

Appendix M

Conceptual Fish Habitat Offsetting Plan

Crawford Nickel Project Conceptual Fish Habitat Offsetting Plan

November 22, 2024

Prepared for:

Canada Nickel Company



Prepared by:

Stantec Consulting Ltd.



Limitations and Sign-off

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Acronyms and Abbreviations

DFO	Fisheries and Oceans Canada
FMZ	Fisheries Management Zone
GS	Generating Station
HADD	harmful alteration, disruption, or destruction
IAAC	Impact Assessment Agency of Canada
kV	kilovolt
km	kilometre
LSA	Local Study Area
masl	metres above sea level
MDMER	Metal and Diamond Mining Effluent Regulations
MNR	Ministry of Natural Resources (formerly Ministry of Natural Resources and Forestry [MNR])
MRCA	Mattagami Region Conservation Authority
Mt	million tonnes
NMCA	National Marine Conservation Area
OLI	Ontario Land Inventory
OPG	Ontario Power Generation
ORA	Ontario Rivers Alliance
RSA	Regional Study Area
TIA	Tailings Impoundment Area
TKLU	Traditional Knowledge and Land Use Studies
TWG	Technical Working Group

Crawford Nickel Project Conceptual Fish Habitat Offsetting Plan
Acronyms and Abbreviations
November 22, 2024

WMP Water Management Plan

WSP WSP Canada Inc.

1 Introduction

Canada Nickel Company (Canada Nickel) proposes to develop, operate, and progressively reclaim the Crawford Nickel Project ('the Project'), a new open pit nickel mine and processing facility located approximately 42 kilometres (km) north of Timmins, Ontario (Figure A.1, Appendix A). The Project includes development of an Open Pit, Stockpiles, two ore Processing Plants, and other mine-related infrastructure, as well as a new rail spur line and the relocation of Highway 655 and existing 500 kilovolt (kV) transmission line (Figure A.2, Appendix A). Ore will be extracted from a single Open Pit that will be divided into an East Zone and Main Zone. The Project has a mineral reserve estimate of 1,715 million tonnes (Mt) and an expected project life of 41 years.

The Project is being assessed in accordance with the *Impact Assessment Act*, 2019 by the Impact Assessment Agency of Canada (IAAC).

Despite implementation of avoidance and mitigation measures, construction of the Project will result in the unavoidable harmful alteration, disruption, or destruction (HADD) of fish habitat in the headwaters of the North Driftwood River, West Buskegau River, and Jocko Creek watersheds. This HADD of fish habitat will require authorization from Fisheries and Oceans Canada (DFO), under paragraph 35(2)(b) of the *Fisheries Act*. Additionally, the Project will result in the deposition of deleterious substances (e.g., waste rock, tailings) into fish-bearing watercourses in the North Driftwood River and West Buskegau River watersheds. Before deleterious mine wastes can be deposited, the watercourses must be designated as "tailings impoundment areas" (TIAs) under Schedule 2 of the Metal and Diamond Mining Effluent Regulations (MDMER) by the Government of Canada. Authorization of the HADD of fish habitat and the designation of fish-bearing waters as TIAs under Schedule 2 require Canada Nickel to submit a Fish Habitat Offsetting Plan that, when implemented, will counterbalance the unavoidable habitat losses to the satisfaction of DFO.

This Conceptual Fish Habitat Offsetting Plan is being prepared to inform the Impact Statement. This conceptual plan provides preliminary accounting of potential habitat losses caused by the Project and a preliminary suite of habitat restoration, enhancement, or creation projects that could be included in the final Fish Habitat Offsetting Plan to be submitted to DFO during permitting. The objectives of the Conceptual Fish Habitat Offsetting Plan are to identify potential offset options that could be used to counterbalance the unavoidable HADD of fish habitat and/or death of fish by means other than fishing, to inform on-going engagement with DFO, Ontario Ministry of Natural Resources (OMNR), and potentially affected Indigenous nations about offsetting, and to provide DFO and the Impact Assessment Agency of Canada (IAAC) with the information needed to assess whether there is a suite of technically feasible and biologically relevant offsets, that if implemented, could be expected to avoid a significant adverse effect on fish and fish habitat.

2 Existing Conditions

2.1 Hydrology

The Project Area (PA), which encompasses the anticipated area of physical disturbance associated with construction, operations, and decommissioning and closure of the Project, encompasses an approximately 11,785 hectare (ha) area in the headwaters of three watersheds: the North Driftwood River, the West Buskegau River, and Jocko Creek watersheds (Figure A.3, Appendix A). The PA contains the North Driftwood River mainstem, which ranges from a third to fourth order stream, and first and second order tributaries of the North Driftwood River, West Buskegau River, and Jocko Creek.

The North Driftwood River originates from a series of small headwater lakes located near the southwest corner of the PA: Martin Lake, Gerry Lake, Jack Lake, Sutherland Lake, Mel Lake, and Davis Lake. The North Driftwood River drains north for approximately 60 km to its confluence with the Abitibi River. There are several major tributaries to the North Driftwood River between the PA and the Abitibi River; in order from upstream to downstream, these are Nesbitt Creek, Lennox Creek, Chenier Creek, Sauve Creek, Pellman Creek, Calder Creek, Sherriff Creek, and Tributary Creek.

The West Buskegau River originates east of the PA and flows north for approximately 18 km to its confluence with the Buskegau River. The Buskegau River then flows north for approximately 35 km to its confluence with the Frederick House River. The Frederick House River flows north for approximately 26 km to its confluence with the Abitibi River, located approximately 12 km downstream of the confluence of the North Driftwood River and the Abitibi River. Major tributaries of the West Buskegau River and Buskegau River between the PA and the confluence with the Frederick House River, in order from upstream to downstream, are Prosser Creek, Reaume Creek, and Fourier Creek.

Jocko Creek is an eastern tributary of the Mattagami River with its confluence upstream of the Lower Sturgeon Falls Generating Station (GS). Kidd Creek is the major tributary of Jocko Creek.

The topography across the PA is generally flat, with local topographic lows typically associated with surface water features, and topographic highs associated with watershed boundaries. The ground surface elevation generally ranges between 265 and 290 metres above sea level (masl), averaging about 15 m in local relief.

2.2 Fish Habitat

Existing aquatic habitat in the PA is influenced by current and historic beaver activity and, therefore, is composed of numerous shallow ponded areas connected by small, shallow streams. Ponded areas have broad floodplains that are dominated by sedges and grasses as well as emergent macrophytes (e.g., cattail). Woody shrubs are abundant near the water's edge, transitioning to a mostly coniferous forest farther upland. Submergent (e.g., milfoil) and floating macrophytes (e.g., yellow pond lily) are common, with dead standing trees and submerged woody debris providing in-water cover for fish.

Stream habitat is characterized by moderate to broad flood plains with bankfull widths typically less than three metres and bankfull depths typically less than one metre (Appendix B.8.2 of the Impact Statement [2021-2023 Fish and Fish Habitat Baseline]). Stream morphology is largely pools with occasional glides due to low gradient. Instream substrates are predominantly depositional materials such as silt, fine organics, and clay. Instream cover is predominantly submergent and/or floating macrophytes with smaller percentages of woody debris. Riparian communities have emergent macrophytes (e.g., cattail and horsetail), but are dominated by sedges, grasses, and woody shrubs which transition to a mostly coniferous forest farther upland (Appendix B.8.2 of the Impact Statement).

