Agence d'évaluation d'impact du Canada | Impact Assessment Agency of Canada

Timiskaming Dam-Bridge of Quebec Replacement Project

INFORMATION REQUEST NO 1 (PART 1)

APPENDICES TO PSPC RESPONSES

20 March 2024

50 YEARS OF ASSESSMENTS

Canada

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LÉGENDE

EXISTANT/EXISTING
PROPOSÉ/PROPOSED

- Marquage/Pavement Markings
- Bord Pavage/Edge of Pavement
- Bordure/Curb
- Trottoir/Sidewalk
- Accotement/Shoulder
- Fossé/Ditch
- Drain de chaussée/Subdrain
- Ponceau/Culvert
- Regard/Maintenance Hole
- Regard–Puisard/Inlet Catch Bassin
- Puisard/Catch Bassin
- Puisard/Ditch Inlet Catch Bassin
- Égout Pluvial/Storm Water
- Voie Ferrée/Rails
- Bâtiment/Building
- Fosse septique/Septik tank
- Haut Talus/Top of Bank
- Bas Talus/Bottom of Bank
- Clôture/Fence
- Glissière/Guide Rail
- Conduit téléphonique souterrain / Underground Phone Line
- Conduit électrique souterrain / Underground Electrical Line
- Gaz naturel/Natural Gas
- AqueducWatermain
- Ligne Électrique Aérienne / Aerial Power Line
- Courbe de niveau/Contour Line
- Arbres/Trees
- Forage/Drilling
- Poteau Service Publique / Public Service Pole
- Poteau relocalisé (Par d'autres) / Pole relocated (By others)
- Hauban/Anchor for Pole
- Lampadaire/Lam post
- Boîte de tirage/Junction Box

CABANON RELOCALISÉ
SHED RELOCATED
PUISARD À RACCORDER AU RÉSEAU PLUVIAL PROJETÉ
CHAUSSÉE PROPOSÉE ET INFRASTRUCTURE (VOIR C101)
PROPOSED ROADWAY AND INFRASTRUCTURE (SEE C101)
LIGNE ÉLECTRIQUE (VOIR E001)
ELECTRIC LINE (SEE E001)
CABANON RELOCALISÉ
SHED RELOCATED
POTAGER RELOCALISÉ
GARDEN RELOCATED
A
GÉNÉRATRICE EXISTANTE
EXISTING GENERATOR
CLÔTURE (VOIR S081)
FENCE (SEE S081)
PASSE À POISSON (S050)
FISH PASSING (S050)
CONDUITE DE GAZ SOUS PASSE À POISSON (VOIR C108)
GARDE–CORPS (VOIR S081)
DALLE SUR SOL (VOIR S050)
SLAB ON GRADE(SEE S050)
CONDUITE 1200ø
1200ø PIPE
PORTE SIMPLE (VOIR S081)
CLÔTURE (VOIR S081)
DALLE POUR ENTREPOSAGE DES POUTRELLES D'ENTRETIEN (VOIR S080)
SLAB FOR MAINTENANCE STOPLOGS SUPPORT (SEE S080)
NOUVEAU BÂTIMENT DE SERVICE (VOIR E002 ET S060)
NEW SERVICE BUILDING (SEE E002 AND S060)
NOUVEAU QUAI D'ENTREPOSAGE DES POUTRELLES PROPOSÉ
MASSIF DE CONDUITS (VOIR PLAN E001)
UNDERGROUND CONDUITS (SEE E001)
NOUVEAU PUITS DE TIRAGE (PAR D'AUTRES)
4–BOLLARDS
CLÔTURE
FENCE
LIGNE À VAPEUR (VOIR M013)
STEAM LINE (SEE M013)
PORTE SIMPLE (VOIR S081)
RAILS ET APPUIS (VOIR M012)
RAILS AND PADS (SEE M012)
SENTIER VOIR C108 FOOTPATH SEE C108
DALLES POUR SUPPORT DE POUTRELLE EN BOIS (VOIR S003)
PORTE DOUBLE (VOIR S081)
GARDE–FOU (VOIR S043)
CLÔTURE
FENCE
LIMITE DES TRAVAUX
LIMIT OF CONSTRUCTION
CH:0+450
ONTARIO
QUEBEC
CLÔTURE (VOIR S081)
4–BOLLARDS
PORTE SIMPLE (VOIR S081)
LIMITE DES TRAVAUX
LIMIT OF CONSTRUCTION
CH:10+200
B
C
D
EXUTOIRES
OUTLETS
SENTIER DE MOTONEIGE ET VTT VOIR C108
SNOWMOBILE PATH SEE C108
MURS DE SOUTÈNEMENT VOIR PLAN S014 À S016
RETAINING WALLS SEE DWG S014 TO S016
GARDE–CORPS (VOIR S081)
GARDE–FOU (VOIR S043)
DALLE SUR SOL (VOIR S050)
SLAB ON GRADE(SEE S050)
EXUTOIRE/OUTLET
PORTE DOUBLE (VOIR S081)
NOUVEAU PUITS DE TIRAGE (PAR D'AUTRES)
SENTIER MOTONEIGE ET VTT (VOIR C108)
SNOWMOBILE PATH (SEE C108)
DRAIN VOIR C101
EXUTOIRE/OUTLET
BÂTIMENT DES ALGONQUINS
ALGONQUIN BUILDING
MONUMENT RELOCALISÉ
RELOCATED MONUMENT
TOUS LES PANNEAUX DE SIGNALISATION ROUTIÈRE DOIVENT ÊTRE REMIS EN PLACE SI DÉPLACÉS (VOIR C103)
NOUVELLES FOSSES SEPTIQUES (VOIR T002)
NEW SEPTICS TANKS (SEE T002)
ZONE POTENTIEL POUR LE FUTUR CHAMP D'ÉPURATION (VOIR T002)
POTENTIAL AREA FOR FUTUR LEACHING BED (SEE T002)
CONDUIT ÉLECTRIQUE SOUTERRAIN EXISTANT À DÉSAFFECTER (PAR D'AUTRES)
EXISTING UNDERGROUND ELECTRICAL LINE TO DESAFFECT (BY OTHERS)
<<OTTAWA RIVER
<<RIVIÈRE DES OUTAOUAIS
ONTARIO
QUEBEC

VUE EN PLAN - PLAN VIEW

Horizontale 1:250 / Verticale
0 2.5 5 12.5m
0 m

0 10 20mm 40 60 80 100 120 140 160 180 200mm

\\TTS349F53\PRJ_REG\327601\DESSIN\CIV-INFRA\DESSINS CONCEPTUELS\C-101_PLAN AMENAGEMENT GENERAL.DWG DATE D'IMPRESSION: 2018/03/02 8:51:27 PAR: RICHARD.BOUTIN

PWGSC B1 (1000 x 707)

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada
Real Property Branch / Direction générale des biens immobiliers

TETRA TECH
No. 32760TT

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

L'entrepreneur doit vérifier toutes les dimensions et conditions sur le site et aviser immédiatement le représentant du ministère de toute divergence.

revisions	description	date
–	EN COURS 99%, FRANCAIS	18–03–13

A detail no., no. du detail
B location drawing no., sur dessin no.
C drawing no., dessin no.

project / projet
REMPLACEMENT DU BARRAGE TÉMISCAMINGUE DU QUÉBEC

TIMISKAMING QUEBEC DAM REPLACEMENT

drawing / dessin
AMÉNAGEMENT GÉNÉRAL PROJETÉ

GENERAL PROPOSED LAYOUT

Designed By	Véronique Giroux, ing.	Conçu par
Date	2017-09-09	(yyyy/mm/dd)
Drawn By	Mario Chiquette, t.s.	Dessiné par
Date	2017-09-09	(yyyy/mm/dd)
Reviewed By	Éric Cloutier, ing.	Examiné par
Date	2017-12-15	(yyyy/mm/dd)
Approved By	Pierre Wagner, ing.	Approuvé par
Date	2017-12-15	(yyyy/mm/dd)
Tender	TPSGC PWGSC	Soumission
Project Manager		Administrateur de projets

Project no. / No. du projet
R.073116.307

Drawing no. / No. du dessin
C101

LÉGENDE

EXISTANT/EXISTING
PROPOSÉ/PROPOSED

- Marquage/Pavement Markings
- Bord Pavage/Edge of Pavement
- Bordure/Curb
- Trottoir/Sidewalk
- Accotement/Shoulder
- Fossé/Ditch
- Drain de chaussée/Subdrain
- Ponceau/Culvert
- Regard/Maintenance Hole
- Regard–Puisard/Inlet Catch Bassin
- Puisard/Catch Bassin
- Puisard/Ditch Inlet Catch Bassin
- Égout Pluvial/Storm Water
- Voie Ferrée/Rails
- Bâtiment/Building
- Fosse septique/Septik tank
- Haut Talus/Top of Bank
- Bas Talus/Bottom of Bank
- Clôture/Fence
- Glissière/Guide Rail
- Conduit téléphonique souterrain / Underground Phone Line
- Conduit électrique souterrain / Underground Electrical Line
- Gaz naturel/Natural Gas
- AqueducWatermain
- Ligne Électrique Aérienne / Aerial Power Line
- Courbe de niveau/Contour Line
- Arbres/Trees
- Forage/Drilling
- Poteau Service Publique / Public Service Pole

PONCEAU EXISTANT À REMPLACER
EXISTING CULVERT TO REPLACE
600ø X 21,96m
(OPSD 802.030, 802.031)

EMPIERREMENT 200–300ø
RIP–RAP 200–300ø
(OPSD 810.010)

PASSE MIGRATOIRE
FISH PASSAGE
(VOIR/SEE: S050)

GLISSIÈRES
GUIDE RAIL
(OPSD 912.185)

TRAITEMENT EXTRÉMITÉ
GUIDE RAIL SYSTEM
(OPSD 912.180)

CONDUITE 1200ø
1200ø PIPE
(VOIR/SEE: S050)

EMPIERREMENT 200–300ø
RIP–RAP 200–300ø
(OPSD 810.010)

EXUTOIRE DRAIN DE FONDATION
FOUNDATION DRAIN PIPE OUTLET
(VOIR/SEE: S060)

TRAITEMENT EXTRÉMITÉ
GUIDE RAIL SYSTEM
(OPSD 922.180)

GLISSIÈRES
GUIDE RAIL

BORDURE–CURB
(DN II–4–003)

TRANSITION DE RIGIDITÉ
STRUCTURE CONNECTION
OPSD 912.530

MAINTENIR L'ACCÈS
DURANT LES TRAVAUX
MAINTAIN THE ACCESS
WHILST CONSTRUCTION

LIMITE DES TRAVAUX
LIMIT OF CONSTRUCTION
CH:10+200

LIMITE DES TRAVAUX
LIMIT OF CONSTRUCTION
CH:0+450

1500ø Puf 05

1200ø P 01

OPSD 809.010

OPSD 706.010

EXUTOIRES
OUTLETS

REMBLAI/BACKFILL
(VOIR/SEE: C022)

ÉMISSAIRE/OUTLET 450ø
OPSD 810.010
OPSD 804.030
OPSD 804.050

EXUTOIRE/OUTLET

DN VIII–3 GSR 004

DN VIII–3 GSR 003

BORDURE–CURB
(DN II–4–003)

600ø Pu 04

900ø RP 02

900ø RP 03

BORDURE ABAISSÉE
LOW PROFILE CURB
(DN VIII–4–7)

RACCORDEMENT
À L'EXISTANT
MATCH TO
EXISTING ROAD

(DN VIII–3–GSR 010B
DN GSR–026A)

DN VIII–3 GSR 004

RACCORDEMENT À L'EXISTANT
MATCH TO EXISTING ROAD

PLANAGE SI REQUIS
COLD PLANING
IF REQUIRED

NOUVELLE LOCALISATION GAZ ET TÉLÉPHONE
SOUTERRAIN (PAR D'AUTRES)
NEW LOCATION FOR GAS AND
TELEPHONE LINES (BY OTHERS)

ROUTE 63
HIGHWAY 63

TRAIT DE SCIE
SAW CUT
(DN II–2–010)

BORDURE ABAISSÉE
LOW–PROFILE CURB
(DN VIII–4–7)

PLANAGE SI REQUIS
COLD PLANING IR REQUIRED

DN–II–3–009

DN–II–3–004

STATIONNEMENT CAMIONS
TRUCKS PARKING
(VOIR/SEE: C107)

ONTARIO
QUÉBEC

<<RIVIÈRE DES OUTAOUAIS
<<OTTAWA RIVER

VUE EN PLAN - PLAN VIEW
0 5 10 25m
1:500

ROUTE 101

TERRAIN NATUREL
ORIGINAL GROUND

RACCORDEMENT À L'EXISTANT
MATCH TO EXISTING ROAD

TCV:10+225.00
EL:182.06
Entrée Privée

PIV:10+240.00
EL:182.05

PLANAGE
COLD PLANNING

-1.04%

TCV:10+255.00
EL:181.90

TCV:10+284.17
EL:181.60

PROFIL PROJETÉ
ROUTE 63
NEW PROFILE
HIGHWAY 63

REGARD
MANHOLE

CTV:10+354.17
EL:181.13

PUISARD DE FOSSÉ
DITCH INLET

PIV:10+388.12
EL:181.025

PROFIL PROJETÉ
PROJECTED PROFILE

-0.30%

0.00%

PIV:10+465.48
EL:181.025

CADRE COVER
180,79

PIV:10+485.26
EL:180.92

CADRE COVER
180,78

PIV:10+495.61
EL:181.00

CADRE COVER
180,80

PIV:10+499.98
EL:181.09

-0.53%

0.76%

2.00%

RACCORDEMENT À L'EXISTANT
MATCH TO EXISTING ROAD

CONDUIT TÉLÉPHONIQUE PROJETÉ
(PAR D'AUTRES)
LOCALISATION APPROXIMATIVE

GAZ METRO PROJETÉ
(PAR D'AUTRES)
LOCALISATION APPROXIMATIVE

LIMITE DES TRAVAUX
CH:10+200

EL:179,86m

EL:179,66m

EL:179,05m

EL:179,66m

EL:179,59m

PIV:10+319.17
EL:181.23

EL:180,53

EL:179,75m(G–L)

EL:180,12m
(FOSSÉ DROIT–RIGHT DITCH)

RADIER GAUCHE/LEFT INVERT:179,77m

EXUTOIRE DRAIN DE CHAUSSÉE
OUTLET SUBGRADE DRAIN

RADIER/INVERT:179,46m
(OPSD 809.010)

EXUTOIRE/OUTLET
EL:179,05m

EXUTOIRE/OUTLET
EL:178,36m

EXUTOIRE/OUTLET
EL:178,22m

EL:179,83m(G–L)

EL:180,04m(G–L)

EL:179,80m(D–R)

EL:179,47m

EL:179,44m

1,5min.

EL:178,50m

600ø X 21,96m
PONCEAU EXISTANT À REMPLACER
EXISTING CULVERT TO REPLACE
PENTE/SLOPE=2,78%

450ø x 29,9m
PONCEAU PROJETÉ
NEW CULVERT
PENTE/SLOPE=0,68%

EXUTOIRE DU PUITS ÉLECTRIQUE
OUTLET FOR ELECTRICAL MANHOLE
L=32m slope=0,5% ø=100mm
(VOIR S060)
RADIER/INVERT: 178,38m–178.22

PASSE MIGRATOIRE
FISH PASSAGE
(VOIR/SEE: S050)

1200mmø x 107,84m
Rad. AMONT/INVERT INLET: 177,00m
Rad. AVAL/OUTLET INVERT: 175,275m
PENTE/SLOPE=1,6%

450ø x 11,6m
ÉGOUT PLUVIAL PROJETÉ
NEW STORM SEWER
PENTE/SLOPE=1,0%

450ø x 46,0m
ÉGOUT PLUVIAL PROJETÉ
NEW STORM SEWER
PENTE/SLOPE: 0,91%

MUR DE SOUTÈNEMENT OUEST
WEST RETAINING WALL
(VOIR/SEE: S014)

375ø x 14m
ÉGOUT PLUVIAL PROJETÉ
NEW STORM SEWER
PENTE/SLOPE: 1,00%

RADIER DROIT/RIGHT INVERT:179,47m
RADIER GAUCHE/LEFT INVERT:179,57m

RADIER DROIT/RIGHT
INVERT:179,50m

EL:179,54m(DROIT/RIGHT)

EL:179,45m(GAUCHE/LEFT)

EL:179,25m

EL:179,08m

EL:178,98m

EL:178,49m

EL:178,61m

EL:178,76m

NIVEAU D'EAU VARIABLE
VARIABLE WATER LEVEL

MUR DE SOUTÈNEMENT EST
EAST RETAINING WALL
(VOIR/SEE: S014)

200ø x 17m
ÉGOUT PLUVIAL PROJETÉ
NEW STORM SEWER
PENTE/SLOPE:1,00%

450ø x 24m
ÉGOUT PLUVIAL PROJETÉ
NEW STORM SEWER
PENTE/SLOPE: 0,5%

300ø x 22m
ÉGOUT PLUVIAL PROJETÉ
NEW STORM SEWER
PENTE/SLOPE:1,00%

FOSSÉ CÔTÉ GAUCHE
LEFT SIDE DITCH

FOSSÉ CÔTÉ DROIT
RIGHT SIDE DITCH

DRAIN FILTRANT 200ø
SUBGRADE DRAIN 200ø

VUE EN PROFIL - PROFILE VIEW
Horizontale 1:500 — 0 5 10 25m
Verticale 1:50 — 0 0,5 1 2,5m

10+120 10+200 10+300 10+400 10+500 10+530

| | | |

APPENDIX B – SART LAKE STURGEON STUDIES

B-1: Neme (Lake Sturgeon) Conservation Plan for the Ottawa River

Neme (Lake Sturgeon) Conservation Plan for the Ottawa River



Photo by Rosanne Van Schie

March 2023

WOLF LAKE FIRST NATION
Hunters Point, P.O. Box 998
Temiscaming, Qc
J0Z 3R0

KEBAOWEK FIRST NATION
Land Management
P.O. Box 756
Temiscaming, Qc
J0Z 3R0

TIMISKAMING FIRST NATI
24, Algonquin Avenue
Notre Dame du Nord, Qc
J0Z 3B0

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Executive Summary

Lake Sturgeon (Acipenser fulvescens), are known to Algonquin Anishinaabeg as Neme. Having originated over 200 million years ago, they are recognized as the largest and longest living fish species on Anishinaabeg territory. Over time this fish has maintained many of the physical characteristics of its ancestral form and are of historical and contemporary significance to Anishinaabeg Peoples. *'Neme'* are known to Algonquin Anishinaabeg not only as a source of food but as an integral part of our Anishinaabeg traditional culture and governance system.

This Indigenous led Neme conservation plan has been developed in partnership with the Algonquin Statement of Asserted Rights and Title (SART) communities of Wolf Lake First Nation (WLFN), Kebaowek First Nation (KFN) and Timiskaming First Nation (TFN) as we share a common experience and intertwined history around the Kichi-Sibi (Great River) and specifically the Timiskaming Dam Quebec Replacement Project (TDQRP). In alliance, we formed the Kitchi Sibi Technical Team to work to protect the spawning beds of Lake Sturgeon at the Timiskaiming Dam.

For our SART communities, a key component of self-determination is our supporting and exercising conservation of our animal kinship relations in the Kichi-Sibi (Ottawa River watershed). The goal of this conservation plan is to where feasible, restore, rehabilitate or re-establish, self-sustaining Lake Sturgeon populations in the Ottawa River which are viable in the long term and in a manner that is consistent with maintaining the integrity and function of the aquatic ecosystem they rely on. We have taken this lead role to promote greater understanding of the cultural relationships and kinships we share with Neme on the Kichi-Sibi. The decrease in abundance of Lake Sturgeon is a great loss to our communities. Today, Neme populations in the La Cave section of the Ottawa River are facing imminent extinction or extirpation if nothing is done to reverse the factors leading to their decline.

In order to achieve this, several recommendations under the Department of Fisheries and Oceans (DFO) Aboriginal Fund for Species at Risk (AFSAR) were made to help develop Kichi Sibi technical team conservation efforts and potential partnerships. In formulating these recommendations, consideration was given to Lake Sturgeon (*Acipenser fulvescens)* ecology including their longevity, delayed reproductive maturation, spawning periodicity, ability and tendency to migrate long distances and the requirement of distinct habitat types for various life history stages (e.g., eggs, larvae, juveniles, subadults, adults). DFO specifically recomended SART to:

- Address knowledge gaps (i.e., population status and habitat availability) that are intended to inform future protection, conservation and recovery efforts as it relates to the Ottawa River population;
- Assess, monitor, maintain, enhance and, where feasible, restore habitat in order to support the critical life history stages of Lake Sturgeon in the river; and

- 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 for future generations.

1.0 Objectives of the Conservation Plan

A conservation plan is a site – specific, action – oriented document that addresses the current state of a specific population of organisms or natural resource with the intent to define methods and strategies to maintain or enhance that natural resource. This *Neme-Lake Sturgeon Conservation Plan for the Ottawa River* will act as a guide to help manage Neme-Lake Sturgeon populations in the Ottawa River in the area below the Temiskaming dam, known otherwise as Lac la Cave. Specifically, this is the stretch of the Ottawa River from the Temiscaming Dam to the Otto – Holden Dam upstream of the town of Mattawa, Ontario, an impounded portion of the river that runs for approximately 70 km.

This is our SART communities starting point in Neme conservation which has the potential to expand throughout the watershed, as more Algonquin rights holding communities become engaged in Lake Sturgeon (*Acipenser fulvescens)* and Hickory nut Conservation initiatives in their own geographic areas of interest. The ultimate goal of the plan is for the Kebaowek, Wolf Lake and Temiskaming First Nations to work in conjunction with other interested Algonquin communities and stakeholders in helping to restore Neme-Lake Sturgeon population numbers to pre – colonization levels in the Ottawa River.

This is a live document that will be updated with the most current and relevant information as it becomes available.

1.1 Omamiwinniwag-Travellers of the River

Algonquin Anishinaabeg Peoples have been associated with the Kitchi-Sibi (Ottawa River) for at least 6,000 years, and likely longer. Our presence in the Kichi- Sibi coincided with the recession of the ice sheets from the Wisconsin ice age that started melting around 9,000 years ago.

The Kichi Sibi, which translates into the "Great River" in English is also known as the Ottawa River. Known as the Omamiwinniwag (travellers of the river) our ancestors were involved in inter - tribal trade. The Kitchi Sibi reamins a central part of our nation's livelihood. It was once commonly used and recognized highway that could be compared to the 401 for example in Toronto and our Nation controlled access vigorously from Morrison Island.

Our ancestors used this watershed as a means for travel, trade and access to the territory for hunting, fishing, and other cultural purposes. With neighbouring tribes we traded furs and dried fish in exchange for corn and cornmeal, wampums and fishnets. The river has many tributaries and brought access to our vast territory. There are significant evidence of pre- contact trade connected to the Algonquin cultural matrix (Di Gangi, 2015).

Our ancestors have been stewards of the Ottawa Valley since time immemorial, with archeological records dating back 8,500 years (Global Centre for Pluralism & About Archipel Research & Consulting,

December 2021). The river stretches between all 10 communities starting at Barriere Lake traveling 1271 kms ending in Montreal where it meets the St Laurence River and then flows to the Atlantic Ocean.

2 .0 Algonquins and Neme- Lake Sturgeon

Neme were the only fish that travelled the entire Ottawa River watershed (Decoursay, 2023). For this reason, Algonquins of Barriere Lake elders have referred to the watershed as Neme sibi (Sturgeon River). Archeological digs have also revealed the importance of Lake Sturgeon to the Algonquin Nation. On Allumette and Morrison Islands, 1.9% of all fish remains found were made up of Lake Sturgeon (Clermont et. al., 2002). The high absolute numbers of sturgeon uncovered in these digs indicates that Algonquins were using and continiue to use Neme as a food source.

Lake Sturgeon were, and continue to be, an important food source strongly linked to Anishinaabeg governance, spiritual and cultural identity of Algonquin Anishinaabeg people. Lake Sturgeon a typically large fish, are used as food; the meat can be smoked, or pounded and dried to make pemmican. The caviar, or roe, was eaten and the cartilaginous back-bone could be used to make soups. The swim bladders made of proteinaceous connective tissue, called isinglass, was used in the clarification of liquids and also used to make gelatin. No part of the fish was wasted. The rough skin, covered in bony plates known as denticles, was used to make containers while oil extracted from the head, viscera and gonads was valued as a high energy product. The bony plates of the skin could be used for grating and rasping and even arrowheads. A spring tradition throughout the watershed was to gather where the Lake Sturgeon spawned to catch the fish using spears, weirs, hook and line and harpoons. Wooden platforms were sometimes built over the rapids to allow for easier access to catch these giant fish.

For Algonquin families this was also a time of social and ceremonial gathering for our widely dispersed family hunting groups coming together after the winter at popular fishing sites like Allumette Island or Gordon Creek. These were places where we celebrated marriages, had funerals, caught sturgeon, talked about land use (na'dikan), visited, and traded(Holtzman, 1987, Morrison 2007). Algonquin elders refer to the entire Kitchi-Sibi system as ‘Namesibi’ as Lake Sturgeon travelled the whole system. (Decoursay 2018; Thusky 2018) Marriages were also arranged within the range the sturgeon travelled.

Haxton (2009) notes that to the Anishinaabeg living in the Great Lakes watershed, the Lake Sturgeon’s importance to us was equivalent to what the buffalo were to the First Nations of the great plains. For Algonquins, the Lake Sturgeon was the King of the Fish Nation (Decoursay, 2022). There is an Anishinaabeg shaped bone in the skull that links Anishinaabeg to their governance responsibilities in the watershed (Decoursay 2023).

Traditionally, Anishinaabeg social, political and economic organization was based around watersheds that included sturgeon clan as part of their traditional governance system. For Algonquin Anishinaabeg waterways served as their transportation corridors and family land management units.

From the late 1800s onwards, the regional economy around Ottawa River basin became focused on extractive timber harvest and later pulp and paper production. To facilitate the development of a forestry industry, Québec and Ontario gave “open access” to the Ottawa River watershed so that forest companies could maximize yields and create more jobs. By the early 1900s, waterways and sturgeon

populations came under severe pressure not only from forestry but also from hydro-electric dams, farming, mining and commercial fishing (Morrison 2005).Algonquin Anishinaabeg laws and governance models were flagrantly ignored during expansion of these activities (Morrison 2005), as were the inherent 'conservation' practices of the Anishinaabeg – the 'seven generations' obligation to ensure all environmental resources were sustained over the long term.

To this day the Ottawa River Watershed faces significant complex issues and water quality governance challenges. For decades, government agencies, industries and municipalities (most of who are non-Indigenous) have relied on their own governance and pollution approaches for managing watershed health. Over a period of less than 200 years, over-exploitation and habitat alteration resulted in dramatic declines in sturgeon stocks throughout much of the Nemesibi (Decoursey 2018 in reference to the Ottawa River) -their historical range.

Today, the area at the Timiskaming Dam complex area of the watershed is exposed to many contaminants from both upstream agricultural pollutants and pulp and paper industry contaminants from the Rayonnier Pulp and Paper mill complex at Gordon Creek next to the dam.

Although community members no longer fish in this area for reasons of potential contamination the SART communities have been working closely with other partners Water First, Ottawa RiveKeeper, OBVT and DFO AFSAR to develop long term actions towards remediating this local section of the Ottawa RIver. where Lake Strugeon species are most vulnerable.

3.0 History of Lake Sturgeon in the Ottawa River

The Ottawa River was colonized by Lake Sturgeon after the retreat of the Wisconsin ice sheet approximately 10,000 years ago. They colonized the Ottawa River from the Mississipia refugia through the Fossmill outlet, and later the North Bay outlet (Mandrak and Crossman, 1992). The Ottawa River was not colonized by the St. Lawrence river sturgeon population due to the existence of the marine Champlain Sea. The St. Lawrence sturgeon came from the Atlantic refuga. As a result, there is some indication that these populations are morphologically distinct, based mainly on head measurements (Guenette et. al., 1992), however, genetic studies between the two populations do not indicate significant genetic differences (Guenette et al., 1993).

Both Indigenous knowledge and zcademic literature confirms, Lake Sturgeon were once considered abundant in the Ottawa River prior to the 1900's (Dymond, 1939; Desoursay, 2023) and were found throughout the entire Ottawa River and many of its tributaries (Harkness and Dymond, 1961;Decoursay, 2023). Small (1883) in the Transactions of the Ottawa Field Naturalist, notes that Lake Sturgeon frequented the Ottawa River and curiously, he mentions a second species, the Sharp - nosed Sturgeon to be found in the river. However, with European colonization came industry and increased anthropogenic stressors of various kinds on Lake Sturgeon, ultimately causing a decline in sturgeon population numbers in the Ottawa River and other North American watersheds that have yet to rebound to historical numbers.

Prior to establishment of the logging and lumber operations, the Ottawa River was a crystal-clear source of water, where the riverbed could easily be seen. The water chemistry of the Ottawa River has since been affected due to the accumulation of bark and wood chips during the logging era, which had also altered the riverbed causing optimal fish habitats to degrade overtime. Log movements mostly occurred in the spring; this unfortunately could have abraded the Lake Sturgeon spawning ground in the Ottawa

River. The destruction of spawning beds continues to occur on the Ottawa River and the species continue to be under threat. The SART communities are currently (2023) assessing the effects of the Temiskaming Dam complex replacement in a key sturgeon spawning bed. Lake Sturgeon have very low reproductive potential, females spawn for the first time between 14-23 years of age, then only every 7-9 years afterwards.

Historically, the Hudson's Bay Company took great efforts to secure supplies of isinglass from native fishermen. Analysis of isinglass returns from Hudson's Bay Company account books reveals the magnitude of sturgeon production. During the fur trade period, the sturgeon fishery was a highly productive industry, characterized by a sustained annual yield. With the advent of non-native commercial fisheries in the region, production increased beyond the level of sustained yield. This resource was virtually destroyed by the early 20th century (Holtzkamm T., 1987).

Historical reports indicate that some large fish were taken from the Ottawa River. In March of 1931, the Globe and Mail reports a large Lake Sturgeon of 216 pounds being caught near Montebello. A fisherman near Davidson, Quebec, in 1952 had a 35 pound sturgeon jump out of the water and land right in his boat, making for an interesting fish tale (Egan, 2020).

Sturgeon were considered a nuisance specie by new settlers as there was no viable market for them, as they wreaked havoc on fishermen's nets creating unnecessary work in repairing holes in the nets. Sturgeon were seen as such a nuisance that they would be stacked up on the shore like 'cord - wood', and once dried enough, set ablaze with their rich oil content (Harkness and Dymond, 1961), or used as fertilizer. They were used to feed steamship boilers as well, not having yet appreciated their value as anything other than fuel.

General causes of population decline:

- Records of Isinglass sales to the Hudson Bay Company at Norway House, Manitoba from 1832 to 1892 (MacDonell 1997, 1998).
- Commercial harvest for caviar production was initiated in Sandusky, Ohio in 1855 (Harkness and Dymond 1961), and Canadian waters of the Great Lakes were opened to commercial sturgeon fishing in 1879 (Prince 1905).
- habitat loss and degradation
- Construction of dams and hydropower generation
- Invasive species

Lake Sturgeon (*Acipenser fulvescens*) have been greatly impacted as a result of unregulated fisheries, overfishing, overexploitation, pollution, construction of dams and hydroelectric facilities, logging and pulp and paper operations that established in the Ottawa river watershed in the early 1800's and continue today (Bruch et al., 2016).

Spawning habitat for Lake Sturgeon in the Ottawa river prior to hydro-electric development is not well-documented. It is believed that spawning now occurs at most generating stations (Haxton, 2008) and generating station and dam infrastructures are looking to include more fish friendly operating solutions. For example, see https://fb.watch/i5rGbklk9f/.

4.0 Life History and Ecology of Lake Sturgeon in the Ottawa River

Lake Sturgeon are one of 27 sturgeon species worldwide. They are considered a prehistoric fish with ancestral ties to species from the Jurassic period, 200 million years ago. The first fossil evidence of sturgeons dates back to the late cretaceous period (145.5 to 66 mya). They have remained virtually unchanged since then, hence are often regarded as a primitive group. In contrast to most fish species that have a bony skeleton, sturgeon have a largely cartilaginous skeleton, similar to sharks. Contrary to sharks however, the cartilaginous skeleton of sturgeon is a feature that is derived from a bony skeleton. Sturgeon do not have scales as do most fish, but instead they have 'denticles', which are scale-like plates that give their skin a very rough texture. The heterocercal tail (the upper lobe larger than the lower) is an indication that sturgeon frequent the lower stratums of the water column as the tail is adapted to pushing the fish downwards.

Sturgeon are the largest freshwater fish on the planet with lake sturgeon reaching a length of greater than 2 meters and weights up to 180 kg. They are a long-lived species, reaching ages of more than 100 years. Lake sturgeon are slow to mature, putting their energy into growth during the first 15 - 20 years rather than reproduction. Putting energy into growth during their first years allows them to decrease predation rates during their early years. This trend towards late maturity makes it difficult for a fast population recovery under circumstances when large numbers of adults are taken out of the population i.e. when exposed to commercial fishing pressure.

Lake Sturgeon are almost exclusively freshwater, preferring lakes and rivers with a substrate of soft mud, sand or gravel at depths of 5 - 20 meters. Sturgeon have a sucking mouth located on the underside of their head, ideal for pulling a variety of prey from the river bottom. They are a benthic generalist feeder, taking bottom-dwelling organisms such as amphipods, chironomids (midge fly larvae), oligochaetes (worms), ephemeroptera (mayflies), trichoptera (caddisflies), diptera (two-winged flies), molluscs, crayfish and fish eggs. Ephemeroptera have been identified by Beamish et al. (1998) as a primary food item. Some studies of lake sturgeon in rivers suggest a preference for drifting prey, especially among juvenile fish (Chiasson et al. 1997; Kempinger, 1996; Nilo et al., 2006). Sandilands (1987) found that crayfish were more frequently consumed by larger sturgeon.

Age at maturity ranges from 14 - 33 years for females, and 12 - 20 years for males in the Ottawa river. Length and age at 50% maturity was 106.7 cm and 20.4 years for males and 112.2 cm and 25.4 years for female lake sturgeon. Males spawn on average every 2-3 years while females only spawn every 4 - 9 years. Fecundity, or the number of eggs produced per female was 12,170 eggs per kg of body weight in the Ottawa river. Annual mortality of sturgeon in the Ottawa River was estimated to be around 15% overall (Haxton, 2008).

For the purpose of this description of species biology and the description of habitat requirements that follows, Lake Sturgeon life history stages are defined as follows:

eggs: from deposition, through incubation, to hatch;

larvae: including drift phase of life cycle;

young-of-the-year: larvae once drift phase is complete up to the end of the first year of life;

yearlings: age one up to end of the second year of life;

juveniles: age 2 to 10 years;

sub-adults: 10 years up to onset of maturity; and adults: from onset of maturity onwards (Golder Assoc., 2011).

Spawning occurs in the spring in relatively fast water (up to 1.5 m/s), over a substrate of gravel and boulders that provide interstitial spaces to protect the eggs and larvae. Spawning occurs below waterfalls, rapids and dams. Lake sturgeon are potamodromous, meaning they are migratory strictly within a freshwater system. It's not uncommon for lake sturgeon to make long-distance migrations from their over-wintering areas to the spawning grounds, with movements greater than 200 km documented. Migrations of this distance are not possible now in the Ottawa river due to the multiple man-made barriers that now only allow a certain amount of movement. Other than during the spawning season lake sturgeon are relatively sedentary as evidenced by a number of tagging studies (Haxton 2008). Telemetry of juvenile lake sturgeon in Upper Alumette lake showed no extensive movement, and a propensity towards site fidelity (Haxton, 2008).

Males show up to the spawning grounds first, typically in early male to late June, with variation in timing depending on seasonal climate and location. Spawning can occur anywhere from 10 - 20 deg. C. Sturgeon typically spawn in the Ottawa River at about 17 deg. C, based on work done by Haxton (2008) and recent studies conducted at the Temiskiming Dam by Hatch environmental consultants. Their appears to be no preference between day and night spawning (Bruch and Binkowski, 2002). Male lake sturgeon only spawn every 2 to 3 years whereas females spawn only every 4 - 9 years. Typically there is one spawning period, however, there can be two separate spawning events involving different females. The number of spawning events seems to be linked to migration distance, warming trends and temperature fluctuations. Bruch and Binkowski (2002) reported a second spawning event in lake sturgeon up to four weeks following the first, likely as a result of a sudden decline in temperature.

During spawning, a female will be surrounded by multiple males, where they deposit their adhesive eggs over a rock and rubble substrate. The males will release their milt or gametes to fertilize the eggs as the female deposits them. There may be multiple acts of egg deposition by a female with different males. Once spawning is complete, the sturgeon will immediately abandon the spawning grounds.

A curious behaviour that has been documented by lake sturgeon in some rivers is that of 'porpoising' prior to, and during the spawn. During porpoising, sturgeon swim upstream and with their head out of the water and occasionally jump completely clear of the water (Bruch and Binkowski, 2002). To date, this behaviour has not been reported on the Ottawa River, however, it is something to look for on spawning grounds in spring on the Ottawa River.

Depending on temperature, the eggs will incubate for 5 - 14 days prior to hatching. No parental care is given to the eggs which have a mortality rate estimated to be approximately 99%. Egg mortality can result from sedimentation that essentially smothers the eggs as well as a rapid increase in flow (Kempinger, 1988) as may occur below dams that regulate water flow. Low water levels as a result of flow regulation and predation on eggs also contribute to mortality. Optimal temperature for egg survival is 14 - 17 deg. C. with 100% mortality when temperatures rise above 20 deg. C. (Wang et al., 1988). The egg stage is when the highest predation rates occur on lake sturgeon. Fish predators include sucker sp., logperch, yellow perch and sturgeon, all species that occur in the Ottawa River. Crayfish, which are able to get into the interstitial spaces, are also known to consume lake sturgeon eggs (Caraffino et al., 2010; Scribner and Baker, 2008).

Soon after lake sturgeon eggs hatch, they enter a pelagic life stage known as 'larval drift'. Emergence of the hatched larvae is largely temperature dependent. Smith (2003) reports that the larval drift stage didn't start until the temperature was 15 deg. C. Larval drift in the Ottawa River will likely start at a higher temperature as spawning doesn't typically occur until 16 deg. C. The larvae, which at this stage still have a yolk sac, emerge at night from the interstitial spaces between the rock and rubble. Peak larval drifting occurred 8 - 14 days post hatch, and between the hours of 2100 and 0200 (Kempinger, 1988). Drifting larvae have been found 45 km downstream of where they hatched, 25 - 40 days post hatch (Auer and Baker, 2002). Lake sturgeon larvae in this study ranged in size from 20 mm 14 km downstream of the hatching area to 22 mm average 45 km downstream of the hatching area. While drifting larvae are vulnerable to predators during this life stage, not a lot of evidence of predation of this life stage has been reported. Despite the high rate of mortality during the egg stage and the infrequent spawning by lake sturgeon, high fecundity rates spread out over several years has allowed lake sturgeon populations to persist.

5.0 Current Status of Lake Sturgeon in the Ottawa River

Lake Sturgeon were first added to the species at risk list when the Endangered Species Act took effect in 2008. On September 10, 2009 the species was divided into three distinct populations and listed as threatened (Great Lakes - Upper St. Lawrence and Northwestern Ontario populations) and special concern (Hudson Bay - James Bay population). The Great Lakes - Upper St. Lawrence populations were reassessed as endangered in November 2017. In the context of how levels of threat are defined, 'endangered means' that the population faces imminent extirpation or extinction if efforts are not made to slow or stop the decline in population numbers.

Lake Sturgeon are native to, and were once considered abundant in the Ottawa River. Unfortunately, historical records don't indicate what the absolute population numbers may have been during this period of abundance. There is no doubt, however, that there has been a drastic decline in the numbers of Lake Sturgeon in this watercourse. Studies that looked at other Great Lake populations of Lake sturgeon estimate current populations at only 1% - 2% of historical numbers (Haxton et al., 2014).

A comprehensive study of the current status of Lake Sturgeon in the Ottawa River was conducted by the Ministry of Natural Resources and Forestry in Ontario between 1997 and 2001 (Haxton, 2002) (fig. 1). The study examined the nine reaches of the river between Lake Temiskaming and the Carillon Dam (approximately 140 km downstream of Ottawa). They found significant variation in Lake Sturgeon abundance between reaches, with the greatest abundances observed in unimpounded lengths of the river. Lake Sturgeon numbers are lowest in reaches with extreme water drawdowns and highest in reaches where more natural flow regimes are maintained (OMNRF and MFFPQ, 2008).

The areas of greatest relative abundance of sturgeon were found in Upper and Lower Alumette lakes and Lac Coulonge, while lowest abundance was found in Lac La Cave (below the Temiskaming Dam), Holden Lake, (below the Otto - Holden dam) and Lac Dechesnes. During the study,which included a combination of Fall Walleye Index Netting (FWIN) and Nearshore Community Index Netting (NSCIN), both of which are standard MNRF protocols, a high of 263 Lake Sturgeon were caught in Upper Alumette lake, and a low of only one individual was caught in Lac La Cav, below the Temiskaming dam.

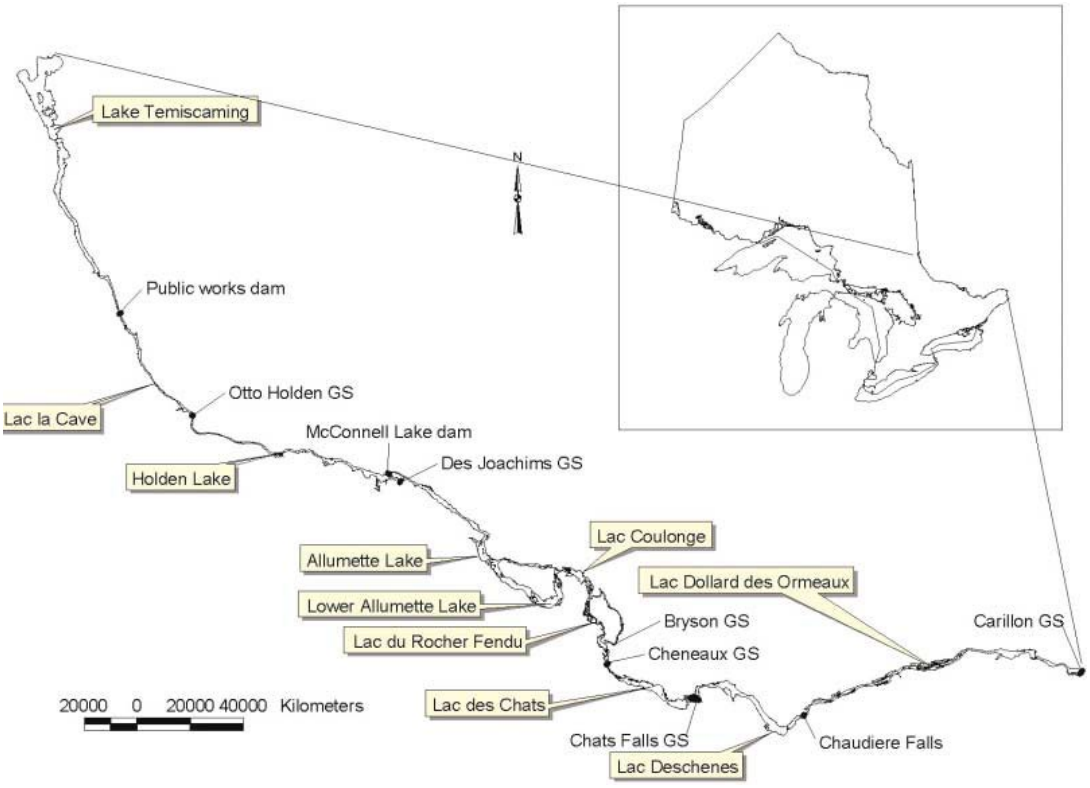


Figure 1. The Nine reaches of the Ottawa river assessed for Lake Sturgeon population by the MNRF between 1997 and 2001. From Haxton (2002).

Haxton (2008) also assessed tissue contaminant levels for 21 different potentially toxic chemicals in lake sturgeon in the Ottawa river. Only three of the 21 chemicals tested had at least one sample above the detection limits. Polychlorinated Biphenyls (PCB's) ranged from 20 - 120 nanograms/gram (ng/g); DDT and metabolites ranged from 2 - 170 ng/g with mercury being the most commonly detected contaminant with concentrations ranging from 0.06 - 0.69 micrograms/gram of tissue. The total mercury concentration of lake sturgeon tissue was positively correlated with length of the fish (Haxton, 2008). Despite an increased level of mercury in tissues of lake sturgeon in the Ottawa River, this heavy metal does not appear to have had a noticeable effect on growth or health of the fish (Haxton, 2007).

Examination of the lake sturgeon of the Ottawa River suggest they are genetically similar throughout the watercourse. There is some evidence that they may be genetically unique from the St. Lawrence River population (Guenette et. al., 1993).

All commercial fisheries for Lake Sturgeon were closed in Ontario in the 1980's with recreational fisheries closed in 2009. All commercial fishing for lake sturgeon in Quebec was closed in 2013 with the closure of recreational fishing for the species under consideration as of 2018 (OMNRF and MFFPQ, 2018). At the time of this writing (April 2022), angling for lake sturgeon remains legal, with one fish 106 cm or less allowed to be taken.

6.0 Limiting Factors to Recovery of Lake Sturgeon in the Ottawa River

6.1 The Temiskaming Dam

The Timiskaming Dam is a water level control dam, controlling the level of the water upstream of the dam in Lake Temiskaming and the flow of the Ottawa River downstream. The dam is located approximately 65 km Northeast of North Bay, and is the last dam on the Ottawa River upstream of the St. Lawrence River and is a part of a network of seven dams used to manage water levels in the upper Ottawa River. The dam complex is comprised of two separate dams that connect on either side of the river to Long Sault Island in the middle. The portion of the dam on the west side of the island is the Ontario dam; the dam on the East side of the island is the Quebec dam. Highway 63 on the Ontario side becomes highway 101 on the Quebec side, providing an important interprovincial transportation route. The dam also accommodates a natural gas pipeline.

The dam is located on unceded Alqonquin - Anishinaabegg lands as well as federal lands as claimed by Public Works and Government Services of Canada. Currently the flow rate over the dam is controlled by stop logs that are moved by a custom log - lifting machine.



Figure 2. the Timiskaming Dam complex viewed from the Northwest, looking Southeast. The Ontario dam is on the right (west) of Long Sault Island. The Quebec dam is on the left (East) of the island. (photo credit Public Services and Procurement Canada website, 2020).

6.1.1 History of the Timiskaming Dam

Prior to the construction of the dam this area was know as the Long Sault rapids which were a series of downstream rapids beginning at Long Sualt Island and what is know know at Gordon Creek (Morrison 2008). Gordon Creek was a known summer gathering place for Algonquin Peoples likely around the rich Lake Sturgeon resources. The original Timiskaming dam complex was intended to change this landscape. It was constructed between 1909 and 1913 to control the water level in Lake Timiskaming upstream and the flow of the Ottawa River downstream. The Quebec side was rebuilt in the 1930's following a foundation failure. Between 2014 and 2017, the Ontario side of the dam was replaced as the dam was deemed to be at the end of its useful life.

6.1.2 New Dam Construction

The new dam on the Quebec side of the dam complex will be built 25 meters downstream of the existing dam. Although the old dam is still functional, it is nearing what is deemed to be the end of its serviceable life. Once the new structure is built, only then will the old dam be demolished and removed (PSPC, 2020).

The new dam will be 75 meters in length and will incorporate 10 bays with sluice gates that will be used to control the water level. This is a more efficient system of managing the water level than the old log lift system, allowing a much faster response to changing conditions due to weather events. A two lane highway across the dam will continue to connect Hwy 63 on the Ontario side to Hwy 101 on the Quebec side.

A fish passage is being proposed as part of the design of the new dam. The fish passage will allow fish to move freely between the Ottawa River and Lake Timiskaming, bypassing the dam. The proposed fish passage will cross Long Sault Island and will have a total length of 140 meters. Details of the design and the species the passage will attempt to accommodate have yet to be clarified.

The construction of the Quebec side of the dam is currently under environmental review at the time of this writing. Tetra Tech QI has been awarded the contract to design the new dam. The design work will not begin until an Environmental Assessment has been completed. Construction is slated to begin in 2026 with a completion date of 2026 (PSPC, 2022).

Pursuant to the Canadian Environmental Assessment Act, an environmental assessment of the Quebec dam construction project was started on June 20, 2018 by the Impact Assessment Agency of Canada (formerly the Canadian Environmental Assessment Agency). Final Environmental Impact Statement Guidelines were issued by the Impact Assessment Agency to Public Services and Procurement Canada (PSPC) on August 21, 2018 for the preparation of an environmental impact statement.

6.1.3 First Nations Communities and Dam Construction

The dam is located on unceded Algonquin territory, the Algonquin First Nations people having a long history of cultural and spiritual connection to the Ottawa River. It is important that local First Nations communities continue to be involved in the planning, construction and operating processes for the new dam. The new dam will be built near historical spawning grounds of Lake Sturgeon and will most likely have an impact on these fish of great historical significance to the Algonquins of the area.

The PSPC have been in active consultation on the Timiskaming Dam Quebec replacement project environmental assessment under CEAA 2012 with Indigenous communities that could potentially be

affected by the new dam construction. It is important that these impact assessment consultations recognize and make accommodations for the possible impacts of changes to the environment, and how these changes may impact Indigenous communities, as well as how the project may adversely impact on potential or established Section 35 rights and title holders such as the SART First Nations.

6.1.4 Impacts of dams on Lake Sturgeon populations

Declines in lake sturgeon populations that were historically once abundant can at least in part be attributed to the construction of dams and hydroelectric facilities (Hrenchuk et al., 2017; Kerr et al. 2011). Negative impacts on sturgeon from barrier construction include impediments to migration, fragmented habitats, changes in flow regime, changes in water quality and impacts to spawning grounds. Downstream migrants can be entrained at hydroelectric dams or damaged as a result of impacts when going over dams at high flow or mechanical damage from turbines. As a result of dams, changes in flow regime and water chemistry, community structure, and diversity of organisms, especially prey items, can have a detrimental effect on diet and nutrition of sturgeon (Kerr et al., 2010). Haxton and Finlay (2008) report that water power management was the primary factor in preventing the recovery of lake sturgeon in the Ottawa river. Aquatic habitat upstream of a dam or hydroelectric facility will also be impacted as a result of a barrier which alters flow regime resulting in consequent changes to water quality and chemistry as well as the ecology of the system.

Juvenile lake sturgeon in large riverine systems have been reported to exhibit restricted movement patterns. This lack of movement is thought to be attributable to a general unwillingness to move up or downstream through narrow areas that are either natural or artificially altered falls and rapids (Barth et al., 2011; McDougall et al., 2013).

Regarding water release from dams there are two basic modes of operation - ‘peaking’ and ‘run of river’. In the peaking system, water is stored upstream (the dam is closed) for a period and then released through turbines to capture the energy of the moving water. This system results in periods of dramatic reduction in flow for many hours with a sudden rapid release of water. Peaking is believed to impair recruitment of young lake sturgeon into the population by negatively impacting eggs and larvae in spawning areas (Haxton and Findlay, 2008). The ‘run of river’ regime sees a constant flow through a dam or hydroelectric facility that emulate natural flows. This system of dam operation is considered to have less impact on aquatic biota (Prosser, 1986).

Conversion from a peaking system to run-of-river system at the Prickett hydroelectric facility on the Sturgeon river in Wisconsin, resulted in an increase in the number of lake sturgeon spawning below the dam (Auer, 1996). Alteration of flow regimes outside of natural variability has a pronounced impact on lake sturgeon. Constant water flows can trigger reproductive cues in sturgeon thus altering their behaviour outside their usual timing (Kerr et al., 2010).

Conversely, a reduction in water levels and flow rate in spring can delay upstream migration to spawning areas (Friday and Chase, 2005). Both climate and water flow during spawning and incubation are widely believed to influence year class strength in lake sturgeon (Votinov and Kasyanov, 1978; Nilo et al., 1997; Randall and Sulak, 2007). Sudden changes in flow (increases) are known to dislodge eggs and larvae from the protection of spawning substrate (Swanson et al., 1990).

One of the major impacts of dams on river systems is on the success of spawning by lake sturgeon. Shifts in the timing of peak flows and reduction in flows from the natural regime are directly related to sturgeon spawning success and year class strength (Kerr et al., 2010).

The impoundment of rivers unquestionably impacts lake sturgeon populations and the Ottawa river is no exception. A thorough investigation of flow regime at both the Temiscaming Dam and the Otto - Holden dam, at the downstream end of Lac la Cav, will be required as part of the assessment and management program in efforts to restore the sturgeon population in this area. Flow enhancement strategies will be required, especially during spawning, incubation and the largely nocturnal larval drift periods (Schilt, 2007).

7.0 Monitoring and Assessment of the Lake Sturgeon Population

An assessment and monitoring program for Lake Sturgeon in the Ottawa River below the Timiskaming dam is a tool that will be most useful only if it is done over a long period of time, namely years, and ideally, decades. Sturgeon are a long - lived species that take up to two decades to reach reproductive maturity. As a result, it can take years to see any substantial change in numbers of adult sturgeon.

A monitoring and assessment program will not only focus on the population numbers of sturgeon, but will also rely on monitoring numbers of spawning sturgeon at known spawning habitats, assessing spawning success through the detection of eggs and larvae post - spawn, assessing the availability of critical spawning habitat, and assessment of any deleterious anthropogenic impacts that may affect critical habitat or affect fish health directly.

7.1 Sturgeon population assessment

Monitoring and assessment methods carried out to date on the Ottawa River have been able to give some measure of the relative abundance of Lake Sturgeon in various reaches of the Ottawa River, however, absolute numbers of fish are much more difficult to determine (Haxton, 2008). To determine absolute numbers of sturgeon in a given reach or location of the river, a mark-recapture program is recommended. The low numbers of fish caught in some regions would mean that the mark-recapture program would have to be relatively intense in order to catch enough individuals to determine population size. It must be kept in mind that individual Lake Sturgeon do not spawn every year, with gaps as long as 3 - 4 years between spawning events for individuals. This will have a bearing on the success of a mark-recapture program.

The mark-recapture technique works by initially tagging a number of fish within a specified location and timeframe. After a period of time has passed, a second attempt at capturing the fish is made. From this subsequent capture, the number of tagged fish vs. non-tagged fish is recorded. The ratio of the tagged to untagged fish can then be used to estimate the population size at that location.

For a mark-recapture program to estimate a population with any accuracy, there are a number of assumptions that must be made. In reality, these assumptions are often not met, and must be taken into account when estimating population size. Some of the assumptions that are made are as follows:

- there is no input (birth or immigration) or output (death or emigration) from the population of interest.
- all individuals are equally susceptible to being captured.
- the population is randomly distributed throughout the area of assessment.
- no tags are lost from individuals.

A long-term monitoring and assessment program for Lake Sturgeon in the reach below the Temiskaming dam to the Otto-Holden dam (Lac La Cav) is recommended. Monitoring Lake Sturgeon in this area of the Ottawa River over a number of years (10 - 15 minimum) is the only way to determine long term trends in population numbers as well as absolute numbers through mark-recapture methods. The length of time for Lake Sturgeon to reach maturity (up to 20 years) necessitates a decades long monitoring program to see changes in numbers of adult sturgeon.

Assessment of adult and juvenile lake sturgeon should follow established protocols for various methods of gill netting that are currently in use by the Ministry of Northern Development, Natural Resources and Forestry (MNDNRF) The established methods are the Fall Walleye Index Netting (FWIN) method and the Near Shore Community Index (NSCIN) method, the protocols for which should be available through the MNDNRF.

While the FWIN and NSCIN methods will target all size and age classes of Lake Sturgeon, the most productive time to capture adult sturgeon is during the spawning period in the spring. At this time the adult sturgeon will be congregating, making them easier to catch. Gill nets used during the spawn will have a mesh size that will target only large sturgeon (see monitoring protocols below).

Assessment of the juvenile lake sturgeon population is another important indicator of the success of rehabilitation efforts. Little is currently known about the habitat requirements for the juvenile phase (Haxton, 2011). Another advantage of examining the juvenile stage is that it can provide information on a more realistic timeline than assessing the adult population, which can represent a lag time of 25 - 30 years due to their delayed maturity. Targeting the juvenile population as part of a monitoring program will help to provide much needed information on where and when these fish are caught, as well as their preferred habitat. Work done by Haxton (2011) in the Ottawa River found that juvenile lake sturgeon were most likely to be captured in gill nets between 12 and 20 meters depth. Mesh size used in the Ottawa River study was 38 - 127 mm, stretched panel measurement. Nets were set for a minimum of 18 hours and maximum of 22 hours, when temperatures were greater than 18 deg. C.

The greatest number of juvenile lake sturgeon caught by Haxton (2011) in the Ottawa River were in Upper and lower Alumette Lakes and Lake Coulonge. Only one juvenile lake sturgeon was caught in Lac la Cave in 28 net sets.

7.2 Tagging for population analysis

Tagging sturgeon with a unique identification number will make it possible to estimate the number of the species in that population or localized area, in this case, Lac La Cav. It is likely that the greatest catches of sturgeon will be captured during the spring spawn, providing an excellent opportunity to tag the fish. It is important that a method of tagging is used that does little harm to the fish and can be applied in a fast and efficient manner. Since sturgeon are long-lived fish, it is important that the tag

selected will remain with the fish for many years. Methods for tagging lake sturgeon are outlined in attached Lake Sturgeon Monitoring and Handling Protocols.

Tagging lake sturgeon with a unique identifier will allow for the collection of a variety of information. Growth rate of fish can be determined by measuring fish each time they are subsequently caught; an estimate of age can also be made if the program runs long enough; tagging can provide information on fish movements if the netting program spans a wide area and an estimate of the population size can be made by comparing the ratio of tagged to untagged individuals during subsequent netting operations.

7.3 Spawning success

Measuring spawning success can provide an indication of the quality of the habitat conditions to allow successful recruitment of young fish into the population. It can also provide clues as to the number of adult fish spawning in a particular season. Spawning success is notoriously difficult to measure however, due to the difficulty of making accurate observations of the initial stages of the lake sturgeon life history, namely, eggs and larvae.

Under ideal circumstances, sturgeon spawning can be observed visually from shore and can be a method to determine numbers of fish spawning from year to year. Such studies have been conducted in the Winnebago system in East Central Wisconsin (Bruch and Binkowski, 2002). On the Ottawa River, approximately 20 km east of Cobden, the Chenaux generating station provides an ideal viewing platform to observe sturgeon spawning. Observations of spawning lake sturgeon have been made at this location for several years (Haxton, 2008).

Measurements of spawning success can be achieved by observing the relative number of eggs laid and the numbers of larvae that are drifting in the water column after they emerge from interstitial spaces in the spawning beds. It must be kept in mind that mortality in the egg stage is typically around 99%, due to a variety of stressors including predation, sedimentation, fluctuations in water flow and water quality.

7.4 Visual spawning surveys

Currently there is little information, if any, regarding the potential to view lake sturgeon spawning below the Temiskaming dam. A dedicated effort during the spawning season to examine potential spawning areas from shore is recommended in the area below the Temiskaming dam as well as in the nearby Ruisseau Gordon (Gordon Creek). There are a number of spawning areas that have been identified in previous studies that would be worth examining visually. If it is verified that lake sturgeon can be observed from shore at easily accessible sites from the shores of Lac la Cav, it would be valuable to incorporate visual surveys into the yearly monitoring program.

7.5 Egg and larval assessment

Assessment of egg deposition and larval abundance during the pelagic drift phase of lake sturgeon life can be valuable tools in determining the reproductive biology and success of a lake sturgeon population.

Monitoring of egg deposition during spawning can provide evidence that allows identification of critical spawning habitat and its key characteristics (Thiem et. al., 2013). Relying solely on the presence or absence of fish on a spawning ground provides little direct information regarding spawning success. Identification of critical spawning habitat can be crucial for the protection of essential habitat and to make effective management decisions (Thiem et. al., 2013).

The easiest and most often used method of egg collection is to deploy egg mats on the river bottom in suspected spawning areas. The mats act as a collection device that the adhesive eggs will stick to when sturgeon deposit their eggs over top of them. These mats can be a variety of designs and materials, ranging from furnace filters (Roseman et. al., 2011) to latex - coated synthetic animal hair (Thiem et. al., 2013; McCabe and Beckman, 1990). Placement of the mats is critical to optimize the chances of egg collection. They must be deployed on the river bottom in appropriate habitat which means in areas of suitable substrate such as gravel or cobble that provides interstitial spaces that will protect the eggs and larvae; the water velocity should be between 0.4 and 1.39 m/s (Thiem et. al. 2013). The mats should be checked at minimum every 6 days to ensure that the period of collection is less than the incubation period which can be as short as 8 days. Once checked, the eggs should be removed and preserved in 70% ethanol and the egg mats pressure washed before being deployed. Location, depth, temperature, water velocity at the egg mat and substrate should all be recorded for each egg mat.

Quantification of lake sturgeon larval abundance may be useful in the rehabilitation of the population as it may provide some understanding of recruitment rates. Assessment of larval abundance in the water column at various sampling locations may provide information on where it is best to focus rehabilitation efforts to increase recruitment of lake sturgeon (Smith and King, 2005). Adult mortality of sturgeon is typically low. It is important to focus rehabilitation efforts to increase the survival and recruitment rates of young sturgeon as this stage of life is where mortality rates are the highest. Reduced habitat availability and quality will likely have more of an impact on the early life stages of the population than the adult stages (Smith and Baker, 2005).

When monitoring larval abundance, it is important to focus efforts at a time and location where you are most likely to capture sturgeon during this pelagic life stage. Larval drift is not uniform throughout the water column (Smith and King, 2005) with most larvae being caught in the middle of the river channel, or 'thalweg'. Temperature is an important environmental cue for larvae to start the drift phase, with 16 deg. C. being reported as an important temperature to cue the drifting phase (Smith and baker, 2005).

Vertical depth distribution of lake sturgeon larvae varies as well. In the Peshtigo River, Wisconsin, in studies at a depth of 1.4 m, the greatest number of larvae were caught between 40 cm above the bottom to the surface, indicating that in shallow areas, the distribution of the larvae was not benthic (near the bottom) (Caroffino et. al., 2009). Work in the Upper Black River, Wisconsin by Smith and King (2005), observed best catches of larvae at mid-depth and near the bottom in deeper rivers. Their work is corroborated by D'Amours et al. (2000) who found that larvae were distributed throughout the water column with a tendency to be concentrated at mid-depth and near the bottom.

Larval abundance can be calculated using the following formula from Veshchev et. al. (1994).

$$P = (q \times N)/O \times K$$

Where P is the number of larvae passing the sample site

q is the volume passing the stie(cubic meters/hour)

N is number of larvae collected in the net after one hour

O is volume of water sampled (cubic meters) where O = V x S;

V is current velocity in the net; S is sectional area of the net (square meters)

K is a collection coefficient - the difference in velocities in front of the net and beside the net.

7.6 Recommendations for population monitoring and assessment

- establish a long - term assessment and monitoring program for lake sturgeon below the Temiskaming dam that will include spawning surveys in spring, egg and larval assessment and monitoring of juvenile populations in Lac La Cav.
- tagging of adult and juvenile fish to determine population estimate, number of fish spawning, spawning frequency and movement patterns of fish throughout the portion of Ottawa river below the Temiskaming dam.
- thorough assessment of lake sturgeon in Lac La Cav, determine those habitat features that are most closely associated with the different life stages including: habitat requirements for larval sturgeon; nursery habitat post - larval stage; habitat preferences of juvenile sturgeon and seasonal habitat preferences of adult lake sturgeon.

8.0 Habitat Assessment and Restoration

Prior to creating and implementing a successful habitat management and restoration strategy, an assessment of the current habitat must be undertaken. When assessing habitat needs, the requirements of each life stage of the lake sturgeon must be taken into consideration. Lake sturgeon will utilize different habitat types depending on their life - history stage and will display seasonal movements between habitats depending on seasonal needs. Different habitat types are required by lake sturgeon to fulfill various life functions including reproduction, egg and larval development, feeding and growth, refugia and movement. An open connection between habitats is paramount to survival of this long - lived fish species (Golder Associates Ltd. 2022).

8.1 Identification of critical Lake Sturgeon habitat

Reproduction is fundamental to the maintenance and diversity of a population. Although habitat requirements for lake sturgeon will change depending on life history stage and season, it is critical that the habitat requirements for spawning are met, otherwise the population will not propagate.

Lake sturgeon typically choose high gradient reaches of large rivers to spawn, typically below waterfalls, or dams where current velocities range from 0.5 - 1.3 m/s, at water depths of 0.10 to 2.0 meters. The substrate most suitable for spawning is coarse gravel, cobble, boulders and hardpan sand (Golder and Associates, 2011). It is important for the eggs to have ‘interstitial’ spaces within the spawning substrate

to allow protection of the eggs from predators and fluctuations in flow rate. As always, there is variation between populations in their ecology. In connecting waters of the great lakes and St. Lawrence River, lake sturgeon have been observed spawning at depths of 9 - 12 meters, although at similar flow rates as noted above.

Strong site fidelity to spawning habitat is shown by lake sturgeon, meaning they will return, as many species do, to the precise location where they have spawned in previous years. In the Groundhog River in Northern Ontario, sturgeon used the same 30 x 50 m patch of spawning habitat despite suitable habitat close by (Golder, 2010a).

Highly critical to healthy lake sturgeon populations are non - fragmented habitats. Many authors have reported that lake sturgeon will move upstream to the farthest impassable barrier to spawn (Auer, 1996). It is important that management strategies make every effort to allow sturgeon unobstructed passage to areas for feeding, overwintering and reproduction (Auer, 1996).

At this point, it is unclear whether the larval stage of lake sturgeon has a specific habitat preference. This area represents a knowledge gap where larval and young sturgeon monitoring studies below the Temiskaming dam can help to provide needed information.

Young of the year (YOY) sturgeon have been reported using a variety of substrates including sand, pea size gravel and organic material (Kempinger, 199; Holtgren and Auer, 2004). Young of year lake sturgeon are reported to feed at night, and are most commonly reported in shallow water (less than two meters) of low velocity. There is some indication that YOY sturgeon may be attracted to particular substrates due to their camouflaging abilities (Benson et al., 2005). Auer and Baker (2002) note that in lower sections of the Sturgeon River in Michigan, deeper flowing areas were important habitat for YOY sturgeon. During high flows in the Groundhog river, yearling, juvenile and sub - adult sturgeon occupied discrete pools, however, during times of low flow, they were evenly distributed, exhibiting no depth preference (Seyler, 1997). In the Winnipeg River, juvenile lake sturgeon preferred deep areas, greater than 13.7 m over a variety of substrates during spring, summer and autumn. In the Pic river, which flows into Lake Superior,, adult lake sturgeon retreat down river after spawning, utilizing the deep pools of the lower river in summer..

Prey availability appears to have some bearing on habitat selection by young sturgeon. This is unsurprising as there must be an adequate food supply to satisfy the requirements of rapid growth characteristic of sub - adult lake sturgeon. In both the Groundhog and Mattagami Rivers of Northern Ontario, juvenile and sub - adult lake sturgeon were most commonly associated with clay substrates where macro - invertebrates were most abundant (Chiasson et al., 1997). Dipteran (two - winged flies) larval abundance was related to abundance of juvenile lake sturgeon in the Peshtigo River in Wisconsin.

Specific to the Ottawa River, work by Haxton (2002) suggests that lake sturgeon are generally more abundant in reaches of the river that are unimpounded. He also notes that changes in natural water flows and water levels in the Ottawa River can impact spawning, which will have an effect on recruitment. Fluctuation in water levels can also eliminate backwater areas that are used for feeding and nursery areas for young sturgeon.

Work conducted by Biophilia in 2917 identified 10 potential spawning areas downstream of the Temiskaming dam (Biophilia, 2019). Eight of these spawning areas are in the Ottawa River itself, with

two in Ruisseau Gordon (Gordon Creek). The area of spawning habitat in the Ottawa River covers a total of 3.3 Ha, while that in Ruisseau Gorond covers 0.4 Ha. These areas were assessed as spawning grounds based largely on substrate characteristics. They noted that flow varied greatly from year to year and even within a given spawning season. Attempts to collect larvae and eggs as evidence of spawning at the identified spawning areas met with low success rates. Larvae or adult sturgeon were only caught in three of the ten areas during studies in 2017.

Biophilia (2019) concluded that management of the dam does affect spawning success of lake sturgeon, as well as other fish species they assessed at the time. It is imperative to thoroughly investigate the timing and determination of how water levels are managed at the Temiskaming Dam during spawning season, and to work with dam management to ensure that water levels remain at a level that is optimal for lake sturgeon reproduction. All stages of lake sturgeon spawning that will determine recruitment of young fish to the population must be considered when determining water levels and flow rates. These stages of lake sturgeon reproduction include: spawning and egg laying; incubation of the eggs as well as the pelagic larval drift phase. Efforts should also be made to determine habitat used by young lake sturgeon as a 'nursery', the stage of life after the larval drift phase.

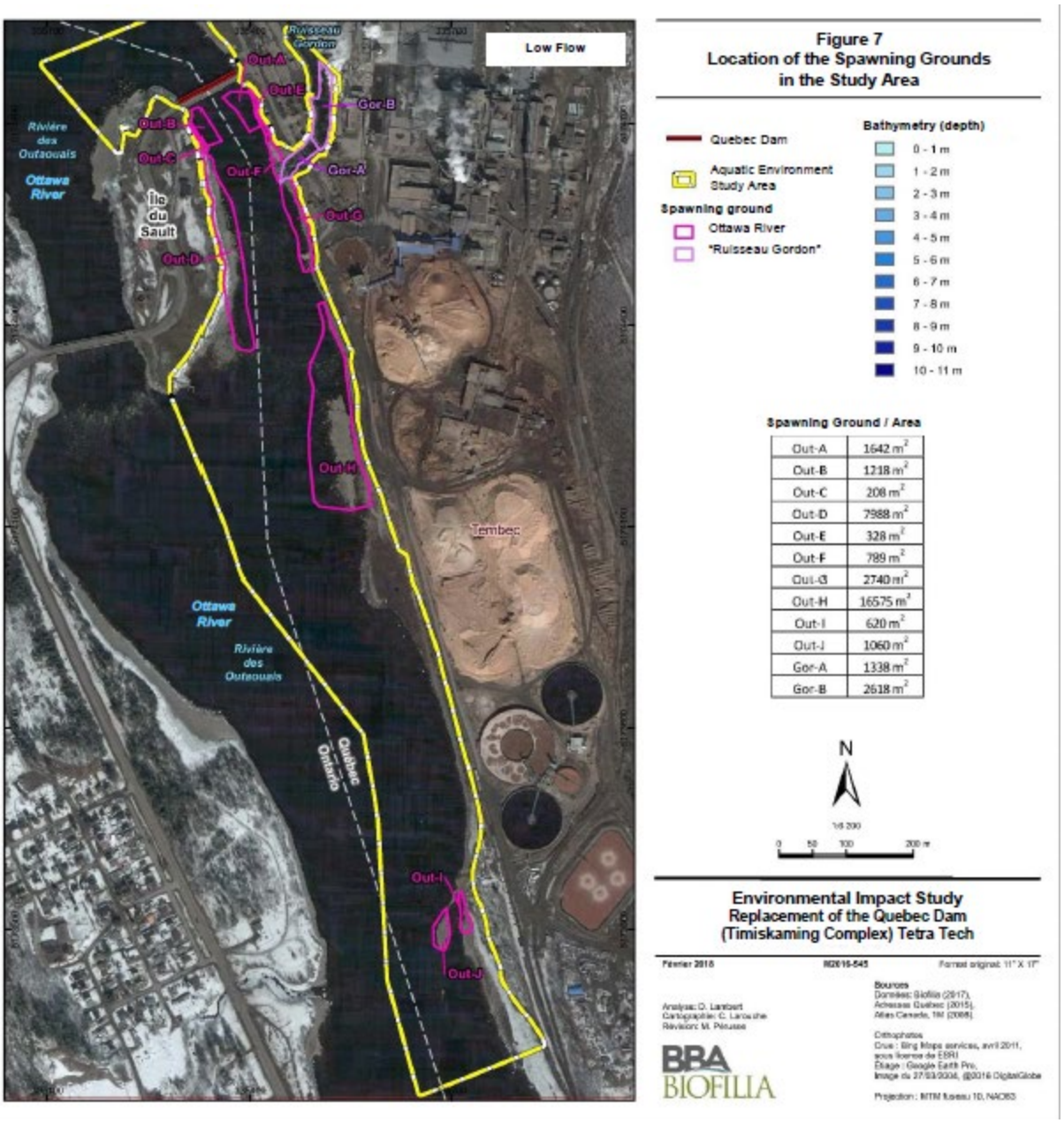


Figure 3. Location of spawning grounds determined to be suitable for Lake Sturgeon by Biophilia in a 2017 study below the Temiskaming dam (Biophilia, 2019).

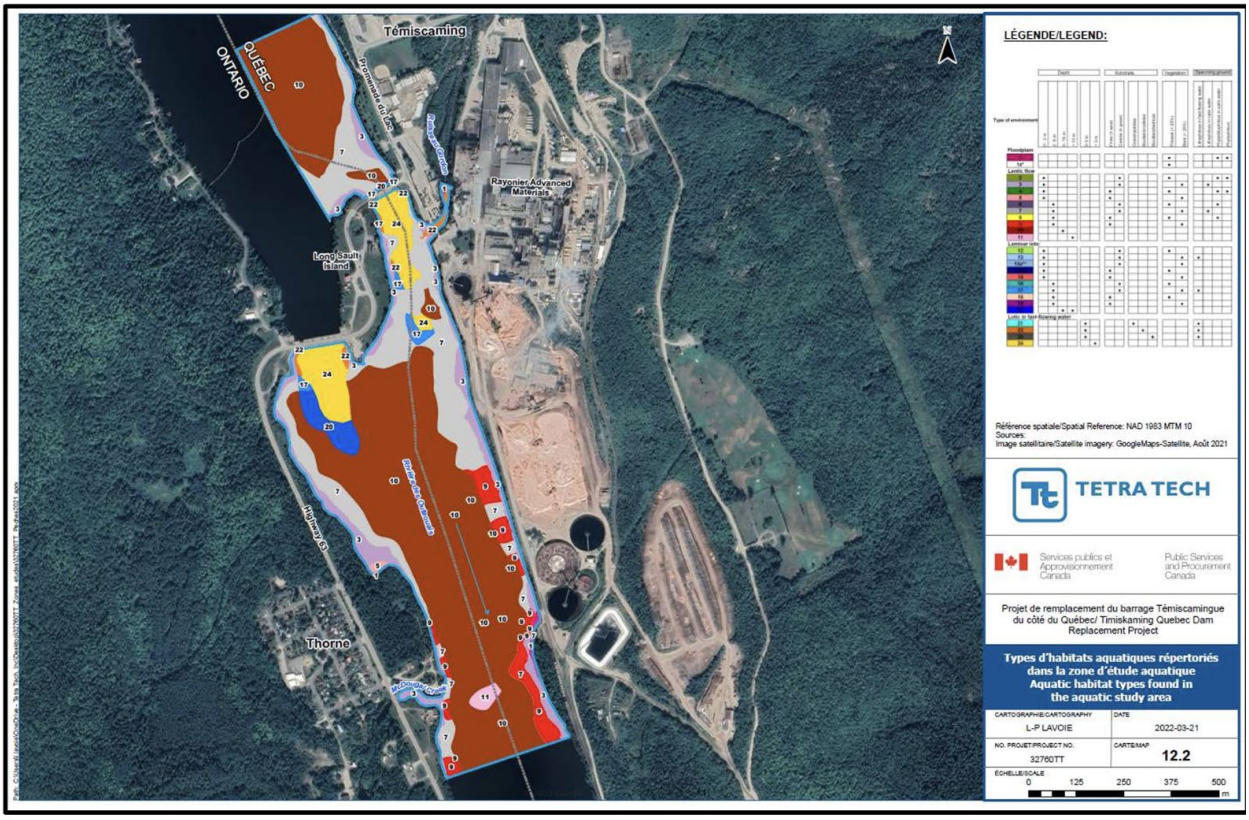


Figure 56: Aquatic Habitats
(Tetra Tech 2023: Figure 12.2)

Figure 4: Aquatic Habitats TDQRP Environmental Impact Statement (Tetratech 2023)

8.2 Examination of methods to allow uninhibited movement of Lake Sturgeon (fish passage).

Dams and hydroelectric facilities on rivers that traditionally support Lake Sturgeon populations alter the normal patterns of water temperature fluctuation, alter flow regime, water chemistry, nutrient transport, fish movement and community structure (Kerr et al., 2011). Haxton and Findlay (2008) suggest that power management on the Ottawa River was the primary factor preventing Lake Sturgeon population recovery.

The construction of the new dam that is proposed on the Quebec side of the Temiskaming dam site is supposed to include a fish passage component to allow fish free movement around the dam. Unfortunately, developing an appropriate fish passage design for large - bodied fish has proven difficult (Kerr et al., 2011), with further research being required. Work with juvenile sturgeon found that these younger fish restricted their movements in large riverine systems. This was thought to be attributable to a general unwillingness to pass through shallow river narrows (natural or inundated falls or rapids) (Hrenchuk et al., 2017).

A literature review of fish passage systems for Lake Sturgeon by Pandit et al. (2016) report that passage design criteria for migration upstream and downstream is not well established at this point. They

confirm that fragmentation of river ecosystems by dams alters migration patterns of sturgeon, and changes riverine systems to reservoir systems, having an overall detrimental effect on the natural fish populations. The several fishway types that currently do exist are designed for strong swimming fish species such as salmonids. These passageways are not nearly as effective for the large-bodied lake sturgeon which exhibit poor overall swimming performance relative to many other species.

Another important consideration to the health of the fish population downstream of a dam is the regulation of water flow at the dam. Low water flows in spring can delay upstream migration to spawning grounds by sturgeon as these large fish cue in on water flow rate for spawning (Friday and Chase, 2005). Climate and water flow during spawning and incubation is widely believed to influence year class strength (Votinov and Kasyanov, 1978; Nilo et al., 1997, Jager et al., 2002, Randall and Sulak, 2007). Changes in flow (sudden increase) shortly after spawning can dislodge eggs and larvae (Swanson et al., 1990). The larval drift phase occurs shortly after spawning and is another important life stage of lake sturgeon which must be given consideration when managing water flow rates below a dam. Larvae drift primarily at night. Flow enhancement strategies during the spawning period must be developed for spawning, incubation and larval drift (Schilt, 2007).

When considering various options for fish passage over a dam, attention must be given to water quality and habitat suitability upstream of the dam. Measures to prevent mortality during downstream migration back over the dam must be given consideration as well. The Temiskaming dam is not a hydroelectric facility, and therefore fish are not at risk of entrainment by turbines (being pulled in by the pressure of the blades), or physical damage due to contact with turbine blades. However, injury and mortality can still result from shear forces and turbulence which could potentially occur at the Temiskaming Dam (Cada, 1990 in Kerr et al., 2010).

There are typically three options available when considering movement of fish across a dam. These are: trap and transfer, fishways and fish lifts. Trap and transfer involves physically capturing and transporting fish across a dam. Although this method can be successful, it is very labour intensive. Fish lifts have been used with success in the past however, again this is a labour intensive and time - consuming method of moving fish. Fish locks designed for use by salmon and steelhead at the Bonneville dam on the Columbia River were used by Lake Sturgeon incidentally (Warren and Beckman, 1993). During a 31 year period, 4,711 white sturgeon were move upstream by the fish locks at Bonneville. Fishways, of which there are a multitude of designs, are the most common method of moving fish across artificial barriers. Fishways are typically designed for salmonids and often require the fish to jump from one level to the next. Sturgeon, being a large - bodied and slower swimming fish are not well - suited for using fish ladders where jumping from one level to the next is required. Ideally, uninhibited movement of lake sturgeon across the Temiskaming dam will be via a fish passage (fishway) that will accommodate the biology and swimming behaviour of sturgeon.

Design of fishways for sturgeon must take into consideration a number of factors, including entrance to the fishway, slope of the fishway, water velocity in the fishway, weirs and pool placement, slots and orifice and some other miscellaneous considerations. Kerr et al. (2010) provides a good summary of each of these features of fishway design for sturgeon.

All three options for the proposed new dam construction include the creation of a fishway across the dam (which is currently not passable in its entirety on either the Quebec or Ontario side). The construction of this fishway near the dam on the Quebec side is one of the conditions of the

authorization from Fisheries and Oceans for the work on the dam on the Ontario side that has been done in the last few years. In fact, the positioning of a fishway near the dam on the Quebec side is technically more favorable than near the Ontario side. The Quebec side of the river, which is narrower and deeper, would encourage fish to swim toward a fish passage. Input from Indigenous communities has led PSPC to consider designing a passage for other species (Section 7.6, Tetratech,). The positioning of the fishway will vary slightly depending on the options.

The fish passage channel that is currently proposed for the new dam construction that is scheduled to commence in 2023 will be designed strictly for the American eel (*Anguilla rostrata*). The Department of Fisheries and Oceans has only authorized construction of a fish passage for the American eel to date.

Public Services and Procurement Canada are considering four different options for fish passage during construction of the new dam that may or may not include multiple species including lake sturgeon. the four options being considered are as follows (from TetraTech, 2022):

1) A passage for eel only (as mentioned in DFO's authorization for the Ontario dam);

2) A multi-species fish passage;

3) No fish passage;

4) Delaying the construction of a potential fish passage until a more detailed impact assessment has been carried out as part of the Fisheries Management Plan for the Ottawa River.

Stakeholders including DFO, PSPC and local First Nations must be consulted to determine a fish passage design that will maximize the health of fish populations on a broad scale examining the impacts on multiple species and not only lake sturgeon. There has been concern expressed by some stakeholders that designing a fishway without the science to determine the ecological impacts of allowing multiple species to move up or downstream, may result in unwanted outcomes (TetraTech, 2022).

Pandit et al. (2016) report on two case studies examining the success of fishways for lake sturgeon. A side-baffle fishway at Turner Falls, Massachusetts with a 6.3% slope (30.5 cm rise over 487.7 cm), 1 meter deep on a 6.1 meter diameter circle accommodated both juvenile (mean length 87cm) and adult (mean length 140 cm). For juveniles, 46-73% ascended the fishway while 91% of adults moved to the top. Side baffles which alternated on the inside and outside of the channel walls created a large eddy behind each baffle allowing sturgeon areas to rest.

A vertical slot fishway on the Richelieu River at the St. Ours dam provides access to approximately 50 km of unimpounded river upstream. Of 43 radiotagged individual lake sturgeon (out of a total of 334 caught), none were documented approaching or entering the fishway after they had been tagged and released (Thiem et al., 2013). In another study by Thieme et al., (2016) that was also conducted at the Vianney - Legendre Fishway, 44 lake sturgeon were outfitted with electronic tags as well as accelerometers to determine swimming energetics required to successfully make passage upstream. Only seven sturgeon successfully negotiated the 85 meter channel and that was after 16 attempts. Twenty three of the fish failed to successfully negotiate the fishway and 14 of the fish didn't attempt

passage. The accelerometers indicated that during passage attempts, fish swim at a rather leisurely rate of less than 1.25 m/s. High speed or hyperactivity was rarely observed in the sturgeon. This led the study authors to conclude that swimming performance is an unlikely limiting factor in negotiating the fishway. The two turns in the fishway (figure 5) significantly increased energy consumption as the sturgeon tried to negotiate the turns. They suggested that removal of the turn structures would greatly increase the likelihood of passage as it would reduce passage time and energy expenditure by the fish.

Fish ladders that were constructed on the Columbia River (figure 6) with salmonids in mind were thought to be inadequate for sturgeon passage. However, annual reports from the U.S. Army Corps of Engineers indicated to the surprise of biologists that lake sturgeon were observed using the fish ladders at five of the dams on the Columbia river in Washington State (Warren and Beckman, 1993). The fish ladders on the Columbia river are primarily over - flow weir types that ascend from the tailrace to the forebay with a minimum one foot drop between pools. The weirs are typically 24 - 30 feet wide and 6 feet in height, spaced 10 to 16 feet apart. Although it is commonly thought that salmonids prefer to jump from one pool to the next, it was found that they would actually rather stay under water while moving upstream from one pool to the next. With this discovery in mind, the weirs were constructed with orifices at the bottom of each weir ranging from 18 to 24 inches square. It is these orifices that have allowed the white sturgeon on the Columbia river to move through the fish ladders, as sturgeon are a bottom -dwelling fish. On the Columbia river, the small size of the orifices would prevent large sturgeon from using the fish ladders. This is a design that may be appropriate for lake sturgeon being of a smaller size than white sturgeon.

Fish locks were also used at the Bonneville dam on the Columbia river, again, largely with the notion of moving salmon and steelhead upstream during the spring spawning period. White sturgeon also entered the locks and were moved upstream with the salmonids. The locks required someone to operate the fish locks which was done to coincide with the peak of the salmonid spawning run.



Figure 5. Vianney - Legendre Fishway at St. Ours Dam on the Richelieu River in Quebec. A vertical slot fishway design.

