishes.

#### **1.6.6 Stream 6 Watershed**

Multiple surveys of L26 during 2009, 2010 and 2011 resulted in no fish being collected. Backpack electrofishing at L24 in 2010 and 2011 indicated that this area does not support fish. Only Brook Stickleback have been collected at Stream 6 Stations upstream of Highway 17. Possible explanations for such a limited fish community in the upstream reaches and headwater lakes include a lack of overwintering habitat, low flow and barriers (including beaver dams and cascades). For example, at Station S14 there are a number of cascades that would be impediments to upstream fish passage. There is a waterfall which

occurs in the lower reach of Stream 6 upstream of S31 which prevents migrating Lake Superior species from getting upstream.

Within the lowest reaches, upstream of the outlet to Lake Superior, a limited number of salmonids were captured in 2009. In total four fish species were collected including Rainbow Trout, Chinook Salmon, Longnose Dace and Mottled Sculpin. This reach of Stream 6 provides a limited amount of nursery habitat for migratory coldwater species from Lake Superior, as well as some other small-bodied species. The quality of this lower reach for nursery is reduced compared to other tributaries in the area primarily due to the predominantly sandy substrates compared to more productive habitats which are typically comprised of courser substrates (i.e., gravel, cobble). A small area just below the barrier falls near S31 has coarser substrate and does provide limited potential spawning habitat for Rainbow Trout, that can move upstream from the lake during freshet flows.

### **1.6.7 Pic River and Small Tributaries**

Of all of the Pic River Tributaries which appeared to have some potential to contain a resident fish community, fish were only collected in one. The presence of Rainbow Trout fry at Station S32 (a small tributary north of the Project site) indicates that this tributary affords potential (albeit limited) nursery habitat – no potential spawning habitat was noted. Overall the value of these small streams from a fish habitat perspective is considered minimal as flows are dependent on the amount of precipitation and their channels are only wetted for a period of time each year. Salmonid spawning habitat is relatively scarce due to the paucity of coarse substrates in most of the tributaries.

The fish community of the Pic River is diverse, with a variety of coolwater and coldwater fish species reported including Lake Sturgeon, Walleye, Longnose Sucker, Silver Redhorse, Muskellunge, Trout-perch, Spottail Shiner, Northern Redbelly Dace, Rainbow Trout, Coho Salmon, Chinook Salmon, Brook Trout, Rainbow Smelt, Northern Pike, White Sucker and Shorthead Redhorse.

### **1.6.8 Lake Superior**

The near shore embayments of Lake Superior provide habitat for a variety of fishes, including both coldwater and coolwater species. These embayments offer nursery habitats for many species including whitefish, salmon, trout and suckers. Spawning habitat for species such as whitefish is also likely present. In addition, many Lake Superior species migrate through the embayments to spawning tributaries which outlet to the lake, including Hare Creek and Shack Creek.

### **1.6.9 Fish and Fish Habitat Summary**

The Project site is drained by a total of six primary watersheds, four of which drain to the Pic River and two which drain directly to Lake Superior. Water bodies and water courses in the interior of the Project site include streams, ponds and small lakes. Many of the ponds

and lakes are maintained by active or inactive beaver dams, or debris jams. The interior of the site is isolated from both the Pic River and Lake Superior by steep relief (i.e., topography) and therefore much of this area is fishless. In the instances where fish do occur, the community is limited to small-bodied (forage) fish.

The Pic River watershed tributaries afforded limited coldwater spawning and/or nursery habitats within their lowest reaches for migratory species (e.g., Rainbow Trout, Chinook Salmon), as well as resident species (e.g. Brook Trout, Slimy Sculpin). The fish community of the Pic River is diverse, with a variety of coolwater and coldwater fish species are reported including Lake Sturgeon and Walleye. Lake Sturgeon move extensively up and down the Pic River during spawning migration and utilize the lower river for foraging. Lake Sturgeon are designated as Threatened and therefore protected under the Ontario Endangered Species Act and federal Species at Risk Act.

Bamoos Lake supports a diverse coldwater community, including Lake Trout, Brook Trout and Cisco. The Hare Lake fish community is comprised primarily of coolwater species, including Northern Pike and Yellow Perch. Hare Creek (Stream 5), below the Highway 17 crossing, supports a coldwater fish community and affords spawning and nursery habitats for both migratory and resident salmonids. Within its lowest reaches, below a cascade barrier, Stream 6 provides a limited amount of nursery and spawning habitat for coldwater migratory species from Lake Superior.



## 2.0 SUMMARY OF POTENTIAL FISH HABITAT EFFECTS

The Project will interact both directly and indirectly with fish and fish habitat during all Project phases. Potential direct interactions relate to those associated with the Project footprint. Potential indirect interactions relate to water management needs that may direct water away existing surface water features or to water discharged from site (PSMF effluent, MRSA effluent) into receiving environments and thereby altering flows (and available habitat). Fish and fish habitat can also be affected by the release of solids into surface water features via erosion around disturbed and/or developed areas. Water that will be released from the PSMF or MRSA will be treated as necessary to protect the receiving water quality. The release of solids from disturbed areas will not be an issue as appropriate/suitable mitigation measures will be undertaken

The primary effects of the Project on fish habitat will result from the diversion of existing surface water features, removal of small lakes and streams, and the construction of road crossings. A summary of the direct interactions of the water bodies and the major mine components is presented in Table 2.1 and can be seen in Figures 1.4 and 1.5.

The Project will impact approximately 9.3 ha of aquatic habitat, of which only approximately 1.8 ha is fish frequented (direct fish habitat). Of the direct fish habitat approximately 0.35 ha will need to be compensated under Section 35(2) of the *Fisheries Act*. Compensation for an additional 1.45 ha is also required under Section 27.1 of the *Metal Mining Effluent Regulations* due to loss of fish frequented habitat associated with the footprint of PSMF, MRSA and temporary mine rock stockpiles. A summary of the compensation requirements for each mine component can be found in Table 2.2

The Project footprint will directly affect water bodies within watersheds 2, 3, and 6. A summary of each major mine component and their impact upon existing watercourses are as follows:

- MRSA - Lakes 12, 13, and 13a – all fishless, portions of Stream 2 (fish frequented), Stream 3 (fishless) and Pic River Tributary (fishless);
- Pits – Lakes 9, 10, 11, and 16 (all fishless), Lake 14 (fish frequented), portion of Streams 2 (part fish frequented and part fishless) and Stream 3 (fishless);
- PSMF – Lake 26 (fishless) and portions of Stream 6 (part fish frequented and part fishless) and;
- Temporary Type 2 Storage Areas – Portion of Lake 16 outlet stream (fishless) and portion of the main stem of Stream 2 (fish frequented).

The Project will also have indirect influences on water bodies within watersheds 1, 2, 3, 5, and 6.

A summary of the nature of the effects in each watershed are as follows:

- Stream 1 will be traversed by two new road crossings associated with the proposed new access road;
- Pic River Streams 2 and 3 will experience reduced flow during mine operation as the water draining the MRSA in these watersheds will be collected. Following mine closure, natural drainage patterns will be restored to these streams when it has been demonstrated that water quality is sufficient to support biota;
- Stream 5 (Hare Creek) will receive, at times, increased water flow due to the discharge of excess water from the PSMF. The normal flow regime will be restored after mine closure; and
- Stream 6 (Angler Creek) will experience reduced flow during mine operation as the water from the upper part of the watershed, in which the PSMF is located, will be diverted. Natural drainage patterns and flow will be restored after mine closure.

**Table 2.1: Direct Interactions between Major Mine Development Components and Fisheries Resources for the Marathon PGM-Cu Project.**

Mine Component	Waterbody			Nature of Interaction	Nature of HADD <sup>3</sup>
	Name	Area	Description <sup>1, 2</sup>		
Primary Open Pit	L9	0.37 ha	Indirect – no fish present; provides water to downstream areas of Stream 3 watershed.	L9 is in the footprint of the primary pit. A permit to take water will be obtained and L9 will be dewatered prior to excavation of the pit. The water will be directed to the process water pond to provide initial make-up water for the mill.	Section 35(2) of the Fisheries Act.
	L10/11	1.66 ha	Indirect – no fish present; provides water to downstream areas of Stream 3 watershed.	L10/11 is in the footprint of the primary pit. A permit to take water will be obtained and L10/11 will be dewatered prior to excavation of the pit. The water will be directed to the process water pond to provide initial make-up water for the mill.	Section 35(2) of the Fisheries Act.
	L16	0.55 ha	Indirect – no fish present; provides water to downstream areas of Stream 3 watershed.	L16 is in the footprint of the primary pit. A permit to take water will be obtained and L16 will be dewatered prior to excavation of the pit. The water will be directed to the process water pond to provide initial make-up water for the mill.	Section 35(2) of the Fisheries Act.
	Connecting channel L9 to L10/11	0.015 ha (150 m long * 1 m wide)	Indirect – no fish present; conveys water between L9 and L10/11 (Stream 3 watershed).	The connecting channel is in the footprint of the primary pit.	Section 35(2) of the Fisheries Act.
	Connecting channel L9 to L16	0.056 ha (560 m long * 1 m wide)	Indirect – no fish present; conveys water between L9 and L16 (Stream 3 watershed) only during high flow periods.	The connecting channel is in the footprint of the primary pit.	Section 35(2) of the Fisheries Act.