2.3 Fish Community

The fish community within the PA is dominated by small-bodied fish species including various cyprinid (minnow) species and brook stickleback (Appendix B.8.2 of the Impact Statement). Large-bodied fish species are less abundant, particularly in the beaver ponds and smaller headwater streams. However, large-bodied fish species are found in the North Driftwood River and West Buskegau River mainstems and in the headwater lakes of the North Driftwood River and include Northern Pike (*Esox lucius*), White Sucker (*Catostomus commersoni*), Burbot (*Lota lota*), and Yellow Perch (*Perca flavescens*).

3 Assessment of Potential Death of Fish by Means Other than Fishing

Without mitigation, the Project has the potential to result in the death of fish due to the following activities:

- Stranding of fish or fish eggs during dewatering of fish-bearing watercourses and waterbodies
- Physical trauma from the placement of materials or structure in water
- Entrainment in intake pipes or impingement on intake screens
- Sound overpressures from blasting in the Open Pit
- Accidental release of hydrocarbons during use of heavy machinery
- Increased sediment loading due to excavation, grading, and storage of topsoil and overburden

Canada Nickel will develop and implement mitigation measures to reduce the potential death of fish or fish eggs during construction, operations, and decommissioning and closure of the Project. Identification of these mitigation measures will be guided by DFO's Measures to Protect Fish and Fish Habitat and DFO's Standards and Codes of Practice, as appropriate. The mitigation measures will include, but are not limited to, the following:

- Conducting fish salvages prior to dewatering or infilling watercourses or waterbodies required to build or operate the Project
- Avoiding work in or adjacent to fish habitat during provincial restricted activity timing windows, as appropriate for the fish species present
- Installation of fish screens on freshwater intakes that have been designed to protect the weakest swimming life stage of the weakest swimming fish species present using DFO's *End-of-Pipe Screen Size Tool* (Di Rocca and Gervais 2024)
- Developing a blast management plan so that sound overpressures and peak particle velocities in the closest fish-bearing watercourses and waterbodies do not exceed the risk thresholds identified in DFO's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998)
- Maintaining heavy equipment in good working condition, prohibiting refuelling of heavy machinery within 50 m of a fish-bearing watercourse or waterbody, and storing fuels and other hydrocarbons in industry-standard containment units at least 50 m from the closest fish-bearing watercourse or waterbody
- Designing and implementing an erosion prevention and sediment control plan that reduces exposure of erodible soils to precipitation, reduces slope angles, and collects and treats sediment-laden water before it enters fish-bearing watercourses and waterbodies
- Designing and implementing a water management plan (WMP) that diverts non-contact water around the mine site and captures, collects, and treats contact water before release to the receiving environment

- Following applicable measures in:
 - DFO’s Code of Practice: Beaver Dam Breaching and Removal (DFO 2023a)
 - DFO’s Code of Practice: Clear Span Bridges (DFO 2023b)
 - DFO’s Code of Practice: Temporary Fords, if necessary (DFO 2023c)
 - DFO’s Interim Standard: In-water Site Standard (DFO 2023d)

When implemented, the above measures are expected to reduce the number of fish or fish eggs killed during construction, operations, and decommissioning and closure of the Project. While no mitigation measure can eliminate the risk of death of fish or fish eggs, Canada Nickel believes that a separate paragraph 34.4(2)(b) *Fisheries Act* authorization for the death of fish, by means other than fishing, will not be required for the Project. Instead, it is Canada Nickel’s understanding that residual death of fish after mitigation, by means other than fishing, can be accommodated within the paragraph 35(2)(b) *Fisheries Act* authorization for the unavoidable HADD of fish habitat. Canada Nickel will look to DFO for guidance on this issue during future meetings.

4 Assessment of Potential Harmful Alteration, Disruption, or Destruction of Fish Habitat

4.1 Methods

Potential HADD of fish habitat may occur in the North Driftwood River, West Buskegau River, and Jocko Creek watersheds resulting from:

- Overprinting of fish-bearing watercourses and waterbodies under the mine footprint
- Change in stream flows downstream of the PA
- Change in lake levels due to changes in surface run-off or groundwater table elevation near the Open Pit

A geographic information system was used to overlay the mine infrastructure (e.g., pit and TIA) within the PA on top of the fish habitat spatial dataset. The fish habitat dataset was created from the 1:10,000 scale Ontario Land Inventory (OLI) database, an ArcGIS waterflow model using LiDAR imagery to identify smaller headwater streams not captured in the LIO database, and aerial photo interpretation to identify small headwater ponds not captured in the LIO database. The macro-habitat types (i.e., mainstem, headwater tributary, and headwater pond) in the fish habitat dataset were delineated using the fish habitat assessments conducted between 2021 and 2023 by WSP Canada Inc. (WSP) for the Project baseline characterization (Appendix B.8.2 of the Impact Statement).

Twenty-five different fish species are known to use fish habitat within the PA (Appendix B.8.2 of the Impact Statement). These include large-bodied fish species such as White Sucker, Northern Pike, Yellow Perch, and Burbot and small-bodied fish species such as Brook Stickleback, Fathead Minnow, Finescale Dace, Northern Redbelly Dace, Northern Pearl Dace and 16 other minnow, chub, and dace species (collectively called the “forage fish guild”). A summary of the total habitat area, by fish species and life stage, potentially affected by the Project footprint in the North Driftwood River, West Buskegau River, and Jocko Creek watersheds is provided in Chapter 17 of the Impact Statement. This information was calculated using:

- Fish habitat assessments conducted between 2021 and 2023 by WSP for the Project baseline that includes characterization of meso-habitat types (e.g., pools, riffles, and runs), channel morphology, cover, substrate, riparian and aquatic vegetation
- Fish distribution and abundance data collected between 2021 and 2023 by WSP for the Project baseline characterization (Appendix B.8.2 of the Impact Statement) (circulated with Technical Working Group [TWG] #1 materials)
- *In situ* water temperature and dissolved oxygen concentration data collected between 2021 and 2023 by WSP for the Project baseline characterization (Appendix B.8.2 of the Impact Statement) (circulated with TWG #1 materials)
- Habitat suitability information compiled from the published literature for each fish species.

Flow reductions greater than 10% are predicted during spring freshet in the North Driftwood River subwatershed ND1, the subwatershed extending from the downstream of the PA to the confluence with Nesbitt Creek (Chapter 15 of the Impact Statement). This predicted flow reduction may reduce water depths and water velocities in riffles and affect habitat suitability for spring spawning fish species. However, predicted flow reductions did not fall below environmental flow values and changes in the suitability of these riffles for walleye and white sucker spawning are, therefore, not expected. The final Fish Habitat Offsetting Plan will identify and account for harmful alteration of fish habitat associated with this flow reduction and may consider additional field data collected to build upon existing information and more accurately quantify offset requirements.