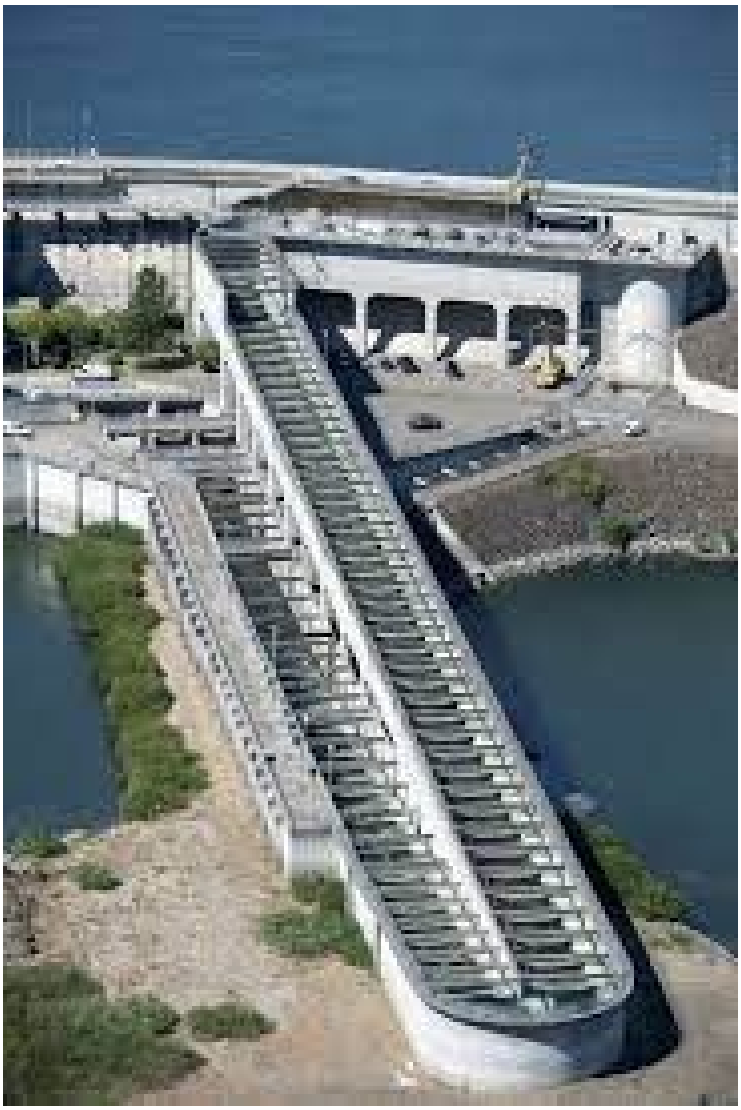


Figure 6. Dalles Dam East fishway used by White Sturgeon on the Columbia River.

Kynard et al. (2003) looked at passage of juvenile lake sturgeon using a spiral-side baffle fish ladder. Water velocity was controlled so that it didn't change from top to bottom. The slope of the ladder was 6% with side baffles alternating from the inside and outside of the walls. Lake sturgeon were able to negotiate the fish ladder, however there was great variability among individual fish in their ability to make passage.

Fish passages for sturgeon must take into account swimming performance and accommodate their poor jumping ability. Velocities in the fish passage must be lower than the maximum sustained swimming velocity of lake sturgeon which is reported to be around 0.57 m/s (TetraTech, 2022.)

8.3 Examination of methods of habitat restoration

Fragmentation of rivers, such as what has happened to the Ottawa river by the placement of dams and hydro-electric facilities over the past century has resulted in the loss of critical spawning habitat for Lake Sturgeon. Sturgeon spawn mostly at the base of rapids, the same places that are desirable for placement of barriers by humans. Habitat fragmentation places limits on the ability of sturgeon populations to recover when they have been decimated by years of overharvest. Creation of new spawning grounds, or expansion of existing spawning grounds, holds promise for the recovery of a species when suitable spawning habitat is limited (Thiem et al., 2013). Important Lake Sturgeon habitat is not limited to spawning areas. Habitat for all life stages of lake sturgeon must be taken into consideration when planning artificial habitat enhancement. Important habitat features include spawning areas, nursery areas, overwintering areas, staging areas and the migration corridors connecting them (Lake Sturgeon Recovery Strategy).

Prior to establishing a habitat enhancement program, an assessment and identification of available habitat for different life stages of sturgeon must first be established. This will require efforts in the field to determine the location of all spawning areas; staging areas prior to spawning and nursery areas for young fish. This kind of data can only be collected through a reasonably intensive monitoring program for the young, juveniles and adult sturgeon. The use of geolocators may be useful to determine which areas of the river the different life stages prefer.

The creation of artificial spawning grounds for sturgeon has met with some success (Kerr et. al., 2011). When substrates are poor, or when egg densities are high, creation or enhancement of spawning beds increases reproductive success of lake sturgeon (Daugherty et el., 2008). Although spawning bed enhancement has met with some success, efforts my be better spent maintaining existing habitat (Kerr et all, 2011). Several spawning site creation projects have been undertaken on a number of different rivers. Kerr et al., (2011) provide a good overview of various spawning bed creation and enhancement projects.

When proposing construction of new spawning grounds for lake sturgeon, a range of suitable conditions for spawning under varying seasonal conditions of water discharge must be built into the plan. Kerr et al. (2011) identify some key considerations for the construction of new spawning grounds for lake sturgeon as follows:

- Current velocities ranging from 0.1 - 1.5 m/s
- Substrate composed of coarse cobble and rubble
- Water depths ranging from 0.1 - 5.0 meters
- Substrate thickness of at least 0.3 meters
- Maintenance of sediment-free interstitial spaces
- Distance of staging areas from spawning site should be minimized (e.g., < 3 km)
- Current breaks (e. g. boulders) are important

Artificial spawning habitat at Riviere de Prairies by Hydro Quebec approximately 250 m downstream of a hydroelectric facility were constructed in 1985. Gravel and cobble (20 - 30 cm diameter) was deposited at a water depth of 15 - 3.0 m, in current velocity of 1.0 m/sec. This project met with great success with egg-larval survival increasing five-fold whild larval production almost doubled in about five years. The

results from this project indicated that the best egg-larval survival rates corresponded to a spawning bed area of 13 square meters per female (Kerr et al., 2011).

As indicated above, a habitat enhancement program should consider all life stages of lake sturgeon including eggs, larvae, yearlings, juveniles, sub-adults and adults. There appears to be considerable variation in habitat preference of various life stages of sturgeon from one water body to another.

Once larval lake sturgeon have completed their downstream drift, it is unclear whether or not they prefer a specific habitat type. This is a significant knowledge gap that needs to be filled prior to considering habitat enhancement or mitigation for this young stage (Golder Assoc. 2011).

Young of year (YOY) lake sturgeon have been documented over a variety of substrates, including sand, pea size gravel and organic substrate. The most commonly reported habitat features associated with YOY lake sturgeon are shallow water, less than two meters in depth and low velocities. In contrast, Auer and Baker (2002), found that deep slower moving areas of the Sturgeon River represented important habitat for YOY lake sturgeon.

Prey availability is a potentially important driver for habitat preference for young sturgeon, and for later life stages as well. Young sturgeon are fast - growing and therefore need an abundant food supply to meet their metabolic needs. In the St. Clair River, the smallest individuals showed a preference for habitats with an abundance of amphipods and chironomids that are associated with soft sediments (Golder Assoc. 2011). Juvenile and sub - adult sturgeon in the Mattagami and Groundhog rivers in Northeastern Ontario were most highly associated with clay substrates where macroinvertebrates were most abundant.

During periods of high flow in the Groundhog river, juveniles, sub - adults and adults occupied discrete pods. As water flows slowed in the summer and autumn, the different life stages became more evenly distributed throughout habitat features (Seyler, 1997b). Adult sturgeon in the St. Clair River preferred rock and cobble substrates where molluscs were abundant

The stretch of the Ottawa river below the Temiskaming dam offers a variety of habitat types. The only way to determine the importance of the various habitats to the different life stages of lake sturgeon in this area is through an intensive monitoring program. Targeting of different life stages that are suspected of using specific habitat types along with an analysis of the parameters that define those habitats (i.e. substrate type and size, water depth and flow velocity, macroinvertebrate abundance) will reveal which habitats are most important to each life stage. Once the association of life stage to habitat type has been determined, only then can habitat and mitigation strategies be implemented.

8.4 Recommendations for habitat assessment, restoration and fish passage

- Lake Sturgeon spawning areas below the Temiskaming dam and throughout Lac La Cav need to be located and mapped in greater detail than they are currently. This need is greatest in those areas where lake sturgeon populations are depressed, which includes Lac la Cave.
- a thorough assessment of critical habitat will examine substrate features of the river where feasible as well as determination of flow regime and thermal stability of the river.

- a thorough examination of water quality, focused on contaminants from pulp mill effluent and potential changes due to climate change. Analysis should include an assessment of debris build up that has resulted from historical logging practises on the Ottawa river.
- critical to spawning success of lake sturgeon is a thorough evaluation of water level fluctuations during spawning, incubation and larval drift periods below the dam. This will require collaboration with PSPC and all stakeholders who determine regulation of water levels at the Temiskaming dam.
- the feasibility of designing a fishway that will accommodate lake sturgeon is recommended to determine if there is any suitable habitat for sturgeon above the dam that was accessed historically.
- Work with PSPC to design a fishway that could potentially accommodate lake sturgeon based on the success of fishways at other dams on rivers inhabited by sturgeon.

9.0 Potential for Artificial Propagation and Stocking of Lake Sturgeon in the Ottawa River

Culture and stocking of lake sturgeon can be an essential too in the rehabilitation of sturgeon populations where they have been diminished through commercial fishing and other threats due to human activity (Golder Assoc. Ltd. 2011). Stocking of lake sturgeon can be used as either a short term or long term management strategy, the use of which will depend on the goals of the management program. Each waterbody must be assessed individually when considering stocking program, with realistic and achievable goals in place prior to any fish being released.

Supplemental stocking is the addition of individual fish to an already established, but diminished, or threatened population (Golder Assoc. Ltd, 2011). This is the case for Lac La Cav, or the Ottawa river below the Temiskaming dam. Although the population has been assessed as 'stable' (Haxton, 2008), the overall numbers of sturgeon are miniscule now relative to abundances that have been reported historically for the Ottawa river.

Assessment of the success of a lake sturgeon program must cover at least one generation in the life history of lake sturgeon which is 15 - 20 years. As a result of this time frame, many sturgeon stocking programs lack effective evaluation.

The largest sturgeon stocking programs are currently in Wisconsin and Michigan (Smith and Hobden, 2011). In Manitoba, Saskatchewan and Quebec, stewardship groups in combination with industry have implemented stocking programs for lake sturgeon (Smith 2009). Lake sturgeon have been cultured for stocking programs for Rainy river and Dalles First Nation in Northwestern Ontario by the Mantou rapids fish hatchery (auer and Baker, 2009). Despite the preponderance of lake sturgeon stocking programs in other jurisdictions, stocking of lake sturgeon is currently not endorsed in the Ontario fish stocking guidelines (OMNR, 2002b).

It may be deemed through the lake sturgeon assessment and monitoring program that the portion of the Ottawa river below the Temiskaming dam may benefit from a stocking program. If the population suffers from a problem of low recruitment, then a stocking program may help to overcome the obstacle of low recruitment, if combined with mitigation strategies to increase recruitment success. If the cause

of population decline is due to fishing pressure, changes in habitat, including flow regime, or an abundance of predatory fish, these issues must be addressed before a stocking progam can be considered. Essential habitat and appropriate water quality must also be present if stocked fish are to have any chance of survival to reproductive age.

Prior to undertaking a stocking program, there are a number of factors to consider. First and foremost, a stocking plan must be created that outlines objective goals of the program. Stocking duration, strain/source, age/size, stocking rate, marking, disease/invasive species transfer prevention, stocking methods, assessment and evaluation of project success must all be put in place prior to starting the stocking program (OMNR, 2002b). Stocking rates, appropriate sizes and numbers of fish stocked must be based on modeling of annual survival rates of all life stages of lake sturgeon in a given population. Stocking has yet to be proven 'successful' (Galarowicz, 2003). As a result, appropriate stocking rates have yet to be determined.

When stocking fish of any species, caution must be exercised regarding the genetic consequences of broodstock used to create new young. Ideally, genetic strains that are similar to, or from within the same basin should be used (Galarowicz, 2003). Welsh et al. (2010) provide a good synopsis of genetic guidelines for stocking lake sturgeon.

10. 0 Lake Sturgeon and Hickorynut mussels in the Ottawa River.

The Hickorynut mussel is a long-term brooder. After sperm is released into the water by a male mussel, the gametes are taken up by the female mussel to form 'glochidia', the larval stage of the mussel. Spawning occurs in the fall, however, the glochidia are not released from the female until the following summer (Gov. Canada, Species At Risk https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1150)

The Hickorynut mussel (*Obovaria olivaria* Rafinesque, 1820) was assessed as 'endangered' in 2011 by COSEWIC. Measures to rehabilitate the Hickorynut population will depend on extent of suitable habitat. Suitable habitat includes a silty/sandy to sandy/gravelly substrate, from three to four meters in depth with moderate flows. Threats from invasive species including the zebra mussel and Quagga mussel must be low or non-existent, and the area must be free of chemical contaminants. The other characteristic that will determine the feasibility of recovering Hickorynut populations is the presence in suitable numbers of the host fish species that the mussel relies on for early stages of its life - history.

It is presumed that the Lake Sturgeon is the host fish which the Hickorynut depends on to host its glochidia when they are first released from the female Hickorynut. However, most of the evidence that points to the lake sturgeon as the fish host is largely circumstantial. In the few remaining pockets of high abundance of Hickorynut, such as the Coulonge River and the area near Fitzpatrick Island in the Ottawa River, there are relatively high numbers of Lake Sturgeon found as well. There is a great deal of overlap in habitat between the two species, including the depth and flow at which the mussels are typically found. The Hickorynut typically resides deeper than most unionid mussels (Andre Martel, Pers. Comm).

Glochidia have been found on the gills of Lake Sturgeon, during recent work on the Ottawa River near Lake Coulonge. The glochidia were extracted and have been sent for genetic analysis to confirm if they are Hickorynut. Glochidia can't be identified to species visually. The glochidia that have been found on the gills of Lake Sturgeon were found in juvenile fish. If indeed the Lake Sturgeon is confirmed to be the host fish for the Hickorynut, future work will need to address the most likely life stage (age and size) of the sturgeon that are most important to the life - history of the mussel. Laboratory studies by Brady et. al. (2004) have confirmed Lake Sturgeon as a suitable host for the Hickorynut.

10.0 The Role of First Nations in the Restoration and Stewardship of Lake Sturgeon in the Ottawa River

SART communities have unique inherent rights and responsibilities related to the restoration and stewardship of lake sturgeon in the Ottawa river. Lake sturgeon have been and continue to be of great cultural and spiritual importance to the First Nations people with their long association with the Ottawa river.

This conservation plan is a first step in providing a framework within which SART communities with work with DFO, stakeholders and industry in consultation with with the goal of restoring the Ottawa river and its lake sturgeon closer to pre - industrial levels. The importance of using Aboriginal Traditional Knowledge (ATK) in the development and implementation of SART lake sturgeon co-management strategies is stressed in the Recovery Strategy of Lake Sturgeon in Ontario (Golder Assoc., 2011).

First Nations communities that have been relying on the Ottawa river for sustenance and cultural value, have en-massed large amounts of information related to lake sturgeon distribution, habitat use and status of sub-populations. This information is extremely important to fully understand current distributions and habitat features of lake sturgeon in the Ottawa river (Golder Assoc., 2011). SART communities have an excellent opportunity to build on ATK systems as they move forward with their assessment, management and restoration efforts of lake sturgeon sub-populations within their traditional waterways.

Preliminary assessment of the lake sturgeon population below the Temiskaming dam commenced in the spring of 2022. This assessment program is being carried out by the SART Kitchi Sibi technical team with the goal of determining numbers of lake sturgeon spawning; determination of spawning area; spawning success and movement patterns of these culturally important fish. The lake sturgeon assessment and monitoring program by First Nations is a long - term project, the success of which will be determined optimally over two or more decades of research due to the life - history characteristics of lake sturgeon.

11.0 Literature cited

Auer, N.A. 1996. Importance of habitat and migration to sturgeons with emphasis on lake sturgeon. Canadian Journal of Fisheries and Aquatic Sciences 53 (Supplement 1):152-160.

Auer, N.A. and E.A. Baker. 2002. Duration and drift of larval lake sturgeon in the Sturgeon River, Michigan. Journal of Applied Ichthyology 18:557-564.

Barth, C. C., S. J. Peake, P. J. Allen, and W. G. Anderson. 2009. Habitat utilization of juvenile lake sturgeon (Acipenser fulvescens) in a large Canadian river. Journal of Applied Ichthyology 25:18-26.

Beamish, F. W. H., D. L. G. Noakes, and A. Rossiter. 1998. Feeding ecology of juvenile lake sturgeon (Acipenser fulvescens) in northern Ontario. Canadian Field-Naturalist 112:459-468.

Benson, A. C., T. M. Sutton, R. F. Elliott and T. G. Meronek. 2005. Seasonal movement patterns and habitat preferences of age-0 lake sturgeon in the Lower Peshtigo River, Wisconsin. Transactions of the American Fisheries Society 134:1400-1409.

Biophilia, 2019. REPLACEMENT OF THE QUEBEC DAM PART OF THE TIMISKAMING DAM COMPLEX; Environmental Impact Study ; Description of the Biological Environment. Report prepared for Tetra Tech Environmental Consultants.

Brady, T., Hove, M., Nelson, C., Gordon, R., Hornbach, D. & Kapucinski, A. 2004. Suitable host fish species determined for hickorynut and pink heelsplitter. Ellipsaria 6: 14-15

Bruch, R.M. and F.P. Binkowski. 2002. Spawning behaviour of lake sturgeon (Acipenser fulvescens). Journal of Applied Ichthyology 18:570-579.

Caroffino, D. C., T. M. Sutton and D. J. Daugherty. 2009. Assessment of the vertical distribution of larval lake sturgeon drift in the Peshtigo River, Wisconsin, USA. J. App. Ichthyol. 25 (Suppl. 2):14-17.

Caroffino, D.C., T.M. Sutton, R.F. Elliott and M.C Donofrio. 2010. Predation on early life stages of Lake Sturgeon in the Peshtigo River, Wisconsin. Transactions of the American Fisheries Society 139:1846-1856.

Chiasson, W. B., D. L. G. Noakes and F. W. H. Beamish. 1997. Habitat, benthic prey and distribution of juvenile lake sturgeon (Acipenser fulvescens) in northern Ontario rivers. Canadian Journal of Fisheries and Aquatic Sciences 54:2866-2871.

Clermont, N., C. Chapdelaine and J. Cinq-Mars. 2003. Île aux Alluemettes L'Archaique supérieur dans l'Outaouais. Collection Paléo-Quebec.

Daugherty, D. J., T. M. Sutton and R. F. Elliott. 2008. Suitability modeling of lake sturgeon habitat in five northern Lake Michigan tributaries; implications for population rehabilitation. Restoration Ecology 17:245-257.

D'Amours, J., S. Thibodeau and R. Fortin. 2000. Comparison of lake sturgeon (*Acipenser fulvescens*), *Stizostedian* spp., *Catastomus* spp., *Moxostoma* spp., quilback (*Carpiodes cyprinus*), and mooneye (*Hiodon tergisus*) larval drift in Des Praires River, Quebec. Can. J. Zool. 79:1472-1489.

Di Gangi, P. D. G. (2015, December). *history of the ottawa watershed*. ottawa; Octopus Books. https://equitableeducation.ca/2015/podcast-history-ottawa-river-watershed

Dymond, J.R. 1939. The fishes of the Ottawa Region. Contribution to the Royal Ontario Museum of Zoology No. 15.

Egan, Kelly. Ottawa Citizen, August 29, 2020.

Tracy Galarowicz, 2003. Conservation Assessment for Lake Sturgeon (Acipenser fulvescens). USDA Forest Service, Eastern Region

Golder Associates Ltd. 2010a. Groundhog River Lake Sturgeon Monitoring 2010. Submitted to Xstrata Nickel. 23 pp.

Golder Associates Ltd. 2011. Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.

Guénette, S., E. Rassart, and R. Fortin. 1992. Morphological differentiation of lake sturgeon (Acipenser fulvescens) from the St. Lawrence River and Lac des Deux Montagnes (Quebec, Canada). Canadian Journal of Fisheries and Aquatic Sciences 49: 1959–1965.

Guénette, S., R. Fortin, and E. Rassart. 1993. Mitochondrial DNA variation in lake sturgeon (Acipenser fulvescens) from the St. Lawrence River and James Bay drainage basins in Quebec, Canada. Canadian Journal of Fisheries and Aquatic Sciences 50: 659–664.

Global Centre for Pluralism, & About Archipel Research & Consulting. (n.d.). (rep.). *WHERE SUSSEX DRIVE MEETS THE KICHI SIBI:History and Pluralism at 330 Sussex* (pp. 1–62). 330 Sussex Drive Ottawa, Ontario: Global Centre for Pluralism.

Haxton, T. J. and C. S. Findlay. 2008. Variation in lake sturgeon (Acipenser fulvescens) abundance and growth among river reaches in a large regulated river. Canadian Journal of Fisheries and Aquatic Sciences 65:645-657.

Haxton, Tim. 2002. An assessment of lake sturgeon (Acipenser fulvescens) in various reaches of the Ottawa River. J. Appl. Ichthyol. 18: 449-454

Haxton, 2007. Impacts of waterpower management of select fish in the Ottawa River, Canada, with an emphasis on lake sturgeon. Ph.D. Thesis, University of Ottawa, Ottawa, ON.

Haxton, Tim. 2008. A synoptic review of the history and our knowledge of lake sturgeon in the Ottawa River. Southern Science and Information Technical Report SSI #126, 31p.

Haxton, Tim. 2011. Depth selectivity and spatial distribution of juvenile lake sturgeon in a large, fragment river. J. Appl. Ichthol. 27 (Suppl. 2):45-52.

Haxton, Tim, G. Whelan and R. Bruch. 2014. Historical biomass and sustainable harvest of Great Lakes lake sturgeon (Acipenser fulvescens Rafinesque, 1817). J. Appl. Ichthyol. (3):1371-1378.

Hrenchuk, C. L., C. A. McDougall, P. A. Nelson and C. C. Barth. 2017. Movement and habitat use of juvenile Lake Sturgeon (*Acipenser fulvescens* , Rafinesque, 1817) in a large hydroelectric reservoir (Nelson River, Canada). J. Appl.. Icthyol., 33:665-680.

Holtgren, J. M. and N. A. Auer. 2004. Movement and habitat of juvenile lake sturgeon (Acipenser fulvescens) in the Sturgeon River/Portage Lake system, Michigan. Journal of Freshwater Ecology 19:419-432.

Holzkamm, T. E. (1987). Sturgeon utilization by the Rainy River Ojibwa bands. *Algonquian Papers-Archive*, *18*.

Holzkamm, T. E., Lytwyn, V. P., & Waisberg, L. G. (1988). Rainy River sturgeon: an Ojibway resource in the fur trade economy. *Canadian Geographer/Le Géographe Canadien*, *32*(3), 194-205.

Kempinger, J.J. 1996. Habitat, growth, and food for young Lake Sturgeon in the Lake Winnebago system, Wisconsin. North American Journal of Fisheries Management. 16: 102–114.

Kerr, S. J., M. J. Davison and E. Funnel. 2010. A Review of Lake Sturgeon Habitat Requirements and Strategies to Protect and Enhance Sturgeon Habitat. Fisheries Policy Section, Biodiversity Branch. Ontario Ministry of Natural REsources. Peterborough, ONtario. 58p. + appendices.

Kynard, B., D. Push, and T. Parker. 2003. Development of fish passage for lake sturgeon. Final Report to the Great Lakes Fishery Trust. Leetown Science Center. Turners Falls, Massachusetts. 44p.

Mandrak, N. E. and E. J. Crossman. 1992. Postglacial dispersal of freshwater fishes into Ontario. Canadian Journal of Zoology. 70: 2247–2259.

McCabe, G. T. and I. G. Beckman. 1990. Use of an artificial substrate to collect white sturgeon eggs. Calif. Fish Game. 76:248-250

McDougall , C. A. , Blanchfield , P. J. , Peake , S. J. , & Anderson , W. G.(2013). Movement patterns and size- class influence entrainment susceptibility of Lake Sturgeon in a small hydroelectric reservoir . Transactions of the American Fisheries Society , 142 , 1508 – 1521 .

Morrison, J. 2005. Algonquin history in the Ottawa River watershed. Cultural Heritage pp.17-32. http://www.thealgonquinway.ca/pdf/algonquin-history.pdf. Last accessed June 07, 2013.

Nilo, P., S. Tremblay, A. Bolon, J. Dodson, P. Dumont and R. Fortin. 2006. Feeding ecology of juvenile Lake Sturgeon in the St. Lawrence River system. Transactions of the American Fisheries Society 135:1044–1055.

Ontario Ministry of Natural Resources. 2002b. Guidelines for Stocking Fish in Inland Waters of Ontario. Fisheries Section, Fish and Wildlife Branch. Peterborough, Ontario. 43 pp.

OMNRF and MFFPQ. (2018) Fisheries Management Plan for the Ottawa River

Pandit, L., S. N. Pandit and E.C. Enders. 2016. Fish Passage for Lake Sturgeon: A literature review. Conference: Proceedings of the 11th International Symposium on Ecohydraulics At: Melbourne, Australia, The University of Melbourne, ISBN: 978 0 7340 5339 8.

Prosser, N. S. 1986. An overview of reservoir fisheries problems and opportunities resulting from hydropower. p. 238-246 In G. E. Hall and M. J. Van Den Avyle [eds.]. Reservoir Fisheries: Management Strategies for the 80s. American Fisheries Society. Bethesda, Maryland. 327 p. 44.

PSPC, 2022. Government of Canada, Public Services and Procurement, Timiskaming Dam Complex, Website: https://www.tpsgc-pwgsc.gc.ca/biens-property/pdb-bdd/timiskaming-eng.html#s1

Randall, M. T. and K. J. Sulak. 2007. Relationship between recruitment of gulf sturgeon and water flow in the Suwannee River, Florida. American Fisheries Society Symposium 56:69-83.

Roseman, E. F., J. Boase, G. Kennedy, J. Craig and K. Soper. 2011. Adaption of egg and larvae sampling techniques for lake sturgeon and broadcast spawning fishes in a deep river. J. Appl. Ichthyol. 27(2):89-92

Sandilands, A. P. 1987. Biology of the Lake Sturgeon (*Acipenser fulvescens*) in the Kenogami River, Ontario. p. 33–46 In C. H. Olver [ed.]. Proceedings of a Workshop on the Lake Sturgeon. Fisheries Technical Report Series No. 23. Ontario Ministry of Natural Resources. Toronto, Ontario.

Schilt, C. R. 2007. Developing fish passage and protection at hydropower dams. Applied Animal Behaviour Science. 104:295-325.

Scribner, K. and E. Baker. 2008. Assessment of simulated lake sturgeon supplementation in Michigan drainages of the Great Lakes. Department of Fish and Wildlife. Michigan State University. East Lansing, Michigan.

Seyler, J.C. 1997. Biology of Selected Riverine Fish Species in the Moose River Basin. OMNR Northeast Science and technology. Timmins, Ontario. IR-024. 100 pp.

Schilt, C. R. 2007. Developing fish passage and protection at hydropower dams. Applied Animal Behavior Science 104:295-325.

Smith, K. M. 2003. Spawning stock abundance and larval production of lake sturgeon (Acipenser fulvescens) in Black Lake, Michigan. M.Sc. Thesis. Central Michigan University. Mount Pleasant, Michigan.

Smith, A. L. 2009. Lake sturgeon (Acipenser fulvescens) stocking in North America. Fish and Wildlife Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. 17pp + appendices.

Smith, K. M. and E. A. Baker. 2005. Characteristics of spawning lake sturgeon in the Upper Black river, Michigan. N. Am. J. Fish Manage.

Smith, K. M. and D. K. King. 2005. Dynamics and extent of larval lake sturgeon Acipenser fulvescens drift in the Upper Black River, Michigan. J. Appl. Ichthyol. 12:161-168

Smith, A.L. and D. Hobden. 2011. A synopsis of lake sturgeon (Acipenser fulvescens) culture, marking and stocking techniques. Biodiversity Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. 36 pp.

Swanson, G. M., K. R. Kansas, and S. M. Matkowski. 1990. A report on the fisheries resources of the lower Nelson River and the impacts of hydroelectric development. Fisheries Branch Report 90-18. Manitoba Department of Natural Resources. Winnipeg, Manitoba. 260 p.

Tetratech, 2022. Temiskaming Dam - Bridge of Quebec Replacement Project (Quebec). Environmental Impact Statement, Chapters 3 - 7, Preliminary Report. Public Services and Procurement Canada.

Tetratech, 2023. Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec), Environmental Impact Statement. Prepared for Public Service and Procurement Canada

Thiem, J. D., D. Hatin, P. Dumont G. Van Der Kraak and S. J. Cooke. 2013. Biology of lake sturgeon (Acipenser fulvescens) spawning below a dam on the Richeliew River, Quebec: behaviour, egg deposition, and endocrinology. Can. J. Zool. 91:175-186

Veshchev, P. V, A. Slivka, A. Novikova and K. Shekhodanov. 1994. Guidelines for counting sturgeon eggs and migrating larvae in rivers. J. Hydrobiol. 30:5-13

Votinov, N. P. and V. P. Kasyanov. 1978. The ecology and reproductive efficiency of the Siberian sturgeon (Acipenser baeri) in the Ob as affected by hydraulic engineering works. Journal of Applied Ichthyology 18:20-28.

Wang, Y.L., F.P. Binkowski and S.I. Doroshov. 1985. Effects of temperature on early development of white and lake sturgeon (Acipenser transmontanus and fulvescens). Environmental Biology of Fishes 14:43-50.

Warren, J. J. and L. G. Beckman. 1993. Fishway use by white sturgeon on the Columbia River Series Report WSG-AS93_02. Washington Sea Grant Program. Marine Advisory Service. Seattle, Washington.

Welsh, A.B., Elliott, R.F., Scribner, K.T., Quinlan, H.R., Baker, E.A., Eggold, B.T., Holtgren, J.M., Krueger, C.C., May, B. 2010. Genetic guidelines for the stocking of lake sturgeon (Acipenser fulvescens) in the Great Lakes basin. Great Lakes Fish. Comm. Misc. Publ. 2010-01.

APPENDIX B – SART LAKE STURGEON STUDIES

B-2: SART Neme Lake Sturgeon and Hickorynut Mussel Population Assessment and Monitoring Protocol

SART Neme Lake Sturgeon and Hickorynut Mussel Population Assessment and Monitoring Protocol

The following protocol will be used as a long - term assessment tool to determine the health of the Neme Lake Sturgeon population in the Ottawa River below the Temiscaming Dam to the Otto - Holden Dam, a stretch of river measuring approximately 55 km known as Lac La Cave (measured from Google maps). The objective of the SART monitoring program is to assess the health of the sturgeon population and to monitor its recovery as efforts are made to mitigate factors that are detrimental to the health and reproductive success of the fish. This objective will be met by examining trends in population numbers and spawning success over time. As sturgeon are a long - lived species (up to 100 years or longer), and slow to mature, evidence in changes in the health of the population can take years and even decades to be revealed.

Assessing Population Numbers

Current technology does not allow for a direct count of all fish in a given body of water so we have to rely on methods that give a population estimate at best, based on sampling a portion of the population that is accessible. More important than determining absolute numbers of fish, is to determine trends in numbers of fish caught per unit of sampling effort over time.

<u>Gill Netting</u>

Gill netting will be the primary method used to capture fish. The most productive time to capture sturgeon for sampling will be when they congregate to spawn. The literature indicates that Lake Sturgeon don't have a preference for spawning during the day or night, however, some workers have had more success gill netting sturgeon at night (Lyons and Kempinger, 1992; Baker and Borgeson, 1999; Chiasson, 1999).

Best success at catching sturgeon during the spawn is to use large mesh gill nets with a mesh size ranging from 204 mm - 306 mm (8" - 12", extra large mesh). Netting should begin when water temperature on known spawning grounds is between 12°C and 15 °C to catch the timing of the beginning of the spawn. Peak spawning typically occurs in the Ottawa River when water temperature is 17 °C (Haxton, 2008). Nets should be set perpendicular to flow, or if flow is such that the net can't remain perpendicular, the net should be set at an angle to the flow. The optimal flow rate for spawning Lake Sturgeon is in the range of 0.2 - 1.0 m/s. Nets should be set approximately 100 m below the spawning grounds to capture the fish as they move in or out of the spawning area. Setting directly on the spawning grounds is not recommended for optimal success at catching sturgeon. Nets will be set for a maximum of one hour to prevent mortality to fish, and to keep disruption of spawning activity to a minimum. Set nets in the middle of the river below the spawning area, in the 'thalweg', the area of main flow of in an

eddy. The spawn may last as long as two weeks, and may happen in more than one event, depending on temperature fluctuations. It is recommended that netting take place for a period of a minimum of two weeks once the conditions for spawning are met, and continue until the spawn is over, or the water temperature reaches 20°C.

Netting for juvenile sturgeon can be done any time during the open water season. Sturgeon from 4 - 10 years of age are considered juveniles, with a maximum size of approximately one meter (100 cm) in length. Lake Sturgeon in the Ottawa river don't mature until approximately 115 cm. Location of net sets for juvenile sturgeon can be based on a randomized sampling distribution for the area below the Temiskaming dam. Sampling throughout the entire reach will give some idea of where the juvenile sturgeon are found. To capture juvenile sturgeon, a mesh size of 1.5 inches - 5 inches is required. Nets used for the Broad Scale Monitoring Program are of this mesh size. Keep in mind that success at catching juveniles in Lac La Cave has met with little success in the past (Haxton, Pers. Comm.)

Each time a net is set, record the following data:

Names of all workers, date, location (GPS coordinates), time, duration of set, water temperature (just below surface), depth and flow rate.

When extricating sturgeon from the gill net, it must be done as gently as possible, keeping the fish in the water as long as possible to prevent suffocation from lack of oxygen. Processing of the fish must be done as efficiently and quickly as possible as well, keeping the fish out of the water for as little time as possible.

Handling the Fish

Fish must be handled gently taking care to keep stress levels to the fish as low as possible. Fish must never be picked up by the gills, eyes, mouth or caudal peduncle (tail). When holding or carrying fish, they must be supported from the underside with two hands, one hand just behind the head and the other between the pelvic fins and anal fin close to the posterior end of the fish (see figure 1). Keep fish out of the water only long enough to collect required samples and information from the fish. Photos of fish can be a valuable document. Photos should be taken to indicate that the fish is close to the water and in a position to be released. Photos depicted as such will show that the fish was treated in a caring and respectful manner.



Figure 1. Proper handling technique for Lake Sturgeon. Note support from underneath, fish is close to the water for quick release. (photo credit 'My Wild Alberta')



Figure 2. Proper release technique for Lake Sturgeon. Note support from underneath, fish is close to the water and held by tail in water for release. (photo credits Rosanne Van Schie and Perry Mongrain)

Sampling Sturgeon

Processing fish caught by netting will include the following procedures:
Fork length and weight measures; observation and recording of any abnormalities; examination for the presence of tags (PIT tag reader); tissue sampling for aging and genetic analysis; sexing if possible and injection with a PIT tag.

Measurements

Fork length and total length of all fish caught will be measured to the nearest centimeter. Fork length is the distance from the tip of the snout to the 'fork' in the tail where the upper and lower portions of the tail fin meet (fig. 2), whereas, total length is the length of the fish from the tip of the snout to the end of the upper lobe of the heterocercal tail.

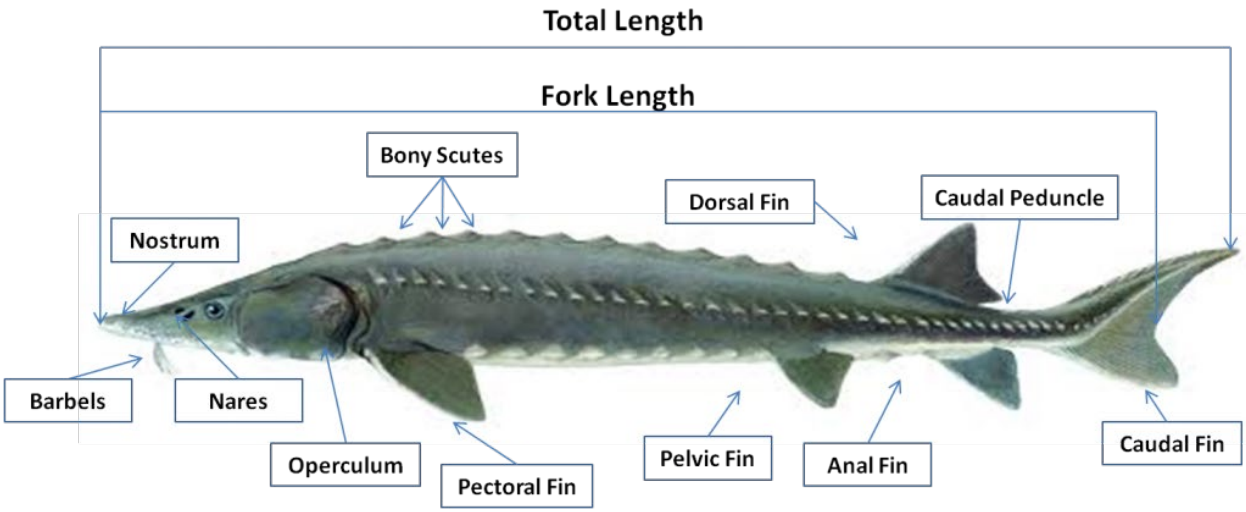


Figure 3. External anatomy of Lake Sturgeon and measurement of fork length.

Weight of the fish will be recorded to the nearest +/- 10 gram. For measuring weight of large fish, a fish cradle should be used to ensure the fish is supported horizontally so as not to put undue stress on the internal organs of the fish.

Tissue Samples

Tissue samples will be collected for the determination of age, sex and genetic analysis. For aging the fish, a small sample of the *leading* (marginal) ray of the *right* pectoral fin can be removed using cutting pliers (see Rossiter et. al., 1995) (Fig. 3). For fish larger than 50 cm total length, a cut is made at the proximal end of the ray, approximately 1cm from the base of the fin. For smaller fish, the cut can be made closer, however, closer than 0.5 cm may result in severe bleeding. A 2 cm length of the ray will be removed using a scalpel starting from the posterior end. For larger fish, a hacksaw blade of 24/1 tooth pattern may be used to cut through the fin ray. Once the section of fin ray is removed, the piece of tissue is stored in either a paper envelope or plastic bag and allowed to air dry. A solution of Betadine antiseptic solution and petroleum jelly is applied to the site of fin removal to help prevent infection to the fish (Baremore and Rosati, 2014). Aging by fin ray analysis is only accurate to within 10 or 15 years in large

mature sturgeon. Fin ray samples from juvenile fish do provide better accuracy. The utility of the information gleaned from removing a piece of the fin ray must be weighed against the harm done to the fish.

A less invasive method of tissue sampling is to remove a piece of the fleshy lobe from the distal area (outer edge) of the pectoral fin, approximately 1 cm x 1 cm in size. This tissue can be removed using a sharp scalpel and preserved in 70% ethanol. Although not suitable for aging, the tissue can be used for genetic analysis and sex determination.

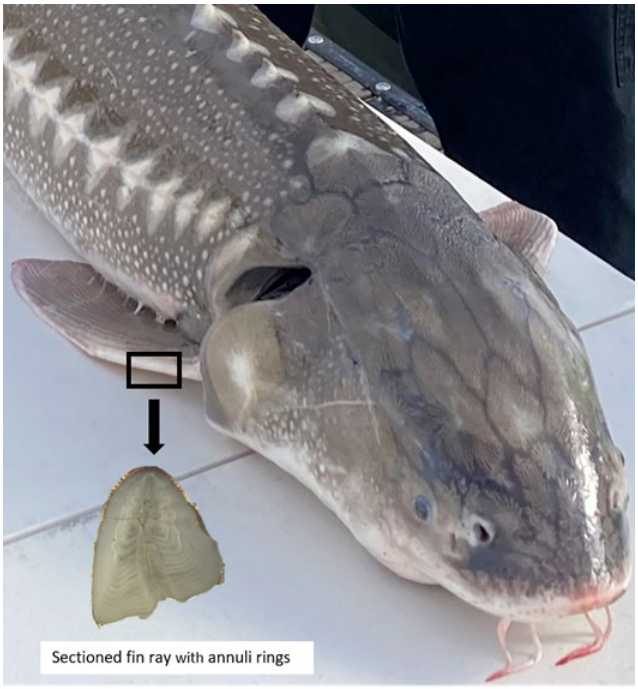


Figure 4. The section of the leading ray of the pectoral fin to be removed from Lake Sturgeon for aging analysis.



Figure 5. Example of removal of a piece of pectoral fin ray from Lake Sturgeon (from Haxton, Field Sampling Manual).

PIT – tagging

PIT tagging (PIT = passive integrated transducer) is a method of marking fish so they can be identified when captured again in the future. Each PIT tag has a unique identification number associated with it that is determined by scanning the tag with the PIT tag reader. The same technology is commonly used for domestic pets. Tagging fish is one method of determining population size. Once a sample of fish have been tagged, by comparing the ratio of fish tagged to non-tagged fish during subsequent sampling sessions, a rough estimate of the numbers of fish in that population can be determined, assuming that certain conditions have been met. Tagging can also be used to determine movement patterns of fish if sampling is conducted in different areas of a waterbody.

A PIT tag will be injected into each Lake Sturgeon caught, after all measurements have been taken from the fish. The PIT tag is to be injected beneath the third dorsal scute (figure 5), injecting in the anterior to posterior direction (back to front). Prior to releasing the fish, ensure the tag reader can read the PIT tag. Make sure to record the PIT tag number.



Figure 6. Injection location of the PIT tag, behind the third dorsal scute (photo credit, Haxton, Field Manual).

Visual Spawning Surveys

In some areas of the Ottawa river, i.e. Chenaux Generating Station, Lake Sturgeon can be observed during spawning from the tail race deck in mid-June when temperatures are between 16° and 18°C. Visual observations have been conducted at this location for years (Haxton, 2008).
There does not seem to be any indication that sturgeon can be seen from shore spawning in the area below the Timiskaming dam. It would be a valuable exercise to look for spawning sturgeon in this area when the sturgeon are likely to be spawning (early to mid - June) to determine if this may be an effective method of determining numbers of fish spawning.

Visual spawning surveys should be conducted on 'known' spawning grounds, as identified by previous workers. This includes two or three areas directly below the Quebec side of the dam; the mouth of Ruisseau Gordon; an area on the east bank approximately 90 meters downstream of the dam and an area along the bank of Ile du Sault (Long Sault Island) 70 meters downstream of the dam. Sturgeon don't seem to have a preference for spawning at a specific time of day, although some reports indicate that they are more likely to spawn at night. This may be more related to temperature changes rather than the time of day. Visual surveys from shore should be conducted at night as well as during the day to determine if there is a difference in numbers of sturgeon spawning at this time.

Underwater camera surveys have been used in the past to determine spawning activity in Lake Sturgeon, however with limited success. Haxton, 2008 reports that underwater surveillance in the Ottawa River was able to record the presence of sturgeon but did not capture spawning activity. Camera surveys by Hatch consultants in 2015 between June 23 and June 25, at water temperatures between 14.6° and 15.5°C did not result in the detection of Lake Sturgeon below the Timiskaming Dam. Hatch did detect fish species other than sturgeon.

The use of underwater cameras to detect spawning Lake Sturgeon below the Timiskaming Dam is a tool that likely warrants further investigation. Efforts made by others were limited in scope (three days only). If the cameras are deployed on a daily basis, starting in early June when temperatures are at 10°C, they may be successful in detecting fish that have moved in to the area to spawn. Camera surveys would continue until temperatures reach 20°C, the upper temperature limit for Lake Sturgeon spawning. The use of cameras may be a valuable tool in determining when Lake Sturgeon start to spawn in this area.

Underwater camera work will be conducted from a boat with the camera affixed to a pole up to 5 meters in length. Moving slowly over presumed spawning beds, one person will operate the boat while another person will be dedicated to watching the handheld screen to look for fish. Visibility is estimated to be approximately 1 meter in this area of the river so it is imperative

that the area is covered very slowly. Record the timing and duration of underwater camera viewing and all fish species detected.

Detection of Hickorynut Glochidia on Gills of Lake Sturgeon

Little information currently exists regarding the presumed relationship between Lake Sturgeon and the endangered Hickorynut mussel in the Ottawa river. Circumstantial evidence indicates that the Hickorynut relies on Lake Sturgeon for an important early life stage. It is presumed that the Hickorynut glochidia attach to the gills of sturgeon during the first few weeks of life before dropping off the gills and into the river substrate.

When Lake Sturgeon are caught, the gills of the fish will be examined for the presence of glochidia. The glochidia will show up as a white 'blob' of approximately 250 - 260 microns (0.25 mm) attached directly to the gills. Examining the gills will require two people minimum. One person will hold the gill operculum open while the other will examine the gills using a high - power hand lens (4x - 10x power), using a strong light (i.e. headlight) to enhance the view of the gills. Record any glochidia detected and document with a photograph. Record the fish tag number as well.

To determine the species of the glochidia, genetic analysis is required. This means removing the glochidia from the gill tissue, in essence, sacrificing the fish to do so. Special permits will be required to sacrifice Lake Sturgeon for this purpose as Lake Sturgeon are a species at risk. Once the glochidia has been excised from the gills of the fish, place the tissue in 70% ethanol. Label the vial with Date, Location and PIT tag number of the fish.

Hickorynut Mussel Assessment

Currently there are few records documenting the presence of the Hickorynut mussel, (*Obivaria olivaria*) in the area of the Ottawa river below the Timiskaming dam to the Otto - Holden generating station upstream of Mattawa, Ontario. This may be more a result of low sampling effort for the mussel in this area (Andre Martel, Pers. Comm) as opposed to a lack of mussels. Circumstantial as well as lab evidence point to the Lake Sturgeon as the host for the Hickorynut during its glochidial life stage. To date, the highest occurring density of Hickorynut is found in Lac Coulonge and the Coulonge river that drains into the Ottawa River in this area. The Lake Sturgeon are also abundant in this reach of the Ottawa River, further indication of the importance of the relationship between Lake Sturgeon and the Hickorynut. Few, if any confirmed records of the Hickorynut in Lac La Cave, below the Timiscaming dam, may be to some degree a result of low sturgeon populations in this area in the last century.



Figure 7. Hickorynut mussel, *Obivaria olivaria*.

Hickorynut mussels are found in silty/sandy to sandy/gravel susbstrates, typically in three to four metres depth in flowing water. Detection of Hickorynut mussels must be done with SCUBA gear due to the depth where they are typically found.

A sampling program for detecting Hickorynut mussel will involve the following:

1. Prior to sampling for Hickorynut mussels, ensure that all required permits have been obtained. Hickorynut is a species at risk.
2. Determination of locations of suitable habitat where Hickorynut may be found.
3. Ensuring each location is safe to conduct searches for mussels by SCUBA
4. Develop a schedule for each location to perform searches by SCUBA
5. Using a 1 m x 1 m grid placed on the river bottom in suitable habitat, collect all mussels within that grid.
6. Use a minimum of 10 grids at each location, and more if possible; more sampling increases the chances of finding Hickorynut.
7. Collect all mussels in each grid, placing them in a mesh bag labeled with the grid number.
8. Identify all clams (mussels) found in each grid and the number of each species observed.
9. Once all mussels have been identified and counted, replace mussels back into the same area from which they were collected.
10. Record date, location, depth, water temperature, turbidity, substrate type, flow velocity and visibility for each grid sample.

<u>Determining Spawning Success of Lake Sturgeon</u>

Larval Drift nets

After Lake Sturgeon eggs have hatched, the larvae sequester themselves amidst the knooks and crannies between the rocks in the river bottom. After approximately 13- 19 days post hatching,

the larvae emerge from the river bottom and enter a pelagic life stage where they drift with the current (Petersen et. al, 2007). At this stage, the larvae are 17 - 18 mm in length. They emerge from the substrate at night often drifting downstream for several kilometres before once again settling on the river bottom. The timing of the larval drift appears to be variable however a minimum water temperature of 16°C seems to trigger this behaviour (Smith and King, 2005). Best catches of larvae in the Upper Black River in Michigan were greatest after peak water flows, and in the middle of the river channel.
Assessment of larval numbers can be a valuable method of determining spawning success and recruitment of young sturgeon to the population. Mortality during the egg stage can be high, due to predation by other fish species and crayfish, as well as poor water quality and siltation. The number of larvae that make it to the drift stage, if monitored over time, may be useful in determining
changing trends in spawning success from one season to the next.

There does not appear to be any strong correlation to depth and larval drift numbers when reviewing the literature. Auer and Baker (2002) had the best catches in 1.3 - 1.8 metres of water. In the Detroit River, Roseman et. al. (2011) had success catching larval in drift nets from 8 to 10 m depth. In the St. Clair - Detroit River system, 57% of larval drift net sets caught larvae in nets set between 9 and 17 m deep (Hunter et. al. 2020). Best catches of larvae occur at night, between 23:00 hr and 24:00 hr., over a substrate of sand and gravel at a flow of 0.2 - 0.7 m/s (Auer and Baker, 2002). Larval drift sampling in a new environment may take require trying various depths and locations to optimize larval catch. Drift nets can be purchased from scientific supply companies such as Wildco (fig. 7).
https://shop.sciencefirst.com/wildco/drift-nets/7769-drift-net.html
Larval Lake Sturgeon caught in drift nets can be released alive and unharmed.

Protocol for Drift Net Sampling for Lake Sturgeon Larvae.

1. Locate potential areas to deploy larval drift nets. Ideally, this will be in areas downstream of the spawning area, shallow enough to access by wading, over a substrate of sand and gravel, with a moderate flow (0.3 - 1.0 m/s). If shallow areas are not available, the nets can be deployed in deeper areas, however, an anchor and buoy lines will be required to set the nets. The closer to the spawning ground, the higher the density of the larvae as their distribution will become dilute as they flow downstream of the spawning grounds.
2. Using a D-frame net, with a mesh of 800 - 1,600 micron, deploy the net after 20:00 hours. In shallow areas that can be accessed by wading, the net can be staked into the substrate using re-bar or t-posts. In deep water, a trap-net anchor is attached with a long buoy line (15 - 30 m) to the D - frame drift net. A buoy is attached to the anchor for retrieval, and another buoy is attached to the D - frame net. To deploy the net, drop the

trap net anchor at a location such that when you lay out the line attached to the net, the net will be in the location you desire to sample. Drop the D - frame net down with the second attached buoy and buoy line.

3. When setting in deeper water (which will be the case in the area of interest below the Temiskaming dam), rows of three nets to a column can be set so there is both horizontal and vertical coverage of the water column. Each column should be set with one net close to the bottom, one at mid - depth and the top net within one meter of the surface (fig. 8).
4. Nets should be checked each hour if possible to provide the best chance for the captured larvae to survive. For shallow sets, there is no need to pull up the entire drift net. There is a removeable 'cod end' (small bucket) that can be pulled up and removed and the contents washed into a white enamel pan to look for larvae. This is a fast process (less than 5 minutes), allowing for the reattachment of the cod end and re-deployment of the net. For deeper nets, it will be necessary to pull up the entire net to check the cod end for larvae.
5. Once larvae are counted and measured to the nearest mm, they can be released back into the waterbody if they are still living. Deceased larvae can be placed into a well - labeled vial with 70% ethanol.
6. Note the date, time of set, duration of set and location of set for each net.
7. Nets can be deployed for as many hours as the workers wish to conduct the drift study, however, studies done at night typically end well before sunrise.
8. Calculate CPUE (catch per unit effort) for each net set. CUPE = No. larvae caught/duration of net set.



Figure 8. Larval drift net set to catch Lake Sturgeon larvae in shallow water. (photo credit, Wildco)

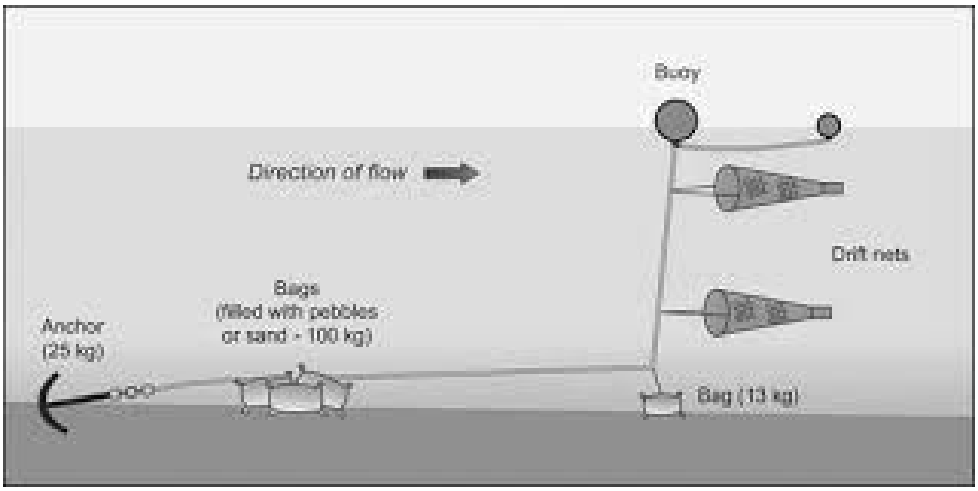
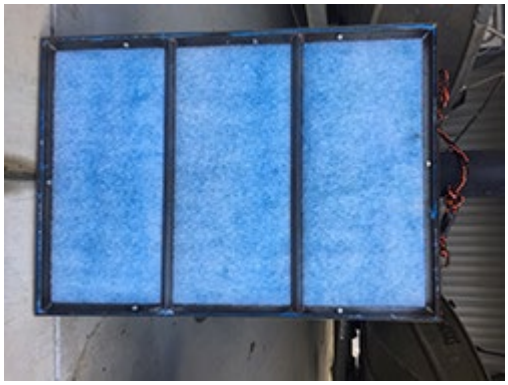


Figure 9. example of vertical column of larval drift nets (Verdon et. al. 2021).

Egg Mats

Another method that can be used as a measure of Lake Sturgeon spawning success is through the use of egg mats. The egg mat is a tool used to collect eggs as the fish spawn, and can give an indication of 'strength' of the spawn. Egg mats can be a variety of materials but a simple method is simply a furnace filter wrapped onto a concrete block and dropped directly onto the spawning grounds. Another method, used by Roseman et. al. (2011) is to use a furnace filter connected to a steel frame using document spring clamps (Fig. 9A). For the mats to effectively collect eggs, the fish must spawn directly over the mats so that they eggs adhere to the mat as they are deposited by the female (Fig. 9B). Natural mortality is high in the egg stage, up to 99%, so the collection of a few eggs will have little detrimental effect on the population.

A. 

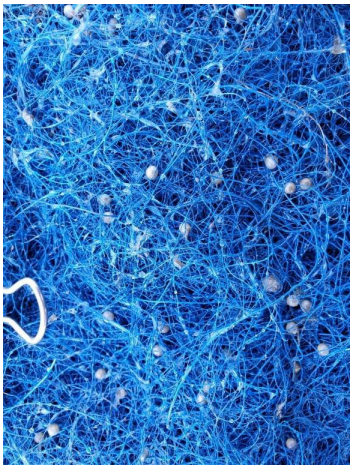
B. 

Figure 10. Example of an egg matt made from a furnace filter prior to deployment (A) (photo credit, Mark Beccio, California Dep't. of Fish and Wildlife), and an egg mat with Lake Sturgeon eggs attached (B).

An effective method of egg collection used by Roseman et. al. (2011) is to set the egg mats out in gangs of three to five mats linked together by 3 meters of 0.95 cm braided nylon rope (fig. 10). The upstream end is anchored using a a small (3.6 kg) trap-net anchor, and at the downstream end using a 4.5 kg navy anchor. A visible buoy is connected to the downstream anchor. Both anchors are separated from the egg mats by 3 meters of braided line. Egg mats should be set out in anticipation of the spawn or when the temperature reaches 15°C, or even earlier.

Lake Sturgeon eggs can be distinguished from other fish species by their large size, relative to eggs of other fish species. Sturgeon eggs will be approximately 250 microns or 2.5 mm (Fig. 9B). Keep in mind that once the egg mats have been deployed, the floating buoys may be a source of curiosity and possibly even frustration to local anglers who may be interested in knowing what is at the other end of the buoys. The egg mats and ropes may not only be effective at capturing eggs, but can be quite good at collecting fishermen's tackle as well.

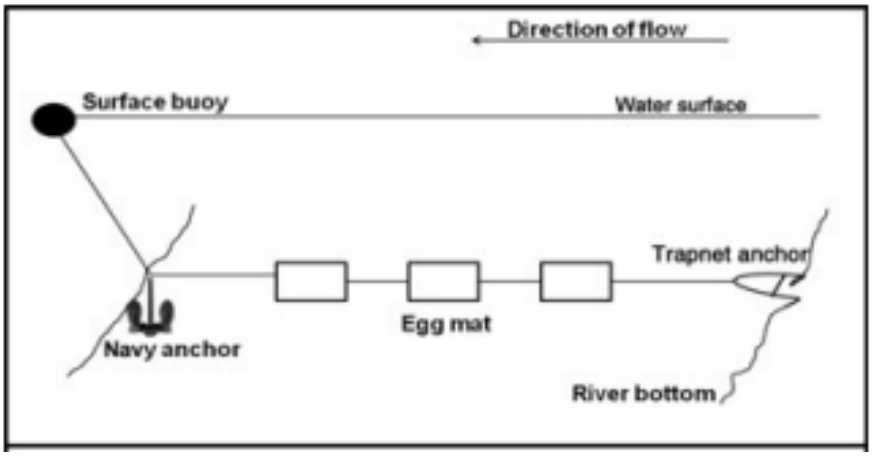


Figure 10. Method of egg mat deployment in a river setting (from Roseman et. al., 2011).

Protocol for Use of Egg Mats

1. Navigate to the upstream staring location where you will begin deploying the egg mats and record GPS location, date, time, flow rate and water temperature.
2. Moving downstream with the vessel in reverse, deploy the trap-net anchor and pay out the line and egg mats off the bow of the boat. As you reach the end of the rope after the last egg mat has been deployed, deploy the navy anchor and finally the buoy which will remain floating on the river surface.

3. Return to check the egg mats once per week, fetching the buoy line with a hooked pike pole. After the egg mats have been checked and all eggs counted, redeploy the mats. The egg mats can be left in for 8 - 10 weeks, or until it is determined that the sturgeon have finished spawning.

Equipment Required for Sampling Adult Lake Sturgeon

Gill nets
Net floats and anchors
High power lens for observing glochidia on gills
Small high-power light for viewing glochidia on gills
Cradle/sling, for large fish
Measuring board
Weigh scale
GPS
Thermometer
Field book/pencils
Flow meter
Depth measurer
PIT tag injector (two)
PIT tags
PIT tag reader
Vials of 70% ethanol for tissue samples and extracted glochidia

Equipment Required for Sampling Hickorynut mussel

Required sampling permits
SCUBA gear
1m x 1m sampling grid
GPS
Mesh collection bags
Flow meter
Depth measurer
Thermometer
Field book and pencils
Turbidity meter

Equipment Required for Sampling Larvae and Eggs of Lake Sturgeon

D - Frame nets, 500 - 1500 micron mesh.
Egg mats (furnace filter clipped to a frame or wrapped around a concrete block)
Braided Rope
Anchors
Floats
GPS
Field book and pencil
Thermometer
Depth measurer
Flow meter
Pike pole to fetch lines when pulling up nets or mats
Magnifiying eyepiece
White enamel tray
Measuring device (to the mm for larvae)
Vials
70% ethanol

Literature Cited

Auer, N. A.; Baker, E. A., 2002: Duration and drift of larval lake sturgeon in the Sturgeon River, Michigan. J. Appl. Ichthyol. 18, 557–564

Baker, E. A., and D. J. Borgeson. 1999. Lake sturgeon abundance and harvest in Black Lake, Michigan, 1975–1999. North American Journal of Fisheries Management 19: 1080-1088.

Chiasson, W. B., D. L. G. Noakes, and F. W. H. Beamish. 1997. Habitat, benthic prey, and distribution of juvenile lake sturgeon (Acipenser fulvescens) in northern Ontario rivers. Canadian Journal of Fisheries and Aquatic Sciences 54: 2866- 2871.

Lyons, J., and J. J. Kempinger. 1992. Movements of adult lake sturgeon in the Lake Winnebago system. Wisconsin Department of Natural Resources Research Report 156-92, Madison, Wisconsin.

Peterson, D.L., Vecsei, P. & Jennings, C.A. 2007. Ecology and biology of the lake sturgeon: a synthesis of current knowledge of a threatened North American *Acipenseridae* . *Rev Fish Biol Fisheries* **17,** 59–76

Roseman, E.F., Boase, J., Kennedy, G., Craig, J. and K. Soper. 2011. Adaption of egg and larvae samlpling techniques for lake sturgeon and broadcast spawning fishes in a deep river. J. App. Ichthyol. 27, 89 - 92.

R. Verdon, J.-C. Guay, M. La Haye, M. Simoneau, A. Côté-Bherer ,N. Ouellet, M. Gendron. 2012. Assessment of spatio-temporal variation in larval abundance of lake sturgeon (*Acipenser fulvescens*) in the Rupert River (Quebec, Canada), using drift nets. J. Appl. Icthyol.

APPENDIX C – LAKE STURGEON TECHNICAL NOTE ON POTENTIAL HABITAT

À :	Services Publics et Approvisionnement Canada
Par :	Marion, Melloul, M.Env. Analyste en environnement Martin Dorais, biologiste, M. Env., directeur - Environnement
Date :	Le 6 décembre 2023
Objet :	Remplacement du barrage-pont Témiscamingue du Québec
Nos références :	32760TT

1. MISE EN CONTEXTE

La méthodologie proposée dans la présente note technique s'inscrit dans la procédure d'évaluation et d'examen des impacts sur l'environnement requise dans le cadre des travaux de remplacement du barrage-pont Témiscamingue du Québec, situé sur la rivière des Outaouais à la frontière du Québec et de l'Ontario à la hauteur de la ville de Témiscaming le long de la route 101 au Québec devenant la route 63 en Ontario. Le projet consiste à la reconstruction d'une nouvelle structure approximativement 25 mètres en aval du barrage-pont existant et à la démolition des installations existantes. Le nouveau barrage-pont possédera les mêmes caractéristiques que la structure en place actuellement.

Dans ce contexte, la firme Tetra Tech QI Inc. (Tetra Tech) a été mandatée pour réaliser une revue de la littérature et la collecte de données concernant les inventaires ichyologiques et toutes autres sources de données présentant des occurrences de l'esturgeon jaune (*Acipenser fulvescens*) dans la rivière des Outaouais. La zone d'étude de la présente notre technique s'étend entre le Lac Témiscamingue en amont et le barrage Otto Holden en aval.

Tel que convenu avec Services Publics et Approvisionnement Canada et le Ministère Pêches et Océans Canada (MPO), l'objectif de la présente *Note technique* est de présenter les différentes sources d'informations consultées, ainsi que les occurrences historiques contemporaines et récentes de l'esturgeon jaune dans la zone d'étude.

2. MÉTHODOLOGIE

2.1 RECHERCHE PRÉLIMINAIRE

Afin de bien cibler l'effort de recherche documentaire nécessaire, la méthodologie préconisée a été d'identifier les sources d'informations pertinentes. Une recherche préliminaire a été réalisée à partir de bases de données accessibles, des sources académiques et gouvernementales disponibles en ligne ainsi que d'autres sources. Les données suivantes ont servi d'intrants afin de réaliser la présente recherche documentaire :

- Les rapports du Comité sur la situation des espèces en péril au Canada (COSEPAC/COSEWIC) ;
- Les rapports du Ministère Pêches et Océans Canada (MPO) ;
- Les rapports d'inventaire du Ministry of Natural Resources of Ontario (MNRO) ;
- Les articles scientifiques relatifs aux efforts d'inventaires de l'esturgeon jaune ;
- La consultation de la base de données participative iNaturalist
- La base de données ouverte Fish Biodiversity Database du Gouvernement du Canada ;
- Les applications de pêche FishBrain et FishAngler ;
- La consultation de l'Organisme de Bassin Versant (OBV) Témiscamingue et le Club de chasse et pêche Témiscamingue centre ;

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- Les données issues des inventaires ichtyologiques de Tetra Tech inc.

2.2 MÉTHODOLOGIE

La recherche documentaire a consisté en la recherche de documents et de bases de données en lignes présentant des occurrences de l'esturgeon jaune dans la zone d'étude entre 1989 et 2023. Chaque occurrence, la date de capture ou d'observation, le détail de la capture (lorsque disponible), la source, l'auteur et le lien internet vers la source (lorsqu'applicable) ainsi que la date de publication des données ont été colligés et géolocalisés approximativement dans le fichier Google Earth joint à la présente note technique (*32760TT_Note_technique_annexe_Occurrences.kmz)*.

3. RÉSULTATS

Cette section présente les résultats de la recherche documentaire réalisée en novembre 2023 ainsi que la qualité des sources consultées (**Tableau 1**).

À la suite de cette recherche documentaire, les faits saillants sont les suivants :

- Treize mentions de capture entre 2008 et 2023 ont été comptabilisées d'après les différentes sources consultées. Au total, 50 individus (adultes ou de sexe indéterminé) ont été capturés dans la zone d'étude (Tetra Tech, 2021; BBA-Biofilia, 2018; MPO, 2021; MRNO, 2008; COSEPAC, 2008; iNaturalist, 2023; FishBrain, 2023);
- Une observation réalisée lors de deux campagnes en 2003 et 2006 dans l'aire de frai identifiée en amont du barrage Otto Holden, comptabilisant moins de 1 000 individus, a été compilée (Paradis *et al.*, 2022);
- Une mention de quota de pêche commerciale, n'indiquant pas le nombre de capture annuelle réelle entre 1986 et 2009, a été compilée;
- Un total de six captures réalisées par des pêcheurs ayant publiés leur prise sur l'application FishBrain entre 2018 et 2023 ont été compatibilisées (FishBrain, 2023);
- Une mention de capture en 2021, provenant de la base de données participative iNaturalist a été compilée dans le lac Témiscamingue (iNaturalist Canada, 2023);
- L'OBV Témiscamingue mentionne des efforts d'inventaires des sites de fraie de l'esturgeon jaune dans son Plan Directeur de l'eau entre 2013 et 2016 en collaboration avec les communautés autochtones présentes dans la zone d'étude (OBV Témiscamingue, 2014). Tetra Tech n'a pas reçu de retour de la part de l'OBV à la suite de notre demande d'information;
- Le club de chasse et pêche Témiscamingue centre n'a pas souhaité répondre à notre demande d'information lorsque contacté par téléphone en novembre 2023;
- La consultation de la documentation rendue disponible par la communauté autochtone de Wolf Lake, notamment un protocole de pêche de l'esturgeon jaune à des fins d'inventaire, n'indiquait aucune capture;
- La consultation de l'application de pêche FishAngler a permis d'identifier des mentions de captures. Cependant, celles-ci se trouvent entre l'aval du barrage Otto Holden et le barrage Des Joachims, en dehors de la zone d'étude;
- La consultation de la base de données ouverte Fish Biodiversity Database du Gouvernement du Canada n'a permis d'identifier aucune mention de l'esturgeon jaune.

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Tableau 1 : Liste des mentions de l'esturgeon jaune issue de la recherche documentaire

Type (adulte, œuf, larve, frayère)	Capture, observation ou donnée historique	Quantité	Coordonnées approximatives	Source	Année de capture ou observation	Fiabilité/Qualité de la source*
Adultes (dont 2 mâles en laitance)	Capture	8	46.70082128 -79.09643384	Tetra Tech	2021	Haute
Œufs	Capture	12	46,71051956 -79,10003088	Tetra Tech	2021	Haute
Larve	Capture	>0 - <0,05 (Larves/1000 m^3 d'eau filtrée)	46.710266 -79.099634	BBA/Biofilia	2017	Haute
Adulte (femelle)	Capture	2	46.705119 -79.099248	BBA/Biofilia	2017	Haute
Indéterminé	Capture	28	En aval du barrage Otto Holden (localisation exacte non précisée)	MRNO	2008	Haute
Indéterminé	Capture	1	Lac La Cave (localisation exacte non précisée)	MPO	2010	Haute
Indéterminé	Quota de pêche commerciale	118/an	Lac Temiscamingue (localisation exacte non précisée)	MPO	1986 – 2009	Haute
Indéterminé	Capture	2	Lac Temiscaminque (localisation exacte non précisée)	COSEPAC	2008	Haute
Indéterminé	Capture	3	Lac Témiscamingue (localisation exacte non précisée)	Base de données iNaturalist	2021	Moyenne
Indéterminé	Capture	1	Antoine's Creek 46.348820 -78.730774	FishBrain	2018	Faible
Indéterminé	Capture	2	Lac Témiscamingue 47.331451 -79.495009	FishBrain	2017	Faible
Indéterminé	Capture	1	Lac Témiscamingue	FishBrain	2018	Faible

…4

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Tél. 418 871-8151 | tetratech.com

			47.478000 -79.662725			
Indéterminé	Capture	1	Mattawa 46.320807 -78.708711	FishBrain	2023	Faible
Indéterminé	Capture	1	Notre-Dame-Du-Nord 47.589476 -79.484023	FishBrain	2019	Faible
Géniteurs	Observation	<1000	En aval du barrage Otto Holden	Paradis *et. al.*	2003 et 2006	Haute

*La fiabilité/qualité de la source est déterminée selon les facteurs suivants : la méthodologie utilisée pour réaliser les inventaires; le type d'auteur à l'origine de l'inventaire (les ministères et sources académiques citées dans des journaux scientifiques sont considérées comme des sources fiables); les sources ayant fait l'objet d'une révision scientifique par des paires (iNaturalist fait l'objet de révision par des paires, avec une fiabilité variable ; les applications de pêche n'ont pas fait l'objet de révision puisque les informations et photos publiées proviennent des utilisateurs de l'application uniquement).

Les figures qui suivent localisent ces lieux d'observation.



Figure 1 : Vue d'ensemble des observations

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Figure 2 : Tronçon amont du barrage Témiscamingue

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Figure 3 : Secteur barrage Témiscamingue

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Figure 4 : Tronçon aval

4. CONCLUSION

La méthodologie présentée dans le présent document vise à identifier les récentes mentions d'occurrence de l'esturgeon jaune dans la rivière des Outaouais, entre le Lac Témiscamingue en amont et le barrage Otto Holden en aval. La recherche documentaire a permis d'identifier des mentions de cinquante captures dans la zone d'étude entre 2008 et 2023, provenant de source de haute fiabilité, tels que les inventaires réalisés par Tetra Tech et ses consultants ou par des ministères ou des chercheurs. Des efforts de pêche réalisés par Tetra Tech identifiaient en 2021 une aire de fraie directement en aval du barrage Témiscamingue, avec la capture d'individus adultes, de larves et d'œuf réalisées entre 2017 et 2021. Une aire de fraie a aussi été identifiée par des sources académiques avec l'observation de moins de 1 000 individus entre 2003 et 2006 en aval du barrage Otto Holden (Paradis et al., 2022). Parmi les mentions de captures compilées lors de la recherche documentaire, neuf des plus récentes captures identifiées, entre 2018 et 2023, proviennent de sources de faible fiabilité/qualité, telle que l'application participative de pêche FishBrain. Bien que l'information qu'elle offre est difficile à vérifier, cette source reste un indicateur de la présence de l'espèce dans la zone d'étude. Plusieurs inventaires de l'esturgeon jaune ont été réalisés dans la rivière des Outaouais ces dernières années. Cependant, des efforts d'inventaire réguliers dans la zone d'étude pourraient permettre de bonifier l'état des connaissances sur l'impact de la fragmentation de l'habitat de l'esturgeon jaune par les barrages dans la rivière des Outaouais.

…8

5. RÉFÉRENCES

BBA-Biofilia (2018). Remplacement de la partie québécoise du complexe du barrage Témiscamingue - Étude d'impact sur l'environnement - Description du milieu biologique. (Document interne)

COSEPAC (2017). COSEPAC/COSEWIC : Information in Support of the 2017 COSEWIC Assessment and Status Report on the Lake Sturgeon (Acipenser fulvescens) in Canada. https://publications.gc.ca/collections/collection_2019/mpo-dfo/Fs97-4-3166-eng.pdf (Page consultée le 14 novembre 2023).

iNaturalist Canada (2023). Occurrence d'esturgeon jaune dans la rivière des Outaouais. esturgeon jaune en mai 2021 par Susan Rapin. Third sturgeon in three days - Other two reported via email. · iNaturalist Canada (Page consultée le 30 novembre 2023).

FishBrain (2023). Captures d'esturgeon jaune par des utilisateurs issues de la consultation de l'application. (Application consultée le 14 novembre 2023).

MPO (2021). Information in support of a recovery potential assessment of Lake Sturgeon, Acipenser fulvescens (Western Hudson Bay, Saskatchewan-Nelson River, and Great Lakes-Upper St. Lawrence populations). Information in support of a recovery potential assessment of Lake Sturgeon, Acipenser fulvescens (Western Hudson Bay, Saskatchewan-Nelson River, and Great Lakes-Upper St. Lawrence populations) (dfo-mpo.gc.ca) (Page consultée le 14 novembre 2023).

MNRO (2008). A synoptic review of the history and our knowledge of lake sturgeon in the Ottawa River. https://awsassets.panda.org/downloads/17_2008_lake_sturgeon_haxton_canada_1.pdf. (Page consultée le 14 novembre 2023).

OBV Témiscaminque (2014). Plan Directeur de l'Eau (PDE) - Troisième partie : Le diagnostic du bassin versant du Témiscamingue. Partie_4-1_eujeux-orientations-Objectifs_PDE_OBVT_FINAL.pdf. (Page consultée le 15 novembre 2023).

Paradis, Yves; Bernatchez, Simon; Valiquette, Éliane; Mingelbier, Marc; Hatin; Daniel, Brodeur; Philippe, Paquin, Émilie; Côté Chantal; L'Italien, Léon; Calvé, Thierry; Hamel, Jean-Pierre; Bélanger, Martin; Haxton, Tim J. (2022). A review of lake sturgeon Acipenser fulvescens spawning sites in the Lower St. Lawrence and Ottawa river systems. Journal of Great Lakes Research, p. 858-864.

Tetra Tech, (2021). Tableau Excel des campagnes de pêches du 14 au 19 juin 2021. (Document interne).

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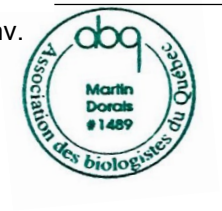
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Marion Melloul, M.Env.
Analyste en environnement

Révisé par :

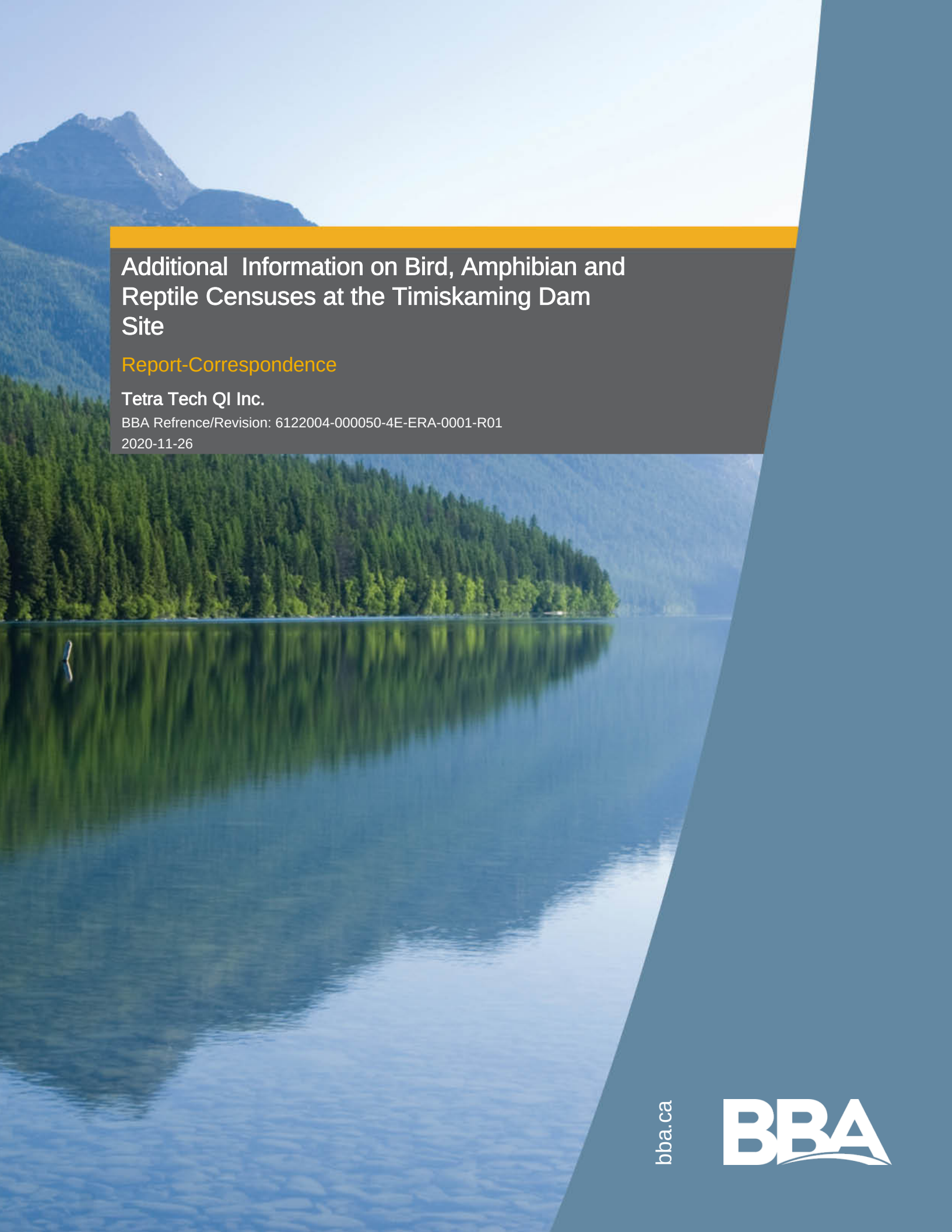
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APPENDIX D – BIRD SURVEY TECHNICAL NOTE



Additional Information on Bird, Amphibian and Reptile Censuses at the Timiskaming Dam Site

Report-Correspondence

Tetra Tech QI Inc.

BBA Refrence/Revision: 6122004-000050-4E-ERA-0001-R01
2020-11-26

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Tetra Tech QI Inc.

Additional Information on Bird, Amphibian and Reptile Censuses at the Timiskaming Dam Site

Report-Correspondence

Replacement of the Quebec Dam of the Timiskaming Dam Complex, Témiscaming

BBA Reference/ Revision: 6122004-000050-4E-ERA-0001-R01

November 26, 2020

FINAL

Prepared by:
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REVISION HISTORY

Revision	Document Status – Description of the Revision	Date
R00	Final	2020-11-15
R01	Final	2020-11-26

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1. BACKGROUND

In 2018, BBA provided Tetra Tech with a description of the biological environment in the context of the environmental impact assessment for the replacement of the Quebec Dam part of the Timiskaming Dam Complex[1]. Tetra Tech commissioned BBA to provide additional information on the bird, amphibian and reptile censuses carried out in 2017. This additional information aims to answer the questions asked by the Algonquins of Ontario.

2. METHODOLOGY

2.1 Avifauna

The avifauna census consisted exclusively in observing specimens and signs of presence, as well as in listening for sounds that indicated the presence of the various species. All observations inside the study area were noted, including, among others, specimens, songs, calls and other sounds and signs of presence such as holes and nests. These are all signs that may suggest or confirm the presence of various species of birds. Once a species was observed, subsequent observations were not systematically noted, unless the observations indicated increased nesting[2].

The observations were made between May 21 and May 30, 2007, between June 20 and July 3, 2017, and between November 16 and November 21, 2017, inclusive. The field team spent an average of 6 hours per day in the study area and the total observation effort was approximately 700 hours. Most of the observations were made during the day, but some members of the census team occasionally made observations in the evening and in the early hours of the night (May 21st, May 30th, June 20th, June 21st, June 30th, July 1st and July 2nd).

In the context of this study, passerine birds and other terrestrial birds were not counted by means of sound monitoring stations, e.g. using the Unlimited Distance Point Counts (UDPC, also known as IPA)[3] and fixed-radius counts[4]. These methods consist in counting the birds seen or heard in 20-minute periods and in a 50-meter radius or greater. They were not used mainly because the ambient noise from the Rayonier Advanced Materials plant (formerly Tembec), the rapids at the foot of the dam during the high water period and vehicular traffic was considerable, rendering these techniques useless and unsuitable due to the reality at the site. In addition, sound monitoring stations are generally installed in forest environments not applicable in the study area. Trees and shrubs are found along the river, in a 20-meter

[1] Biofilia/BBA. Février 2018. Remplacement de la partie québécoise du complexe du barrage Témiscamingue. Étude d'impact sur l'environnement – milieu biologique. Rapport réalisé pour Tetra Tech. 124 p. et annexes.

[2] Espèce observée → nidification possible → nidification probable → nidification confirmée

[3] Bibby, C. J., N. D. Burgess et D. A. Hill. 1992. Bird census techniques. British Trust for Ornithology and Royal Society for the protection of birds, Academic press, London. 257 pages.

[4] Blondel, J., C. Ferry et B. Frochot. 1981. Point counts with unlimited distance. Pages 414-420 dans C. J. Ralph et J. M. Scott, éd. Estimating the numbers of terrestrial birds. Studies in Avian Biology No 6.

strip generally less than 5 meters wide. In addition, the census team spent a considerable amount of time in a small area with sparse vegetation. BBA is confident that it has provided an accurate picture of the avifauna in the study area in 2017.

2.2 Herpetofauna

The herpetofauna census was carried out through the observation of specimens, signs of presence and listening for sounds (calls and cries). The methods used for such species included manual search under woody and artificial debris, listening for anuran calls and passive observation.

The observations were made between May 21 and May 30, 2007, between June 20 and July 3, 2017, and between November 16 and November 21, 2017, inclusive. The active search for amphibians and reptiles took place on May 24, 2017 in the entire terrestrial study area. Woody and artificial debris were lifted to try to catch sight of specimens. Permit SEG 2017-05-15-043-08-GF had been delivered by the “Ministère des Forêts, de la Faune et des Parcs” or MFFP (the Quebec government authority on forests, wildlife and parks) so that the census could be carried out.

On May 30, 2017, the installation of sound monitoring stations to confirm the presence of anurans in the terrestrial study area was attempted but the ambient noise from the dams, the Rayonier Advanced Materials plant and nearby traffic was too loud and sound monitoring was abandoned because deemed ineffective.

3. STUDY AREA

All the observations within the terrestrial and aquatic study areas (Figure 1 of the Biofilia/BBA report dated 2018) were noted.

Although the observation regarding the tetraploid grey treefrogs was made in the aquatic study area, their calls came from outside the study area, in Ontario. As it was the only observation for that species, the tetraploid grey treefrog was not deemed a species observed in the study area.

An active bald eagle nest was observed approximately 5 km south of the aquatic study area. This nest was mentioned in Biofilia/BBA’s report (2018) as it indicated where the observed adult bald eagles were nesting in the study area. The bald eagle is a vulnerable species under the *Act Respecting Threatened Or Vulnerable Species* and protection measures are applicable up to 700 m from the nests. The observed nest was located outside of the protection area recommended for the bald eagle.

4. CENSUS TEAM

All team members participated in the censuses. They were all biologists specializing in wildlife or wildlife technicians. Mr. Daniel Lambert supervised their work and participated every census day during all three

censuses. Daniel Lambert had already carried out several avifauna and herpetofauna censuses. He was also a teaching assistant for the undergraduate program in biological sciences at Université de Montréal. The names of the team members who participated in the censuses are listed below:

- Daniel Lambert, biologist, M.Sc. Biologye;
- Christine Larouche, biologist, B.Sc. Biology;
- Guillaume Tétreault, wildlife management technician;
- Nicolas Roy, wildlife management technician;
- Isabelle Laramée, technician, bio-ecology;
- Jérémie Masse-Maillé, wildlife management technician.

5. 2017 CENSUS RESULTS

Every bird, amphibian or reptile observation noted during the 2017 censuses is listed in Table 1. Twenty-eight species of birds (Table 2) and two species of amphibians (the Northern two-lined salamander and the American toad) were confirmed in the terrestrial and aquatic study areas during the three censuses.

Of the 28 species of birds observed, 21 are species included in the list of protected species (*Migratory Birds Convention Act*, 1994) and out of those 21 species, four have a special status. Nesting was confirmed for five species, was deemed probable for one species and possible for three other species. See Section 5.3.2 of the Biofilia/BBA (2018) report for more information.

Table 1. Bird, Amphibian and Reptile Observations During the Three 2017 Field Censuses

Species		Date	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Observation Type	Number	Comment(s)
English Name	Scientific Name						
Avifauna							
Yellow warbler*	*Setophaga petechia*	2017-05-21	46.71074	-79.09879	Visual	1	In a mountain-ash.
American robin*	*Turdus migratorius*	2017-05-21	46.71074	-79.09879	Visual	1	
Common merganser*	*Mergus merganser*	2017-05-21	46.71074	-79.09879	Visual	1	
Common grackle	*Quiscalus quiscula*	2017-05-21	46.71074	-79.09879	Visual	1	
Yellow warbler*	*Setophaga petechia*	2017-05-21	46.70676	-79.09773	Visual	1	
Common loon*	*Gavia immer*	2017-05-21	46.70041	79.09654	Visual	1	
Brant*	*Branta bernicla*	2017-05-22	46.70633	-79.09801	Visual	±30	Migrating formation over the river.
Common yellowthroat*	*Geothlypis trichas*	2017-05-22	46.71077	-79.09871	Visual	1	
Eastern phoebe*	*Sayornis phoebe*	2017-05-22	46.71077	-79.09871	Visual	1	Nest under the bridge most downstream of “Ruisseau Gordon”.
Song sparrow*	*Melospiza melodia*	2017-05-23	46.71056	-79.10053	Acoustic	1	
American crow	*Corvus brachyrhynchos*	2017-05-23	46.71056	-79.10053	Visual	1	
Common starling	*Sturnus vulgaris*	2017-05-23	N-D	N-D	Visual	1	Flying over Long Sault Island and holding material in its beak.
Yellow-rumped warbler*	*Setophaga coronata*	2017-05-24	N-D	N-D	Visual	1	On Long Sault Island.