	L16 outlet stream (portion)	0.0795 ha (530 m long * 1.5 m wide)	Indirect – no fish present; conveys water to downstream areas of Stream 3 watershed.	This portion of the L16 outlet stream is in the footprint of the primary pit.	Section 35(2) of the Fisheries Act.
Satellite Pit 1	Portion of Stream 2 tributary	0.068 ha (450 m long * 1.5 m wide)	Indirect – no fish present; flow is seasonal due to small drainage area; contributes water to downstream areas of Stream 2 on a seasonal basis.	340 m of this portion of this Stream 2 tributary is in the footprint of Satellite Pit 1. The remaining 110 m will be dewatered during pit excavation and is considered for the purposes here as within the pit footprint. Additional habitat in this tributary is in the footprint of the MRSA.	Section 35(2) of the Fisheries Act.
Satellite Pit 2 Complex	L14	0.345 ha	Direct – Lake Chub and Brook Stickleback collected. Primary overwintering refuge for fish in this part of the Stream 2 watershed is L5 (upstream).	L14 will be in the footprint of the Satellite Pit 2 Complex. A permit to take water will be obtained and L14 will be dewatered prior to excavation of the pit. The water will be directed to the process water pond to provide initial make-up water for the mill. A fish rescue plan will be developed to account for the removal of any fish prior to dewatering.	Section 35(2) of the Fisheries Act.
	Portion of the L5 outlet stream (a Stream 2 tributary)	0.006 ha (120 m long * 0.5 m wide)	Direct – Lake Chub and Brook Stickleback collected. Primary overwintering refuge for fish in this part of the Stream 2 watershed is L5 (upstream). No overwintering habitat in this channel.	A portion of the L5 outlet stream will be in the footprint of Satellite Pit 2 Complex.	Section 35(2) of the Fisheries Act.
	L14 inlet stream (to the east of the L5 outlet stream)	0.03 ha (400 m long * 0.75 m wide)	Indirect – no fish present; flow is seasonal/intermittent due to small drainage area; contributes water to downstream areas of Stream 2 on a seasonal basis.	The L14 inlet stream is in the footprint of the Satellite Pit 2 Complex.	Section 35(2) of the Fisheries Act.

MRSA	L12	1.54 ha	Indirect – no fish present; provides water to downstream areas of the Stream 3 watershed.	L12 is within the footprint of the MRSA. A permit to take water will be obtained and L12 will be dewatered prior to the creation of the MRSA. The water will be directed to the process water pond to provide initial make-up water for the mill.	Section 35(2) of the Fisheries Act.
	L13	0.18 ha	Indirect – no fish present; provides water to downstream areas of Stream 3 watershed.	L13 is within the footprint of the MRSA. A permit to take water will be obtained and L13 will be dewatered prior to the creation of the MRSA. The water will be directed to the process water pond to provide initial make-up water for the mill.	Section 35(2) of the Fisheries Act.
	L13A	0.38 ha	Indirect – no fish present; provides water to downstream areas of the Stream 3 watershed.	L13A is within the footprint of the MRSA. A permit to take water will be obtained and L13A will be dewatered prior to the creation of the MRSA. The water will be directed to the process water pond to provide initial make-up water for the mill.	Section 35(2) of the Fisheries Act.
	Connecting channel between L12 and L13A	0.0375 ha (250 m long * 1.5 m wide)	Indirect – no fish present; conveys water to downstream areas of the Stream 3 watershed.	The connecting channel is within the footprint of the MRSA. The connecting channel will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.
	Connecting channel between L13 and L13A	0.021 ha (140 m long * 1.5 m wide)	Indirect – no fish present; conveys water to downstream areas of the Stream 3 watershed.	The connecting channel is within the footprint of the MRSA. The connecting channel will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.

	Lake 13a outlet stream to the main stem of stream 3	0.094 ha (625 m long* 1.5 m wide)	Indirect – no fish present; channels convey water to downstream more downstream areas of the Stream 3 watershed.	This portion of the L13a outlet stream will be within the footprint of the MRSA. It will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.
	Lake 10/11 Outlet Stream to the lake 13a outlet stream	0.062 ha (415 m long* 1.5 m wide)	Indirect – no fish present; channels convey water to downstream more downstream areas of the Stream 3 watershed.	This portion of the L10/11 outlet stream will be within the footprint of the MRSA. It will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.
	Portion of Pic River Tributary that drains to the north	0.15 ha (1000 m long * 1.5 m wide)	Indirect – no fish present; flow is seasonal/intermittent due to small drainage area.	The upper portion of this intermittent stream will be within the footprint of the MRSA.	Section 35(2) of the Fisheries Act.
	Portion of L16 outlet stream	0.045 ha (300 m long * 1.5 m wide)	Indirect – no fish present; channels convey water to downstream more downstream areas of the Stream 3 watershed.	This portion of the L16 outlet stream will be within the footprint of the MRSA. It will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.
	Main stem Stream 3 below confluence of L16 outlet stream and L13A outlet stream to Pic River	0.015 ha (150 m long * 1.5 m wide)  0.15 ha (1,000 m long * 1.5 m wide)	Indirect – no fish present; channels convey water to downstream more downstream areas of the Stream 3 watershed.  Direct – Main stem of Stream 3 includes cold water fish species.	This portion of the main stem of Stream 3 will be within the footprint of the MRSA. It will be dewatered prior to the creation of the MRSA.  This portion of the main stem of Stream 3 will be partially within the footprint of the MRSA. Drainage in the Stream 3 watershed will be collected and pumped back to the mine site during operations. It will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.  Section 27.1 of the MMER.
	Portion of a Stream 2 tributary that originates in the footprint of Satellite Pit 1.	0.035 ha (350 m long * 1 m wide)	Indirect – no fish in Stream 2 tributary that originates in footprint of Satellite Pit 1.	This portion of the Stream 2 tributary will be within the footprint of the MRSA. It will be dewatered prior to the creation of the MRSA.	Section 35(2) of the Fisheries Act.

	Main stem of Stream 2	0.18 ha (2,000 m long * 0.85 m wide)	Direct – Main stem of Stream 2 includes cold water fish species.	This portion of the main stem of Stream 2 will be partially within the footprint of the MRSA. Drainage in the Stream 2 watershed will be collected and pumped back to the site during operations. It will be dewatered prior to the creation of the MRSA.	Section 27.1 of the MMER.
PSMF	Stream 6 (main channel between headwater and east side of PSMF)	0.06 ha (300 m long * 2 m wide)  0.84 ha (1,200 m long * 2 m wide, plus ponded areas of 0.6 ha)	Indirect – no fish present; provides water to downstream areas of the watershed.  Direct – Brook Stickleback collected. Beaver ponded areas may provide overwintering refuge for fish.	This portion of Stream 6 is in the footprint of the PSMF.  This portion of Stream 6 is in the footprint of the PSMF.	Section 35(2) of the Fisheries Act.  Section 27.1 of the MMER.
	L26	1.91 ha	Indirect – no fish present; provides water to downstream areas of the watershed.	L26 is in the footprint of the PSMF.	Section 35(2) of the Fisheries Act.
	L26 outlet stream (tributary of Stream 6)	0.11 ha (747 m long * 1.5 m wide)  0.15 ha (1,000 m long * 1.5 m wide)	Indirect – no fish present; provides water to downstream areas of the watershed.  Direct - Brook Stickleback collected. Beaver ponded areas may provide overwintering refuge for fish.	This portion of the outlet stream of L26 is in the footprint of the PSMF.  This portion of the outlet stream of L26 is in the footprint of the PSMF	Section 35(2) of the Fisheries Act.  Section 27.1 of the MMER.



Temporary Type 2 Rock Storage Areas	Lake 16 outlet stream (portion)	0.045ha (225 m long * 2 m wide)	Indirect – no fish present; provides water to downstream areas of the watershed.	This portion of the Stream 3 channel will be in the footprint of the storage pile	Section 35(2) of the Fisheries Act.
	Stream 2 main stem (portion)	0.135 ha (675 m long * 2 m wide)	Direct – Brook Stickleback collected. Beaver ponded areas upstream may provide overwintering refuge for fish	This portion of the Stream 2 channel will be in the footprint of the storage pile	Required under Section 27.1 of the MMER
Road Crossings	Stream 1	0.003 ha (30 m long * 0.5 m wide)	Direct – Finescale Dace and Northern Redbelly Dace collected in the watershed. Beaver ponded areas may provide overwintering refuge for fish.	The main road in to site will cross the main stem of Stream 1	Required under Section 35(2) of the Fisheries Act. (No HADD anticipated as culvert installation will follow DFO and MNR guidance)
	Stream 1	0.003 ha (30 m long * 0.5 m wide)	Indirect – no fish present; provides water to downstream areas of the watershed.	The main road in to site will cross Stream 1 at the lake 1 outlet channel	Required under Section 35(2) of the Fisheries Act. (No HADD anticipated as culvert installation will follow DFO and MNR guidance)

<sup>1</sup> The terms direct and indirect fish habitat are used to refer to fish frequented waters (i.e., direct fish habitat) and waters where no fish are found but a contribution (hydrological) to downstream areas in a watershed is provided (i.e., indirect habitat).