4.2 Results

Construction, operations, and decommissioning and closure of the Project is anticipated to result in the unavoidable HADD of approximately 147 ha of fish habitat within the PA (Table 4.1). Most (70%) of the affected habitat will be in the North Driftwood River watershed, with smaller areas affected in the West Buskegau River watershed (29%) and Jocko Creek watershed (<1%) (Table 4.1). In the North Driftwood River watershed, potentially affected fish habitat includes approximately 8 km of the North Driftwood River mainstem channel, a 4th order stream, and smaller, unnamed tributaries (1st, 2nd, and 3rd order streams) and headwater ponds in 14 subwatersheds of the North Driftwood River. Most (92%) of the fish habitat potentially affected by the Project footprint in the North Driftwood River watershed is headwater tributary habitat and headwater pond habitat.

In the West Buskegau River watershed, the potentially affected fish habitat is primarily unnamed tributaries and headwater ponds in six subwatersheds that drain into the West Buskegau River mainstem from the west; this potentially affected fish habitat comprises over 99% of all potentially affected habitat in the West Buskegau River watershed. Habitat in the West Buskegau River mainstem may be affected by mine effluent discharge locations, comprising <1% of the total potentially affected fish habitat in the West Buskegau River watershed.

In the Jocko Creek watershed, the potentially affected fish habitat is limited to a small, headwater tributary of Jocko Creek.

Table 4.1 Summary of Fish Habitat Potentially Affected by the Project Footprint in the North Driftwood River, West Buskegau River, and Jocko Creek Watersheds

Watershed	Habitat Type	Total Spatial Area (ha)
North Driftwood River	Mainstem ¹	14.96
	Headwater tributary ²	21.42
	Headwater pond ³	66.32
West Buskegau River	Mainstem ¹	0.36
	Headwater tributary ²	10.08
	Headwater pond ³	34.02
Jocko Creek	Headwater tributary ²	0.15
Total		147.31
Notes: ¹ includes channels with stream orders 4 ² includes tributaries with stream orders 1 to 3 ³ includes ponds and beaver dam impoundments		

5 Conceptual Fish Habitat Offsetting Plan

5.1 DFO Guiding Principles

Canada Nickel will develop the Fish Habitat Offsetting Plan for the Project in recognition of the four guiding principles in DFO's *Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat under the Fisheries Act* (DFO 2019a):

1. Measures to offset should support fisheries management objectives and give priority to the restoration of previously degraded habitat
2. Benefits from measures to offset should balance the adverse effects resulting from the works, undertakings, or activities
3. Measures to offset should provide additional benefits to the ecosystem
4. Measures to offset should generate self-sustaining benefits over the long term

Canada Nickel will also develop the Fish Habitat Offsetting Plan for the Project with an understanding of the factors that DFO must consider before making decisions (e.g., issuing paragraph 35(2)(b) Authorizations) under the Fish and Fish Habitat Protection Provisions of the *Fisheries Act* as articulated in DFO's *Fish and Fish Habitat Protection Policy Statement* (DFO 2019b):

1. The contribution to the productivity of the relevant fisheries by fish or fish habitat that is likely to be affected
2. Fisheries management objectives
3. Whether there are measures or standards to avoid the death of fish or to mitigate the extent of their death or to offset their death
4. Whether there are measures or standards to avoid, mitigate, or offset the harmful alteration, disruption, or destruction of fish habitat
5. The cumulative effects of carrying on the works, undertakings, or activities in combination with other works, undertakings, or activities that have been or are being carried out, on fish and fish habitat
6. Any fish habitat banks that may be affected
7. Whether measures and standards to offset the HADD of fish habitat give priority to the restoration of degraded fish habitat
8. Indigenous knowledge of the Indigenous peoples of Canada that has been provided to the Minister of Fisheries and Oceans Canada
9. Any other factors that the Minister of Fisheries and Oceans Canada considers relevant

5.2 Methods

5.2.1 Fish Habitat Offset Measure Compilation

Candidate fish habitat offset measures that could be used to counterbalance the unavoidable death of fish or HADD of fish habitat due to construction, operations, and decommissioning and closure of the Project will be compiled from the following sources:

1. Design options for the North Driftwood Diversion Channel
2. Desktop review of available documents, websites, and databases relevant to the Project, the watersheds of interest, and fish species of interest including, but not limited to, the following:
 - a. Mattagami River Conservation Authority
 - b. Mattagami River Water Management Plan
 - c. Recovery Strategy for Lake Sturgeon in Ontario
 - d. Ontario Rivers Alliance website
 - e. Ontario Federation of Anglers and Hunters website
3. Interviews with Ontario Power Generation (OPG) staff, Ontario Ministry of Natural Resources (MNR) regional biologists, Ontario Rivers Alliance (ORA) staff, Mattagami Region Conservation Authority (MRCA) staff, Mushkegowuk Environmental Research Centre staff, and Canada Nickel's consulting biologists who conducted the baseline fish and fish habitat surveys between 2021 and 2023
4. Interviews with members of potentially affected Indigenous nations (e.g., Chief and Council, Land and Resources Departments, Elders, and resource harvesters), as identified in the Indigenous Engagement and Partnership Plan ¹
5. Input from TWG members
6. Input from participants at Public Information Centre events hosted by Canada Nickel in Timmins and Cochrane
7. Observations made during field surveys conducted within the PA in 2023 and 2024

While the intent of the above methods is to compile a list of all potential offset measures that could be included in the final Fish Habitat Offsetting Plan, the following criteria will be used to focus the search:

1. In order of priority, identify offset measures at the following spatial scales:
 - a. PA
 - b. Local Study Area (LSA)
 - c. Regional Study Area (RSA)
 - d. Ontario's Fisheries Management Zone (FMZ) ⁸

¹ Available at: <https://iaac-aeic.gc.ca/050/evaluations/document/147339>

2. Identify offset measures that benefit fish species valued by recreational, commercial, and/or Indigenous fisheries (e.g., Lake Sturgeon (*Acipenser fulvescens*), Walleye (*Sander vitreus*), Northern Pike, Lake Whitefish (*Coregonus clupeaformis*), Burbot, Yellow Perch, Smallmouth Bass (*Micropterus dolomieu*), Brook Trout (*Salvelinus fontinalis*), and Lake Trout (*Salvelinus namaycush*))
3. Identify offset measures that proportionally benefit fish species most affected by the Project (*Culaea inconstans*) (*Margariscus nachtriebi*) (*Chrosomus neogaeus*) (*Chrosomus eos*)
4. Identify offset measures that are commensurate with the scale of potential impact and provide long-term benefits without ongoing maintenance

5.2.2 Engagement with Potentially Affected Indigenous Nations

Canada Nickel is engaging with the six potentially affected Indigenous nations in accordance with the Indigenous Engagement and Partnership Plan for the Project². These Indigenous nations are:

1. Apitipi Anicinapek Nation
2. Flying Post First Nation
3. Matachewan First Nation
4. Mattagami First Nation
5. Taykwa Tagamou Nation
6. Métis Nation of Ontario