Species		Date	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Observation Type	Number	Comment(s)
English Name	Scientific Name						
Tree swallow*	*Tachycineta bicolor*	2017-05-24	46.710693	-79.101559	Visual	6	Nesting in birdhouses attached to the garage of the dam operator's house on Long Sault Island.
Chimney swift*	*Chaetura pelagica*	2017-05-24	N-D	N-D	Visual	1	Flying over the river.
Grey catbird*	*Dumetella carolinensis*	2017-05-24	46.70792	-79.09798	Visual	1	
Yellow warbler*	*Setophaga petechia*	2017-05-24	46.71261	-79.10054	Visual	3	On the river bank upstream of the bridge.
Ring-billed gull*	*Larus delawarensis*	2017-05-24	46.71261	-79.10054	Visual	3	On the river bank upstream of the bridge.
Common merganser*	*Mergus merganser*	2017-05-24	46. 71091	-79.09931	Visual	1	At the mouth of "Ruisseau Gordon".
American crow	*Corvus brachyrhynchos*	2017-05-24	46.71124	-79.09912	Visual	1	
Common loon*	*Gavia immer*	2017-05-25	46.69997	-79.09547	Acoustic	1	Visual observation elsewhere also in the study area.
Spotted sandpiper*	*Actitis macularius*	2017-05-25	46.69997	-79.09547	Visual	1	
American robin*	*Turdus migratorius*	2017-05-25	46.71062	-79.09902	Visual	1	On the river bank upstream of the bridge.
Common loon*	*Gavia immer*	2017-05-26	46.69913	-79.09602	Visual	2	On the river.
Common merganser*	*Mergus merganser*	2017-05-28	46.71063	-79.09899	Visual	1	At the mouth of "Ruisseau Gordon".
Song sparrow*	*Melospiza melodia*	2017-05-28	46.71063	-79.09899	Acoustic	2	At the mouth of "Ruisseau Gordon".
Common grackle	*Quiscalus quiscula*	2017-05-28	46.71063	-79.09899	Visual	1	At the mouth of "Ruisseau Gordon".

Species		Date	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Observation Type	Number	Comment(s)
English Name	Scientific Name						
Barn swallow*	*Hirundo rustica*	2017-05-29	46.710327	-79.100955	Visual	2	Seen entering and exiting the open door of one of the dam managers' garages on Long Sault Island. There was no nest inside the garage at that time and the door was later kept closed. There was no sign that the barn swallow was nesting.
Bald eagle	*Haliaeetus leucocephalus*	2017-06-20	46.70952	-79.10112	Visual	1	Young specimen observed repeatedly in the study area. Hand-fed by passers-by.
Common nighthawk*	*Chordeiles minor*	2017-06-20	46.71002	-79.10152	Acoustic	1	Specimen heard in flight over the river.
Ring-billed gull*	*Larus delawarensis*	2017-06-20	46.69969	-79.0961	Visual	1	In flight.
Common merganser*	*Mergus merganser*	2017-06-20	46.70771	-79.101	Visual	7	Female with six young birds in the Ottawa River at the mouth of "Ruisseau Gordon" and south in the study area.
Ruby-crowned kinglet *	*Regulus calendula*	2017-06-20	46.7114	-79.09955	Visual	2	Singing.
Common loon*	*Gavia immer*	2017-06-21	N-D	N-D	Visual	1	Anxiety call due to the presence of a bald eagle in the vicinity. Observed on several occasions.
Broad-winged hawk	*Buteo platypterus*	2017-06-21	46.70785	-79.10143	Visual	1	In flight.
Ring-billed gull*	*Larus delawarensis*	2017-06-21	46.70778	-79.100965	Visual	1	Specimen on the pier.
Bald eagle	*Haliaeetus leucocephalus*	2017-06-24	46.70507	-79.09983	Visual	1	Adult specimen in flight.
Common raven	*Corvus corax*	2017-06-30	N-D	N-D	Visual	1	In flight.
Common merganser*	*Mergus merganser*	2017-11-16	N-D	N-D	Visual	3	In the water on the river.

Species		Date	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Observation Type	Number	Comment(s)
English Name	**Scientific Name**						
Common goldeneye*	*Bucephala clangula*	2017-11-16	N-D	N-D	Visual	2	In the water on the river.
Common loon*	*Gavia immer*	2017-11-17	N-D	N-D	Visual	1	In the water on the river.
Red-tailed hawk	*Buteo jamaicensis*	2017-11-17	N-D	N-D	Visual	1	In flight.
American crow	*Corvus brachyrhynchos*	2017-11-17	N-D	N-D	Visual	1	In flight.
Rock dove*	*Columba livia*	2017-11-18	N-D	N-D	Visual	2	In flight.
Snow goose*	*Chen caerulescens*	N-D	N-D	N-D	Visual	N-D	Migrating formation over the river.
Common goldeneye*	*Bucephala clangula*	2017-06-ND	46.692441	-79.091628	Visual	N-D	Female with young birds.
Herring gull*	*Larus argentatus*	N-D	N-D	N-D	Visual	1	In the parking lot.
Herpetofauna							
American toad	*Anaxyru americanus*	2017-07-01	46.708209	-79.101090	Visual	1	
American toad	*Anaxyru americanus*	2017-07-03	46.707870	-79.101490	Visual	1	Very small.
Tetraploid grey treefrog	*Hyla versicolor*	2017-05-28	46.70315	- 79.09732	Acoustic	1	Call coming from outside the study area, in Ontario.

Notes:

Bold, underlined: Special status species.

*: List of protected birds in Canada under the *Migratory Birds Convention Act*, 1994 (Environnement Canada, 2016)

Table 2. Birds Observed in the Terrestrial and Aquatic Study Areas

Species		Nesting Index	Nesting Status
English Name	Scientific Name		
Snow goose*	*Chen caerulescens*	X	None
Brant*	*Branta bernicla*	X	None
Common goldeneye*	*Bucephala clangula*	JE	Confirmed
Common merganser*	*Mergus merganser*	JE	Confirmed
Common loon*	*Gavia immer*	H	Possible
Bald eagle	*Haliaeetus leucocephalus*	X	None
Broad-winged hawk	*Buteo platypterus*	X	None
Red-tailed hawk	*Buteo jamaicensis*	X	None
Spotted sandpiper*	*Actitis macularius*	X	None
Ring-billed gull*	*Larus delawarensis*	X	None
Herring gull*	*Larus argentatus*	X	None
Rock dove*	*Columba livia*	X	None
Common nighthawk*	*Chordeiles minor*	X	None
Chimney swift*	*Chaetura pelagica*	X	None
Eastern phoebe*	*Sayornis phoebe*	NO	Confirmed
American crow	*Corvus brachyrhynchos*	X	None
Common raven	*Corvus corax*	X	None
Tree swallow*	*Tachycineta bicolor*	NO	Confirmed
Barn swallow*	*Hirundo rustica*	X	None
Ruby-crowned kinglet*	*Regulus calendula*	X	None
American Robin*	*Turdus migratorius*	S	Possible
Grey catbird*	*Dumetella carolinensis*	X	None
Common starling	*Sturnus vulgaris*	AT	Confirmed
Yellow warbler*	*Setophaga petechia*	A	Probable
Yellow-rumped warbler*	*Setophaga coronata*	X	None
Common yellowthroat*	*Geothlypis trichas*	X	None
Song sparrow*	*Melospiza melodia*	S	Possible
Common grackle	*Quiscalus quiscula*	X	None

Notes:

Bold, underlined: Special status species.

*: List of protected birds in Canada under the *Migratory Birds Convention Act*, 1994 (Environnement Canada, 2016)

1 Nesting Index:

X = Species observed.

Possible nesting:

H = Species observed during the reproduction period in a habitat suitable for nesting.

S = Specimen singing or producing sounds associated with reproduction, e.g. calls, drumming, heard during the species' reproduction period in a habitat suitable for nesting.

Probable nesting:

A = Agitated behavior or alarm calls from an adult specimen during the species' reproduction period in a habitat suitable for nesting.

C = Courtship behavior between a male and female or agonistic behavior between two specimen during the species' reproduction period in a habitat suitable for nesting.

Confirmed nesting:

AT = Adult transporting food for one or several young birds.

JE = Young bird that recently left the nest (nidicolous species) or young bird covered in down (nidifuge species) and incapable of sustained flight.

NO = Adult occupying, leaving or arriving at a probable nesting site (visible or not) and behavior indicative of an occupied nest.

NF = Nest containing one or several eggs.

NJ = Nest containing one or several young birds (seen or heard).


BBA

APPENDIX E – BIRD SURVEY FIELD NOTES

eBird Québec

LISTE D'OBSERVATION S88950254

ven. **21 mai 2021** 07:00

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Relevé exhaustif dans un secteur Complète

4 10 h

Superficie	50.0 ha

Pêche en amont et aval du barrage pour évaluation ichtyologique dans le cadre du travail. Observations opportunistes afin de documenter les espèces aviaires présentes. Du 12 au 21 mai 2021, effort de 10h par jour.

48 Espèces observées

800	**Bernache cravant** *Branta bernicla*	Ok, migrateurs direction Nord.
4	**Bernache du Canada** *Branta canadensis*	
13	**Grand Harle** *Mergus merganser*	
2	**Colibri à gorge rubis** *Archilochus colubris*	
2	**Pluvier kildir** *Charadrius vociferus*	
1	**Chevalier grivelé** *Actitis macularius*	
6	**Goéland à bec cerclé** *Larus delawarensis*	
4	**Goéland argenté** *Larus argentatus*	
3	**Sterne caspienne** *Hydroprogne caspia*	
2	**Plongeon huard** *Gavia immer*	
6	**Urubu à tête rouge** *Cathartes aura*	

1	**Busard des marais**	*Circus hudsonius*
1	**Pygargue à tête blanche**	*Haliaeetus leucocephalus*
1	**Petite Buse**	*Buteo platypterus*
1	**Grand Pic**	*Dryocopus pileatus*
2	**Faucon émerillon**	*Falco columbarius*
1	**Faucon pèlerin**	*Falco peregrinus* Ok, gros faucon
1	**Moucherolle phébi**	*Sayornis phoebe*
1	**Viréo à tête bleue**	*Vireo solitarius*
2	**Geai bleu**	*Cyanocitta cristata*
2	**Corneille d'Amérique**	*Corvus brachyrhynchos*
1	**Grand Corbeau**	*Corvus corax*
10	**Mésange à tête noire**	*Poecile atricapillus*
5	**Hirondelle bicolore**	*Tachycineta bicolor*
2	**Hirondelle rustique**	*Hirundo rustica*
1	**Troglodyte familier**	*Troglodytes aedon* Chant caractéristique court
10	**Étourneau sansonnet**	*Sturnus vulgaris*
1	**Moqueur roux**	*Toxostoma rufum*
1	**Grive à dos olive**	*Catharus ustulatus*
3	**Merle d'Amérique**	*Turdus migratorius*
5	**Jaseur d'Amérique**	*Bombycilla cedrorum*
5	**Roselin pourpré**	*Haemorhous purpureus*
1	**Bruant des prés**	*Passerculus sandwichensis*
3	**Bruant chanteur**	*Melospiza melodia*
4	**Quiscale bronzé**	*Quiscalus quiscula*

1	**Paruline couronnée**	*Seiurus aurocapilla*
1	**Paruline des ruisseaux**	*Parkesia noveboracensis*
3	**Paruline noir et blanc**	*Mniotilta varia*
1	**Paruline triste**	*Geothlypis philadelphia*
1	**Paruline masquée**	*Geothlypis trichas*
8	**Paruline flamboyante**	*Setophaga ruticilla*
1	**Paruline tigrée**	*Setophaga tigrina*
1	**Paruline à collier**	*Setophaga americana*
7	**Paruline jaune**	*Setophaga petechia*
3	**Paruline à flancs marron**	*Setophaga pensylvanica*
1	**Paruline rayée**	*Setophaga striata*
2	**Paruline des pins**	*Setophaga pinus*
2	**Paruline à gorge noire**	*Setophaga virens*

eBird Québec

LISTE D'OBSERVATION S88776424

sam. **22 mai 2021** 06:55

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

1

Soumise à partir de eBird pour iOS, version 2.4.35

23 Espèces observées

2	**Canard colvert**	*Anas platyrhynchos*
4	**Grand Harle**	*Mergus merganser*
1	**Chevalier grivelé**	*Actitis macularius*
2	**Goéland argenté**	*Larus argentatus*
2	**Plongeon huard**	*Gavia immer*
1	**Urubu à tête rouge**	*Cathartes aura*
1	**Tyran tritri**	*Tyrannus tyrannus*
2	**Corneille d'Amérique**	*Corvus brachyrhynchos*
1	**Grand Corbeau**	*Corvus corax*
3	**Hirondelle bicolore**	*Tachycineta bicolor*
2	**Hirondelle rustique**	*Hirundo rustica*
1	**Grive à dos olive**	*Catharus ustulatus*
1	**Merle d'Amérique**	*Turdus migratorius*
4	**Jaseur d'Amérique**	*Bombycilla cedrorum*

2	**Chardonneret jaune**	*Spinus tristis*
1	**Bruant à gorge blanche**	*Zonotrichia albicollis*
1	**Bruant des prés**	*Passerculus sandwichensis*
3	**Bruant chanteur**	*Melospiza melodia*
2	**Quiscale bronzé**	*Quiscalus quiscula*
1	**Paruline flamboyante**	*Setophaga ruticilla*
1	**Paruline à tête cendrée**	*Setophaga magnolia*
1	**Paruline jaune**	*Setophaga petechia*
1	**Paruline à flancs marron**	*Setophaga pensylvanica*

eBird Québec

LISTE D'OBSERVATION S88896110

dim. **23 mai 2021** 09:25

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

1

Soumise à partir de eBird pour iOS, version 2.4.35

14 Espèces observées

9	**Bernache cravant** *Branta bernicla*	Petite bernache qui bat vite des ailes avec un court coup tout noir. Suis l'Outaouais vers l'amont.
3	**Bernache du Canada** *Branta canadensis*	
4	**Grand Harle** *Mergus merganser*	
1	**Pluvier kildir** *Charadrius vociferus*	
2	**Plongeon huard** *Gavia immer*	
1	**Moucherolle phébi** *Sayornis phoebe*	
2	**Viréo aux yeux rouges** *Vireo olivaceus*	
1	**Corneille d'Amérique** *Corvus brachyrhynchos*	
1	**Grand Corbeau** *Corvus corax*	
2	**Mésange à tête noire** *Poecile atricapillus*	
8	**Étourneau sansonnet** *Sturnus vulgaris*	
3	**Merle d'Amérique** *Turdus migratorius*	
1	**Bruant chanteur** *Melospiza melodia*	
1	**Paruline jaune** *Setophaga petechia*	

- **Paradižnikova** *Solnična pečenka*

eBird Québec

LISTE D'OBSERVATION S88950409

lun. **24 mai 2021** 11:14

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

2

Soumise à partir de eBird pour iOS, version 2.4.35

24 Espèces observées

2	**Canard noir**	*Anas rubripes*
9	**Grand Harle**	*Mergus merganser*
2	**Chevalier grivelé**	*Actitis macularius*
3	**Goéland argenté**	*Larus argentatus*
2	**Plongeon huard**	*Gavia immer*
1	**Cormoran à aigrettes**	*Nannopterum auritum*
3	**Urubu à tête rouge**	*Cathartes aura*
1	**Faucon émerillon**	*Falco columbarius*
1	**Viréo aux yeux rouges**	*Vireo olivaceus* INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**
1	Viréo de Philadelphie ou V. aux yeux rouges	*Vireo philadelphicus/olivaceus*
2	**Geai bleu**	*Cyanocitta cristata*
1	**Corneille d'Amérique**	*Corvus brachyrhynchos* INDICE DE NIDIFICATION ET DE COMPORTEMENT: **CF Adulte transportant de la nourriture (Confirmé)**

6	**Hirondelle bicolore**	*Tachycineta bicolor*
2	**Hirondelle rustique**	*Hirundo rustica*
3	**Étourneau sansonnet**	*Sturnus vulgaris*
1	**Moqueur roux**	*Toxostoma rufum*
1	**Grive à joues grises**	*Catharus minimus* Cri sur la rive ontarienne
2	**Jaseur d'Amérique**	*Bombycilla cedrorum*
1	**Chardonneret jaune**	*Spinus tristis*
1	**Bruant familier**	*Spizella passerina*
2	**Bruant chanteur**	*Melospiza melodia*
3	**Quiscale bronzé**	*Quiscalus quiscula*
1	**Paruline couronnée**	*Seiurus aurocapilla*
2	**Paruline jaune**	*Setophaga petechia*
1	**Paruline rayée**	*Setophaga striata*

eBird Québec

LISTE D'OBSERVATION S88994906

mar. **25 mai 2021** 08:04

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.4.35

20 Espèces observées

31	**Bernache du Canada**	*Branta canadensis*
4	**Grand Harle**	*Mergus merganser*
2	**Goéland argenté**	*Larus argentatus*
2	**Plongeon huard**	*Gavia immer*
1	**Cormoran à aigrettes**	*Nannopterum auritum*
1	**Martin-pêcheur d'Amérique**	*Megaceryle alcyon*
4	**Geai bleu**	*Cyanocitta cristata*
2	**Corneille d'Amérique**	*Corvus brachyrhynchos*
1	**Grand Corbeau**	*Corvus corax*
6	**Hirondelle bicolore**	*Tachycineta bicolor*
3	**Étourneau sansonnet**	*Sturnus vulgaris*
1	**Moqueur roux**	*Toxostoma rufum*
3	**Merle d'Amérique**	*Turdus migratorius*
1	**Bruant familier**	*Spizella passerina*

2	**Bruant à gorge blanche**	*Zonotrichia albicollis*
2	**Bruant chanteur**	*Melospiza melodia*
1	**Paruline couronnée**	*Seiurus aurocapilla*
1	**Paruline flamboyante**	*Setophaga ruticilla*
2	**Paruline jaune**	*Setophaga petechia*
1	**Paruline à flancs marron**	*Setophaga pensylvanica*

eBird Québec

LISTE D'OBSERVATION S89038807

mer. **26 mai 2021** 06:34

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

2

Soumise à partir de eBird pour iOS, version 2.4.35

17 Espèces observées

6	**Grand Harle** *Mergus merganser*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **P Couple dans un habitat favorable (Probable)**
5	**Pigeon biset (forme domestique)** *Columba livia (Feral Pigeon)*	
1	**Chevalier grivelé** *Actitis macularius*	
4	**Goéland argenté** *Larus argentatus*	
2	**Plongeon huard** *Gavia immer*	
1	**Urubu à tête rouge** *Cathartes aura*	
1	Viréo de Philadelphie ou V. aux yeux rouges *Vireo philadelphicus/olivaceus*	
3	**Geai bleu** *Cyanocitta cristata*	
1	**Corneille d'Amérique** *Corvus brachyrhynchos*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **ON Nid occupé (Confirmé)**
2	**Grand Corbeau** *Corvus corax*	
6	**Hirondelle bicolore** *Tachycineta bicolor*	
1	**Hirondelle rustique** *Hirundo rustica*	

1	**Jaseur d'Amérique**	*Bombycilla cedrorum*
2	**Bruant chanteur**	*Melospiza melodia*
1	**Paruline flamboyante**	*Setophaga ruticilla*
1	**Paruline jaune**	*Setophaga petechia*
1	**Paruline rayée**	*Setophaga striata*
2	**Paruline à croupion jaune**	*Setophaga coronata*

eBird Québec

LISTE D'OBSERVATION S89093818

jeu. **27 mai 2021** 06:53

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

2

Soumise à partir de eBird pour iOS, version 2.4.35

12 Espèces observées

1	**Grand Harle**	*Mergus merganser*
1	**Chevalier grivelé**	*Actitis macularius*
1	**Goéland argenté**	*Larus argentatus*
2	**Plongeon huard**	*Gavia immer*
3	**Corneille d'Amérique**	*Corvus brachyrhynchos*
1	**Grand Corbeau**	*Corvus corax*
3	**Hirondelle bicolore**	*Tachycineta bicolor*
1	**Étourneau sansonnet**	*Sturnus vulgaris*
2	**Merle d'Amérique**	*Turdus migratorius*
	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**	
2	**Chardonneret jaune**	*Spinus tristis*
1	**Bruant chanteur**	*Melospiza melodia*
	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**	
2	**Ouiscale bronzé**	*Ouiscalus auiscula*

eBird Québec

LISTE D'OBSERVATION S89126166

ven. **28 mai 2021** 06:46

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

2

Soumise à partir de eBird pour iOS, version 2.4.35

10 Espèces observées

2	**Goéland argenté**	*Larus argentatus*
1	**Plongeon huard**	*Gavia immer*
1	**Viréo aux yeux rouges**	*Vireo olivaceus*
1	**Geai bleu**	*Cyanocitta cristata*
1	**Grive fauve**	*Catharus fuscescens*
1	**Merle d'Amérique**	*Turdus migratorius*
1	**Bruant à gorge blanche**	*Zonotrichia albicollis*
2	**Bruant chanteur**	*Melospiza melodia*
1	**Paruline couronnée**	*Seiurus aurocapilla*
1	**Paruline à tête cendrée**	*Setophaga magnolia*

eBird Québec

LISTE D'OBSERVATION S89982695

mer. **9 juin 2021** 06:56

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

30 Espèces observées

2	**Canard noir** *Anas rubripes*
1	**Garrot à oeil d'or** *Bucephala clangula* Avec 10 canetons INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**
1	**Grand Harle** *Mergus merganser*
1	**Chevalier grivelé** *Actitis macularius*
3	**Plongeon huard** *Gavia immer*
1	**Pygargue à tête blanche** *Haliaeetus leucocephalus*
1	**Petite Buse** *Buteo platypterus*
1	**Martin-pêcheur d'Amérique** *Megaceryle alcyon*
1	**Pioui de l'Est** *Contopus virens*
1	**Moucherolle phébi** *Sayornis phoebe*
4	**Viréo aux yeux rouges** *Vireo olivaceus*
1	**Geai bleu** *Cyanocitta cristata*

3	**Corneille d'Amérique**	*Corvus brachyrhynchos*
2	**Mésange à tête noire**	*Poecile atricapillus*
2	**Hirondelle rustique**	*Hirundo rustica*
1	**Sittelle à poitrine blanche**	*Sitta carolinensis*
1	**Moqueur roux**	*Toxostoma rufum*
1	**Grive fauve**	*Catharus fuscescens*
1	**Grive à dos olive**	*Catharus ustulatus*
1	**Merle d'Amérique**	*Turdus migratorius*
1	**Chardonneret jaune**	*Spinus tristis*
1	**Bruant familier**	*Spizella passerina*
1	**Bruant à gorge blanche**	*Zonotrichia albicollis*
1	**Bruant chanteur**	*Melospiza melodia*
1	**Paruline noir et blanc**	*Mniotilta varia*
1	**Paruline masquée**	*Geothlypis trichas*
2	**Paruline flamboyante**	*Setophaga ruticilla*
1	**Paruline jaune**	*Setophaga petechia*
2	**Paruline à flancs marron**	*Setophaga pensylvanica*
1	**Paruline à croupion jaune**	*Setophaga coronata*

eBird Québec

LISTE D'OBSERVATION S90078631

ven. **11 juin 2021** 07:07

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois

Observation informelle Incomplète

2

Soumise à partir de eBird pour iOS, version 2.5.23

1 Espèces observées

3 **Quiscale bronzé** *Quiscalus quiscula*

eBird Québec

LISTE D'OBSERVATION S90073806

sam. **12 juin 2021** 07:23

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

23 Espèces observées

30	**Bernache du Canada** *Branta canadensis*	
2	**Grand Harle** *Mergus merganser* Femelle	
2	**Martinet ramoneur** *Chaetura pelagica*	
3	**Goéland argenté** *Larus argentatus*	
1	**Plongeon huard** *Gavia immer*	
1	**Pygargue à tête blanche** *Haliaeetus leucocephalus*	
1	**Pic flamboyant** *Colaptes auratus*	
1	**Moucherolle phébi** *Sayornis phoebe* INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**	
3	**Viréo aux yeux rouges** *Vireo olivaceus* INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**	
1	**Geai bleu** *Cyanocitta cristata*	
3	**Corneille d'Amérique** *Corvus brachyrhynchos*	

1 **Grand Corbeau** *Corvus corax*

2 **Mésange à tête noire** *Poecile atricapillus*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

4 **Hirondelle bicolore** *Tachycineta bicolor*

1 **Moqueur roux** *Toxostoma rufum*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**

1 **Grive fauve** *Catharus fuscescens*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

3 **Merle d'Amérique** *Turdus migratorius*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

2 **Bruant familier** *Spizella passerina*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

3 **Bruant chanteur** *Melospiza melodia*

5 **Quiscale bronzé** *Quiscalus quiscula*

2 **Paruline flamboyante** *Setophaga ruticilla*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

3 **Paruline jaune** *Setophaga petechia*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

2 **Paruline à croupion jaune** *Setophaga coronata*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

eBird Québec

LISTE D'OBSERVATION S90301765

dim. **13 juin 2021** 07:39

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

2

Soumise à partir de eBird pour iOS, version 2.5.23

8 Espèces observées

2	**Goéland argenté**	*Larus argentatus*
1	**Plongeon huard**	*Gavia immer*
1	**Pygargue à tête blanche**	*Haliaeetus leucocephalus*
1	**Viréo aux yeux rouges**	*Vireo olivaceus*
1	**Grand Corbeau**	*Corvus corax*
1	**Moqueur chat**	*Dumetella carolinensis*
1	**Merle d'Amérique**	*Turdus migratorius*
1	**Bruant familier**	*Spizella passerina*

eBird Québec

LISTE D'OBSERVATION S90193435

lun. **14 juin 2021** 11:23

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

14 Espèces observées

2	**Grand Harle** *Mergus merganser*	Femelles
2	**Goéland argenté** *Larus argentatus*	
1	**Plongeon huard** *Gavia immer*	
1	**Urubu à tête rouge** *Cathartes aura*	
1	**Faucon émerillon** *Falco columbarius*	
1	**Faucon pèlerin** *Falco peregrinus*	Grand faucon Traversant la rivière et regagnant l'usine Tembec
1	**Viréo aux yeux rouges** *Vireo olivaceus*	
1	**Geai bleu** *Cyanocitta cristata*	
2	**Corneille d'Amérique** *Corvus brachyrhynchos*	
3	**Hirondelle bicolore** *Tachycineta bicolor*	
2	**Étourneau sansonnet** *Sturnus vulgaris*	
1	**Bruant chanteur** *Melospiza melodia*	
2	**Quiscale bronzé** *Quiscalus quiscula*	
1	**Paruline jaune** *Setophaga petechia*	

- **Paradine jadne** *Setophaga petechia*

eBird Québec

LISTE D'OBSERVATION S90301737

mer. **16 juin 2021** 07:33

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

5 Espèces observées

2	**Grand Harle**	*Mergus merganser*
3	**Goéland argenté**	*Larus argentatus*
1	**Plongeon huard**	*Gavia immer*
1	**Corneille d'Amérique**	*Corvus brachyrhynchos*
1	**Paruline flamboyante**	*Setophaga ruticilla*

eBird Québec

LISTE D'OBSERVATION S90339973

jeu. **17 juin 2021** 06:46

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

19 Espèces observées

2	**Grand Harle**	*Mergus merganser*
4	**Goéland argenté**	*Larus argentatus*
1	**Plongeon huard**	*Gavia immer*
1	**Cormoran à aigrettes**	*Nannopterum auritum*
1	**Petite Buse**	*Buteo platypterus*
1	**Moucherolle phébi**	*Sayornis phoebe*
3	**Viréo aux yeux rouges**	*Vireo olivaceus*
1	**Corneille d'Amérique**	*Corvus brachyrhynchos*
4	**Grand Corbeau**	*Corvus corax*
4	**Hirondelle bicolore**	*Tachycineta bicolor*
1	**Hirondelle rustique**	*Hirundo rustica*
2	**Troglodyte familier**	*Troglodytes aedon*

Au moins deux mâles près de la marina qui chante

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

2	**Moqueur chat**	*Dumetella carolinensis*
4	**Merle d'Amérique**	*Turdus migratorius*
2	**Bruant familier**	*Spizella passerina*
5	**Bruant chanteur**	*Melospiza melodia*
5	**Quiscale bronzé**	*Quiscalus quiscula*
2	**Paruline flamboyante**	*Setophaga ruticilla*
1	**Paruline jaune**	*Setophaga petechia*

eBird Québec

LISTE D'OBSERVATION S90414625

ven. **18 juin 2021** 06:34

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

17 Espèces observées

4 **Canard noir** *Anas rubripes*

2 **Grand Harle** *Mergus merganser*
INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**

5 **Goéland argenté** *Larus argentatus*

3 **Plongeon huard** *Gavia immer*
Adulte et Ensemble

1 **Pygargue à tête blanche** *Haliaeetus leucocephalus*
Adulte

3 **Corneille d'Amérique** *Corvus brachyrhynchos*

2 **Grand Corbeau** *Corvus corax*

6 **Hirondelle bicolore** *Tachycineta bicolor*

2 **Hirondelle rustique** *Hirundo rustica*

2 **Moqueur roux** *Toxostoma rufum*
INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

3 **Merle d'Amérique** *Turdus migratorius*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FY Adulte nourrissant un jeune (Confirmé)**

---

5 **Jaseur d'Amérique** *Bombycilla cedrorum*

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2 **Bruant chanteur** *Melospiza melodia*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

---

4 **Quiscale bronzé** *Quiscalus quiscula*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **CF Adulte transportant de la nourriture (Confirmé)**

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1 **Paruline noir et blanc** *Mniotilta varia*

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1 **Paruline jaune** *Setophaga petechia*

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1 **Paruline à croupion jaune** *Setophaga coronata*

eBird Québec

LISTE D'OBSERVATION S90467592

sam. **19 juin 2021** 07:11

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

18 Espèces observées

1	**Garrot à oeil d'or** *Bucephala clangula*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**
1	**Grand Harle** *Mergus merganser*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**
1	**Pluvier kildir** *Charadrius vociferus*	
3	**Goéland argenté** *Larus argentatus*	
2	**Plongeon huard** *Gavia immer*	
1	**Petite Buse** *Buteo platypterus*	
4	**Hirondelle bicolore** *Tachycineta bicolor*	
1	**Hirondelle rustique** *Hirundo rustica*	
1	**Étourneau sansonnet** *Sturnus vulgaris*	
4	**Merle d'Amérique** *Turdus migratorius*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**
1	**Bruant à gorge blanche** *Zonotrichia albicollis*	

1	**Bruant des prés**	*Passerculus sandwichensis*
2	**Bruant chanteur**	*Melospiza melodia*
3	**Quiscale bronzé**	*Quiscalus quiscula*
1	**Paruline couronnée**	*Seiurus aurocapilla*
1	**Paruline flamboyante**	*Setophaga ruticilla*
1	**Paruline jaune**	*Setophaga petechia*
1	**Paruline à flancs marron**	*Setophaga pensylvanica*

eBird Québec

LISTE D'OBSERVATION S90536911

dim. **20 juin 2021** 07:36

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

14 Espèces observées

2	**Canard noir** *Anas rubripes*	
1	**Grand Harle** *Mergus merganser*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**
4	**Goéland argenté** *Larus argentatus*	
2	**Plongeon huard** *Gavia immer*	
1	**Martin-pêcheur d'Amérique** *Megaceryle alcyon*	
5	**Viréo aux yeux rouges** *Vireo olivaceus*	
4	**Hirondelle bicolore** *Tachycineta bicolor*	
1	**Moqueur roux** *Toxostoma rufum*	
2	**Merle d'Amérique** *Turdus migratorius*	
4	**Bruant chanteur** *Melospiza melodia*	
2	**Quiscale bronzé** *Quiscalus quiscula*	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **CF Adulte transportant de la nourriture (Confirmé)**
1	**Paruline couronnée** *Seiurus aurocapilla*	

1 **Paruline couronnée** *Seiurus aurocapilla*

1 **Paruline noir et blanc** *Mniotilta varia*

1 **Paruline flamboyante** *Setophaga ruticilla*

eBird Québec

LISTE D'OBSERVATION S90584198

lun. **21 juin 2021** 07:57

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.5.23

9 Espèces observées

1	**Goéland argenté**	*Larus argentatus*
1	**Plongeon huard**	*Gavia immer*
1	**Moucherolle phébi**	*Sayornis phoebe*
1	**Viréo aux yeux rouges**	*Vireo olivaceus*
2	**Jaseur d'Amérique**	*Bombycilla cedrorum*
	INDICE DE NIDIFICATION ET DE COMPORTEMENT: **CN Transport de matériel de nidification (Confirmé)**	
1	**Chardonneret jaune**	*Spinus tristis*
2	**Bruant des prés**	*Passerculus sandwichensis*
2	**Bruant chanteur**	*Melospiza melodia*
1	**Paruline jaune**	*Setophaga petechia*

eBird Québec

LISTE D'OBSERVATION S90884946

mar. **22 juin 2021** 05:37

Barrage Témiscamingue Témiscamingue Comté, Quebec, Canada

Daniel Néron

Marie-Pierre Langlois, Samuel Boucher

Observation informelle Incomplète

3

Soumise à partir de eBird pour iOS, version 2.6.9

16 Espèces observées

1 Garrot à oeil d'or *Bucephala clangula*
INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**

8 Martinet ramoneur *Chaetura pelagica*

1 Goéland argenté *Larus argentatus*

2 Plongeon huard *Gavia immer*

1 Pygargue à tête blanche *Haliaeetus leucocephalus*

1 Pic chevelu *Dryobates villosus*
INDICE DE NIDIFICATION ET DE COMPORTEMENT: **H Habitat favorable (Possible)**

1 Viréo aux yeux rouges *Vireo olivaceus*
INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**

1 Corneille d'Amérique *Corvus brachyrhynchos*

3 Hirondelle bicolore *Tachycineta bicolor*

2 Grive fauve *Catharus fuscescens*
INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**

1 **Chardonneret jaune** *Spinus tristis*

---

1 **Bruant à gorge blanche** *Zonotrichia albicollis*

---

1 **Bruant des prés** *Passerculus sandwichensis*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S Individu chantant (Possible)**

---

3 **Bruant chanteur** *Melospiza melodia*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **FL Jeune ayant récemment quitté le nid (Confirmé)**

---

1 **Paruline noir et blanc** *Mniotilta varia*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**

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1 **Paruline à croupion jaune** *Setophaga coronata*

INDICE DE NIDIFICATION ET DE COMPORTEMENT: **S7 Individus chantant pendant 7 jours ou plus (Probable)**

APPENDIX F – SART TIMISKAMING DAM BAT ASSESSMENT

2021-2022

TDQRP SART Indigenous-led Assessment
Kitchi Sibi Technical Team
prepared and presented by Mike Laderoute

TIMISKAMING DAM BAT ASSESSMENT

The Timiskaming dam replacement project falls within the Kitchi Sibi territory. The Kitchi Sibi has been monitoring and surveying for species at risk in and around the dam replacement project. Starting August 7th 2021, bat monitoring with sight and bat monitoring equipment was conducted. On July 11th 2022 hand held units recorded bats near the dam.



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INTRODUCTION

LIFE HISTORY

In Ontario and Quebec there are 8 different species of bats 3 of which are endangered, the little brown bat, the tri coloured bat, and the Northern myotis (*Myotis septentrionalis)* . The Kitchi Sibi Tech Team spares no effort to monitor and protect species at risk in and around the territory. These bats have a long history in Canada on our territory. Bats have been a huge part of the Anishinabe culture as far back as we can trace. We can see this from stories and drawings our First Nation Ancestors have created and left us. “Humans have caused the extinction of several species of bat in modern history, the most recent being the Christmas Island pipistrelle (Pipistrellus murrayi), which was declared extinct in 2009.” [Ceballos, G.; Ehrlich, A. H.; Ehrlich, P. R. (2015). The Annihilation of Nature: Human Extinction of Birds and Mammals.]

HABITAT

For the bats, there are 3 types of habitat and strategies they follow for the winter months including, mines and caves, buildings, and migration. Old buildings such the pump houses, marinas, and old power plants can act like a mine or cave. Most bats hunt insects over the water, so closer roosts to the water are ideal for the bats. Bats will also use 4 types of roosts, in the case of over wintering bats they will use mines and caves and form hibernacula. Day, night, roosts are for the bats to take a break some would be on trees or under bridges for example. Finally maternity roosts, where female bats can give birth and rear their pups. Bats can live for 10-20 years in the wild.



RANGE

The Little brown bat is only found in North America and has a strong distribution throughout central North America.



Figure 4 Global distribution of Little brown bat (hww.ca/en/wildlife/)

The Northern myotis bats global range is North America. These bats are associated with boreal forests, choosing to roost under loose bark and in the cavities of trees. These bats hibernate from October or November to March or April, most often in caves or abandoned mine.

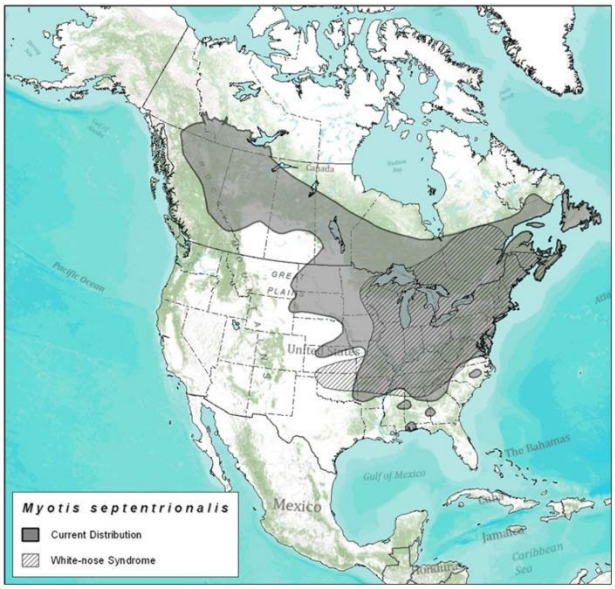


Figure 5 Northern myotis global distribution (Canada.ca/environment-climate-change)

The Tricolour is an eastern North American species that ranges from the Maritimes to the Great Lakes, and south to the eastern coast of Central America (van Zyll de Jong 1985) The species

appears to be expanding its range westward into the US prairies, possibly by using new dams and mines for hibernacula (Geluso et al. 2004).

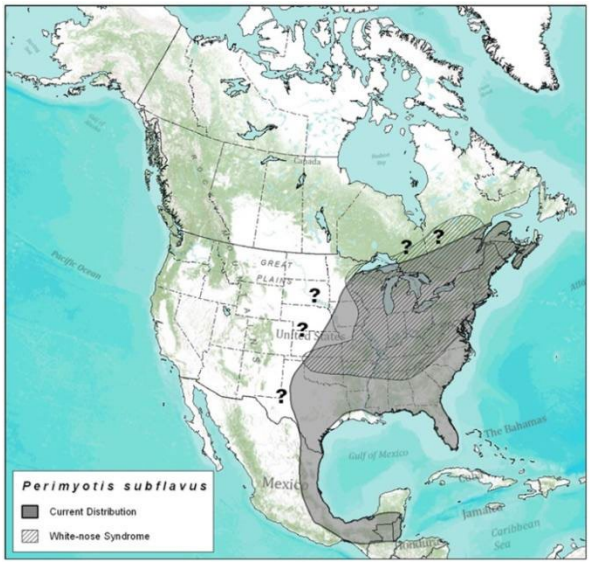


Figure 6 Tricolour bat global distribution (Canada.ca/environment-climate-change)



STUDY SITE

The old Timiskaming Dam Complex is nearing the end of its life. They are to build a new structure 25 metres downstream of the existing dam. After the new structure is finished, they will demolish the old structure. The new dam will take over the task of regulating water flow in the river.

Like the old dam, the new dam will have a 2-lane roadway that connects the provinces of Quebec and Ontario. The new structure will be approximately 75 metres long. It will include 10 bays. The bays will have mechanical gates that open and close to regulate the flow of water. These gates are called sluice gates.

The new dam will use gates instead of logs, making it easier to manage and operate. As well, a new fish ladder is being considered. The ladder would allow fish to pass from downstream to upstream of the structure. This fish passage is planned to be about 140 metres long. The ladders will be located on Long Sault Island.

The old power plant located north of the dam (Fig 8) was also surveyed and 3 rocket box's (bat recording devices) were placed in key open locations to have a wide range to collect and record bat echolocation. They were placed in the basement, on the top floor, and one on the main level. Old buildings close to water such as pump houses, marinas, and this old power station can be a main hibernaculum roost for overwintering bat species, 3 of which are endangered. The plant was built by the Gatineau Company Ltd, a subsidiary of the Canadian International Paper Co., before 1920. It is now private property and in use by RYAM.





Figure 7 Timiskaming dam in yellow both dams in blue Tembec paper mill in red
Figure 8 Old Timiskaming power plant

MATERIALS AND METHODS

MATERIALS

-PPE

-Binoculars

-Maps

-Pencil/pen

-Book/paper

-GPS

-Field guides

-Rocket boxes

-Hand held sonar

METHODS

Firstly when arriving at the Timiscaming dam, binoculars were carefully taken out and equipped. Birds were observed by sight and sound, and recorded in the book. Walking around the area we look for bird nests, such as cavity nests, stick nests, and grass nests. If nests were present a photo, and GPS point was taken and the species most likely to be using it was recorded. Bird's signs such as woodpecker holes in trees, and tracks in the mud were also recorded. Bats and Birds seem to like to use the same places to roost.

Rebecca Geauvreau, a bat expert from FRICORP, helped us set up the rocket boxes (bat sound recorder) in the old power plant north of the dam. 3 rocket boxes were set up in different locations in the abandoned building. Upstairs, downstairs, and the main floor were chosen to be key areas to set up the boxes. The box's radar needs to be facing an open area to limit the amount of noise disturbances for the data.

Samples of bat guano were taken and sent to Northern Arizona University for analysis. When looking for and collecting bat guano it is important to sample bat droppings and no other mammal's droppings. It is important to view the surroundings of where the droppings were found; bats will be or have roosting spots above the guano pile. If that is the case you might be on to bat poop. It is also important to look if the droppings are shiny. Bats eat insects with shiny exoskeletons; therefore their guano will also appear shiny to sight.

Young and pup bats have been known to make a small chirp like noise waiting for their mothers to return to the maternity roost. This noise was listened for and binoculars were also used to look into tight corners of the building in search of bats and birds. When looking for SAR plants, ID apps work very well to help identify species. Guide books help for plants, birds, bat, and bug ID.

RESULTS

BAT SURVEY

On August 8th 3 Song Meter SM4BAT FS and 3 SMM-U2 ultrasonic microphones (bat recording devices) (Fig11 & 12) were placed in the old power plant at a GPS point of 46.7198178, -79.1055747. These devices are able to pick up the echolocation sounds from the bats around them and analyze what bat species are present via the recording. Guano samples were taken from a corner with a possible roost above in the basement level. (Fig 13) The samples were sent off to Northern Arizona University for analysis. The results came in to be 100% Big brown bat guano (Fig 13).The recording device came back with results showing 789 Big brown bat, 1108 Eastern red bat, 1349 Hoary bat, 2130 Silver-haired bat, 754 Little brown bat, 3 Small-footed bats, 365 Tricolored bat, and 2 Northern long-eared myotis sounds. (Fig 14) Under the Timiskaming bridge pups could be heard chirping.





Figure 11 & 12 Song meter and Ultrasonic microphone



Figure 13 Bat guano sampled

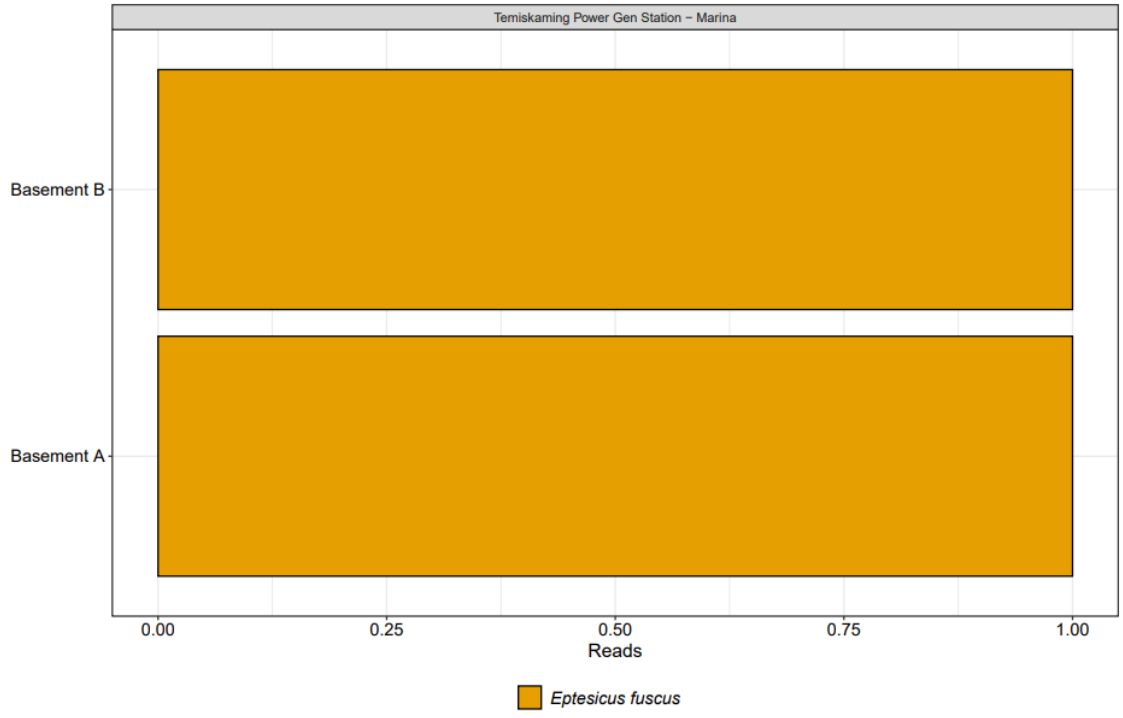


Figure 14 Bat guano test results Big brown bat

DISCUSSION

The bat Survey was a great success with a great turn out in results and we are happy with the data turn out and findings of 3 endangered bat species. Results suggest that the old power plant is a hibernaculum for the bats during winter and the site should be protected. No signs of white nose syndrome that affects and kills bats were found in the power plant. White nose syndrome is a fungus whose host is bats. The fungus gets into and affects the bats noses where it slowly spreads and grows bigger. While growing the fungi affects the bats energy levels and weakens the bat to the point of death. The White fungi exposed on the bats nose spread fungi spores in the air that will affect other bats present. If white nose syndrome gets into bats hibernaculum it can wipe out a huge number of bats.

Bats are a great control method on insects and without bats insect population can skyrocket. Insect species that prey on humans are also controlled by bats and without them these numbers could also rise.

Some of the bat species use mines and caves as hibernaculum here around Temiscaming Quebec and local areas, there not a lot of natural caves present, leading bats to use buildings like this power plant as their main hibernaculum. Making the power plant a must to protect and monitor to keep white nose syndrome out.

Dietary Overlap with TDQRP

Located within 800 metres of TDQRP project benthic invertebrates and insect populations within this area are a dietary source for these bat populations that must be further assessed. Most benthic invertebrates emerge out of the water during metamorphosis.

CONCLUSION

SPECIES AT RISK FOUND

For Bats the Little brown bat, Tricolor bat, and the Northern long-eared Myotis.

RESCUE EFFECTS

It's important to keep monitoring the Temiskaming Quebec dam area yearly for bat species at risk and introduce methods to help these species succeed in the future. Putting out specially designed box homes for species at risk is a great way to help these species. Bat boxes can be constructed and placed in and around the old power plant and around the dam. These bat boxes can act as maternity, day, and night roosts for certain bat species. Bird boxes can be constructed as well for species at risk birds. Bird boxes offer a safe nesting place for bird species and have been shown to be much affected. Insect home boxes as well can be built and put out around the power plant and dam. These boxes introduce homes to solitary bee species that are at risk in Canada.

There are a lot of invasive and non-native vegetation present around the dam and the power plant. These species can overcrowd native species and even species at risk by competing with them for soil space to grow. These species then affect the insect species around that the bats prey on. Careful manual removal of these species is recommended to encourage native and species at risk plants to move in. It is important when removing native species to do it in a controlled manner not to spread the invasive species seeds around when removing them.

Introduction of vegetation to support bat species at risk is highly recommended. Planting small black ash trees to grow for the future will be very beneficial to bird species that use tall trees to hunt and perch. Ash tree introductions will also encourage more bats to come and stay in the area to roost. Species at risk insects also use the crevasses on the ash to overwinter and nest in. Downed ash trees will also benefit reptiles and amphibians because they add cover on the ground to hide and hunt in. Amphibians will also overwinter under fallen logs on the ground making planting black ash a huge benefit for the future of the area. Also Bee Balm would be great to re plant in the area for hummingbirds and solitary bee populations. The more species at risk vegetation we can plant and introduce to the area will be very beneficial for the species in general and to other species that utilize these plants.

Introducing Cattail species to the water way is a great way to control pollution factors on the species at risk in the area. Cattails can pull metals and contaminants from the environment and filter them out. With fewer pollutants around it will make it easier for species at risk to flourish.

Finally, continuing monitoring of species in the work site during and after construction is very important. This will lay the foundation of the species successes and problems they might be facing in the area. All this baseline data collected is leading to a great future for species at risk. With these rescue attempts implemented native insect populations will rise and stay steady which

in turn will feed the bats. During construction it is very important to keep the dust at minimum, dust in the air can negatively affect bats echolocation skills. In a Study about bats and fog, researchers noticed that the bats would stop and turn back away from walls of fog (Webster F.A). Noise greatly affects a bats skills to echolocate its food. If a bat can't locate its prey it can starve and enter a torpor stage where the bats won't reproduce. When blasting, explosions, and ambient noise are present in the dusk it will result in bats leaving the area. With the possible hibernaculum in the site area, it is important to keep night time noise to an all time low, if any noise at all.

LIST OF FIGURES & REFERENCES

FIGURES

Fig. 4……Little brown bat range map

Fig. 5 ……Northern myotis range map

Fig.6…….....Tricolor bat range map

Fig.7……Timiskaming study site

Fig.8……..……..Timiskaming power plant

Fig.11……Song meter

Fig.12……Ultrasonic microphone

Fig.13……..... Bat guano

Fig.14……..……Bat guano results

REFERENCES

Rebecca's Bat Report…Bat Monitoring Summary Timiskaming Marina Dam August - October 2021.pdf

Rebecca Geauvreau Species at Risk Biologist FRi Ecological Services

Ontario Species at Risk……Species at risk | ontario.ca

Timiskaming Dam Replacements Project…..Timiskaming Dam-Bridge of Quebec Replacement Project - Canada.ca (ceaa-acee.gc.ca)

Webster's F.A: Busnel, R. (Ed.). (2013). *Animal sonar systems* (Vol. 28). Springer Science & Business Media

APPENDIX G – REVISED EIS TABLE 1 ON SPECIES AT RISK

Table 1 - Status, Biology, Habitat, Occurrence and Presence of Species at Risk

Common name used by COSEWIC	COSEWIC Status	Scientific name	Status on Schedule 1 of SARA	Provincial Status (Quebec)	Biology	Distribution - Habitats - Biology HIGHLIGHTS	Overlap between range and study site	Presence of occurrence(s)		Temporary and Permanent Habitat Loss	Replacement/Compensation Habitat	Mitigation, Monitoring, Follow-up Measures
								Field survey(s)	CDPNQ			
Blanding's Turtle	Endangered	*Emydoidea blandingii*	Endangered	Threatened	The Blanding's turtle has an exceptional longevity and a particularly late maturity, even compared to other turtles. It takes14 to 25 years to reach maturity and can successfully reproduce until at least 75 years of age. Mature females produce a clutch every one to three years, and fecundity and reproductive frequency are positively correlated with age. Females make a long distance nesting migration and can travel more than 10 km out of the water. The Blanding's turtle's ability to travel long distances facilitates gene flow between wetlands and perhaps greatly increases reproductive success. The average generation length of this species in Canada is about 40 years.	Southern Quebec (despite isolated records as far north as Abitibi-Témiscamingue and as far east as the Capitale-Nationale region of Quebec City). Wetlands characterized by clear, eutrophic waters.	Possible	-	-	No habitat loss (no wetland on project site).	N/A	General wildlife monitoring in case of accidental presence or catch.
Eastern Painted Turtle	Special Concern	*Chrysemys picta picta*	Special Concern	None	Painted turtles, with their slow growth, late maturation, low juvenile but high adult survival, long lifespan, and low annual reproductive investment, are a good example of the evolutionary strategy of risk allocation common among turtles. In northern populations, low temperatures and a short growing season restrict the annual growth of individuals. Egg and hatchling survival is low and often highly stochastic due to predation. In contrast, adult males and females show an exceptionally high annual survival rate (97-98%), which is important for achieving high reproductive potential over the lifetime of an individual and maintaining population stability. Painted turtles are known to have life spans in excess of 60 years in the wild, but their maximum lifespan and reproductive life span are unknown. Generation length is 29 to 44 years for central painted turtles in subpopulations in Canada, and is likely similar for eastern painted turtles. Life history data show that the Painted Turtle, like other turtle species in Canada, is vulnerable to chronic increases in adult mortality. Mating occurs in spring and fall, nesting in late spring and summer, and egg hatching occurs in the fall. Due to an evolutionarily acquired physiological tolerance to low temperatures and oxygen-poor environments, young are able to overwinter on land in their natal nest, and adults may spend half the year overwintering, inactive, submerged in wetlands with low dissolved oxygen. Although painted turtles have been extensively researched throughout their range, many aspects of their basic biology, particularly that of the eastern painted turtle in Atlantic Canada, remain unknown.	The range of the Central Painted Turtle extends from Ontario and western Quebec to the U.S. states of the Great Lakes and Ohio Valley. Wetlands (e.g., marshes, swamps, ponds, bogs, ancient meanders) and water bodies (e.g., lakes, rivers, streams) that are relatively shallow with low currents and an abundance of vegetation, sun exposure sites, and organic substrate. The species is semi-tolerant to human-modified landscapes and may occasionally inhabit urban ponds and lands subject to human-induced disturbance (e.g., agricultural ponds, impoundments, water treatment facilities).	Yes	Seen in some locations in 2014	Yes, within a 25 km radius	No habitat loss as project site conditions are not favorable to this species (no low current river with abondance of vegetation and organic substrate).	N/A	General wildlife monitoring in case of accidental presence or catch.
Snapping Turtle	Special Concern	*Chelydra serpentina*	Special Concern	None	In Canada, females reach sexual maturity at the late age of 15 to 20 years. Mating occurs in early spring and nesting takes place from late May to late June. The females, faithful to their nesting site, dig a nest where they deposit about 40 eggs. There is only one clutch per year. The eggs hatch in mid to late September. However, if the summer is cool, only a few, if any, develop to hatching. Although sometimes active at night, snapping turtles are primarily diurnal animals. For most of the day, they remain inactive, secluded in shallow water. They may also bask in the sun to raise their internal temperature. As its name suggests, the snapping turtle has a reputation for being snippy. When encountered on land, adults will quickly attack the enemy by extending their long necks, while when disturbed underwater, they usually prefer to flee. Many snapping turtles return to their hibernation site each year. These turtles hibernate alone or in groups, and emerge from their hibernation state in May. The snapping turtle feeds primarily on plants, including Schreber's brasenia, but recently dead or living animals are also part of its diet. Snapping Turtles eat mollusks, insects, small fish, frogs, young turtles and birds. In Algonquin Park, the probability of a snapping turtle embryo surviving to sexual maturity is less than 0.1%. When active, adult snapping turtles need fear only a small number of predators, including mink, other than humans. Hibernating adults may be preyed upon by river otters. Eggs and young turtles are most vulnerable to predation. The most common nest predators are raccoons and red foxes. Nests are frequently parasitized by sarcophagus fly larvae. Studies in Algonquin Provincial Park, Ontario, indicate that the snapping turtle may live for over 100 years.	Southern and central Quebec. Prefers habitat characterized by weak current, soft muddy bottom and dense aquatic vegetation. Ponds, swamps and shallow bays, along rivers, in slow-moving streams or in areas combining several types of aquatic environments. Some individuals manage to survive in urbanized environments, such as golf course basins or irrigation canals, but it is unlikely that a population will be able to settle there.	Yes	Seen in some locations in 2014	Yes, within a 25 km radius	No habitat loss as project site conditions are not favorable to this species (no weak current river, moddy riverbed, abondance of aquatic vegetation).	N/A	General wildlife monitoring in case of accidental presence or catch.
Northern Myotis	Endangered	*Myotis septentrionalis*	Endangered	None	Bats reproduce in promiscuity. Females can give birth to a young (sometimes two in the case of the eastern pipistrelle) from the age of one year. Maximum longevity varies from 15 (eastern pipistrelle) to over 30 years (little brown bat). Survival rate is low for the first year of life, and then becomes highly variable (e.g., 0.6 to 0.9). Generation length is estimated to be 5-10 years for little brown bats and northern bats, and 5-7 years for eastern pipistrelle. The growth rate of a finite population is low, ranging from 0.98 to 1.2.	Wintering in mines and caves, resting in trees or anthropogenic structures. Northern Myotis maternity colonies are strongly associated with forest cover, streams and tree characteristics. Female northern bats make greater use of anthropogenic structures in areas where habitat is fragmented and there are few potential trees for resting	Yes	-	-	No wintering habitat loss. Possible loss of resting habitat in the existing dam structure, although no sighting confirmed.	PSPC intends to integrate nesting structure in final design of the new dam.	Bat specific survey 1 year before deconstruction of existing dam. If bat activity noted, existing dam structure to be covered with nets before spring to avoid bat resting during deconstruction work. Successful use of nesting structure on new dam to be integrated in a 3-year follow-up program.
Little Brown bat	Endangered	*Myotis lucifugus*	Endangered	None	Bats reproduce in promiscuity. Females can give birth to a young (sometimes two in the case of the eastern pipistrelle) from the age of one year. Maximum longevity varies from 15 (eastern pipistrelle) to over 30 years (little brown bat). Survival rate is low for the first year of life, and then becomes highly variable (e.g., 0.6 to 0.9). Generation length is estimated to be 5-10 years for little brown bats and northern bats, and 5-7 years for eastern pipistrelle. The growth rate of a finite population is low, ranging from 0.98 to 1.2.	Little Brown bats are one of only a few bat species that use buildings and other anthropogenic structures (e.g., bat roosts, bridges and barns) to rest (particularly to form maternity colonies). Can use the same site for more than 50 years. Hunt above water	Yes	Presence of a maternity roost in an abandoned building 1 km upstream from the dam on the Quebec side	-	No wintering habitat loss. Possible loss of resting habitat in the existing dam structure, although no sighting confirmed.	PSPC intends to integrate nesting structure in final design of the new dam. An abandonned building 1 km North of the dam is a well documented resting and wintering site available for the species.	Bat specific survey 1 year before deconstruction of exising dam. If bat activity noted, existing dam structure to be covered with nets before spring to avoid bat resting during deconstruction work. Successful use of nesting structure on new dam to be integrated in a 3-year follow-up program.
Tri-colored bat	Endangered	*Perimyotis subflavus*	Endangered	Likely to be designated	Bats reproduce in promiscuity. Females can give birth to a young (sometimes two in the case of the eastern pipistrelle) from the age of one year. Maximum longevity varies from 15 (eastern pipistrelle) to over 30 years (little brown bat). Survival rate is low for the first year of life, and then becomes highly variable (e.g., 0.6 to 0.9). Generation length is estimated to be 5-10 years for little brown bats and northern bats, and 5-7 years for eastern pipistrelle. The growth rate of a finite population is low, ranging from 0.98 to 1.2.	Overwinters in the deepest sections of caves or mines. Hunt over water. Resting sites are in forest environments	Yes	Presence of a maternity roost in an abandoned building 1 km upstream from the dam on the Quebec side	-	No wintering habitat loss. Possible loss of resting habitat in the existing dam structure, although no sighting confirmed.	PSPC intends to integrate nesting structure in final design of the new dam. An abandonned building 1 km North of the dam is a well documented resting and wintering site available for the species.	Bat specific survey 1 year before deconstruction of existing dam. If bat activity noted, existing dam structure to be covered with nets before spring to avoid bat resting during deconstruction work. Successful use of nesting structure on new dam to be integrated in a 3-year follow-up program.
Eastern whip-pour-Will	Threatened	*Antrostomus vociferus*	Threatened	Likely to be designated	Little information is available on this species in Canada. However, it is known that the Whip-poor-will can breed as early as one year of age and that adults appear to be faithful to nesting sites. Early in the nesting season, males establish their territories. In Ontario, egg laying occurs from late May to early July. Females lay two eggs directly on the ground on a bed of leaves. Incubation takes 19 to 21 days. Both parents take care of the young and can raise two broods per year. The male takes care of the first nest as soon as the eggs in the second nest begin to be incubated by the female. The Whip-poor-will is an insectivore feeding on a wide variety of species. It feeds primarily by darting from perches, rather than by hunting its prey in flight like the American Nighthawks. The annual survival rate of adults may be as high as 77%, and the oldest known Whippoorwill was 15 years old.	Associated, in summer as in winter, with pines and oaks. Prefers to nest in semi-open forests or fragmented forests with clearings	Yes	No Spring/Summer eBird List No eBird-EPOQ Fall/Winter Listing	Yes, within a 25 km radius	No habitat loss as project site conditions are not favorable to this species (no pine or oak trees, no semi-open forest). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.

Common Nighthawk	Special Concern	*Chordeiles minor*	Threatened	Likely to be designated	Individuals live an average of 4 to 5 years (Brigham et al., 2011). The Common Nighthawk can utilize disturbed and highly urbanized environments, but its flexibility in this regard is limited by its need for a supply of flying insects for foraging and specific features for nesting (Brigham et al., 2011). In urban environments, where flying insect habitat and suitable nesting site features can be easily characterized (artificial lighting and gravel roofs, respectively), their presence has been directly attributed to these features (Brigham et al. 2011). Nesting Period: In Canada, egg and chick stages typically extend from late May to early August (Rousseu and Drolet, 2017). Nesting may fail due to low or high temperatures, flooding, or predation (Brigham et al., 2011). In early May to mid-June, Common Nighthawks arrive in Canada, where they produce one brood per year. Faithful to nesting sites, females lay an average of two eggs, directly on the ground, until mid-August. Only the female incubates the eggs, which lasts from 16 to 20 days, depending on the region. During this period, she continuously incubates the eggs, while the male feeds her. The chicks remain in the nest from mid-June to the end of August and reach full development at 45 to 52 days of age. The species migrates to South America from mid-August to mid-September. The Common Nighthawk is an aerial insectivore feeding on a wide variety of insects at dawn or dusk. It consumes mainly flying ants and beetles, which it locates with its excellent night vision. If the density of insects is high, the species may feed in groups. Potential predators of adult fish fry include the domestic cat, American Kestrel and Peregrine Falcon. Eggs and nests are frequently preyed upon by several other predators, including American Crows, Common Ravens, gulls and seagulls. The Common Nighthawk lives to be four to five years old.	Nests in a wide variety of open habitats with vegetated soils, such as dunes, beaches, newly logged forests, burns, deforested areas, rocky outcrops, bare rocky terrain, grasslands, pastures, bogs, marshes, lake shores and river banks. roofs covered with gravel (mainly in Montreal).	Yes	No Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	Yes Nesting Last observation: 2007 (25 km radius from the dam)	Temporary grassland loss during construction work. Minimal permanent habitat loss as parts of the grassland will be revegated with shrubs to increase biodiversity and improve habitat for other nesting species valued by Indigenous groups. No nesting couple affected.	Some grassland will be added in former alignment of the road passing on the dam.	General wildlife monitoring in case of accidental presence or catch.
Peregrine Falcon anatum/tundrius	None	*Falco peregrinus anatum/tundrius*	Special Concern	Vulnerablefor anatum andn Likely to be designated for tundrius	The Peregrine Falcon feeds mainly on birds, which it often catches in flight. It sometimes adds bats, rodents and other mammals to its menu. This falcon reaches breeding age in its second year. Adults are very loyal to the nesting site and may reuse the same site year after year for decades. Nests are usually simple depressions in the ground on a cliff ledge. Peregrine Falcons normally produce a single clutch of two to five eggs per year. The clutch, which is largely provided by the female, lasts 32 to 35 days. The young falcons leave the nest about 40 days after hatching, and continue to be fed by the adults. Falcons may remain near the nest for three to six weeks after fledging. Most then disperse over great distances, up to hundreds of kilometers from where they were born. Peregrine life expectancy is 4-5 years, but some individuals have lived to be 20 years old. Although in some areas falcons may be preyed upon by Red Fox, Golden Eagle and Great Horned Owl, predation is not a significant threat to the species. The main causes of mortality are collisions with buildings or vehicles, in the case of young birds taking their first flight, or unfavorable weather conditions (cold, rainy weather) for the northernmost populations. In the fall, most Peregrines migrate to the southern United States, Mexico, Central America and South America. However, some pairs in coastal and northern populations may remain at the nest site throughout the winter if food remains plentiful. This is particularly true of anatum individuals that nest in urban areas in eastern Canada. Its ability to adapt to and nest in the urban environment has been instrumental in the recovery of North American populations of Anatum Peregrines.	Arctic tundra to coastal regions, grasslands and large urban centres. Nests in a crevasse or on the protrusion of a cliff of 50 to 200 m preferably, but sometimes on a ledge of a large building or bridge	Yes	Yes Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	Yes Nesting Last observation: 2010 (25 km radius from the dam)	None as project site not suitable nesting habitat for this species. Hunting opportunity unchanged with replacement of the dam. No nesting couple affected.	N/A	N/A
Golden-winged Warbler	Threatened	*Vermivora chrysoptera*	Threatened	Likely to be designated	In early May, male Golden-winged Warblers arrive in southern Ontario. A week or two later, it is the turn of the females. These small warblers will remain in their breeding habitats until late August and early September. Little is known about the dispersal movements of these migratory birds, but both males and females have been observed to be very faithful to their nesting sites. Golden-winged Warblers typically breed at one year of age and may continue to do so for up to nine years. Pairs build their nests on the ground at the base of a plant and produce only one clutch of 2 to 6 eggs per year. In Ontario, the average female lays 4.75 eggs. When nesting fails, subsequent breeding attempts are common, but a decrease in fecundity is observed. Fifty-five percent of nests sampled in the province had at least one chick fledged, while 45% failed to nest due to predators or abandonment. Eggs and chicks of this species are subject to a variety of predators including raccoons, red foxes, coyotes, ermine, mink, red squirrels, grey squirrels, chipmunks, fisher, striped skunks, blue jays, American crows, American toads, and several species of mice and snakes. Adults probably face a less diverse group of predators. During the breeding season, Golden-winged Warblers are strictly insectivorous. Although their diet consists primarily of pest caterpillars belonging to the moth family, these warblers also eat other moths and their chrysalises, other winged insects and spiders. Similar feeding habits are observed in the areas where they overwinter. Golden-winged and Blue-winged Warblers often breed together when they come in contact. This interbreeding results in two hybrids, Brewster's and Lawrence's Warblers, that resemble either of the original species.	Regeneration areas where young shrubs grow, surrounded by mature forests	Possible	No Spring/Summer eBird List No eBird-EPOQ Fall/Winter Listing	Yes (25 km radius from the dam)	None as project site not suitable habitat for this species (no regeneration areas with shrubs). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.
Rusty Blackbird	Special Concern	*Euphagus carolinus*	Special Concern	Likely to be designated	Rusty Blackbirds are usually monogamous, with pairs isolating to nest on the edges of wetlands. Depending on the latitude, the birds usually reach their nesting grounds in April or May. The female builds the nest near or over a body of water in riparian vegetation. Nests are usually built with coniferous twigs, dead grasses with small roots or other plant parts, mosses and lichens. They are lined with a bed of fine grasses and occasionally feathers, hair and sphagnum moss. The female usually produces one clutch per year and incubates her eggs alone while the male brings her food. Clutches of eggs range from three to six, and incubation takes two weeks. The chicks usually stay in the nest for 11 to 13 days, and may leave for several days before they can fly. Migration begins in late August and continues until early October. Rusty Blackbirds feed primarily on invertebrates, including aquatic insect larvae, crustaceans and snails living in aquatic environments. It may also eat salamanders and small fish. In winter, the Rusty Blackbird supplements its diet with seeds and berries.	In Canada, the Rusty Blackbird is found in all provinces and territories, representing 70% of the North American breeding range. Nesting in the boreal forest where the species prefers the shores of wetlands, such as low-flow streams, bogs, marshes, swamps and beaver ponds, and pasture edges. In winter, the Rusty Blackbird mainly occupies humid forests and, to a lesser extent, cultivated fields.	Yes	No Spring/Summer eBird List No eBird-EPOQ Fall/Winter Listing	Yes (25 km radius from the dam)	None as project construction site not suitable habitat for this species (no boreal forest, no low-flow stream). No nesting couple affected.	N/A	N/A
Barn Swallow	Special Concern	*Hirundo rustica*	Threatened	None	Barn swallows are social throughout the year, as they travel on migration and rest in large dormitories on their wintering grounds. The species is monogamous, but polygamy is common. Barn swallows nest in small, loosely organized colonies that usually consist of no more than about 10 pairs of birds. Nests are mainly made of mud pellets. Egg laying begins in the second week of May in southern Canada. The species frequently produces two broods each year, except in the northernmost regions. This species is a flight feeder, and its specialized diet consists primarily of flying insects.	Nests primarily on and in man-made structures, including barns and outbuildings, garages, houses, bridges and culverts	Yes	Yes Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	No provincial status	Possible loss of nesting habitat in the existing dam structure, although no sighting confirmed. No nesting couple affected.	PSPC intends to integrate nesting structure in final design of the new dam.	Bird specific survey 1 year before deconstruction of existing dam. If bird nesting activity noted, existing dam structure to be covered with nets before spring to avoid bird nesting during deconstruction work. Successful use of nesting structure on new dam to be integrated in a 3-year follow-up program.
Chimney Swift	Threatened	*Chaetura pelagica*	Threatened	Likely to be designated	Chimney Swifts are extremely gregarious birds, feeding and resting in large flocks. These insectivores spend a lot of time in the air to catch their tiny prey. They return to land only to sleep in dormitories or to build their nests and raise their young. Although a chimney usually houses a single pair, larger chimneys often act as dormitories before or after nesting. Many of the dormitories are well known, and many visitors enjoy the sight of hundreds of birds entering the chimneys at sunset. Chimney Swifts are monogamous and generally do not breed until their second year. Pairs usually stay together for life and return to the same nesting site each year. Using its sticky saliva, the Chimney Swift builds a nest of half-cut twigs and cements it to a vertical wall of the chimney. The clutch usually consists of four or five eggs and in Canada there is only one clutch per year. The female and the male share the clutch, which lasts about 20 days. The fledging rate reaches a high average of three young per nest. Chimney Swifts live an average of 4.6 years, although the record longevity for this species is 14 years. Because swifts spend most of their time flying and nesting and resting in hard-to-reach places, they are virtually out of reach of predators. In the fall, large groups of swifts move south through the United States, across the Gulf of Mexico and along the Atlantic coast to South America where they spend the winter. In the spring, Chimney Swifts make much the same journey in reverse, arriving in the southern United States in mid-March.	Associated with urban and rural areas where chimneys are available as a nesting and resting site. Traditional masonry chimneys (made of bricks, clay tiles, concrete blocks or stones) typically found on older religious buildings (churches, rectories, convents, schools), commercial and residential buildings located in neighborhoods built before 1960	Yes	Yes Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	Yes Area of concentration Last observation: 2016 (25 km radius from the dam)	None as project site not suitable habitat for this species (no chimney or open building). No nesting couple affected.	N/A	N/A
Wood Thrush	Threatened	*Hylocichla mustelina*	Threatened	None	Wood Thrushes are usually monogamous, but out-of-pair breeding is also observed. In Canada, most breeding adults arrive on the nesting grounds from mid to late May. Nests are usually located in live saplings, trees or shrubs, usually sugar maple or American beech. Clutches average 4 eggs, and double clutches are common. Incubation lasts 10 to 12 days; both parents care for the young, and they fledge 12 to 15 days after birth. Fledglings remain in the natal home range for 24 to 33 days, then move to the wintering area from mid-August to mid-September. In the Wood Thrush, age at first breeding is one year.	Nests mainly in secondary forests and mature deciduous and mixed forests	Yes	No Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	Yes (25 km radius from the dam)	None as project construction site not suitable habitat for this species (no secondary and mature forest). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.
Eastern wood-pewee	Special Concern	*Contopus virens*	Special Concern	None	The Eastern wood-pewee is considered monogamous, but polygyny has occasionally been observed. In Canada, adults arrive on the breeding grounds primarily from mid to late May. Pairs form and nests are built soon after their arrival. Nests are usually located on a horizontal branch of a live tree, at a height of 2 to 21 m. The clutch size is, on average, 3 eggs. The incubation period lasts 12 to 13 days, and the chicks fledge after 16 to 18 days. Up to 2 broods are produced per year. It is estimated that the duration of a generation is 2 to 3 years.	Middle forest cover of clearings and at the edge of deciduous and mixed forests	Yes	Yes Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	No provincial Status	None as project site not suitable habitat for this species (no middle forest or edge of forest). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.

Olive-sided flycatcher	Special Concern	*Contopus cooperi*	Threatened	Likely to be designated	Olive-sided Flycatchers arrive in Canada to breed between April and June, but mainly in mid to late May. These birds are monogamous and nesting pairs are usually well spaced apart. Females select the nesting site and normally build their nest in conifers from twigs and small roots. They lay one egg per day until the clutch averages three eggs (two to five eggs). Only one clutch is raised each year. The female incubates her eggs alone, and the male will bring her food during this period. The incubation lasts from 15 to 19 days. The female incubates the chicks during their first week of life and both parents feed them. The stay at the nest lasts from 17 to 23 days and, once the nest is left, the young will remain dependent on their parents for food until one week after fledging. Fall migration begins as early as late July, but most birds migrate to the wintering grounds between mid-August and early September. Individuals make migrations of more than 8,000 km. Adult life span is unknown. The Olive-sided Flycatcher is a passive predator that waits, perched on a tree, until it spots insects in flight. It will then actively pursue its prey until it catches it, then return to its perch. Insects of the bee family make up the majority of the diet.	Forest clearings, forest edges near a natural opening (such as a river or swamp) or man-made opening (such as felled forest), burnt forests, or openings in old forest stands	Yes	No Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	Yes (25 km radius from the dam)	None as project site not suitable habitat for this species (no forest or edge of forest). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.
Short-eared Owl	Threatened	*Asio flammeus*	Special Concern	Likely to be designated	Short-eared Owls are nomadic birds and most individuals move around a great deal seasonally and annually. However, owls populating islands seem to exhibit greater fidelity to their breeding sites. In areas where prey is plentiful, the birds congregate in groups. Unlike other owls, this species builds a new nest rather than using an abandoned one. Only the female prepares the nest, which is usually a simple hole in the ground lined with grass and a few feathers. Canadian populations normally raise only one clutch per year. Females may produce a second clutch if nests or eggs are destroyed. Between late April and early June, the female lays an average of four to seven eggs, the clutch size being directly related to the abundance of prey. She incubates the eggs alone for an average of 27 days, while the male stands guard and provides food. Before they can fly, the chicks move away from the nest for short distances, hiding in the surrounding vegetation. Although its diet consists primarily of voles, the Short-eared Owl also feeds on a variety of small mammals, including shrews, gray waffles, mice, kangaroo rats and lemmings. Eggs and chicks are preyed upon by many mammals, including foxes, skunks, and feral cats and dogs. Predatory birds include Great Horned Owls, Snowy Owls, Red-tailed Hawks, Rough-legged Hawks, Northern Harriers, Northern Goshawks, Peregrine Falcons, Herring Gulls, and Common Ravens. The species appears to be sensitive to human activity during the egg-laying and incubation stages, as females usually desert the nest if disturbed during this period.	Dense grasslands, as well as tundra composed of areas of small willows	Yes	No Spring/Summer eBird List No eBird-EPOQ Fall/Winter Listing	Yes (25 km radius from the dam)	None as project site not suitable habitat for this species (no dense grassland or tundra). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.
Bank Swallow	Threatened	*Riparia riparia*	Threatened	None	The Bank Swallow breeds in colonies ranging from a few pairs to a few thousand pairs. In North America, they produce only one clutch per year, and their nesting success is often quite high. The average age of nesters likely ranges from 1.7 to 2 years.	Vertical slopes, including river banks, cliffs along lakes and oceans, aggregate quarries, road trenches and earth piles.	Yes	No Spring/Summer eBird List Yes eBird-EPOQ Fall/Winter Listing	Yes Nesting (25 km radius from the dam)	None as project site not suitable habitat for this species (no vertical slope or suitable river bank). No nesting couple affected.	N/A	General wildlife monitoring in case of accidental presence or catch.
Yellow Rail	Special Concern	*Coturnicops noveboracensis*	Special Concern	Threatened	Yellow rails probably begin breeding at one year of age, and pair formation probably occurs on the nesting grounds. In the wild, males may mate with two or more females in succession, as observed in captivity. Females have only one clutch per year, but may re-nest if the first clutch does not survive. The nest is a roughly scraped depression in the vegetation on the ground, or a few inches above it, which is usually camouflaged by a canopy of dead vegetation. The seven to ten eggs are laid within a day of each other. Once laid, the female incubates her eggs until they hatch 17 or 18 days later. Their hatching is synchronous (they all break at the same time) and after a few hours the young, semi-precocious, can stand on their feet. The success rate of the brood is generally quite high. Two days after hatching, the whole brood follows the female out of the nest; at five days, the young can feed themselves; at 35 days, they can fly. Adults feed on invertebrates and seeds; the diet of the chicks is unknown.	It nests in places in the southern portion of Quebec, mainly along the St. Lawrence River, as far as Gaspésie, and along the Saguenay River. There are also summer mentions in Abitibi-Témiscamingue. Preference for the upper part of large freshwater and brackish water marshes, where vegetation is dense and short. Dense sedge marsh or other low plants.	No	No Spring/Summer eBird List No eBird-EPOQ Fall/Winter Listing	Yes (25 km radius from the dam)	N/A	N/A	N/A
Yellow-banded Bumble Bee	Special Concern	*Bombus terricola*	Special Concern	Likely to be designated	The yellow-banded bumble bee has an annual life cycle. Fertilized queens (founders of new colonies) emerge from their hibernation site in the spring and fly off in search of a potential nesting site. Once they have chosen a site, they stock up on pollen and nectar and return to the nest to lay the eggs that will produce the first cohort of workers. Once they emerge, the workers take over the maintenance of the nest and the supply of pollen and nectar to the colony. At the end of the summer, males and new queens are produced. These breeding individuals leave the colony to mate, and the fertilized queens enter hibernation. Only the young fertilized queens overwinter, and all other castes, including the old queen, die before winter arrives.	Has been reported in all Canadian provinces and territories except Nunavut. Mixed forests, agricultural land, urban areas, mountain meadows, grasslands and boreal environments. Flowers of plants belonging to many genera. Queens hibernate in soil and in decaying organic matter such as rotten tree trunks.	Yes	-	-	Temporary grassland loss during construction work. Improved permanent habitat as parts of the grassland will be revegated with shrubs and other medicinal plants to increase biodiversity and improve habitat for other nesting species valued by Indigenous groups.	Improved permanent habitat as parts of the grassland will be revegated with shrubs and other medicinal plants to increase biodiversity and improve habitat for other nesting species valued by Indigenous groups.	None planned at this point.
Monarch	Endangered	*Danaus plexippus*	Special Concern	None	Adults breed during the winter and early spring on wintering grounds in Mexico or California, then begin their northward migration in late February or early March. About 10% of the eastern population makes the entire trip to Canada, but most of the females that leave the overwintering sites breed in the southern United States. The female monarch lays 300 to 400 eggs, each egg laid individually on the underside of milkweed leaves. Hatching occurs three to eight days after egg laying, then the caterpillar feeds on milkweed leaves almost continuously, increasing its body weight by 2,000 times. After feeding for 9 to 14 days, the caterpillar pupates, and the adult emerges 9 to 15 days later. The next generation of adults continues the northward migration, and many of them breed in the central United States, giving rise to a new generation. Most individuals that reach Canada are actually the great-grandchildren of those that left Mexico. In southern Ontario and Quebec, the species produces two or three generations each year, from June to October. In southern British Columbia, the species produces at least one generation each summer. Summer adults have a lifespan of two to five weeks, but overwintering adults can live up to nine months. Adults that emerge in late summer migrate to Mexico or California, where they overwinter before beginning another migration in the opposite direction. The monarch caterpillar stores chemical compounds found in milkweeds, making the species, also in the adult stage, inedible to most birds and other vertebrates.	The species' breeding range in Canada is south of the 50th parallel in Ontario, Quebec and the Maritimes and south of the 54th parallel in Manitoba, Saskatchewan and Alberta. Milkweed (many species) are the only plants on which the monarch caterpillar feeds. These plants grow mainly in open and periodically disturbed environments, such as roadsides, fields, wetlands, grasslands and open forests.	Yes	-	-	No temporary or permanent habitat loss (no milkweed on site).	Improved permanent habitat as parts of the grassland will be revegated with shrubs and other medicinal plants to increase biodiversity and improve habitat for other nesting species valued by Indigenous groups.	None planned at this point.

APPENDIX H – BAT EXCLUSION GUIDE

DOCUMENT TITLE: BATS IN BUILDINGS: A GUIDE TO SAFE AND HUMANE EXCLUSIONS.

Document Reference: Bat Conservation International. 2011. Bats in Buildings: A Guide to Safe & Humane Exclusions. Austin, Texas, USA. 7pp.

Available online at:
http://www.batcon.org/pdfs/education/fof_ug.pdf

Ce document sera disponible en Français et en Anglais sous peu. Veuillez appeler Pamela Wesley au 705 755-5217 si vous avez des questions.

Summary of Document

The document provides instructions on how to safely and humanely capture and release a stray bat from your living space and how to humanely exclude bats from an area in your home where they are roosting.

Purpose

This document provides details on what you can do when you find a bat in your living space or if you find bats roosting in other areas of your home (e.g. your attic). The document can be used as a do-it-yourself guide to humane bat removal and exclusion in co-ordination with Table 1 below. The Ministry of Natural Resources does not encourage handling of bats due to the risks it can pose to humans and to the bat. Persons who choose to handle a bat do so at their own risk. The document does not address species-specific techniques and does not supersede any species-specific guidance that may exist or become available.

Adaptations, Recommendations and Comments

The document makes reference to capturing a living bat and then releasing it outside for the purposes of removing it from areas that are regularly occupied by people or pets (e.g. not an attic). Before capturing a bat, the Ministry of Natural Resources encourages persons to open their doors and windows and give the bat a reasonable amount of time to escape outside on its own. The Ministry of Natural Resources does not endorse handling of bats due to the risks it can pose to humans and to the bat. Persons who choose to handle a bat do so at their own risk.

The table below identifies the best times of year to undertake various exclusion activities in Ontario based on timing windows suitable to bats in Ontario.
Table 1.

Timing Window	Exclusion Activity
April until early-May Bats may be present but no pups (baby bats) yet	Installing one-way doors in identified openings to evict or exclude bats from the building will let bats exit the building but not re-enter.
mid-May until mid-August Bats and flightless pups present	Immobile pups may be present so any action to evict bats or prevent access (e.g. through the use one way doors or sealing entrances) could present a risk to the pups. Flightless pups will die if they are separated from their mothers. This is a good time to watch the bats exit at dusk to identify openings for exclusion activities at a later date once pups are able to fly.
late-August until November Some bats may remain	Some bats may remain in an attic or basement. Installing one-way doors in identified openings to evict or exclude bats from the building will let bats exit the building but not re-enter.
December until the end of March Some overwintering bats (e.g. big brown bat) might still be present	This is a good time to seal entrances completely (e.g. not through the use of one-way doors, to complete bat proofing before bats arrive back in the spring. However, it is not humane to seal entrances completely until you are sure that all bats have left to hibernate elsewhere and no bats remain. Furthermore, taking action to evict or exclude any remaining bats during winter months would likely result in their death as they are highly vulnerable to the cold.