<sup>2</sup> Channel widths are given as the average width over the given stream reach.

<sup>3</sup> As per the Metal Mining Effluent Regulations water bodies that are directly impacted by the process solids or mine rock stockpile footprints will be scheduled on MMER Schedule 2 and require compensation under Section 27.1 under the MMER. Other compensation requirements will be provided under Section 35(2) of the Fisheries Act

**Table 2.2: Summary of the HADD Related to the Stillwater Canada Inc. Marathon PGM-Cu Project<sup>1,2</sup>**

Mine Component	Total Affected Habitat Area (ha)			Portion to be Compensated under <i>Fisheries Act</i> Section 35(2)			Portion to be Compensated under <i>Metal Mining Effluent Regulations</i> Section 27.1		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Primary Pit	-	2.73 ha	2.73 ha	-	2.73 ha	2.73 ha	-	-	-
Satellite Pit 1	-	0.07 ha	0.07 ha	-	0.07 ha	0.068 ha	-	-	-
Satellite Pit 2 Complex	0.35 ha	0.03 ha	0.38 ha	0.35 ha	0.03 ha	0.406 ha	-	-	-
MRSA	0.32 ha	2.56 ha	2.88 ha	-	2.65 ha	2.65 ha	0.32 ha	-	0.32 ha
PSMF	0.99 ha	2.08 ha	3.07 ha	-	2.08 ha	2.08 ha	0.99 ha	-	0.99 ha
Type 2 Mine Rock Storage Areas	0.135 ha	0.045 ha	0.18 ha	-	0.045 ha	0.045 ha	0.135 ha	-	0.135 ha
Road Crossings	0.0015	0.0015 ha	0.003	0.0015 ha	0.0015 ha	0.003 ha	-	-	-
<b>Total</b>	<b>1.80 ha</b>	<b>7.52 ha</b>	<b>9.31 ha</b>	<b>0.35 ha</b>	<b>7.52 ha</b>	<b>7.87 ha</b>	<b>1.45 ha</b>	<b>-</b>	<b>1.45 ha</b>

<sup>1</sup> The terms direct and indirect fish habitat are used to refer to fish frequented waters (i.e., direct fish habitat) and waters where no fish are found but contribute (hydrological) to downstream areas which do support fish (i.e., indirect habitat).

<sup>2</sup> Channel widths are given as the average width over the given stream reach were used in the area calculations.

## 3.0 HABITAT COMPENSATION OBJECTIVES

### 3.1 MMER Requirements

Pursuant to subsections 34(2), 36(5) and 38(9) of the *Fisheries Act*, Section 27.1 of the *Metal Mining Effluent Regulations* (MMER), requires a compensation plan and the Minister's approval of that plan before depositing a deleterious substance into a tailings impoundment area that is added to Schedule 2. The purpose of the compensation plan is to offset for the loss of fish habitat resulting from the deposit of a deleterious substance into the tailings impoundment area. The compensation plan requires several specific elements as outlined in the regulation including:

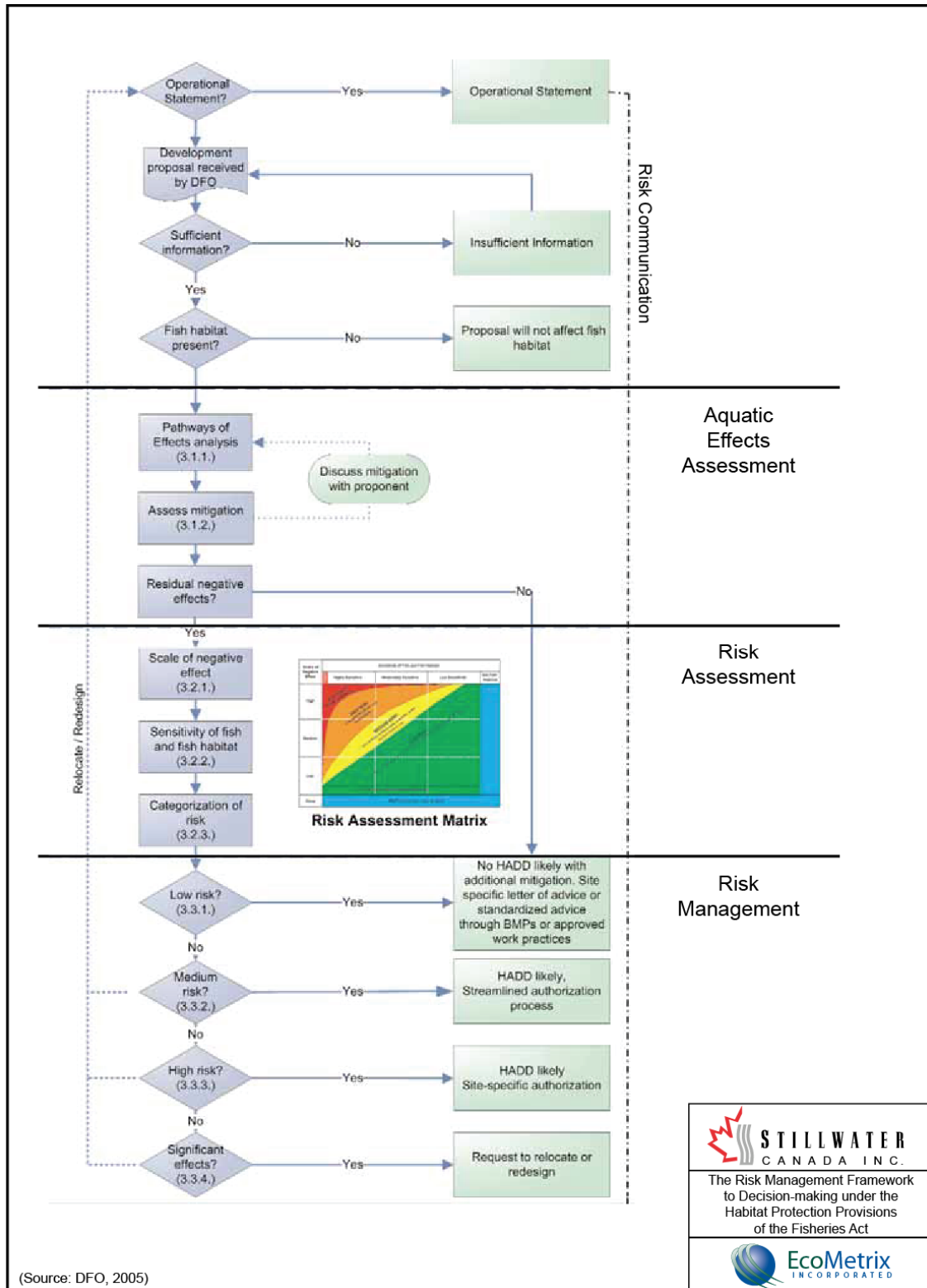
- (a) a description of the location of the tailings impoundment area and the fish habitat affected by the deposit;
- (b) a quantitative impact assessment of the deposit on the fish habitat;
- (c) a description of the measures to be taken to offset the loss of fish habitat caused by the deposit;
- (d) a description of the measures to be taken during the planning and implementation of the compensation plan to mitigate any potential adverse effect on the fish habitat that could result from the plan's implementation;
- (e) a description of measures to be taken to monitor the plan's implementation;
- (f) a description of the measures to be taken to verify the extent to which the plan's purpose has been achieved;
- (g) a description of the time schedule for the plan's implementation, which time schedule shall provide for achievement of the plan's purpose within a reasonable time; and
- (h) an estimate of the cost of implementing each element of the plan.

The MMER compensation plan, along with the compensation plan under Section 35(2) of the *Fisheries Act*, will be developed based on the compensation strategy during EA approval and Project permitting.

### 3.2 Risk Management Framework

Section 35 (2) of the *Fisheries Act* outlines the regulations regarding the protection of fish habitat. Under this section, no one may carry out any work which results in the harmful alteration, disruption or destruction (HADD) of fish habitat, unless otherwise authorized by the Minister of Fisheries and Oceans Canada (DFO).

Fisheries and Oceans Canada (DFO, 2005) has developed a Risk Management Framework to provide guidance to habitat management practitioners in applying a risk management approach to decision-making under habitat protection provisions of the *Fisheries Act*. The Risk Management Framework is comprised of three components including Aquatic Effects Assessment, Risk Assessment and Risk Management. The flow chart for the decision-making process is presented in Figure 3.1.



**Figure 3.1: The Risk Management Framework to Decision-making under the Habitat Protection Provisions of the Fisheries Act**

### **3.2.1 Aquatic Effects Assessment**

Aquatic effects assessment is a means of identifying the potential effects a development proposal may have on fish and fish habitat. Pathways of Effects (PoE) diagrams are used to describe development proposals in terms of the: activities that are involved, the type of cause-effect relationships that are known to exist; and the mechanisms by which stressors ultimately lead to effects in the aquatic environment. Each cause-and-effect relationship is represented as a line, known as a pathway, connecting the activity to a potential stressor, and a stressor to some ultimate effect on fish and fish habitat. Each pathway represents an area where mitigation measures can be applied to reduce or eliminate a potential effect. When mitigation measures cannot be applied, or cannot fully address a stressor, the remaining effect is referred to as a residual effect.