Engagement efforts to date have focused on identifying key concerns about the Project, fish species of cultural importance, traditionally important fishing locations, and recommendations for fish habitat offset measures. Canada Nickel has provided funding to Indigenous nations to conduct Traditional Knowledge and Land Use Studies (TKLU) that include Indigenous Knowledge and recommendations regarding fish and fish habitat in their traditional territories. A presentation focusing on the Conceptual Fish Habitat Offsetting Plan was given to attendees of the Project's TWG held on June 19 and 20, 2024, which included Apitipi Anicinapek Nation, Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Taykwa Tagamou Nation. TWG members also received a draft of the Conceptual Fish Habitat Offsetting Plan in advance of the June 2024 session for review. After the TWG session held in June, Canada Nickel engaged with the Métis Nation of Ontario – Region 3 (July 18, 2024) and the three potentially affected Indigenous nations that are members of the Wabun Tribal Council (Flying Post First Nation, Matachewan First Nation, and Mattagami First Nation) (July 31, 2024) about fish habitat offsetting. Canada Nickel also intends to pursue engagement with Apitipi Anicinapek Nation and Taykwa Tagamou Nation regarding fish habitat offsetting, and will continue to engage all interested Indigenous nations regarding the fish habitat offset plan, including consideration of nation-specific recommendations and input following submission of the Impact Statement.

² Available at: <https://iaac-aeic.gc.ca/050/evaluations/document/147339>

5.2.3 Fish Habitat Offset Measure Screening

Once a list of candidate fish habitat offset measures has been compiled, Canada Nickel intends to screen each measure semi-quantitatively against the following criteria using a three-point rating system (i.e., low = 1, moderate = 2, and high = 3):

- Technical feasibility
- Biological relevance
- Liability and cost implications
- Consistency with local fisheries management objectives, where available
- Consistency with Indigenous knowledge, fisheries management objectives, and/or culturally important fish species
- Consistency with DFO's Guiding Principles in the *Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the Fisheries Act* (DFO 2019a)

The purpose of this screening process will be to narrow down the list of candidate fish habitat offset measures to a suite of options that, when considered collectively, can be expected to counterbalance the unavoidable HADD of fish habitat caused by the Project by restoring, enhancing, or creating fish habitat that will provide long-term benefits to fish production in FMZ 8, the management zone that the Project is located within.

While this suite of options may not be the final list of offset measures included in the fish habitat offset plan submitted as part of Canada Nickel's paragraph 35(2)(b) *Fisheries Act* authorization application, its intention will be to show DFO and potentially affected Indigenous nations that there are sufficient opportunities for fish habitat offsetting available locally and regionally, so that a decision about the significance of potential effects of the Project on fish and fish habitat can be made by DFO and IAAC during the Impact Assessment process.

5.3 Fisheries Management Objectives

DFO's guiding principles and the factors that the Minister of Fisheries and Oceans Canada must consider when making decisions under the *Fisheries Act* include the need to best align offsetting measures with available fisheries management objectives. Therefore, fisheries management objectives to guide development of this Conceptual Fish Habitat Offsetting Plan were determined from the following sources:

- Ontario's Provincial Fish Strategy: Fish for the Future (MNR 2019)
- Fisheries Management Zone 8 (Cochrane, Hearst, Timmins, Kapuskasing, and Kirkland Lake)
- Fisheries Management Objectives for Ontario's Northeast District
- Mattagami River Water Management Plan (MNR 2005)
- Recovery Strategy for Lake Sturgeon (Golder Associates Ltd. 2011)

5.3.1 Ontario Provincial Fish Strategy

MNR's vision is healthy ecosystems supporting native self-sustaining fish communities and fisheries that provide long-term ecological, social, economic, cultural, and health benefits for the people of Ontario. This vision can be summarized into two broad outcomes:

1. Biodiversity conservation where aquatic ecosystems and habitats are healthy, common fish species remain common, fewer aquatic alien species are introduced and the spread of invasive species is slowed, and the status of fish species at risk is improved.
2. Sustainable fisheries where abundance of fish populations is greater than that expected at a maximum sustainable yield, fishing mortality is lower than natural mortality, benefits derived from the fisheries resource increase, more people are fishing, and more people are involved in the management of Ontario's fisheries.

The *Ontario Provincial Fish Strategy: Fish for the Future* (MNR 2019) includes long-term aspirational goals, shorter-term objectives, and specific tactics to achieve these goals and objectives. The long-term goals and their shorter-term objectives are described below.

5.3.1.1 Goal #1: Healthy Ecosystems that Support Self-Sustaining Native Fish Communities

The focus of Goal #1 is to protect, rehabilitate, or restore native fish communities and their supporting ecosystems and habitats, and to avoid introductions of new species. Like native species, naturalized species and their supporting ecosystems and habitats should be afforded protection and rehabilitated or restored consistent with established fisheries management objectives. The objectives of Goal #1 are to:

1. Protect and maintain aquatic ecosystem diversity, connectivity, structure, and function, including fish habitat
2. Protect the composition of native fish communities
3. Restore, recover, or rehabilitate degraded fish populations and their supporting ecosystems, including fish habitat
4. Prevent unauthorized introductions and slow the spread of invasive fish and other aquatic species, including pathogens
5. Anticipate and mitigate or adapt to large-scale environmental change and minimize cumulative environmental effects

5.3.1.2 Goal #2: Sustainable Fisheries that Provide Benefits to Ontarians

The objectives of Goal #2 are to:

1. Harvest fish within safe biological limits
2. Allocate fish resources considering the needs and interests of all users
3. Increase economic, social, and cultural benefits derived from fish resources
4. Promote the development and use of responsible fishing practices

5. Reduce the risks to human health associated with contaminants and pathogens

5.3.1.3 Goal #3: An Effective and Efficient Program for Managing Fisheries Resources

The objectives of Goal #3 are to:

1. Provide sound governance to successfully achieve fish management objectives and continually improve the efficiency and effectiveness of fisheries management
2. Create effective regulations, policies, and practices to guide present and future actions and decisions
3. Maintain a competent, well-trained, and educated workforce
4. Provide services that are accessible, responsive to needs, consistent, and fair
5. Achieve a high level of compliance with legislation, regulations, and policies

5.3.1.4 Goal #4: Fisheries Policy Development and Management Decisions that are Informed by Sound Science and Information

The objectives of Goal #4 are to:

1. Monitor at the appropriate spatial and temporal scales
2. Develop and use fisheries and aquatic sciences and social sciences
3. Maintain a coordinated and standardized approach to information management and sharing of knowledge

5.3.1.5 Goal #5: Informed and Engaged Stakeholders, Partners, First Nations and Métis Communities, and the General Public

The objectives of Goal #5 are to:

1. Manage fisheries using an inclusive and participatory approach
2. Develop effective partnerships among government agencies, industry, academics, First Nations and Métis communities, and stakeholders
3. Encourage individuals, stakeholders, and communities to act as effective stewards
4. Increase public awareness and understanding.

5.3.2 Fisheries Management Zone 8

The MNR has divided the province into 20 FMZs based on biological, climatic, and social considerations. FMZs are the primary units for planning, management, and monitoring of fisheries in Ontario and are consistent with the Province's landscape approach to fisheries management.