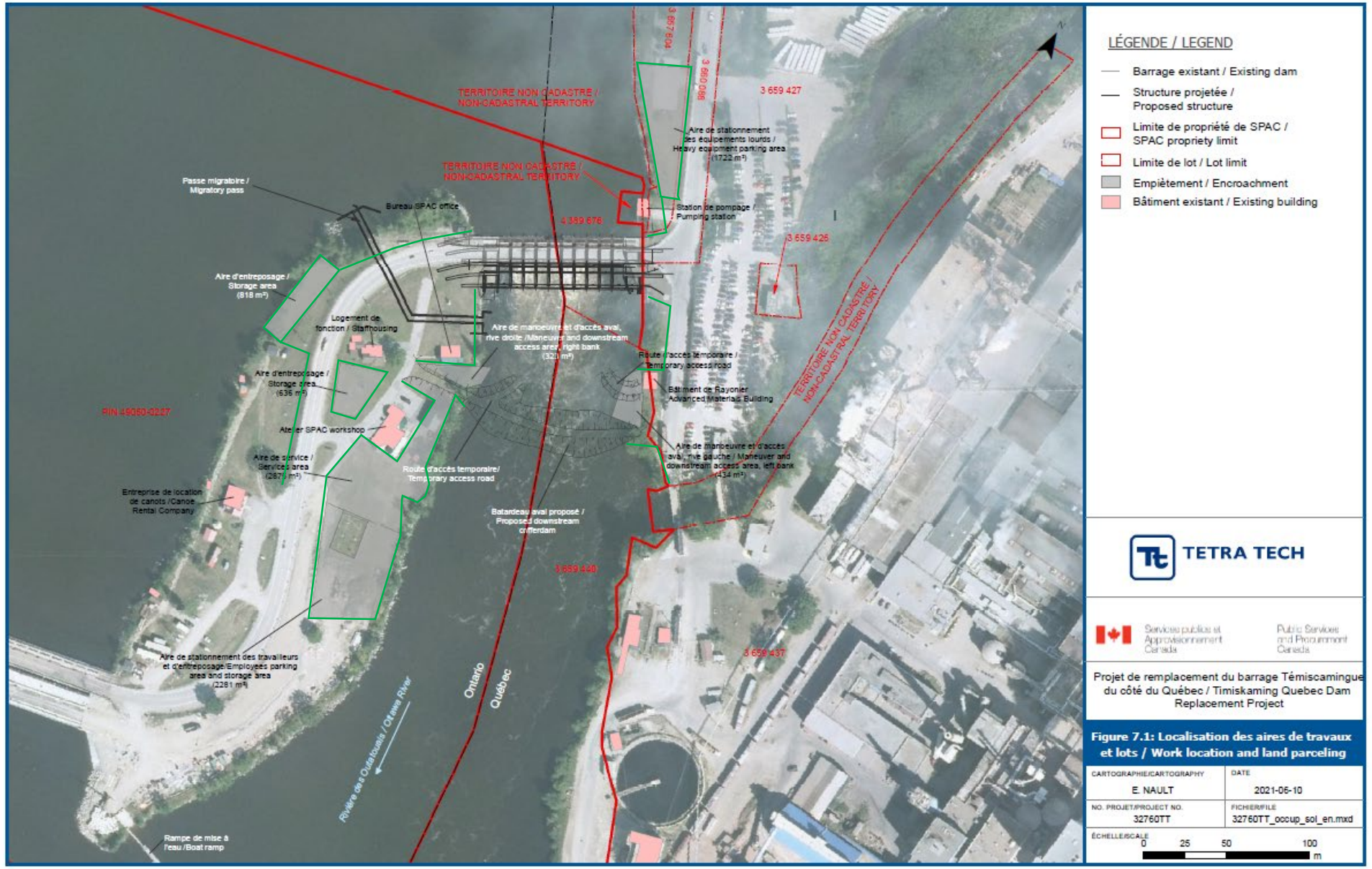
Approvals

If you are considering an activity that may impact a species at risk, permissions, approvals or authorizations may be required from MNR (e.g. Endangered Species Act authorization, Wildlife Scientific Collector's Authorization) or other agencies, levels of government (e.g. a conservation authority, municipality, federal or provincial government), or landowners. It is your responsibility to ensure that all necessary permissions, approvals and authorizations are acquired prior to proceeding with your activity.

Document last updated on: June 19, 2013

For additional information, please contact MNR at: esa.permits.agreements@ontario.ca

APPENDIX I - TURTLE FENCING DRAWING


TERRITOIRE NON CADASTRE / NON-CADASTRAL TERRITORY
TERRITOIRE NON CADASTRE / NON-CADASTRAL TERRITORY
TERRITOIRE NON CADASTRÉ / NON-CADASTRAL TERRITORY
3 660 048
3 659 427
Aire de stationnement des équipements lourds / Heavy equipment parking area (1722 m²)
Station de pompage / Pumping station
4 369 676
3 659 426
Passe migratoire / Migratory pass
Bureau SPAC office
Aire d'entreposage / Storage area (818 m²)
Logement de fonction / Staffhousing
Aire de manoeuvre et d'accès aval, rive droite /Maneuver and downstream access area, right bank (321 m²)
Route d'accès temporaire / Temporary access road
Aire d'entreposage / Storage area (636 m²)
Bâtiment de Rayonier Advanced Materials Building
PIN 49060-0227
Atelier SPAC workshop
Aire de manoeuvre et d'accès aval, rive gauche / Maneuver and downstream access area, left bank (434 m²)
Aire de service / Service area (287 m²)
Route d'accès temporaire/ Temporary access road
Entreprise de location de canots /Canoe Rental Company
Batardeau aval proposé / Proposed downstream cofferdam
3 659 440
3 659 437
Aire de stationnement des travailleurs et d'entreposage/Employees parking area and storage area (2281 m²)
Ontario
Québec
Rivière des Outaouais / Ottawa River
Rampe de mise à l'eau /Boat ramp
N
LÉGENDE / LEGEND
Barrage existant / Existing dam
Structure projetée / Proposed structure
Limite de propriété de SPAC / SPAC propriety limit
Limite de lot / Lot limit
Empiètement / Encroachment
Bâtiment existant / Existing building
TETRA TECH
Services publics et Approvisionnement Canada
Public Services and Procurement Canada
Projet de remplacement du barrage Témiscamingue du côté du Québec / Timiskaming Quebec Dam Replacement Project
Figure 7.1: Localisation des aires de travaux et lots / Work location and land parceling
CARTOGRAPHIE/CARTOGRAPHY
E. NAULT
DATE
2021-06-10
NO. PROJET/PROJECT NO.
32760TT
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0 25 50 100 m

APPENDIX J – SPECIES AT RISK HANDLING MANUAL

Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders

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Introduction

Ontario's *Endangered Species Act, 2007* (ESA) protects endangered and threatened species and their habitats.

Ontario is home to over 30,000 species, about 200 of which are considered at risk. Roughly 40 per cent of the species at risk in Canada are found in Ontario.

Activities that would harm individual species at risk or their habitats are prohibited by the ESA, unless they are authorized under the act. Authorizations include permits, stewardship agreements and exemption agreements.

This manual is designed to provide guidance to those whose authorization under the ESA may require the capture, relocation, handling, and/or transport of species at risk.

Enclosed is both a DVD presentation and CD of this manual which are also available from your Ministry of Natural Resources (MNR) District Office.

For additional information and assistance with species identification, please consult MNR *Ontario Species at Risk Quick Reference Guide*, or email: esa.permits.agreements@ontario.ca.

Visit our wesite **ontario.ca/speciesatrisk** for more general information about all Ontario's species at risk.

1. Safe Handling of Turtles

1.1 Materials

a) The following materials are required for the handling, capture, temporary safe keeping and transport of turtles:

» Large plastic bin and lid with air holes, a large bucket or a cloth/burlap bag. Ensure both sides of the container/bag and the lid are well marked with “live animal”. See section 1.5 to determine when it is appropriate to use a specific type of container.

» Thick work gloves

» Thermometer

» SAR Notification/Contact Schedule

» SAR Encounter Reporting Form

» Broom or broom handle with small paint brush roller attached to end.

b) Equipment must be maintained on each job site.

1.2 Safety considerations

a) Generally, there is little risk associated with handling turtles. However, all turtles can scratch and bite, and work gloves should be worn to help avoid minor injuries.

b) Snapping, Spiny Softshell and Eastern Musk Turtles cannot completely retract into their shell and are more likely to bite in defence. These species should be handled more cautiously and as follows:

I. **Always keep your hands as close to the back of the turtle’s shell as possible, and always behind the midpoint of the shell**. These species have a considerable reach above their shells. Snapping Turtles can reach the midpoint of the shell, and in some cases Spiny Softshell Turtles and Eastern Musk Turtles can almost reach the back of their shell.



II. Always maintain a safe distance between the front of the turtle and other people.

c) Snapping and Spiny Softshell Turtles have a powerful and painful bite that is likely to bruise and may break the skin. However, it will almost never break bone. The damage inflicted by a Snapping Turtle bite is greatly exaggerated (such as being able to bite a boat oar or golf club in half). Forcing a Snapping Turtle to bite hard implements may result in an injury to the turtle. Wearing gloves will significantly reduce the risk of injury from these turtles.

d) If bitten by a turtle, remain calm and allow the turtle to relax and let go on its own. Pulling away from the turtle may cause further injury to you or the turtle.

e) Always wash your hands after handling a turtle. Turtles (and many other animals, including humans) carry potentially harmful bacteria in their gut. Although it is possible to contract salmonella from handling turtles, there are few reported cases of contracting these bacteria from wild turtles. Cases of salmonella poisoning from turtles are almost always limited to pet turtles, since these captive turtles are forced to live in the same small space that they defecate in.

1.3 Capture and handling of turtles

Safely handle, move or capture a turtle by following these steps:

a) Always handle turtles carefully and slowly, yet firmly. Rough handling may cause injury or stress to the turtle and/or the developing eggs and may cause the turtle to be more defensive (increased biting and scratching).

b) With the exception of very small individuals, always handle turtles with both hands. Turtles are good at freeing themselves with a bit of wiggling, kicking, clawing and biting, and a good grip is essential to ensure no harm comes to you or the turtle.

c) Never pick up a turtle by the tail. This can dislocate bones throughout the tail and is extremely painful for the turtle. For larger, heavier turtles this may result in dislocation of bones in the spinal cord as well.

d) Wear gloves when handling turtles to minimize risk from scratches and bites. If gloves are not available, handle turtles with clean hands that are free of insect repellent, antibacterial hand sanitizer, sunscreen, etc.

e) **Painted, Map, Wood, Blanding's and Spotted Turtles:** Pick up these species using both of your hands, one on each side of the shell, between the front and back legs.



f) **Snapping Turtle:** Always wear gloves when handling a Snapping Turtle and always keep your hands behind the midpoint of the top or sides of the turtle's shell. To pick up a Snapping Turtle:

I. Hold it by the back of the shell, placing your thumbs on the top of the shell and your fingers in the hind leg pockets (the space between the upper shell and the hind legs). Your hands will be at approximately 5 and 7 o'clock.



II. Or use one hand to hold the base of the tail near the shell and slide your second hand under the turtle to support its weight. Lift the turtle using the hand underneath the turtle. Never pick up a turtle by the tail.



III. Or you can move it by guiding it into a pail or garbage can with a broom.



IV. It is important to get a good, strong hold on the turtle's shell as the force that is exerted by the turtle snapping may result in an unexpected release. A good grip will ensure that both the turtle and the handler remain safe and uninjured.

g) **Eastern Musk Turtle:** Pick up Eastern Musk Turtles by the back of the shell. This turtle species can be held with one hand, as long as you ensure that you have a good grip.



h) **Spiny Softshell:** Always wear gloves when handling a Spiny Softshell, and always keep your hands well behind the midpoint of the top or sides of the turtle's shell. To pick up a Spiny Softshell turtle:

I. Use both hands, one on each side of the shell, as close as possible to the back legs.



II. Or place one hand under the turtle between its back legs (in the middle to balance its weight) and the other hand, also from behind, on the top of the turtle's shell (close to the back).

i) Turtles can be difficult to capture. If a turtle escapes or heads for cover, let it disperse on its own, ensuring it is safe from harm before allowing activities to continue. If continuing activities poses a threat to the turtle, postpone activities for up to 24 hours to allow the turtle to disperse. If it is not possible to leave the area for 24 hours, have a Qualified Member relocate the individual. Do not disturb any natural cover under which the turtle has retreated. If necessary, contact MNR for further direction using the SAR Notification/ Contact Schedule.

1.4 Moving turtles out of harm's way (distances under 50 metres)

a) If it is necessary to move a turtle more than 50 metres, refer to section 1.6 on turtle relocation.

b) Turtles should only be moved when they are in imminent, unavoidable danger.

c) If possible, allow the turtle to move on its own by walking toward the turtle in the direction that you want it to move. This will not work for Snapping Turtles, as they often turn to face a potential threat head-on rather than running away. If the turtle does not move on its own, you may have to pick it up and move it (see section 1.3).

d) When moving a turtle a short distance, such as across a road, move the turtle in the direction that it was heading, regardless of what the habitat looks like. These animals often make intentional movements to specific areas, and if you put them back where they started they may simply turn around and start their journey again. If it is not clear which direction the turtle was headed, move the turtle to the closest suitable habitat that will not be disturbed. In this case, suitable habitat includes a water body or the vegetation/forest at the edge of the road allowance, disturbed area or clearing.

e) If possible, release the turtle near a retreat site (somewhere the animal can seek shelter from the elements and avoid predators, such as water or dense vegetation) to allow it to take cover. Do not release it in the open where it could be exposed to inclement weather, extreme sunlight or predators.

1.5 Temporary safe keeping and transportation of turtles

a) You are responsible for this animal. Remember, once you have put it in a container, it depends on you to keep it safe and at the right temperature.

b) Always create air holes in the lid of a container prior to placing an animal in the container.

c) If the turtle will be in captivity for **less than one hour**, place the turtle in a cloth or burlap bag, a large bucket or a large plastic bin with a lid that has adequate air holes. Cloth or mesh bags should not be used for snapping turtles as they can become tangled and strangle themselves. Always use large plastic bins or large buckets for snapping turtles.

d) If the turtle will be in captivity for **more than one hour**, avoid the use of cloth or burlap bags. For adults, use a large plastic bin or bucket with a lid that has adequate air holes and a small amount of water (no more than an inch deep). Ensure that the turtle is not fully submerged, as it will drown if it cannot breathe. For hatchlings and juveniles, use an appropriately sized container with a lid that has air holes and line the bottom of the container with wet towels or paper towels. Never transport small juveniles or hatchlings in water.



e) It is extremely important to monitor the air temperature regularly in the container to ensure it **never exceeds 30°C or drops below 5°C**. Never leave the container in direct sunlight or in a closed vehicle parked in the sun, as this will cause the turtle to overheat and could be fatal.

f) Never put more than one turtle in a container or bag at a time, especially in the case of Snapping Turtles. This will help to minimize stress and prevent injury to the turtles.

g) Once the turtle is in the container or bag, ensure that the lid is secure or that the bag is tied tightly.

h) **Never leave the container or bag unattended** in an unsecured location (e.g., side of road).

i) If using a bag, ensure that it is in a secure location where it cannot fall if the turtle moves the bag. The movement of a turtle within a bag can easily cause the bag to fall off of a table.

j) Do not offer the turtle any food. Turtles do not have to eat as often as mammals, and it is no problem for a turtle in temporary captivity to go a few days without food.

k) Turtles should be checked periodically (every hour should suffice). Hatchlings are especially susceptible to dehydration and must be carefully monitored during transport.

1.6 Relocation of turtles

a) A turtle should only be relocated if the destruction of its habitat is unavoidable or if it is not possible to release it at the capture location.

b) Transport and release the turtle within one hour of capture in order to minimize stress on the animal.

c) Turtles should not be relocated during their over-wintering season. This varies depending on the species and location, but is generally from October to May. If you are unsure whether you should relocate the turtle or take it to a wildlife custodian, contact MNR for further direction using the SAR Notification/ Contact Schedule.

d) If it is not possible to relocate the turtle due to the time of year (October to May) or other conditions, transport the turtle to a wildlife custodian per the SAR Notification/Contact Schedule.

e) **Turtles should never be moved more than 250 metres** from the location where they were found. Only move a turtle as far as necessary to avoid potential harm to the turtle, and avoid moving turtles more than 125 metres unless absolutely necessary. If it is not possible to relocate the turtle within 250 metres of the capture location, contact MNR for further direction using the SAR Notification/Contact Schedule.

f) If hatchlings are found and must be relocated, move them to the nearest permanent body of water. Never place hatchlings directly into water. Release the turtle at the shoreline of the appropriate habitat (see below). The turtle may or may not choose to enter the water; do not force it.

g) Whenever possible, release the turtle in the same water body where it was found and in the same type of natural habitat as the capture site. To determine if the habitat is of the same type, consider the water depth, water current, substrate type (mud, rock, etc.) and vegetation type (cattails vs. lily pads vs. aquatic vegetation).

h) If possible, release the turtle near a retreat site (somewhere the animal can seek shelter from the elements and avoid predators, such as water or dense vegetation) to allow it to take cover. Do not release it in the open where it could be exposed to inclement weather, extreme sunlight or predators.

i) To release the turtle, gently pick up the turtle (per section 1.3) from the container and set it down in the new location. To release a Snapping Turtle or Spiny Softshell Turtle, you may wish to tip the container on its side and allow the turtle to move out on its own. Allow the turtle to disperse on its own at this new location.

1.7 Injured turtles

a) Use the methods outlined in section 1.3 to handle injured turtles whenever possible. If those methods are not applicable due to the turtle's injuries, use a shovel or other flat object to pick up the turtle. Ensure that any injured areas are supported.

b) Place the turtle in a large plastic bin or large bucket with a lid that has air holes. Darkness helps to reduce stress to the turtle. Do not place anything else in the container with the turtle, including water or other turtles.

c) Thoroughly wash your hands after handling injured turtles.

d) Immediately transport the turtle to a veterinarian or wildlife custodian per the SAR Notification/Contact Schedule, in order to increase its chances of survival.

2. Safe Handling of Snakes

2.1 Materials

a) The following personal protective equipment should be worn when working with Massasauga rattlesnakes:

» High-ankle hiking or rubber boots

» Thick pants (jeans) or baggy pants

» Leather work gloves

b) The following materials are required for the handling, capture, temporary safe keeping and transport of snakes:

» Pail, large garbage can or bucket (1 metre deep) with air holes in the lid. Ensure both the side of the container and the lid are well marked “live animal” or “caution rattlesnake”.

» A snake bag (for non-venomous species only). A snake bag must be cloth. (A pillowcase works well.) Plastic and non-breathable materials are not appropriate. Ensure the bag is well marked “live animal”.

» Broom or broom handle with small paint brush roller holder attached to end. Never use “snake pinchers”.

» Thermometer

» SAR Notification/Contact Schedule

» SAR Encounter Reporting Form

c) Equipment must be maintained on each job site.

2.2 Safety considerations

a) **The Massasauga is the only venomous snake in Ontario.**

The venom is an adaptation for hunting and is used to kill prey (primarily small rodents).

As a defence mechanism, Massasaugas may also bite when threatened, at which time they may or may not release venom. Camouflage, rattling and retreating are their primary defensive strategies, and they generally bite as a last resort.

Their maximum striking distance is about half of their body length. Generally, your safety zone is yourheight plus 50 centimetres away from the snake. (This accounts for the snake’s striking distance to you if you fall.)

A Massasauga bite is generally not deadly. Only two people have ever died from a Massasauga bite in Ontario. Neither person received medical attention, and both cases were almost 50 years ago.

If you are bitten by a Massasauga, remain calm and seek medical attention immediately. Do not apply a tourniquet or try to suck out the venom. Never try to capture the snake to take it to the hospital; if you were bitten by a venomous snake in Ontario, we know it was a Massasauga. Have someone else drive you safely.

b) **Never under any circumstances pick up a Massasauga rattlesnake**. Massasaugas occur in very specific regions of the province, and if you are well outside of those regions it should be safe to handle any native snake you find. If you are working within a region where Massasaugas may occur, never pick up a snake unless you are absolutely certain that it is not a Massasauga.

c) All other Ontario snakes are non-venomous and harmless. Despite being harmless, many of Ontario’s snakes will put on defensive displays to intimidate potential predators. These include:

I. Rearing up, hissing and striking.

II. Eastern Hog-nosed Snakes will flatten out their necks like cobras, hiss loudly and pretend to strike (although their mouths remain closed).

III. Eastern Foxsnakes, Milksnakes, Gray Ratsnakes and Eastern Hog-nosed Snakes sometimes vibrate their tails to imitate a rattlesnake. If their tails come into contact with rocks, dry leaves, or some other medium, they can produce a buzzing sound like that of a rattlesnake. Combined with their blotchy pattern, this mimicry is often very effective at fooling humans.

d) Holding the snake properly (see section 2.4) will significantly reduce stress to the snake and the likelihood that it will try to bite in self-defence.

2.3 Capture and handling of the Massasauga rattlesnake

Safely move a Massasauga by following these steps:

a) Put on personal protective equipment (per section 2.1).

b) Clear the area of unnecessary bystanders to lessen the stress on the animal.

c) Determine your plan for capture to anticipate where the snake may move or retreat as well as any potential hazards you may encounter.

d) If capturing injured snakes, avoid touching or manipulating injured areas.

e) Tip the 1-metre-deep pail on its side.

f) Use the broom to position the snake near the pail.

g) Gently and slowly guide the snake into the pail, being careful not to push the snake too hard or lift if off the ground. Never pin a Massasauga or use tools that constrict or pinch the snake. Quick, abrupt movements are threatening to the snake and may also cause it to make quick movements in an attempt to escape.



h) Be patient and gentle with the snake. Gravid (pregnant) females are carrying live young, and rough handling may cause damage to the developing snakes.

i) Once the snake is in the pail, slowly tip the pail upright and secure the lid.



j) Snakes can be difficult to capture. If a snake escapes or heads for cover, let it disperse on its own, ensuring it is safe from harm before allowing activities to continue. If allowing activities to continue is not safe for the snake, postpone activities for up

to 24 hours to allow the snake to disperse. If it is not possible to leave the area for 24 hours, have a Qualified Member relocate the individual. Do not disturb any natural cover under which the snake has retreated. If necessary, contact MNR for further direction using the SAR Notification/Contact Schedule.

2.4 Capture and handling of non-venomous snakes

a) If you are uncomfortable handling large, non-venomous snakes with your hands, you can use the above method for capturing venomous snakes (section 2.3). However, it is much easier to capture most non-venomous snakes using your hands. Some of the smaller species, such as the Butler's Gartersnake, are almost impossible to capture with a stick and a pail.

b) If you elect to use thick gloves, be very careful not to squeeze the snake too hard, as you can crush internal organs and kill it. Do not use gloves to capture small snakes, as the risk of accidentally crushing them is too high.

c) Clear the area of unnecessary bystanders to lessen the stress on the animal.

d) Determine your plan for capture to anticipate where the snake may move or retreat and to anticipate any potential hazards you may encounter.

e) Never grab the snake behind the head or grip the snake tightly in order to restrain it. This may injure or scare the snake, cause it to struggle and encourage it to bite in self-defence.

f) Always support the snake's body with both hands and never pick up a snake only by the tail. Holding a snake only by the tail can result in dislocated bones or other serious injury to the snake.

g) To capture a large snake (more than 30 centimetres in length):

I. Gently grab it by the back of the body to prevent it from getting away.



II. Holding the snake by the back end while it is still on the ground, slide your other hand underneath the snake to support its weight and lift it up. Do not lift if off the ground by the tail.

III. As soon as the snake is off the ground, continue to support its weight by keeping both hands under the snake, with one hand about a third of the way back and one hand about two thirds of the way back along the snake's body.



IV. As the snake tries to move forward, reposition the hand from the back of the snake to the front of the snake, and continue to rotate your hands between the front and back of the snake to allow it to continue to crawl through your hands. Calm and slow movements will help the snake relax and make it move more slowly.

V. Often a snake will stop moving once it no longer feels threatened. If the snake continues to move rapidly after a minute or so, you can try holding the back end of the snake more firmly to prevent it from continuing to move forward. Continue to support the unrestricted front half of the snake with your other hand.

h) To capture a small snake (less than 30 centimetres in length):

I. Grasp the snake gently but firmly with one or both hands. It may be necessary to gently restrain it against the ground with your hands initially to prevent it from escaping. Never use a stick, snake hook or any other object to pin a snake.



II. Hold the back end of the snake in one hand and support the front of the snake with your fingers or your second hand. Allowing the snake's front end to remain free helps the snake remain calm.



III. For very small snakes, hold the snake in the palm of your hand using your thumb or fingers to gently apply only enough pressure to prevent the snake from wiggling free.

i) Snakes can be difficult to capture. If a snake escapes or heads for cover, let it disperse on its own, ensuring it is safe from harm before allowing activities to continue. If continuing activities poses a threat to the snake, postpone activities for up to 24 hours to allow the snake to disperse. If it is not possible to leave the area for 24 hours, have a Qualified Member relocate the individual. Do not disturb any natural cover under which the snake has retreated. If necessary, contact MNR for further direction using the SAR Notification/ Contact Schedule.

2.5 Moving a snake out of harm's way (distances under 50 metres)

a) If it is necessary to move a snake more than 50 metres, refer to section 2.7 on snake relocation.

b) Snakes should only be moved when they are in imminent, unavoidable danger.

c) If possible, allow the snake to move on its own by walking toward the snake in the direction that you want it to move. If the snake does not move on its own, you will have to pick it up and move it (see section 2.4). Unlike most snake species, Massasaugas may not

move away when you walk toward them. Rather, they often adopt a defensive position (coiled), hold their ground and rattle (asking you to go the other way). To encourage a Massasauga to move away on its own, give it lots of space and observe it from a distance (ideally so the snake cannot see you).

d) When moving a snake out of harm's way, such as across a road, move the snake in the direction that it was heading, regardless of what the habitat looks like. These animals often make intentional movements to specific areas, and if you put them back where they started they will simply turn around and start their journey again. If it is not clear which direction the snake was headed, move it to the closest habitat that will not be disturbed. In this case, suitable habitat includes a rock pile or other cover that the snake can retreat under, or the vegetation at the edge of the road allowance, disturbed area or clearing.

e) If possible, release the snake near a retreat site (somewhere the animal can seek shelter from the elements and avoid predators: loose rocks, logs, rock crevices or dense vegetation) to allow it to take cover upon release. Do not release the snake in the open where it could be exposed to inclement weather, extreme sunlight or predators.

2.6 Temporary safe keeping and transportation of snakes

a) You are responsible for this animal. Remember, once you have put it in a container, it depends on you to keep it safe and at the right temperature.

b) Always use a pail, large garbage can or bucket (at least 1 metre deep) with adequate air holes in the lid for Massasaugas. Ensure the lid is properly secured, and always create the air holes before putting the snake in the container.

c) If using a snake bag:

I. **Make sure it is properly closed**. To close the snake bag, gather the material at the opening together in one hand and run your other hand down the bag to ensure that the snake is in the bottom. Twist the neck of the bag and tie it into a tight knot. Never rely on a drawstring, as snakes can wiggle out of tight holes. When tying a snake bag, make sure the snake remains in the bottom of the bag so it does not get tangled in the part you are tying.



II. **Make sure it is in a secure location** where it cannot fall if the snake moves the bag. The movement of a snake within a bag can easily cause the bag to fall off of a table.

III. If transporting the snake or holding it for a longer time (over an hour), the closed snake bag should be placed in a well-ventilated hard container (such as plastic tub) for added protection.

d) It is extremely important to monitor the air temperature regularly in the container or around the snake bag to ensure it **never exceeds 30°C or drops below 5°C**. Never leave the container or snake bag in direct sunlight or in a closed vehicle parked in the sun, as this will cause the snake to overheat and could be fatal.

e) **Never leave the container or snake bag unattended** in an unsecured location (e.g., side of road).

f) Do not offer the snake any food. Snakes do not have to eat as often as mammals, and it is no problem for a snake in temporary captivity to go a few days without food.

2.7 Relocation of snakes

a) A snake should only be relocated if the destruction of its habitat is unavoidable or if it is not possible to release it at the capture location.

b) Snakes should not be relocated during their over-wintering season. This varies depending on the species and location, but is generally from October to May. If you are unsure whether you should relocate the snake or take it to a wildlife custodian, contact MNR for further direction using the SAR Notification/Contact Schedule.

c) If it is not possible to relocate the snake due to the time of year (October to May) or other conditions, transport the snake to a wildlife custodian per the SAR Notification/Contact Schedule.

d) Transport and release the snake within one hour of capture in order to minimize stress on the animal.

e) **Snakes should never be moved more than 250 metres** from the location where they were found. Only move a snake as far as necessary to avoid potential harm to the snake, and avoid moving snakes more than 125 metres unless absolutely necessary. If it is not possible to relocate the snake within 250 metres of the capture location, contact MNR for further direction using the SAR Notification/Contact Schedule.

f) Release the snake in the same type of natural habitat as the capture site. If this is not possible, contact MNR for further direction using the SAR Notification/Contact Schedule.

g) If possible, release the snake near a retreat site (somewhere the animal can seek shelter from the elements and avoid predators: loose rocks, logs, rock crevices or dense vegetation) to allow it to take cover upon release. Do not release the snake in the open where it could be exposed to inclement weather, extreme sunlight or predators.

h) To release the snake from a pail, gently tip the pail onto its side, remove the lid, back away from the pail and allow the snake to leave on its own. If necessary, use the broom to gently guide the snake out of the pail or gently tip the pail on an angle to slide the snake out of the pail.



i) To release a non-venomous snake from a bag, untie the bag, gently tip the bag by holding one of the bottom corners (make sure you are not holding the snake) and gently slide the snake onto the ground.



2.8 Injured snakes

a) If dealing with an injured Massasauga, ensure compliance with all instructions and safety considerations provided in sections 2.1-2.3.

b) If the methods of handling snakes that are outlined in section 2.3 or 2.4 are not applicable due to the snake's injuries, use a shovel or other flat object to pick up the snake. Ensure that any injured areas are supported.

c) Place the snake in a large plastic bin or bucket with a lid that has air holes (the darkness helps to reduce stress to the snake). You can place newspaper in the container to provide cover for the snake and help to reduce its stress. Do not place anything else in the container with the snake or offer it any food.

d) Thoroughly wash your hands after handling injured snakes.

e) Immediately transport the snake to a veterinarian or wildlife custodian per the SAR Notification/Contact Schedule, in order to increase its chances of survival.

Snakes

3. Safe Handling Of The Five-lined Skink

3.1 Materials

a) The following materials are required for the handling, capture, temporary safe keeping and transport of Five-lined Skinks:

» Small plastic container with a lid that has air holes. Ensure the container and the lid are well marked “live animal”.

» Thermometer

» SAR Notification/Contact Schedule

» SAR Encounter Reporting Form

b) Equipment must be maintained on each job site.

3.2 Capture and handling of Five-lined Skinks

a) There is no risk associated with handling Five-lined Skinks. They may bite, but this will not cause any substantial injury – they have small mouths and tiny teeth.

b) Safely handle, move or capture a Five-lined Skink by following these steps:

I. Always handle Five-lined Skinks gently and slowly. Rough handling may cause injury or stress to the animal. Skinks can drop their tail as an anti-predator defence and may do so if they feel threatened, even if they are not being held by the tail.

II. **Never grab or pick up a Five-lined Skink by the tail**. This may cause the skink to drop its tail (even if you are being gentle) and can be detrimental to the survival of the animal.

III. Do not pick up Five-lined Skinks by the body; exerting too much pressure by accident can result in internal injury.

IV. Capture a skink by cupping your hands over the skink while it is on the ground. (You have to be quick!)

V. Carefully close your hand(s) around the skink to pick it up. Note that they can fit through small holes between your fingers.

c) Always wash your hands after handling any wildlife.

3.3 Moving a Five-lined Skink out of harm’s way (distances under 25 metres)

a) If it is necessary to move a skink more than 25 metres, refer to section 3.5 on Five-lined Skink relocation.

b) Five-lined Skinks should only be moved when they are in imminent, unavoidable danger.

c) If possible, allow the skink to move on its own by walking toward the skink in the direction that you want it to move. Skinks are fast and tend to hide whenever possible. If the skink continues to seek shelter within the area where work is taking place, it will have to be picked up and moved (see section 3.5).

d) When moving a skink out of harm’s way, such as across a road, move the skink in the direction that it was heading, regardless of what the habitat looks like. These animals often make intentional movements to specific areas, and if you put them back where they started they will simply turn around and start their journey again. If it is not clear which direction the skink was headed, move the skink to the closest suitable habitat that will not be disturbed. In this case, suitable habitat includes rocks or other cover objects that the skink can retreat under.

e) If possible, release the Five-lined Skink near a retreat site, which is somewhere the animal can seek shelter from the elements and avoid predators (vegetation, rocks, logs or leaf litter). Do not release it in the open where it could be exposed to inclement weather, extreme sunlight or predators.

3.4 Temporary safe keeping and transportation of Five-lined Skinks

a) You are responsible for this animal. Remember, once you have put it in a container, it depends on you to keep it safe, moist and at the right temperature.

b) Keep Five-lined Skinks in a small container with a lid that has air holes. Always create the air holes before putting the skink in the container.

c) Skinks can move very quickly and may try to escape before the lid is on the container. Be careful that the skink does not get crushed when you place the lid on the container.

d) It is extremely important to monitor the air temperature regularly in the container to ensure it **never exceeds 30°C or drops below 5°C**. Never leave the container in direct sunlight or in a closed vehicle parked in the sun, as this will cause the animal to overheat and could be fatal.

f) **Never leave the container unattended** in an unsecured location (e.g., side of road).

3.5 Relocation of Five-lined Skinks

a) A Five-lined Skink should only be relocated if the destruction of its habitat is unavoidable or if it is not possible to release it at the capture location.

b) Transport and release the skink within one hour of capture in order to minimize stress on the animal.

c) Five-lined Skinks should not be relocated during their over-wintering season, which is generally from October to May. If you are unsure whether you should relocate the skink or take it to a wildlife custodian, contact MNR for further direction using the SAR Notification/Contact Schedule.

d) If it is not possible to relocate the skink due to the time of year (October to May) or other conditions, transport it to a wildlife custodian per the SAR Notification/Contact Schedule.

e) Five-lined Skinks should never be moved more than 100 metres from the location where they were found. Only move a skink as far as necessary to avoid potential harm to the skink, and avoid moving skinks more than 50 metres unless absolutely necessary. If it is not possible to relocate the animal within 100 metres of the capture location, contact MNR for further direction using the SAR Notification/Contact Schedule.

f) Always release Five-lined Skinks in the same type of natural habitat as the capture site.

g) If possible, release Five-lined Skinks near a retreat site, which is somewhere the animal can seek shelter from the elements and avoid predators (vegetation, rocks, logs or leaf litter). Do not release them in the open where they could be exposed to inclement weather, extreme sunlight or predators.

h) To release Five-lined Skinks, remove the lid and gently tip the container onto its side and allow the animal to leave on its own. If necessary, gently tip the container on an angle to slide the animal out.

3.6 Injured Five-lined Skinks

a) Use the methods outlined in section 3.2 to handle injured skinks whenever possible. If those methods are not applicable due to the skink's injuries, use a shovel or other thin, flat object to pick up the skink. Ensure that any injured areas are supported.

b) Place the Five-lined Skink in a small container with a lid that has air holes. Always create the air holes before putting the skink in the container.

c) Newspaper or paper towels may be added to the container to give the skink something to hide in. Do not place water, other skinks, food or anything else in the container with the skink.

d) Thoroughly wash your hands after handling injured skinks.

e) Immediately transport the skink to a veterinarian or wildlife custodian per the SAR Notification/Contact Schedule, in order to increase its chances of survival.

Five-lined Skink

4. Safe Handling of Amphibians

Important Note: Many amphibian species absorb oxygen through their skin as well as breathing with lungs; some species rely completely on their skin for respiration. If their skin dries out, they can suffocate. Therefore, careful handling of amphibians (especially salamanders) includes ensuring that their skin is kept moist.

4.1 Materials

a) The following materials are required for the handling, capture, temporary safe keeping and transport of amphibians:

- A pail, bucket or large plastic bin with a lid that has air holes (for frogs). Ensure both the side of the container and the lid are well marked “live animal”.
- Plastic kitchen-style container lined with paper towel (needs to be wet when used) with a lid that has air holes (for salamanders and toads). Ensure both the side of the container and the lid are well marked “live animal”.
- Thermometer
- SAR Notification/Contact Schedule
- SAR Encounter Reporting Form
- Net (optional)

b) Equipment must be acquired and maintained on each job site.

4.2 Capture and handling of salamanders, toads and frogs

Note: Eastern Newts have toxins in their skin and some salamanders may release a white, mildly toxic substance from their skin and tail. If ingested, these toxins may cause mild nausea. There is no risk associated with handling Ontario’s amphibians, provided you wash your hands afterwards. Toads will not give you warts.

Safely handle, move or capture a salamander, toad or frog by following these steps:

a) Always make sure your hands are clean and free of insect repellent, antibacterial hand sanitizer, sunscreen, etc. Amphibians have very wet, porous skin through which they absorb oxygen and other compounds. Harmful chemicals (such as bug repellent) are quickly absorbed through an amphibian’s skin and can cause serious damage to the animal.

b) If possible, wet your hands before picking up salamanders in order to avoid drying out their skin. Some species rely completely on their skin for respiration. If their skin dries out, they can suffocate and die. You can also ensure dampness is maintained by picking up some wet soil with the salamander.



c) Keep handling times to a minimum as oil produced by human skin can easily clog amphibian pores, causing suffocation in some species.

d) Always handle amphibians gently and slowly. Rough handling may cause injury or stress to the animal. Salamanders can drop their tail as an anti-predator defence, and may do so if they feel threatened (even if you are not holding them by the tail).

e) Never grab or pick up a salamander by the tail. This may cause the salamander to drop its tail (even if you are being gentle) and can be detrimental to the survival of the animal.

f) Capture a **frog or toad** using a net or pick it up with your hands by:



I. Cupping your hands over the frog or toad while it is on the ground. (You have to be quick!)

II. Closing your hand(s) to create a “cage” around the animal and picking it up. Note that they are slippery and can fit through small holes between your fingers.

III. If it is necessary to identify the species after picking it up, carefully allow it to partially crawl out of your hand between your thumb and forefinger and then gently tighten your grip around its back legs (near its waist), holding onto both back legs. Support its front legs with your other hand.



g) Pick up a **salamander or newt** by scooping it up in one or two hands and then closing your hands to create a “cage”. Note that these animals are slippery and can fit through small holes between your fingers.



h) Use a net, container or your hands to catch frog tadpoles or salamander larvae. A net is easiest.

4.3 Moving amphibians out of harm's way (distance under 25 metres)

a) If it is necessary to move an amphibian more than 25 metres, refer to section 4.5 on amphibian relocation.

b) Amphibians should only be moved when they are in imminent, unavoidable danger.

c) Salamanders do not move large distances and will tend to hide whenever possible. If there is the need to move a salamander, you will have to pick it up and move it (refer to section 4.2).

d) If possible, allow a frog and a toad to move on its own by walking toward it in the direction that you want it to move. If the frog or toad does not move on its own, you will have to pick it up and move it (see section 4.2).

e) When moving an amphibian out of harm's way, such as across a road, move it in the direction that it was heading, regardless of what the habitat looks like. These animals often make intentional movements to specific areas and if you put them back where they started they will simply turn around and start their journey again. If it is not clear which direction the animal was headed, move it to the closest suitable habitat that will not be disturbed. Suitable habitat includes: any shoreline habitat in the case of frogs; leaf litter, rocks or logs in a vegetated/forested area that the animal can hide under in the case of salamanders; any cover, such as rocks or vegetation, in the case of toads.

4.4 Temporary safe keeping and transportation of amphibians

a) You are responsible for this animal. Remember, once you have put it in a container, it depends on you to keep it safe, moist and at the right temperature.

b) Make sure that all containers that will be housing amphibians are thoroughly washed and rinsed and do not contain any soap or chemical residue.

c) Keep **frogs** in a pail, bucket or large plastic bin with a lid that has adequate air holes. Always create the air holes before putting the animal in the container. Fill the container with less than one inch of water. Frogs should never be fully submerged, or they will drown.

d) Keep **toads** in a pail, bucket, large plastic bin or plastic kitchen-style container with a lid that has adequate air holes. Always create the air holes before putting the animal in the container. Line the bottom of the container with wet paper towels.



e) Keep **salamanders** in a plastic kitchen-style container with a lid that has adequate air holes. Line the bottom of the container with wet paper towels.



f) Keep **newts and mudpuppies** in a pail, bucket, large plastic bin or plastic kitchen-style container with a lid, and fill the container with water. Replace water twice daily to ensure proper aeration, as these animals breathe through gills (like fish).

g) It is extremely important to monitor the air temperature regularly in the container to ensure it **never exceeds 25°C or drops below 5°C**. Never leave the container in direct sunlight or in a closed vehicle parked in the sun, as this will cause the animal to overheat and could be fatal.

h) **Never leave the container unattended** in an unsecured location (e.g., side of road).

4.5 Relocation of amphibians

a) Amphibians should only be relocated if the destruction of their habitat is unavoidable, or if it is not possible to release the animal at the capture location.

b) Transport and release it within one hour of capture in order to minimize stress on the animal.

c) Amphibians should not be relocated during their over-wintering season. This varies depending on the species and location, but is generally from October to May. If you are unsure whether you should relocate the animal or take it to a wildlife custodian, contact MNR for further direction using the SAR Notification/ Contact Schedule.

d) If it is not possible to relocate the animal due to the time of year (October to May) or other conditions, transport it to a wildlife custodian per the SAR Notification/Contact Schedule.

e) **Amphibians should never be moved more than 100 metres** from the location where they were found. Only move the amphibian as far as necessary to avoid potential harm to the amphibian, and avoid moving amphibians more than 50 metres unless absolutely necessary. If it is not possible to relocate the animal within 100 metres of the capture location, contact MNR for further direction using the SAR Notification/Contact Schedule.

f) Release amphibians as close as possible to the capture site.

g) Always release frogs and larvae in the same water body where they were found, or in the same type of natural habitat as the capture site.

h) Release salamanders and toads in the same type of natural habitat as the capture site.

i) If possible, release frogs, toads and salamanders near a retreat site, which is somewhere the animal can seek shelter from the elements and avoid predators (vegetation, rocks, logs or leaf litter in the case of salamanders; water or vegetation in the case of frogs). Do not release them in the open where they could be exposed to inclement weather, extreme sunlight or predators.

j) To release frogs, toads and salamanders, remove the lid and gently tip the container onto its side and allow the animal to leave on its own. If necessary, gently tip the container on an angle to slide the animal out of the container.

4.6 Injured amphibians

a) Use the methods outlined in section 4.2 to handle injured amphibians whenever possible. If those methods are not applicable due to the animal's injuries, use a shovel or other thin, flat object to pick up the animal. Ensure that any injured areas are supported.

b) Place the amphibian in a small container with a lid that has air holes and line the bottom of the container with wet paper towels. Always create the air holes before putting the animal in the container.

c) Newspaper or paper towels may be added to the container to give the amphibian something to hide in. Do not place water, other animals, food or anything else in the container with the individual.

d) Thoroughly wash your hands after handling injured amphibians.

e) Immediately transport the injured animal to a veterinarian or wildlife custodian per the SAR Notification/Contact Schedule, in order to increase its chances of survival.

Amphibians

5. Safe Handling of Birds

The protocol for handling birds is based on the size of the birds you may encounter.

Small Birds: e.g., Loggerhead Shrike, Prothonotary Warbler, Whip-poor-will

Large Birds: e.g., King Rail, Least Bittern, Peregrine Falcon

5.1 Materials

a) The following materials are required for the handling, capture, temporary safe keeping and transport of birds:

- Sturdy cardboard box or large plastic bin and lid with air holes. Ensure both sides of the box/ container and the lid are well marked with “live animal”.
- Sheet or blanket large enough to cover a large bird
- Thick work gloves
- Safety glasses
- Thermometer
- Digital camera (optional)
- MNR Notification/Contact Schedule
- SAR Encounter Reporting Form

b) Equipment must be acquired and maintained on each job site.

5.2 Safety considerations

a) Generally, there is little risk associated with handling birds. However, some species can scratch or bite, and work gloves should be worn to help avoid minor injuries. Safety glasses are recommended for larger birds, especially the Least Bittern.

b) Always wash your hands after handling a bird. In addition, cloths, blankets and containers used to hold or transport birds should be washed with soap and water after each use. Discard a cardboard box after using it to hold or transport a bird.

5.3 Capture and handling of birds

a) The first consideration is to determine if the bird needs handling. It may be that the bird is healthy and can fly away. To find out, approach the bird slowly and wave your arms to make it fly or move away. Ensure that the direction in which the bird will fly is clear and free of obstruction. If this occurs (i.e., bird flies away), there is no need to proceed further with trying to catch it. If it doesn’t fly and instead crouches down or wobbles, indicating that it can’t fly, then it may be injured or a young bird not yet capable of flight.

c) Determine if it is a small or large bird from the list above. If possible, take a picture of the bird so that it can be identified without having to reopen the container.



d) **Small birds:** Use your bare or gloved hands, or the cloth or blanket, if that is more appropriate. Place your hands or the cloth/blanket over the bird around its body and over its wings to keep it from escaping. Gently pick it up and place it in the cardboard box or the large plastic bin. If it attempts to escape, work it towards a corner and attempt capture again.

e) **Large birds:** Use gloves and safety goggles for protection. Take the cloth or blanket and throw it over the bird to keep it from escaping. Use both hands to clasp the body of the bird through the cloth and gently restrain it. Pick up the bird, including the cloth, and place it all in the cardboard box/plastic bin. Free the bird from the cloth, remove the cloth, and then place the cover on the box.

If the bird jabs or bites at you during capture, use your gloved hand to fend off the attacks. Ensure it does not get close to your eyes if you are not wearing glasses.

f) Always handle birds carefully and gently, yet firmly. Birds may at any time struggle in an attempt to escape.



g) Never pick up a bird by the legs alone. Always support the body by grasping it around the wings.



5.4 Moving and releasing young birds or recovered birds

a) If the bird is a young bird incapable of long flight, it may be that its parents are nearby. Check around the site where the bird was found for the parents. If you locate parents, the young bird should be moved to a nearby tree, bush or ledge where the parents can attend to it and feed it. The location should be close to the parents and removed from danger. Watch the bird for 15 minutes and see if a parent attends to it.



b) In other cases, the captured bird may recover in the container and begin struggling to escape. In this case, you may wish to try releasing it in a natural habitat near where it was found. Place it in a location where it has shelter from the elements and can avoid predators. Allow it to move into cover. Do not release it in the open where it could be exposed to inclement weather, extreme sunlight or predators.

5.5 Temporary safe keeping and transportation of birds

a) You are responsible for this bird. Remember, once you have put it in a container, it depends on you to keep it safe and at the right temperature.

b) Always create air holes in the sides or lid of the box or container prior to placing the bird in it.



c) Place the box in a sheltered environment, preferably in the dark or semi-dark. This will quiet the bird down and let it rest.

d) Contact one of the MNR staff indicated on the SAR Notification/Contact Schedule. Ask for instructions on how to care for the bird. Send a picture of the bird if necessary.

e) It is extremely important to monitor the air temperature regularly in the container to ensure it **never exceeds 30°C or drops below 15°C**. Never leave the container in direct sunlight or in a closed vehicle parked in the sun, as this could cause the bird to overheat and could be fatal.

f) Never put more than one bird in a container at a time, especially raptors (Peregrine Falcon).

g) Once the bird is in the container, ensure that the lid is secure.

h) **Never leave the container unattended** in an unsecured location (e.g., side of road) or on the edge of a car seat.

i) Do not offer the bird any food or water unless instructed to do so following consultation with MNR staff on the SAR Notification/Contact Schedule.

j) Birds should be checked periodically (every hour should suffice). Young birds are especially susceptible to dehydration and must be carefully monitored during transport.

5.6 Evaluation and disposition of captured birds

a) Contact the MNR staff person listed on the SAR Notification/Contact Schedule immediately. Inform him or her of the capture and holding of the bird and ask for advice on the next steps.

b) It may be useful to take a picture of the bird for identification purposes. Send the photo to the MNR staff person or another person as requested.

c) You may be asked by the staff person to take the bird to a wildlife custodian.

5.7 Injured birds

a) If the bird is injured, immediately request and follow instructions given by the MNR staff person listed on the SAR Notification/Contact Schedule.

b) If so instructed, immediately transport the bird to a veterinarian or wildlife custodian per the SAR Notification/Contact Schedule, in order to increase the chances of the bird's survival.

6. Reporting Species at Risk Encounters

a) Contact MNR to report the occurrence (including dead animals) within the period of time set out in the permit or agreement, or within 24 hours if not stipulated. Report injured animals to MNR immediately.

b) Complete and submit the SAR Encounter Reporting Form, which includes the following information:

I. Name of Qualified Member

II. Contact number of Qualified Member

III. Date and time of the encounter

IV. Detailed location of the encounter (with lat-long or UTM coordinates, if possible). To obtain coordinates without a GPS, zoom into the area using Google Maps, right click on the location and select “what’s here?” from the right-click menu. The coordinates (in decimal degrees) will be provided to you in the Google Maps search bar.

V. Species encountered, with photo documentation, when possible. For assistance with species identification, see MNR’s *Ontario Species at Risk Quick Reference Guide*. Detailed species accounts can be found at **www.ontarionature.org/atlas** or the “Species Guides” at **www.torontozoo.com/AdoptAPond**.

VI. Action taken

Risk Encounters

7. Handling and Transporting Dead Animals

Dead species at risk that are encountered should be reported to the MNR as soon as possible. It is possible that the Ministry will request that the individual be stored and/or transported to the MNR.

Many researchers are currently studying the genetics of wild populations in Ontario, and genetic materials extracted from dead animals can make a valuable contribution to this research.

Examining a dead animal may provide important information about the cause of death or threats affecting the population.

If the MNR asks to see the species at risk and it is not possible to transport it on the same day it was found, the specimen should be stored in a freezer.

7.1 Materials

a) The following materials must be used for the handling and transport of dead species at risk:



I. A plastic resealable bag or plastic kitchen-style container with a tight lid with label “dead SAR for transport to MNR”

II. Permanent, water-resistant marker for labelling the bag or container with additional information, such as the date and location

III. Latex gloves or thick work gloves that can be washed

IV. Cooler with cold ice packs, if possible

V. SAR Notification/Contact Schedule

VI. SAR Encounter Reporting Form

7.2 Safety Considerations

Always wear gloves or wash your hands after handling any dead animal. Turtles (and many other animals) carry potentially harmful bacteria in their gut. Handling dead, rotting animals may also expose you to bacteria that can make you sick.

Handle a dead Massasauga with extreme caution

I. The snake’s venom is still a serious biohazard even after the snake is dead.

II. Never handle a dead Massasauga with your hands. Use a broom or sticks to place it into a container with a secure lid (not a bag).

III. Although unlikely, nerves can trigger the Massasauga’s bite reflex even after the snake is dead.

IV. In some situations, it can be very difficult to confirm that a snake is dead. For example, extreme shock can make a snake appear dead for several minutes until it slowly regains its senses. Unless you can confirm that the Massasauga is dead, always treat it as though it is alive and never place any part of your body within its potential strike range (approximately half of the snake’s body length).

Dead Animals

7.3 Handling a dead animal

a) Always make sure that an animal is actually dead before handling or capturing it. In some situations, live animals can easily be mistaken for being dead:

I. Extreme shock can make a reptile or amphibian motionless and appear dead for several minutes until it slowly regains its senses.

II. Air temperature controls the metabolism, and therefore the activity level, of reptiles and amphibians. If an over-wintering snake or turtle is encountered, it will only be 4 or 5°C and may be so inactive that it will appear dead. Very cold animals in the spring or fall may also be very inactive and appear dead until closely examined.

III. Eastern Hog-nosed Snakes sometimes play dead as a defensive strategy to deter predators. This display includes rolling onto their back with their mouth gaping open and tongue hanging out, regurgitating food or defecating and emitting a foul smell. It is very difficult to determine if this species is actually dead without manipulating the snake and carefully inspecting it. If you flip the snake onto its belly, it will often roll back over and continue to play dead.

7.4 Temporary storage of dead animals

a) Place the dead animal in a plastic resealable bag or container with a tight lid that will not leak. Always use a thick container with a secure lid for Massasauga rattlesnakes.

b) Do not place anything else in the container with the animal.

c) Label the container with “dead SAR for transport to MNR” as well as the date, location and name of the observer.

d) Place the bag or container in a freezer as soon as possible. If a freezer is not immediately available, place it in a cool place, preferably a cooler with ice packs.

e) If the animal cannot be delivered to MNR on the same day that it was found, place it in a freezer until it can be delivered to MNR.

8 Appendices

Appendix I - Definitions

Species at Risk (SAR) Notification/Contact Schedule:
A contact list provided by the Ministry of Natural Resources District Office to be used when immediate guidance is required concerning species at risk (SAR) encounters. This list will include Ministry of Natural Resources staff as well as local veterinarians and wildlife custodians.

Species at Risk (SAR) Encounter Reporting Form:
A reporting form provided by Ministry of Natural Resources that must be completed any time that a species at risk (SAR) is encountered.

Qualified Member:
An individual who has received training by, in consultation with, or in a manner approved by Ministry of Natural Resources to capture, handle, move and relocate species at risk (SAR).

Appendix II - References

Ontario Ministry of Natural Resources, Parry Sound and Sudbury District. *Draft Turtle and Snake Capture and Relocation Protocol For Hwy 69/400 ESA Authorization Requirements.*
Revised January 19, 2011.

Parks Canada. *The Eastern Massasauga Rattlesnake Stewardship Guide: A Resource and Field Guide for Living with Rattlesnakes in Ontario*, Parks Canada, pp 84.

Karch, Mandy. 2008. *Standard Turtle Handling Practices and Protocols*. Prepared for the Ontario Ministry of Natural Resources and the Ontario Multi-species Turtles At Risk Recovery Team. 2008.

Unless otherwise noted, all photographs are credited to Jason Mortlock.

Appendix III - Equipment and Materials Checklist

The following materials must be acquired and maintained on each job site, and are required for the handling, capture, temporary safe keeping and transport of species at risk:

All Species (including for dead animals)

- ❑ Thermometer
- ❑ Plastic resealable bag or plastic kitchen-style container with a tight lid with label “dead SAR for transport to MNR”
- ❑ Permanent, water-resistant marker for labelling bag or container with additional information, such as the date and location
- ❑ Latex gloves or thick work gloves that can be washed
- ❑ SAR Notification/Contact Schedule (from MNR District Office – see Appendix IV)
- ❑ SAR Encounter Reporting Form (See Appendix V)

Additional Materials for Turtles

- ❑ Large plastic bin or bucket and lid with air holes, with both sides of the container and lid marked “live animal”
- ❑ Cloth/burlap bag with both sides marked “live animal”
- ❑ Broom or broom handle with small paint brush roller attached to end

Additional Materials for Snakes

- ❑ Pail, large garbage can or bucket with air holes in the lid, with side of the container and lid marked “live animal”
- ❑ A cloth snake bag (e.g., pillowcase) for non-venomous species only, marked “live animal”

For Massasaugas:

- ❑ Pail, large garbage can or bucket (1 metre deep) with air holes in the lid, with side of the container and lid marked “caution rattlesnake”
- ❑ Broom or broom handle with small paint brush roller holder attached to end

Additional Protective Gear to be Worn When Working in or near Massasauga Habitat

- ❑ High-ankle hiking or rubber boots
- ❑ Thick pants (jeans) or baggy pants
- ❑ Leather work gloves

Additional Material for Skinks

- ❑ Plastic kitchen-style container and lid with air holes, marked “live animal”

Additional Materials for Amphibians (Salamanders, Newts, Mudpuppies, Frogs, Toads)

- ❑ Pail, bucket or large plastic bin with a lid that has air holes (for frogs), both side of container and lid marked “live animal”
- ❑ Plastic kitchen-style container and lid with air holes, marked “live animal”
- ❑ Paper towels (to be moistened and put in plastic kitchen-style container)
- ❑ Net (optional)

Additional Materials for Birds

- ❑ Sturdy cardboard box or large plastic bin and lid with air holes, with both sides of box/container and lid marked “live animal”
- ❑ Sheet or blanket large enough to cover a large bird
- ❑ Safety glasses
- ❑ Digital camera (optional)

Appendix IV - SAR Notification/Contact Schedule

Appendix V - SAR Encounter Reporting Form

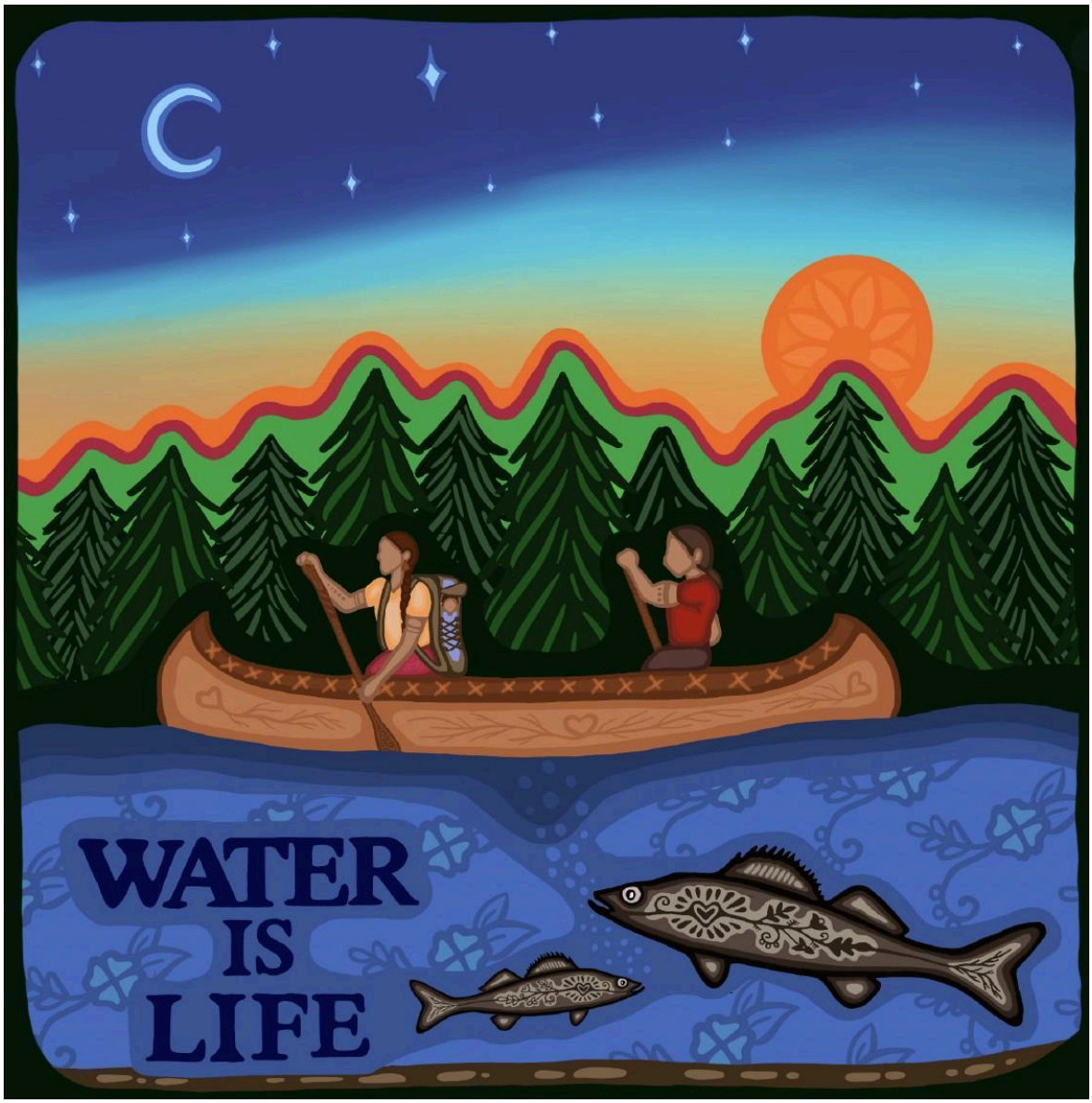
APPENDIX K – SART STUDIES

K-1: Bio-Cultural Impact Pathways Study

Bio-Cultural Impact Pathways Study

For the

Timiskaming Dam-Bridge Quebec Replacement Project (TDQRP)



Prepared by signatories to the Statement of Asserted Rights and Title (Timiskaming, Kebaowek and Wolf Lake First Nations)By the Kichi Sibi Technical Team, February 16, 2024

This Bio-Cultural Study Impact Pathways Study was prepared by the Kichi Sibi Technical Team at the request of Public Services and Procurement Canada (PSPC), the proponent of the Timiskaming Dam-Bridge Replacement Project of Quebec (TDQRP),

The report is intended to provide advice from the SART First Nations (Timiskaming, Kebaowek and Wolf Lake) to PSPC, the proponent for the TDQRP, regarding responses to the Information Requests from the Impact Assessment Agency about the Effects Assessment for the project.

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Introduction

Using an ecosystem approach in reviewing the potential environmental impacts of proposed projects is implicitly required by the Canadian Environmental Assessment Act (CEAA, 2012). Additionally, such an approach will need to consider biodiversity loss, an issue also required to be considered by the 2030 biodiversity strategy and Canada's international commitments.

Several Valued Ecosystem Components (VECs) or Valued Ecosystem Components (VCs) are identified by EIS methodology to assess potential impacts on the environment. The VCs are used in the proponent's Environmental Impact Statement (EIS) to determine what, if any, consequences (effects) the project will have for SART community values, and – if the negative effects are severe - whether a project should go ahead. This is called an Effects Assessment.

Changes to a VC should alert the communities and/or governments of impacts (effects) caused by the Dam project before, during and after construction. The approach is similar to biology methodologies that identify and study "indicator species" to assess ecological processes. By selecting species this way, studies can claim to represent comprehensive environmental conditions without addressing each ecological input individually.

SART has found that these studies (when conducted by third party consultancies) routinely exclude species at lower trophic levels, as well as ecosystem foundations like aquatic benthic communities, thus failing to develop a comprehensive ecosystem approach to species and effects characterization. Academic disciplines like biology and environmental toxicology rely on VCs as an accepted method. There are, however, standards within this field that ensure that this methodology is carried out comprehensively. The academic discipline of biology is also increasingly recognizing Indigenous knowledge and Indigenous methodologies for assessing ecosystem health.

There are thousands of years' difference between PSPC and its contractors and the knowledge of the land and waters of the Algonquin Nation, especially in the areas where several dam facilities are located on Algonquin lands. As a result of SART's own assessment efforts, SART has identified gaps in the PSPC contractor-led ecological surveys. The SART knowledge of these areas, as well as SART laws and governance, will assist in determining appropriate future pathways for the TDQRP project proposal. This Bio-Cultural Impact Study for the Timiskaming Dam-Bridge Replacement Project of Quebec (the "Pathways Study") identifies indicators that represent the environmental, cultural and social values and relations important to our communities.

The impact of something that happens in dam construction and/ or operation to a VC is called a "pathway". So, for example, where spawning beds are a VC, consistent disruption of spawning beds at the Timiskaming Dam Complex affects fish reproduction and abundance of fish stocks in the La Cave section of the Ottawa River. The associated fisheries population decline leads to increased country food scarcity and grocery store reliance for SART community members. There is a "pathway" from spawning bed destruction to food scarcity to increased food costs to member anxiety and more lateral violence.

The High Level Values on which the indicators (the VCs) are based can be found in the Statement of Aboriginal Rights and Title (2013) and are re-iterated in Chapter 13.1 of the Proponent Environmental Impact Statement (EIS). They are:

- Sufficient Lands and Services to enable their people and future generations to live in harmony with one another and with the land, plants, animals and waters around them
- Culturally safe space and opportunity for younger generations to reclaim their language and culture
- Control over development and services on their territory
- Ability to reclaim and heal damage to their territories and people and to get reparations for cumulative effects

The Algonquins of Timiskaming, Kebaowek and Wolf Lake First Nations (SART First Nations) have long been concerned about the Timiskaming Dam Complex. Its operations limit Indigenous cultural rights associated with waterway travel, community gathering places, food sovereignty, maintaining the caretaking responsibilities that SART exercise for water, fish, plants, and animals and for ensuring Algonquin food is safe to eat. Member surveys indicate there has been long term harvesting alienation from the Timiskaming Dam site since 1909 or earlier.

The Timiskaming Dam Complex and the pulp mill installation at the confluence of Gordon Creek and the Ottawa River have transformed SART lands and waterways with changed water flows and contamination. These have caused grave changes to our seasonal reliance on Aboriginal fisheries and other food harvesting at the Dam site, upstream in the dam reservoir (Lake Temiscaming), and downstream from the Dam.

In August 2021 our First Nations signed an agreement with PSPC to undertake a baseline Socio- Cultural-Economic Study (SCEIA) and to suggest Valuable Components for the Effects Analysis. This was undertaken and submitted July 27, 2022.

A community TDQRP survey was undertaken and completed in 2023. It asked community members about their preferred option for the placement of the dam-bridge: Option 1 (downstream of the current dam), Option 2 (upstream of the current dam) and Option 3 (in the same location). The survey also asked questions on anticipated impacts on the environment. The results from the SCEIA and the TDQRP Survey were submitted to PSPC and became Chapter 13.1 of the proponent's EIS.

The Kichi Sibi Technical Team has also undertaken a Species at Risk Bat Study (submitted June 22, 2023), a Vegetation Study Report (submitted August 23, 2022), a SART Lake Sturgeon Conservation Plan and Neme (Lake Sturgeon)Assessment and Monitoring Protocol (submitted November 22, 2023), and a Neme Biocultural Study Report (February 6, 2024).

A Traditional Land Use and Occupancy interviews with resource users proximate to the dam were undertaken in 2023- 2024. Ten SART users were interviewed. They showed an already heavily impacted baseline in terms of water quality and safety of food, and related Aboriginal fisheries' harvesting at the TDQRP site. See Appendix 2 for the questions used in the study.

The TDQRP community survey was undertaken in spring 2023. There were 324 SART respondents and a clear preference for Option 3 in-situ dam replacement with Option 2 upstream as the clear second choice.

The most recent study undertaken by our team is this Bio-Cultural Impact Pathways Study, requested by PSPC to inform their Effects Analysis. The Pathways Study relies on primary data collected during the Traditional Land Use and Occupancy interviews, TDQRP community survey data as well as primary data from the SCEIA and other studies undertaken for this Impact Assessment. A Baseline Impact Assessment Report of the Algonquin Canoe Company was also undertaken, and has been submitted to PSPC (February 9, 2024).

This document must be read in conjunction with Chapter 13.1 of the EIS and the findings from our other studies, and does not supersede them.

Methodology to establish the Valued Components and Effects

SART communities undertook land use and occupancy interviews and a TDQRP community survey to understand how the TDQRP project will affect SART rights and practices.

The studies and research goals were developed in an ethically sound and methodologically rigorous manner in consultation with the SART community leadership and survey team consisting of Kacie McLaren (KFN), Samantha Green (KFN), Matthew Chevrier (KFN), Kim Chevrier (KFN), Laura Moore (KFN), Brenda St Denis (WLFN), Martha Polson (WLFN), Kelsea McKenzie (KFN), Michael Laderoute (TFN) Serena Polson (TFN) and Lindsey Polson (TFN).

In January 2023, the SART communities developed and distributed the TDQRP community survey (a paper questionnaire) to all members of the three SART communities (See Appendix 3). A total of 324 SART members responded to the survey, 55 from WLFN, 90 from TFN and 179 from KFN.

The SART land use and occupancy (LUO) methodology was a continuum of practice from the Terry Tobias LUO methodology employed by the SART communities in 1995. The 2023 methodology used digital inputs with the assistance of Firelight Group. Potential interviewees proximate to the dam were identified during the TDQRP community survey, and asked to participate in the TLUO. Given the history of displacement from the area, we were pleased to have ten resource users close to the dam agree to be interviewed: four from WLFN, four from KFN and two TFN. The interviews were completed in the winter of 2023-4. The interview questionnaire is attached as Appendix 2.

Additionally in 2023 WLFN conducted seven interviews for an Algonquin Canoe Company Business Impact Assessment Survey. Interviews were based on a survey developed by the WLFN technical team. (See Appendix 4)

The complete VCs identified through the TLUO and TDQRP community survey can be found in the graphs attached as Appendix 1. Since each of the SART communities did their own TDQRP community survey, the graphs differ from one another. The findings are summarized below.

Valued Components- Summary of Key Findings

Below is a very brief summary of the findings of the SART Traditional Land Use and Occupancy Study and the TDQRP Survey which established Valued Components for each First Nation in the SART. This document summarizes the VCs that were significant to the largest number of respondents in each community. VCs that were indicated by only one or two participants are eliminated.

These Valued Components do not significantly differ from the suggested VCs on pages 19-31 of Chapter 13.1 of the EIS. They do differ slightly from one First Nation to the other, largely based on our proximity to the dam-bridge.

Timiskaming First Nation.

Environmental valued components: All fish species, spawning beds/ habitat, water quality and all wildlife. The respondents were most concerned about impacts during construction.

Cultural valued components: fishing, identity, familial ties, Kichi Sibi water quality, connectivity and future fenerations

Socio-Economic valued components: employment, quality of life, and travel.

For all three categories of VCs, members were most concerned about impacts during construction.

The TFN portion of the TDQRP survey also compared responses to the three Options for the dam-bridge design and concluded that Option 3 (same location as the current dam) was by far the preferable option. Their second choice was Option 2 (construction upstream of the current dam). It should be noted that TFN is not proximate to the Dam itself, and has access to a northly route to the other side of the Ottawa River.

Wolf Lake

Environmental Valued Components: pickerel, pike, spawning bed and all wildlife

Cultural Valued Components: (for Option 1) Fishing (higher during construction than after construction), travel routes (during construction), hunting (after construction). For Options 2 and 3, there was a high level of concern for many VCs both during and after construction: access to

territory, fishing, hunting, gathering, governance, identity, ceremony, travel routes, stewardship, familial ties, Aki Sibi, connectivity and mental health.

Socio-economic Valued Components: community well-being, employment, education and training, commercial business, quality of life, health, medical appointments and shopping.

For Options 1 and 2, level of concern was high for all VCs before and during construction. All concerns reduced to moderate (especially for medical appointments and shopping) after construction. For Option 3, concern was very high during construction, but considerably lower after construction.

Wolf Lake does not have a reserve, It is also the home of the Algonquin Canoe Company.

Kebaowek

Environmental valued components: Although a list of many fish, bird and animal species was offered to respondents in the survey, only water quality and level, lake sturgeon and spawning bed recorded more than a few responses. “Spawning bed” received by far the most responses. The level of concern about impacts was consistently high across all indicators during construction, but reduced to moderate for some species after construction. The results were consistent across all three Options.

Cultural Valued Components: access to territory, fishing, hunting, trapping, gathering, identity, Governance and self, rights and way of life, connectivity and mental health. Of these, access to territory and connectivity had the most support from the community, with fishing, identity and governance next.

Level of concern about these VCs was uniformly high during construction and after construction. For Option 1, concern about governance and self-determination, and rights and way of life was high before, during and after construction. For Option 2, concern was high across all indicators during construction, but moderated after construction. The exception was identity, governance, rights and way of life, connectivity, which remained at a “very high” level of concern. For Option 3, during construction, only access to territory, fishing, connectivity and mental health showed high level of concern, but all other indicators were at a moderate level during construction and low levels of concern after construction.

Socio-economic Valued Components: economic development, employment, health and social services, medical appointments and shopping. The level of concern was high for all indicators during the construction phase of the project but reduced considerably during operations. There was little difference in concern about socio-economic VCs between the three Options.

Conclusions from the Bio-Cultural Impact Pathways Study

Food system

SART Algonquins have a heavily impacted food system and are very concerned about protecting their access to wild foods, particularly fish.

The traditional food system of the Algonquin SART communities is made up of well over 100 kinds of fish, birds, large and small mammals, and plants. The studies affirmed the deep and ongoing connection and reliance on the land and water for food and medicinal and spiritual purposes. Most SART members reported actively harvesting (hunting, fishing, and collecting plants) as well as just enjoying the Ottawa River for spiritual and recreational purposes. Many members in all surveys and interviews pointed out that there were multiple stressors on the traditional food system and increasing barriers to accessing Algonquin food on their territory.

Forestry, ZECs sports fishing and hunting and the Quebec trap line system has substantially reduced accessible areas for harvesting and membership decline in the frequency and use of the traditional food system, at the expense of nutrition and food security as evidenced by the high degree of food insecurity reported by SART members at the TDQRP dam.

Research has shown that not only are traditional foods more nutrient rich than commercially available food but that, as traditional food intake declines, there is a much higher risk of poorer diet and health outcomes.

Many SART members are currently unable to afford nutritious equivalents at the store as evidenced by increasing food insecurity and relatively low levels of household income. These barriers to reliance on the traditional food system and/or affordability of acceptable quality food make it impossible for many families to have a basic foundation of healthy eating, making members highly vulnerable to immediate and chronic nutrition inadequacies, which can have serious long- term impacts on mental and physical health.

Connectivity

Mobility has always been central to Indigenous Cultural Landscapes: people live with the land's seasons and move within it, through hunting, gathering and visiting. Day-to-day travel builds local and personal knowledge through interactions and relationships with other organisms on the landscape leading to the laws that support these relationships. Relationships with one another, with non-human creatures are important to Algonquins, as are familial ties and gatherings.

Concerns about contamination of the environment

Contamination of the environment and bioaccumulation of toxins has a serious impact on our harvesting rights. It limits the resources available to us for gathering and consumption and poses

a health risk for members consuming wild foods. The presence of arsenic and other residual pulp industry contaminants in the environment is not limited to the TDQRP footprint, as water, animals, and plants move and spread throughout the territory. In this context, members repeatedly expressed concern about the risk of contamination, with a particular emphasis on increased avoidance of the area and protecting future generations. Climate change will cause heightened concerns about dam malfunction and/or contamination.

There are serious concerns about resuspension of contaminants from the Rayonnier facility during dam construction with all options for design. These are not unfounded. In the EIS, Chapter 12, 4.1 it states:

"Significant concentrations of nutrients, toxic metals and metalloids are not reflected in surface water classifications which local agencies have deemed "good quality". Concentrations of known toxic substances such as aluminum, copper, iron, pH and total suspended solids exceed federal and provincial guidelines for the protection of aquatic life. Several toxic metals and metalloids in sediments were found to be above the low effect level (LEL) safety guidelines and Manganese was above the severe effects level (SEL). <u>These sediments represent a reservoir of contaminants, which can be re-released into the water column upon disturbance.</u> Over a century of pulp and paper manufacturing in Temiscaming has generated significant Titanium, Phosphorus and Mercury contamination in sediments downstream of the P&P effluent release pipes. Lac aux Brochets on Gordon Creek was found to be seriously contaminated with arsenic, chromium, copper, iron, nickel, total phosphorus, lead and zinc all exceeding Provincial and Federal guidelines for the lowest level for protection of aquatic life."

The Kichi Sibi Technical Team has found concerning levels of toxins in soils at the dam site (EIS Chapter 12, 4.2)

Irreversible Loss of Biodiversity

If the TDQRP is built using Option 1 as proposed by PSPC, this footprint will be permanently altered into an engineered site downstream in a known spawning bed.

SART does not accept the current design option selected by PSPC for the location of the dam. This position is a violation of Indigenous laws, treaties and protocols between Nations including persons, plants, animals, land, and water.

We are aware that the acceptance of Option 2 for Dam construction (upstream of the existing dam/bridge) would affect Rayonnier Advanced Materials (RYAM) requiring them to move their power plant, and likely adding this expense to the TDQRP. We submit that a spawning bed that nurtures sturgeon and other fish important to our diet and culture is more than worth the cost.

Missing baseline studies

There are a number of missing baseline studies, such as inventories of hickory nut mussels and Lake Sturgeon, of benthic communities near the dam site, of the possibility of sediment re-

suspension, and of the impacts of water flows on the seasonal rounds of fish. Further studies of benthic aquatic communities, hickory nut mussels and bats and chimney swifts foraging behavior in the area also need to be completed. Firm information about fish habitat offsetting has not yet been given to the SART First Nations. Currently, the EIS does not properly analyze how losing lake sturgeon spawning habitat will affect the species. (See SART Lake Sturgeon Bio-Cultural Impact Report)

Climate change, including increasingly severe and unpredictable precipitation events, flooding, and any resulting changes in the water table around the TDQRP site are issues of interest to SART communities but we are yet to be engaged.

The EIS employs a very limited SART cumulative effects analysis. SART wishes to supplement this with its own characterization of cumulative effects from dams and other industries in the region. The EIS fails to employ an environmental justice lens for examining cumulative impacts of the TDQRP infrastructure over time.

Aboriginal Rights

The Duty to respect Aboriginal Rights and to consult and accommodate in good faith must be at the top of government responsibilities.

The SART First Nations have identified six categories of rights potentially impacted by the TDQRP, namely:

Rights to harvest

Harvesting rights include the right to hunt, fish, and gather food or plants through SART communities preferred means and in SART communities preferred safe consumption locations. Harvesting rights protect the ability to engage in stewardship activities necessary to facilitate the harvesting right (e.g. flood and flow control while netting).

Rights to a safe and healthy environment

SART communities' way of life depends on the sustainability and health of the environment. SART recognizes the importance maintain balance between all relations: humans, animals, birds, fish, plants, trees, and insects. Respecting health and diversity amongst all relations result in a healthy ecosystem. As stewards, SART communities have a right and responsibility to protect the environment from harm across generations. This includes how TDQRP operational effects on the environment.

Rights to govern and protect the territory

Governance rights include the right to make decisions about issues that will impact SART community rights and interests (such as decisions around resource allocation or the TDQRP

development options); the right to apply SART customs, protocols and law; and the right to exercise traditional governance mechanisms.

SART wants to ensure that non-Indigenous or non-Section 35 rights holders' participation in engagement with the Agency and consultation with the PSPC, and Canada does not negatively impact human rights of true Algonquin Anishinaabeg rights holders. SART has highlighted the non-Section 35 Rights holders are only entitled to engagement.

As stewards, SART communities have an inherent, sacred obligation to protect the land and resources, not only for its members but also other living beings on Aki (earth) Sibi (river). SART must continue to maintain and protect its treaty relationship with the living beings on the land and waters. In particular, water is extremely important and women have a special role as protectors of the Kichi Sìbì watershed.

Rights to access and occupy traditional territory

As traditionally nomadic peoples, mobility on the territory is a key aspect of Anishinaabe and SART's culture. Mobility means eliminating physical, environmental, legal, and psychological barriers (e.g., fear) to accessing the territory. A right to access and occupy traditional territory is both a right in itself, and a necessary condition for exercising other rights (e.g., harvesting).

Rights to maintain a cultural and spiritual relationship with the territory

To maintain a relationship with the territory, SART communities must be able to protect, revitalize and teach their ways of being to future generations. SART community ways of being are often understood in relation to natural environment and physical landscapes. As such, a crucial aspect of SART communities' relationship with the land is SART's ability to use, travel through, and enjoy the surroundings in peace, without fear or trepidation. Physical obstructions in or alterations to the natural environment can not only sever the physical but also spiritual relationship to the territory.

Rights to dignity of culture and enterprise

SART communities' relationship with Long Sault Island is another crucial foundation for Algonquin culture and way of life. Algonquin culture comes from the land, and from being on the land. This relationship, based on respect and gratitude, is expressed through enterprise that reflects our cultural history, for example the Algonquin Canoe Company just next to the TDQRP project site. The integrity of and the access to this business site is a major concern to WLFN. (See WLFN Business Impact Assessment Report)

SART Aboriginal rights are and have been violated by PSPC and the IAAC during the entire process of seeking approval for the TDQRP. Despite our agreement to provide PSPC with baseline studies and effects analysis, the project proponent and the IAAC have:
failed to consult any of the SART communities until the project design was well underway, and then only after vigorous advocacy by the First nations.
b) failed to recognize our right to decide on the design of the project

have granted recognition to the “Antoine Nation” and the “Algonquins of Ontario” equal to that of the status First Nations which have held responsibility for the land since time immemorial have dismissed and ignored the clear design preference by SART members for Option 3 (building on the same site) and Option 2 (building upstream of the present dam) have dismissed and ignored our concern to give priority to the spawning bed downstream of the current dam.

Advice to PSPC re: responses to IAAC Information Requests IAAC 1-70 to 1-76

The Agency evaluates potential environmental effects from projects based on the use of a log-frame matrix (valued component-effect-magnitude-duration-frequency - reversibility/mitigation).

This template makes it extremely difficult to explain our concerns to the decision-makers of the project. It does violence to our wholistic Indigenous worldview. However, not using this tool often renders our concerns invisible to the proponent and the Agency. The following tables summarize the concerns expressed above where possible in table form.

IR IAAC-1-70. Aboriginal and Treaty Rights

PLANNING AND PRE-CONSTRUCTION

Effect	**Aboriginal Rights**	**Magnitude**	**Geographic Extent**	**Duration**	**Mitigation**
AOO and Antoine Nation given recognition	Right/Responsibility to protect Territory	severe	Algonquin traditional territory	2012-ongoing	No, but could be reversed
Dismissive and time-wasting approach by PSPC – frustration for FNs.	Duty of Crown to consult in good faith	high	high	On-going	Reversible
Continued preference by PSPC for Option 1, despite effect on spawning beds	Right to Protect Teritory. Right to Harvest. Right to a Healthy Environment	high	high	On-going	Reversible

Incomplete Fishery, contaminant studies.	Right to Harvest; Right to Healthy Environment Right to Protect Territory	high	immediate	Complete before EIS accepted	Reversible

CONSTRUCTION (ASSUMING OPTION 1 IS CHOSEN)

Effect	**Aboriginal Right**	**Magnitude**	**Geographic Extent**	**Duration**	**Mitigation?**
Destruction of spawning bed	Right to Harvest; to a Healthy Environment	severe	La Cave section of Ottawa River	years	Irreversible; if Option 2 or 3 chosen, can be mitigated
Damage to Fishery and interrelated ecosystem	Right to Harvest; right to a healthy environment; to diversity. (traditional foods)	high	Ottawa River	years	Irreversible
Disrupted Travel/daily life over bridge (school, shopping, appointments leading to increased frustration at home)	Right to Occupy Territory; Right to a Safe and Healthy Environment	high	local	Construction period	yes
Noise	Right to a safe Environment	high	local	Construction period	yes
Algonquin Canoe company-losses	Right to dignity of culture and enterprise	high	medium	Entire construction period	Irreversible/compensation

Disturbance of sediments: contaminant release	Right to a Safe Environment; right to Harvest	high	Ottawa River	Entire construction period	Irreversible
Air Quality; dust from blasting	Right to a Healthy environment	medium	local	Entire construction period	Mitigation possible

DURING OPERATIONS (OPTION 1)

Effect	**Right**	**Magnitude**	**Geographic Extent**	**Duration**	**Mitigation**
Diminished Fishery, due to spawning ed destruction, contaminant release, water flows (1-13-to 1-18; and 1-31 -41)	Right to Govern and Protect Territory; Right to Harvest; right to Biodiversity	high	medium	Permanent	Irreversible/ may possibly be mitigated
Increased industrial uses of road	Right to Occupy and Use Territory	high	medium	permanent	Irreversible
Increased non-native/ AOO use of territory; hunting; inability to protect culturally important areas.	Right to Occupy and use Territory; Right to Harvest; right to Protect Territory.	high	High	Permanent	Irreversible
Less possibility to reclaim original flows of Ottawa River	Right to Protect and Govern; Right to Access and Occupy	high	Algonquin Territory	Permanent	Irreversible

	traditional Territory				

IAAC 1-71 and 1-72*:* the interaction of environmental changes caused by the TDQR on the health, mental and social well-being of Indigenous Peoples; impacts on traditional foods.

DURING CONSTRUCTION

Environmental change	**Effect on community**	**Effect on well-being**	**Magnitude**	**Duration**	**Mitigation**
Disruption of traffic on bridge	Difficulty accessing services, etc on other sides of river	Frustration among already vulnerable people,	High	Construction period	possible
	Difficulty getting to high schools, work	Increased frustration of hopes and economic well-being	High	Construction period	possible
Increased pressure on FN governance	Less time for other community concerns	exhaustion	High	ongoing	mitigated
Impacts on fishery, spawning beds, mussel propagation	Loss of important food sources	Mal-nutrition, impoverishment	Severe	permanent	irreversible
Noise, air quality, etc	Contaminate, frighten wildlife, fish, medicines	loss of country foods	Severe	Construction period	mitigated
Increased construction traffic; staging yard	Contaminate, frighten wildlife, fish;	Loss of country foods	High	Construction period	mitigated

Contaminant sediments disturbed	Contaminate food sources	Loss of country foods, malnutrition	Severe	permanent	irreversible
Algonquin Canoe Company	Loss of income-generating, cultural business	Impoverishment, cultural identity, Worker health/safety/standards (reportable events)	Severe	permanent	Could be mitigated.

OPERATIONS

Environmental Change	**Effect on Community**	**Effect on Well-Being**	**Magnitude**	**Duration**	**Mitigation**
Depletion of healthy fish stocks;	Loss of a culturally important food source	Mal-nutrition; impoverishment; further loss of culture	Severe	years	Co-management agreement
Changed water flows disrupting fish, benthic invertebrae, turtles and their predators	Loss of a culturally important food source\safety of fishers	Mal-nutrition; impoverishment; further loss of culture	Severe	years	Co-management agreement
Resuspension of contaminants in the river	Loss of a culturally important food sources	Mal-nutrition; impoverishment; further loss of culture	Severe	years	irreversible
Destruction of a fisheries spawning area	Loss of a culturally important food source/biocultural aspect	Mal-nutrition; impoverishment; further loss of culture	Severe	years	mitigated
Increased non-native (AOO) and industrial traffic	Further intrusion into culturally and socially important areas of traditional territory	Loss of country foods, sacred spaces, culture and identity	Severe	years	mitigated
Opportunities for guardianship and monitoring	Employment, traditional custodians of the waterway	Decisions re local environment, catalyst for improvement	High	years	Co-management agreement

IR- IAAC – 1- 73: The effects of environmental changes on socio-economic conditions of the three SART First Nations.