#### **3.2.1.1 Pathways of Effect**

A proposed development may involve one or more activities which have the potential to affect fish and fish habitat. These activities include both in-water and land-based undertakings. Typically, the more complex the proposal, the more activities (and hence PoEs) are involved. PoE diagrams can be used to review the potential effects of the development proposal; identify appropriate mitigation measures; develop guidelines and best management practices; and assess the effects of alternative design options.

#### **3.2.1.2 Assessment of Mitigation**

It is the proponent's responsibility to develop a mitigation plan and to demonstrate how the plan addresses potential effects on fish and fish habitat. Proponents can use the PoE diagrams to determine where mitigation is required, or conversely to summarize what residual effects are likely to result from the proposed development.

#### **3.2.1.3 Sources of Uncertainty**

There is always some level of uncertainty associated with predicting the residual effects that may result from a proposed development. Uncertainty can arise due to a lack of information, or in predicting the effectiveness of new or innovative mitigation measures. In addition, there may be synergistic effects whereby two or more effects in combination express an effect greater than they would have been expressed individually. These are difficult to identify and hence have the potential of being overlooked or underestimated.

### **3.2.2 Risk Assessment**

Risk assessment is the process used to determine the level of risk that residual effects pose to fish and fish habitat. To assess risk, one must consider the outcome of the aquatic effects assessment (i.e., the Scale of Negative Effect) in the context of the fish and fish habitat being affected (i.e., the Sensitivity of Fish and Fish Habitat). The Risk Assessment Matrix incorporates these two factors in order to characterize the level of risk that the development proposal poses to the productive capacity of fish habitat.

### **3.2.2.1 Scale of Negative Effect**

Three attributes are used to scale residual effects on the y-axis of the Risk Assessment Matrix, including extent, duration and intensity. Extent refers to the direct "footprint" of the development proposal, as well as areas indirectly affected. Duration is the amount of time that a residual effect will persist. Intensity is the expected amount of change from the baseline condition.

### **3.2.2.2 Sensitivity of Fish and Fish Habitat**

The sensitivity of fish and fish habitat is represented by the x-axis of the Risk Assessment Matrix. Attributes used to describe sensitivity of fish and fish habitat include species sensitivity; species' dependence on habitat; rarity; and habitat resiliency.

### **3.2.2.3 Categorize Risk**

Categorizing risk involves using the analysis which was done for determining the Scale of Negative Effect and the Sensitivity of Fish and Fish Habitat to plot a point on the Risk Assessment Matrix. The Risk Assessment Matrix is divided into four categories of risk: Low Risk, Medium Risk, High Risk and Significant Negative Effects.

### **Sources of Uncertainty**

It is important to acknowledge the various sources of uncertainty that may be associated with predicting both the Scale of Negative Effect and the Sensitivity of Fish and Fish Habitat. Uncertainty is illustrated on the Risk Assessment Matrix in terms of how it might alter management decisions. A tight circle illustrates a relatively low level of uncertainty, which is unlikely to influence the risk ranking or the resulting management decision. A higher level of uncertainty predicting either scale of negative effect or sensitivity is represented as an oval, whereas uncertainty associated with both would be illustrated as a larger circle. Higher uncertainty may overlap several risk categories. The level of uncertainty can be reduced through provision of additional information relating to the development proposal and the mitigation proposed.

### **3.2.3 Risk Management**

Once the risk to fish and fish habitat has been characterized, results can be used to support and guide a decision on how to best manage the risk. Additional mitigation measures including relocation and redesign can be used to lower the risk ranking. Low Risk Development proposals that are characterized as Low Risk are not likely to result in HADD, providing appropriate mitigation measures are applied. Development proposals where the effects are well understood and readily mitigable using standard measures, fit into this category.

### 3.2.3.1 Medium Risk

Development proposals characterized as Medium Risk are likely to result in HADD, and a *Fisheries Act* authorization will be required. The purpose of the Medium Risk category is to recognize that some activities result in HADDs that are small-scale and/or temporary in duration, and have predictable outcomes with a low level of uncertainty surrounding potential negative effects.

### 3.2.3.2 High Risk

Proposed developments that are High Risk will result in HADD over a long period of time and/or a broad geographic extent, and/or will take place in areas ranked high on the Sensitivity of Fish and Fish Habitat scale. Such development proposals will require a site-specific review and authorization under subsection 35(2) of the *Fisheries Act*.

## 3.3 Application to Marathon PGM Project

The Risk Management Framework was applied to the Marathon PGM Project as part of the development of the Fish Habitat Compensation Strategy (FHSC). The entire Project was considered as a whole relative to potential impact upon fisheries.

### 3.3.1 Aquatic Effects Assessment

Aquatic effects were evaluated in terms of the potential effects upon fisheries and habitats which support a fishery. Although the Project will impact upon waters frequented by fish, none would be considered as supporting, or potentially supporting a fishery, as defined by the *Fisheries Act*. “Section 35 is not about the protection of fish habitat for the benefit of fish, but of fisheries. Therefore, the decision required is a determination of whether or not the potentially affected fish habitat directly or indirectly supports - or has the potential to support - a commercial, recreational or subsistence fishery” (DFO, 1998).

Project development activities and the effects on fish habitats which support fisheries would be minimal. Nevertheless, appropriate mitigation measures will be employed during all development activities.

### 3.3.2 Risk Assessment

The scale of potential negative effect was determined by considering the extent, duration and intensity of the Project upon fish habitats supporting a fishery. None of the waterbodies within the Project footprint support a fishery. However, indirect support (conveyance of flow, forage fish production, etc.) to water bodies which do support fisheries, including Lake Superior and the Pic River, is afforded. Overall, the Project will impact approximately 9.3 ha of aquatic habitat, of which only approximately 1.8 ha is fish frequented. The extent of the fish habitat affected by the Project would be considered insignificant relative to the extent of the local and regional fisheries (e.g., Lake Superior and Pic River), as it will have no effect on the fisheries. The duration of effect would be considered as long term (10+



years) and some would be permanent. The intensity (expected change) of the habitat quality within areas directly impacted by the Project will be significantly reduced to unusable during mine development and operations. However, none of the directly affected fish habitat supports a fishery. Applying this evaluation to the Risk Assessment Matrix, the scale of negative effects would be rated on the medium to high range on the y axis of the assessment chart.

In terms of sensitivity of fish and fish habitat, a few species (e.g., White Sucker, Fathead Minnow, Johnny Darter) occurring in the Project area may be considered as “tolerant”; however, most would be classified as “intermediate” in terms of resilience to anthropogenic or natural stresses (Eakins, 2012). Species of intermediate tolerance would also be considered as capable of utilizing a range of habitat conditions. However, some species would be categorized as “intolerant”, often due to very specific habitat requirements or sensitivity to environmental disturbance. This group includes the salmonids (i.e., salmon and trout). Within the Project area, the majority of directly impacted habitat is fishless (~7.5 ha) and would be considered as low sensitivity. These areas are not colonized by fish, due to a number of factors including, barriers to upstream migration, a lack of overwintering habitat, poor water quality (e.g., low pH, anoxia) and intermittent flow. In those areas that do support a fish population (~1.8 ha), critical habitats for all life stages of most species would likely be afforded (i.e., spawning, nursery, foraging) and considered as moderately to highly sensitive at the site-specific (local) level.

No habitats directly impacted by the Project would be considered moderate or highly sensitive at the watershed or subwatershed level. Fish populations and fish habitats affected by the Project are highly prevalent within the larger watersheds in which they are found and do not represent significant fisheries. In habitat areas that are accessible to the Pic River and Lake Superior fisheries critical habitat, such as spawning, have been found to be limited. Applying this evaluation to the Risk Assessment Matrix, the sensitivity of fish and fish habitat would be ranked as low to moderate sensitivity.

Following assessment of both scale of negative effects and sensitivity of fish and fish habitat, a risk ellipse was generated around the point based on the sources of uncertainty. Based on the extensive baseline data collected to date, there is very little uncertainty regarding fish species utilization of habitats within the Project area. There is also very little uncertainty associated with expected impact. An ellipse has been generated to illustrate the low uncertainty with the sensitivity of the fish habitat. It also shows a slightly higher uncertainty on the scale of negative effect depending on the scale that is used to determine the effect (regional or local). Figure 3.2 illustrates the risk assessment matrix for the Project.