The Project lies within FMZ 8 in northeastern Ontario. FMZ 8 is bounded by the Ontario-Quebec border to the east, James Bay to the north, FMZ 3 to the northwest, FMZ 7 to the west, and FMZs 10, 11, and 12 to

the south. It includes the towns of Cochrane, Hearst, Timmins, Kapuskasing, and Kirkland Lake, and the community of Gogama (Figure A.4, Appendix A). It includes the Kapuskasing, Opasatika, Groundhog, Mattagami, Frederick House, Abitibi, North French, Wekweyaukastik, and Kesagami Rivers, all which flow north to James Bay. Lake Abitibi, Frederick House Lake, and Kesagami Lake are the largest lakes in FMZ 8.

Fisheries resources within each FMZ are to be managed by an Advisory Council. The purpose of advisory councils is to increase public involvement in the recreational fisheries management decision-making process, to develop fisheries management plans and objectives consistent with Ontario's Provincial Fish Strategy, and to monitor and adaptively manage fisheries resources within their FMZ. To date, an Advisory Council for FMZ 8 has not yet been struck and there are currently no monitoring reports or management plans available for FMZ 8. For these reasons, there are no FMZ-specific fisheries management objectives for the region within which the Project is located.

5.3.3 District Fisheries Management Objectives

Ontario MNR staff in Ontario's Northeast Region, which includes the Cochrane and Timmins districts, provided Canada Nickel with the following list of fisheries management objectives as they relate to the Project:

1. Maintain or enhance First Nation traditional fish harvesting opportunities within the waterbodies and watercourses of watersheds impacted by the Crawford Nickel Project
2. Maintain or enhance sustainable recreational angling opportunities for all fish species presently angled within the waterbodies and watercourses of watersheds impacted by the Crawford Nickel Project
3. Maintain current levels of native biodiversity within the waterbodies and watercourses of watersheds impacted by the Crawford Nickel Project
4. Maintain or enhance native fish species' populations within the waterbodies and watercourses of watersheds impacted by the Crawford Nickel Project
5. Maintain existing aquatic habitat diversity and connectivity within the waterbodies and watercourses of watersheds impacted by the Crawford Nickel Project
6. Protect and maintain ecological function within the waterbodies and watercourses of watersheds impacted by the Crawford Nickel Project

In addition, Ontario MNR staff indicated that Ontario:

1. supports and advocates for DFO's "hierarchy of measures" for the protection of fish and fish habitat in Canada (i.e., avoidance, mitigation, offsetting)
2. supports and advocates for restoration and protection of aquatic habitats that still exist but have been, or will be disturbed/alterd so that they are functionally indistinguishable from their original state
3. supports and advocates for offsetting measures that are located within the same aquatic system and as close to the altered/destroyed habitat as possible, functionally indistinguishable from the

habitat they are replacing, and support at least one of the district fisheries management objectives

4. does not support offsetting measures that do not have a compelling biological rationale and/or demonstrable benefit to the affected fish populations within a useful timeframe.

5.3.4 Mattagami River Water Management Plan

The Mattagami River Water Management Plan was developed, under the auspices of the *Lakes and Rivers Improvement Act* (LRIA), to provide certainty as to how hydroelectric facilities and control structures in the Mattagami River watershed are operated with respect to water levels and flows, and to balance environmental, social, and economic objectives (MNR 2005). The plan covers 10 generating stations and eight water control dams on the Mattagami River. The objectives of the Mattagami River Water Management Plan are as follows (MNR 2005):

1. Maintain or improve fisheries health throughout the river system
2. Maintain or improve navigability throughout the river system
3. Maintain or improve recreational opportunities throughout the river system
4. Minimize the risks of damage due to flooding throughout the river system
5. Maintain or improve protection of known First Nations values and traditional relationship throughout the river system
6. Maintain or improve protection of known cultural heritage values throughout the river system
7. Minimize the impacts of erosion caused by facility operation throughout the river system
8. Maintain or improve wildlife habitat throughout the river system
9. Maintain or improve sustainable economic opportunities throughout the river system
10. Maximize public safety throughout the river system
11. Maintain or improve power production throughout the river system
12. Maintain or improve water levels and flows to more closely match the natural flow regime of the river

5.3.5 Recovery Strategy for Lake Sturgeon in Ontario

The goal for Recovery Strategy for Lake Sturgeon in Ontario is to maintain existing Lake Sturgeon populations throughout their current range and, where feasible, restore, rehabilitate, or re-establish self-sustaining Lake Sturgeon populations which are viable in the long term within their current habitat and/or within habitats they have historically occupied (Golder Associates Ltd. 2011). Long-term viability is characterized by successful spawning and hatching, natural recruitment, stable genetic diversity, and size and age structures that include representation of all life history stages. Objectives of the Recovery Strategy for Lake Sturgeon in Ontario are to:

1. Protect or increase the extent of Lake Sturgeon populations at an abundance commensurate with the capacity of their habitat to support them and the existing fish community
2. Maintain, enhance and, where feasible, restore habitat to support Lake Sturgeon
3. Restore Lake Sturgeon populations in locations where they have become extirpated, where feasible, and where functional habitat exists
4. Develop local scale Lake Sturgeon Management Strategies
5. Increase public awareness of the cultural and ecological significance and uniqueness of Lake Sturgeon and the importance of maintaining, enhancing, and restoring Lake Sturgeon populations
6. Address knowledge gaps to enable and enhance protection, conservation, and recovery efforts

For the Southern Hudson Bay-James Bay Lake Sturgeon population (which Lake Sturgeon in the Mattagami River watershed are part of), the management priority is ensuring that future impacts on Lake Sturgeon and their habitats do not result in subpopulation declines (Golder Associates Ltd. 2011).

5.4 Results

5.4.1 Engagement With Potentially Affected Indigenous Nations

To date, the following recommendations have been made by the potentially affected Indigenous nations to Canada Nickel as they relate to the Project and the Conceptual Fish Habitat Offsetting Plan:

- Explore alternatives during mine design and construction to reduce habitat loss and overprinting of tributaries to the North Driftwood River and West Buskegau River
- Reinvest Project revenues into fish habitat conservation in the local and regional area
- Create community-focused offsetting measures for aquatic habitat overprinted by the Project
- Target offsets that restore previously disturbed or damaged fish habitat; avoid offsets that enhance or expand existing fish habitat because these activities disturb habitats that may already be functioning and create indirect impacts to other habitats and species (i.e., terrestrial impacts)³

³ The Métis Nation of Ontario – Region 3 (July 18, 2024)

- Avoid creating new fish habitat because these tend not to function as well as natural habitats³
- Look at all functional elements (e.g., vegetation and insects) of potentially affected fish habitat and how interactions between different components of the habitat can be replicated by fish habitat offsets; need to look at opportunities that go beyond what has been done in the past⁴
- Offsets should try to replicate the natural environment⁵
- Offsets should provide permanent benefits to fish and not be impacted by future development in the region⁵

The fish species of greatest cultural importance, based on their frequency of occurrence listed by the six potentially affected Indigenous nations in their TLRU studies, are: Lake Sturgeon, Northern Pike/Jackfish, Walleye/Pickereel, Yellow Perch, Burbot/Lingcod, Suckers, Lake Trout, Brook Trout, and Lake Whitefish/Whitefish.