Although the SART First Nations understand that the building of the dam-bridge in 1909 did facilitate their cross-river access, they have been dealing with the negative socio-economic conditions caused by the Timiskaming Dam since 1909, including (and not limited too):

- The obstruction of boat traffic on the Ottawa River
- the creation of the current configuration of Lake Timiskaming, which destroyed wild rice beds, dramatically ended the commercial fishery and caused the release of methyl mercury into the environment
- enabled the settlement by colonial and industrial interests on their territory
- entrapped pollutants from agricultural run-off, forestry operations and mines (which have settled into the sediments
- entrapped pollutants from the Tembec/Rayonnier facility in the sediments upstream of the dam.

It is unlikely that the replacement will improve any of these serious socio-economic conditions.

The most important economic effect of the Dam construction will be on the fragile business of the Algonquin Canoe Company. Dependent upon drop-in and some local traffic, it is an important source of employment and cultural identity for Wolf Lake First Nation. The loss of even one year of business might mean that the effect would be catastrophic. It is difficult to see how this might be mitigated and is probably irreversible.

There is a possibility that employment and contracts at the site might briefly enhance our economies; but we are also concerned (as indicated in the tables above), that the project will diminish our well-being and our rights even further. If so, those changes will be serious, of medium economic impact, but will be experienced daily and be irreversible.

The possibility of contracts and work for SART First Nation members during construction might contribute to the communities' economies, but it is also possible that it will pull workers away from existing jobs in their communities, creating a skimming effect. The latter is more likely as there is a current shortage of skilled workers. The other possible source of employment might be for guardians or monitors as proposed by the SART co-management agreement.

IAAC 1-74, Effects on the physical and cultural heritage of Indigenous People.

The construction of the Timiskaming Dam-Bridge in 1909 irreversibly altered the Ottawa River, creating Lake Timiskaming and the changes described in the baseline. The new construction (if Option 1 is chosen) will destroy a spawning bed for sturgeon and other fish important to the Algonquin peoples. This is a completely unacceptable activity which will cause a huge,

cumulative, irreversible loss to our physical and cultural heritage. Chapter 13.1 of the EIS shows the over-whelming rejection by the SART First Nations of Option 1, and their strong preference for the in-situ option 3.

IAAC1-75 Changes in the quantity, quality and availability of resources including cumulative effects.

As stated in responses above, most of the negative cumulative effects of the Timiskaming Dam have been experienced for more than a century by the SART First Nations. The specific effects from the replacement project are described in our responses above: to rights, to habitat, to health, to traditional food, socio-economy and physical and cultural heritage.

One purpose of CEAA 2012 is to encourage "the study of the cumulative effects of physical activities in a region and the consideration of those study results in environmental assessments." Indeed, it is mandatory that "any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out" be accounted for in the IA, as well as a review of the significance of those effects.[1]

At the heart of cumulative effects assessment is understanding the effects of other past, proposed, and reasonably foreseeable future activities.[2] As the Canadian Council of Ministers of the Environment explain:

"Cumulative effects denote the combined impacts of past, present, and reasonably foreseeable future human activities on the region's environmental objectives. It requires a broader, forward-looking approach to planning and management that balances environmental factors with economic and social (may include cultural and spiritual) considerations. " [3]

Regarding past and present events at the TDQRP site, we have previously detailed how colonialism, land dispossession, legal oppression, industrial encroachment, and contamination (among other things) have severely curtailed our ability to exercise our rights in and around the TDQRP site.

SART families residing in (and practicing rights in) the Timiskaming Dam Gordon River Area were displaced from the larger pulp and paper industry site beginning in the 1920s, and SART members have since had essentially no access around the industrial site going forward, and thus limited ability to practice their rights on the Quebec shoreline for over 100 years.

One crucial aspect of this historical context is that the TDQRP site was appropriated decades ago, without any consent from or consultation with the Algonquin Nation. SART has not been

[1] CEAA 2012, s 19(1)(a), (b)

[2] Impact Assessment Agency of Canada, "Cumulative Effects Assessment Practitioners' Guide," (1999).

[3] Canadian Council of Ministers of the Environment, Canada-wide Definitions and Principles for Cumulative Effects, PN 1541 (2014).

consulted on previous dam replacements at the TDQRP complex, or in managing the dam operations concerning river water levels and flow. Most recently, the Ontario side of the dam was replaced in a spawning bed without consultation with SART.

There have also been cumulative effects on the Kichi Sìbì watershed due to industrial effects in the area. For instance, pulp and paper and advanced materials facilities and sawmills have polluted the watershed to the extent that SART cannot carry out fishing rights due to contamination levels in the Timiskaming Dam catchment area. These temporal and spatial cumulative effects are well documents in the baseline SCEIA.

The cumulative effects of the TDQRP in conjunction with other activities at the Rayonnier pulp and paper site on SART's exercise of rights have not been assessed. These other activities include emissions from facility operations, management of wastes currently on site, imports of off-site wastes, remediation of contaminated areas, and decommissioning of unused structures at Rayonnier. All the above SART points need to be reflected in PSPC’s cumulative effects assessment as the severity of these cumulative impacts is likely to be high.

Appendices

Appendix 1
Valued Components Graphs

The SART high valued components and construction impacts are summarized as follows:

SART High Valued Components (VCs)

Wolf Lake First Nation (WLFN) Valued Components and Timiskaming Dam-Bridge of Quebec Replacement Project Potential Dam Relocation Impacts

Environmental Valued Components

Figure 1

Environmental valued components identified from Wolf Lake First Nations Traditional Knowledge and Land Use Study: Species

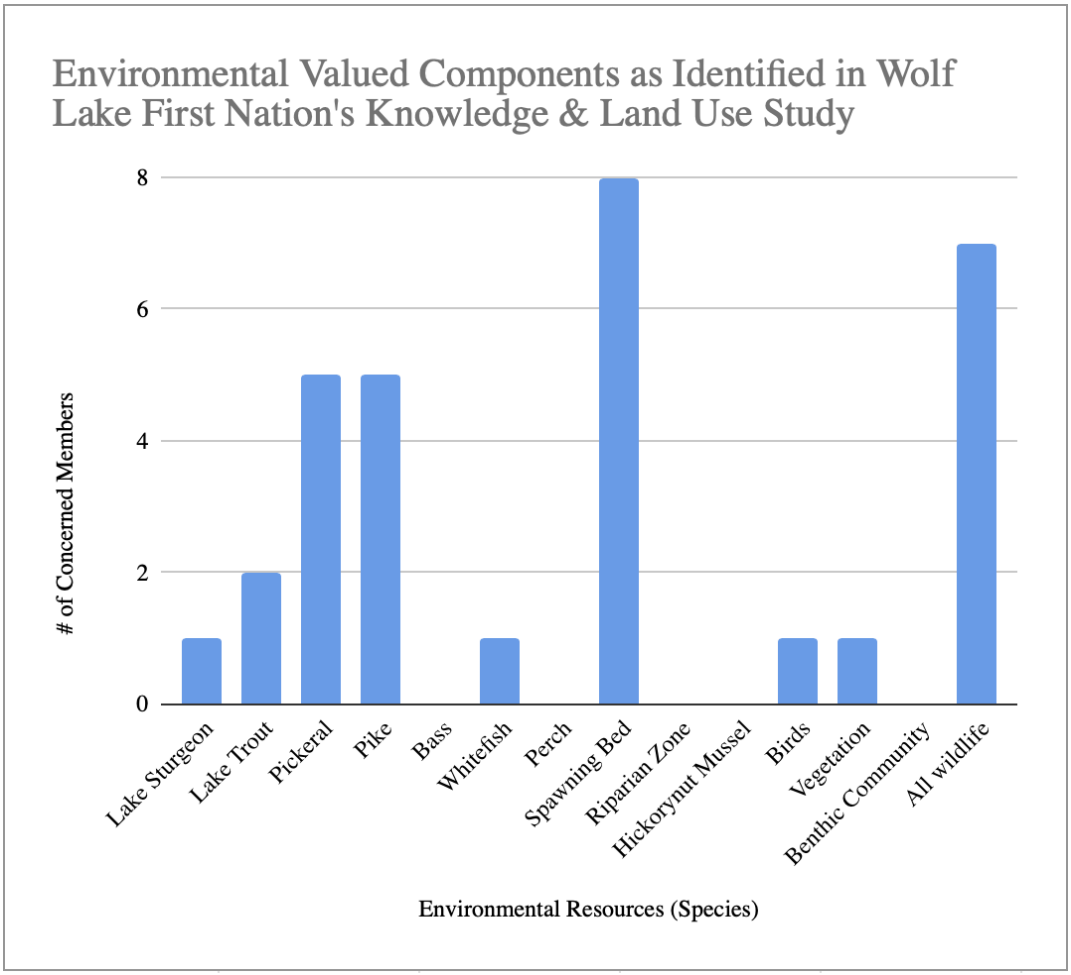


Figure 2

The level of concern expressed for Option 1 (downstream) by Wolf Lake First Nation members regarding the potential impacts on environmental valued components as identified in the Traditional Knowledge & Land Use Study

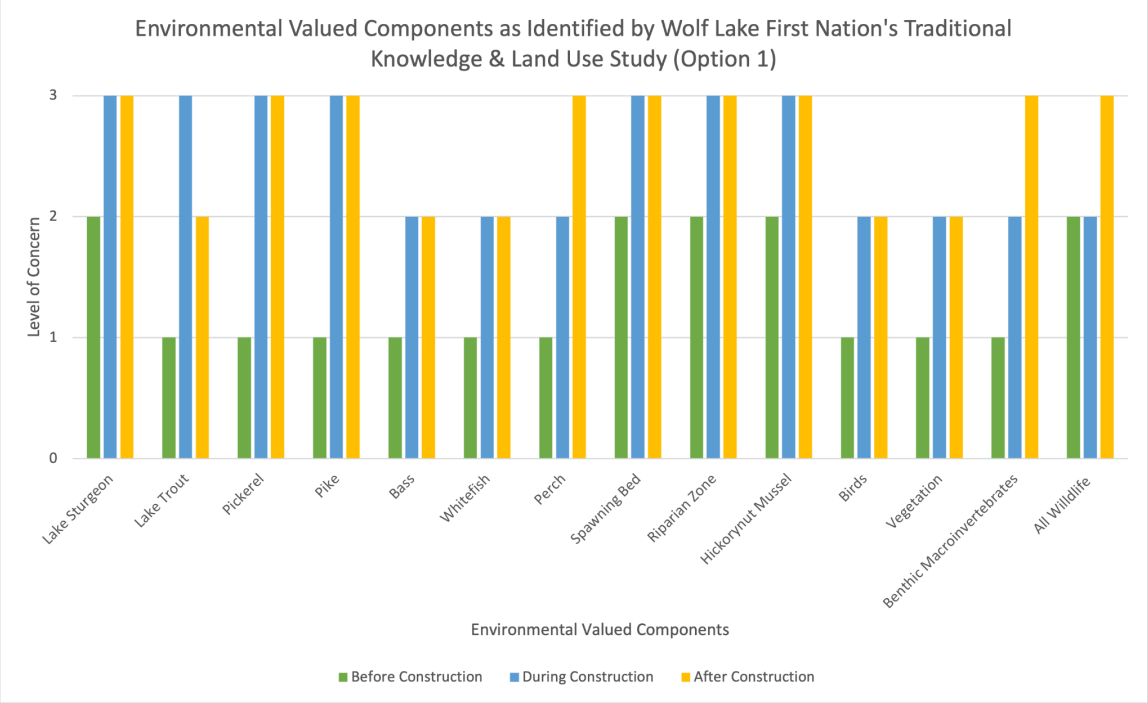


Figure 3

The level of concern expressed for Option 2 (upstream) by Wolf Lake First Nation members regarding the potential impacts on environmental valued components as identified in the Traditional Knowledge and Land Use Study

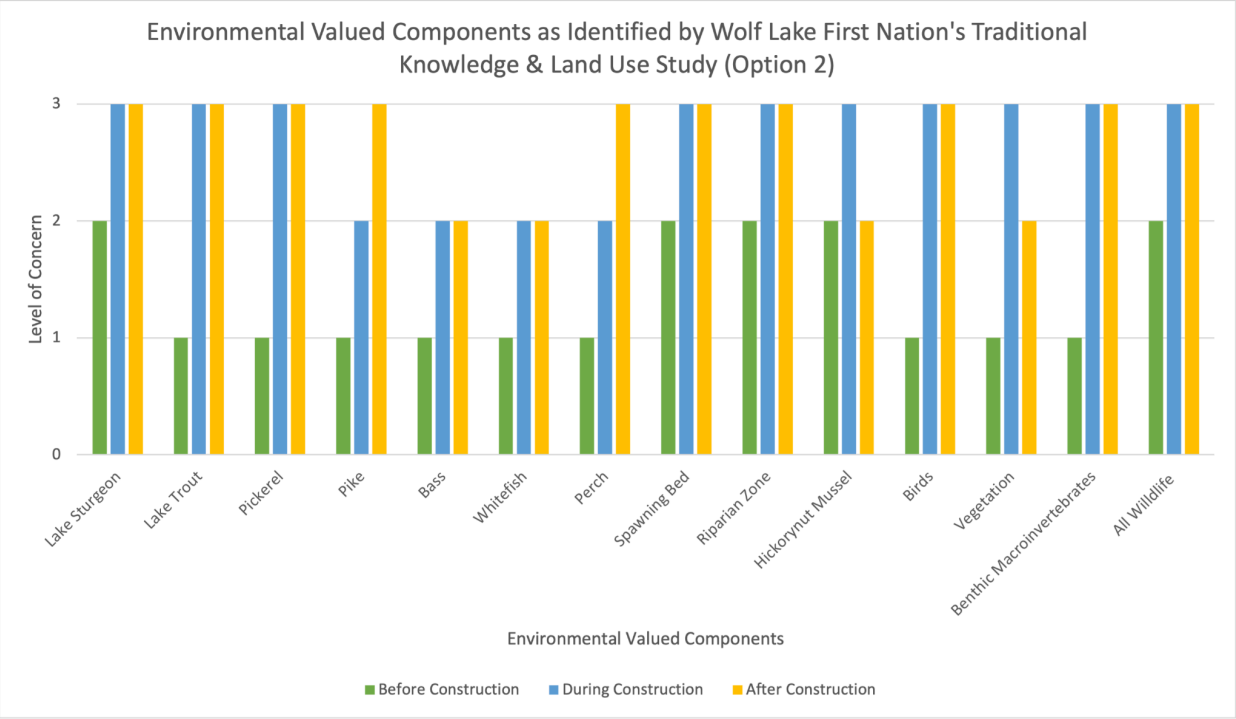
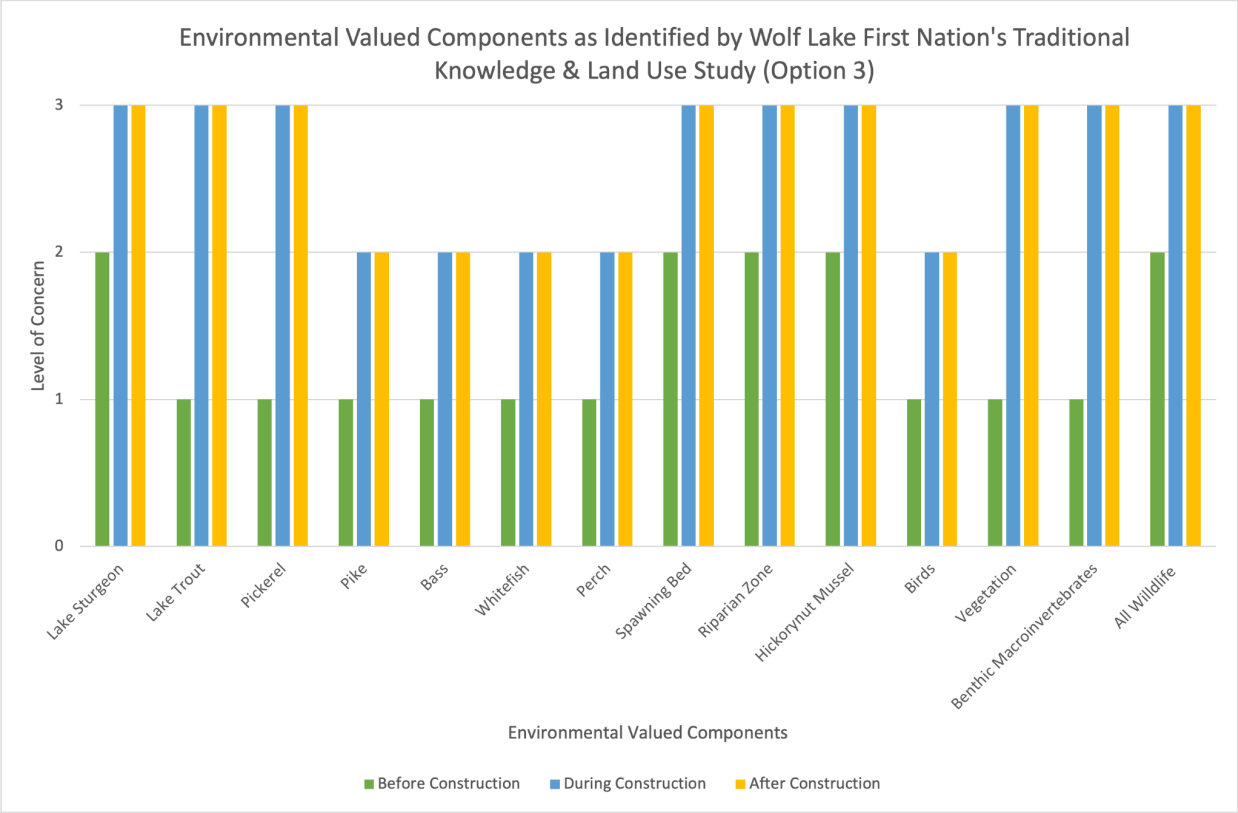


Figure 4

The level of concern expressed for Option 3 (current location) by Wolf Lake First Nation members regarding the potential impacts on environmental valued components as identified in the Traditional Knowledge and Land Use Study



Cultural Valued Components

Figure 5

Cultural valued components identified from Wolf Lake First Nations Traditional Knowledge and Land Use Study

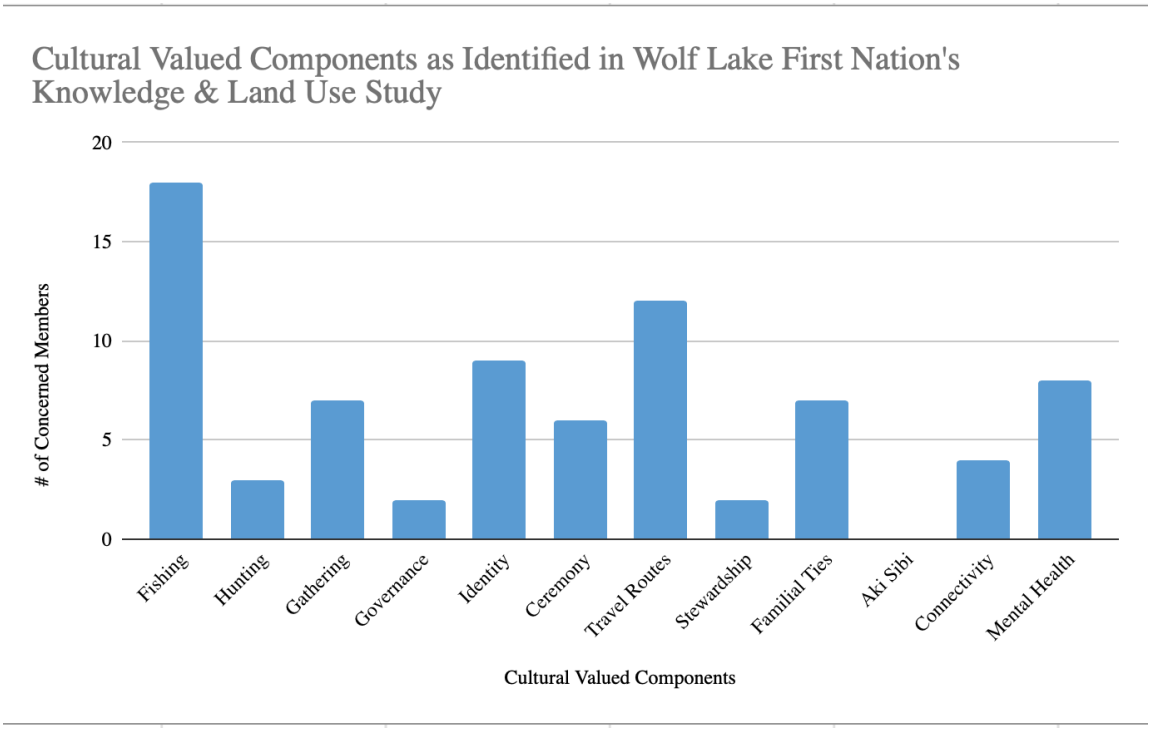


Figure 6

The level of concern expressed for Option 1 (downstream) by Wolf Lake First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge and Land Use Study

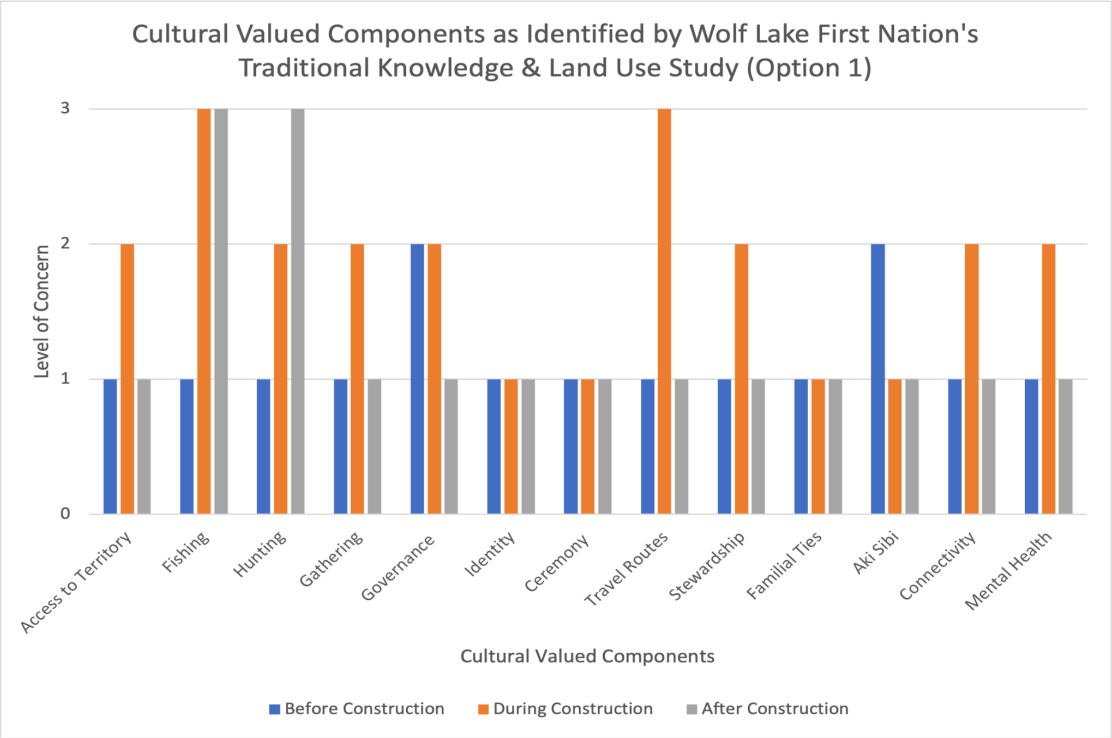


Figure 7

The level of concern expressed for Option 2 (upstream) by Wolf Lake First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge and Land Use Study

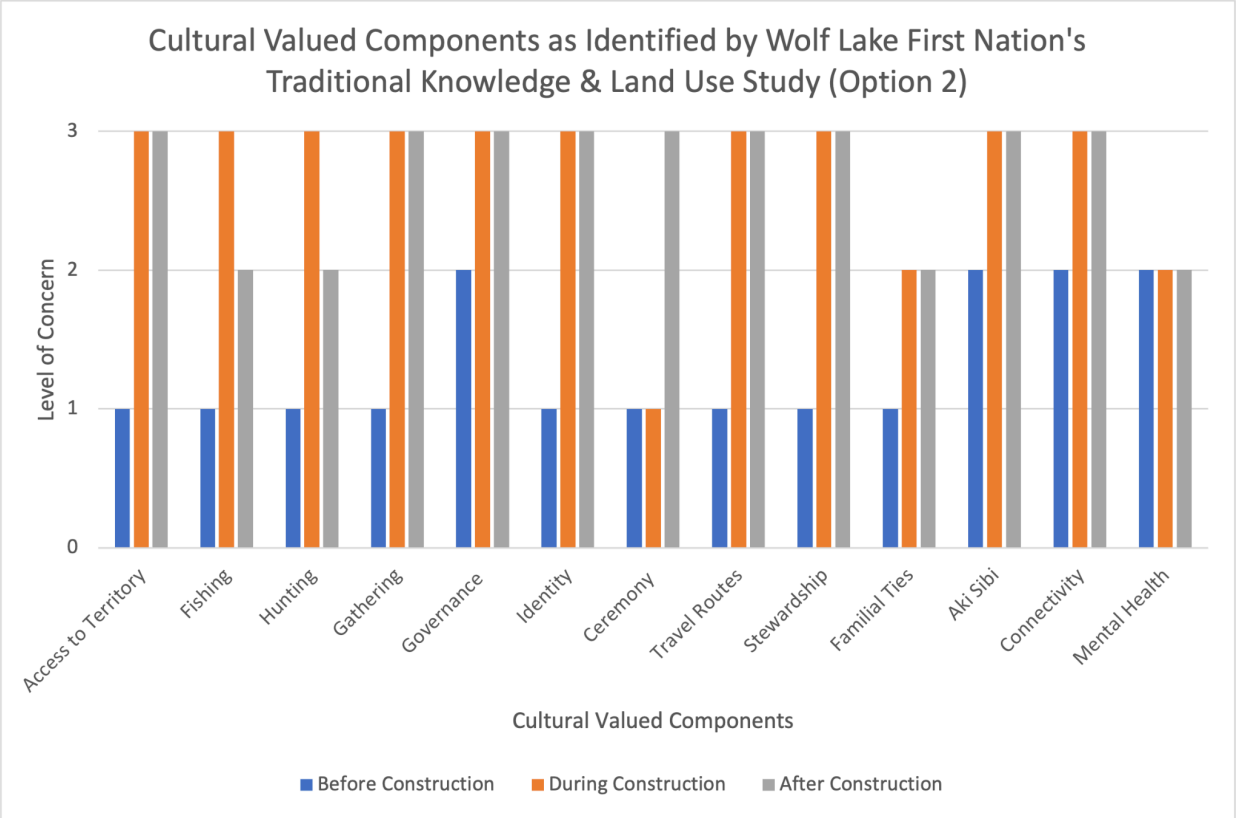
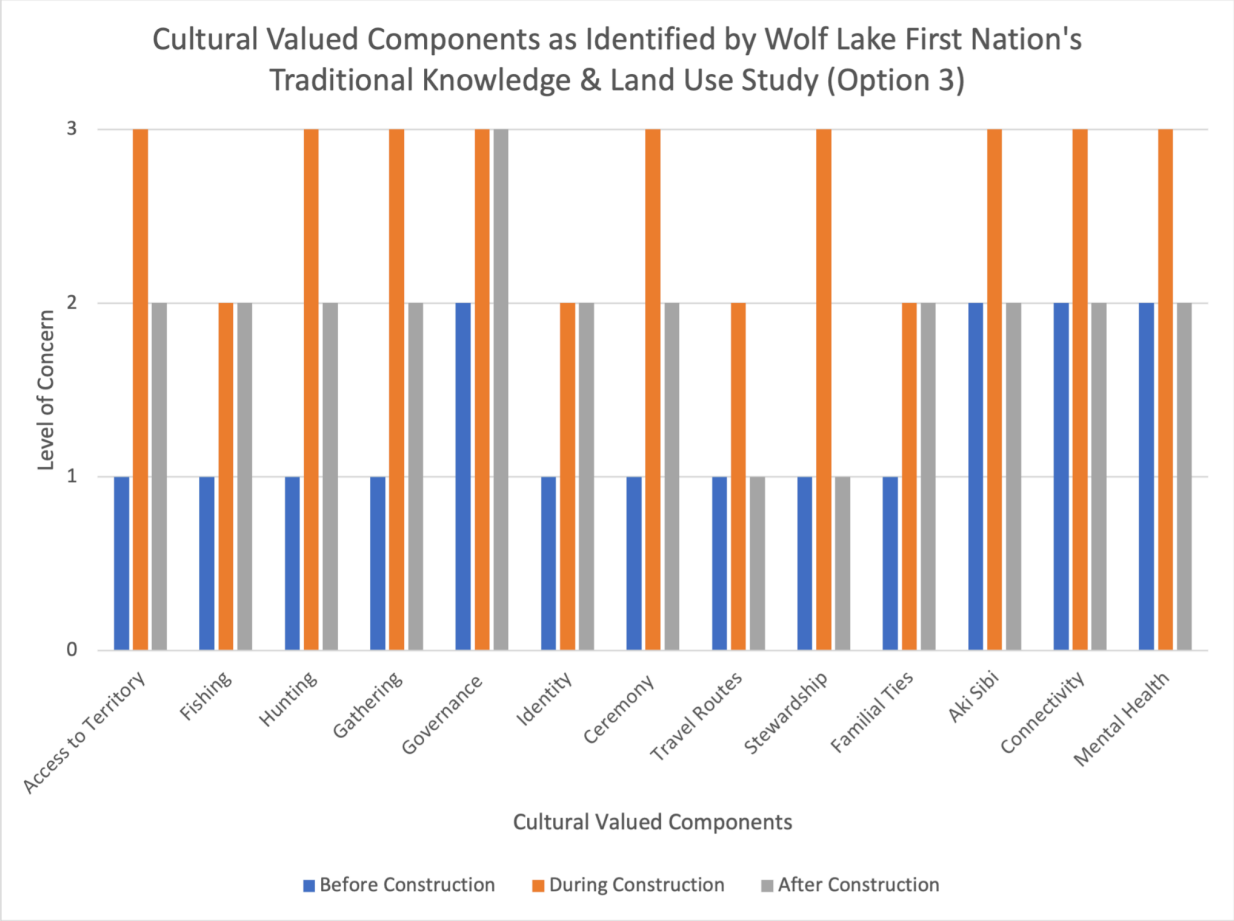


Figure 8

The level of concern expressed for Option 3 (current location) by Wolf Lake First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge and Land Use Study



Socio-economic Valued Components

Figure 9

Wolf Lake First Nations socio-economic valued components concerns identified in the Traditional Knowledge and Land Use Study

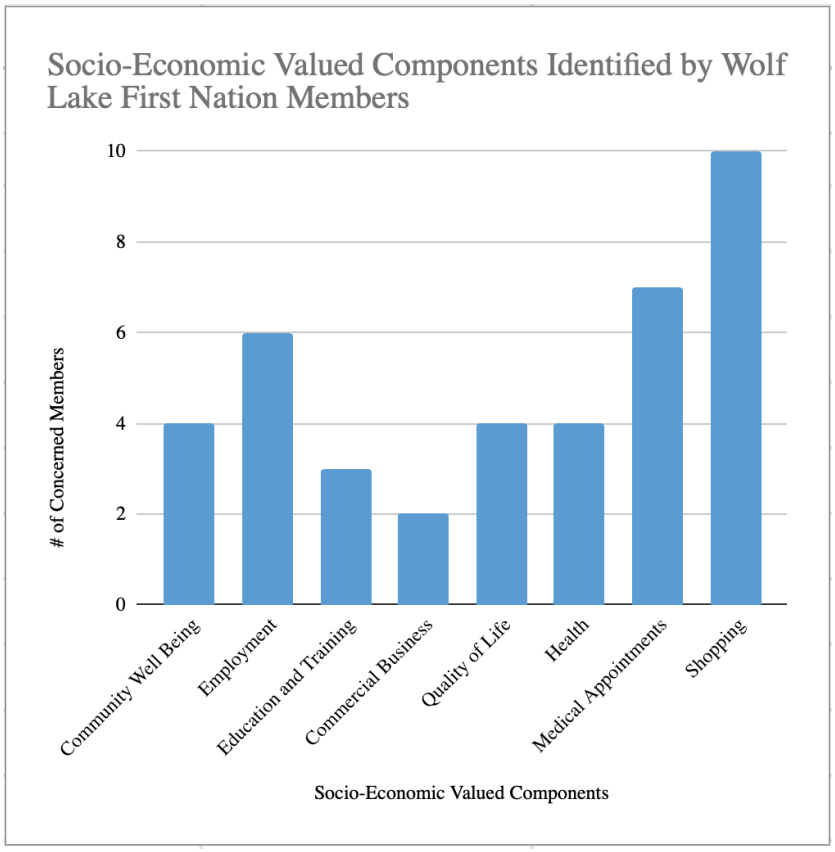


Figure 10

The level of concern expressed for Option 1 (downstream) by Wolf Lake First Nation members for potential relocation of the dam

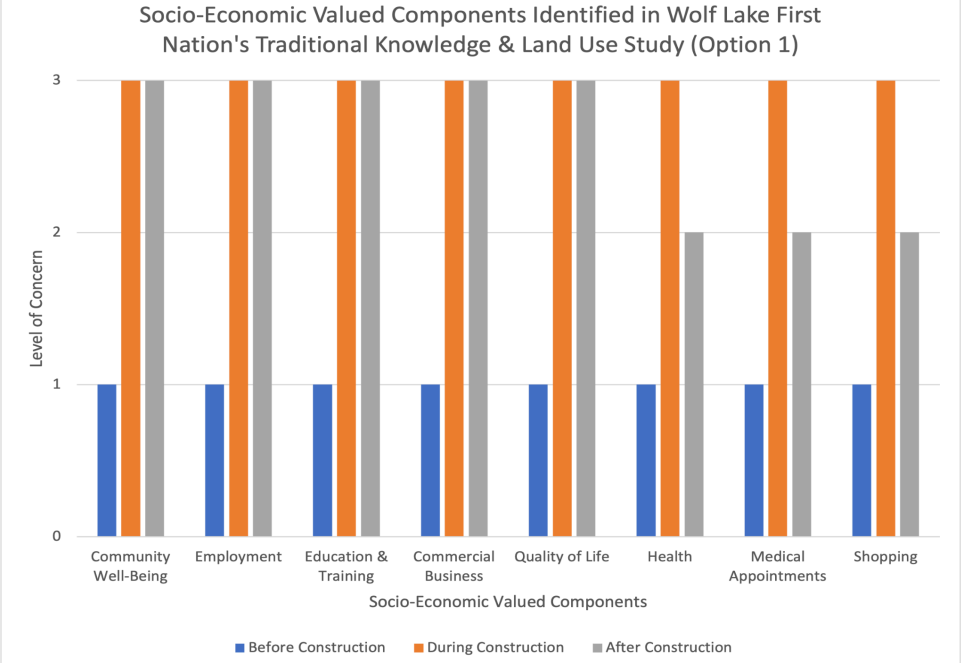


Figure 11

The level of concern expressed for Option 2 (upstream) by Wolf Lake First Nation members for potential relocation of the dam

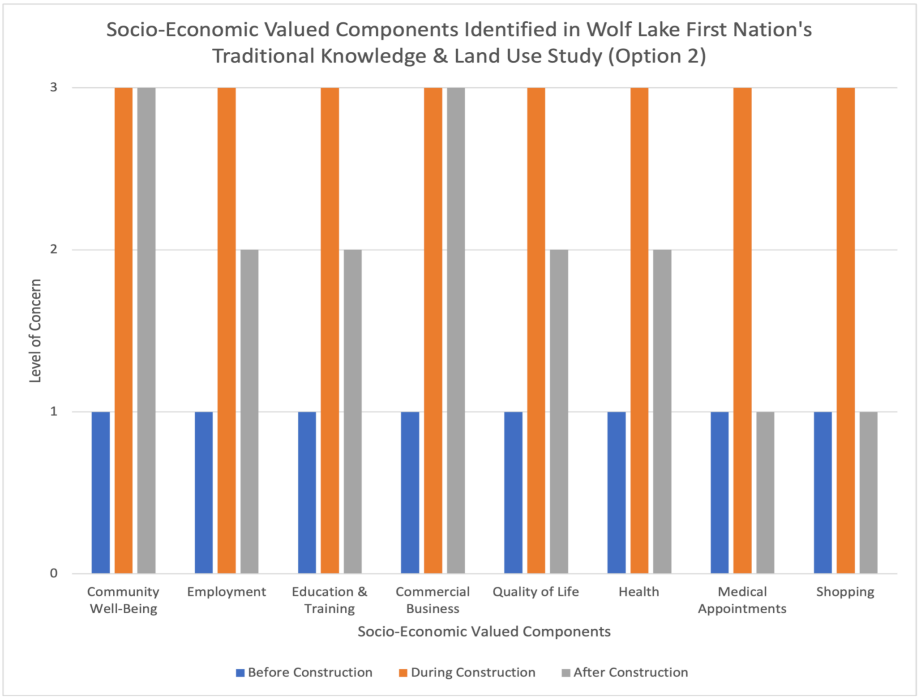
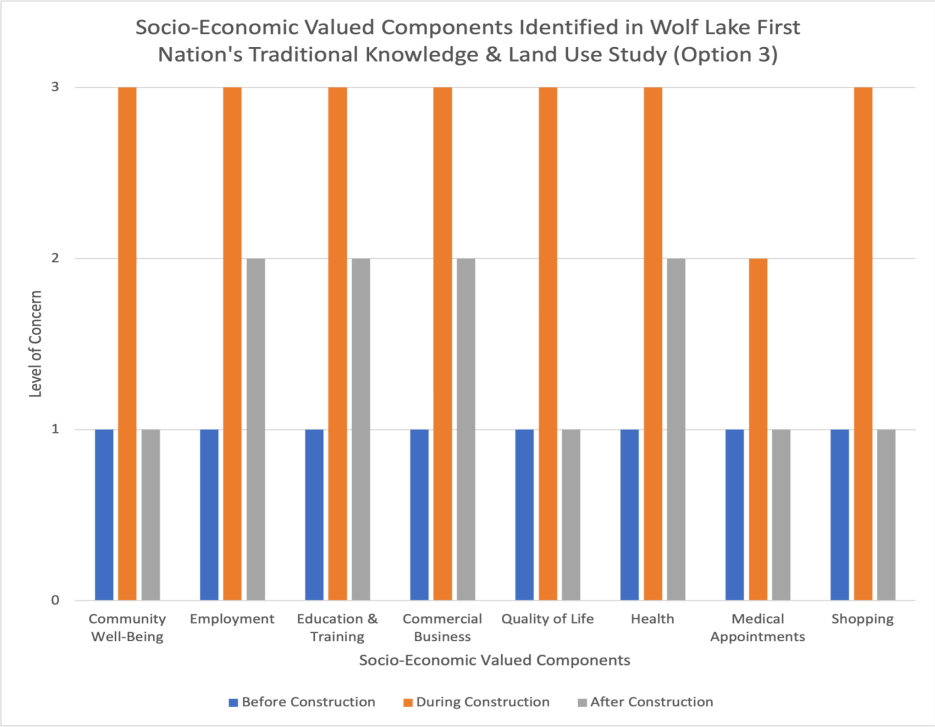


Figure 12

The level of concern expressed for Option 3 (current location) by Wolf Lake First Nation members for the dam to remain in the same location



Kebaowek First Nation Valued Components

Environmental Valued Components

Figure 13

Environmental valued components identified from Kebaowek First Nations Traditional Knowledge and Land Use Study: Resources

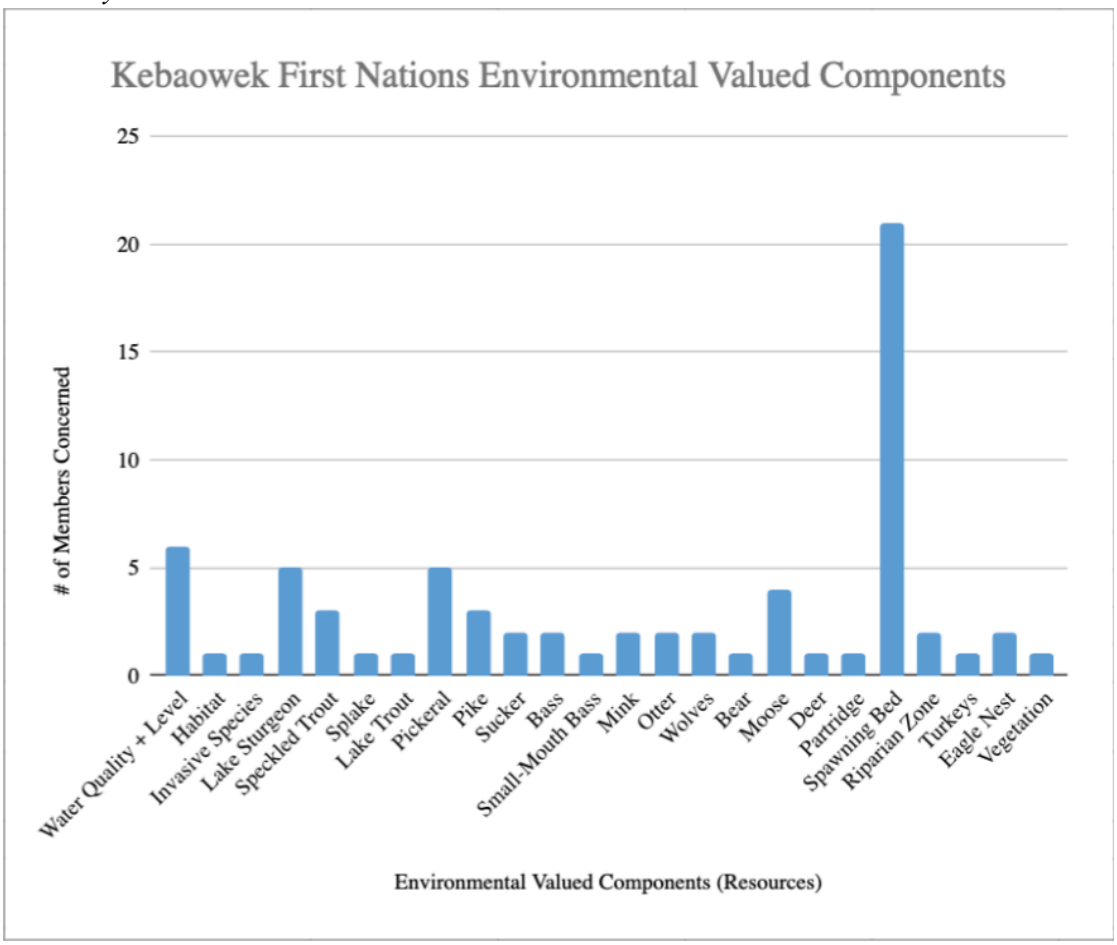


Figure 14

The level of concern expressed for Option 1 (downstream) by Kebaowek First Nation members regarding the potential impacts on environmental valued components as identified in the Traditional Knowledge and Land Use Study

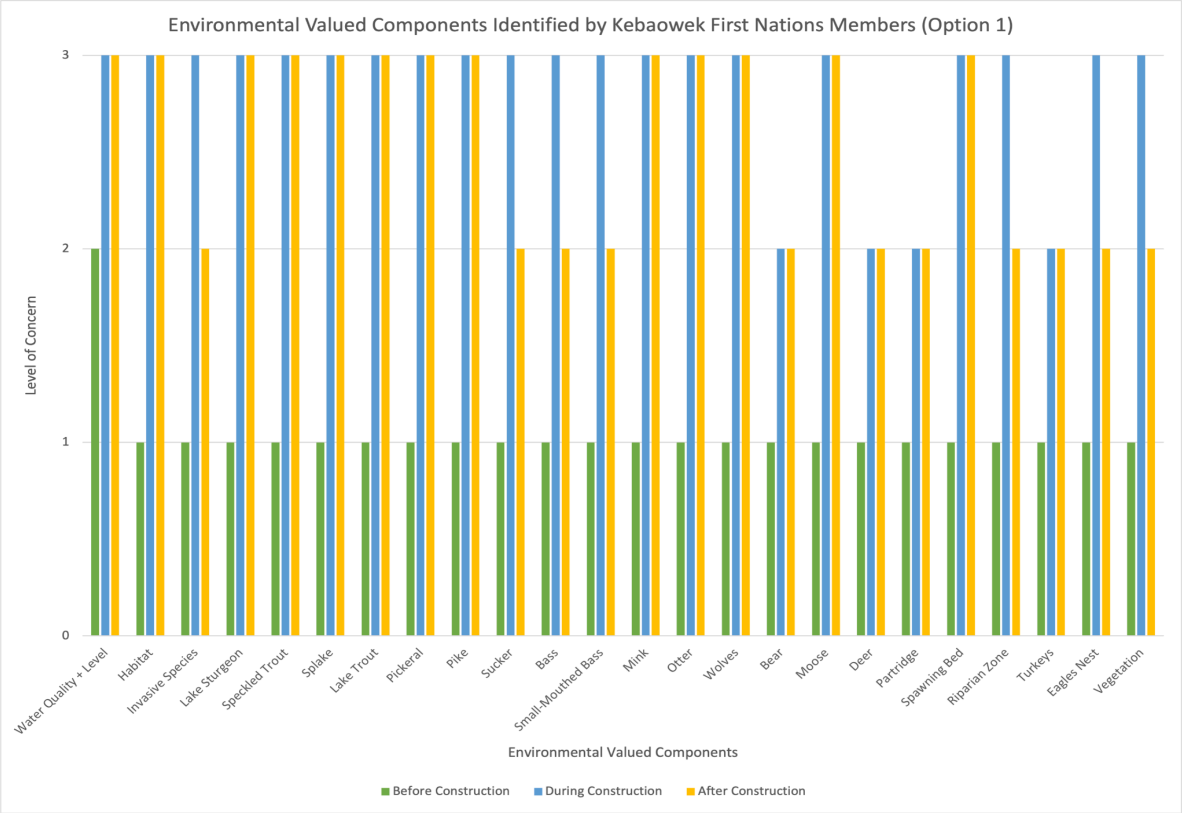


Figure 15

The level of concern expressed for Option 2 (upstream) by Kebaowek First Nation members regarding the potential impacts on environmental valued components as identified in the Traditional Knowledge and Land Use Study

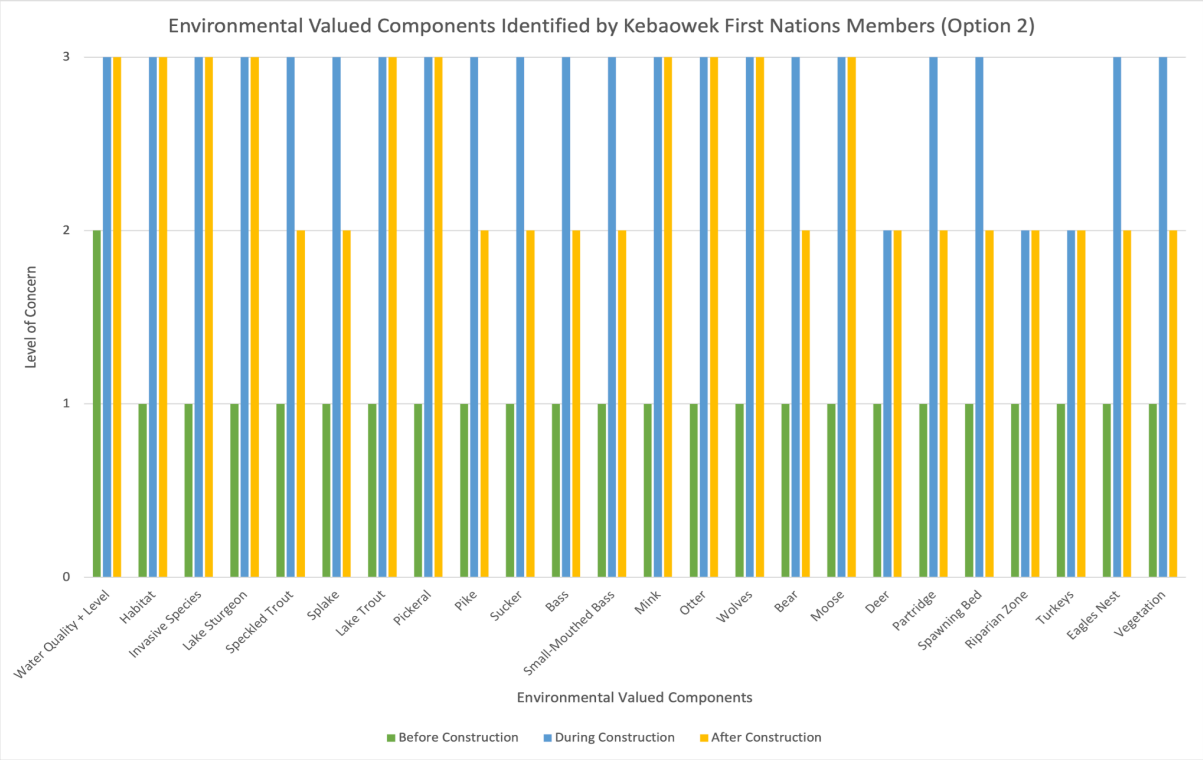
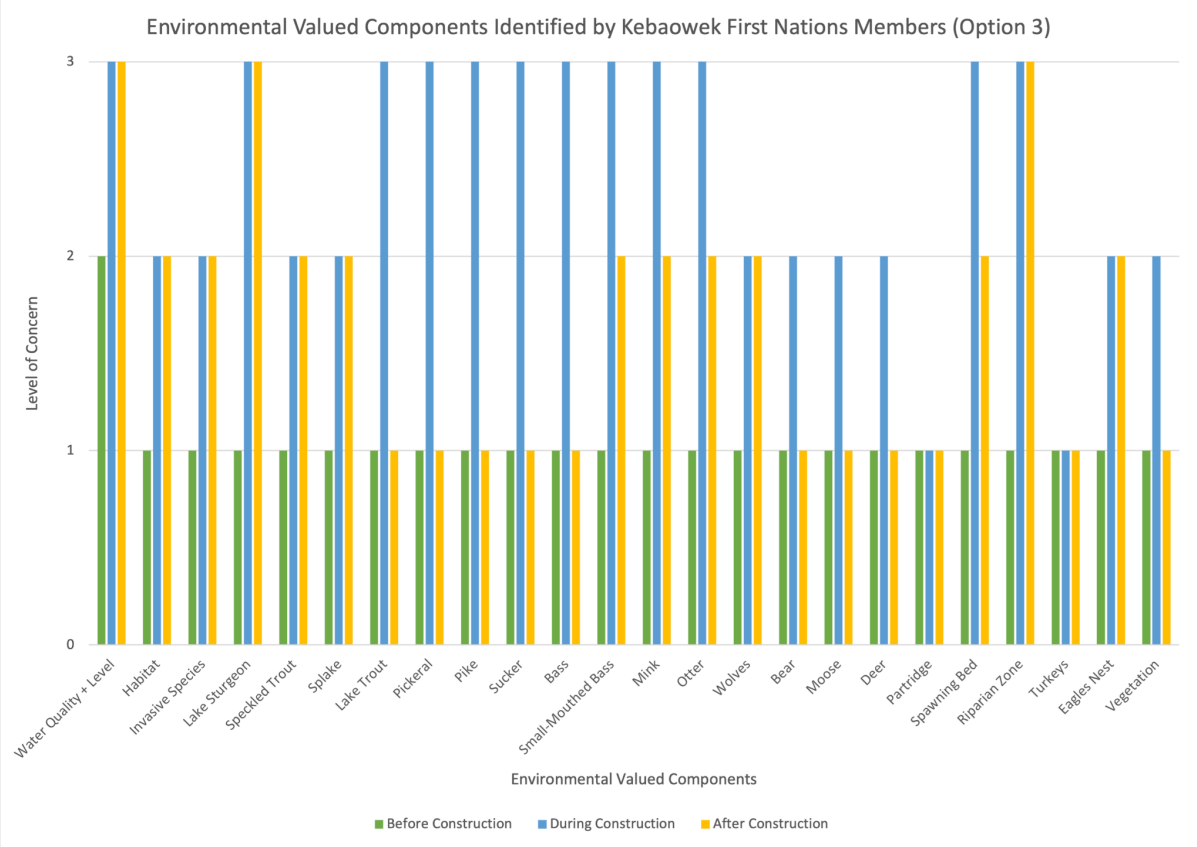


Figure 16

The level of concern expressed for Option 3 (current location) expressed by Kebaowek First Nation members regarding the potential impacts on environmental valued components as identified in the Traditional Knowledge & Land Use Study



Cultural Valued Components

Figure 17

Cultural valued components identified from Kebaowek First Nations Traditional Knowledge and Land Use Study

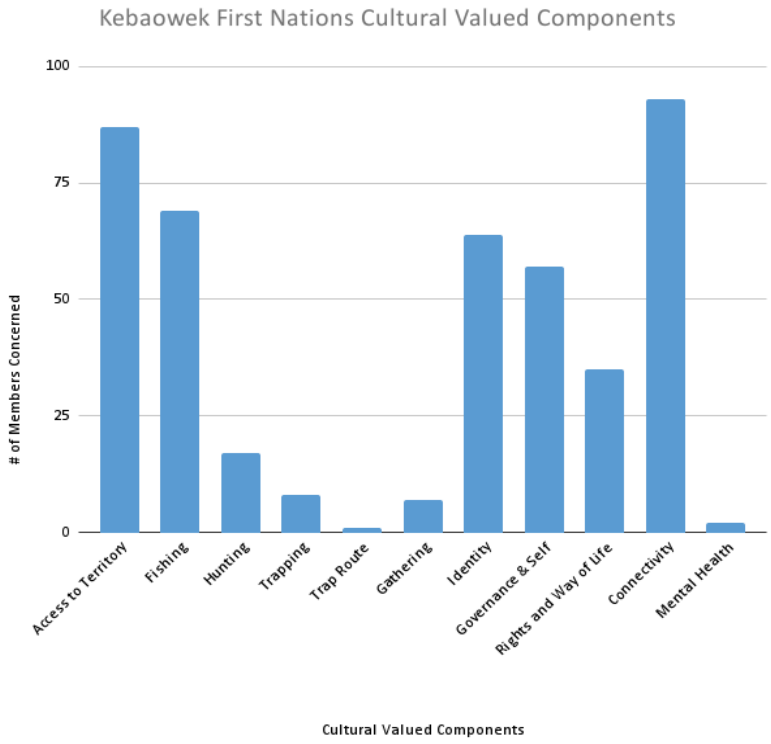


Figure 18

The level of concern expressed for Option 1 (downstream) by Kebaowek First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge & Land Use Study

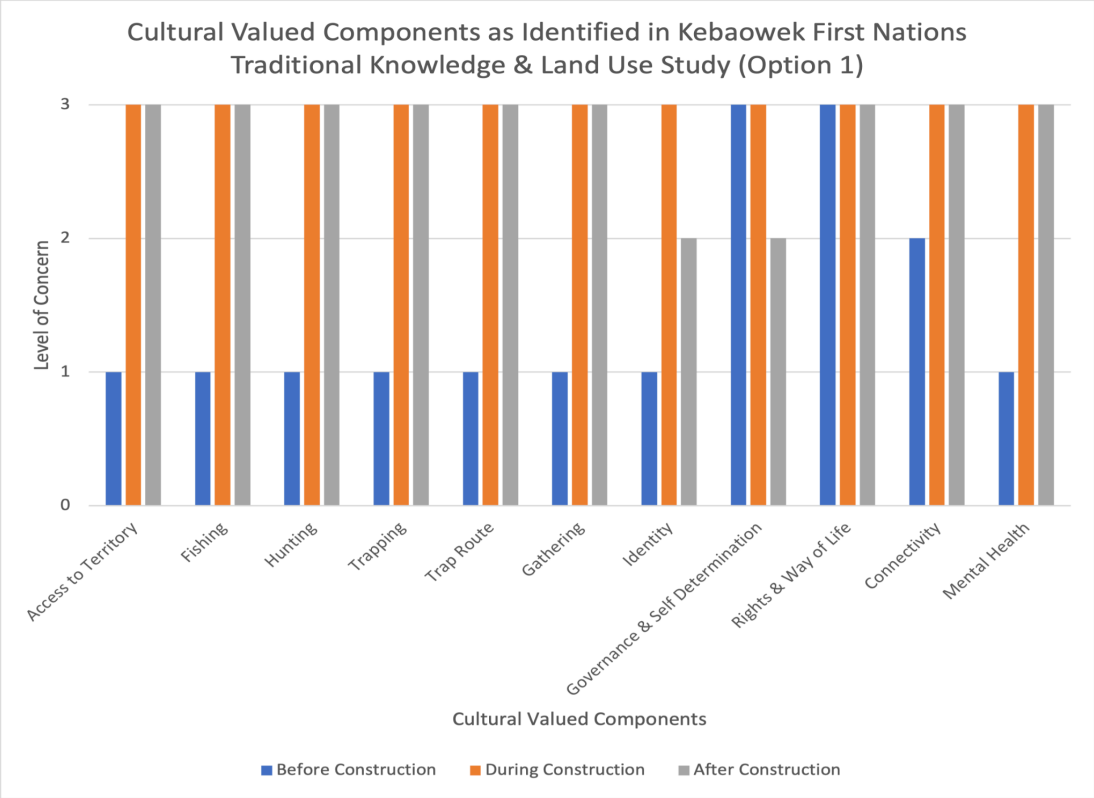


Figure 19

The level of concern expressed for Option 2 (upstream) by Kebaowek First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge & Land Use Study

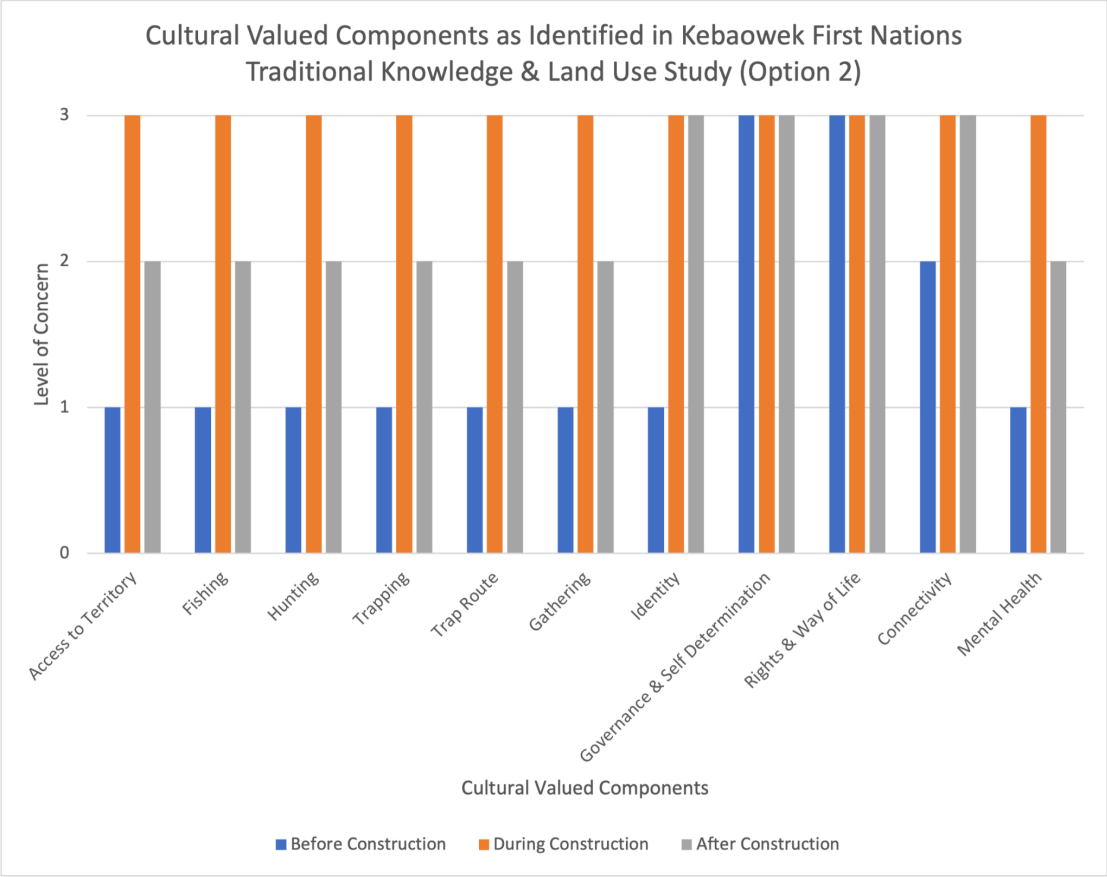
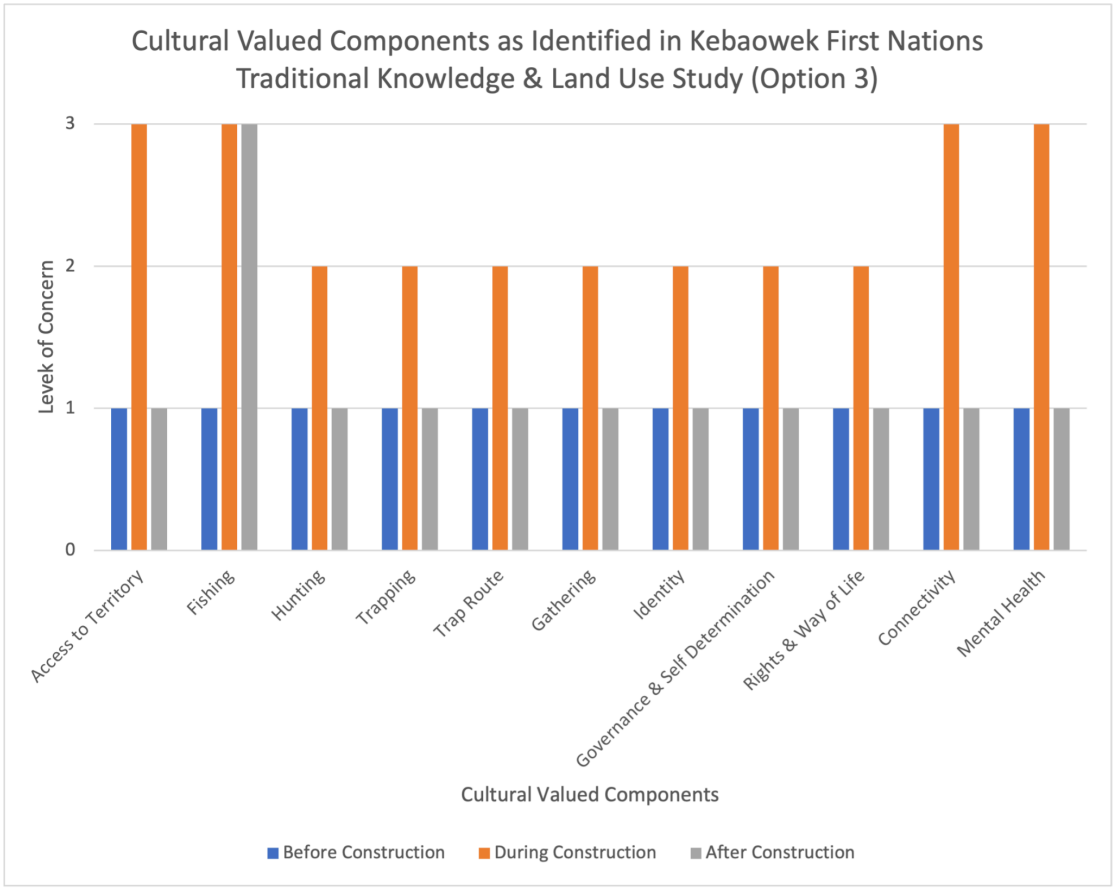


Figure 20

The level of concern expressed for Option 3 (current location) by Kebaowek First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge & Land Use Study



Socio-economic Valued Components

Figure 21

Kebaowek First Nations identified socio-economic valued components in the Traditional Knowledge and Land Use Study

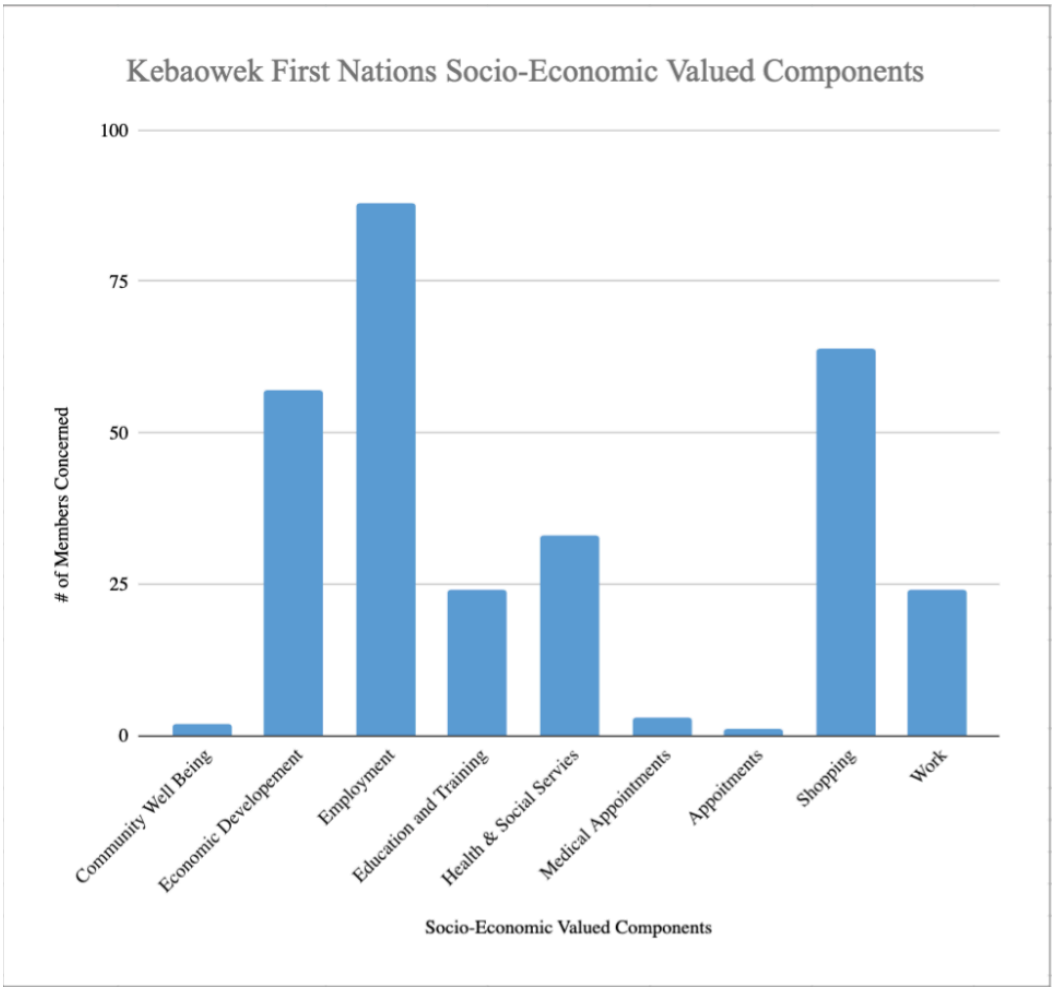


Figure 22

The level of concern expressed for Option 1 (downstream) by Kebaowek First Nation members regarding the potential impacts on identified socio-economic valued components as identified in the Traditional Knowledge & Land Use Study

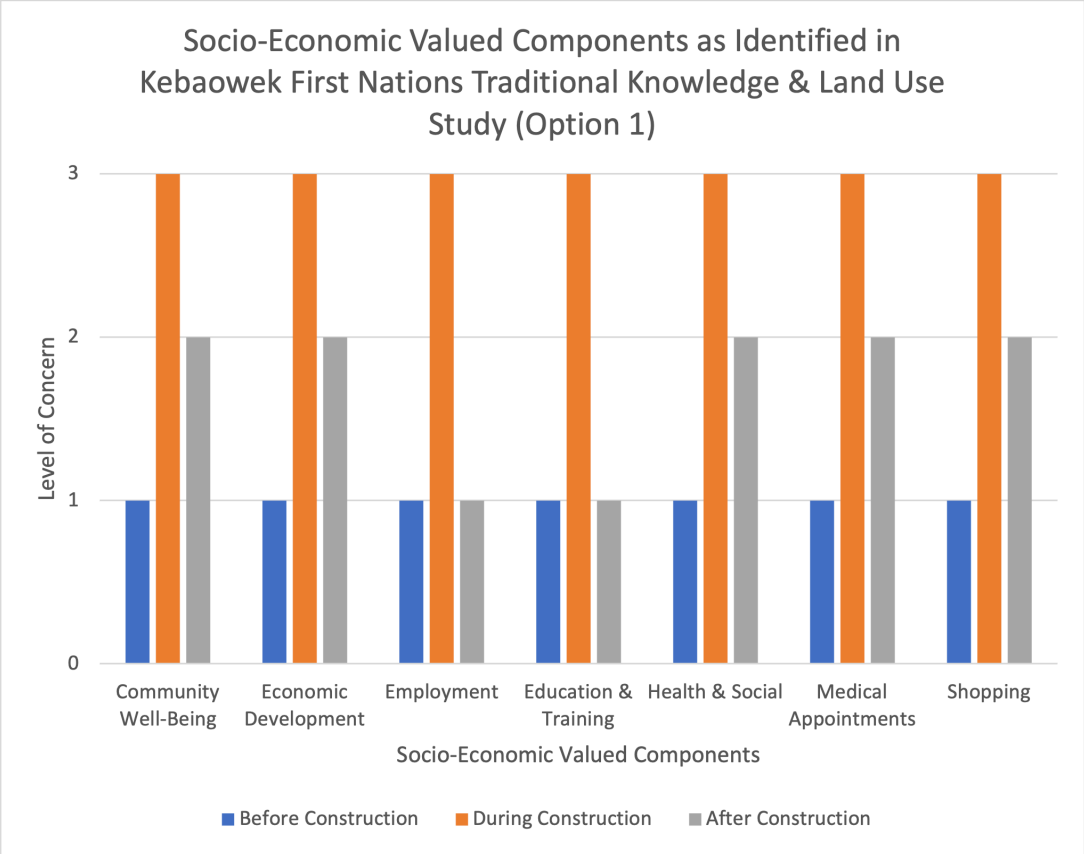


Figure 23

The level of concern expressed for Option 2 (upstream) by Kebaowek First Nation members regarding the potential impacts on identified socio-economic valued components as identified in the Traditional Knowledge & Land Use Study

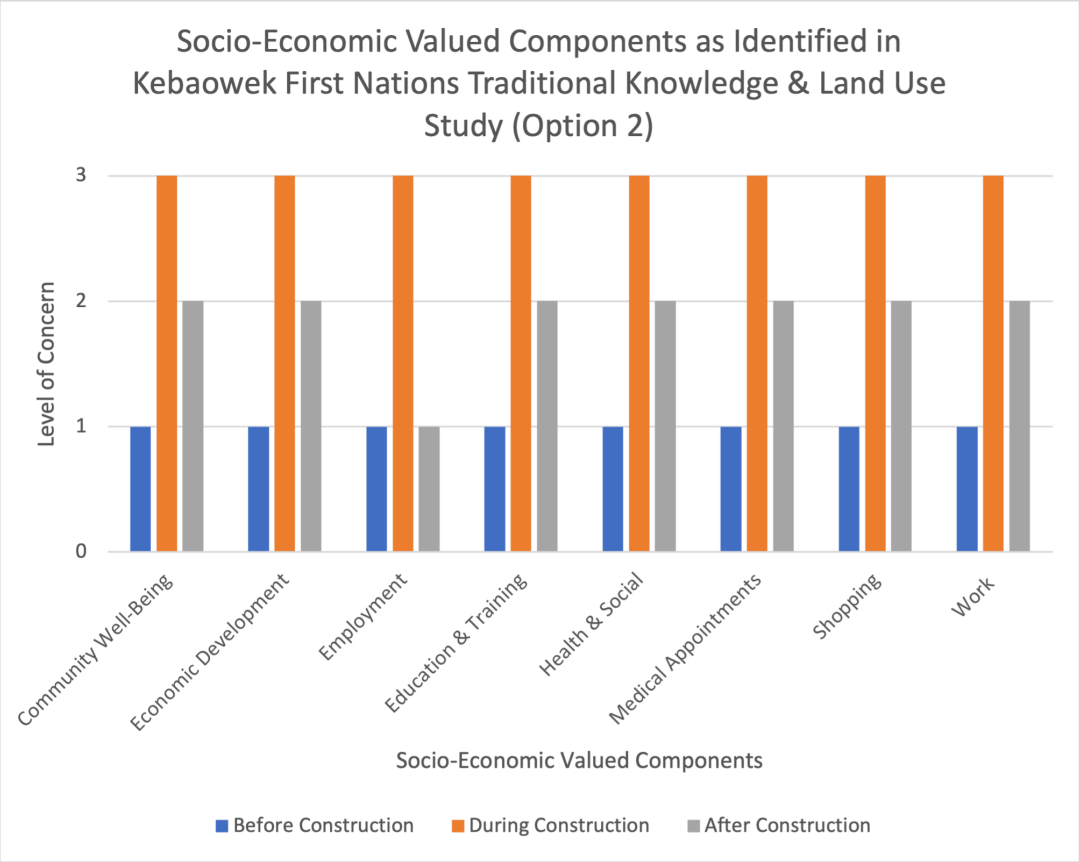
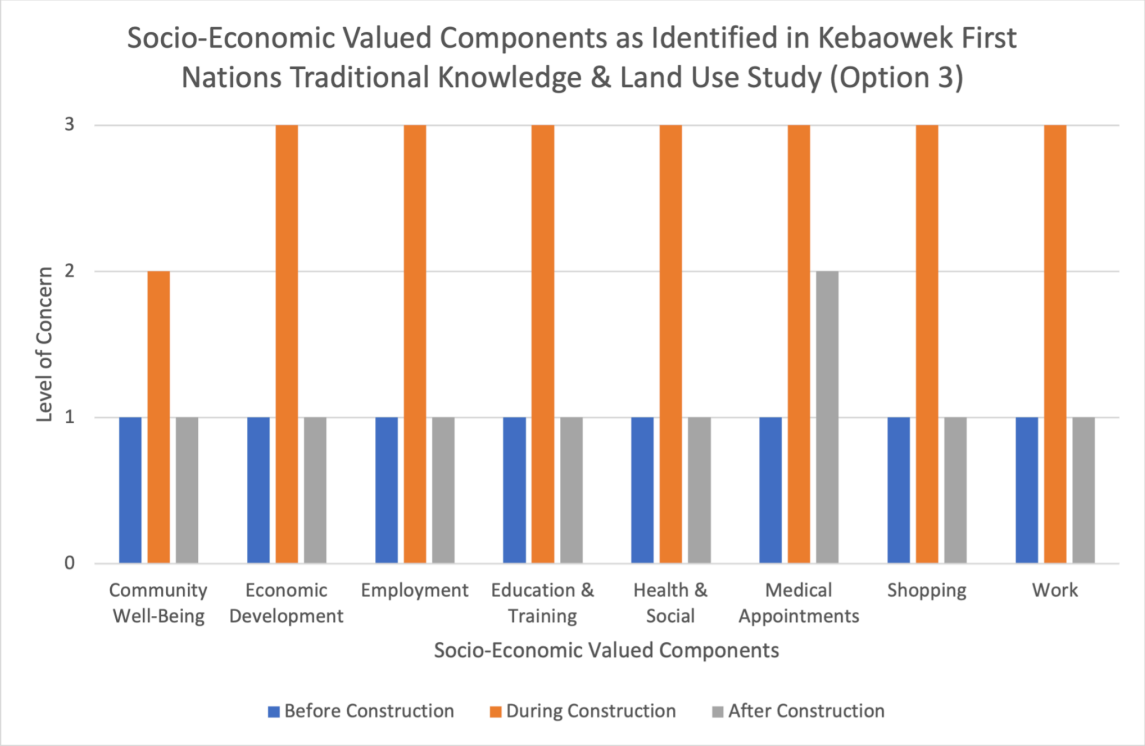


Figure 24

The level of concern expressed for Option 3 (current location) by Kebaowek First Nation members regarding the potential impacts on identified socio-economic valued components as identified in the Traditional Knowledge & Land Use Study

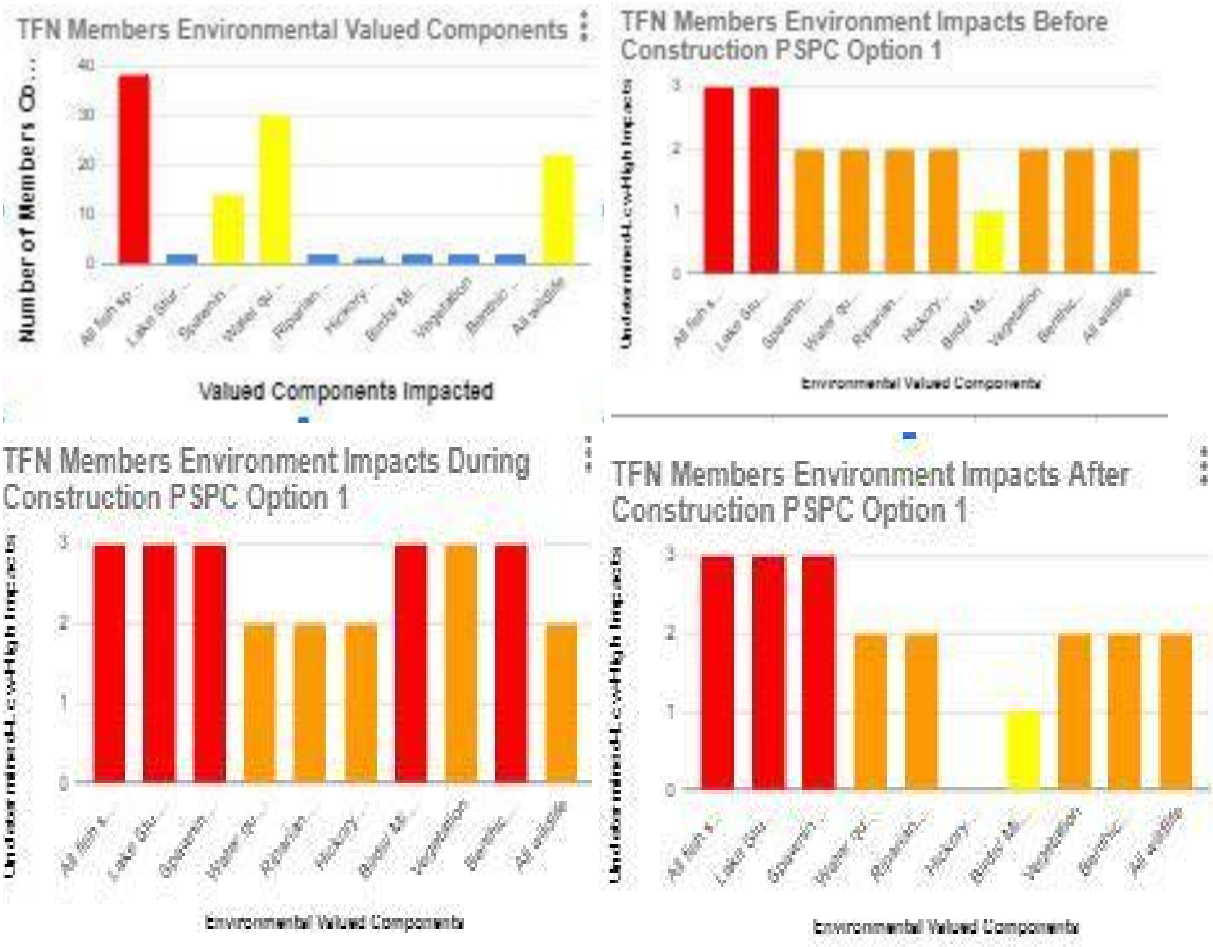


Timiskaming First Nation (TFN)

Environmental Valued Components

Figure 25

Environmental Valued Components and TDQRP Construction Impacts



Note. * Based on PSPC Replacement Option 1 Downstream from existing dam in Spawning Bed

Figure 26

Timiskaming First Nation (TFN) Preferred Option 3 Environmental Impacts

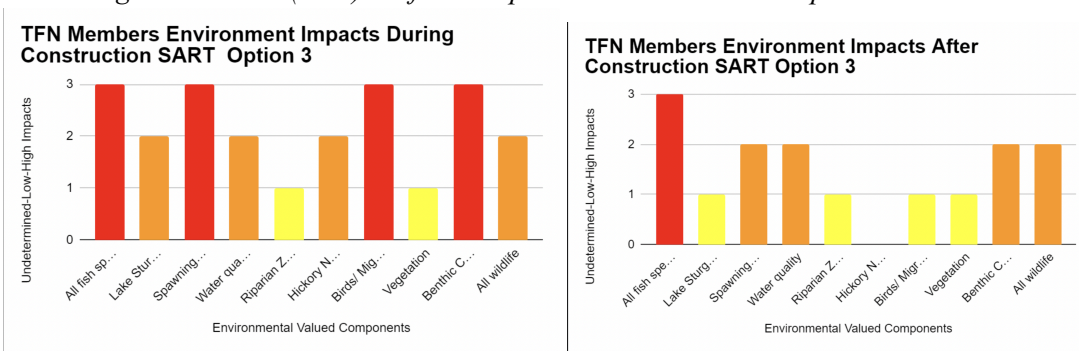
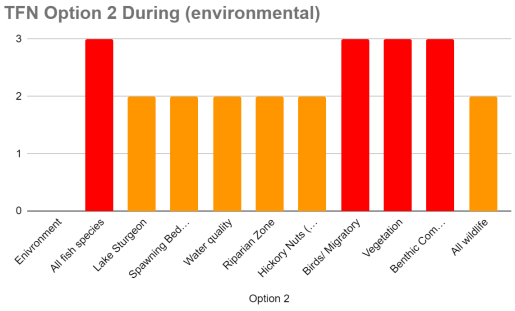
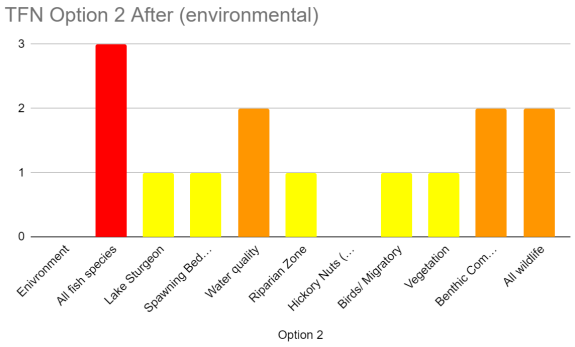


Figure 27

Timiskaming First Nation Option 2 Environmental Impacts





Cultural Valued Components

Figure 28

Concerns expressed by Timiskaming First Nation members for TDQRP Construction Impacts on cultural valued components: experience

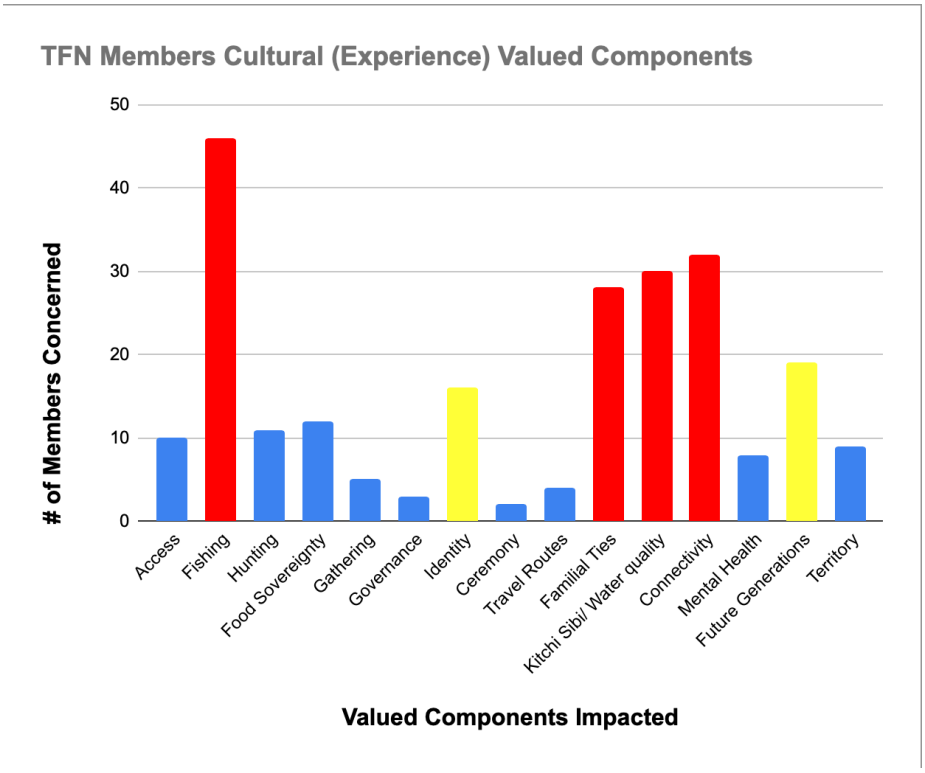
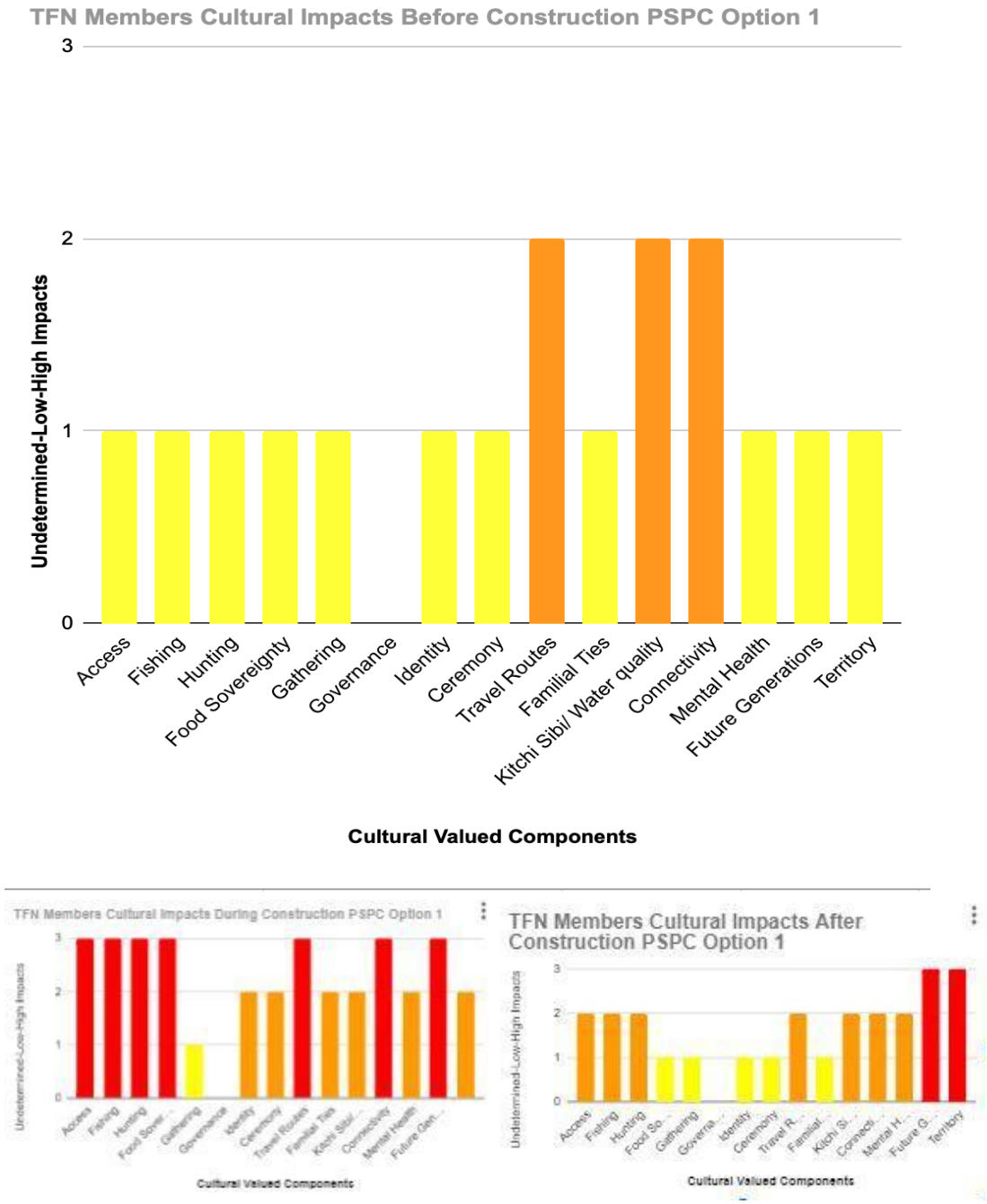