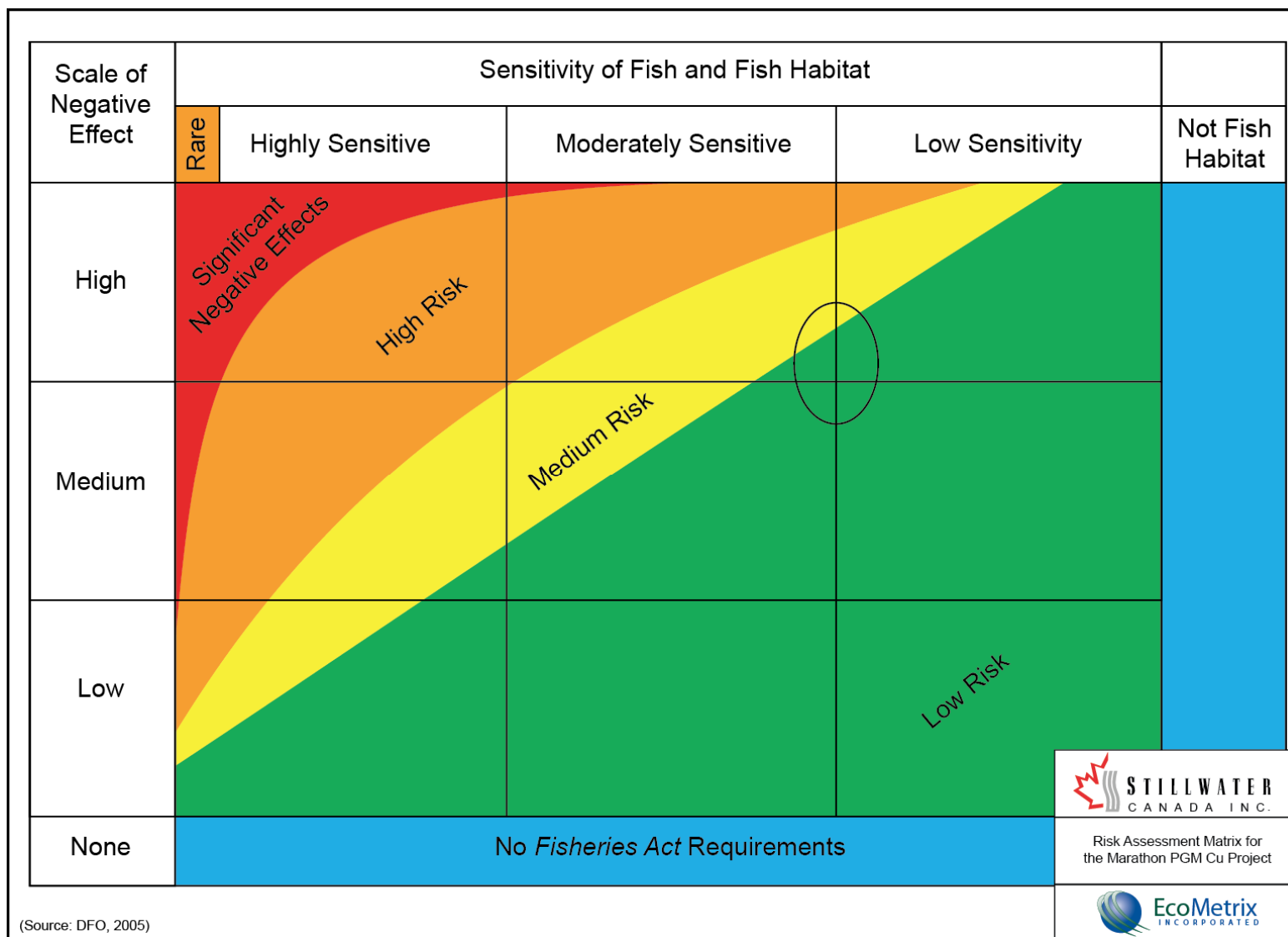


Figure 3.2: Risk Assessment Matrix for the Marathon PGM Cu Project

### 3.3.3 Risk Management

The risk to fisheries habitat is low to medium based on the DFO Risk Assessment Framework. Since the Project cannot avoid a HADD, even with additional mitigation, the Project would be classified as Medium Risk according to the decision making framework. Within this category the authorization process is streamlined.

As a HADD is likely, the FHCS was developed to evaluate potential fisheries compensation opportunities around the Project site that would more than offset the impacts of the Project.

### 3.4 DFO Habitat Compensation Policy

It is preferred that a HADD is avoided through project relocation, redesign and impact mitigation, whenever possible. Proponents are required to compensate for the HADD as a condition of Subsection 35(2) Fisheries Act Authorizations. Compensation is defined in the Policy as:

*"The replacement of natural habitat, increase in the productive capacity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources".*

DFO's Habitat Policy sets to achieve a No Net Loss (NNL) scenario in the productive capacity of fish habitat through the avoidance of negative impacts, the implementation of effective mitigation, or as a last resort, offsetting unavoidable negative impacts with habitat compensation in accordance with their hierarchy of preferred compensation options:

- Like for like habitat in the same ecological unit
- Unlike habitat in the same ecological unit
- Habitat in a different ecological unit
- Artificial maintenance of a stock of fish or deferred compensation

Compensation efforts are based on the residual loss of habitat after application of redesign and mitigation measures. Ratios of compensation to habitat loss are influenced by several factors:

- Certainty of success of the proposed compensation
- Variance in the quality of the replacement habitat in relation to the impacted habitat
- Delays in the functionality of compensation habitat

- Position of implemented compensation in the hierarchy of compensation options

Other factors to be considered in compensation planning include:

- Fish species or stocks targeted in compensation objectives, and any fisheries management objectives, fishery use, or potential use of fish in the project area
- Opportunities to improve existing impacts or constraints to fish and fish habitat in the watershed
- First Nations traditional access to fish in the area, and traditional uses and ecological knowledge
- Compliance of compensation plans with recovery planning for species listed under the *Species at Risk Act* (SARA)
- Amount and temporal nature of impact (permanent or temporary)
- Risk of failure and the time lag until compensatory habitats become fully functional
- Potential for the proposed project to adversely affect the compensation works in the future
- Intrinsic value of habitat to be enhanced compared with the productive capacity gained through habitat enhancement
- Perpetuity of compensation works

### **3.5 Marathon PGM Habitat Compensation Objectives**

The development of the FHSC considered: legislative requirements and policy detailed in the previous section, timeframes of the various project stages, and specific characteristics of existing habitat within the Project area. Objectives of the FHSC include increasing the productivity of fish habitat in the Stream 1 watershed by creating a connection to the Pic River and adding a lake in the upstream which will increase the watershed area, stabilizing the banks of the Pic River, and reclaiming existing streams by restoring flows to pre-development conditions, following mine closure. The design of this compensation strategy reflects the intent of DFO's *Policy for the Management of Fish Habitat* (DFO, 1986) and incorporates many considerations and factors outlined within the policy.

The following Sections describe how the factors outlined above are considered within the framework of the FHCS.

**“No Net Loss” and Hierarchy of Compensation Options**

The FHCS maintains that full compensation for fish habitat losses associated with the Project is feasible. All elements of the proposed strategy meet the criteria of DFO's first two options in the hierarchy of preferences for compensation under its habitat policy within the Project area. Individual components of the compensation design are either incorporated into the Project design, or are proposed in watercourses situated within watersheds directly affected by the Project.

**Targeted Fish Species/Stocks, Fishery Use, Management Objectives**

The FHCS objectives include increasing the net productivity and complexity of fish in the watersheds affected by the Project. The compensation strategy proposes to utilize native fish from around the Project area to aid in the compensation efforts including the creation of a potential baitfish fishery within the newly created Pit 5 Lake.

**Improve Existing Impacts or Address Existing Constraints to Fish Habitat**

The compensation strategy includes the mitigation of existing impacts and addressing existing constraints, including the removal of the barrier to fish passage in the lower reach of Stream 1 and Pic River bank stabilization.

**Use of the Area for Fishing**

For the most part, areas affected by the Project are either fishless or support a limited number of forage fish species, and are not capable of providing a recreational, commercial or substance fishery. One person in the area has a baitfish license and occasionally uses Claw Lake (Lake 19) for his baitfish collections. Claw Lake is outside of the footprint of the Project and will not be impacted by the proposed development. Stream 6 also has a limited Steelhead fishery below the falls near the downstream end of the watershed. This area will be restored to its natural state and flow pattern during the closure phase.

**Species at Risk Act (SARA) Listed Species**

No freshwater fish species on Schedules 1 or 2 of SARA are present on the Project site. Therefore no SARA listed species or their habitat will be directly affected by the Project. Lake Sturgeon are known to utilize the Pic River adjacent to the Project during spawning migration and foraging habitat is reported downstream (Ecclestone, 2012). The Great Lakes - Upper St. Lawrence population of Lake Sturgeon is designated as *Threatened* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2011). The habitat compensation strategy includes a bank stabilization of the Pic River that is aimed at preventing erosion from impacting upon important Lake Sturgeon foraging habitat.

**Type, Amount, and Supply of Fish Habitat at Impact and Compensation Sites**

Total proposed habitat gains are 9.97 ha as compared with 1.85 ha of direct impacted fish habitat. Detailed discussion of impacted habitats and compensation habitats are provided in Section 4.

**Temporal Nature of Impacts**

All Project-related HADDs involving removal of aquatic resources have been treated as permanent in nature. The restoration of watershed flows back their natural course at closure will offset some of the losses associated with the Project. However, for purposes of habitat loss calculation within the compensation strategy, the HADDs identified are considered permanent. More detailed discussion of habitat impacts is provided in Section 4.

**Risk of Failure and Time Lag Associated with Compensation Habitat**

There is minimal risk that compensation habitat will not function as planned, however a high ratio of compensation habitat to lost habitat (5.5:1) is proposed to mitigate the risk (Section 4.3). Compensation habitat will be subject to adaptive management processes and monitoring of habitat function will be undertaken (Sections 4.4.4 and 4.4.5).