5.4.2 Fish Habitat Offset Measure Compilation

Table 5.1 describes the current list of candidate fish habitat offsetting measures that have been identified for possible inclusion in the Fish Habitat Offsetting Plan for the Project. Identification of candidate fish habitat offsetting measures will continue as the Project moves forward.

⁴ Mattagami First Nation (July 31, 2024)

⁵ Matchewan First Nation (July 31, 2024)

Table 5.1 Summary of Candidate Fish Habitat Offset Measures Currently Identified for the Project

Offset Measure	Source	Location	Description
North Driftwood Diversion Channel	Canada Nickel	West side of the PA	Two options are currently under consideration for the North Driftwood Diversion Channel alignment, with alignments west and east of the proposed re-aligned Highway 655 corridor. Canada Nickel will determine the preferred alignment for the North Driftwood Channel Diversion during detailed design. The North Driftwood Diversion Channel alignment could include the following fish habitat features: <ul style="list-style-type: none"> • Sinuous central watercourse with defined bankfull channel • A variety of in-stream depths and cover types to increase fish habitat diversity • Backwater oxbows and side-channels • Riparian ponds and wetlands in the floodplain • Native riparian vegetation plantings to provide shade, bank stability, and leaf and woody debris inputs
Artificial lake creation	Canada Nickel	West side of the PA	Creation of an artificial lake adjacent to, or in-line with, the North Driftwood Diversion Channel. Lake could be constructed deep enough (e.g., >5 m) to provide overwintering habitat for large-bodied fish species, with a diversity of littoral habitats (e.g., weedy bays and rocky beaches) to provide spawning, rearing, and foraging habitat for a variety of large-bodied and small-bodied fish species
Alleviate anoxic conditions and/or impediments to fish movement between fish-bearing headwater lakes	Canada Nickel	Headwater lakes in the North Driftwood River watershed	Implement measures to increase dissolved oxygen concentrations in Martin, Jerry, Sutherland, Mel, Jack, and/or Davis Lakes such as: aeration, alum addition to reduce phosphorus concentrations, increased inflow/circulation patterns. Implement measures to increase the passage of small-bodied and large-bodied fish species between the six lakes at low winter and summer flows.
Side-channel habitat	Canada Nickel	North Driftwood River downstream of PA	Creation of off-channel ponds within the North Driftwood River floodplain in areas with groundwater or tributary inflows. There is a paucity of off-channel habitat in the North Driftwood River; the river largely flows through a single, meandering channel. Off-channel habitats provide refuge from current and cover from predators for juvenile fish, and potential spawning areas for fish that utilize weeds (e.g., pike and perch). An increase in habitat diversity in the river could increase species diversity and fish production by reducing habitat bottlenecks.

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Offset Measure	Source	Location	Description
Artificial pond creation	Canada Nickel	Immediately west and east of PA	Creation of ponded areas in headwater areas using beaver-dam like structures to increase habitat area and amount of overwintering habitat.
Spawning reefs	Canada Nickel	Mattagami River	Creation of spawning shoals or reefs in the Mattagami River downstream of the Lower Sturgeon Falls GS and/or Yellow Falls GS.
Lake Sturgeon research	Canada Nickel	Regional / FMZ 8	Supporting science initiatives related to Lake Sturgeon recovery in FMZ 8, or the National Marine Conservation Area (NMCA) that is proposed by the Mushkegowuk Council, or other Indigenous-led conservation projects in Northern Ontario
Fish hatchery establishment or expansion	Matachewan First Nation	Mattagami River watershed	Increase the capacity of existing fish hatcheries or create new fish hatcheries to increase the number of fish stocked annually into lakes in the region
Wetland expansion or creation	Matachewan First Nation	Mattagami River watershed	Create new or enhance existing wetlands to increase habitat for ducks and geese
Rearing areas	Mattagami First Nation	Mattagami River watershed	Create or restore fish rearing habitats that support residency, survival, and growth for all fish life stages
Smooth Rock Falls Pulp and Paper Mill habitat restoration	Métis Nation of Ontario	Mattagami River	Mattagami River has significant cultural importance to the Métis Nation of Ontario – Region 3 due to its use during the fur trade. Restoring habitat affected by the former pulp mill near Smooth Rock Falls on the Mattagami River would be supported by the Métis Nation of Ontario – Region.
North Driftwood Diversion Channel	Métis Nation of Ontario	North Driftwood River watershed	The Métis Nation of Ontario – Region is supportive of Canada Nickel's efforts to include fish habitat offsetting in the North Driftwood Diversion Channel
Pond habitat in West Buskegau River watershed	Chris Chenier (Ontario Ministry of Natural Resources and Forests, Cochrane)	West Buskegau River watershed	Creation of new ponds and outlet channels in upland areas to the east of the West Buskegau River mainstem to replace the ponds and channels in the headwater tributaries of the West Buskegau River lost under the Project footprint.
Restoration of historical 'log-drive' impacts to the Mattagami River	D. Gibson (OPG) ¹	Mattagami River	Identifying areas impacted by historical "log-drives" and implementing measures to restore physically damaged spawning areas and/or to remove accumulated organic debris that may be negatively affecting water quality. The relative density of macroinvertebrates, the main food source for Lake Sturgeon, was found to be significantly reduced in rivers where substrate was covered with wood chips (Beamish et al. 1998).

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Offset Measure	Source	Location	Description
Smooth Rock Falls Pulp and Paper Mill habitat restoration	D. Gibson (OPG) ¹	Mattagami River	Investigating habitat restoration options associated with the former pulp and paper mill in Smooth Rock Falls.
Expanding capacity of walleye hatchery	D. Gibson (OPG) ¹	Mattagami Lake	Expanding the capacity of the walleye hatchery built and operated by the Mattagami First Nation so that fish can be released in greater numbers to Mattagami Lake and into other lakes in the region.
Restoration of contaminated lakes	Timmins resident (communicated at Open House)	Porcupine and Pearl lakes	Removal of contaminated sediments from the bottom of Porcupine Lake and Pearl Lake within the Timmins city limits to provide a fishery for the youth, elderly, and disabled of Timmins
Walleye and sturgeon spawning habitat	Marc Caron (Caron Equipment Inc.) ²	Mattagami River watershed	Offset measures that increase walleye and sturgeon production would be preferred by members of the Treaty 9 Indigenous nations.
Rehabilitation of bank slumping near Highway 655	Marc Caron (Caron Equipment Inc.) ²	Mattagami River watershed	Rehabilitation of a bank failure along Provincial Highway 655 near Lennox Creek which is a source of sediment to the North Driftwood River during high flow events.
Translocation of lake sturgeon downstream of Lower Sturgeon GS	Laurent Robichaud (Ontario Rivers Alliance) ³	Mattagami River	Translocation of lake sturgeon into the 41 km reach of the Mattagami River between the Lower Sturgeon GS and the Yellow Falls GS. This section of river is like the 40 km reach between the Sandy Falls GS and the Lower Sturgeon GS, in length and habitat, where 70 lake sturgeon were successfully translocated in 2002 and 2011. These initial fish have now established a self-sustaining population estimated to be between 300 and 400 fish. Lake sturgeons could be captured in the Mattagami River downstream of the Kipling GS and transported upstream for release like what was done previously.
Enhancement of habitat in the Mattagami River for lake sturgeon	Laurent Robichaud (Ontario Rivers Alliance) ³	Mattagami River	Identify habitat bottlenecks and conduct enhancement measures to alleviate these bottlenecks in the Mattagami River between Lower Sturgeon Falls GS and Yellow Falls GS prior to, or during, translocation of lake sturgeon into this reach
Culvert replacements in abandoned forestry roads	Canada Nickel	FMZ 8	Replacement of hanging or undersized culverts with new clear-span structures (e.g., open bottom arch culverts or bridges) or removal of culvert and restoration of stream channel.