Figure 29

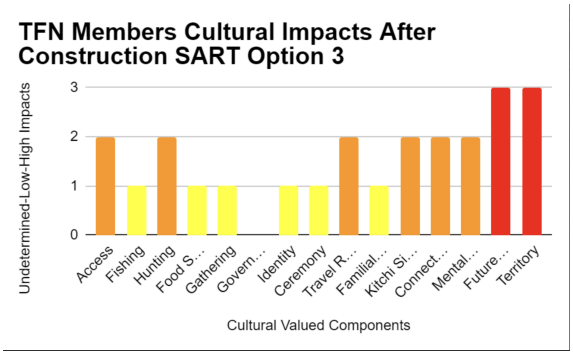
The level of concern expressed for Option 1 (downstream) by Timiskaming First Nation members regarding the potential impacts on cultural valued components as identified in the Traditional Knowledge & Land Use Study



Note. Based on PSPC Replacement Option 1 Downstream from existing dam in Spawning Bed

Figure 30

Timiskaming First Nation (TFN) Preferred Option 3 Cultural Impacts



Note. * Based on PSPC Replacement Option 1 Downstream from existing dam in Spawning Bed

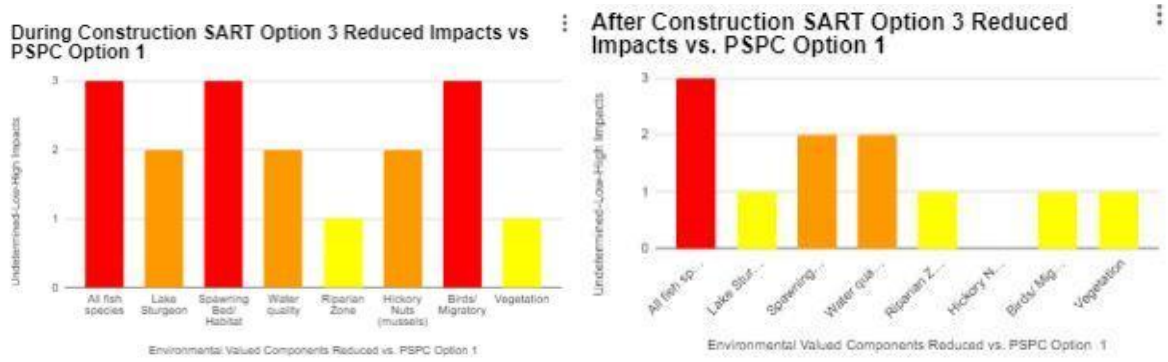
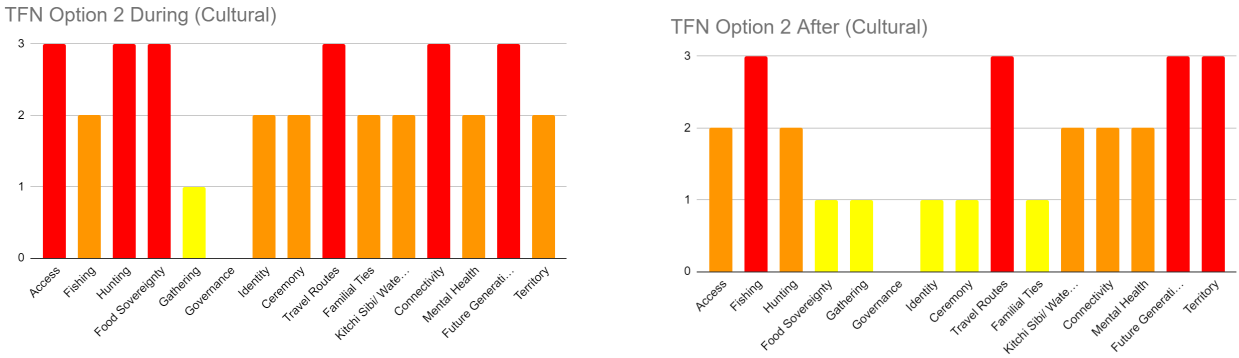


Figure 31

Timiskaming First Nation Option 2 Cultural Impacts



Socio-economic Valued Components

Figure 32

Timiskaming First Nation (TFN) Socio-Economic Valued Components and TDQRP Construction Impacts

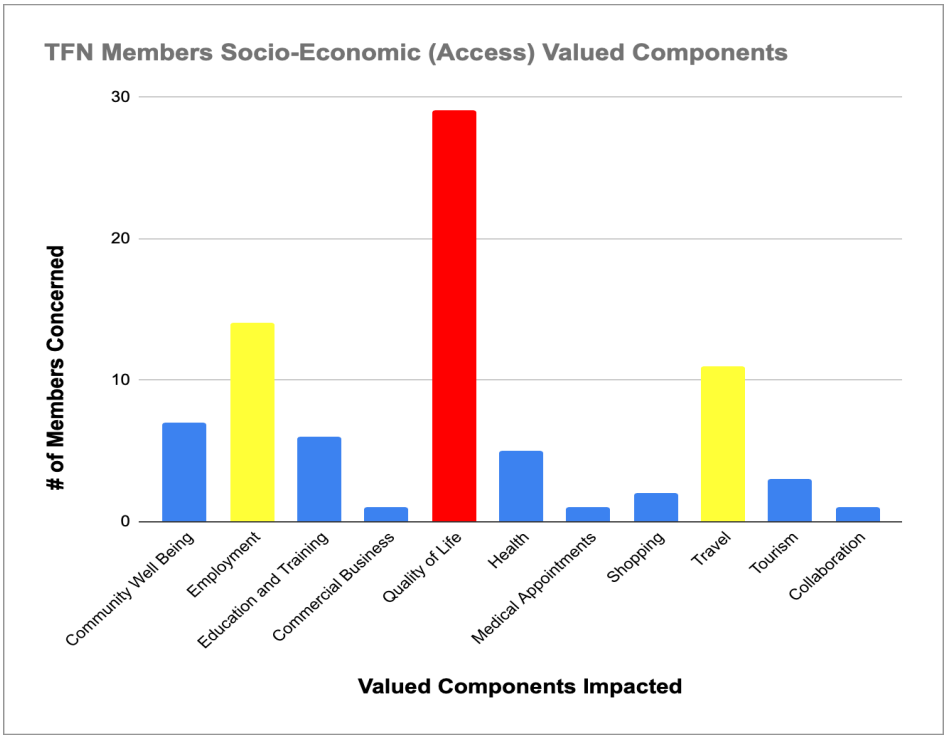


Figure 33

Concerns expressed by Timiskaming First Nation members regarding impact of construction on socio-economic impacts: before construction

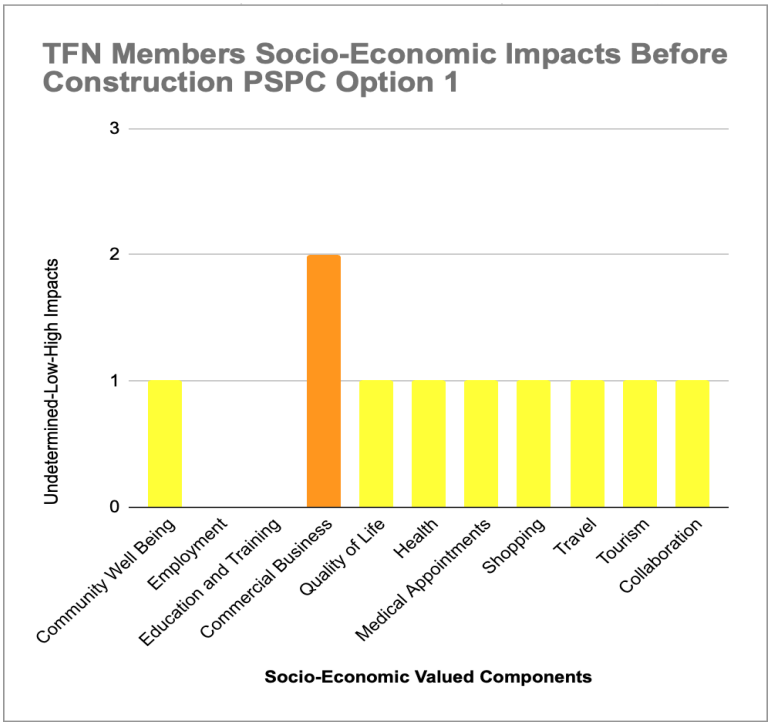


Figure 34

Concerns expressed by Timiskaming First Nation members regarding impact of construction on socio-economic impacts: during construction

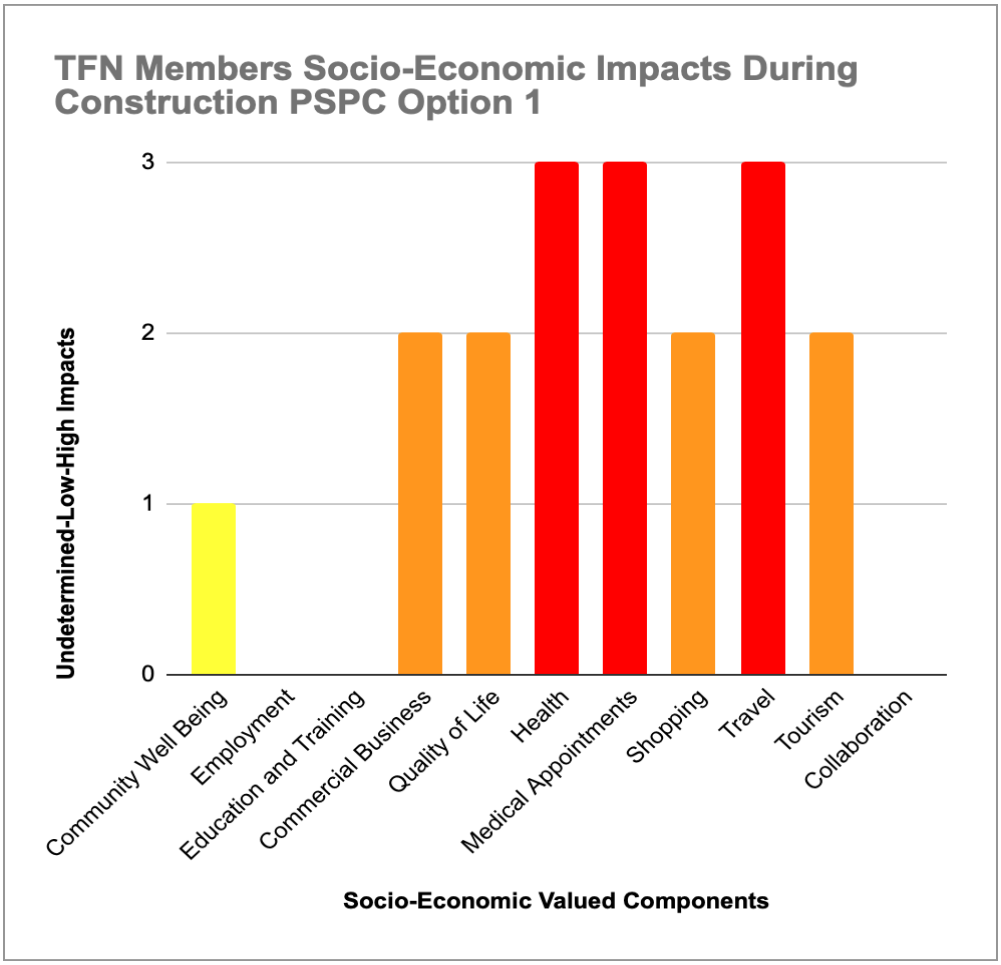
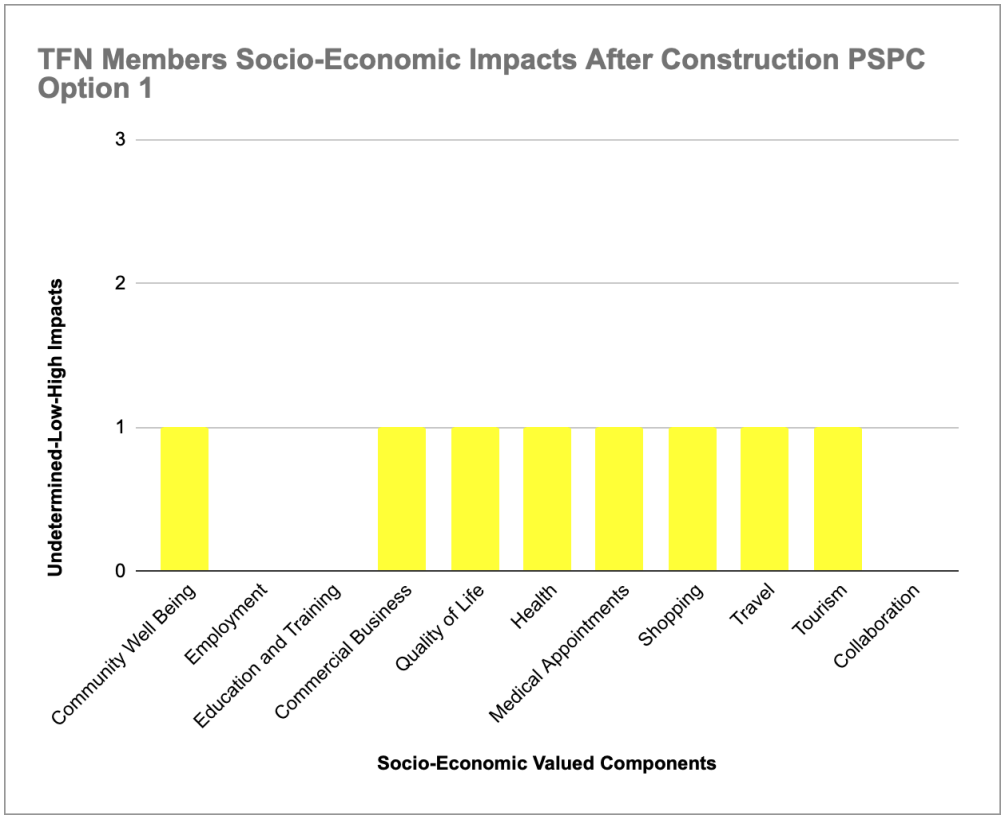


Figure 35

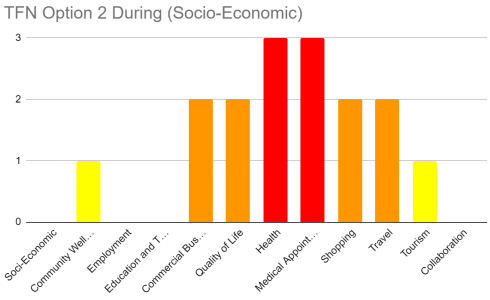
Concerns expressed by Timiskaming First Nation members regarding impact of construction on socio-economic impacts: after construction

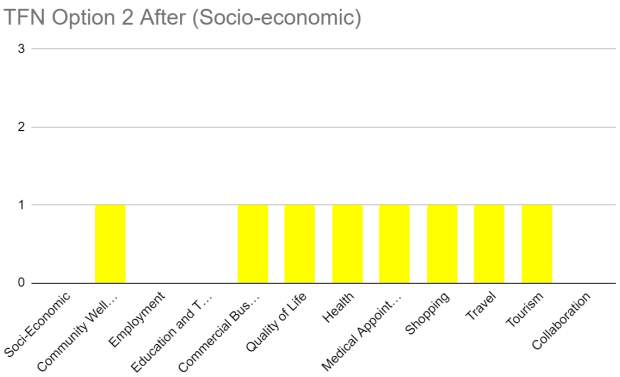


Note. Based on PSPC Replacement Option 1 Downstream from existing dam in Spawning Bed

Figure 36

Timiskaming First Nation Option 2 Socio-Economic Impacts





Appendix 2

Traditional land Use and Occupation Questionnaire

Interview Guide for Kebaowek First Nation Knowledge and Use Study for Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Quebec Replacement Project

This guide includes:

- **Pre-interview setup guide**
- **Interview questions**
- **Mapping notes**
- **Mapping codes**

1. PRE-INTERVIEW

Before formally beginning the interview, ensure the following steps have been completed:

Introductions

- **Introduce yourself and the research team, who you work for, who you were hired by and who you report to.**

Give the participant an overview of the Project

In advance of the interview, the research team will have developed a one- or two-page summary of the proposed Project and its components. Provide the participant with the Project summary and/or describe it in detail verbally and demonstrate on Google Earth where Project components would be located in relation to landmarks such as the community, neighbouring towns, roads, rivers, lakes, etc.

Explain the mapping and interview process and goals of the research

Read the following:

The purpose of this research is to document community members' knowledge and use on the land in relation to the Project. This means we will be mapping places and areas where community members hunt, trap, fish, collect plants and medicines, camp, practice other culturally important activities and spend time out on the land. We will also be recording other cultural places and environmental features that are important to you and the community such as sacred sites, teaching areas, or gathering places. We will be focusing on the Study Area outlined by [define Study Area and indicate its location on the map]. Afterwards, we will map other areas that are important to you.

From this, we will be compiling all of the data and preparing a report for the community based on community members' knowledge and use in the Study Area. This report will be given to the community so that they may use it to support their goals and objectives.

Provide an opportunity for the participant to ask questions

- **Providing accurate answers to participants' questions is an important aspect of free, prior and informed consent.**

- **Technical questions relating to the Project should only be answered if you have the necessary Project information from the proponent or regulator.**

- **Questions that you cannot answer should be directed to the community coordinator, principal investigator or proponent contact, as appropriate.**

Review the consent form

- **Read the consent form aloud to the participant.**

- **Ask the participant if they have any questions.**

- **Once the participant's questions have been answered, ask them if they give their consent and, if yes, ask if they will sign the form are comfortable signing the consent form.**

Note that the consent form provides options for different aspects of consent provision. If the participant does not consent to being recorded then DO NOT begin recording.

- **If the participant would prefer to give verbal consent, ensure that the audio recorders are on, read through the consent form, and have the participant provide their verbal consent for the recording.**

- **If the participant does not sign the consent form or provide recorded verbal consent, do not continue with the interview.**

Provide participant with honorarium or tobacco where appropriate

In case of technical difficulties during a remote/virtual interview

If technical difficulties occur and participants are unable to view the map, interviewers can ask for a verbal description of areas of importance for each section. Ensure that areas being discussed are recording in notes with as much verbal detail and confirmation from the participant as possible. From there, follow-up questions

2. INTRODUCTION

[Complete the interview checklist and pre-interview section above, then read the text below with AUDIO & VIDEO RECORDERS ON at the start of each interview.]

Today is [date]. We are interviewing [participant name] for the Kebaowek First Nation Knowledge and Use Study for Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Quebec Replacement Project. Thank you for coming.

My name is [name] and my co-researcher(s) is/are [name]. We're at [building/office] in [community] in [region/province]. [Participant name] has read and signed the consent form, and we have assigned him/her participant ID [number]. We have explained the purpose of the study, mapping process, and interview plan. We will be mapping in Google Earth at 1:50 000 or better.

Alternate text for virtual interviews

My name is [name] and my co-researcher(s) is/are [name]. [participant name] has provided verbal consent, and we have assigned him/her participant ID [number]. We are conducting this interview remotely using Zoom video conferencing software using a shared screen and screen control techniques. We have explained the purpose of the study, mapping process, and interview plan. We will be mapping in Google Earth at 1:50,000 or finer as much as possible.

Primary goal: to document community knowledge and use in the area of the Project. We'd like to know how you have and continue to use these areas, as well as what you may know about how community members have used them in the past.

3. BACKGROUND AND EXPERIENCE

3.1 PERSONAL INFORMATION

- **What is your full name?**
- **Do you go by any other names, or use a traditional name?**
- **Where were you born?**
- **What is your date of birth?**
- **Where were you raised?**
- **Where do you live now?**
- **Are you a member of Kebaowek First Nation?**
- **What are your parents' names?**
- **What are your grandparents' names?**

- **On your mother's side?**
- **On your father's side?**

- **Do you have any siblings? If yes, what is/are their name(s)?**
- **Do you have a spouse/partner? If yes, what is their name?**
- **Do you have any children? If yes, what is/are their name(s)?**

3.2 GENERAL USE QUESTIONS

Be sure to ask the following questions with Google Earth centred on and displaying the entire Study Area. Questions in Section 3.2 are designed to give an overview of the parts of the Study Area that are important to participants, and how they use this area and its resources.

For this first part of the interview, we are hoping to get an overview of how you or your family members use this area and whether it is important to you. We will map these locations in more detail afterwards.

Have you ever used the area around the Project, or areas nearby?

- **If yes, what activities have you done there?**
- **Which locations or areas are used?**
- **If no, why?**

Have your family or community members ever used the area around the Project, or areas nearby?

- **If yes, how have family/community members used the area?**
- **Which locations or areas are used?**
- **If no, why?**

Is the Project area important to you / your family / your community?

- **If yes, what makes this area important?**
- **If no, why?**

Do you use any other areas close to the Study Area?

Are there other areas that are important to you?

Are there other areas that are important to your family or your community?

4. DETAILED DISCUSSION OF USE AND OCCUPANCY

Section 4 of the interview will focus on a more detailed discussion of the participant's use and occupancy of the areas identified in Section 3. Skip to the subsection below for each identified activity or value as appropriate to find relevant questions.

The goal is to discern why an area and/or activity is important, whether the participant's use or experience of an area has changed in any way and how the participant feels the proposed Project may affect their use and experience of the area.

Mapping notes

Ensure all features are mapped below an eye height of 10 km.

When mapping routes and linear features in Google Earth, follow the actual route indicated by the participant and follow natural features. Do not record a straight line from A to B.

When mapping polygons in Google Earth, avoid mapping large areas where possible; follow natural features and avoid recording straight lines. Ask the participant to be as precise and specific as possible.

For each site mapped in Google Earth, ensure to include the following in the Name field:

- **The activity code (e.g., Permanent Habitation, PX)**
- **The mapped site number (i.e., sequence in the interview)**
- **Any relevant modifiers:**
    - **If second-hand knowledge, map with a ***
    - **If they were with someone who carried out the activity, map with a +**
    - **If the activity was for commercial purposes, map with a $**
    - **If an approximate location given, map with a ?**
    - **If mapped above 10 km eye height (i.e., 1:50,000), map with a ^**
- **The Participant ID**

Example map code:

PX01*?^$-X01
[ActivityCode/SequenceNumber/Modifier(s)-ParticipantID]

For each mapped site, ensure to include the following in the Description field:

- **Who was there? (Spell out all proper names)**

- **What activities took place at the site**

- **When they were first there, last there, how frequently they return there, and whether they plan to return there in the future? (Include the year, month and season)**

- **Relevant value-based information on why that area is used for that purpose. This may include the importance of the site for kinship, ecological, or knowledge transfer values. (See follow-up questions below)**

- **Reference to any other recorded values that may be related (e.g., cabin access by recorded route TR02-X01)**

- **Include trapline number, if applicable**

Make sure to record all other activities and values in this area. See further detailed questions on additional values throughout Section 4.

Next, we will talk about each of the important areas you just discussed and we will try and record as much as possible on the map while we do so.

Leading questions

It is important <u>not</u> to ask "leading" questions. A question may be leading if it suggests a particular answer or assumes a particular answer or reality. Ask yourself if the questions you are asking encourages a particular answer over other possible responses?

DON'T ASK: "This Project will impact moose populations. How does that make you feel?"
DO ASK: "Do you think the Project will impact moose populations? How?"

DON'T ASK: "You like camping here, right?"
DO ASK: "Do you like camping here?"

4.1 HABITATION

Permanent Habitation (PX) & Temporary Habitation (TX)

Can you show us where you were born? (BP)

Can you show us where you live? (PX)

Can you show us where have you stayed in one of the following?

- **A cabin you built or used, campsite, tent, other temporary or permanent structures?**
    - **How many times have you stayed there?**
        - **§ Once or short-term (less than 3 days): (TX)**
        - **§ More than once or long-term (more than 3 days): (PX)**

Read the map code aloud for each mapped feature.

Example map code:

PX01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] stayed at this cabin with [names] in February 2018. [Participant name] built the cabin in 2010 and they have stayed there every summer since 2010. [Participant name] accesses this cabin through the trail recorded as TR02-X01. They plan to return there in 2019.

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **Can you describe where this place is?**
- **Can you describe what this place is like/the current conditions of this place?**
- **How do you get there?**
- **What is this place called? Does it have any other names in other languages?**
- **How did you find out about this place? Who showed it to you?**
- **Why do you go there?**
- **What other activities do you do when staying there?**
    - **Follow up with questions from the relevant parts of Section 4.**
- **Specifically, have you taken younger generations there? Do you teach them there? If so, what do you teach them? (Map as TA)**

- **Is this place important to you/your family/community? Why?**
- **Is this place important for your culture/way of life? Why/how so?**
- **Can you describe what it is like to be in this place? How does it make you feel?**
- **Are there many places like this one, or is this place unique? What makes it unique?**
- **If this Project were to go ahead, how would that make you feel about visiting/staying at this place in the future?**
- **How would you explain the importance of this place to people who do not know it/the government/industry?**

4.2 TRAVEL ROUTES

This refers to routes used specifically for hunting, trapping, gathering plants, accessing camping or fishing areas etc, rather than just driving on a highway

Trail (TR)

Can you show us routes you have travelled by foot, quad, snowmobile, truck or other means?

Can you show us old trails that have been used by community members? (Map with *)

Water route (WR)

Can you show us routes you have travelled along creeks, lakes or rivers by boat?

Can you show us old water routes that used to be used by community members? (Map with *)

When recording routes and linear features in Google Earth, follow the actual route indicated by the participant and follow natural features. Do not record a straight line from A to B.

Read the map code aloud for each mapped feature.

Example map code:

PX01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] travels along this route with [names] in order to access the [related value] located at [identity e.g., PX01-X99]. They learned about it from [name] and have travelled along it every [season] since [year]. They last travelled there in [year/month]

and plan to return there in [year/month]

Make sure to record all other activities and values in this area. See further detailed questions on additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **Why did you use this route?**
- **What do you do when you are travelling along here?**
    - **Do you teach younger generations along this route? If so, what do you teach them? (Map as TA)**
- **How did you learn about this route? Did anyone teach you about it?**
- **Does this route have a name? In your language?**
- **What is the farthest point that you have travelled along this route?**
- **Is this the only route to get from point A to B, or is there an alternative?**
- **Is this a new route, or a well-travelled, well-recognized route?**
- **What is this route like (i.e., current condition)?**
- **Is this route important to you? If so, how/why?**
- **Can you describe how it makes you feel when you're travelling this route?**
- **Is this route important to you/your family/community? Why/how so?**
- **Is this route important for your culture/way of life? How?**
- **Are there many routes like this one or is this route unique? What makes it unique?**
    - **If this Project were to go ahead, how would that make you feel about travelling this route in the future?**

4.3 HUNTING AND TRAPPING

Can you show us places where you have trapped any of the following animals?

- **Badger [BG]**
- **Beaver [BR]**

- **Bobcat [BO]**
- **Chipmunk [CK]**
- **Coyote [CO]**
- **Ermine [ER]**
- **Fisher [FI]**
- **Fox [FO]**
- **Groundhog [GH]**
- **Lynx [LX]**
- **Marten [MT]**
- **Mink [MK]**
- **Mouse [MO]**
- **Muskrat [MU]**
- **Other Fur Bearer [FO]**
- **Otter [OT]**
- **Rabbit [RB]**
- **Raccoon [RC]**
- **Skunk [SK]**
- **Squirrel [SQ]**
- **Weasel [WE]**
- **Wolf [WO]**
- **Wolverine [WV]**

A mapped trapping area or line can be copied and pasted for each species listed by the participant. Mapped trapping values can be copied as a general trapping area (TP) for mapped polygons and trapline (TL) for mapped linear feature.

Can you show us places where you have shot and killed any of the following animals?

- **Black Bear [BB]**
- **Bison/Buffalo [BI]**
- **Caribou [CA]**
- **Chicken [CH]**
- **Elk [EK]**
- **Grizzly Bear [GB]**
- **Grouse [GR]**
- **Moose [MO]**
- **Mule Deer [MD]**
- **Other Game [OG]**
- **Porcupine [PO]**
- **Sheep [SH]**
- **White-tailed Deer [WD]**
- **Whistler/Marmot [MM]**

Do you hunt birds? If so, can you show us where you have shot and killed any of the following birds?

- **Blue Heron [BM]**
- **Crow [CQ]**
- **Duck [DU]**
- **Eagle [EA]**
- **Falcon [FL]**
- **Geese [GE]**
- **Grouse [GR]**
- **Hawk [HA]**
- **Loon [LO]**
- **Other Bird [OB]**

- **Owl [OW]**
- **Partridge [PA]**
- **Ptarmigan [PT]**
- **Raven [RV]**
- **Sand Hill Cranes [SC]**
- **Sandpipers [SN]**

Environmental Feature (EF)

Can you show us the locations of habitats or environmental features that are important for birds/mammals? (E.g., calving or mating areas, mineral licks).

Environmental Feature Corridor (EC)

Can you show us any migration routes or crossings that birds/mammals use to move through the area?

Mark any locations where the participant has hunted but not killed any mammals or birds as an Environmental Feature (EF).

Read the map code aloud for each mapped feature.

Example map code:

PX01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] trapped/shot and killed [species] in the [season/month] of [year] with [name(s)]. [Participant] first hunted/trapped here in [year/month] and last hunted/trapped here in [year/month]. [Participant] accesses this hunting/trapping area by [mode of travel].

Make sure to record all other activities and values in this area. See further detailed questions on additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **Where did you cut up the animal? (Mark as PR)**

- **Did you share the meat?**
- **Did you smoke/dry the meat? Where?**
- **Is hunting/trapping important to you? Why?**
- **Who taught you how to hunt/trap? Who? Where? (Mark as TA)**
- **Is it important to teach younger generations how to hunt/trap? Why?**
- **How many people can [animal species] feed? For how long?**
- **Does [animal species] have a name in your traditional language?**
- **Are any of these animals hard to find? Which ones?**
- **Does this animal have a name in your traditional language?**
- **What is this area like for hunting/trapping?**
- **Are there many areas like this to hunt/trap this/these animal(s), or is this area unique? What makes it unique?**
- **Is/are this/these animal[s] important for your culture/way of life? If so, how/why?**
- **Can you describe what it is like to be out on the land hunting/trapping?**
- **If the proposed Project went ahead, how would that make you feel about hunting/trapping in this area in the future?**
- **How would you explain the importance of these animals to people who do not know/the government/industry?**

4.4 FISHING

Can you show us places where you have caught any of the following fish species?

- **Bass [BS]**
- **Brook Trout [BD]**
- **Carp [CD]**
- **Catfish/Bullhead [BH]**
- **Jackfish [JF]**
- **Lake Trout [LT]**

- **Mariah / Burbot / Lingcod [MR]**
- **Minnows [MN]**
- **Northern Pike [NP]**
- **Other Fish [OF]**
- **Perch [PE]**
- **Pickerel/Walleye [PK]**
- **Rainbow Trout [RT]**
- **Shallow Water Siskel [SW]**
- **Shells/Mussels [MC]**
- **Sturgeon [ST]**
- **Suckers [SU]**
- **Whitefish [WF]**

Mapped fishing areas can be copied and pasted for each species caught by the participant.

Mark any locations where the participant has fished but released the fish or not caught anything as an Environmental Feature (EF).

Read the map code aloud for each mapped feature.

Example map code:

LT01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] caught [species] in the [season/month] of [year] with [name(s)]. [Participant] first fished here in [year/month] and last fished here in [year/month]. [Participant] accesses this fishing area by [mode of travel].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What did you do with the fish (meat, e.g., dry it, smoke it, other)? Where?**
- **Is fishing important to you? Why?**
- **Who taught you how to fish? Where? (Map as TA)**
- **Have you taught anyone how to fish? Who? Where? (Map as TA)**
- **Is it important to teach younger generations how to fish? Why?**
- **How many people can [fish species] feed? For how long?**
- **Does [fish species] have a name in your traditional language?**
- **Are any of these fish hard to find? Which ones?**
- **What is fishing like in this area?**
- **Are there many areas like this to fish this/these species, or is this area unique? What makes it unique?**
- **What does it mean to you to be able to fish?**
- **Can you describe what it is like to be out on the water fishing? How does it make you feel?**
- **Are these fish important for your culture/way of life? How?**
- **If the proposed Project went ahead, how would that make you feel about fishing in this area in the future?**
- **How would you explain the importance of these fish/fishing to people who do not know/the government/industry?**
- **If the proposed Project went ahead, how would that make you feel about fishing in this area in the future?**

4.5 HARVESTING BERRIES / OTHER PLANTS / FUNGI

Can you show us places where you've collected any of the following berries, other plants, or fungi/lichen/mosses?

- **Aspen Bark [AB]**
- **Balsam [BL]**
- **Berries/Wild Fruit [BE]**
- **Cambium [CB]**

- **Cattail [CT]**
- **Cottonwood [CW]**
- **Dandelion [DL]**
- **Dye Plant [DP]**
- **Eggs [EG]**
- **Food Plants [FP]**
- **Juniper/Crow Trees [JU]**
- **Lily Pad [LP]**
- **Mosses/Lichen [ME]**
- **Mushrooms [MS]**
- **Other Plant [OP]**
- **Parsnip [PA]**
- **Pincherry [PI]**
- **Pine Cones [PC]**
- **Plums [PU]**
- **Poplar [PP]**
- **Poplar Sap [PB]**
- **Rose Bush [RS]**
- **Rotten Wood [RW]**
- **Spruce Gum [SG]**
- **Wheat [WT]**
- **Wild Carrots [WK]**
- **Wild Lillies [WS]**
- **Wild Onion [ON]**
- **Wild Rhubarb [RH]**
- **Wild Rice [WL]**

- **Wild Root [WB]**

Can you show us places where you're collected any of the following medicinal plants?

- **Cedar Tea [CE]**
- **Chi [CI]**
- **Choke Cherry Bark [CC]**
- **Devils Club [DC]**
- **Flowers [FR]**
- **Fungus [FU]**
- **Labrador Tea [LB]**
- **Medicinal Plant [MP]**
- **Mint Tea [MI]**
- **Mountain Ash [MA]**
- **Muskeg Tea [MG]**
- **Northern Bed Straw [NB]**
- **Peppermint [PM]**
- **Pine Cones [PC]**
- **Rat Root/Weecay [RR]**
- **Red Willow [RD]**
- **Red Willow Bark [RE]**
- **Sage [SA]**
- **Sweet Grass [SE]**
- **Tamarack [TM]**
- **Willow [WG]**

- **Willow Fungus [WI]**
- **Yellow Slippers [YS]**

Can you show us places where you've collected plants for crafts or other uses? (E.g., for creating art, building a drying rack, etc.)

Read the map code aloud for each mapped feature.

Example map code:

MP01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] harvested [plant species] in the [season/month] of [year] with [name(s)]. [Participant] first harvested here in [year/month] and last harvested here in [year/month]. [Participant] accesses this harvesting area by [mode of travel]. These harvested items are used for [use].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What do you use [medicine* / plants / fungi] for? (*If appropriate to share)**
- **Is gathering [medicine / plants / fungi] important to you? Why?**
- **Who taught you how to collect and use [medicine / plants / fungi]? Where? (Map as TA)**
- **Have you taught anyone about how to collect and use [medicine / plants / fungi]? Who? Where? (Map as TA)**
- **Is it important to teach younger generations about [medicine / plants / fungi] resources? Why?**
- **Does [medicine / plant / fungus] have a name in your traditional language?**
- **Are any of these [medicine / plants / fungi] hard to find? Which ones?**
- **What is picking/gathering [medicine / plants / fungi] like in this area (i.e., current condition)?**

· **Are any of these [medicine / plants / fungi] hard to find? Which ones?**

· **Are there many areas like this to pick [medicine / plants / fungi], or is this area unique? What makes it unique?**

· **Can you describe what it is like to be out picking/gathering [medicine / plants / fungi]? How does it make you feel?**

· **Are these medicine/plants/fungi important for your culture/way of life? How?**

· **If the proposed Project went ahead, how would that make you feel about gathering [medicine / plants / fungi] in this area in the future?**

· **How would you explain the importance of these [medicine / plants / fungi] to people who do not know/the government/industry?**

4.6 OTHER RESOURCES

Can you show us places where you have collected any of the following resources?

· **Antlers or sheds [SD]**

· **Bark used for construction, crafts, or other purposes [BA]**

· **Feathers [FE]**

· **Other materials collected for crafts/crafting [CZ]**

· **Rocks, clay, vermillion, other earth materials [EM]**

Read the map code aloud for each mapped feature.

Example map code:

SD01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] gathered [resource] in the [season/month] of [year] with [name(s)]. [Participant] first gathered here in [year/month] and last gathered here in [year/month]. [Participant] accesses this gathering area by [mode of travel]. These harvested items are used for [use].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What do you use these resources for?**
- **Is collecting these resources important to you? Why?**
- **Who taught you how to collect these resources? Where? (Map as TA)**
- **Have you taught anyone about how to collect these resources? Who? Where? (Map as TA)**
- **Is it important to teach younger generations about these resources? Why?**
- **Does [resource] have a name in your traditional language?**
- **Are any of these resources hard to find? Which ones?**
- **What is collecting resources like in this area (i.e., current condition)?**
- **Are any of these resources hard to find? Which ones?**
- **Are there many areas like this to collect resources, or is this area unique?**
- **Can you describe what it is like to be out collecting resources?**
- **Are these resources important for your culture/way of life? How?**
- **If the proposed Project went ahead, how would that make you feel about collecting resources in this area in the future?**
- **How would you explain the importance of these resources to people who do not know/the government/industry?**

4.7 COLLECTION OF WATER (WA)

Can you show us places where you have collected water while out on the land? (E.g., for drinking, cooking, making tea, ceremonies, etc.)

Read the map code aloud for each mapped feature.

Example map code:

WA01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] collected water here in the [season/month] of [year] with [name(s)].

[Participant] first collected water here in [year/month] and last collected water here in [year/month]. [Participant] accesses this area by [mode of travel]. [Participant] uses collected water for [purpose].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What did you do with the water collected?**
- **Is the ability to collect water from the land important to you?**
- **Who taught you about where to collect water in this area? (Map as TA)**
- **Have you taught anyone about where to collect water in this area? Who? Where? (Map as TA)**
- **Is it important to teach younger generations about where to collect water? How so?**
- **What is collecting water like in this area (i.e., current condition)?**
- **Do you feel safe drinking the water collected from this area?**
- **Is water that would want to collect hard to find?**
- **Are there many areas like this to collect water, or is this area unique? What makes it unique?**
- **Can you describe what it is like to be out collecting water? How does it make you feel?**
- **Is collecting water important for your culture/way of life? How?**
- **If the proposed Project went ahead, how would that make you feel about collecting water in this area in the future?**
- **How would you explain the importance of collecting water in this area to people who do not know/the government/industry?**

4.8 ENVIRONMENTAL FEATURES (EF) AND CORRIDORS (EC)

Environmental Feature (EF)

Can you show us the locations of habitat or environmental features that are important for mammals/birds/fish/plants? (E.g., calving or mating areas, mineral licks, fish

spawning areas)?

Environmental Feature Corridor (EC)

Can you show us any migration routes or crossings that animals use to move through the area?

When recording routes and linear features in Google Earth, follow the actual route indicated by the participant and follow natural features. Do not record a straight line from A to B.

Read the map code aloud for each mapped feature.

Example map code:

EF01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] identified this area as an [environmental feature/corridor] for [species] due to [features]. [Participant] learned about this from [name]. [Participant name] last travelled through the area in [month/year].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What environmental features (e.g., migration routes / crossings / fish spawning areas) make for good [animal / plant] habitat? Why?**

- **How did you learn about these environmental features? Where? (Map as TA if taught)**

- **Have you taught anyone about these environmental features? Who? Where? (Map as TA)**

- **Is it important to teach younger generations about these environmental features? Why?**

- **Are any of these features hard to find? Which ones?**

- **Are there many areas like this with these features, or is this area unique? What makes it unique?**

· Have you observed any changes to [migration routes / crossings / fish spawning] areas in this area over your lifetime?

· Are these environmental features important for your culture/way of life? How?

· If the proposed Project went ahead, would it impact animals' use of [migration routes / crossings / fish spawning areas]?

· How would you explain the importance of these features to people who do not know/the government/industry?

4.9 CULTURAL AND INTANGIBLE USES AND VALUES

Gathering Place (GP)

Can you show us important places where your community holds or attends gatherings?

· E.g., powwows, rodeos, Treaty celebrations, community camps, village sites, etc.

Ceremonial Place (CP)

Can you show us places that are used for ceremonies?

· E.g., sundances, sweat lodges, shaking tent, etc.

Teaching Area (TA)

Can you show us places that are used or have been used for teaching knowledge to children or others?

Can you show us any places that have special knowledge or stories associated with them?

· E.g., creation stories, dreamer stories, histories, etc.

Burial (BU)

Can you show us places where members of your community are buried or where their remains are found (e.g., cremation)?

Spirit (SP)

Can you show us places where spirit beings live or where there are special rules about how you act or respect the place?

· E.g., little people, spirits, bigfoot, etc.

Place Name (PN)

Can you show us any places with special place names (e.g., in your language)?

Include place names and translations in Google Earth description field

Read the map code aloud for each mapped feature.

Example map code:

CP01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] has [gathered/attended activity/etc.] here in the [season/month] of [year] with [name(s)]. [Participant] first [gathered/attended activity/etc.] here in [year/month] and last [gathered/attended activity/etc.] here in [year/month]. [Participant] accesses this area by [mode of travel]. The traditional name for this location is [name], which means [translation].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What specifically do you use these places for (e.g., what kinds of ceremonies)?**

- **Are [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names] important to you? Why?**

- **Who taught you about this [gathering place / ceremonial place / teaching area / burial site / spiritual location / place name]? (Map as TA)**

- **Have you taught anyone about [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names]? (Map as TA)**

- **Is it important to teach younger generations about these [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names]? Why?**

- **Are these [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names] important to sustaining your culture/way of life?**

- **Does [gathering place / ceremonial place / teaching area / burial site / spiritual location / place name] have a name in your traditional language?**

- **What is the [gathering place / ceremonial place / teaching area / burial site / spiritual**

location / place name] like (i.e., current condition)?

· Have you observed any changes to [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names] in this area over your lifetime?

· Can you describe what it is like to be at [gathering place / ceremonial place / teaching area / burial site / spiritual location / place name]? How does it make you feel?

· Are [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names] important to your culture/way of life? How?

· If the proposed Project went ahead, how would that make you feel about the [gathering place / ceremonial place / teaching area / burial site / spiritual location / place name] in this area?

· How would you explain the importance of these [gathering places / ceremonial places / teaching areas / burial sites / spiritual locations / place names] to people who do not know/the government/industry?

4.10 IMPAIRED USE

Specific Impaired Use (SL)

Can you show us any specific places where you used to [hunt / gather / fish / camp / practice other rights], but cannot anymore? (E.g., from industrial impacts, environmental change or other impacts)

General Impaired Use (GL)

Can you show us any general areas or specific sites where you have experienced degraded habitat for mammals, fish, or plants?

Read the map code aloud for each mapped feature.

Example map code:

GL01*?^$-X01
[ActivityCode][SequenceNumber]Modifier(s)]-[ParticipantID]

Example note:

[Participant name] identified this as a place where they used to [activity]. Use of this place has been impaired due to [reason for loss]. [Participant name] used this area since [month/year] until [month/year].

Make sure to record all other activities and values in this area. See detailed questions for additional values throughout Section 4.

Follow-Up Questions

Use the following questions as prompts to ensure you have a full understanding of why this place is important.

- **What activities did you used to do in this [place/area]?**
- **Why did you first use this area? Why do you continue to use it?**
- **Why can you no longer use this [place/area]?**
- **When was the last time you used this [place/area]?**
- **How often did you go to or use this [place/area]?**
- **Can you do those activities somewhere else? Why or why not?**
- **How does it make you feel that you can no longer go to or use this place [place/area]?**
- **Has the loss of use of this place [place/area] impacted [you / your family / your community]?**
- **Has the loss of use in this place [place/area] impacted your culture/way of life? How?**
- **How would you explain the importance of this place [place/area] to the government/industry?**
- **How would you explain the impact of not being able to use the place [place/area] to people who do not know/the government/industry?**
- **If the proposed Project went ahead, how would that make you feel about this place [place/area]?**

4.11 KNOWLEDGE OF USE BY OTHER COMMUNITY MEMBERS

After you have covered a participant's personal use, and if there is still time, you may want to ask about their knowledge of how other community members use the area. You may do this particularly for important areas, if the participant does not have much personal experience of an area, or if you are trying to collect historical use data. (Map with *)

Can you show us places where members of your family or community or ancestors have camped or stayed in cabins?

Can you show us places where members of your family or community or your ancestors have killed or trapped animals or birds?

Can you show us places where members of your family or community or your

ancestors have caught fish?

Can you show us places where members of your family or community or ancestors have collected [berries / plants / fungi / water / etc.]?

Can you show us places where members of your family or community or your ancestors have attended ceremonies, gatherings, or other important cultural events?

Can you show us places where members of your family or community or your ancestors have travelled across the area?

For follow-up questions, please refer to the relevant part of Section 4 above.

4.12 PROJECT IMPACT QUESTIONS

Make sure industry data and the participant's mapped sites are on the screen.

Refer back to the participant's use in the Study Area, e.g., if they do a lot of fishing.

Do you think the development of the dam-bridge would impact your ability to use this area and its resources?

Do you think the construction of a two-lane roadway and a sidewalk would impact your ability to use this area and its resources?

Based on your understanding of the Project, do you think it will affect:

- **Your ability to enjoy your Treaty or Aboriginal rights, or way of life?**
    - **If so, how?**
- **Your children's or grandchildren's ability to enjoy their Treaty or Aboriginal rights, or way of life?**
    - **If so, how?**

What do you think the most important issues are for your community to focus on in relation to the proposed Project?

Are there any other important places or issues related to the Project that you think we should be documenting today?

Are there other community members that we should talk to?

Note: You may want to ask some of these questions earlier in the interview, for example if a participant has talked a lot about moose hunting in the Study Area, ask them if they think the Project will impact their hunting, and why.

4.13 SENSE OF PLACE

Ask the following questions in relation to territory in general, the Study Area and/or other areas identified as important by the participant during the interview. Use these questions to ensure you have a full understanding of why each place is important.

Do you feel connected to the land in this area?

- **If yes, why do you feel connected to this place?**
- **How does it make you feel to be out on the land in this area?**

Is this place important to your identity? If so, how?

Can you describe what it is like to spend time at your favourite places out on the land?

Is there anything special about these places? What and why?

5. CONCLUSION

Read with audio & video recorders on after every session.

Today is [date]. We have just finished interviewing [participant name] for the Kebaowek First Nation Knowledge and Use Study for Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Quebec Replacement Project.

My name is [name], my co-researcher is [name] and we are here at [office/building] in [community/town]. We've given [participant name] participant ID [#]. We've mapped a total of [#] values in Google Earth at 1:50,000 or better, and recorded a total of [#] tracks on the digital recorders. Notes are recorded in/on [notebook/computer]. This interview has taken approximately [#] hours [#] minutes.

Alternate text for virtual interviews

My name is [name] and my co-researcher(s) is/are [name]. [participant name] has provided verbal consent, and we have assigned him/her participant ID [number]. We've mapped a total of [#] values in Google Earth at 1:50,000 or better, and recorded a total of [#] tracks on the digital recorders. Notes are recorded in/on [notebook/computer]. This interview has taken approximately [#] hours and [#] minutes.

MAPPING NOTES

Map all points, lines and polygons at an eye height of approximately 10 km or less (1:50,000 or better).

Label each site consistently in the name field of the site properties dialogue box.

Each code should indicate:

- **Site use;**
- **Site number;**
- **Modifiers (if relevant); and**
- **Source (participant ID).**

Modifiers (after the site number):

- **First-hand knowledge has no modifier (e.g., TX01-P08; member with ID P08 reports temporary shelter where she has camped).**
- **Second-hand knowledge is mapped with a * (e.g., TX01*-P08).**
- **Approximate spatial information is mapped with a ? (e.g., TX01?-P08).**
- **If the participant was present but did not take part in an activity, map with a + (e.g., BE01+-P08).**
- **Commercial use (including guiding/outfitting) is mapped with a $ (e.g., TX01$-P08).**
- **If multiple modifiers are used, a code could look like, e.g., TX01*?$-P08.**

All other information goes in the description field of the dialogue box.

Transportation routes and all linear features should be controlled.

- **Zoomed in to less than 10 km eye-height; and**
- **Follow the actual route and natural features (i.e., not a straight line from A to B).**

Include in the description field of the dialogue box in Google Earth for each mapped site:

- **First and last use (i.e., day / month / season and year / decade);**
- **Frequency of use;**
- **Species (if relevant);**
- **Number and names of members who were present; and**
- **Any additional information you are told.**

Other:

- **Keep list of place names;**
- **Spell out proper names and place names where possible for the recording; and**
- **Use prompts to gain detailed access and use information.**

MAPPING CODES

Habitation and Transportation

PX = Permanent Habitation
TR = Trail
TX = Temporary Habitation
WR = Water Route

BP = Birth Place

Environmental Features

EC = Environmental Feature Corridor

EF = Environmental Feature

Mammal Kill Sites

BB = Black Bear
BI = Bison / Buffalo
CA = Caribou
CK = Chipmunk
EK = Elk
GB = Grizzly Bear
MD = Mule Deer
MM = Whistler / Marmot
MO = Moose
OG = Other Game
PO = Porcupine
RC = Raccoon
SH = Sheep
SK = Skunk
WD = White-tailed Deer
WE = Weasel

MD = Mule Deer

Furbearer Kill Sites

BG = Badger
BO = Bobcat
BR = Beaver
CO = Coyote
ER = Ermine
FI = Fisher
FO = Other Fur Bearer
FX = Fox
GH = Groundhog
LX = Lynx
MM = Whistler / Marmot
MT = Marten
MK = Mink
MU = Muskrat
OT = Otter
RB = Rabbit
SQ = Squirrel
TP = General Trapping Area
WO = Wolf

WV = Wolverine

Bird Kill Sites

BM = Blue Heron
CQ = Crow
DU = Duck
EA = Eagle
FL = Falcon
GE = Goose
GR = Grouse / Chicken
HA = Hawk
LO = Loon
OB = Other Bird
OW = Owl
PA = Partridge
PT = Ptarmigan
RV = Raven
SC = Sand Hill Cranes
SN = Sandpipers

SW = Swan

Fish Catch Sites

BH = Bullhead / Catfish

BS = Bass
BT = Bull Trout
BR = Brook Trout
CD = Carp
DV = Dolly Varden
GD = Goldeye
GY = Grayling
JF = Jackfish / Pike
KO = Kokanee
LT = Lake Trout
MC = Shells/Mussels
MN = Minnows
MR = Mariah / Burbot / Lingcod
NP = Northern Pike
OF = Other Fish
PE = Perch
PK = Pickerel / Walleye
RT = Rainbow Trout
SU = Sucker
ST = Sturgeon
SW = Shallow Water Siskel

WF = Whitefish

Plants and Other Resources

AB = Aspen Bark
BA = Barks (crafts, construction, etc.)
BL = Balsam
BE = Berries/Wild Fruit
CB = Cambium
CC = Choke Cherry Bark
CE = Cedar Tea
CI = Chi
CT = Cat tail
CW = Cottonwood
CZ = Other materials collected for crafts
DC = Devils Club
DL = Dandelion
DP = Dye Plant
EG = Eggs
EM = Earth Material (rocks, clays, etc.)
FE = Feathers
FR = Flowers
FP = Food Plant (roots, bulbs, cambium)

FU = Fungus
FW = Firewood
JU = Juniper/Crow Trees
LB = Labrador Tea
LP = Lily Pad
MA = Mountain Ash
MI = Mint Tea
MG = Muskeg Tea
MP = Medicine Plant
ME = Mosses / Lichens
MS = Mushrooms
NB = Northern Bed Straw
ON = Wild Onion
OP = Other Plant
PA = Parsnip
PB = Poplar Sap
PC = Pine Cones
PI = Pincherry
PM = Peppermint
PP = Poplar
PU = Plums
RD = Red Willow
RE = Red Willow Bark
RH = Wild Rhubarb
RR = Rat Root/Weecay
RS = Rose Bush
RW = Rotten Wood
SA = Sage
SD = Antlers or sheds
SE = Sweet Grass
SG = Spruce Gum
TM = Tamarack
WA = Water
WB = Wild Root
WG = Willow
WI = Willow Fungus
WK = Wild Carrots
WL = Wild Rice
WS = Wild Lillies
WT = Wheat

YS = Yellow Slippers

Cultural Use

BU = Burial
CP = Ceremonial Place
GP = Gathering Place
DR = Drying Rack
PN = Place Name
SP = Spirit
TA = Teaching Area

PN = Place Name

Impaired Use

GL = General Loss
SL = Specific Loss

Appendix 3

TDQRP community survey questionnaire

Kebaowek First Nation

Local Administration is assured by the Band Council of Kebaowek First Nation - Kipawa, under the direction of Chief and Council. Our Council is part of the Anishnabeg Algonquin Nation.

Mission Statement

Political:
To adequately and transparently represent the members of the community on all government levels and issues according to the direction of its members that will ensure the growth and development of the community.

To promote and protect the collective interest of all Kebaowek First Nation members; through the strength and will of its people and guided by their values, culture and traditions.

Administrative:
To provide equal and fair opportunities to all members accessing programs and services according to established policy and procedures for the betterment of the community.

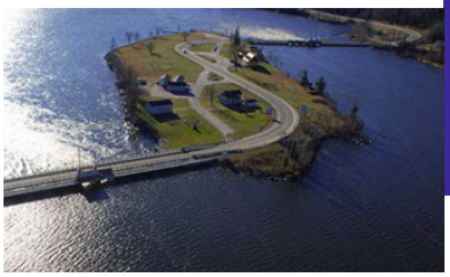
Vision Statement

To develop into a strong, unified community whereas our Anicinabe rights and ownership to our traditional territory have been acknowledged by all government levels. Whereas our community, through economic development, can prosper in a sustainable manner to be self-sufficient.

110 Ogima Street
Kebaowek, QC J0Z 3R1

December 2022

Timiskaming Dam-Bridge of Québec Replacement Project - Survey



KEBAOWEK FIRST NATION

Context

Who is conducting the survey?
Kebaowek First Nation is conducting the survey with the assistance of a survey team consisting of Kim Chevrier – Survey Coordinator, Matthew Chevrier and Samantha Green – Survey Distribution and Pick-up (if applicable) and Data Analysis.

What is the research about?
The objective is to assert and maintain First Nations Rights about land use. The government wants to know if the area is being used by Indigenous peoples and if this project will affect said rights.

Also to maintain road traffic between the two provinces, and avoid changing the control of water flow and water levels in the lake and river. Furthermore, protecting the rights of local First Nations and to protect the environment and fish around the construction zone.

How long will the survey take?
The survey will take approximately 30 - 40 minutes to complete.

Is my data safe?
Data privacy and protection is a component to the survey gathering and analysis. Kebaowek First Nation will take all reasonable measures to protect the identity and maintain the anonymity around member participation.

How will I fill in the survey?
Please read the following project background information on the Timiskaming Dam replacement project and answer each of the following questions by placing a check mark or an X in the box that best reflects your personal opinion.

Once you have completed the survey, please return to the band office starting January 9, 2023 and no later than January 15, 2023 at 4:00 PM. *Please note that each participant aged 15 and over will receive a $50 pre-paid Visa gift card upon return.*

If you require more than one survey per household please contact Samantha Green at 705-358-5960.

This space is for any other comments you wish to share. Also, Feel free to use this space for further questions if needed.

Recommendations

Are there other community members that we should talk to?

If yes, who?

_____
_____
_____
_____
_____
_____
_____
_____

THANK YOU, Chi Meegwetch!

Thank you for doing this survey for the Kebaowek First Nation Knowledge and Use Study of the Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Québec Replacement Project survey. It is really appreciated.

We assure you that the survey will be coded and cannot be linked to your name.

Introduction

Scope of Work

Public Services and Procurement Canada is proposing to replace the Quebec Timiskaming dam-bridge.
The project consists in rebuilding the Quebec Dam/Bridge to continue managing the water levels in Lake Timiskaming in a safe and sustainable manner over time.



The construction of the new structure will take place over a period of 30 months, beginning at the conclusion of the end of an environmental assessment that requires consultation with the Statement of Asserted Rights communities of Wolf Lake, Kebaowek and Timiskaming.

The objective is to maintain road traffic between the two provinces and avoid affecting the control of water levels in the lake and river.



Getting Started

1. Sign Consent Form on page 2-3.
2. Review Maps and answer survey questions.
3. Return Survey Booklet to Band Office starting January 9, 2023
   no later than January 15, 2023 at 4:00 PM.

Consent

I, (print name) _____, on this day, _____, give permission for Kebaowek First Nation to survey me for the Kebaowek First Nation Knowledge and Use Study of the Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Québec Replacement Project.

By signing below, I indicate that I understand the following:

(a) I understand that the study is being conducted by Kebaowek First Nation. The purpose of the study is to document the rights and interests of Kebaowek First Nation in the area of the proposed Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Québec Replacement Project.

(b) I am free to not respond to questions that may be asked and I am free to end the survey at any time I wish.

(c) I maintain intellectual property rights over my information collected through my participation.

(d) Kebaowek First Nation will ask permission from me or my descendants before using my information for purposes not indicated below (under Information Use).

Information Use

(e) I consent to Kebaowek First Nation using the information I provide through my participation to defend and communicate the rights, interests, and titles of its members. This includes, but is not limited to, sharing information for the purposes of negotiation or participation in regulatory or court proceedings in relation to (*select all that apply*):

What other impacts do you think the Timiskaming Dam Replacement will have on you, your Nation or future generations?

- ☐ First Nations sovereignty/self-determination
- ☐ Access to territory
- ☐ Community or family conflict
- ☐ Increase traffic
- ☐ Financial compensation
- ☐ Enable economic development
- ☐ Prevent economic development
- ☐ Job creation
- ☐ Environmental contamination or destruction
- ☐ Make harvests (fish, game, foods or medicines) unsafe
- ☐ Pressure on community health and social services
- ☐ Create more housing issues
- ☐ Other

_____
_____
_____
_____
_____
_____

Are there any other important places related to the Project that you think we should be documenting today?

Yes ☐ No ☐

If yes, where?

_____
_____
_____
_____
_____
_____
_____
_____

What do you think the most important issues are for your community to focus on in relation to the proposed Project?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

☐ This project—the Kebaowek First Nation Knowledge and Use Study of the Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Québec Replacement Project.

☐ Other Kebaowek First Nation projects, initiatives, and/or studies.

Information Storage
(f) I consent to having the information I provide through my participation stored securely:

☐ Until the completion of the Kebaowek First Nation Knowledge and Use Study of the Public Services and Procurement Canada's proposed Timiskaming Dam-Bridge of Québec Replacement Project.

☐ For an indefinite period of time, by the Kebaowek First Nation.

Identification and Anonymity
(g) I understand that Kebaowek First Nation will take all reasonable measures to protect my identity and maintain my anonymity around my participation. However (select all that apply):

☐ I consent to being quoted in reports and other deliverables.

☐ I consent to the use of my name in reports and other deliverables.

For more information, please Kim Chevrier, Survey Coordinator at 819-627-6139.

Signature of participant _____ Witness _____

Future State of the Dam/Bridge Proposed
The new structure would include a two-lane roadway and a sidewalk and would regulate water levels on the river. It would be approximately 75 meters long, and have ten bays with vertical sluice gates. Five will be equipped with sluice gates (potential for impact on fish- mortality, passage). The other five will be equipped with stop logs. This modification will improve responses in terms of management and operation should the water level change quickly.

The deck will support a two-lane roadway and a sidewalk. As for the roadway, its carrying capacity will remain identical to that of the existing structure, i.e. it remains a single carriage way with one lane for each direction. Based on the information available, the number of lanes is sufficient to ensure traffic flow without causing congestion.

The natural gas pipe and the other utilities pipes (to run telephone and electrical cables) will be reinstalled on the new structure.

A new permanent fish ladder is proposed to allow fish to pass from the upstream section of the watercourse to the downstream section. This fish passage is approximately 140 meters long and will be located on "Île Long Sault".

Fish Surveys – Habitat Identified

Quebec Dam - Spawning Grounds (Spring/Fall 2017 – Biofilia)



Is this place important to your identity? (If so, how?)

Can you describe what it is like to spend time at your favorite places out on the land or river in relation to the study area?

Is there anything special about these places? What and why?

Sense of Place

Do you feel connected to Long Sault Island and the Ottawa River in this area?

Yes ☐ No ☐

If yes, why do you feel connected to this place?

How does it make you feel to be out on the land or river in this area?

Timiskaming Dam Project Site



Proposed Spawning Beds



Map of study site and proposed options.
Created by Mike Laderoute, Ni Dakinan

Option 1: Construction of a new dam/bridge downstream of the existing dam/bridge and demolition of the existing dam.

Option 2: Construction of a new dam/bridge upstream of the existing dam/bridge and demolition of the existing dam.

Option 3: Reconstruction of the dam/bridge based on the same place and layout as the existing dam/bridge and demolition of the existing dam.

Let's Get Started

Your Name:

_____

Age: ☐ 15-24 ☐ 25-34 ☐ 35-44 ☐ 45-59 ☐ 60-79 ☐ 80+

Gender: ☐ Male ☐ Female ☐ Non-Binary

Location: ☐ On-reserve ☐ Off-reserve

Survey Questions

From a technical standpoint there are three options for the replacement of the new structure. Please read about the options and select your preferred choice:

Option 1: Construction of a new dam/bridge downstream of the existing dam/bridge and demolition of the existing dam.

This option consists in building a new dam/bridge 19 meters downstream of the existing structure or 25 m between the downstream faces of the future dam and the existing dam (See Diagram 1). This option will affect the aquatic environment and have significant effects on fish spawning habitats for pickerel, sucker and threatened lake sturgeon.

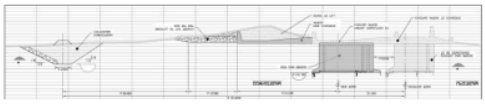


Diagram 1

Based on your understanding of the Timiskaming Quebec dam replacement project, do you think it will affect:

Your ability to enjoy your Aboriginal rights, or way of life?

Yes ☐ No ☐

If so, how?

_____
_____
_____
_____
_____
_____
_____
_____

Your children's or grandchildren's ability to enjoy their Aboriginal rights, or way of life?

If so, how?

_____
_____
_____
_____
_____
_____
_____
_____

Do you use any other areas of the Ottawa River close to the Study Area?

Yes ☐ No ☐

If yes, what areas are important to you?

_____
_____
_____
_____
_____
_____
_____
_____

Project Impact Questions

Do you think the replacement of the dam-bridge would impact your ability to use this area and its resources?

Yes ☐ No ☐

Do you think the construction of a two-lane roadway and a sidewalk would impact your ability to use this area and its resources?

Yes ☐ No ☐

Option 2: Construction of a new dam/bridge upstream of the existing dam/bridge and demolition of the existing dam.

This option consists of building a new dam upstream of the existing structure. Prior to the work, the Rayonier pumping station will need to be relocated. This option would require land purchase from Rayonier.

This option consists in building a new dam/bridge approximately 19 meters upstream of the existing structure or 25 m between the downstream faces of the future dam and the existing dam (Figure 6.2).

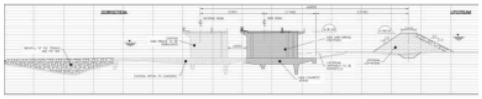


Diagram 2

Option 3: Reconstruction of the dam/bridge based on the same place and layout as the existing dam/bridge and demolition of the existing dam.

This option has minimal environmental impact. This options work period is much longer than that for options 1 and 2 including an alternate traffic route for 17 months.

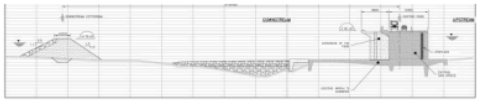


Diagram 3

Location of Dam

Please provide your first choice for the location of the new dam:

☐ Option 1- downstream of existing

☐ Option 2 - upstream of existing

☐ Option 3 - in same location

Please provide your second choice for the location of the new dam:

☐ Option 1 - downstream of existing

☐ Option 2 - upstream of existing

☐ Option 3 - in same location

Future Fish Ladder Construction

All three options for the proposed new dam construction include the creation of a fishway across the dam (which is currently not passable in its entirety on either the Quebec or Ontario side). The construction of this fishway near the dam on the Quebec side is one of the conditions of the authorization from Fisheries and Oceans for the replacement of the dam on the Ontario side completed in 2013.

Positioning of a fishway near the dam on the Quebec side is technically more favorable than near the Ontario side. The Quebec side of the river, which is narrower and deeper, would encourage fish to swim toward a fish passage.

The fish passage channel that is currently proposed for the new dam construction will be designed strictly for the American eel (Anguilla rostrata). The Department of Fisheries and Oceans has only authorized construction of a fish passage for the American eel to date.

If no, why?

_____
_____
_____
_____

Is the Ottawa River important to you or your family?

Yes ☐ No ☐

If yes, what makes this river important?

_____
_____
_____
_____
_____
_____
_____
_____
_____

If no, why?

_____
_____
_____
_____
_____
_____
_____

Have you or your family/friends, ever used the area around the Project (Long Sault Island, Ottawa River boat access) or other areas nearby?

Yes ☐ No ☐

If yes, what activities have you done there?

_____
_____
_____
_____
_____
_____
_____
_____

Which locations or areas are used?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Public Services and Procurement Canada are considering four different options for fish passage during construction of the new dam that may or may not include multiple species including lake sturgeon.

The four options being considered are as follows (from TetraTech, 2022):

1. A passage for eel only (as mentioned in DFO's authorization for the Ontario dam);
2. A multi-species fish passage;
3. No fish passage;
4. Delaying the construction of a potential fish passage until a more detailed impact assessment has been carried out as part of the Fisheries Management Plan for the Ottawa River.

First Nations must be consulted to determine a fish passage design that will maximize the health of fish populations on a broad scale examining the impacts on multiple species and not only lake sturgeon. There has been concern expressed by some stakeholders that designing a fishway without the science to determine the ecological impacts of allowing multiple species to move up or downstream, may result in unwanted outcomes (TetraTech, 2022).

This fish passage for eels is approximately 140 meters long and will be located on "Île Long Sault" (See Diagram 4) on following page.

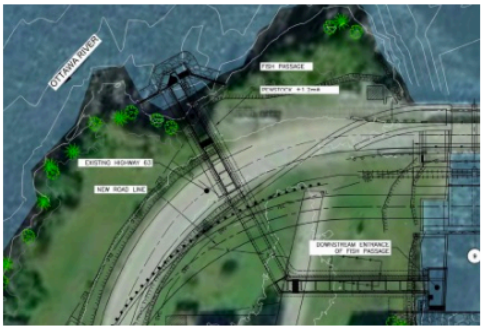


Diagram 4

Regarding the construction of a fish ladder at the new dam I agree with the following (please check boxes you agree with):

- ☐ 1. A passage for eel only (as mentioned in DFO's authorization for the Ontario dam);
- ☐ 2. A multi-species fish passage;
- ☐ 3. No fish passage;
- ☐ 4. Delaying the construction of a potential fish passage until a more detailed impact assessment has been carried out as part of the Fisheries Management Plan for the Ottawa River.
- ☐ 5. I would like to participate in the technical planning committee for the fish ladder.

General Use Questions

For this part of the survey, we are hoping to get an overview of how you or your family members use this area and whether it is important to you. We will map these locations in more detail afterwards.

Transportation

How often do you cross the Ontario-Quebec border to...?

	Two or more times a day	Once a day	A few times a week	About once a week	Never or hardly ever
Visit family	☐	☐	☐	☐	☐
Get to school	☐	☐	☐	☐	☐
Get to work	☐	☐	☐	☐	☐
Go shopping	☐	☐	☐	☐	☐
Access Services	☐	☐	☐	☐	☐
Go on vacation	☐	☐	☐	☐	☐
Other:					
_____	☐	☐	☐	☐	☐

Appendix 4
Wolf Lake Baseline Economic Study (Algonquin Canoe Company)

TDQRP ACC BUSINESS IMPACT ANALYSIS

Purpose:

Completing the "TDQRP Algonquin Canoe Company Business Impact Analysis" (BIA) is a key step in the project environmental assessment and later developing an "Accommodation Agreement" with the proponent Public Services and Procurement Canada (PSPC) for Wolf lake First Nation. The BIA will identify critical business functions and describe what would be necessary to recover these functions, in the event of impacts or disruption in business service during the TDQRP construction. Gathering this information will help WLFN develop accommodations with the proponent. You are being asked to answer these BIA questions because of your knowledge of the ACC and its business and resources.

Algonquin Canoe Company TDQRP Business Impact Assessment Questionnaire

Date of Interview:	
Interviewer:	

Interviewee/Title:	
Phone and Email Address:	
Consent Signature:	

ACC Questions

1. Provide a brief description of your job at ACC.	
2. What are the ACC's key products and services?	
3. A. What are the ACC normal work hours? B. How many personnel currently work in the store?	
4. What days/months have the most customer volume?	
5. What days/months have the most revenue?	
6. How dependent are ACC customers on highway access and parking?	Low Medium High
7. What percentage of your customers are:	Local Visitors
8. A. Do canoe rentals have a peak volume or other critical season? B. If yes, what are these months? C. Would TDQRP construction disrupt this activity?	

9. A. What community cultural events are carried out at ACC? B. When? C. Would TDQRP construction disrupt cultural activities?	
10. Please rate how the following will impact your ability to carry out ACC operations: a. Construction noise b. Construction dust c. Construction traffic slowdowns d. Construction staff and equipment staging	a. Low Medium High b. Low Medium High c. Low Medium High d. Low Medium High

Ontario Dam Replacement QC Traffic Deck Questions

11. Were you working at ACC when the Ontario Dam was replaced? If yes describe any noticeable ACC impacts or benefits.	
12. Were you working at ACC when the QC Traffic deck was replaced? If yes describe and noticeable ACC impacts or benefits.	

APPENDIX K – SART STUDIES

K-2: Algonquin Canoe Company: Business Impact Analysis Report

Timiskaming Dam-Bridge of Quebec Replacement Project

Algonquin Canoe Company: Business Impact Analysis Report

THE ALGONQUIN CANOE COMPANY

Prepared by

Wolf Lake First Nation

January 26, 2024

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1.0 Introduction

Wolf Lake First Nation (WLFN) Mahingan Sagaigan is one of eleven communities representing the Algonquin Nation in Canada. Nine communities are located in Québec and one is located in Ontario. These communities are subject to the Canadian Indian Act. The traditional territory of the Algonquin Nation includes the entire Ottawa River watershed in what is now part of the Canadian provinces of Québec and Ontario (Fig. 1a). The Algonquin people are part of the Anishnaabeg language group, which extends throughout the Great Lakes basin. The term "Anishnaabeg", literally translates as "the real people" (Mamiwinni Adisokan 2010). Today, the community of WLFN is made up of 230 people governed by an elected Chief and Council. All members live on their traditional unceded Algonquin Nation lands within both the Provinces of Québec and Ontario where they assert Aboriginal Rights and Title as recognized by the Canadian Constitution. WLFN traditional territory has been established, documented and substantiated through both historical research and a professional current land use and occupancy mapping project (see case study in Tobias 2010).

For several years, WLFN has prioritized long-term strategies to promote environmental and economic sustainability as an alternative to intensive resource extraction industries on their territory by focusing on the following community development priorities:

- Provide alternative employment to the community's growing population which includes a high number of youth who are faced with few rewarding job options;
- Create economic opportunities which are compatible with the cultural and environmental values and aspirations of the members (for example eco-tourism); and
- Build on environmental education and stewardship opportunities that reflect and strengthen cultural values, with climate change mitigation and adaptation co-benefits, and possible eco-system service opportunities (Van Schie 2011).

In addition to the direct employment created, the community's tourism initiatives are strengthening cultural awareness on the territory. WLFN's emphasis on culture based ecotourism development has influenced regional non-natives and visitors in becoming more aware of the Algonquin's environmental, social and cultural history through modern day activities on the territory (St. Denis pers. comm., Presentation to Crown First Nations Gathering, January 24 2012; Van Schie 2013). This awareness, and the experiences offered through the Algonquin Canoe Company are not dissimilar to the values and experiences provided in legislated protected areas (e.g., national and provincial parks) but differ in that they provide a direct cultural connection with Algonquin peoples (Duinker et al. 2010; Wiersma et al. 2010 and introduction to this issue).

Ecotourism creates jobs of a type that draw upon the skills of, and appeal to, the younger members of the WLFN. Since 2003, WLFN youth have worked summers scouting and maintaining over 500 km of traditional Algonquin canoe routes and portages to service the Algonquin Canoe Company outlets. The Algonquin tourism businesses have been a catalyst for renewed community focus on the land including short term and long term watershed and forest management plans supporting ecosystem protection, conservation and recreation, all of which are values and goals that coincide with legislated protected areas.

2.0 Background

2.1 Algonquin Canoe Company

The Algonquin Canoe Company (ACC) is a tourism business and crafts store, opened in 2004 under Anishinabek Outfitter Inc. by Wolf Lake First Nation (WLFN). Prior to the establishment of the Algonquin Canoe Company, the former Mahingan Arts and Crafts store was located here. The Algonquin Canoe Company operates year-round, offering water vessel rentals and hand-made Indigenous arts and crafts, from local artisans. The location of the Algonquin Canoe Company (Figure 1 & Figure 2) is in close proximity to the proposed Quebec Dam-Bridge replacement. The land surrounding the ACC is also used to host community cultural events, including community feasts, family activities, youth events, Indigenous Peoples Day, Tribal Council Annual Assembly, Truth & Reconciliation Day. These events are important and help bring the community together.

Since 2004, the Algonquin Canoe Company collected GPS points and historical portage routes throughout the unceded and unsurrendered traditional territory of Wolf Lake First Nation, particularly in Hunter's Point and in Lake Kipawa.

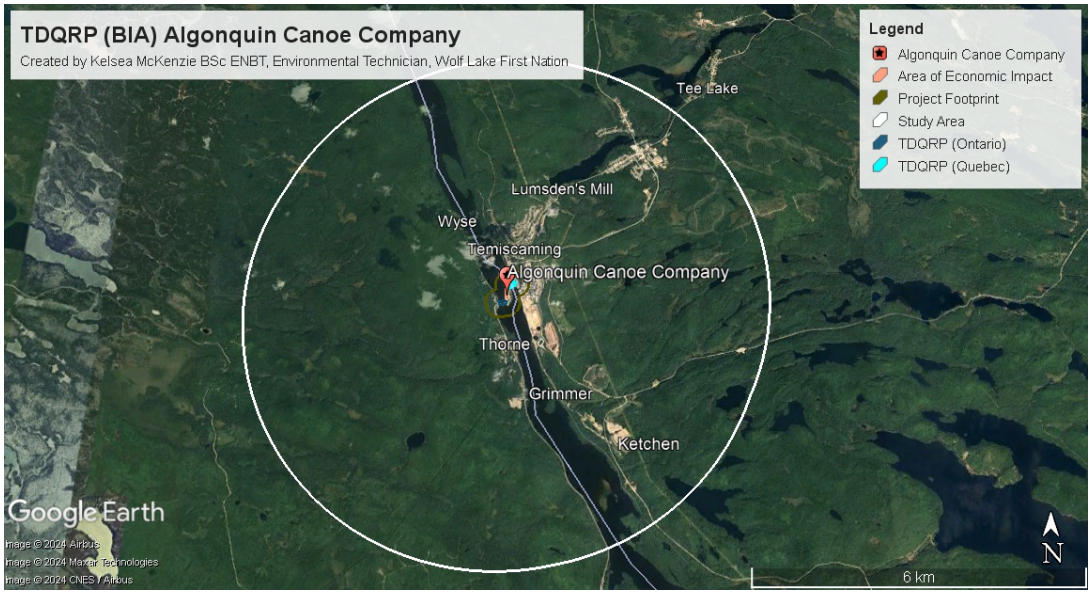


Figure 1. A map of the Timiskaming Dam-Bridge of Quebec Replacement Project (TDQRP) study area.

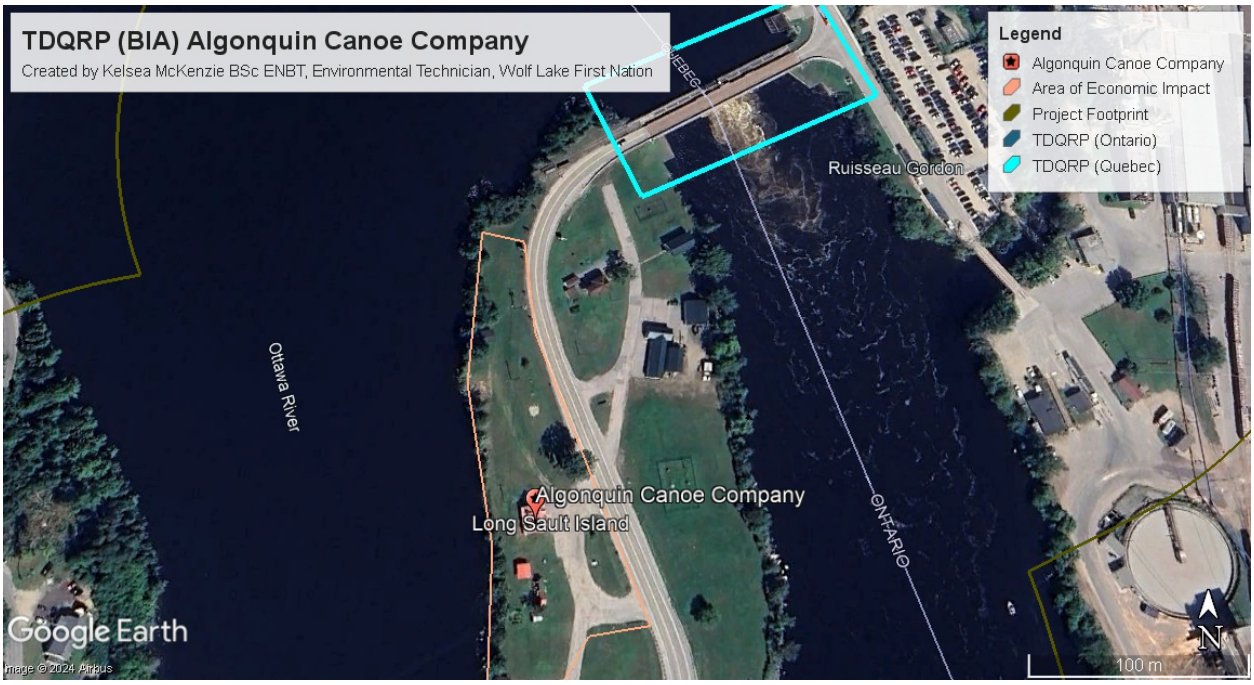


Figure 2. Map of Algonquin Canoe Company (Long Sault, Island, ON) and Timiskaming Dam-Bridge Quebec Replacement Project (Temiscaming, QC).

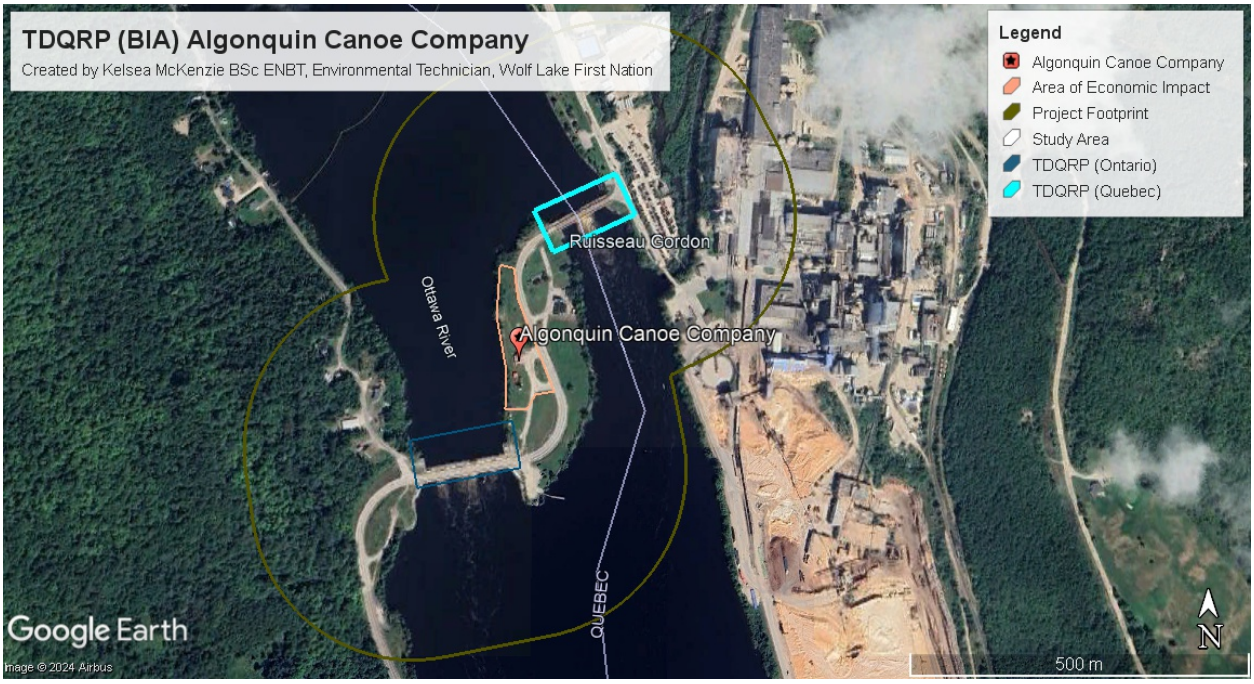


Figure 3. A map of the anticipated project footprint of the TDQRP.

3.0 Business Impact Analysis

3.1 Methods & Materials

Algonquin Canoe Company (ACC) employees completed a questionnaire based on information for a Business Impact Analysis (BIA) to identify any impacts or benefits the Temiscaming Dam-Bridge replacement project may have on the revenue and normal operations. The questionnaire was completed by those who hold knowledge of the ACC and its business and resources, this included: the store manager, health coordinator and councillor, store employees (cashiers, crafters) and the band manager of Wolf Lake First Nation. Interviews were documented and data were collected anonymously in respect to protecting the privacy of each participant. There were a total of 12 questions drafted in the questionnaire, containing normal business operations of the ACC and impacts of previous dam replacement(s) in the prior years. The data collected from the BIA interviews were transferred into Microsoft Excel software to begin the data analysis.

First, the researcher asked participants to provide a brief description of their job at the Algonquin Canoe Company. Respondents' consisted of managers, those with detailed knowledge of how the business functions, as well as the products and services it provides. The seven respondents' provided information on the Algonquin Canoe Company's key products and services: tourism, canoe and kayak rentals, retail sales, Indigenous crafts, clothing, moccasins, and La Lucarne outfitter services (figure 4). Participants were asked to provide the normal business hours of operation and described the store's operating hours as open 7 days a week, from 9:00 AM to 5:30 PM. The follow up question inquired about the number of store employees, which was found to be 4-5 working within the store location as crafters (beadwork and moccasins), store managers, and cashiers.