All of the compensation elements proposed are situated on or adjacent to the Project site and will be integrated into the overall mine development.

The timing of the implementation of compensation elements is dictated by the design, construction, operation and closure phases of the Project. As such, compensation development will occur concurrently with, or as soon as possible after, habitat losses, minimizing the time lag between loss of habitat productivity and the time when compensation habitat becomes functional. However, some elements will not be implemented until the mine closure phase. An overview of the timing and schedule of compensation works, including the lag time between impacts to fish habitat and the creation of functioning compensation habitat, is provided in Section 4.4.3.

## **4.0 HABITAT COMPENSATION ELEMENTS**

### **4.1 Overview**

During baseline studies, the following opportunities were identified as possible compensation options for the HADD resulting from the Project development:

- Fish passage barrier removal near the Stream 1 – Pic River confluence;
- Stabilization of the bank of the Pic River near Stream 1;
- Creation of a new lake from Satellite Pit 5;
- Restoration of natural drainage patterns in the upper part of the Stream 6 watershed that will be part of the PSMF and the creation of fish habitat therein;
- Restoration of flow and habitat enhancement in Streams 2 and 3; and
- Creation of naturalized streams and ponds across the reclaimed areas of Satellite Pits 2, 3 and 4.

Implementation of the above compensation opportunities, in combination, comprise the FHCP, and should satisfy stated compensation objectives and meet the quantity of habitat required to more than offset fish habitat losses associated with the Project. The plan meets the criteria of the first two options in the hierarchy of preferences for compensation under DFO's habitat policy. It focuses on opening up new habitats to fish utilization above existing (natural) barriers through the transplant of forage fish into the newly created lake in the upper reaches of the Stream 1 watershed. It also plans to remove the existing manmade barrier (perched culvert) to upstream fish passage from the Pic River allowing greater potential for fish habitat utilization of the lower reaches of Stream 1. Each of the components of the compensation strategy is discussed in further detail in the following sections.

### **4.2 Compensation Strategy**

Fish habitat productive capacity will be increased through the development of additional fish habitat and enhancement of existing fish habitat. The planned compensation elements are presented below.



### **4.2.1 Stream 1 Watershed**

#### **Pit Lake**

Satellite Pit 5 will be partially backfilled to create a shallow lake (max depth < 8 m) which will outflow into Lake 2 (Figure 4.1). The Lake will and its connecting stream to Lake 2 will create approximately 6.3 ha of direct fish habitat. Native trees and shrubs will be planted in riparian areas and are expected to form functioning riparian habitat within a few years. The Lake and its connecting stream will be designed to maximize habitat potential with plantings of aquatic vegetation, and the placement of a variety of different structures such as coarse organic matter and different substrate types. The lake will be designed to support fish at all life stages and include all the necessary habitats (e.g., spawning, nursery, foraging). Both the Pit 5 Lake and Lake 2 (into which the pit lake will flow and is currently fishless) will be stocked with forage fish from nearby on-site lakes (e.g., Claw Lake). The newly created lake from Pit 5 will be designed to ensure that overwintering habitat is created as this was identified during the baseline studies as one of the potential limiting factors for fish presence in many of the small lakes and ponds within the Project area as the depths in many of the lakes are not suitable.

As the new lake will be connected to the upper part of the Stream 1 watershed it will increase the watershed area of Stream 1. This will increase the baseflow in Stream 1 and therefore has the potential to increase available habitat. No attempt has been made to estimate the potential incremental increase in fish habitat due to increased baseflow. This will be included in the final estimate of compensation provided in the final compensation plan once the water balance for the new pit lake has been derived.

#### **Camp 19 Road Crossing Replacement**

Previous studies have identified the culvert beneath the existing access road crossing, near the outlet of Stream 1 to the Pic River as a barrier to fish passage. With exception of very high flow conditions, this structure presents an impassable barrier to upstream fish passage. As a result, habitat in Stream 1 is underutilized. Stream 1 presently affords limited spawning and nursery habitat due to the restricted access from the Pic River. Removal of this barrier would increase the productive capacity of the Stream 1 watershed, as it would permit more regular upstream movement of migrating salmonids from the Pic River. Therefore a key component of the proposed compensation is the replacement of the perched culvert to allow unrestricted access for fish from the Pic River to the Stream 1 watershed. This will be accomplished by lowering the culvert and creating a series of step pools to allow fish passage between Stream 1 and the Pic River in low flow conditions (Figure 4.2). Additional habitat enhancements within Stream 1 would also be considered in conjunction with the culvert enhancement to enhance productivity; though candidate sites for such works would need to be confirmed. It has been estimated that this option will create an increase of 0.1 ha of direct fish habitat. The actual increase in habitat area will be greater than this value as the watershed is also being increased and will be updated in the

Compensation Plan after the water balance for the increased watershed area has been calculated.

#### **4.2.2 Pic River**

A recent study of the utilization of Pic River by Lake Sturgeon recognized a site on the Pic River downstream of the Stream 1 outlet as important foraging habitat (Ecclestone, 2012). The access road near the Stream 1 crossing is adjacent to the Pic River and exhibits evidence of erosion during high river flows. To protect the Lake Sturgeon foraging habitat downstream, the river bank in the vicinity of the culvert will be stabilized with an armour stone or similar structure to prevent future erosion and potential washouts of the road onto the Lake Sturgeon foraging habitat. This potential compensation option is of high value as it targets protection of habitat utilized by a species at risk.

#### **4.2.3 Stream 2 and 3 Watersheds**

Once water quality draining the MRSA is suitable to support a fish population, drainage to the lower reaches of the Stream 2 and 3 watersheds will be restored (Figure 4.3). The MRSA drainage collection basins within each watershed will be removed. Native trees and shrubs will be planted in riparian areas and are expected to form functioning riparian habitat within a few years. Compensation measures would include the re-establishment of the stream channels. It is assumed that, although there will be some flow in these streams during the mine life, the natural stream channels will need some rehabilitation. This would include removing terrestrial vegetation that has grown into the natural stream channels and some minor channel re-alignment after stabilization. The exact nature of the compensation works would be determined at the time of implementation but should provide and additional creation of approximately 0.2 ha.



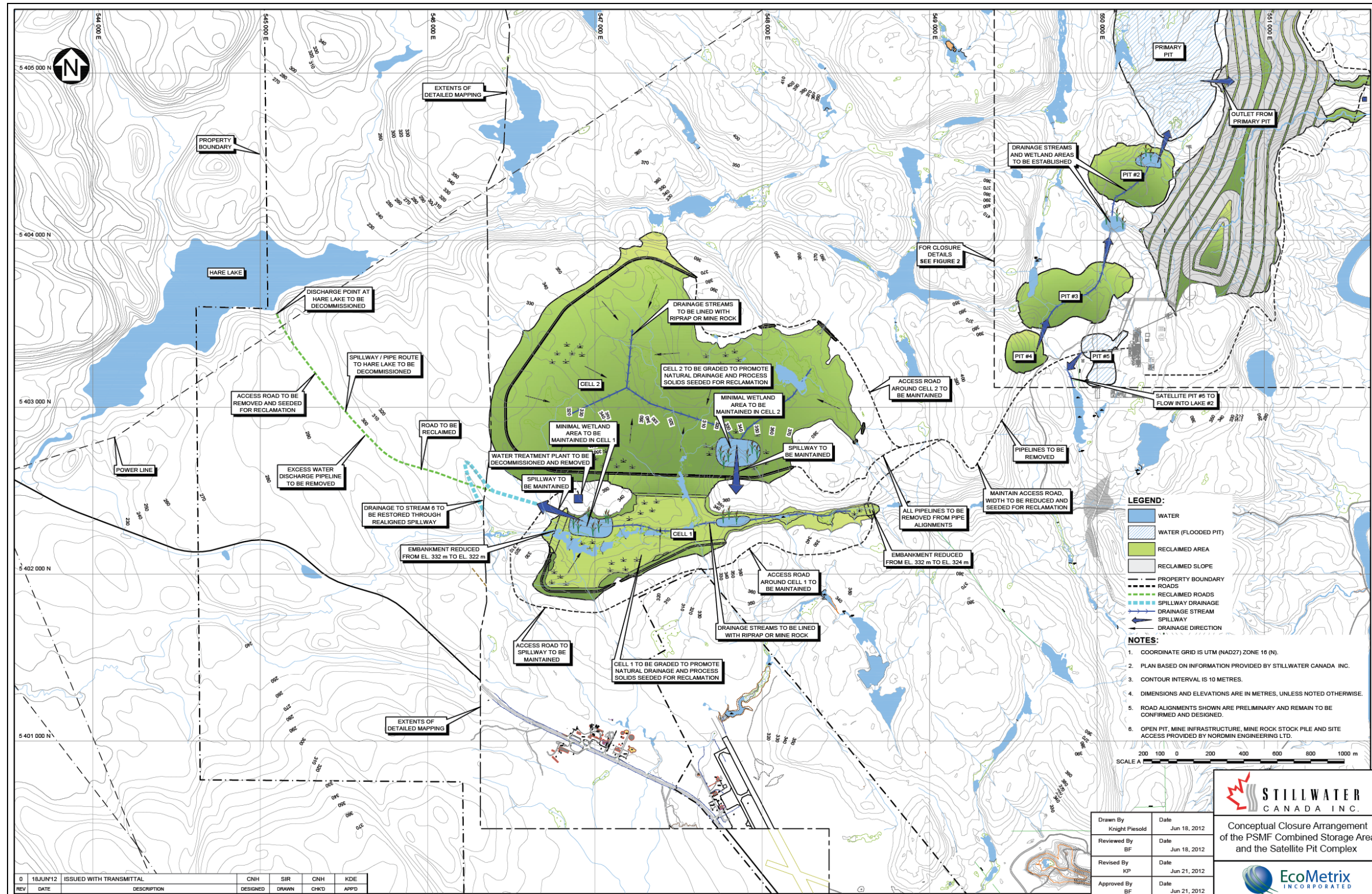


Figure 4.1: Conceptual Closure Arrangement of the PSMF Combined Storage Area and the Satellite Pit Complex