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Offset Measure	Source	Location	Description
Measures to reduce fish mortality at hydro facilities ⁴	Mattagami River Water Management Plan	Mattagami River	Measures to reduce entrainment of fish through turbines and spill ways and/or stranding of fish and fish eggs in spillway channels downstream of dams.
Measures to mitigate threats to lake sturgeon survival and recovery	Recovery Strategy for Lake Sturgeon in Ontario	Mattagami River	<p>The following measures have been identified as possible solutions to fish mortalities at dams on the Mattagami River⁴:</p> <ul style="list-style-type: none"> • Installation of physical or behavioral barriers to entrainment at hydro dams • Installation of “fish friendly” turbines in hydro dams • Design and construction of fish ways compatible with lake sturgeon swimming performance • Maintenance of consistent flows downstream of dams during the spring/early summer spawning and egg development period • Creation or enhancement of spawning reefs/shoals in rivers • Artificial propagation and stocking (i.e. hatcheries)⁵ • Removal of low head barriers to fish passage
<p>Notes:</p> <p>¹ Interviewed by Brad Horne (Stantec Consulting Ltd. [Stantec]) on May 3, 2024.</p> <p>² Interviewed by Brad Horne (Stantec) on May 17, 2024. Marc’s company built the fish habitat offsetting measures for IAMGOLD’s Cote Gold Project.</p> <p>³ Interviewed by Brad Horne (Stantec) on May 19, 2024.</p> <p>⁴ All 10 hydroelectric facilities and water control structures on the Mattagami River have owners (e.g., OPG) so it is unlikely that measures to mitigate fish mortality at these facilities can be included in the Fish Habitat Offsetting Plan for the Crawford Nickel Project. Solutions to improve fisheries upstream or downstream of these facilities would be the responsibility of the facility owners, if operation of the facilities was determined to contravene any section of the <i>Fisheries Act</i>.</p> <p>⁵ Lake Sturgeon stocking is not currently endorsed within the Ontario fish stocking guidelines for inland waters (MNR 2002) and hatchery stocking is low on DFO’s hierarchy of preferred offset options.</p>			

5.4.3 Fish Habitat Offset Measure Screening

Candidate fish habitat offsetting measures have been compiled in this Conceptual Fish Habitat Offsetting Plan. Screening of these options to identify those that best counterbalance the unavoidable HADD of fish habitat, most closely comply with provincial, local, and Indigenous fisheries management objectives (as available), and that best meet the technical, biological, and regulatory objectives will be completed with input from DFO, MNR, and Indigenous nations. The steps involved in this process are anticipated to be:

1. Identify screening criteria for the technical, biological, regulatory, and fisheries management objective categories
2. Develop and apply a ranking system (e.g., high=3, medium=2, and low=1), with or without weightings, to each criterion, for each offset option, and calculate cumulative rankings
3. Develop and apply “relative habitat weightings” to account for differences in the types of habitats lost and gained (i.e., out-of-kind)
4. Prepare a habitat balance that compares habitat losses and habitat gains using various highly ranked offset option(s)
5. Engage with MNR staff, DFO, and affected Indigenous nations on each of the steps above.
6. Collect data for the offset options (as required) to inform and refine the screening process

Canada Nickel anticipates that the screening process will be iterative as engagement proceeds and as new information about the various offset options is acquired.

6 Next Steps

Canada Nickel intends to conduct the following next steps in the development of this conceptual fish habitat offset plan:

1. Continue to solicit input on fish habitat offsetting from each potentially affected Indigenous nation; align fish habitat offsetting measures with fisheries management objectives of potentially affected Indigenous nations to the extent feasible.
2. Continued conversations with regional MNR fisheries biologists to solicit input on candidate fish habitat offset measures.
3. Initiate the fish habitat offsetting options screening process
4. Conduct a geomorphological assessment of the North Driftwood River to characterize the channel geometry, bank height and slopes, channel morphology, and flow pattern, and to record the geomorphic indicators of active river processes (e.g., aggradation and degradation). Once complete, these data will be used to prepare 30%, 50%, and final design drawings of the diversion channel and the fish habitat planned within it.
5. Investigate opportunities to create in-line or off-channel ponds or lakes near the North Driftwood Diversion Channel and/or West Buskegau River.
6. Investigate opportunities to enhance habitat in the Mattagami River for Lake Sturgeon
7. Investigate opportunities associated with restoration of fish habitat near the Smooth Rock pulp mill.
8. Investigate opportunities to restore fish passage at forestry road crossings within FMZ 8.

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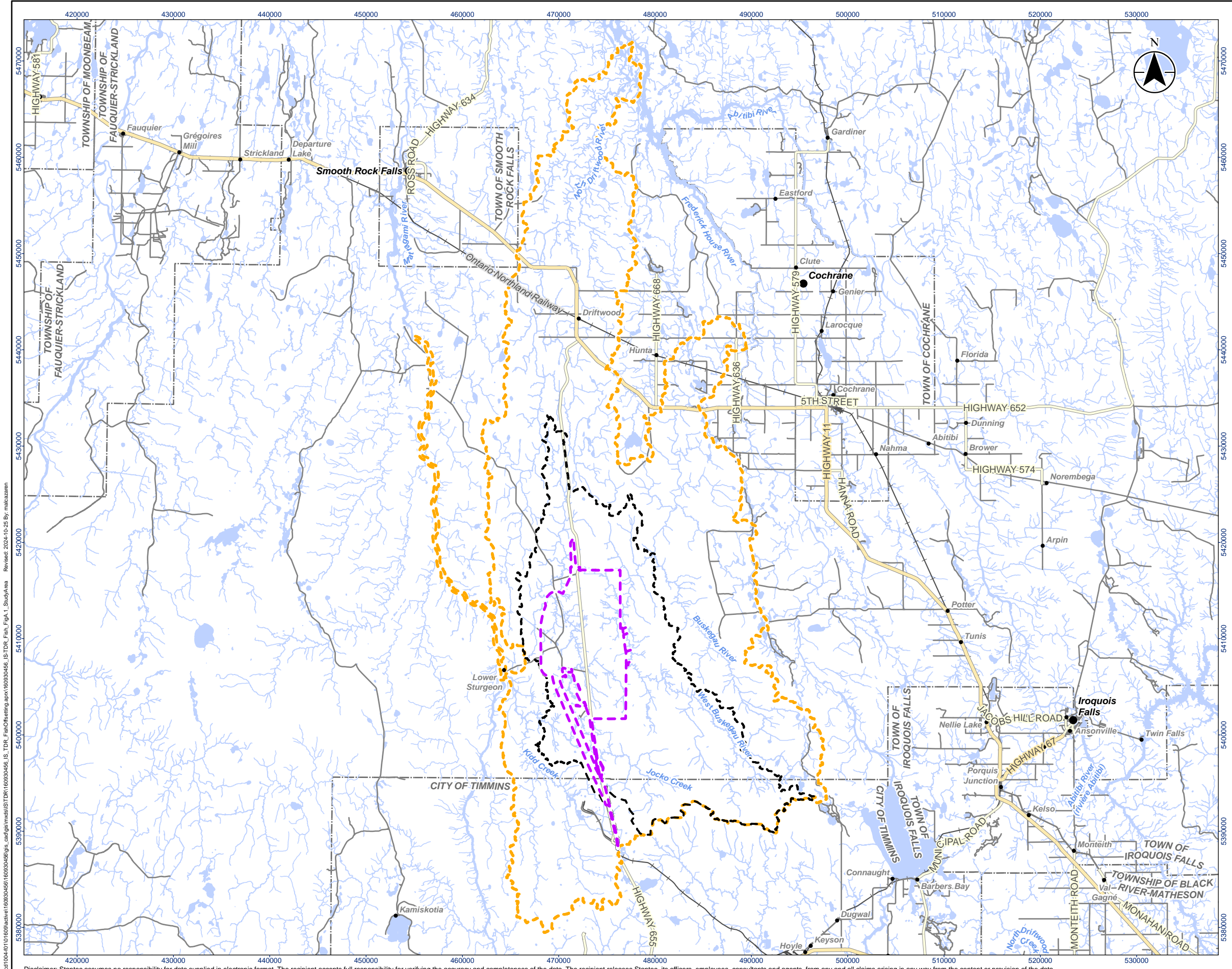
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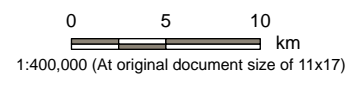
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Appendices