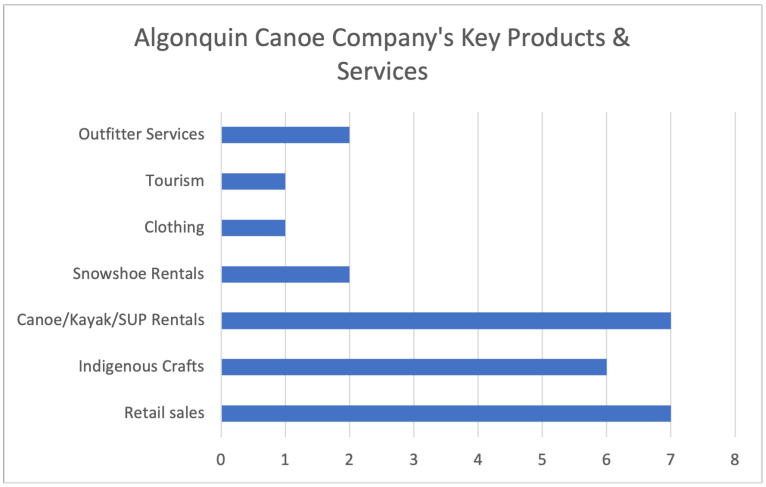


Figure 4. Bar chart of the ACC respondents' identified key products and services. Majority of the key products and services are canoe/kayak and stand up paddle board rentals, indigenous crafts, and retail sales.

The area of economic impact was mapped using Google Earth Pro, with information on the study area and project footprint derived from the Timiskaming Dam-Bridge of Quebec

Replacement Project: Land Use and Occupancy mapping components (refer to Figure 1). The questionnaire was designed to gather information and identify the potential impacts of road construction, specifically in regard to the construction and equipment placement in proximity to the Algonquin Canoe Company outfitting business. Respondents' were asked to identify the days/months of the most customer volume and revenue at the Algonquin Canoe Company and noticed an increase in volume during the summer months, weekends, and special holidays (Appendix A). Most of the customer volume and revenue are from out-of-towners on their summer vacations (see Figure 5), the warmer season indicating more rentals, and shopping for indigenous arts and crafts.

4.0 Results

4.1 Impacts & Benefits

4.1.1 Impacts on Indigenous Rights

Presence of the construction staging and equipment will eliminate the space needed to host community cultural events and gatherings.

4.1.2 Economic Impact on the Algonquin Canoe Company

The results of the Algonquin Canoe Company business impact assessment questionnaire indicated noticeable impacts on the Algonquin Canoe Company during the time of construction projects (Table 1) as a result of its proximity to the Timiskaming Dam Complex. Algonquin Canoe Company employees reported the summer months being a critical season with its peak volume due to demand for canoe rentals from May to September, as well as an increase of out-of-town customers (Figure 5). Customer volume noticeably increases during holidays and weekends. There is concern that construction of the TDQRP would disrupt the customer volume and activity, reducing the accessibility to the store. Customers are dependent on parking accessibility and highway access. Reduced parking spaces and highway access will have a high economic impact on the ACC as a result of traffic delays, construction staging and present construction staff (Figure 6).

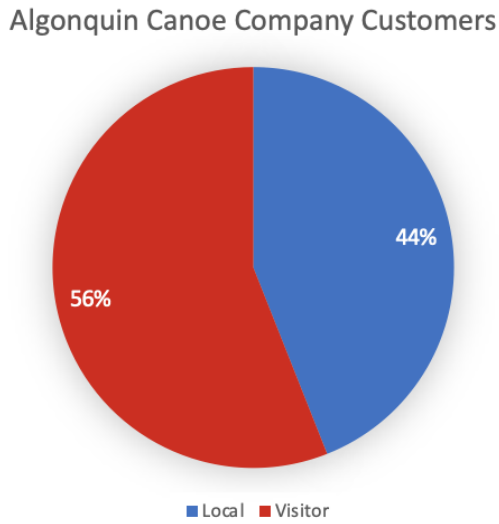


Figure 5. Percentage of Algonquin Canoe Company customer volume: local or visitor.

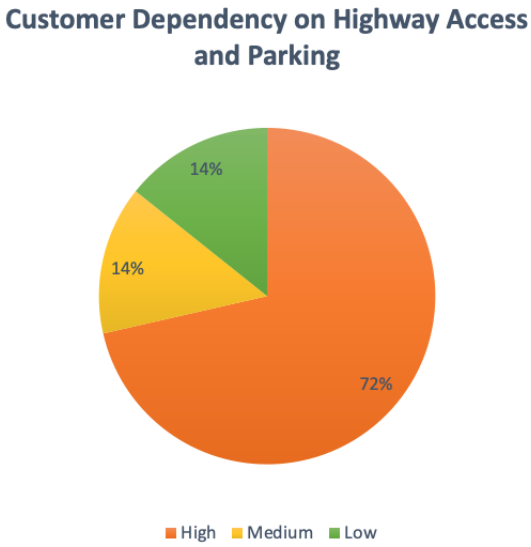


Figure 6. ACC customers are highly dependent on highway access and parking.

4.1.3 Noticeable Impacts During Past Construction Projects

During the Quebec Traffic Deck replacement, the disruption of regular flow of traffic and delays were reported. Some of the impacts that were listed included a decrease in sales, noise, traffic delays, and restrictions from hosting community events and feasts (Table 1). Similarly, the same impacts were reported concerning the replacement of the Ontario Dam in 2014-2016 (Table 1).

Table 1. Respondents' (n=5) reported noticeable impacts on the Algonquin Canoe Company during the Ontario dam replacement in 2014-2016, and during the Quebec dam traffic deck replacement.

Ontario Dam Replacement (2014-2017)		**Quebec Traffic Deck Replacement (2021)**	
Noticeable Impacts	**Noticeable**	**Noticeable Impacts**	**Noticeable**

	Benefits		Benefits
• Noise • Traffic delay • Decrease in sales • Decrease in rentals	N/A	• Traffic delay • Impatient drivers • Worse in winter months	N/A
• N/A	N/A	• Traffic delay • Reduced customer volume	N/A
• Decrease in sales • Accessibility	N/A	• Traffic delay • Poor road conditions • Lane too small for transports • Increased danger • Noise • Construction equipment blockage	N/A
• Decrease in sales • No community activities • Traffic delay	N/A	• Traffic delay • Increased danger • Low customer volume • Cannot fish off dam	N/A
• Decrease in sales • Traffic delay	None	• Traffic delay • Low customer volume	N/A

4.1.3.1 Impact on Algonquin Canoe Company Revenue

The impact of previous dam replacement projects (referring to the replacement of the Ontario-Dam Bridge) construction has previously impacted the Algonquin Canoe Company's revenue sales during the time of the Timiskaming Dam-Bridge Ontario Complex Replacement. The accessibility of the Algonquin Canoe Company was uncertain due to the construction staging of the equipment.

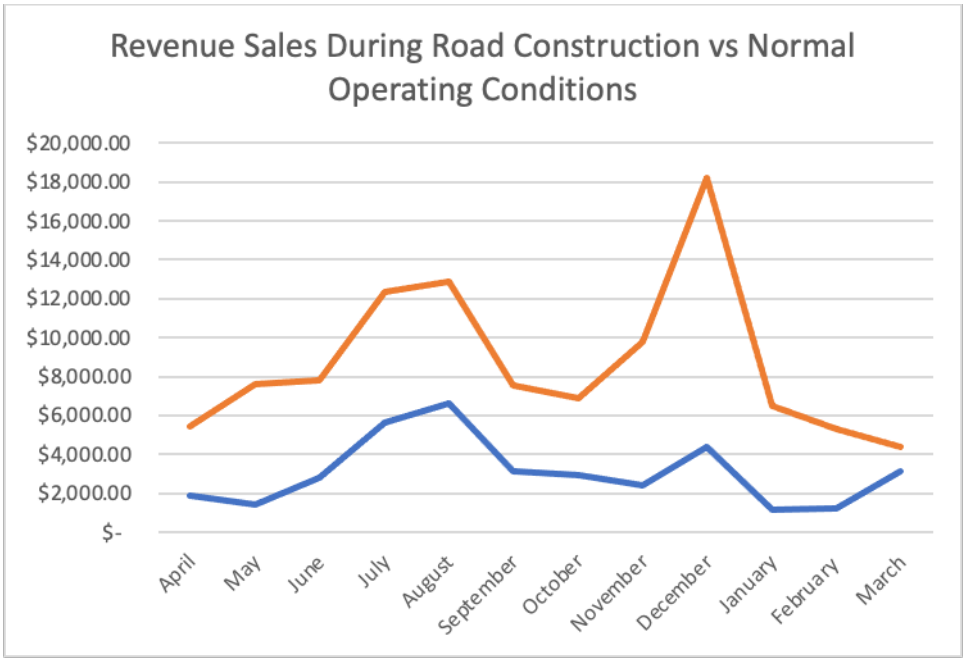


Figure 7. Algonquin Canoe Company Monthly Revenue: Comparison of Revenue Sales vs Revenue During Dam Construction. Orange Line Represents Revenue Sales from 2022/2023 (normal operating conditions). Blue Line Represents Revenue Sales from 2014/2015 (start of road construction for Timiskaming Ontario Dam Replacement).

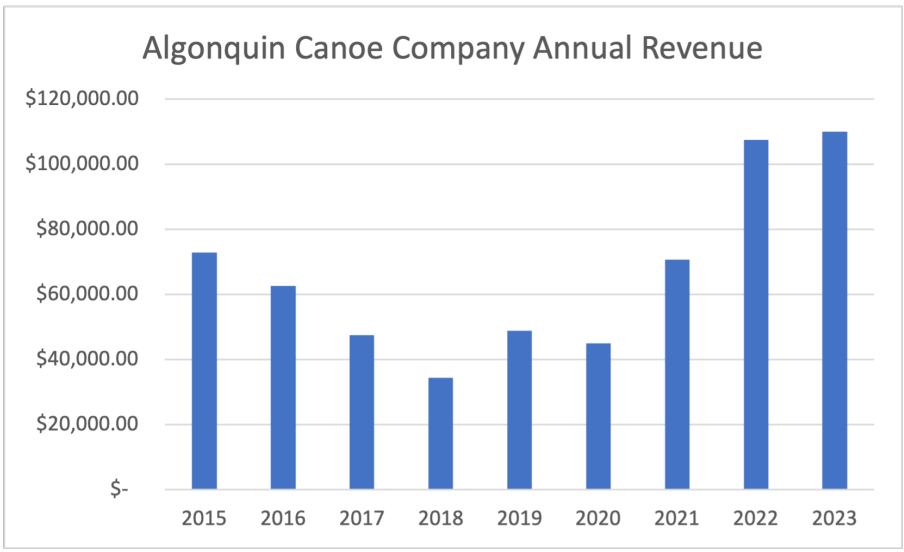


Figure 8. Bar graph of Algonquin Canoe Company Revenue Sales Trend from 2015-2023.

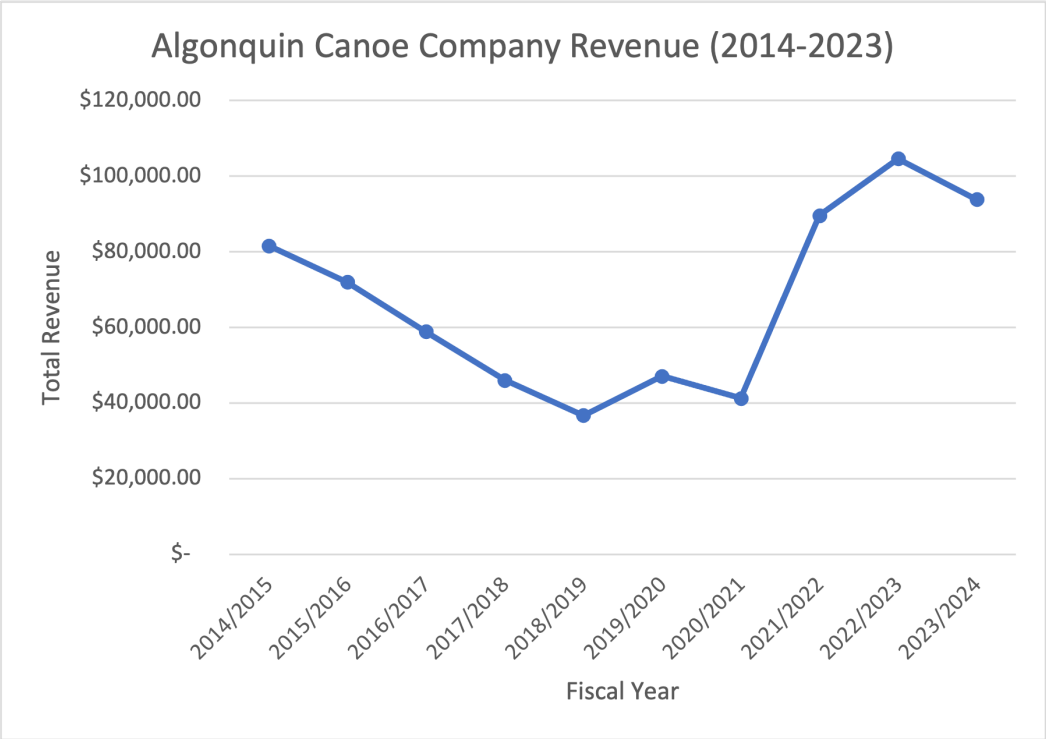


Figure 9. Line graph showing the Algonquin Canoe Company's total revenue from each fiscal year (2014/2015 to 2023/2024).

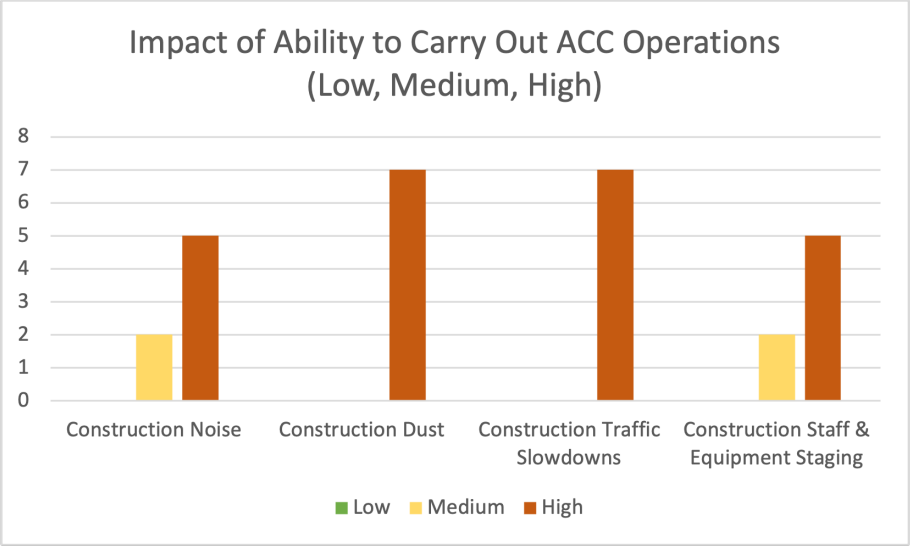


Figure 10. Bar graph of the respondents' ability to carry out the Algonquin Canoe Company operations due to impacts of construction (low, medium, high).

5.0 Discussion

5.1 Mitigation & Measures

5.1.1 Maintaining Customer Volume During Construction

Customer volume is anticipated to decrease throughout the demolition and construction of the Temiscaming Dam-Quebec bridge, as a result of traffic delays and reduced highway lane(s). This will significantly impact the revenue of the Algonquin Canoe Company during the time of construction. To maintain customer volume and reducing impact on store accessibility, the heavy machinery and construction staging equipment shall:

1. Be located 5m away from the Algonquin Canoe Company establishment and parking
2. Be located on the opposite side of highway 63
3. Be located safely within the working location while maintaining its distance from customer parking

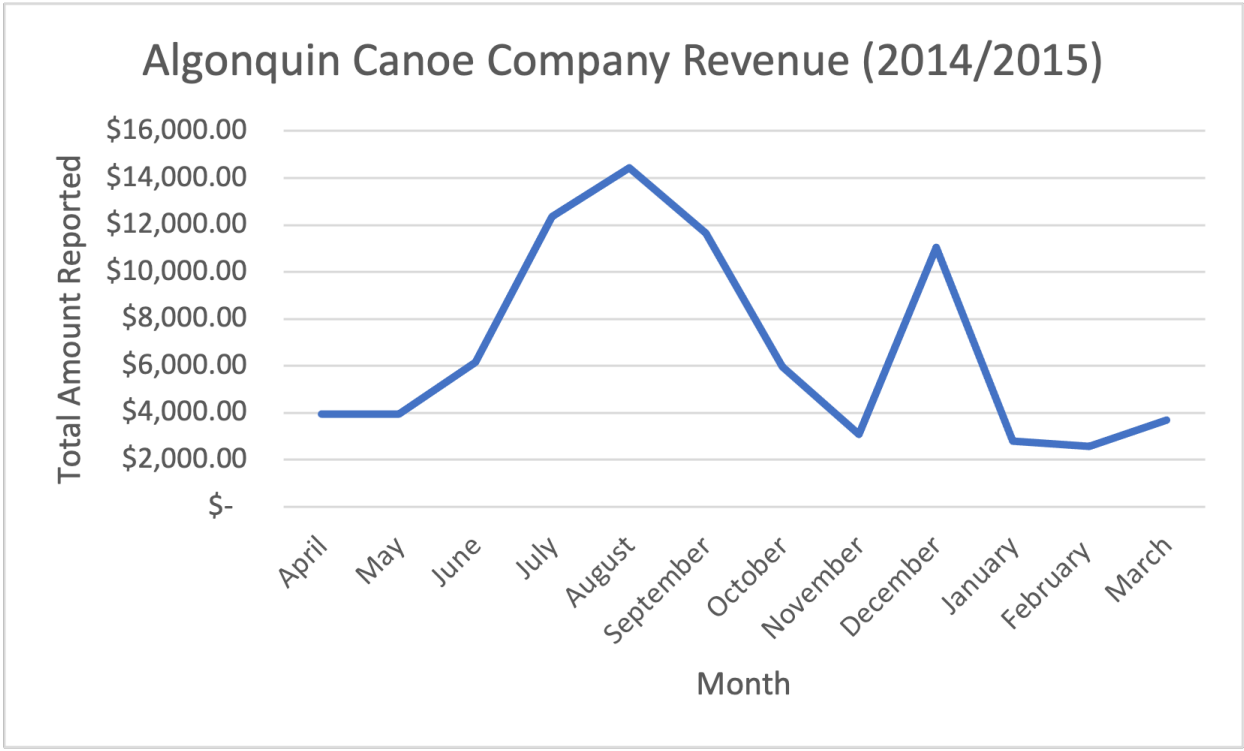
5.1.2 Traffic Control Measures

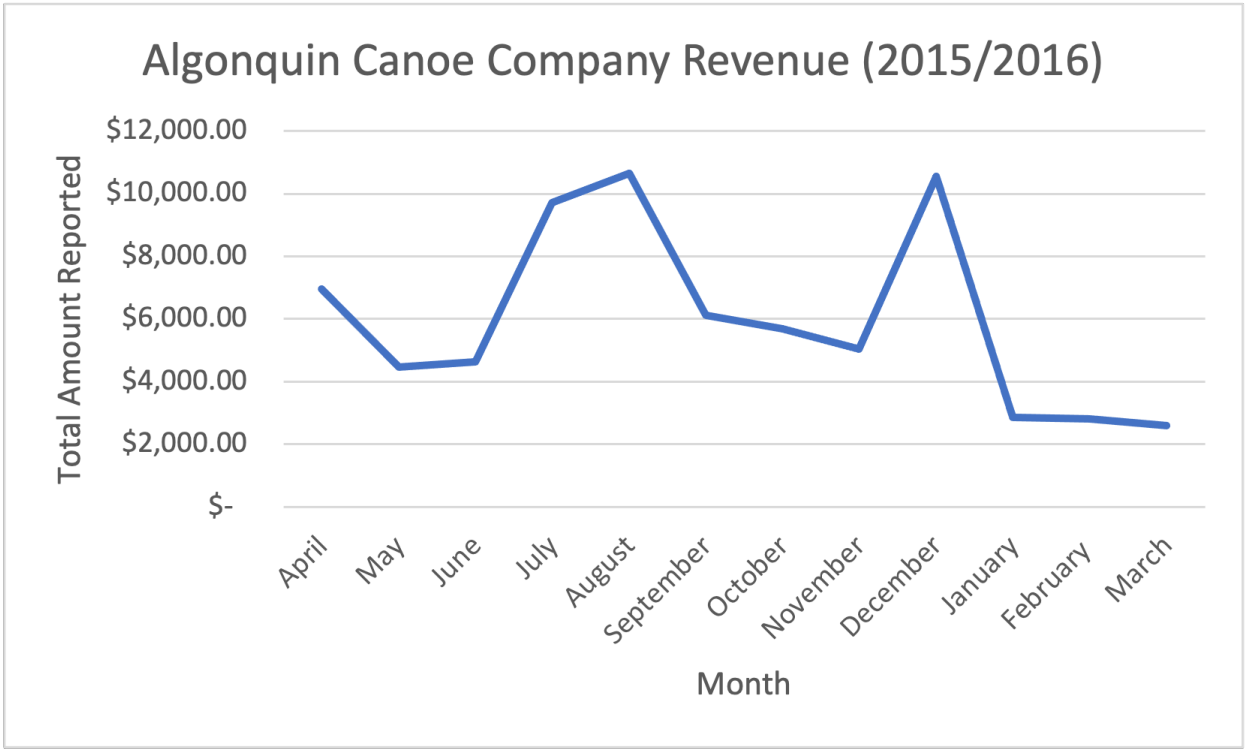
Traffic Control Measures have a significant impact on store access and sales. This impact will require compensation for business loss.

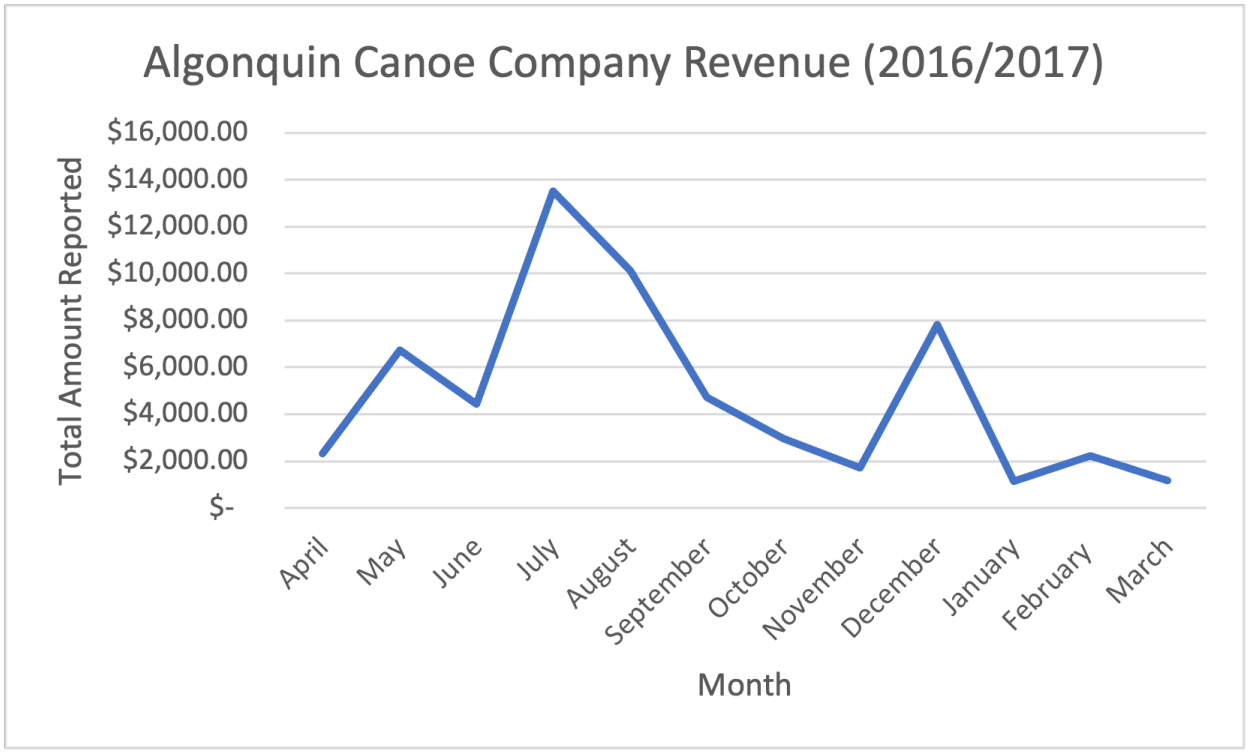
5.1.3 Safety Mitigations for Reduced Lane

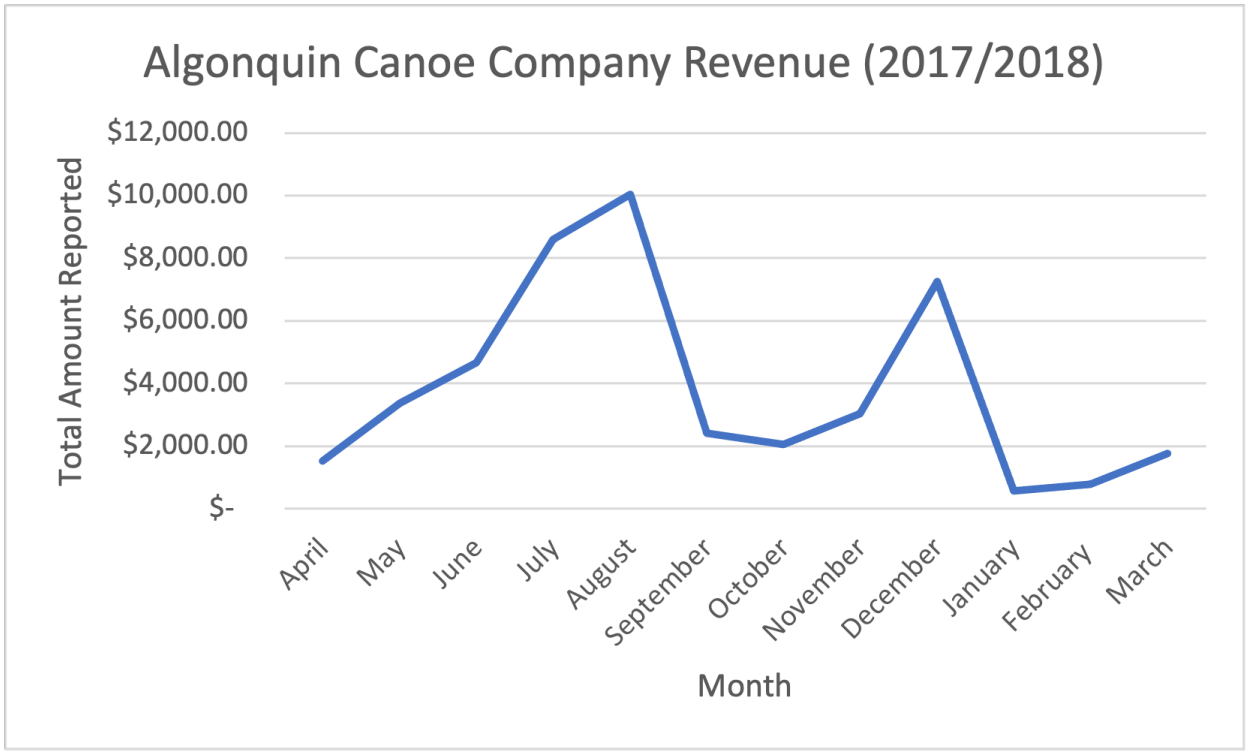
Local sales data from ACC and surrounding businesses is required to accurately depict the economic impacts on revenue throughout the duration of the bridge replacement project

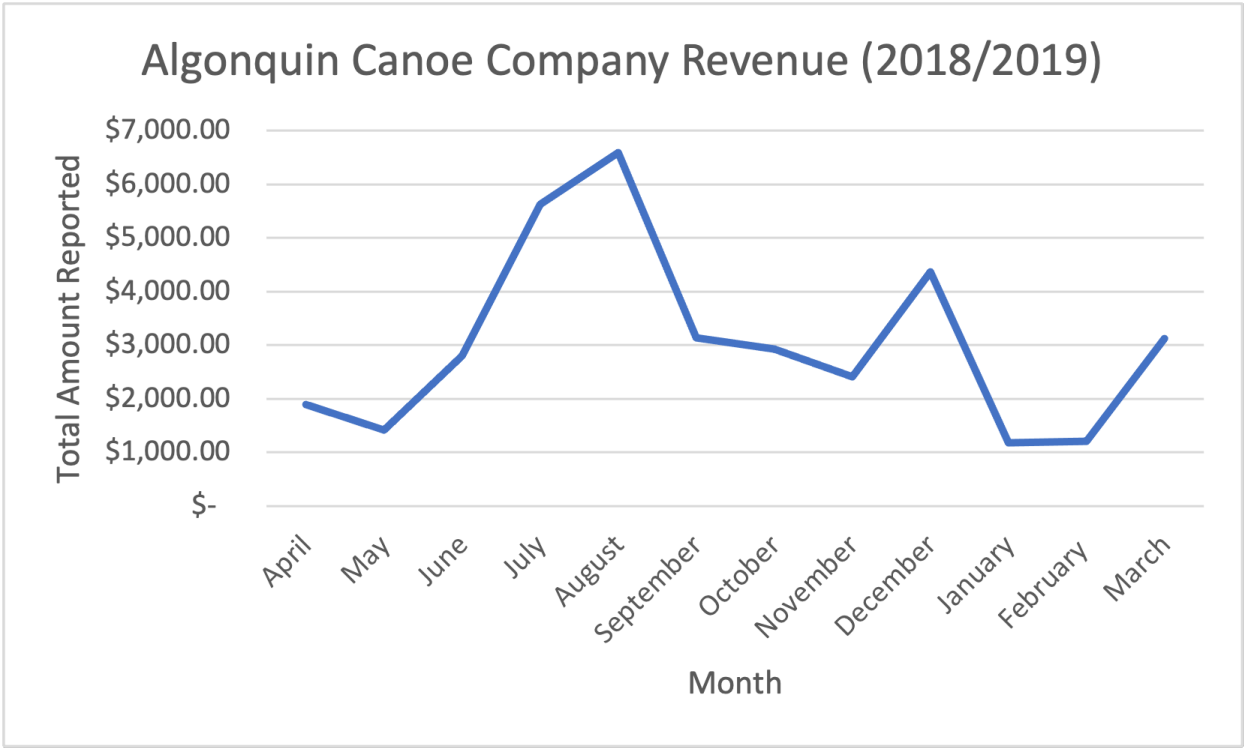
Appendix A

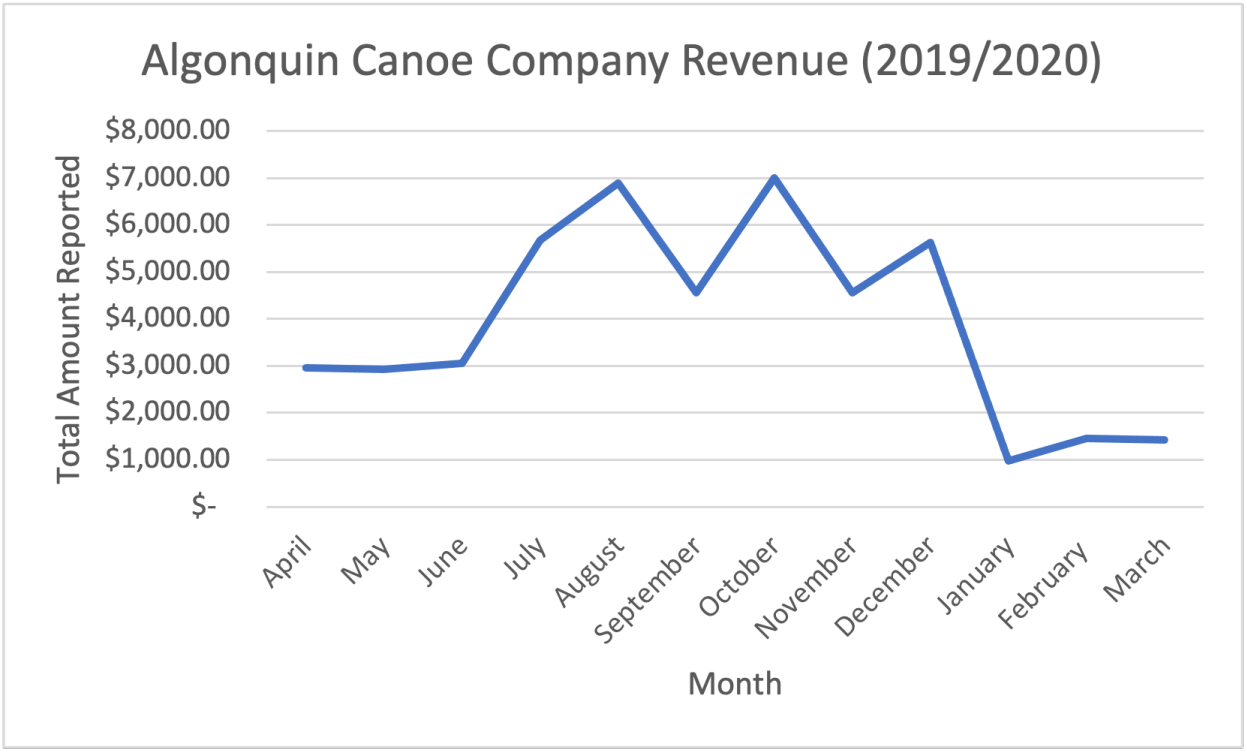

Algonquin Canoe Company Revenue (2014/2015)
Total Amount Reported
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month

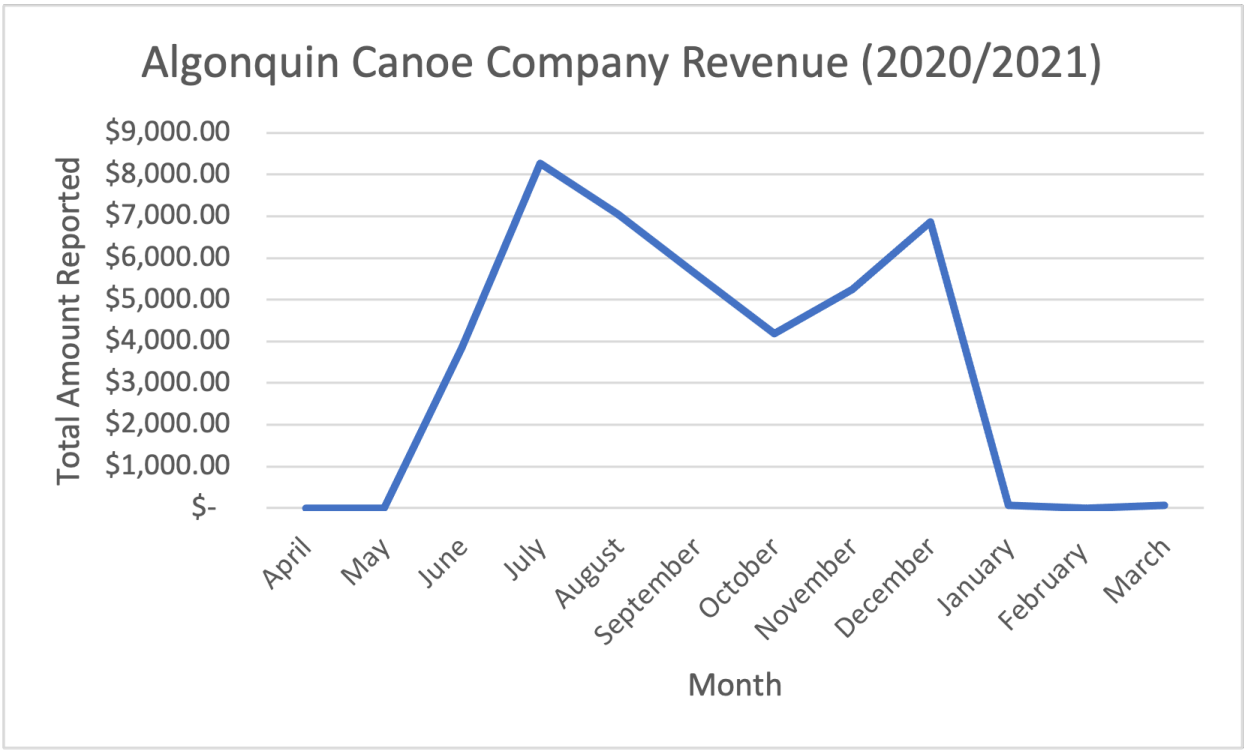

Algonquin Canoe Company Revenue (2015/2016)
Total Amount Reported
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month

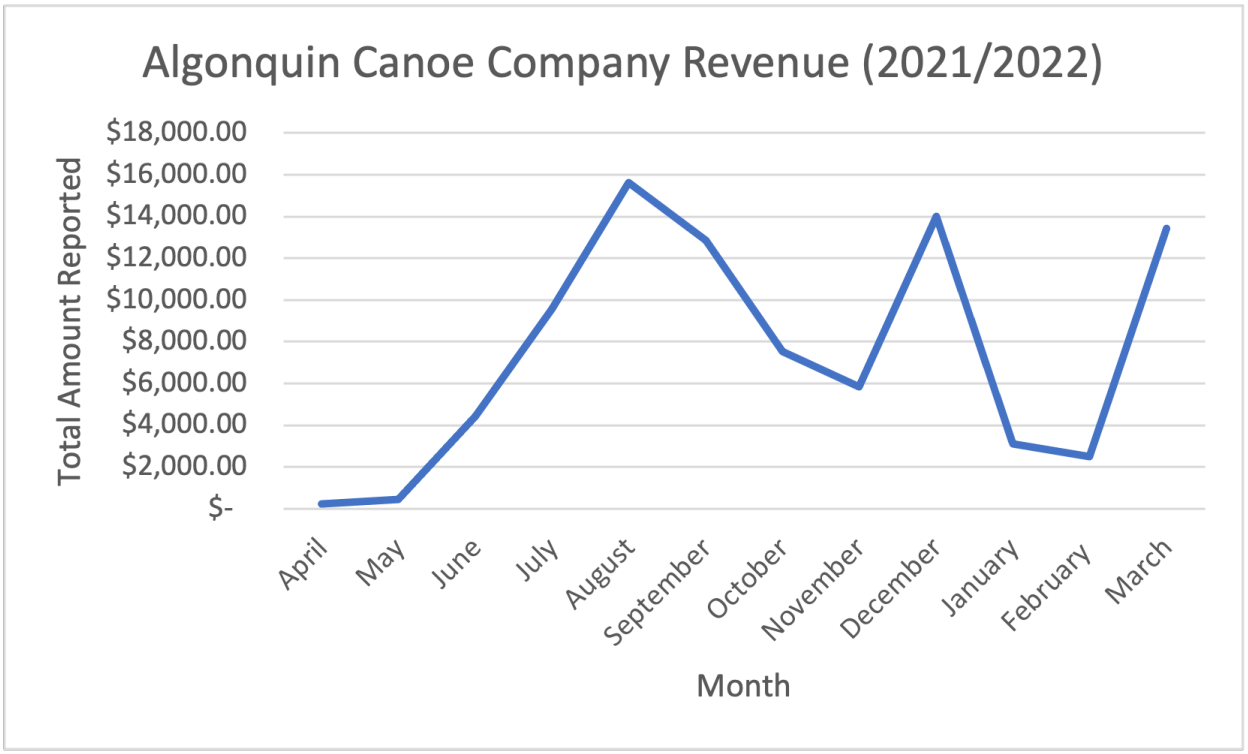

Algonquin Canoe Company Revenue (2016/2017)
Total Amount Reported
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
April
May
June
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December
January
February
March
Month

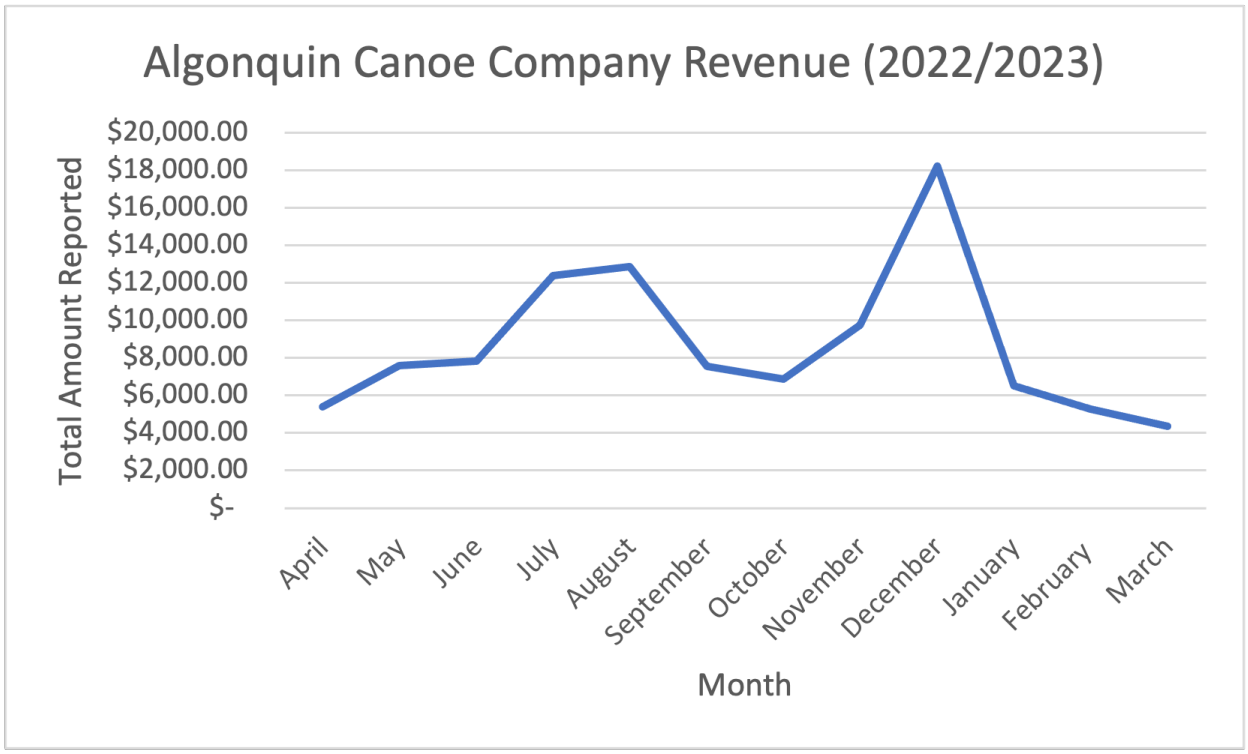

Algonquin Canoe Company Revenue (2017/2018)
Total Amount Reported
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month

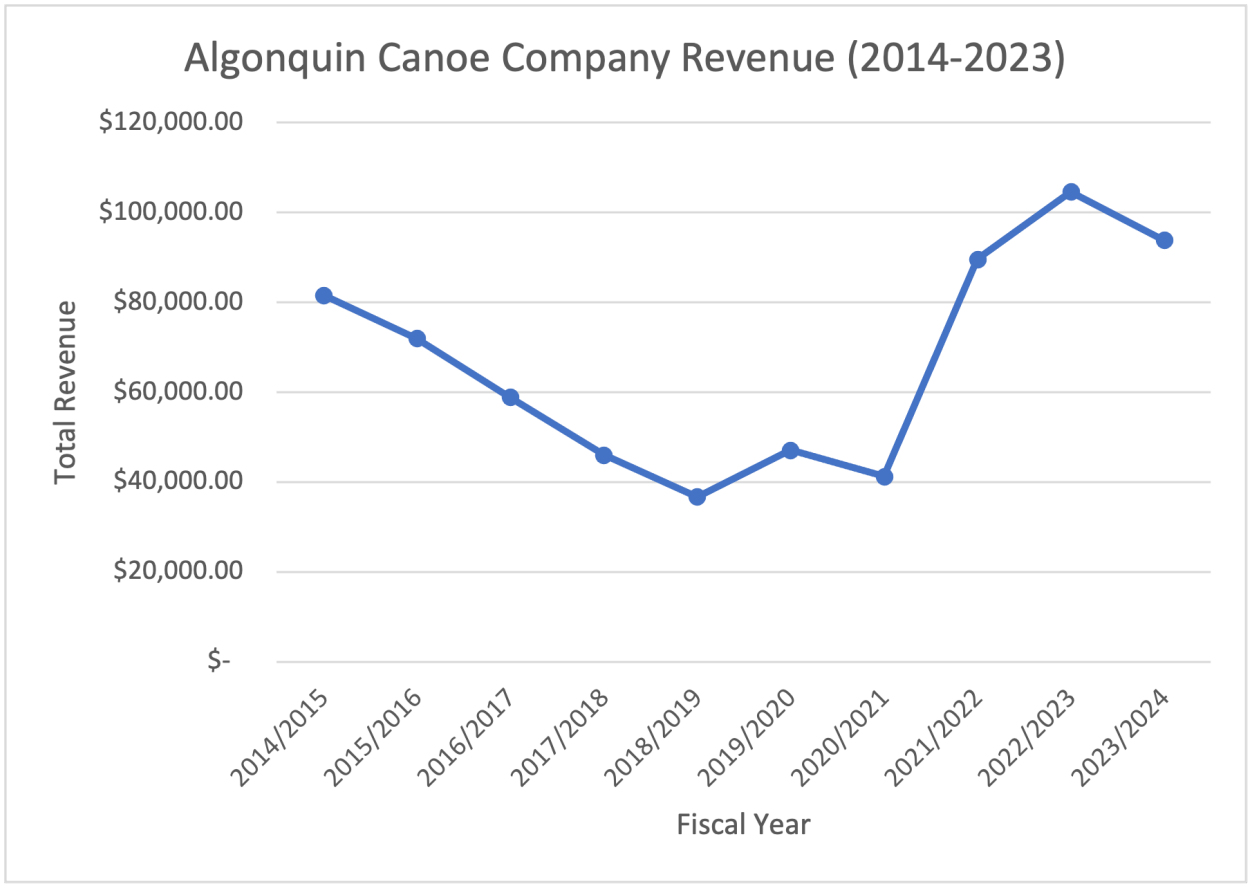

Algonquin Canoe Company Revenue (2018/2019)
Total Amount Reported
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month


Algonquin Canoe Company Revenue (2019/2020)
Total Amount Reported
$8,000.00
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month


Algonquin Canoe Company Revenue (2020/2021)
Total Amount Reported
$9,000.00
$8,000.00
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month


Algonquin Canoe Company Revenue (2021/2022)
Total Amount Reported
$18,000.00
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month


Algonquin Canoe Company Revenue (2022/2023)
Total Amount Reported
$20,000.00
$18,000.00
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
April
May
June
July
August
September
October
November
December
January
February
March
Month


Algonquin Canoe Company Revenue (2014-2023)
Total Revenue
$120,000.00
$100,000.00
$80,000.00
$60,000.00
$40,000.00
$20,000.00
$-
2014/2015
2015/2016
2016/2017
2017/2018
2018/2019
2019/2020
2020/2021
2021/2022
2022/2023
2023/2024
Fiscal Year

APPENDIX K – SART STUDIES

K-3: Species at Risk Neme and Biocultural Impact Study

A 2022 Study

Kichi-Sibi Technical Team
Timiskaming Dam Quebec Replacement Project (TDQRP)
Neme Biocultural Study Report



SPECIES AT RISK NEME AND BIOCULTURAL IMPACT STUDY

An Indigenous-led study contributing to the recovery of Algonquin cultural rights and responsibilities for the endangered Neme Lake Sturgeon (*Acipenser fulvescens*) in the Kichi Sibi
(Ottawa River La Cav Section) Timiskaming Dam Complex.

February 5, 2024

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Introduction

This report provides the results of an Indigenous-led Lake Sturgeon (*Acipenser fulvescens*) (Neme) spawning survey and literature review conducted in 2022 by the Statement of Asserted Rights and Title (SART) Algonquin communities of Kebaowek, Timiskaming and Wolf Lake First Nation's Kichi Sibi Technical Team. The report is intended to support discussions involving the three First Nations and the Department of Fisheries and Oceans on the Timiskaming Dam Quebec Replacement Project (TDQRP) and the future management of the Neme population in the Ottawa River. The intention is to ensure that Traditional Indigenous Knowledge (TIK) and the inherent rights and responsibilities of the First Nations have been considered and incorporated into the future management of the fishery on the river with the intended outcome of conserving and restoring, when possible, the population.

Figure 1
Environmental technician Kacie Mclaren, Kebaowek First Nation



The 2022 spring fisheries assessment completed by the Kichi Sibi Technical Team provided the baseline data at the TDQRP project location prior to the dam reconstruction.

The objectives of the spring 2022 Kichi Sibi Technical Team sturgeon spawning assessment were to:

- Assess the distribution, presence/absence, and spawning activity of Lake Sturgeon downstream of the Timiskaming Dam Complex.
- Establish baselines with respect to the availability, quality and/or suitability of Lake Sturgeon spawning habitat immediately downstream of the Timiskaming Dam Complex.
- Assess habitat characteristics at identified spawning locations in proximity to the Quebec Dam within the Timiskaming Dam Complex.
- Gather meristic information and PIT tag Lake Sturgeon to track distribution, travel and use patterns.

The majority of the fisheries assessments at the Timiskaming Dam Complex or in the Ottawa River that have been completed to date have been government-led or contracted out to private consulting firms with little consideration for Algonquin rights or TIK. This report, which was funded by the Public Service and Procurement Canada (PSPC), provides our SART communities the opportunity to reframe the narrative and socio-political dynamics to support the inherent Algonquin or our Indigenous rights and responsibilities for Neme conservation and habitat protection in the Ottawa River. (See SART Neme Conservation Plan 2022)

Additionally, our goal was to improve our understanding of the current population numbers, the habitat availability, suitability and use as well as the potential threats and cumulative effects of the Timiskaming Dam Complex and the future replacement project on the Lake Sturgeon population, as it relates to both our Section 35 rights and this federally endangered species.

To assess TDQRP's impact on SART's exercise of rights, SART also requires baseline ecological information on the TDQRP's effect on the surrounding environment. In SART's preliminary review of the PSPC Environmental Impact Statement ("EIS"), and through ongoing fieldwork at the TDQRP site, SART has identified some concerning gaps in this baseline information. For instance:

- Inventories of mussels and fishes are needed to better understand populations of Hickorynut mussels and Lake Sturgeon in the area of TDQRP and Beauchene River, an area dominated by large sand deposits. These deposits are well recognized as the ideal substrate to the Hickorynut mussel and the juvenile stage of Lake Sturgeon. There needs to be confirmation of their presence/absence, status of the target Species at Risk population, distribution within the reach, cohort/demographics genetics of the populations, fish and clam community profiles, location of critical habitat, and a traditional ecological knowledge assessment.
- Benthic communities
- SART needs to understand how pulp mill contaminants can bioaccumulate on the top of the river sediment and therefore remain for decades in place in the benthic community living in the area.
- SART species at risk studies

In addition to the fisheries assessments that were completed, a review of the community surveys, fishery habitat information (e.g., spawning sites and dates), aquatic ecosystem changes over time and land use and occupancy interviews were carried out with the community members, the elders and the Lands and Resources Technicians of the SART communities for the period of 1980–2023. This information provided evidence of the depth of knowledge that is held by the community members and fishers about this species and the importance of protecting Neme in the Ottawa River.

Our report concludes by suggesting that a biocultural diversity conservation approach, which reflects both the ecological and socio-cultural Algonquin values and which are informed by scientific and Indigenous knowledge systems, be used to ensure a sustainable approach to managing and enhancing the Lake Sturgeon populations in the Ottawa River moving forward. It recommends a SART co- management agreement for Lake Sturgeon and other species at risk at the Timiskaming Dam Complex and in the Ottawa River.

Background

Lake Sturgeon Under Threat

Lake Sturgeon, also known as Name (Ojibwe), Namay Namaeu (Cree) and Neme (Ottawa and Ojibwe), are one of the largest, longest-lived, freshwater fish species in Canada and have special significance to Indigenous Peoples.

Lake Sturgeon were once considered abundant in the Ottawa River prior to the 1900's (Dymond, 1939) and were found throughout the entire Ottawa River and many of its tributaries (Harkness and Dymond, 1961). In the Transactions of the Ottawa Field Naturalist, Small (1883) notes that Lake Sturgeon frequented the Ottawa River. Curiously, he also mentions a second species, the Sharp-nosed Sturgeon to be found in the river. With European colonization came industry and increased anthropogenic stressors of various kinds on Lake Sturgeon, ultimately causing a decline in sturgeon population numbers in the Ottawa river that have yet to rebound to historical numbers.

Lake Sturgeon have very low reproductive potential, females spawning for the first time between 14-23 years of age, then only every 7-9 years afterwards. Males mature at a younger age, typically from 12 - 20 years and will spawn every 1 - 3 years. Despite depositing millions of eggs during spawning, first-year survival rates are low. Survival after year one increases dramatically. A unique life-history combined with overharvesting, pollution and alterations to habitat contribute to declining population numbers, making recovery of the population a challenge.

Lake Sturgeon can grow up to a length of 3 meters and can live up to a lifespan of 154 years. Lake Sturgeon was historically important to Indigenous peoples; every part of the fish was used and absolutely nothing was wasted. Some of the ways that sturgeon was used include:

- Meat is an important source of food
- Oil was extracted for medicinal purposes
- Cartilage was used to make needles, spears and arrowheads
- The lining of the stomach was used for drum coverings·

- Isinglass was obtained from the swim bladders to make glue and paint for teepees, often used as a paint stabilizer
- The skin was used as a container to hold the extracted oil

Lake Sturgeon was often harvested as a primary food source by Indigenous people to help them get through the long winters when food was scarce, it was often preserved by being smoked and dried over an open fire (C. Hardy Jr. BZA First Nation., n.d.). Every spawning season created an important meeting place for many different nations to gather in the spring at sturgeon spawning sites to share their harvest.

Sturgeon was often discarded by early settlers as they desired Walleye (*Sander vitreus*) and Lake Whitefish (*Coregonus clupeaformis)* and it was fed to their pigs, or sometimes used as fertilizer for crops. The discarded fish were stacked on the shores to be dried and used as fuel for steamboats. Once they learned about the various uses of Lake Sturgeon, it was harvested for:

- Smoking its meat
- Oil was used for paint
- Isinglass was used in beer and wine as a clarifying agent
- The skin was used to create leather products
- Eggs were harvested for caviar

In the 1800s Lake Sturgeon were heavily commercially harvested for their roe (eggs) and meat which caused a huge decline in population numbers. Slow to reproduce, many sturgeon populations have not yet recovered from the days of peak commercial harvest. This population was further impacted by the construction of hydro dams preventing sturgeon from accessing reaches of the waterway which they rely on for spawning, feeding and nurseries for larval and juvenile fish.

Lake Sturgeon in the Ottawa River have been greatly impacted since the early 1800’s as a result of unregulated fisheries, overfishing, overexploitation, pollution, construction of dams and hydroelectric facilities, logging and lumber operations that once used our waterways as a source of transportation (Bruch et al., 2016)

Figure 2

Lake Sturgeon harvest from a 1974 commercial fishery on the Ottawa River



Note. Photo by P. McGuire

Prior to establishment of the logging and lumber operations, the Ottawa River was a crystal-clear source of water, where the riverbed could easily be seen. The water chemistry of the Ottawa River had been affected due to the accumulation of bark and wood chips during the logging period, which had also altered the riverbed causing optimal fish habitats to degrade overtime. Log movements mostly occurred in the spring; this unfortunately could have abraded the lake sturgeon spawning ground in the Ottawa River.

According to the two committees that are responsible for reviewing and assessing the status of wildlife in Canada (Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) or the province of Ontario (Committee on the Status of Species at Risk in Ontario (COSSARO)) respectively, the Great Lakes – Upper St. Lawrence Lake Sturgeon populations in Ontario have been classified as being either Threatened (COSEWIC) or Endangered (COSSARO) or in other terms, those populations that which are facing imminent extinction or extirpation if nothing is done to reverse the factors leading to their extirpation or extinction (Figure 1). However, in Quebec, the Quebec advisory committee for wildlife has deemed the population as Susceptible (Table 1).

Many other species of fish are under threat in the Ottawa River (Table 1) which speaks to the degree of degradation of the river since industrialization, not only affecting the sturgeon population, but the entire ecosystem. Despite sharing the same waters of the Ottawa River, many 'at risk' fish species have different designations of risk as determined by the provinces of Ontario and Quebec. Sturgeon of the Ottawa river have been deemed 'endangered' by Ontario, however Quebec has designated them 'susceptible', affording the sturgeon a much lower level of protection in that province.

It is agreed that the main reason for the decline of the sturgeon, which has been observed across Canada, is the historical overharvest of the species, and the installation of dams which impede passage and alter water regimes, flows, levels, and temperatures and in turn impact food availability for the species.

Table 1

Species at Risk (SAR) Fish of the Ottawa River

Species	Designation*		
	Ontario	Quebec	Federal
American Eel (*Anguilla rostrata*)	Endangered	Susceptible	Under Review (Threatened)
Lake Sturgeon** (*Acipenser fulvescens*)	Endangered	Susceptible	Under Review (Threatened)
Cutlip Minnow (*Exoglossum maxillingua*)	Threatened	Not Designated	Under Review (Special Concern)
Channel Darter (*Percina copelandi*)	Special Concern	Vulnerable	Under Review (Special Concern)
River Redhorse (*Moxostoma carinatum*)	Special Concern	Vulnerable	Special Concern
Northern Brook Lamprey (Ichthyomyzon fossor)	Special Concern	Threatened	Special Concern
Bridle Shiner (*Notropis bifrenatus*)	Special Concern	Vulnerable	Special Concern
Silver Lamprey (*Ichthyomyzon unicuspis*)	Special Concern	Not Designated	Under Review (Special Concern)
American Shad (*Alosa sapidissima*)	Not Designated	Vulnerable	Not Designated
Brassy Minnow (*Hybognathus hankinsoni*)	Not Designated	Susceptible	Not Designated
Margined Madtom (*Noturus insignis*)	Not Designated	Susceptible	Threatened
Yellow Bullhead (*Ameiurus natalis*)	Not Designated	Susceptible	Not Designated

* Designations up to date as of November 2018
** Great Lakes – Upper St Lawrence Population

Biodiversity as a whole is declining around the globe (IPEBES, 2019). There are reverberations of socio-economic and cultural consequences from this ecological trend

for our Algonquin communities and other land-based cultures (Sutherland, 2003). Biocultural diversity refers to the interdependency between ecosystem sustainability and societal and cultural sustainability (Pretty et al., 2007).

Potential Contamination of the TDQRP Project Location

Over the years, several environmental assessments have been conducted at the Timiskaming Dam Complex to assess possible pollution in water, soil, and sediment. Acres International Limited (1993) noted that in 1993, industrial discharges, particularly the Tembec pulp and paper mill, were a major contributor to water and sediment pollution. Other major contributors included municipal sewage treatment plants, agricultural runoff, and the results of log drives, despite the log drives being discontinued in 1991 (Acres International Ltd., 1993).

Between 1996 and 2013, numerous environmental studies, environmental site assessments (ESAs), and site remedial works were conducted for the Timiskaming Dam Complex and surrounding lands. Based on the results of a series of ESAs conducted by PWGSC between 1996 and 1999, the National Classification System identified the site as Class N (action not likely required) (Trow Consulting Engineers Ltd., 2002). In 2000, minor hydrocarbon contamination was noted below the Quebec Dam as part of a Phase II site characterization (Hatch, 2014; PWGSC, 2000). No remediation work was prescribed as contamination was limited to a localized area and not subject to widespread movement (Hatch, 2014).

In 2004, a Phase I ESA was performed on the Quebec Dam and part of the Quebec shore along the Ottawa River, Gendreau Township, and Temiscaming, Quebec (Golder and Associates Ltd., 2004). Two areas of potential environmental concerns were identified:

- Industrial use of adjacent land (Tembec pulp and paper plant, now Rayonnier Advanced Materials). The contaminants of concern are hydrocarbons and possible process chemicals.
- Fill material of unknown chemical composition and characteristics (possibly originating from Tembec). The contaminants of concern are unknown but are possible process chemicals (Hatch, 2014).

Following the findings, a Phase II ESA was performed in 2006 on the two areas of potential environmental concern. Based on the laboratory analytical results, groundwater and soil concentrations met applicable federal and provincial assessment criteria for the tested parameters [i.e., inorganic, metals, petroleum hydrocarbons (PHCs), phenols, polychlorinated biphenyls (PCBs) and volatile organic compounds

(VOCs)] (Trow Associates Inc., 2006). No further environmental work was recommended (Hatch, 2014).

According to an Environmental Assessment on the divestiture of Timiskaming Dam Complex (JWEL, 2005), there could be accidental releases of contaminants affecting soil, groundwater, surface water quality and wildlife associated with the divestiture of the complex (Hatch, 2014).

In 2013, a Phase I ESA was carried out in accordance with Ontario Regulation (O. Reg.) 153/04 of the Environmental Protection Act. It also satisfied the requirements of the Canadian Standard Association (CSA) Z768-01 standard (2001; Reaffirmed in 2012). The 2013 ESA identified the following three areas of potential environmental concern outside the footprint of the TODR Project:

- The mechanic pit of the garage building on Sault Island. This area was previously documented as a small, isolated contaminated zone by Trow Consulting Engineers Ltd. following an investigation in 2002.
- The former designated burning area on the east side of Sault Island, where garbage/waste was burned up until 1996.
- The southern extent of Sault Island, where a suspected UST may have once existed (or potentially still exists) (Hatch, 2014).

In 2020, Camilla Arbour submitted a Masters thesis titled "*Assessing Inputs of Contaminations in the Upper Ottawa River Near the Town of* Timiskaming*, Quebec*." (Arbour, 2020). In order to assess environmental quality, surveys were conducted of aquatic invertebrates as well as general environmental metrics including dissolved oxygen, pH, conductivity and temperature followed by targeted assessment of contaminants in water and sediment. It is imperative to test sediment levels as well as water, as significant concentrations of nutrients, toxic metals and metalloids are not reflected in surface water classifications, despite being deemed 'good quality' by local agencies.

Among her findings, Arbour (2020) showed that concentrations of known toxic substances such as aluminum, copper, iron, pH and total suspended solids exceeded federal and provincial guidelines for the protection of aquatic life. Several toxic metals and metalloids in sediments were found to be above the low effect level (LEL) safety guidelines, while manganese was above the severe effects level (SEL). These sediments represent a reservoir of contaminants, which can be re-released into the water column upon disturbance. Over a century of pulp and paper manufacturing in Temiscaming Quebec has generated significant titanium, phosphorus and mercury contamination in sediments downstream of the P&P effluent release pipes. *Lac aux Brochets* on Gordon Creek was found to be seriously contaminated with arsenic,

chromium, copper, iron, nickel, total phosphorus, lead and zinc all exceeding Provincial and Federal guidelines for the lowest level for protection of aquatic life.

In conclusion, the various ESAs and studies conducted over the past 30 years demonstrate an increase in pollution at the sites sampled in and around the Timiskaming Dam Complex. Additionally, these results show that sampling only surface water may yield inaccurate results and make it difficult to track pollution levels effectively over time. Thus, it is imperative to also collect sediment samples when testing pollution levels. This ensures not only an accurate reading of current pollution levels, but may also help to predict future pollution levels by assessing the reservoir of contaminants that could be released into the water following a disturbance. Finally, the increase in pollution suggests that these contaminants may accumulate over time, calling for regular testing of the environment surrounding the Timiskaming Dam Complex. SART Team is interested in the continued monitoring.

Related Projects

The data presented in this report follow-up on findings presented in several previous studies which collected samples from the Timiskaming Dam Complex and its surrounding areas (Biofilia, 2018, 2020; Hatch, 2014; Tetra Tech, 2017, 2017a, 2018, 2020, 2021; Vegetation Assessment Report, 2022). Specifically, a summary of data from Hatch (2014) and the Vegetation Assessment Report (2022) are presented below.

Hatch 2014. In 2013, Hatch conducted a comprehensive evaluation of both the physical (e.g., climate, air quality, topography, soils, water quality, etc.) and biological (e.g., aquatic environment, fisheries, terrestrial environment, species at risk, etc.) environment surrounding the Ontario Dam, which is part of the Timiskaming Dam Complex (comprised of the Ontario Dam and Quebec Dam, which are separated by Long Sault Island). Among their findings, Hatch identified Lake Sturgeon as a ‘fish of importance’ that was likely to be affected by the TDQRP (p. 6-48). In addition, Hatch posited that water flow variations as well as seasonal water levels directly supported fish productivity at the TDQRP location. For example, changes to water levels and flow provide suitable spawning conditions for the fish species that inhabit this area (e.g., Lake Sturgeon) and are also an integral part of the larval drift cycle of many fish species. Finally, Hatch

identified 35 locations for spawning while investigating Lake Sturgeon, for a total potential spawning habitat of 1,119 m^2.

Soil and Vegetation Assessment Report 2022.

In 2022, the SART communities, led by the Kichi Sibi Technical Team collaborated with the community knowledge keepers and Algonquin Land Stewards to conduct a vegetation assessment of the TDQRP project location. For this, the team verified the results from previous studies (e.g., Biofilia, 2017; Hatch, 2014), and carried out a review to acquire a better understanding of the Indigenous perspectives on current vegetation as it is related to uses for food, medicine, culture, and other ecosystem services. The Kichi-Sibi team identified a total of 10 different soil types up and downstream of the Quebec side of the Timiskaming Dam Complex, as well as Long Sault Island. Two samples were collected from each location (denoted by A or B following the site number), yielding a total of 20 samples overall.

Figure 3
Perry Mongrain collecting soil samples



Analysis of the soil samples showed the presence of 28 heavy metals, including but not limited to arsenic, aluminum, cadmium, chromium, lead, tin, and uranium. These seven heavy metals have been shown to have negative effects on the human body, however the full extent of these effects is still being explored. The highest concentrated samples were aluminum and iron, with all sampled aluminum levels being higher than acceptable for a healthy environment. The most polluted soil samples from the test sites were 6A, 6B, 8B, 9A, and 9B, which contained significant amounts of heavy metal pollution. Area 9A had the highest concentration of trace metals, with 50,900 micrograms of iron per gram of soil. Further, arsenic levels in plots 1A, 1B, 8B, 9A, and 9B all exceeded health standards. These findings are concerning as high arsenic levels have been linked to loss of vegetation such as spinach, green beans, and radishes, depending on the soil type (Environment Canada, 1995). Further, prolonged exposure may result in health complications for organisms at a minimum but can also be lethal. Avian studies conducted by Hoffman and colleagues (1985) have shown a reduced growth rate and lower weight gain in young birds when exposed to high concentrations of lead, while prolonged exposure resulted in death. Adult birds showed significant decreases (28-77% depending on the species) in egg production, which affects the availability of mature birds for consumption. In addition to negative

effects on food sources, there is no known safe dose of lead exposure for humans. Lead accumulates in the brain and other organs and may result in adverse mental health effects in addition to other health concerns (Bouchard et al., 2009). In summary, too much exposure to heavy metals can be detrimental to the health of animals, humans, and vegetation, and can be fatal if the daily limits of these heavy metals are reached. Further, some of these metals (arsenic, cadmium, lead) have no known use in the body, and only account for overexposure limits in individuals. For a full list of heavy metal effects and thresholds, see Appendix A.

While metals can be found naturally in the environment in rocks and veins, heavy metals enter the environment through non-environmental sources such as roads, forestry, industry, and more. Although specific outcomes differ depending on the type of heavy metal and organism is exposed to, these heavy metals can have extremely negative effects on organisms, including reduction in growth rate, weight gain, egg production, and death.

In summary, soil sample results demonstrate the region surrounding the Timiskaming Dam Complex is extremely polluted and plants at a number of the sample sites should not be picked or consumed. The high amounts of soil, sediment, and water contamination, in combination with construction of the Timiskaming Dam Complex and changing water levels as a result of the dam raise environmental, cultural, and health concerns for the SART communities. For instance, pollution has caused SART communities to cease fishing and limit consumption of vegetation at these sites, which raises concerns related to food security rights. Further investigation and potential remediation measures are warranted to address the identified concerns. (Sarwar et al., 2017).

Figure 4
Perry Mongrain collecting soil samples



Figure 5
Map of soil samples TDQRP



Table 2

TDQRP soil sample GPS locations

Name	X_Coord	Y_Coord
S1	-79.09961476610	46.71140353310
S2	-79.09980183890	46.71175389540
S3	-79.10493453440	46.71939954400
S4	-79.10102244630	46.71127707280
S5	-79.09290951420	46.69618713340
S6	-79.09207368450	46.69592720710
S7	-79.09793530290	46.71537653950
S8	-79.10814620490	46.72224478560
S9	-79.11017666110	46.72652392480
S10	-79.10062295110	46.70864417880

Samples S2 (-79.09980183890 46.711753895404) shows a higher level of contaminants than the up or downstream samples and this location is being proposed as the main replacement site for the bridge/dam. The Kichi-Sibi Technical Team believes this is a bad idea to do the construction right at the contaminated area near sample S2. This will negatively affect the area that the lake sturgeon is known to spawn.

All soil data found in the Vegetation Assessment Report (2022) sites can be seen in Appendix B.

Setting

Omamawinini (travellers of the great river)

Historically, watersheds were the basic unit of traditional land management, serving as boundaries for family, band, and tribal territories. Algonquins are traditionally known as Omamawinini and the rivers and lakes were the ‘highways’ with their own Algonquin toponymy. The Algonquin Nation is organized around the Ottawa River Basin. It spans the entire length of the Kichi Sibi, which literally translates to ‘great river’, from its headwaters in North-Central Quebec to the sacred site at Asticou (now known as Chaudiere Falls) to its outlet near Montreal. The Indigenous groups impacted in this project include SART communities of Kebaowek First Nation, Wolf Lake First Nation, Timiskaming First Nation and Algonquins of Pikwakangan. The SART communities do not formally recognize Antoine Nation, Algonquins of Ontario, and Metis Nation of Ontario.

Despite treaties of peace and friendship, Algonquin livelihood came under severe pressure by the early 1900s from industries such as forestry, farming, trapping, and damming (Morrison, 2005). The development of these industries resulted in Algonquin property rights and interests being ignored, including conservation practices for sustainable environmental resources. The combination of industry development and a lack of acknowledgement of Algonquin conservation practices has the potential to reduce the health and well-being of Indigenous populations (see Appendix C for First Nations perspective on health and wellness) . For example, the potential effect of reduced fish abundance due to construction activities relating to the Dam may result in reduced consumption of fish and impact food security. While a decrease in food security may result in health concerns such as malnutrition, chronic health problems, and mental health issues (Lambden et al., 2006), it also disrupts cultural continuity, which is an important factor to Indigenous health and well-being (Chan et al., 2019; Oster et al., 2014; Parlee, 2012).

Despite concerns related to health and well-being, Indigenous communities may see benefits to the reconstruction of the Dam as well. These benefits include increased employment opportunities through business or construction contracts, and improved access to some business, employment, and community services that would otherwise be difficult to reach. In turn, increased income and employment opportunities may improve overall health and well-being as well.

Taken together, there are numerous ways in which the TDQRP project may impact surrounding Indigenous communities. Thus, it is important to recognize the context in which this project is taking place and to consider how this project may influence key factors to Indigenous quality of life, including: health and socioeconomic concerns;

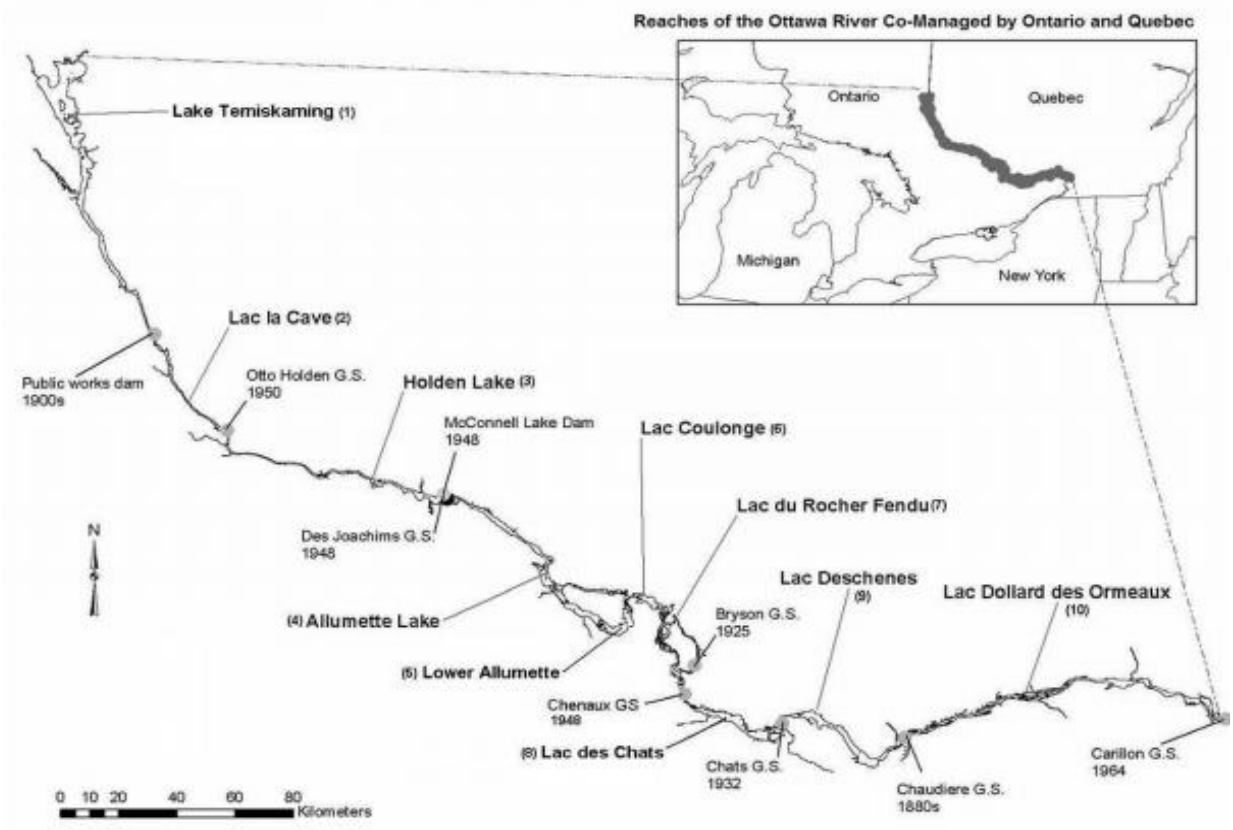
physical and cultural heritage; and current use of lands and resources for traditional purposes.

Dam History and Proposed Construction of New Dam

The Timiskaming Dam Complex was built between 1909 and 1913 at Long Sault Rapids. Its primary function is to control flooding and store water for hydroelectric generation downstream. The dam also serves as a highway for interprovincial transportation between Ontario and Quebec. While the Ontario Dam was replaced in 2015, the Quebec Dam is currently undergoing an environmental assessment (EA) with construction proposed to commence in 2025.

Figure 6

Reaches of the Ottawa River jointly managed by Ontario and Quebec



Similar to the structure of the current dam, the new dam will have a two-lane roadway that connects the provinces of Quebec and Ontario. The new structure will be approximately 75 metres long. It will include 10 bays. The bays will have mechanical (sluice) gates that open and close to regulate the flow of water.

The new dam will use gates instead of logs, making it easier to manage and operate. The Ottawa River flows into the St. Lawrence River, which then leads to the Gulf of St.

Lawrence. Eventually ending up in the Atlantic Ocean, through the “Strait of Belle Isle and “Cabot Strait” outlets.

Figure 7

The proposed project location as identified by the yellow outline



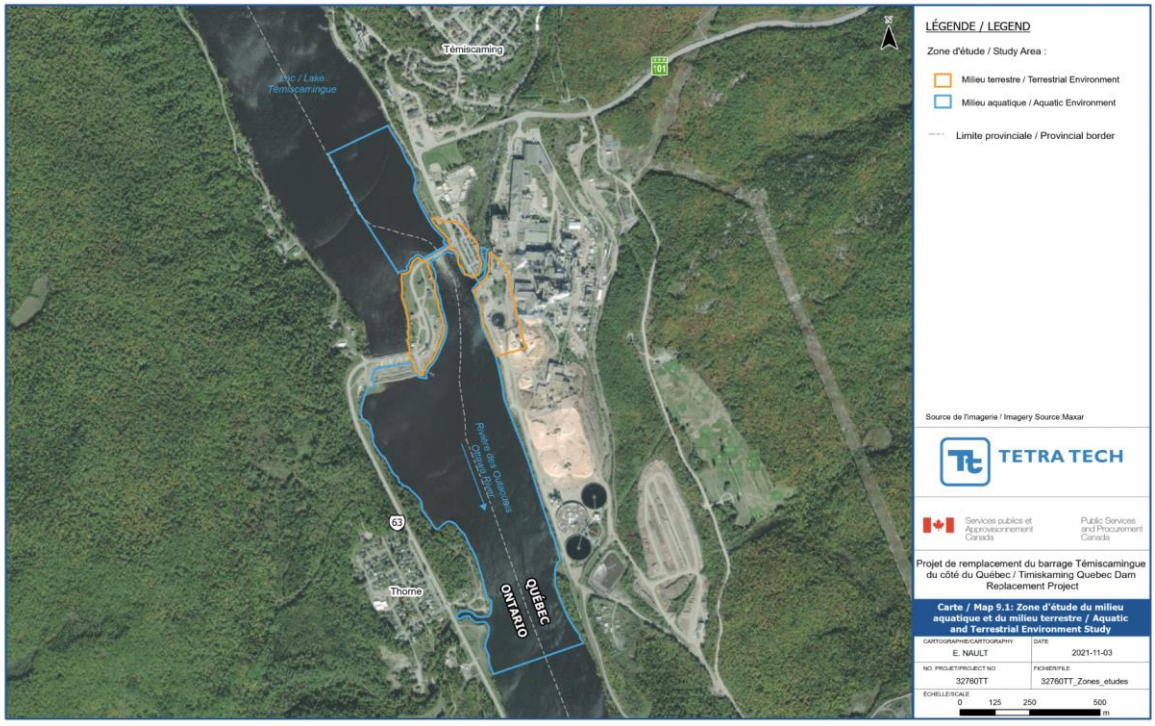
Figure 8

Temiscaming, Quebec Dam bridge



Figure 9

Map of study area at Temiscaming Dam, Quebec side. The study area is outlined with an orange line



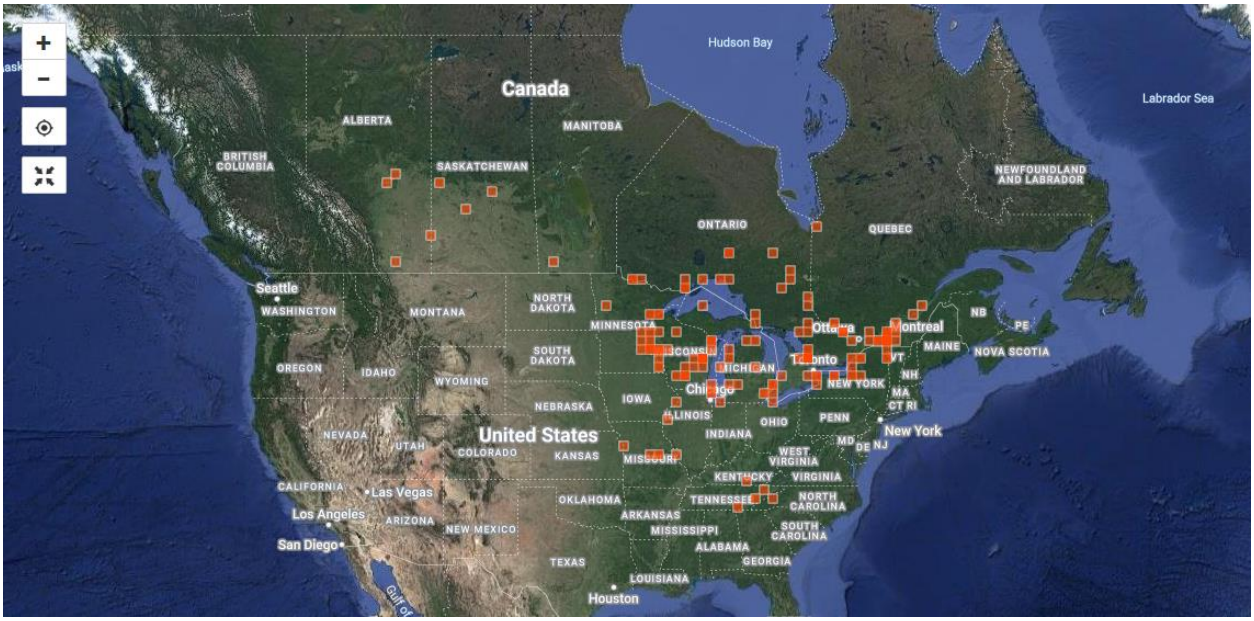
Lake Sturgeon in the Kichi Sibi

Assessing Lake Sturgeon Population Numbers Below the Temiscaming Dam

The Species at Risk Sturgeon study took place at Long Sault Island downstream of the hydroelectric dam in the town of Temiscaming, Quebec, where gill nets were used to sample Lake Sturgeon. Prior to, and in addition to carrying out on-site fisheries assessments, desktop research was also conducted to get a better understanding of the range and location data for Lake Sturgeon and the Hickorynut (*Obovaria olivaria)* which is also a SAR, and which, like all mussels species requires a host fish – in this case Lake Sturgeon – as part of its reproductive cycle. This means they are never found far from sturgeon habitat, and also that their fate is tied to the host fish.

Figure 10

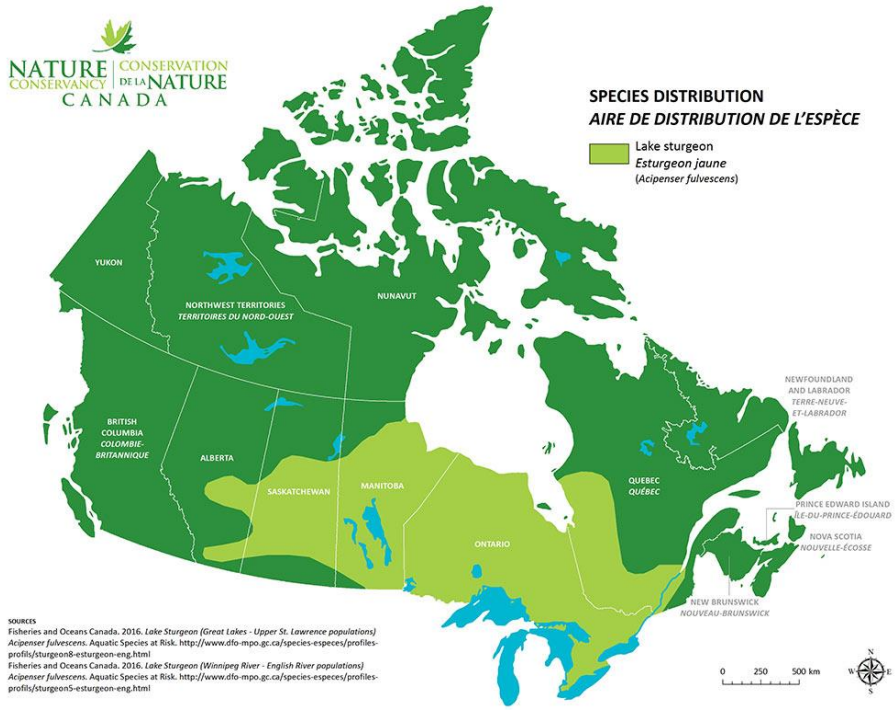
I-Naturalist Lake Sturgeon sightings range map



Note. From: Observations · iNaturalist
https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=107331

Figure 11

Lake Sturgeon range map



Note. From NCC: Lake sturgeon (natureconservancy.ca)

Hickorynut (*Obovaria Olivaria*)

More surveys and inventories of mussels and fishes are needed to better understand populations of Hickorynut and Lake Sturgeon in the area of TDQRP and Beauchene River, an area dominated by large sand deposits. These deposits are well recognized as the ideal substrate to the Hickorynut mussel and the juvenile stage of Lake Sturgeon.

There needs to be confirmation of their presence/absence, status of the target SAR population, distribution within the reach, cohort/demographics genetics of the populations, fish and clam community profiles, location of critical habitat, and a traditional ecological knowledge assessment. SART Proposes to work with DFO and Canadian Museum of Nature Researcher Andre Martel to complete this study work.