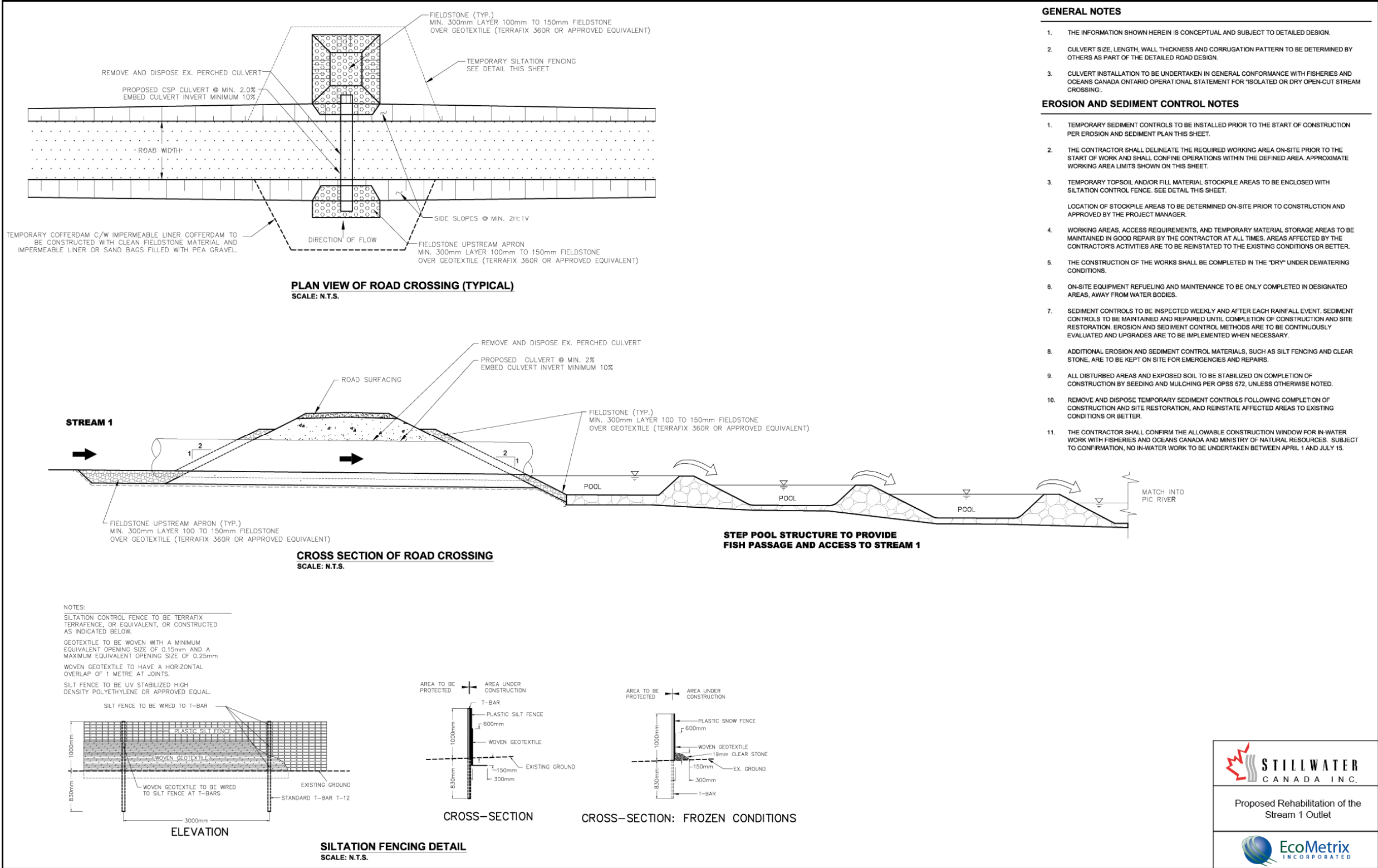


Figure 4.2: Proposed Rehabilitation of the Stream 1 Outlet



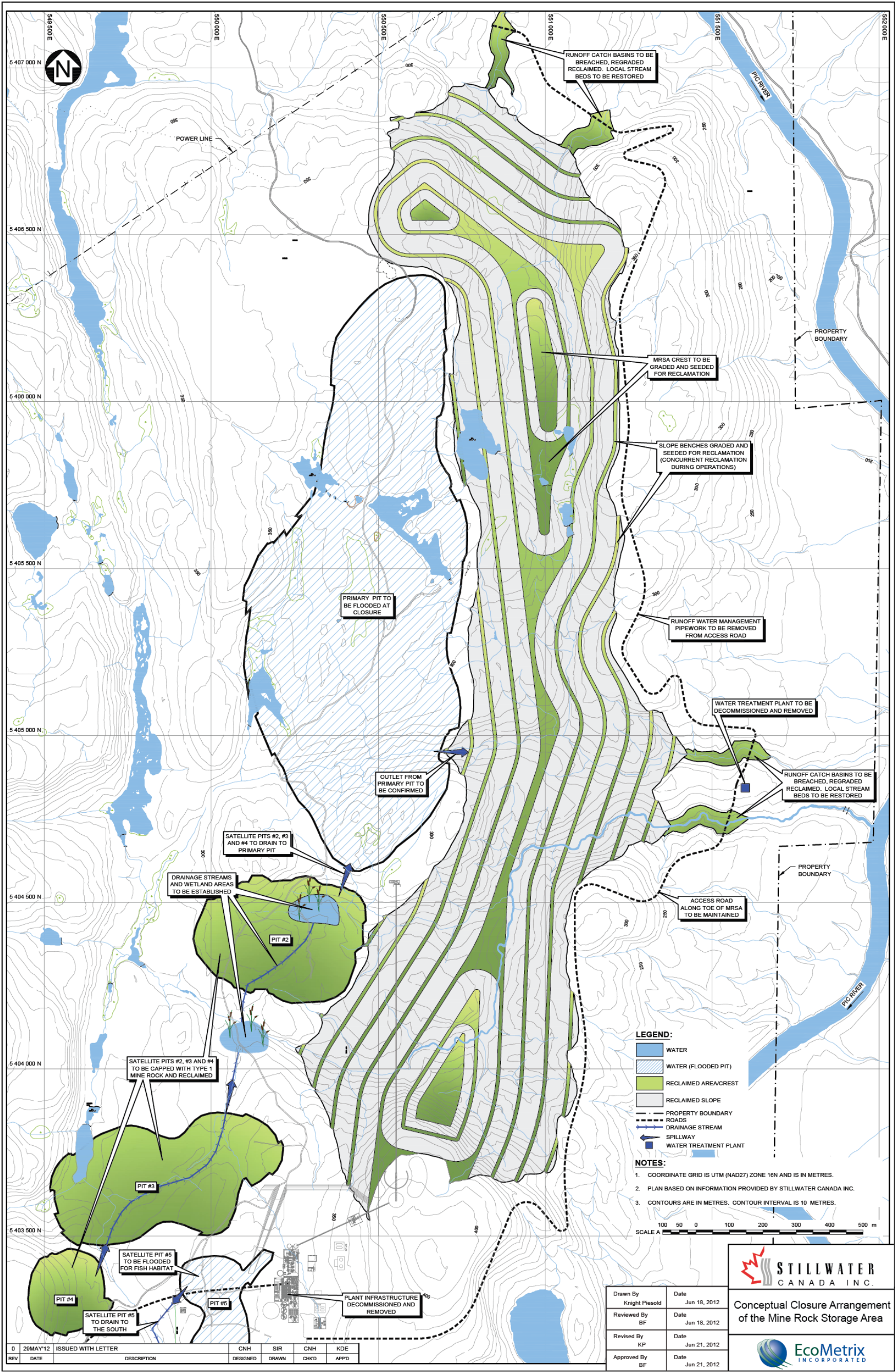


Figure 4.3: Conceptual Closure Arrangement of the Mine Rock Storage Area

#### **4.2.4 Stream 6 Watershed**

The upper reaches of the Stream 6 watershed will be re-graded to restore the pre Project drainage to downstream reaches, after Project completion. The upper reaches will be restored (rechanneled) to provide the same quality of habitat that currently exists.