Appendix A Figures



- Legend**
- Project Area
 - Local Study Area
 - Regional Study Area
 - Expressway / Highway
 - Major Road
 - Minor Road
 - Railway
 - Waterbody
 - Watercourse
 - Municipal Boundary - Lower Tier



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 17N
 2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.

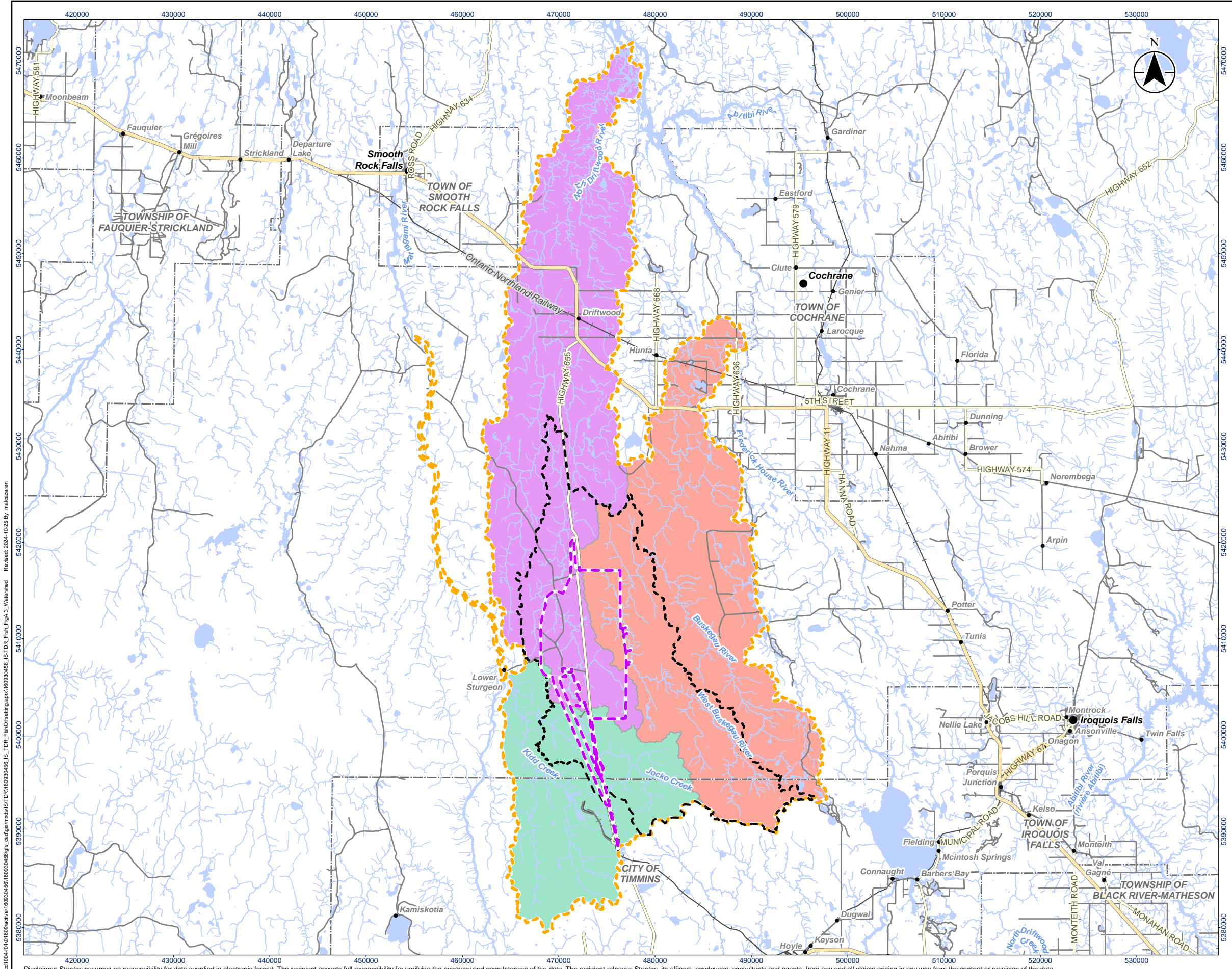


Project Location: Timmins, Ontario
 Prepared by: malcazaren on 2024-10-25
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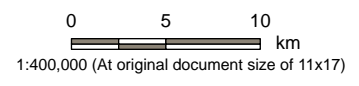
Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No. **A.1**
 Title **Project Area and Local and Regional Study Areas for Fish and Fish Habitat Valued Component**

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- Legend**
- Project Area
 - Local Study Area
 - Regional Study Area
 - Expressway / Highway
 - Major Road
 - Minor Road
 - Railway
 - Waterbody
 - Watercourse
 - Municipal Boundary - Lower Tier
- Watersheds**
- Jocko Creek Watershed
 - North Driftwood River Watershed
 - Buskegau River Watershed



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 17N
 2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



Project Location: Timmins, Ontario
 Prepared by: malcazaren on 2024-10-25

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No. **A.3**

Title: **Project Area in Relation to the North Driftwood River, West Buskegau River, and Jocko Creek watersheds**

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Figure A.4 Geographic Extent of Fisheries Management Zone 8 (Source: Ontario Ministry of Natural Resources and Forestry 2024)