Wetlands and other pond like structures will be created to provide over wintering habitat. A new outlet structure will be created in the southwest corner of the PSMF which will link the upper and lower parts of the watershed (Figure 4.1). Native trees and shrubs will be planted in riparian areas and are expected to form functioning riparian habitat within a few years. Forage fish will be introduced from an onsite population into the newly created habitat. Restoration and enhancement will occur downstream of the PSMF to reconnect drainage to Stream 6. This will create approximately 2.04 ha of additional habitat. This estimate will likely be increased but will be dependent on the final design of the exact compensation structures installed and will be updated in the final Compensation Plan.

### **4.3 Habitat Balance**

A preliminary habitat balance has been prepared to summarize the habitat losses due to the Project development and gains from the proposed compensation options. Table 4.1 provides a summary of the habitat balance between impacted instream habitats and newly created or enhanced habitat. The total area of impacted fish habitat (direct and indirect) for the Project is estimated at about 9.3 ha. Only 1.85 ha is direct fish habitat (fish bearing waters). Approximately 80 % of the impacted habitat is comprised of non-fish-bearing watercourses. The total area of in-stream habitat proposed in the FHCS is estimated at 9.97 ha, all of which will be fish-bearing, for a net gain of 8.17 ha of fish-bearing habitat at a habitat creation ratio of 5.5:1.



**Table 4.1: Habitat Balance for the Marathon PGM Project**

Project Component	Habitat Impacts (ha)		Compensation Works	Approximate Habitat Gain (ha)	
	Indirect <sup>1</sup>	Direct <sup>1</sup>		Indirect <sup>1</sup>	Direct <sup>1</sup>
Main Pit	2.73	-	Stream 1 Fish Barrier	-	0.1
Satellite Pit 1	0.068	-	Pic River Bank Stabilization	-	1
Satellite Pit 2 Complex	0.03	0.35	Pit 5 and Connecting Stream	-	6.33
MRSA	2.56	0.32	Pit Streams	-	0.3
PSMF	2.08	0.99	PSMF Streams and Stream 6	-	2.04
Type 2 Mine Rock Storage	0.045	0.135	Stream 2 and 3	-	0.2
Road Crossings	0.0015	0.0015	-	-	-
<b>Total Habitat Loss</b>	<b>7.52</b>	<b>1.80</b>	<b>Total Habitat Gain</b>	<b>-</b>	<b>9.97</b>
<b>Net Gain (ha)</b>	<b>-</b>	<b>8.17</b>	<b>Compensation Ratio</b>	<b>-</b>	<b>5.5:1</b>

<sup>1</sup> The terms direct and indirect fish habitat are used to refer to fish frequented waters (i.e., direct fish habitat) and waters where no fish are found but a contribution (hydrological) to downstream areas in a watershed is provided (i.e., indirect habitat).

As indicated, Riparian planting will take place along all newly created watercourses. Trees and shrubs planted in riparian areas will be native to the area, and are expected to form functioning riparian habitat within a few years. Total riparian habitat gains are estimated to be approximately the same ratio as the fish habitat compensation. The ratio of compensation riparian habitat to lost riparian habitat will be well above the loss, and meets the compensation plan objective and DFO's policy objective of a net gain in habitat productivity.

## 4.4 Implementation Strategy

The following sections provide an overview of the preliminary planning required to implement the compensation plan. This includes discussion of construction, timing of compensation, adaptive management and monitoring. Site specific works plans and mitigation methods to minimize impacts to fish and fish habitat during construction will be included as an Appendix to the detailed fish habitat compensation plan.

#### **4.4.1 Execution and Administration**

Stillwater will be responsible for the construction of the all compensation works including the implementation of mitigation measures and on-site monitoring during construction.

#### **4.4.2 Construction Timing**

The timing of compensation works construction is a key consideration in ensuring the temporal loss of productive capacity within the Project watersheds is minimized (i.e., the lag time between impacts to fish habitat and the creation of functioning compensation habitat). A preliminary schedule of habitat gains attributed to compensation works in relation to timing of habitat losses is provided below.

#### **4.4.3 Schedule of Predicted Compensation**

Mine development is tentatively scheduled to begin in the beginning of 2013 pending approval of permit and authorization applications. Site preparation, in combination with construction, is estimated to be completed over an 18- to 24-month period. During this time remediation of the Stream 1 culvert and the bank stabilization of the Pic River could take place after the new access road to the site is constructed. This could help to offset the time lag issues associated with the other compensation elements which cannot be implemented until mine closure or post closure.

The operations phase of mine life includes the development of the ore body and the production of copper, PGMs, and possibly iron concentrates. The operating life of the mine is proposed to be approximately 11.5 years. As identified compensation options become available during this phase they could be progressively rehabilitated. The creation of Pit 5 Lake and its connection to the Stream 1 watershed may be able to be completed (or work related to this option could begin) during the operations phase.

After the completion of the operations phase the decommissioning and closure phase will be begin. The closure phase includes activities that are designed to ensure that the Project site is closed in a manner that reduces the potential impacts on the social and natural environment, and to the extent possible returns the site to an end use that is supported by Aboriginal people, the public and government. The most intense period of decommissioning of site infrastructure will occur immediately following the cessation of operations. At this time as much of the site infrastructure will be removed as is possible, while still providing sufficient resources on the site to engage in ongoing closure and post-closure activities. During this phase any habitat compensation works that have not been previously completed will be undertaken.

Most compensation works for the Project are planned to be conducted during the final phases of the Project's life but the habitat compensation ratios proposed in this document



should therefore compensate for any time lag associated with the Project. A schedule for compensation works will be detailed in the final Compensation Plan.

#### **4.4.4 Adaptive Management**

Adaptive management as part of the development of the compensation elements will provide a management tool to adjust the elements as required, ensuring goals are met and habitats are functioning within specified timelines. Ongoing monitoring of compensation planning activities, including collection of habitat data, will provide information which will be measured against established targets and timeframes for individual compensation works. Should deficiencies or data gaps be identified, the adaptive management framework will trigger a feedback mechanism to ensure deficiencies are addressed.

Potential issues that may reduce the effectiveness of compensation habitat are outlined in Table 4.2 along with strategies that may address these issues. Ongoing monitoring and adaptive management will ensure that potential issues are effectively addressed should they arise.

**Table 4.2: Potential Compensation Effectiveness Issues**

Issue	Mitigation Strategies
Failure of habitat to function as designed (e.g. formation of obstructions, beaver activity, winter kill)	<ul style="list-style-type: none"> <li>• Ongoing monitoring and adaptive management will identify habitat function issues or deficiencies as they arise</li> <li>• Contingency planning and a commitment toward redesigning compensation as necessary to achieve habitat productivity objectives.</li> </ul>

#### **4.4.5 Monitoring**

With respect to mitigation and compensation measures, a compliance monitoring program verifies the conditions of the compensation plan have been met, whereas follow-up monitoring is used to determine the efficacy of the required mitigation measures and compensation works. Importantly, fish habitat compensation monitoring will be managed through conditions of required *Fisheries Act* authorizations. To ensure the compensation works are constructed to design specifications, monitoring will be scheduled at regular intervals throughout construction of the various components.

To determine the effectiveness of the proposed compensation works, a monitoring program will be developed as part of the final Compensation Plan. The program will focus on the biological effectiveness (e.g. seasonal use for fish species and physical integrity of constructed components). The monitoring program will include assessments of water

quantity and quality (e.g. temperature, pH); habitat structure, attribute integrity and functionality (e.g. riparian re-vegetation survival; and fish use by at each life-history stage).

The proposed monitoring schedule will include:

- Assessments of water quality, biological, and physical attributes of the constructed compensation works during the first year after compensation, and every few years thereafter as needed or as appropriate to ensure the effectiveness of the compensation; and
- Fish use assessments of the compensated areas during the first year after compensation, and every few years thereafter as needed or as appropriate to ensure the effectiveness of the compensation.

Remedial or adaptive measures will be applied immediately following any evaluation that determines a reduction in functionality or integrity of the compensation work.

## **4.5 Uncertainties**

The uncertainty relating to the habitat compensation project may vary according to several contributing factors, including:

- The technical feasibility of the proposed compensation works;
- The quality and quantity of habitat compensation proposed in relation to the impacted habitat; and
- The timescale over which the benefits of the proposed compensation will be realized.

Uncertainties inherent in the Compensation Strategy will be addressed through:

- Detailed design of the compensation works,
- Inclusion of limiting habitat types that have been demonstrated within the Project watershed;
- Effectiveness monitoring of the compensation works; and
- Implementation of adaptive management to respond to results from effectiveness monitoring.

Habitat compensation ratios proposed within the FHCP are relatively high, and in all cases, fish-bearing habitat is being proposed. These high replacement ratios will help achieve the

goal of net gain in habitat productive capacity in the face of the compensation effectiveness uncertainty.

#### **4.6 Summary and Consultation Regarding Compensation Options**

SCI believes the FHCS adequately addresses the impacts of the proposed Project on fish and aquatic habitat through the creation of new habitat, the restoration of habitats potentially affected by the project and the enhancement of existing habitats. The fish habitat compensation strategy presented herein is considered preliminary and subject to modification during the detailed design of the components and availability of suitable locations for engineered structures. Moreover, SCI will seek input from the public, Aboriginal peoples, stakeholders, and government regarding the strategy/options proposed, as well as other opportunities that might arise through the consultation process, during the formalization of this strategy into a final Compensation Plan.

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