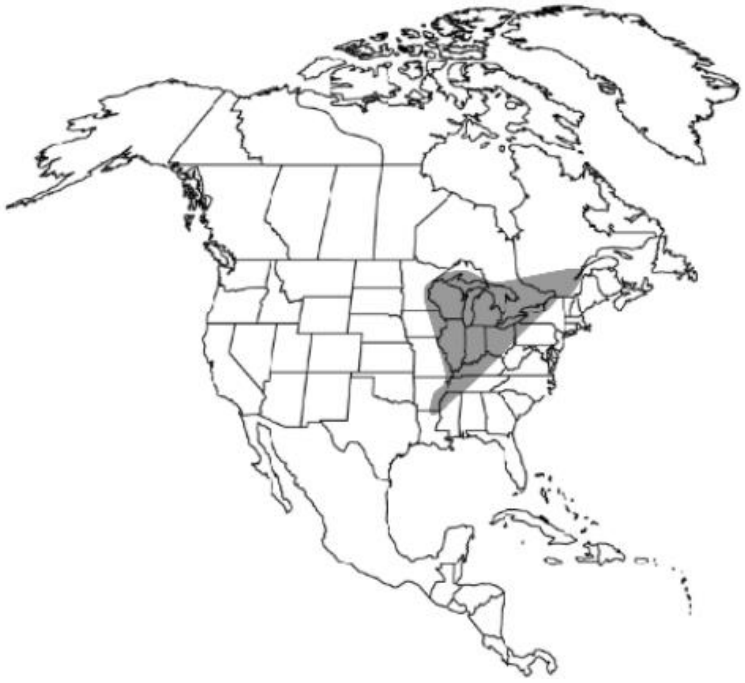
Figure 12

Andre Martel, Canadian Museum of Nature, checking Lake Sturgeon for glochidia on the Ottawa River



Figure 13

Global distribution of the Hickorynut



Note. Modified from Parmalee & Bogan (1998).

Figure 14

Hickorynut mussel sightings map



Current technology does not allow for a direct count of all fish in a given body of water and as such, we have to rely on methods that give a population estimate at best that uses a technique based on sampling a portion of the population that is accessible. More important than determining absolute numbers of fish, is to determine trends in numbers of fish caught per unit of sampling effort over time. As Lake Sturgeon is listed as a threatened species under COSEWIC, we assume the population numbers will be low.

Figure 15

Kichi Sibi Technical Team preparing nets for study



Sampling was done with 8”- 12” mesh size nets to capture and release the sturgeon. The nets were set out for 1 hour periods to mitigate mortality in the Sturgeon. The net lengths were 50 ft long and 2 were tied together to increase catch potential. The project was done from June-July 2022 when the water temperature was between 8.8 and 19°C when the sturgeon spawns. The sampling took place downstream of the Quebec dam and Ontario dam in the town of Temiscaming. A total of 14 sturgeon were caught in 12 nets with 1 recapture. In addition to the sturgeon, a Walleye, a Whitefish, and a Freshwater Drum (*Aplodinotus grunniens)*. The presence of the sturgeon during the spawning period confirmed they are using the area for spawning, whether it be to try and access upstream reaches or to spawn on site. Five egg mats were also sunk near the dam to collect sturgeon eggs, with one egg being seen on the mat. Appendix D provides details on the materials and methodologies used.

Cursory presence-absence surveys were conducted for Hickorynut mussels along with any other SAR that might be on the site over the course of the season.The only other SAR found on or adjacent to the site was the Chimney Swift (Chaetura pelagica), which was confirmed to be nesting adjacent to the site.

Moving forward, to achieve accurate assessments of populations and habitat form and function, it will be important to devise a monitoring program that encompasses the entire reach of the river and is not limited to the Quebec or Ontario side of the river.

Standardized sampling protocols should be used and carried out at appropriate scales and frequencies used when using historical data beyond presence/absence and confirmed reproductive activity/use of spawning habitat.

The work done on the Timiskaming Dam Complex over the years may have accumulated and it is necessary to research the effects that TDQRP may have on the fish habitat, with the appropriate and accurate data collection to assess the spawning activities and subsequent egg incubation and hatching success.

Figure 16

Temiskaming First Nation Environmental Technician Mike Laderoute seeing up egg mats



Methods

Materials

See Appendix D

Results

See Appendix E

Discussion

Factors Affecting Lake Sturgeon Populations

Impacts to Spawning, Reproductive Success, Nursery and Rearing Habitats

Figure 17

Ottawa River below TDQRP at Long Sault Island looking at Rayonnier Pulp and Paper Industrial Site



Our survey focused on spawning at the TDQRP and how the bridge replacement options and continued operations of the dam affect the life cycle of the fisheries present in the TDQRP to Otto Holden section of the river. More work is required to determine how the spawning habitat downstream of the Timiskaming Dam Complex contributes to the Lake Sturgeon status in the river as a whole. Further research is required to determine the spawning success below the dam and recruitment rates of young fish to the population.

As per the guidelines, the broader implications of the project need to be considered and discussed and take into consideration the spatial boundaries assigned to the project (Lake Temiskaming upstream and downstream of the dam to the Ottawa River and Carillion Dam). The impacts of the project as it relates to the reproductive success of the fisheries and the post spawning life stages were not addressed. We feel strongly that the reproductive success of sturgeon in this reach of the river is paramount to the recovery of the sturgeon population. More importance should have been given to this component of the impact assessment.

The assessment of the full suite of habitat features that support all life stages of the key fish species discussed was lacking. In the end, it makes any efforts to restore aspects of the species habitat in the absence of a full understanding of the additional critical habitat features available within the broader aquatic ecosystem questionable.

It is recommended that more effort be put into the assessment of the critical habitat for SAR, key game species, and fisheries identified by the SART communities within this section of the lake such that future management actions are effective, economically meaningful and the fisheries in this segment of the river remain healthy and viable as it relates to the operations of the dam. This is particularly true for the SAR species, in the absence of a commercial and recreational fishery which is in recovery mode.

Additional habitat mapping could also potentially address the current gap in the story as it relates to the reproductive success of the fisheries within or the lack thereof. A lot of spawning seems to be occurring with little documentation to support its success. Is this because larval drift is occurring outside of the area of study or is something else impacting this life stage? Further discussion and exploration of this would be beneficial.

Further, it is acknowledged by the author that the fish populations are gradually impacted by the installation and operations of dams. Haxton and Chubbuck (2002) also noted that the diversity and distribution of fish species has indeed been affected by the development of the Ottawa River, particularly during hydroelectric development. Because there are clear consequences on a fishery with the installation of a dam, it would be recommended that baseline population estimates be collected and presented clearly for the key fish species noted in this section of the Lake (e.g., SAR, game species, and Indigenous VCs) using species-specific or targeted standardized sampling methodology to capture population estimates over time that are repeatable and recognized by the fisheries assessment scientific community. It will also support meaningful Indigenous system monitoring (that is scientifically and traditionally based and replicable) which is intended to be used to assess the intended outcomes of the project and to inform future management actions and decisions for the dam operations as it relates to sustaining a viable fishery in concert with SART Aboriginal rights and title and the dam operations. Again, this is to ensure that future management actions are effective, ecologically meaningful and the fisheries in this segment of the river remain healthy and viable. It would also be good to include discussion on what the objectives for these species are as per the fisheries management plans for the zone so as to ensure there is an alignment with the broader resource management strategies for the key species being discussed and impacted by the project.

The operations of the dam will be changing from 10 bays with water levels being controlled by stop logs, to five bays with stop logs and five bays with sluice gates. Our understanding is that sluice gates involve bottom draw or release of water versus surface water running over the top of the stop logs and in turn, can change the thermal regime of a watercourse or body. This was not discussed in the EIS or the cumulative effects section. Suggest, if this is the case, it be included in the discussion in both documents, what the impacts to the fisheries or downstream aquatic ecosystems will be and how it will be mitigated if need be. And in particular, how it will impact the reproductive success of spawning fish downstream of the dam, nursery habitat, or forage or prey species if at all.

The current version of the EIS, only speaks to the impacts of the changes of flows and levels tied to the operations of the dam which may impact the aquatic ecosystems. However, it is also known that the operations of a dam can also impact the thermal regime of a waterbody or course (i.e., increase temp by way of use of reservoirs, or decrease the temperature by way of bottom draw or release of water). This can have a negative impact on several life stages for fish and wildlife (e.g., spawning, development

of eggs, nursery areas, foraging areas, etc..) downstream. The installation of some dams have also resulted in changes in thermal regimes of the waterways which can negatively impact reproductive success. In the St. Lawrence River, year-class strength appears to be determined in the first few months of life. Climatic and hydrological conditions in June, during which larvae drift from spawning grounds and exogenous feeding begins, were identified as critical determinants of year-class strength in this river (Nilo et al. 1997). Successful incubation seems to be possible within a temperature range of 10-18°C, but highest survival and uniform hatching appear within a narrower range of 14-16°C in White Sturgeon (*Acipenser transmontanus*) and Lake Sturgeon. As part of the flows and levels mitigation plans identified, when and where feasible it would be hoped that options to reduce significant changes in the thermal regime be taken into consideration and implemented e.g., only use stop logs to manage water levels to avoid significantly reducing the temperature downstream during spawning or vice versa) during the critical life stages for the SAR, game and SART VCs discussed in EIS Chapter 13.1.

Contamination to Lake Sturgeon and the downstream aquatic ecosystem and habitat features

The TDQRP presents the likelihood of sediment release into the Ottawa River as a result of construction of the new dam. Increases in sediment load above levels to which the aquatic biota of a given ecosystem are adapted can have drastic negative effects on the health and survival of the organisms in that waterbody. An influx of suspended sediment into a system, whether as a result of a natural or anthropogenic disturbance can negatively influence water quality, impact biodiversity and composition of biological communities, decrease reproductive capacity and growth rates of fish, increase disease incidence of fish, modify migration patterns of fish and alter feeding success in site-feeding species. High sediment concentrations can kill fish outright by limiting their respiratory capacity. Further, the severity of these risks is heightened when the sediment being dispersed contains high levels of contamination such as heavy metals and metalloids. As such, the potential impact to the aquatic biota at the TDQRP is also a potential impact to the SART communities.

Aquatic biota respond to both sediment *concentration* in water and *time of exposure* to sediment levels. These parameters must be kept in mind when considering the potential impacts of a non-preventable sediment load from entering a watercourse. In cases where there already exists a background sediment load in a watercourse, the increase in sediment load over background is the metric of interest, and not the absolute value of the sediment concentration as the biota will be adapted to living with that background sediment load. The Canadian Council of Ministers of the Environment (CCME, 1999) suggests following the guideline of a maximum increase in sediment load over background of 25 mg/l for the short term (< 24 hrs), and no more than 5 mg/l over background for longterm (up to 30 days).

Impacts to water flows and levels

Figure 18

Timiskaming Dam complex upstream



Water levels and flow at the TDQRP do not just potentially affect the dams operations or discharge capacity, but also the environment with particular emphasis on impacts to the aquatic biota. Operational flows are a significant threat to aquatic species populations via lack of water level and flow management attention to their life cycles. Water levels and flow in turn becomes a threat to sustainable Aboriginal fisheries yield and food security. As well the inability to predict rapid changes in water level and flow makes it difficult for actual on the water fishing and netting activities.

Specific to the Lake Sturgeon and TDQRP Phase 1 proposed construction timing from mid July to December 1st. The mid- July dewatering is ineffective in protecting sturgeon spawning as it does not support the early development of Lake Sturgeon eggs into larvae and the timing of their drift downstream. Defining the extent and duration of larval drift after spawning at the TDQRP is essential and requires consistent monitoring methodologies to assess and confirm. For example, Auer and Baker's (2002) study describes the stages of early-life,from egg to about 250 mm total length (TL), are believed to be the most vulnerable to factors affecting survival. Their study over 10 years in the Sturgeon River in Michigan demonstrated that (i) Lake Sturgeon larvae drift to 26 river kilometers (km) below the spawning site within 15 to 27 days after spawning and to 45 km within 25 to 40 days after spawning; (ii) the average size of the larvae increases with distance downstream; (iii) drifting larvae are not distributed uniformly in space or time; (iv) two peaks in spawning were common and spawning seems to be related to the phase of the new moon in years without heavy spring flows; and (v) that the lower river may be an important habitat for young-of-the year sturgeons.

Figure 19

Environmental Technicians Corey Uiselt and Kelsie McKenzie of Wolf Lake First Nation conducting Lake Sturgeon spawning inventory 2022



Bio-Cultural Considerations

The Ottawa River has changed over time, with industry development and the dams contributing to the loss of inland river islands. Had they survived, these islands would have had traditional names and been utilized by Algonquins on the territory. In addition to losing their traditional lands, the loss of these islands also contributes to the loss of stories and teachings that are passed down from generation to generation.

The construction of hydroelectric dams on the Ottawa river has contributed to the displacement of Lake Sturgeon from their natural range. Although small populations of Lake Sturgeon linger in between the dams, their numbers are dwindling. The TDQRP working group, composed of three Algonquin local communities, has been working to help the Lake Sturgeon species populations recover.

Lake Sturgeon have been documented up to the age of 150 years old. Today, there are very few reports of Lake Sturgeon in the Ottawa River reaching their full size or advanced age. The pressures from commercial fishing have caused stress in the Lake Sturgeon population, making it less likely that older fish survive. Recognizing the threat to native sturgeon stocks, the Ontario Ministry of Natural Resources (MNR) implemented a zero harvest quota for the recreational fishery in July 2008, and for the commercial fishery in July 2009. However, by this time the population of ‘giants’ was already severely reduced in the Ottawa River, and their habitat had been fractured by hydro dams. These stressors contribute to why very few older sturgeon have been

recorded. In addition, Lake Sturgeon only spawn every 3-4 years, meaning the population is slow to regenerate following periods of increased stress.

The endangerment of Lake Sturgeon in the Ottawa River has brought a loss of culture to the local Algonquin people. As noted by Noble and colleagues (2016), “Aquatic animals are often central to human connections to freshwaters by providing an important food source and/or a focal point for culturally significant events, ceremonies, and intergenerational teachings about the natural world”. Indeed, the loss of Sturgeon has correlated with a loss of teaching and stories from the locals. These teachings and stories represent a key sense of self and identity for local First Nations, and thus are very important to the community members. Further, fishing is an extremely common practice (see Appendix F), where most community members report learning where, when, and how to fish from elders and relatives. Caught fish are widely shared with family, neighbours, and friends (see Appendix G), strengthening the sense of community in addition to providing an important component of peoples’ diets.

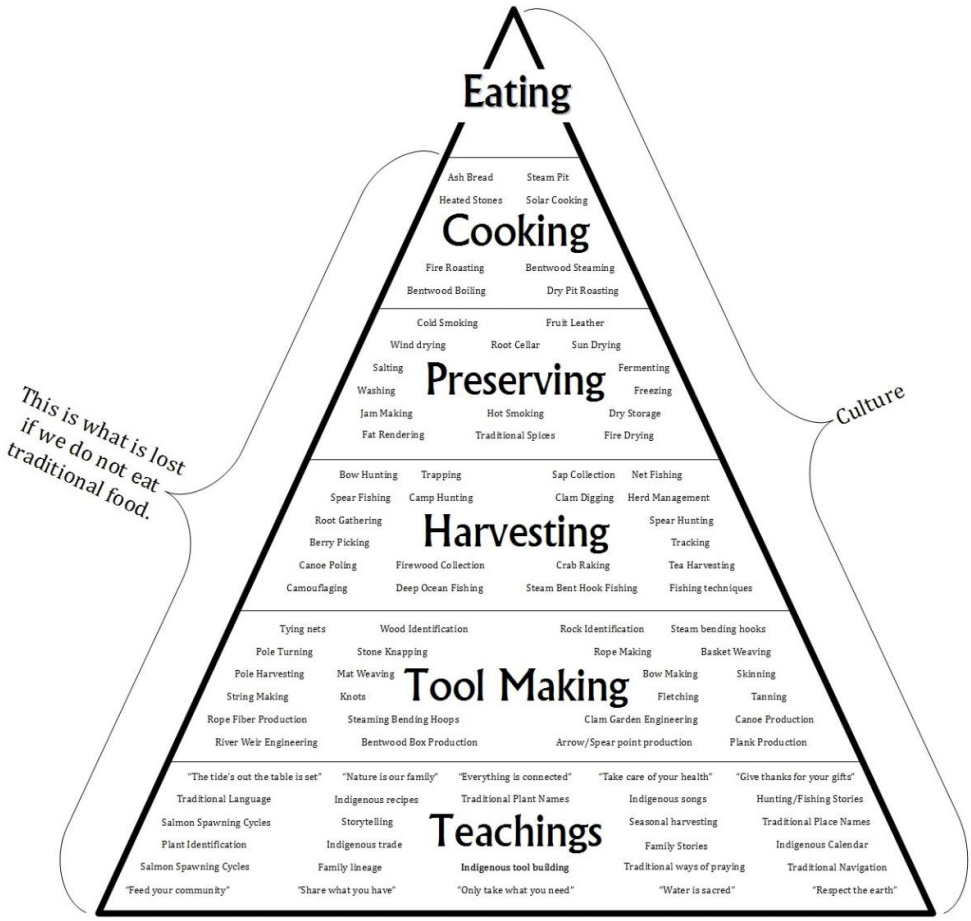
Knowledge Systems and Values Influencing Species Management and Monitoring

Increasing use of this concept of cultural sustainability challenges fisheries environmental assessments to recognize how ecosystems and peoples are mutually interdependent. In many Indigenous territories, these interdependencies have led to unique beliefs, knowledge, practices and institutions (i.e., traditional knowledge). What can these Indigenous knowledge systems tell us?

Below: Figure 12 shows how Lake Sturgeon is not just a food source for the Algonquins. To catch the sturgeon, tools had to be created, teachings passed on, and preservation techniques were taught to younger generations. With all these practices happening, stories and legends were passed on to remember to protect and respect these sacred species.

Figure 20

Why Eating Traditional Food is Important: Traditional Food Production Fosters Culture



Note. Diagram by *Jared Qwustenuxyn Williams*

Gaps and Opportunities for Working Together



SART's Views on PSPC Baseline studies

To assess TDQRP's impact on SART's exercise of rights, SART also requires baseline ecological information on the TDQRP's effect on the surrounding environment. In SART's preliminary review of the PSPC EIS, and through ongoing fieldwork at the TDQRP site, SART has identified some concerning gaps in this baseline information. For instance:

- As referenced to earlier, inventories of mussels and fishes are needed to better understand populations of Hickorynut Mussels and Lake Sturgeon in the area of TDQRP and Beauchene River, an area dominated by large sand deposits. These deposits are well recognized as the ideal substrate to the Hickorynut Mussel and the juvenile stage of Lake Sturgeon. There needs to be confirmation of their presence/absence, status of the target Species at Risk population, distribution within the reach, cohort/demographics genetics of the populations, fish and clam community profiles, location of critical habitat, and a traditional ecological knowledge assessment. SART Proposes to work with DFO and Canadian Museum Of Nature Researcher Andre Martel to complete this study work.
- An examination of the benthic community in the area below the dam would be useful to determine a current baseline of species present and the community assemblage. Lake Sturgeon are primarily a benthic feeder. Having knowledge of the level of health of their food source in this area would provide an important source of information during efforts to aid the recovery of the sturgeon.
- SART needs to understand how pulp mill contaminants can bioaccumulate in the river sediment and potentially remain for decades. These contaminants can have an adverse effect on benthic communities which are an important food source for sturgeon and many other fish species.
- Interviews were conducted with 324 members belonging to Kipawa, Temiscaming and Wolf Lake First Nations communities regarding their views on the construction of the new dam and its potential impacts on Lake Sturgeon below the dam. The overwhelming response was that the preferred location for the new dam is where the dam (the 'old' dam) is currently situated. The members feared that placement of the new dam in the currently proposed location, downstream of the current dam, could adversely affect the spawning habitat of sturgeon.

Figure 21
Kichi Sibi Technical Team, Gordon Creek



Conclusion

To conclude, the TDQRP team is happy to know that there are still a few sturgeon showing up at this sacred spawning ground at the Long Sault. We believe strongly that the dam should not be reconstructed downstream in the sturgeon spawning bed and should be rebuilt in the same location to ensure the protection of this culturally important endangered species. We also strongly recommend the creation of a full fish passage that can support Lake Sturgeon. The TDQRP team understands that invasive species may have an entry point with fishways opening up but mitigation measures to stop invasive species should be implemented to support Neme returning to their full unfractured habitats in what once was known as the Neme Sibi as the Lake Sturgeon travelled the full Kichi Sibi watershed.

Mitigations and Recommendations

Following findings from the 2022 Vegetation Assessment Report, several recommendations were made for both the management of pollution at the TDC and surrounding areas, and the inclusion of cultural and traditional practices from the SART communities. Recommendations from this study and related studies (e.g., Hatch, 2014; Vegetation Assessment Study, 2022) are as follows:

- The TDQRP proposes disruption of fish, fish habitat, and other shoreline-dependent mammalian species. To minimize disruptions to the environment, clearing rocks and vegetation along the shoreline should be avoided.
- Installation of turbidity curtains. The proponent plans to use turbidity curtains to curtail the impacts of sediment on fish and other aquatic life during work on the dam. Caution should be exercised with this strategy as turbidity curtains are only effective if installed properly, as well as monitored and maintained throughout their period of use. It is crucial that the contractor design the curtain such that it effectively seals to the river bottom along its entire length and is anchored with enough weight to prevent movement. The curtain must be monitored regularly to ensure there are no tears or openings. Maintenance of the curtain should proceed as required.
- Exposure of water to concrete can raise the pH levels of the waterbody to the point of toxicity for fish and other aquatic organisms. The Environmental Impact Statement (EIS) states that exposed water will be treated for increased pH during concrete work. It is recommended that the appropriate gear and staff are available on-site to allow for the capture and salvage of fish that come to the surface of the water during attempts to escape exposure to highly alkaline water.

- Construction staging areas and activities can have an impact on breeding grassland habitat for savannah sparrows. Thus, construction activities should take place outside of the breeding period, which spans from March 31 to July 31.
- Species important to the survival of early spring pollinators and bird species should not be disturbed in construction phases. We would like to conduct a study monitoring vegetation in advance of the construction phases to optimally protect species from potential disturbances.
- All site soils require environmental remediation. Organisms such as saprophytic mushrooms, fungi, bacteria, and algae are able to remove heavy metals or transform them into less toxic forms (Mustapha & Halimoon, 2015). In particular, mushrooms will be able to absorb maximum levels of aluminum as well as other metal elements in the soil.
- From the EIS, the most likely time for sediment to impact the river is during removal of the cofferdam. The SART Kichi Sibi team would like to monitor sediment concentrations during the cofferdam installation and removal in the event of any errors with the model predictions or sediment spills, and have a mitigation plan in place for such circumstances. The EIS indicates that mitigation plans are in place for these potential events. Thus, the SART Kichi Sibi team requests a copy of the mitigation plans to familiarize themselves with the plans.
- A SART community objective is to establish a culturally and ecologically informed native plant garden on select degraded grassy areas following the reconstruction of the Timiskaming Dam. Remediation of the soil from our garden restoration project is required and will be done on-site using natural processes. We will be relying on our natural allies to perform microbial, mycological, and phytoremediation. These natural solutions provide affordable and long-lasting benefits to contaminated soils. Soil sampling will be conducted prior to any remediation efforts to assess the baseline soil contamination and to determine the level of remediation achieved. Following the establishment of healthy soil, a food web of native species will be planted.
- Hickorynut Mussel Studies in partnership between SART communities and Canadian Museum of Nature researchers should be carried out. To date, no thorough studies to determine the presence/absence of Hickorynut Mussels have been carried out in the area of the Temiscaming dam, either upstream or downstream. There is strong evidence that the Hickorynut Mussel relies on Lake Sturgeon for an important part of its life cycle. There appears to be suitable habitat for this SAR mussel (soft substrate, appropriate water flow and depth) in the vicinity of the Temiscaming dam, as well as near the mouth of the Beauchene

river. It is important to conduct a methodical study to determine whether or not the hickorynut is found in this area as it is currently only known to exist in a small number of locations in Canada.

Mussels are filter feeders, feeding very near the river bottom. This makes them susceptible to silt and sediment, as well as toxic heavy metals which will settle out of suspension due to their physical attributes. Impacts to water quality, as a result of dam construction, and especially the dismantling of the existing dam, have the potential to adversely affect the health and survival of hickorynut mussels if in fact they do inhabit this area of the river.

- We would like to have a co-management plan with DFO and PSPC to advance the SART Neme Conservation Plan over time. On-going and regular monitoring of the sturgeon population is the only way to determine if the number of fish are in recovery mode or declining in the area below the dam. Since these fish are slow to reproduce, studies must cover many years, and ideally, decades to confidently determine any trends in the population.

- Further, we feel it is important that interjurisdictional regulations and the management of the Ottawa River and the life that depends on it need to occur. Moving forward, we want the federal, provincial, Indigenous and municipal governments to align both the species, harvest and habitat regulations that will support healthy aquatic and terrestrial ecosystems and the species that depend on them on or adjacent to the Ottawa River. Further, we would like the interjurisdictional management of the Ottawa River, to also include a standardized interjurisdictional monitoring program that is scientifically sound, occurring at intervals that allow for detection of success of recovery or management actions or adverse changes, repeatable and will allow for collaborative monitoring of both the aquatic and terrestrial ecosystems and the species that rely on them. The intended outcome is a collaborative management approach that is standardized, inclusive (i.e., includes input from all managing bodies and Indigenous communities), informed (e.g., includes both scientific, and traditional aboriginal knowledge) and is proactive yet responsive (i.e., monitoring that is capable of detecting and signalling the success of the recovery strategy/management plans or the need to change management actions or regulations) and that which also includes regulations that are adopted by all regulatory/enforcement agencies involved and that which are enforceable on an interprovincial waterbody.

Literature Cited

Acres International Ltd. (1993). Ottawa River Northern Reservoirs, preliminary Environmental Assessment.

Arbour, C. (2020). *Assessing inputs of contaminants in the upper Ottawa River near the town of Témiscaming, Québec* [Unpublished Master's thesis]. Nipissing University.

Auer, N. A., & Baker, E. A. (2002). Duration and drift of larval lake sturgeon in the Sturgeon River, Michigan. *Journal of Applied Ichthyology*, *18*, 557-564. https://doi.org/10.1046/j.1439-0426.2002.00393.x

Biofilia/BBA (Biofilia). (2020). Additional information on bird, amphibian and reptile surveys conducted at the Timiskaming Dam. 5 p. + appendices.

Biofilia/BBA (Biofilia). (2018). Timiskaming Dam-Bridge of Quebec Replacement. Environmental Impact Assessment – Biological Environment. Report prepared for Tetra Tech. 124 p. + appendices.

Bouchard, M. F., Bellinger, D. C., Weuve, J., Matthews-Bellinger, J., Gilman, S. E., Wright, R. O., Schwartz, J., & Weisskopf, M. G. (2009). Blood lead levels and major depressive disorder, panic disorder, and generalized anxiety disorder in US young adults. *Archives of General Psychiatry*, *66*(12), 1313-1319. https://doi.org/10.1001/archgenpsychiatry.2009.164

Bruch, R.M., & Binkowski, F. P. (2002). Spawning behaviour of lake sturgeon (Acipenser fulvescens). *Journal of Applied Ichthyology, 18*, 570-579. https://doi.org/10.1046/j.1439-0426.2002.00421.x

Canadian Council of Ministers of the Environment (CCME). (1992). National classification system for contaminated sites. Winnipeg. https://publications.gc.ca/site/eng/35857/publication.html

Chan, L., Receveur, O., Batal, Sasdik, T., Schwartz, H., Tikhhonov, C., Fediuk, K., Ing, A., Marushka, L., Lindhorst, K., Barwin, L., Berti, P., & Singh, K. (2019). *First Nations food, nutrition, and environment study (FNFNES): Final report for eight assembly of First Nations regions*. First Nations and Inuit Health Branch, Department of Indigenous Services Canada. https://www.fnfnes.ca/docs/FNFNES_draft_technical_report_Nov_2__2019.pdf

Dymond, J. R. (1939). *The fishes of the Ottawa Region.* Royal Ontario Museum of Zoology. https://doi.org/10.5962/bhl.title.52156

Golder & Associates Ltd. (2004). Phase I Environmental Site Assessment, Temiscamingue Land, Blocks 16 and 17 (and adjoining lots), Gendreau Township, Temiscaming, Quebec. Project No. 460716.

Harkness, W. & Dymond, J. (1961). *The Lake Sturgeon: The history of its fishery and problems of conservation.* Ontario Department of Lands and Forests. Toronto.

Hatch. (2014). Environmental effects evaluation report for Timiskaming Ontario Dam Replacement (Environmental effects evaluation report for public works and government services Canada)(No. PWGSC Project No. R.010565.503). Gatineau.

Haxton, T., & Chubbuck, D. (2002). *Review of the historical and existing natural environment and resource uses on the Ottawa River* Report No. 119, pp 76). Ontario Ministry of Natural Resources, Science and Information Branch, Southcentral Science and Information Section Technical Report.

Hoffman, D. J., Franson, J. C., Pattee, O. H., Bunk, C. M., & Anderson, A. (1985). Survival, growth, and accumulation of ingested lead in nestling American Kestrels (Falco sparverius). *Archives of Environmental Contamination Toxicology, 14*, 89-94. https://doi.org/10.1007/BF01055766

IPBES. (2019). *IPBES Global assessment report on biodiversity and ecosystem services.* United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Germany. https://doi.org/10.5281/zenodo.3831852

Jacques Whitford Environmental Limited (JWEL). (2005). *Strategic Environment Assessmrnt Divestiture of Temiscaming Dam.*

Lambden, J., Receveur, O., Marshall, J., & Kuhnlein, H. (2006). Traditional and market food access in Arctic Canada is affected by economic factors. *International Journal of Circumpolar Health, 65*(4), 331-340. https://doi.org/10.3402/ijch.v65i4.18117

Morrison, J. (2005). *Algonquin history in the Ottawa River Watershed*. Sicani Research and Advisory Services. Winnipeg. pp 1-38. https://new-wordpress.algonquinnation.ca/wp-content/uploads/2015/08/algonquin-history-james-morrison-sicani-oct-2006-revisedpublic.pdf

Mustapha, M. U., & Halimoon, N. (2015). Microorganisms and biosorption of heavy metals in the environment: A review paper. *Journal of Microbial & Biochemical Technology, 7*(5), 253.256. http://dx.doi.org/10.4172/1948-5948.1000219

Nilo, P., Dumont, P., & Fortin, R. (1997). Climatic and hydrological determinants of year-class strength of St. Lawrence River lake sturgeon (Acipenser fulvescens). *Canadian Journal of Fisheries and Aquatic Sciences, 54*(4), 774-780. https://doi.org/10.1139/f96-330

Noble, M., Duncan, P., Perry, D., Prosper, K., Rose, D., Schnierer, S., Tipa, G., Williams, E., Woods, R., & Pittock, J. (2016). Culturally significant fisheries: Keystones for management of freshwater social-ecological systems. *Ecology and Society, 21*(2), 711–730. http://dx.doi.org/10.5751/ES-08353-210222

Oster, R. T., Grier, A., Lightning, R., Mayan, M. J., & Toth, E. I. (2014). Cultural continuity, traditional Indigenous language, and diabetes in Alberta First Nations: A mixed methods study. *International Journal for Equity in Health, 13*(92), 1-11. https://doi.org/10.1186/s12939-014-0092-4

Parlee, B. (2012). *Resource development and well-being in Northern Canada* (Report No. 7). Yukon College, Lakeland University. https://iportal.usask.ca/record/57944

Pretty, J., Ball, A. S., Benton, T., Guivant, J. S., Lee, D. R., Orr, D., Pfeffer, M. J., & Ward, H. (2007). *The SAGE Handbook of Environment and Society.* Sage: Thousand Oaks. https://doi.org/10.4135/9781848607873

Public Works and Government Services Canada (PWGSC). (2000). Timiskaming Dams Ottawa River Basin - Thornes, Ontario; Temiscaming, Quebec - Operating Manual.

Sarwar, N., Imran, M., Shaheen, M. R., Ishaque, W., Kamran, M. A., Matloob, A., Rehim, A., & Hussain, S. (2017). Phytoremediation strategies for soils contaminated with heavy metals: Modifications and future perspectives. *Chemosphere*, *171*, 710-721. https://doi.org/10.1016/j.chemosphere.2016.12.116

Small, H. B. [Sr.]. (1883). Fishes of the Ottawa district. *Transactions of the Ottawa-Field-Natturalist's Club, 4*, 31-49.

Sutherland, W. J. (2003). Parallel extinction risk and global distribution of languages and species. *Nature, 423*(6937), 276–279. https://doi.org/10.1038/nature01607

Tetra Tech. (2021). Statement of Work: Fish and Turtle Survey. 2021-01-06.

Tetra Tech. (2020). Note technique - Calculus de crues et révision de l'étude hydrologique. 28 avril 2020. 4p.

Tetra Tech. (2018). SR.5 – Plan de gestion des eaux de construction. Remplacement du barrage Témiscamingue situé sur la rivière des Outaouais. 3 mars 2018. Révision 0.

Tetra Tech. (2017). SR3 – Rapport d'élaboration et d'analyse des options conceptuelles (SR3.2b). 42 p. + annexes.

Tetra Tech. (2017a). Remplacement du barrage Témiscamingue situé sur la rivière des Outaouais - SR.2.2.H – Analyse des aspects hydrauliques – Pour examen et approbation. Rapport présenté à Travaux et Services gouvernementaux Canada. N/Réf. Tt : 32760TT V/Réf. : R.073116.307. 30 p. + annexe.

Trow Consulting Engineers Ltd. (2006). Phase II Environmental Site Assessment (ESA) for the Temiscamingue Dam, Flood Control Land, Sault Island, Ontario. DFRP #11684

Trow Consulting Engineers Ltd. (2002). Phase III Environmental Site Assessment (ESA) Temiscamingue Land, Temiscaming. DFRP #31338.

Vegetation Assessment Report. (2022). *Vegetation Study Report: Timiskaming Dam-Quebec replacement project.* Kichi Sibi Technical Team.

Appendix A

Vegetation Assessment Report (2022): Effects of Heavy Metals and Safety Thresholds

4.2.1 Introduction

The highest concentrated metals discovered in the samples were Aluminum and Iron, according to these findings. Soil sample 9A had the greatest concentration of trace metals in the tests, with 50,900 micrograms of iron per gram of soil. Aluminum levels appear to be high throughout the study site's soil.

Aluminum levels in the soil are greater than the acceptable threshold for a healthy environment in all of the soil samples. In addition, arsenic levels in samples 1A, 1B, 8B, 9A, and 9B exceed respective health standards. Lead levels in soil range from 70 to 140 micrograms per gram. Lead is near to passing the threshold in a couple samples. Lead levels in soil samples 1A and 1B were 79 micrograms/g and 71 micrograms/g, respectively.

Lead levels in soil samples 8B and 9A were 89 micrograms/g and 93 micrograms/g, respectively. The lowest concentration of iron in a soil sample was 6520 micrograms per gram. Lead levels should not exceed 70-140 micrograms per gram. Despite the fact that iron levels appear to be high, they are at a healthy level. Uranium concentrations of 8.24 micrograms per gram of soil were discovered in soil sample 6B. The typical concentration of uranium in soil is 300 g/kg - 11.7 mg/kg, according to the United Nations Scientific Committee on the Effects of Atomic Radiation. Anything higher is potentially harmful.

Non-essential heavy metals (arsenic, cadmium, and lead) in high concentrations in soils and water pose a risk to the environment, food safety, and human and animal health. Because of the rapid rise of industry and agriculture, as well as the disruption of natural ecosystems caused by anthropogenic pressure linked to the growth of human populations, heavy metal contamination poses a threat to the environment and food security (Sarwar et al., 2017).
Metals can be found naturally in the environment in rocks and veins, and they can leach into soil and water, where they can be absorbed and used by organisms. Heavy metals enter the environment through non-environmental sources such as roads, mines, forestry, and others, to name a few, and can become a problem in large quantities.

4.2.2 Heavy Metal Effects on Organisms

4.2.2.1 Arsenic

The lowest arsenic content in soil at which phytotoxic effects have been reported is 10 mgkg-1. Resulting in production losses of 22 to 42 percent in green beans, 33 to 41 percent in spinach, and 17 to 23 percent in radishes, depending on soil type. (Environment Canada 1995). Despite the fact that plants grew on arsenic-treated soil. They may have significantly higher arsenic concentrations than plants cultivated in untreated soils; terrestrial plants seldom have higher arsenic concentrations than the soil. Beyer and Cromartie (1987) discovered that arsenic did not bioaccumulate to any significant extent in earthworms from 20 distinct polluted and uncontaminated locations in their experiment.

Terrestrial animal populations may be exposed to various types of arsenic by aerosol inhalation or soil particle ingestion. Because arsenic concentrations in terrestrial plants are normally low, eating of contaminated food is not a significant route of exposure. The lowest documented LD50 in terrestrial animals is 8 mgkg-1 bw per day for rabbits, and 47.6 mgkg-1 bw per day for birds.

4.2.2.2 Lead

Lead affects animals and birds in a variety of ways. Mammals and birds either directly inhale airborne lead or consume particle materials deposited on the earth and plants. When herbivores and birds graze, they consume polluted soil and grit. Animals lick surface and drink water tainted with lead. When waterfowl and raptors eat, they consume large volumes of lead shot and fishing weights. Lead exposure occurs when herbivores, insectivores, and carnivores consume lead-contaminated plants or prey.

Hoffman and colleagues (1985) conducted research on the effects on metal lead powder mixed in maize feed on the American kestrel (Falco sparverius). For the first 10 days of life, American kestrel hatchlings were given metallic lead powder mixed with maize oil orally . The hatchlings on 125 mg Pbkg-1 bw per day had a 16 percent reduction in their growth rate and weight gain after 5 days. By the sixth day, 40% of the hatchlings on the 625 mg Pbkg-1 bw per day diet had died.

Both domestic leghorn chickens and Japanese quail hens were fed lead acetate by Edens and Garlich in 1983. (Coturnix coturnix japonica). After 5 weeks, quail hens had a 28% drop in egg production at 1.8 mg Pbkg-1 bw per day, whereas chickens had a 77% decrease at 26.1 mg Pbkg-1 bw per day after 4 weeks.

WHO (1993) recommends a minimum safe intake of 3.57 gkg-1 bw per day for all age groups for developing human health soil quality standards for lead.

4.2.2.3 Uranium

Uranium has never been proven to be a necessary element in mammals (NRC 1980; Puls 1994). Abnormal biochemistry, renal and hepatic diseases, and protein deposits in the kidneys are all signs of uranium toxicity in birds. Based on histologic and weight changes, a no-observed-adverse-effect level for American black ducks (Anas rubripes) fed uranium in their diet for 6 weeks was greater than 1600 mgkg-1 (Haseltine and Sileo 1983); and a lowest-observed-adverse-effect level for single exposure doses was 0.04 mgkg-1 bw for kidney lesions in Japanese quail (Coturnix coturn) (Kupsh et al. 1991). (Sample et al) (1996) proposed a NOAEL for birds of 16 mgkg bw-1d-1. This figure was obtained by taking a dietary NOEC for black ducks of 1600 mgkg-1 food (Haseltine and Sileo 1983), multiplying it by an average food consumption rate (125 g per day), dividing it by the ducks' average weight (1.25 kg), and applying an uncertainty factor of ten (Sample et al. 1996).

The majority of uranium is deposited in the bone, with a half-life of 20 days (ICRP 1979), whereas uranium in the kidney has a half-life of 2 to 17 days in rats (Bentley et al. 1985; Morrow et al. 1982). Symptoms of uranium poisoning in cattle include changes in blood cell shape, thyroid function disruption, increased basal metabolism, changes in hepatic function, hematological insufficiency and renal damage, and the presence of albumin in urine (Puls 1994). The lowest observed-adverse-effect level in cattle was 0.615 mgkg-1 bwd-1 for a two-week overall worsening of health (Garner 1963).

4.2.3 Thresholds

The World Health Organization (WHO, 1996) and the Food and Agriculture Organization of the United Nations (FAO) indicated the permissible limits for heavy metals in edible plants as follows: 0.5 µg/g arsenic (As), 0.02 µg/g cadmium (Cd), 1.3 µg/g chromium (Cr), 0.01 µg/g cobalt (Co), 10 µg/g copper (Cu), 0.03 µg/g mercury (Hg), 0.1 µg/g nickel (Ni), 2 µg/g lead (Pb), 0.03 µg/g vanadium (V), and 50 µg/g zinc (Zn).

Arsenic exposure may be lethal, and arsenic is commonly found in drinking water. The IDLH (immediately hazardous to life and health) limit for arsenic metal and inorganic arsenic compounds is established at 5 mg/m3 (5 ppb). Any more exposure to arsenic can result in health complications and even death.

Aluminum sulfate has a fatal dosage (LD50) of 6207 mg/kg (oral, mouse), which equates to 435 grams for a 70 kg (150 lb) human (Frank, W.B. 2009). A 2014 multi-

element toxicity study found no negative effects of aluminum consumption at quantities less than 40 mg/day per kg of body weight (Dolara, Piero 21 July 2014).

Cadmium has been linked to a few cases of widespread poisoning as a result of long-term exposure to cadmium in contaminated food and water. Ongoing research into an estrogen mimicking that may cause breast cancer is being conducted. Denise Mann (April 23, 2012) Cadmium's IDLH (immediately harmful to life and health) limit is 9 mg/m3. (From the NIOSH Pocket Guide to Chemical Hazards.)

The acute oral toxicity of chromium ranges between 1.5 and 3.3 mg/kg (Katz, SA; Salem, H 1992). Through oxidation processes, chromium harms the kidneys, liver, and blood cells. As a result, hemolysis, renal failure, and liver failure occur (Dayan, AD; Paine, AJ 2001).
Tin poisoning instances from tin metals, tin salts, and tin oxides are rare and unknown; however some organotin compounds are as lethal as cyanide (Graf, G. G. 2000). Lead has no known biological function, and there is no known safe dose of lead exposure. A 2009 Canadian–American research determined that lead may induce "adverse mental health effects" even at levels thought to represent little to no risk. (2009) (Bouchard et al.) The majority of lead consumed enters the circulation and accumulates in the brain and other organs, where it has harmful consequences and can be lethal. Nephropathy, colic-like abdominal pains, and potential numbness or paralysis in fingers, wrists, or ankles are symptoms of lead poisoning. Anemia can be caused by a slight rise in blood pressure, especially in those in their forties and fifties. In multiple investigations, lower heart rate variability was linked to higher lead exposure.

Appendix B

Vegetation Assessment Report (2022): Lab Analysis of Soil Data

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AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 22T880456

PROJECT:

ATTENTION TO:

SAMPLED BY:

CLIENT NAME: MISC AGAT CLIENT ON

SAMPLING SITE:

Full Metal Scan in Soil

DATE RECEIVED: 2022-04-04

DATE REPORTED: 2022-04-13

	SAMPLE DESCRIPTION:		4A	4B	5A	5B	6A
	SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil
	DATE SAMPLED:						
Parameter	Unit	G / S	RDL	3710784	3710785	RDL	3710786	RDL	3710787	RDL	3710788
Aluminum	µg/g		10.0	8190	9010	100	11500	10.0	9160	100	25900
Antimony	µg/g		0.8	<0.8	<0.8	0.8	<0.8	0.8	<0.8	0.8	<0.8
Arsenic	µg/g		1	2	2	1	14	1	6	1	12
Barium	µg/g		2.0	55.6	60.5	2.0	78.2	2.0	68.0	2.0	146
Beryllium	µg/g		0.4	<0.4	<0.4	0.4	0.9	0.4	0.5	0.4	1.1
Bismuth	µg/g		0.5	<0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5
Boron	µg/g		5	<5	<5	5	<5	5	<5	5	<5
Cadmium	µg/g		0.5	<0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	0.7
Chromium	µg/g		5	34	36	5	21	5	16	5	40
Cobalt	µg/g		0.5	5.9	6.8	0.5	10.6	0.5	9.5	0.5	63.6
Copper	µg/g		1.0	20.2	22.5	1.0	28.2	1.0	20.6	1.0	28.0
Iron	µg/g		500	13000	13900	500	19900	500	14300	500	23300
Lead	µg/g		1	13	15	1	27	1	14	1	24
Lithium	µg/g		0.5	8.5	10.5	0.5	9.7	0.5	10.7	0.5	5.4
Manganese	µg/g		5.0	239	274	5.0	481	5.0	490	50	11300
Molybdenum	µg/g		0.5	1.0	0.6	0.5	2.7	0.5	1.2	0.5	8.4
Nickel	µg/g		1	20	20	1	17	1	12	1	16
Phosphorus	µg/g		10	569	692	10	589	10	503	10	1040
Selenium	µg/g		0.8	<0.8	<0.8	0.8	2.5	0.8	1.3	0.8	0.9
Silver	µg/g		0.5	<0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5
Strontium	µg/g		5	25	22	5	37	5	31	5	44
Thallium	µg/g		0.5	<0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	1.0
Tin	µg/g		1	<1	2	1	1	1	<1	1	<1
Titanium	µg/g		10	698	816	10	641	10	677	1.0	186
Uranium	µg/g		0.50	1.55	1.01	0.50	3.32	0.50	2.44	0.50	6.70
Vanadium	µg/g		0.4	24.9	29.2	0.4	28.1	0.4	23.9	0.4	43.6
Zinc	µg/g		5	64	49	5	35	5	29	5	44
Zirconium	µg/g		1.0	2.2	1.9	1.0	1.7	1.0	1.0	1.0	<1.0

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Certificate of Analysis

AGAT WORK ORDER: 22T880456

PROJECT:

CLIENT NAME: MISC AGAT CLIENT ON

ATTENTION TO:

SAMPLING SITE:

SAMPLED BY:

Full Metal Scan in Soil

DATE RECEIVED: 2022-04-04

DATE REPORTED: 2022-04-13

		SAMPLE DESCRIPTION:		6B		7A		7B		8A
		SAMPLE TYPE:		Soil		Soil		Soil		Soil
		DATE SAMPLED:								
Parameter	Unit	G / S	RDL	3710789	RDL	3710790	RDL	3710791	RDL	3710792
Aluminum	µg/g		100	31000	10.0	7190	100	13300	10.0	1670
Antimony	µg/g		0.8	<0.8	0.8	<0.8	0.8	<0.8	0.8	0.8
Arsenic	µg/g		1	9	1	2	1	4	1	7
Barium	µg/g		2.0	188	2.0	82.9	2.0	63.2	2.0	81.2
Beryllium	µg/g		0.4	1.3	0.4	<0.4	0.4	<0.4	0.4	<0.4
Bismuth	µg/g		0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5
Boron	µg/g		5	<5	5	<5	5	<5	5	8
Cadmium	µg/g		0.5	1.0	0.5	0.6	0.5	0.8	0.5	1.3
Chromium	µg/g		5	46	5	57	5	49	5	6
Cobalt	µg/g		0.5	79.8	0.5	6.9	0.5	7.8	0.5	1.8
Copper	µg/g		1.0	29.3	1.0	38.6	1.0	30.7	1.0	15.9
Iron	µg/g		500	23400	500	15100	500	16900	500	10700
Lead	µg/g		1	20	1	23	1	44	1	44
Lithium	µg/g		0.5	5.6	0.5	7.7	0.5	10.6	0.5	0.9
Manganese	µg/g		50	15800	5.0	284	5.0	281	5.0	124
Molybdenum	µg/g		0.5	9.5	0.5	1.5	0.5	<0.5	0.5	2.8
Nickel	µg/g		1	18	1	37	1	27	1	13
Phosphorus	µg/g		10	1200	10	596	10	579	10	570
Selenium	µg/g		0.8	<0.8	0.8	<0.8	0.8	<0.8	0.8	1.6
Silver	µg/g		0.5	<0.5	0.5	<0.5	0.5	<0.5	0.5	<0.5
Strontium	µg/g		5	56	5	46	5	28	5	32
Thallium	µg/g		0.5	1.3	0.5	<0.5	0.5	<0.5	0.5	<0.5
Tin	µg/g		1	<1	1	1	1	1	1	2
Titanium	µg/g		1.0	173	10	674	10	902	1.0	114
Uranium	µg/g		0.50	8.24	0.50	<0.50	0.50	0.70	0.50	<0.50
Vanadium	µg/g		0.4	48.2	0.4	27.9	0.4	35.3	0.4	5.5
Zinc	µg/g		5	51	5	207	5	90	5	128
Zirconium	µg/g		1.0	<1.0	1.0	2.2	1.0	3.0	1.0	1.5

Certified By:

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 22T880456

PROJECT:

CLIENT NAME: MISC AGAT CLIENT ON

ATTENTION TO:

SAMPLING SITE:

SAMPLED BY:

Full Metal Scan in Soil

DATE RECEIVED: 2022-04-04 **DATE REPORTED: 2022-04-13**

		SAMPLE DESCRIPTION:		8B	9A	9B		10A		10B
		SAMPLE TYPE:		Soil	Soil	Soil		Soil		Soil
		DATE SAMPLED:								
Parameter	Unit	G / S	RDL	3710793	3710794	3710795	RDL	3710796	RDL	3710797
Aluminum	µg/g		10.0	3340	5790	9540	10.0	2970	10.0	7390
Antimony	µg/g		0.8	1.3	1.9	1.2	0.8	<0.8	0.8	<0.8
Arsenic	µg/g		1	17	17	33	1	1	1	1
Barium	µg/g		2.0	72.1	75.7	84.6	2.0	23.9	2.0	89.1
Beryllium	µg/g		0.4	<0.4	<0.4	0.4	0.4	<0.4	0.4	<0.4
Bismuth	µg/g		0.5	0.6	0.7	0.7	0.5	<0.5	0.5	<0.5
Boron	µg/g		5	<5	<5	<5	5	<5	5	<5
Cadmium	µg/g		0.5	1.2	0.8	0.6	0.5	<0.5	0.5	<0.5
Chromium	µg/g		5	9	15	19	5	15	5	31
Cobalt	µg/g		0.5	3.7	6.2	6.6	0.5	2.7	0.5	5.3
Copper	µg/g		1.0	35.1	48.4	39.9	1.0	4.9	1.0	11.7
Iron	µg/g		500	28200	50900	39800	50	6520	500	12500
Lead	µg/g		1	89	93	57	1	4	1	4
Lithium	µg/g		0.5	1.2	2.2	5.9	0.5	3.6	0.5	8.1
Manganese	µg/g		5.0	134	219	272	5.0	100	5.0	230
Molybdenum	µg/g		0.5	5.4	7.1	7.7	0.5	<0.5	0.5	<0.5
Nickel	µg/g		1	24	32	25	1	7	1	14
Phosphorus	µg/g		10	470	1040	1030	10	1240	10	737
Selenium	µg/g		0.8	<0.8	2.0	<0.8	0.8	<0.8	0.8	<0.8
Silver	µg/g		0.5	<0.5	<0.5	<0.5	0.5	<0.5	0.5	<0.5
Strontium	µg/g		5	23	30	22	5	15	5	28
Thallium	µg/g		0.5	<0.5	<0.5	0.7	0.5	<0.5	0.5	<0.5
Tin	µg/g		1	2	3	3	1	<1	1	<1
Titanium	µg/g		10	230	242	550	10	311	10	947
Uranium	µg/g		0.50	0.64	3.44	2.18	0.50	<0.50	0.50	0.67
Vanadium	µg/g		0.4	10.7	14.4	31.7	0.4	12.2	0.4	26.7
Zinc	µg/g		5	86	50	62	5	20	5	30
Zirconium	µg/g		1.0	1.2	1.7	1.9	1.0	1.3	1.0	3.5

Certified By:

Results relate only to the items tested. Results apply to samples as received.

Appendix C
Indigenous Perspectives on Health and Wellness



Source: First Nations Health Authority, 2018

Appendix D
Materials and Methodology

Materials

Equipment Required for Sampling Adult Lake Sturgeon

Gill nets
Net floats and anchors
High power lens for observing glochidia on gills
Small high-power light for viewing glochidia on gills
Cradle/sling, for large fish
Measuring board
Weigh scale
GPS
Thermometer
Field book/pencils
Flow meter
Depth measurer
PIT tag injector (two)
PIT tags
PIT tag reader
Vials of 70% ethanol for tissue samples and extracted glochidia



Photo: PIT Tag practice session

Equipment Required for Sampling Larvae and Eggs of Lake Sturgeon

D - Frame nets, 500 - 1500 micron mesh.
Egg mats (furnace filter clipped to a frame or wrapped around a concrete block)
Braided Rope
Anchors
Floats
GPS
Field book and pencil
Thermometer
Depth measurer
Flow meter
Pike pole to fetch lines when pulling up nets or mats
Magnifying eyepiece
White enamel tray
Measuring device (to the mm for larvae)
Vials
70% ethanol



Photo: Lake Sturgeon in Gill net on the Ottawa River





Photo: Egg Matts

Methods

Sampling Sturgeon

The fisheries study that Hatch completed in 2013, specifically to determine the Lake Sturgeon spawning period and potential spawning grounds, suggests that the Lake Sturgeon started spawning below the Timiskaming Dam Complex when temperatures were approximately 17°C (Hatch, 2013). Tim Haxton (2008) had also determined this to be true when a specific study over a five-year period, "*A Synoptic Review of the History and Our Knowledge of Lake Sturgeon in the Ottawa River"* indicated that the spawning period ranged between water temperatures of 16°C to 20°C. (Haxton, 2008).

Gordon Creek warms up quicker than the Ottawa River, due to the shallow depth and size of the creek, because of this Kebaowek First Nation (KFN) and Wolf Lake First Nation (WLFN) began measuring water parameters upstream of Gordon Creek and downstream of the Ottawa River on May 18th, 2022. The water temperature in Gordon Creek was already measuring at 14.5°C on May 18th, and the water temperature in the Ottawa River was 10°C.

Processing fish caught by netting will include the following procedures:
Fork length and weight measures; observation and recording of any abnormalities; examination for the presence of tags; tissue sampling for aging and genetic analysis; sexing if possible and injection with a PIT tag.

Measurements

Fork length and total length of all fish caught will be measured to the nearest centimeter. Fork length is the distance from the tip of the snout to the 'fork' in the tail where the upper and lower portions of the tail fin meet, whereas, total length is the length of the fish from the tip of the snout to the end of the upper lobe of the tail.

Egg Mats

Another method that can be used as a measure of Lake Sturgeon spawning success is through the use of egg mats. The egg mat is a tool used to collect eggs as the fish spawn, and can give an indication of 'strength' of the spawn. Egg mats can be a variety of materials but a simple method is simply a furnace filter wrapped onto a concrete block and dropped directly onto the spawning grounds. Another method, used by Roseman et. al. (2011) is to use a furnace filter connected to a steel frame using document spring clamps. For the mats to effectively collect eggs, the fish must spawn directly over the mats so that they eggs adhere to the mat as they are deposited by the female. Natural mortality is high in the egg stage, up to 99%, so the collection of a few eggs will have little detrimental effect on the population.

Protocol

1. Navigate to the upstream starting location where you will begin deploying the egg mats and record GPS location, date, time, flow rate and water temperature.
2. Moving downstream with the vessel in reverse, deploy the trap-net anchor and pay out the line and egg mats off the bow of the boat. As you reach the end of the rope after the last egg mat has been deployed, deploy the navy anchor and finally the buoy which will remain floating on the river surface.
3. Return to check the egg mats once per week, fetching the buoy line with a hooked pike pole. After the egg mats have been checked and all eggs counted, redeploy the mats till the spawn has finished.

APPENDIX E
Results

Lake Sturgeon PIT Tagging Results

The photo below, shows the locations where the sturgeon were caught and PIT tagged downstream of the dam.

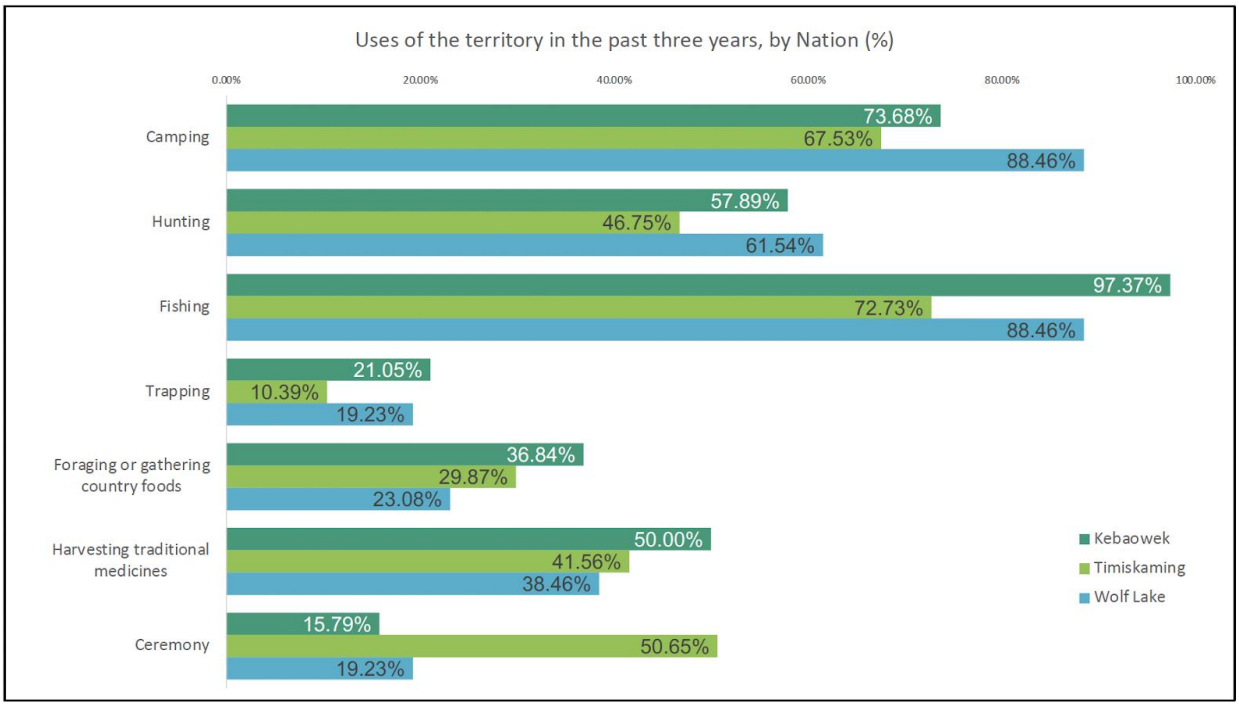


Lake Sturgeon PIT Tag and Biosampling Data

Set #:	Catch #:	Date (yyyy-mm-dd):	PIT Tag No.	Fork Length (cm):	Total Length (cm):	Weight (lbs):	Sex:	Flow Rate (m3/s):	Temp. (celcius)
6	1	2022-06-13	3DD.003E1BF100	-	145	35.5	F	1117.857	14
7	2	2022-06-13	3DD.003E1BF11B	112	119	23.5	-	1117.857	14
16	3	2022-06-14	3DD.003E1B1F0F9	86	90	11.6	M	1129.183	15.5
33	4	2022-06-17	3DD.003E1BF0EE	81	95	13.7	-	1200.959	14.7
45	5	2022-06-19	Unable to get reading	108	115	20.5	-	1242.236	12.9
65	6	2022-06-22	Unable to get reading	89	102	15.3	M	1230.433	14.6
66	7	2022-06-23	3DD.003E1BF123	110	119	26.18	-	1158.179	13.5
66	8	2022-06-23	3DD.003E1BF104	83	92	11.90	M	1158.179	13.5
66	9	2022-06-23	3DD.003E1BF14B	80.5	90	14.8	-	1158.179	13.5
86	10	2022-06-27	3DD.003E1BF0F1	94	109.5	18.9	-	1068.006	13.4
87	11	2022-06-29	-	100	110	23	-	1068.006	16
95	12	2022-07-04	3DD.003E1BF116	107	118	36	-	846.471	18
101	13	2022-07-05	3DD.003E1BF131	103	115	22.6	M	766.385	16.5
113	14	2022-07-06	3DD.003E1BF0EE	81	95	13.3	-	759.694	17

APPENDIX F

Land-based Uses of the Territory in the Past Three Years by SART Community

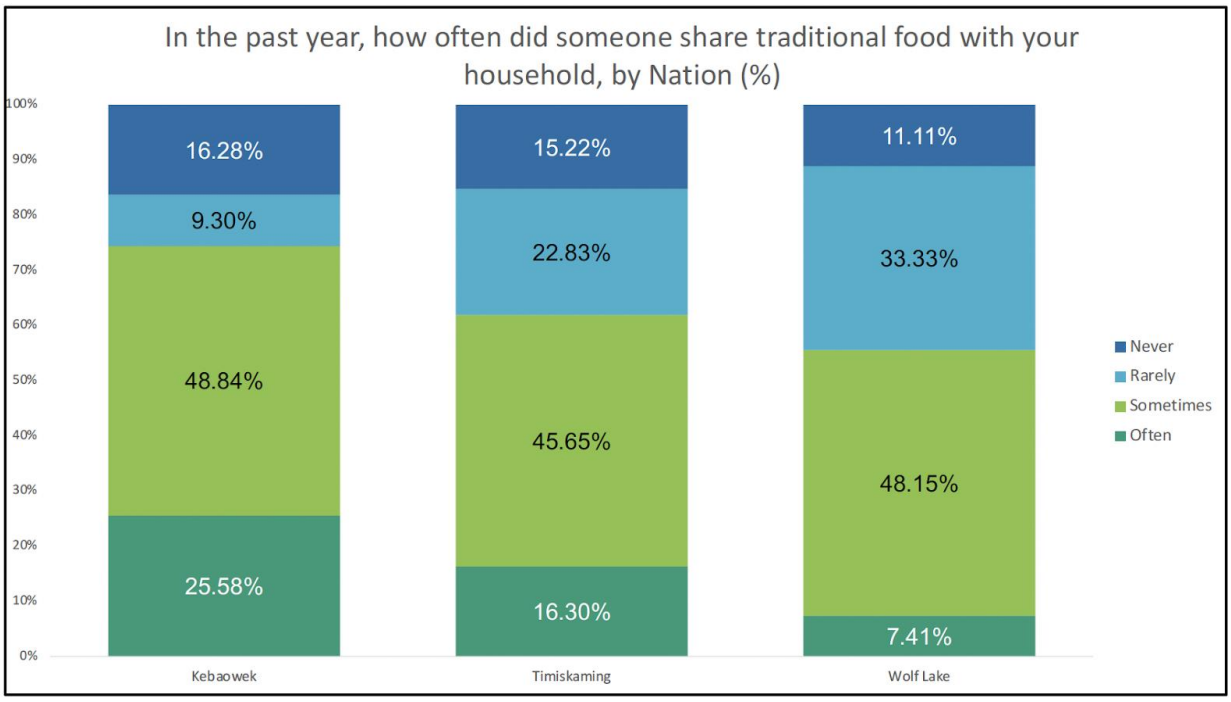


Note: This figure was retrieved from the SART TDQRP Environmental Impact Assessment (EIS) done by the Kichi Sibi Technical team.

The figure illustrates how territory lands are used by community members and provides evidence for the importance of maintaining healthy terrestrial and aquatic environments so that traditional practices such as hunting and fishing can be continued safely and sustainably now and into the future.

APPENDIX G

Frequency of Sharing Traditional Foods with Households by SART Nation



Note. This figure was retrieved from the SART TDQRP Environmental Impact Assessment (EIS) done by the Kichi Sibi Technical team. The figure demonstrates how access to traditional foods, such as fish and gathering of country foods, is important for maintaining and strengthening a sense of community.

Additional Resources

Baker, E. A., and D. J. Borgeson. (1999). Lake sturgeon abundance and harvest in Black Lake, Michigan, 1975–1999. *North American Journal of Fisheries Management 19,* 1080-1088.

Chiasson, W. B., Noakes, D. L. G., & Beamish, F. W. H. (1997). Habitat, benthic prey, and distribution of juvenile lake sturgeon (Acipenser fulvescens) in northern Ontario rivers. *Canadian Journal of Fisheries and Aquatic Sciences, 54,* 2866-2871.

Dolara, P. (2014). Occurrence, exposure, effects, recommended intake and possible dietary use of selected trace compounds (aluminium, bismuth, cobalt, gold, lithium, nickel, silver). *International Journal of Food Science Nutrition, 65*(8), 911–924. https://doi.org/10.3109/09637486.2014.937801

Garner, R. J. (1963). Environmental contamination and grazing animals. *Health Phys., 9*, 597. (Cited in NRC 1980.)

Haseltine, S. D., & Sileo, L. (1983). Response of American black ducks to dietary uranium: a proposed substitute for lead shot. *The Journal of Wildlife Management*, *47*(4), 1124-1129.

Lyons, J. & Kempinger, J. J. (1992). *Movements of adult lake sturgeon in the Lake Winnebago system.* Wisconsin Department of Natural Resources Research Report, 156-192. Wisconsin.

Peterson, D. L., Vecsei, P. & Jennings, C. A. (2007). Ecology and biology of the lake sturgeon: a synthesis of current knowledge of a threatened North American *Acipenseridae*. *Rev Fish Biol Fisheries, 17***,** 59–76.

Roseman, E. F., Boase, J., Kennedy, G., Craig, J. & Soper, K. (2011). Adaption of egg and larvae sampling techniques for lake sturgeon and broadcast spawning fishes in a deep river. *Journal of Applied Ichthyology, 27*, 89 - 92.

Verdon, R., Guay, J. C., La Haye, M., Simoneau, M., Cote-Bherer, A., Ouellet, N., & Gendron, M. (2012). Assessment of spatio-temporal variation in larval abundance of lake sturgeon (*Acipenser fulvescens*) in the Rupert River (Quebec, Canada), using drift nets. *Journal of Applied Icthyology, 29*(1), 15-25. https://ui.adsabs.harvard.edu/link_gateway/2013JApIc..29...15V/doi:10.1111/jai.12088

APPENDIX L – AOPFN STUDIES

L-1: AOPFN Alternative Means Assessment

THE ALGONQUINS OF PIKWAKANAGAN FIRST NATION TIMISKAMING QUÉBEC DAM REPLACEMENT PROJECT ALTERNATIVE MEANS ASSESSMENT

November 10, 2023

Non-Confidential Report by the Algonquins of Pikwakanagan First Nation

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Submitted to: Public Services and Procurement Canada

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Disclaimer: The information contained in this Alternative Means Assessment report is based on research by the Algonquins of Pikwakanagan First Nation, as well as materials provided by Public Services and Procurement Canada, and published works, within limits of available time and resources. It is not intended to be a complete depiction of the dynamic and living systems of resource use, traditional economy, and local knowledge regarding community conditions maintained by The Algonquins of Pikwakanagan First Nation members. The information contained herein does not, and should not be used to, define, limit, or otherwise constrain the Indigenous title, rights, or interests of The Algonquins of Pikwakanagan First Nation.

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1. INTRODUCTION

1.1 ABOUT THE ALGONQUINS OF PIKWAKANAGAN FIRST NATION

The Algonquins of Pikwakanagan First Nation (AOPFN) is an Algonquin First Nation community that has exercised their rights to hunt, trap, gather, and practice other cultural activities in the area adjacent to the Kichi Sìbì (Ottawa River) for thousands of years. The unceded unsurrendered Traditional Territory of the AOPFN stretches through the Kichi Sìbì watershed near North Bay and the Timiskaming dams, through Ottawa and the confluences of Rivers Gatineau, du Lièvre and Rouge, extending near the town of St. Jerome. The AOPFN and its ancestors have occupied the length of the Kichi Sìbì for over 9,000 years (Taylor et al. 2021). The extensive use of Kichi-Sìbì/Kichi sipi over the centuries by AOPFN members and ancestors and Algonquin people and certainly over millennia, is evident in the Algonquin place names provided to describing the Ottawa valley. Mattawa refers to ‘where the river divides’; an upper section of the river, traditionally called Temiskaming sagahigan refers to ‘deep water lake’ that is applied to the northernmost, widest section of Lake Temiscamingue; Wanaweia sipi refers to ‘dirty water’ flowing from Lac des Quinzes into Lake Temiscamingue; Kichi Saki means ‘big-outlet’ for Grand Lac Victoria; and Mitcikinabikong means ‘place of the stone fence or weir’ (Morrison 2005, 9). Today, the AOPFN land users continue to hold Algonquin knowledge and to practice traditional land and water-based activities throughout the Kichi Sìbì watershed across Ontario and Quebec.

Since contact, territorial lands used by members have been appropriated and developed without the consent of the AOPFN. The original Timiskaming Dam-Bridge was built without seeking the consent of the AOPFN members at the time. Today, the AOPFN has been involved in the impact assessment processes for the Timiskaming Quebec Dam-Bridge Replacement project which has informed and is the subtext of this memorandum.

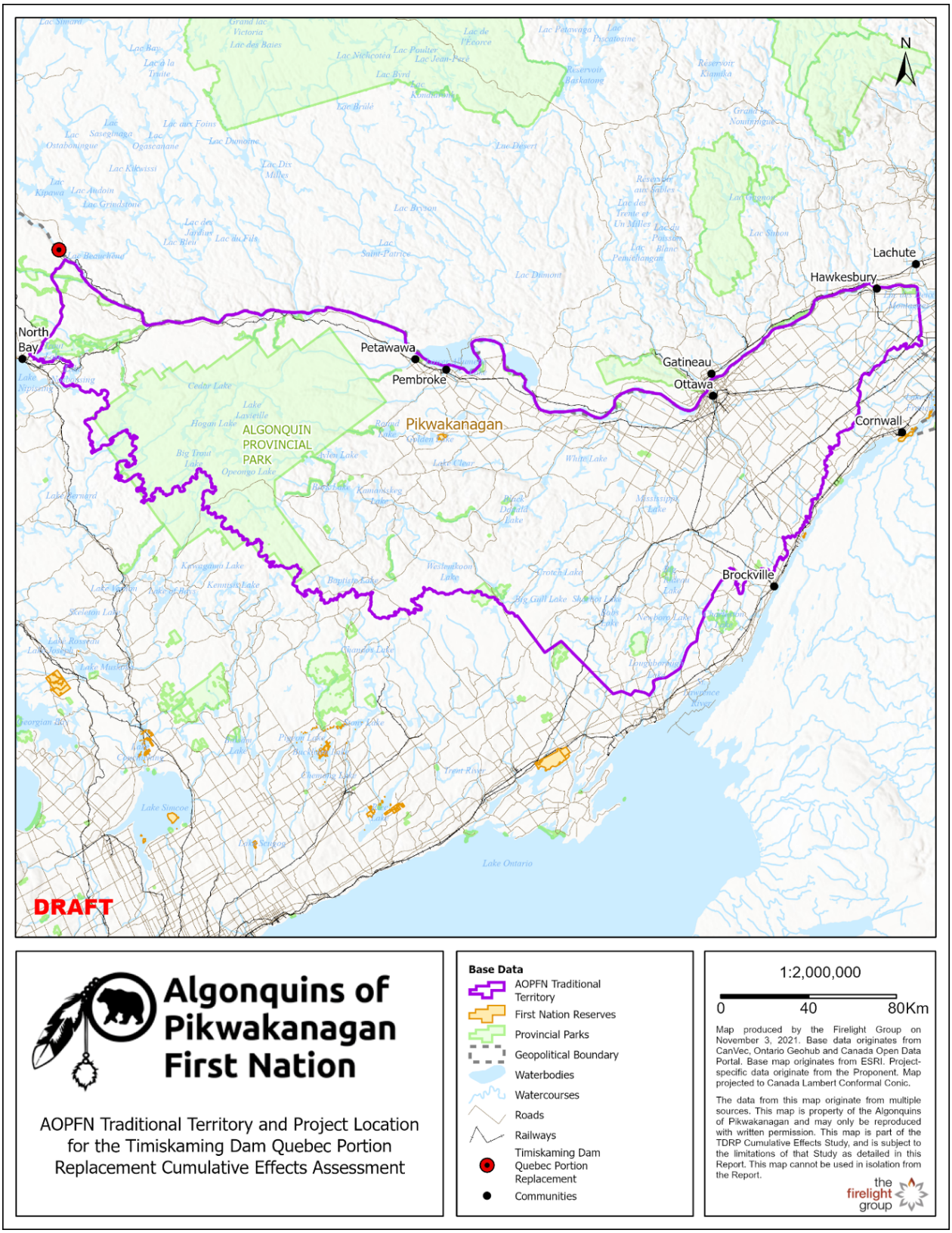


Figure 1 Territory of the Algonquins of Pikwakanagan First Nation, showing the location of the proposed TQDRP at the northwestern edge of AOPFN's unceded unsurrendered Traditional territory.

1.2 TIMISKAMING QUEBEC DAM-BRIDGE REPLACEMENT AND ALTERNATIVE MEANS ASSESSMENT

The Quebec portion of the Timiskaming Dam-bridge complex is located near Témiscaming, in the Abitibi-Témiscamingue region of Quebec, between Long Sault Island and the Quebec shoreline on the Kichi Sìbì. Public Services and Procurement Canada (PSPC or the Proponent) has reported that the Quebec dam is nearing the end of its useful life, as several parts of the structure require immediate repairs, while other elements need to be replaced or repaired. Consequently, PSPC has decided to replace the entire dam-bridge complex. The proposed Timiskaming Quebec Dam-bridge Replacement Project (TQDRP or the Project) is situated adjacent to the northwestern border of the AOPFN's unceded unsurrendered Traditional Territory (see Figure 1).

Based on the Proponent's project description, the new dam-bridge will be similar in design and operation to the existing structure, consisting of a mechanized water regulating system, rising sluice gates, abutments, a road bridge, landscaped areas, and a fish passage, as well as road realignment. Existing utilities (power cables, telephone cables and gas pipeline) are to be re-routed to the new structure. Upon completion of construction, the existing structure is to be demolished and removed.

The Proponent considered three options for the siting of the proposed dam-bridge as described in Table 1. Option 1 is PSPC's preference for the replacement of the Quebec dam-bridge, i.e., construction of a new dam downstream of the existing structure. The Proponent notes that the construction and operation activities for all three options will generally require the same mitigation measures and monitoring programs. PSPC has completed an Environmental Impact Statement (EIS) for the project, which is undergoing environmental assessment by the Impact Assessment Agency of Canada (IAAC). Elements examined for the environmental assessment included evaluating the alternative means of carrying out the Project, that are technically and economically feasible as well as the environmental effects of such alternative means.

The AOPFN opted to conduct its own alternative means assessment (AMA), however, due to the Proponent's early submission of the EIS, The AOPFN's AMA memorandum will be submitted as an addendum to the EIS.

Table 1 New Dam-Bridge Alternative Proposed Locations

Option 1 (Option/Alternative A)	Constructing the new dam-bridge downstream of the existing structure and demolishing the existing dam-bridge. Construction would also involve extending the downstream dam apron and installing riprap and a temporary cofferdam downstream, approximately 70 m from the existing dam. Construction would take about 3 years to complete
Option 2 (Option/Alternative B)	Constructing the new dam-bridge upstream of the existing dam-bridge and demolishing the existing structure. Option 2 would involve building a 20-meter extension of the existing apron and a temporary cofferdam 70 m upstream of the existing structure. Construction would take about 3.5 years to complete
Option 3 (Option/Alternative C)	Option 3 is to rebuild the dam-bridge on the same layout as the existing dam-bridge and to demolish the existing structure. The construction would also involve building a temporary cofferdam 80 m downstream of the existing dam-bridge. Construction would take 4.5 years to complete.

1.3. THE AOPFN ALTERNATIVE MEANS ASSESSMENT: DEVELOPMENT AND PURPOSE

The AOPFN has serious concerns about the extent to which impacts on Algonquin values and rights within the AOPFN's unceded unsurrendered Traditional Territory have accumulated over time. While these concerns pertain broadly to all of the AOPFN's unceded unsurrendered Traditional Territory, they are particularly relevant to the Kichi Sìbì with reference to the TQDRP. The Kichi Sìbì has undergone intense development pressure since the turn of the 20th century, resulting in cumulative impacts to AOPFN members and way of life.[1]

[1] AOPFN has completed a confidential Cumulative Effects Study for the TQDBR Project, while the report cannot be shared publicly, AOPFN can disclose key findings to the Impact Assessment Agency and or PSPC upon request.

The AOPFN has actively participated in the environmental assessment proceedings for the TQDRP, with the aim of ensuring that the AOPFN's values and perspectives are incorporated into the assessment. The AOPFN has found that the Proponent's assessment of alternative locations presented in the EIS for the TQDRP lacks the incorporation of the AOPFN culture and rights, including the AOPFN Algonquin knowledge[2], values, and perspectives. The alternatives evaluated by PSPC based on environmental, economic and societal criteria did not adequately consider the AOPFN perspectives, stewardship and governance roles, or access to culturally important resources. The AOPFN conducted this AMA after PSPC had selected the preferred alternative. In the future, the AOPFN hopes to collaborate with proponents on alternative means assessment early in the project design before core decisions are made. As an AAC member noted:

> *"And before they start even picking out any of these alternatives, we should be on board to be able to go along with it – not once they have alternatives down. And now we are sitting here, looking at these alternatives because they are already leaning in one direction. Like, we need to be there beforehand you know. Like, I just feel like consent and consultation here, you know, are two big things that we need to be involved sooner – much much sooner"* (January 11, 2023)[3].

It is important to fill the current gaps in the EIS, resulting from the absence of the AOPFN perspectives. The primary goal of the AOPFN is to ensure that the best alternative means to carry out the Project is ultimately chosen. To this end, the AOPFN conducted a community-led AMA for the TQDRP. The study will also support the AOPFN's meaningful participation in the environmental assessment for the Project.

The main goals of this study were to identify the AOPFN's preferred alternative for the TQDRP and to propose mitigations for PSPC's preferred alternative, if the AOPFN's preferred alternative is ultimately not selected. The study is framed through the lens of the AOPFN Algonquin rights and values, with the approach developed in collaboration between the AOPFN technical team (composed of the AOPFN Consultation Office staff and consultant support from the Firelight Group) and members of the AAC.

The AOPFN expects that this AMA study will inform further engagement and consultation with PSPC on a preferred alternative means for the TQDRP. Further, the AOPFN AMA, together with its rights impact assessment will inform the AOPFN leadership's free, prior and informed consent decision process.

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[2] AOPFN Algonquin Knowledge is inherently connected to values, place, time, and our members and their families. Consequently, it cannot be treated as interchangeable or transferable from one geographical or temporal context to another. AOPFN Algonquin Knowledge is not representative of and should not be used as a proxy for other Algonquin First Nations.

[3] All quotes are from AAC members. They are not attributable to any individual and AOPFN does not use the names of AAC members to protect confidentiality.

2. THE AOPFN APPROACH TO THE TQDRP ALTERNATIVE MEANS ASSESSMENT

2.1 PRINCIPLES UNDERLYING THE AOPFN AMA

The AOPFN has completed AMA studies for other major projects. The following principles were developed through previous AMA work and supported by the AAC for the study approach:

- Only Indigenous peoples can identify the rights, interests and values, and how they are measured, when conducting an alternative means assessment that includes “Indigenous” considerations.
- Only the AOPFN can accurately gauge impacts on the AOPFN values such as access and willingness to use lands and waters, as well as impacts to culture, governance and stewardship.
- The AOPFN gauges both beneficial and adverse effects when looking at the benefits and risks of different alternative means to their values.
- The AOPFN considers scientifically measurable data when assessing alternative means but is not wholly reliant on Western science in determining impacts and benefits of alternative means.
- Algonquin knowledge is not uniform, or static, but is living, fluid and, cumulative as it is passed down through generations.
- The AOPFN does not limit its alternative means assessment to changes versus a current, “damaged” baseline set of conditions, but also considers past conditions before the site was impacted, and desired future conditions for AOPFN members.

In addition to the established principles, the AAC proposed a new principle for the TQDRP AMA:

- A sustainability lens is critical, as well as an understanding of potential impacts on future generations must be part of the decision process. Decisions must always be made with the next seven generations in mind.

2.2 METHODS FOR THE AOPFN-LED AMA

The alternative means assessment for the TQDRP followed the AOPFN established AMA methods and involved three key steps:

1. Identifying the AOPFN values specific to the AMA for the Project and guiding questions to measure the values. This step also involved defining weightings to be assigned to each value, relative to the collection of values as a whole.

2. Ranking PSPC's three options using the guiding questions, ranking system and weights confirmed by the AAC.

3. Verifying the final outcome and recommended mitigations from the AMA for Chief and Council's decision.

The AOPFN technical team coordinated the AMA through thematic sessions with the AAC and a two-day site assessment.

2.2.1 The AOPFN Advisory Committee Thematic Sessions

The AOPFN technical team facilitated five sessions with the AAC to evaluate alternative means for the replacement of the Timiskaming Quebec dam-bridge. Meetings were conducted in a hybrid mode, with some attendees participating via the video conferencing platform, Zoom, and others physically convening in Pikwakanagan. Sessions were recorded and transcribed for accuracy of information collection and analysis.

The sessions involved facilitated conversations, during which the technical team asked open-ended questions and recorded the responses in real time using Google Jamboard, Microsoft PowerPoint, and traditional note taking. Members of the AAC were, therefore, able to see how their answers were recorded by the technical team and they could adjust inputs in real time.

The first session was held on January 11, 2023, to establish the AOPFN values and value statements (i.e., goals for the Project site for each option) for the AMA. Input from AAC members was collected using Jamboard. At this session, the AAC identified several values and discussed areas of interrelation, where values could be combined. The AAC also began identifying accompanying value statements. In preparation for the second session, the technical team provided the AAC with the list of nine values and value statements the committee established during the first session.

The second session took place on January 20, 2023. During this session, the AAC reviewed the values previously identified and resumed establishing value statements. Value statements were the goals by which the Project site for each PSPC alternative would be compared for alignment with the AOPFN values. The next step was to assign weights to each of the AOPFN values selected for the AMA. Weights were assigned to each of the AOPFN values, in terms of relative importance to the other values, ie, percentage.

During the discussion, the AAC brought up the need for an AOPFN site assessment for a fuller picture and understanding of the Project. Although the AOPFN had previously conducted a site visit (July 2022), this visit did not include a discussion of alternatives nor did it involve in-depth data collection. Subsequently the AAC required more detailed information for their evaluation of alternative means. The AAC insisted that a site assessment was critical to understanding the current state of the AOPFN values in the area and how best to protect them.

On February 8, 2023, the third session was held with the primary goal of establishing objectives and guidance for site visits in the summer. The technical team sought input from the AAC on further information needed from the site assessments for each value, guiding questions pertaining to the state of the AOPFN values for all PSPC alternatives for the TQDRP, and how values could be protected from project impacts. The technical team also developed guiding questions for ranking each alternative against the AOPFN values, in preparation for site assessments.

The fourth session took place on August 29, 2023, following site assessments conducted over the summer. The technical team presented the results of the field work to the AAC for review. Based on findings on the states of the AOPFN values, the AAC reassessed the weightings previously assigned to values.

For ranking the PSPC options, the AAC developed a list of comparison factors from the value statements, by which to rank the options for alignment with the AOPFN values. The AAC then used a scale of one (most protective of the AOPFN Values) to three (least protective of the AOPFN values) to score each option against the AOPFN values.

Although discussions on mitigation measures had occurred previously, more detailed measures were identified based on the findings of the assessments.

On September 26, 2023, the technical team held the final session with the AAC. The committee finalized the ranking of PSPC options for the Project against the AOPFN values, as well as held further discussions and confirmation of recommended mitigation measures for all three options.

The findings and recommended mitigations were presented to Chief and Council for input and endorsement on October 25, 2023.

2.2.2 Site Assessment

A site assessment was undertaken over two days in July 2023 with two AAC members, one the AOPFN staff member and support from one consultant from the Firelight Group. The goal of this assessment was to look for the AOPFN values on the land and water at the three alternative locations for the replacement of the Quebec portion of the Timiskaming dam-bridge, in order to record, report, establish a baseline for water sampling and provide greater context on the locations to the AAC.

Seeing the alternative locations in person was determined to be a critical step of the study, as noted by the AAC:

> *"Because, like I said, I just really think that it's really important and if the AAC members are able to take the time – you know – to be able to go up and see it, these site visits are critical when we sit down and to talk about this. Because, I remember, in the very initial meetings we ever had, and all the things we were talking about are almost completely irrelevant after you see it. So, it makes a lot more sense to take the time to go and see it and then discuss all these things. Because you don't want to be wasting time and throwing out ideas." (AAC Meeting 1)*

The ACC have recommended that all future AMA processes include a site assessment component early on in any AMA process.

Site assessment investigations collected both Algonquin Knowledge and western science about the values at the three locations. Investigations were organized by value and location (on-land versus in-water). Table 2 provides the questions considered by the site assessment field team. Video footage and audio recordings were taken at all three locations on the land and on the water, with notes compiled in a confidential field form. Water quality sampling was also undertaken following standard protocols at one upstream and one downstream location. The AOPFN intends to establish a long-term baseline by conducting further sampling in the near future.

Table 2 Site Assessment Questions to Inform Understanding of Values

Value	Questions for Each Alternative Location
The AOPFN Protection and Stewardship of Culturally Important Plant Species, including Member Harvesting of Plants and Medicines	1. Are there culturally important plants near the alternative? 2. Are there habitats supporting culturally important plants? Are they healthy habitats? 3. Are there wetlands near the alternative? Are they healthy? 4. Is the atmosphere, noise, feel, conducive to harvesting plants and medicines? 5. How could construction in each area affect harvesting? 6. How should this value be protected? Would the alternatives require different measures?
The AOPFN Protection and Stewardship of	1. Are there signs of wildlife at each location?

Wildlife Habitat and Species	2. Are there wildlife habitats at each location? 3. Would the building of the bridge at the alternative location change wildlife access to water? 4. Is there a risk of wildlife accidental death if a bridge is built at the alternative location? 5. Would any of the alternatives increase access for illegal hunting? 6. How should this value be protected? Would the alternatives require different measures?
The AOPFN Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces	1. Are there spiritual, cultural, historic, archaeological relationships and sacred spaces in the area near the alternative? 2. Would the building of a bridge at this location degrade or alter any known spiritual, cultural, historic, archaeological relationships and sacred spaces? 3. Would the building of a bridge at this location affect the AOPFN access to important spaces? 4. How should this value be protected? Would the alternatives require different measures?
The AOPFN Protection and Stewardship of Fish habitat and fish species	1. Is there fish habitat near this alternative? 2. Are there fish habitats sensitive to change upstream or downstream of the Alternatives? 3. Are there any species at risk in the area? Culturally important species? 4. How should this value be protected? Would the alternatives require different measures?
The AOPFN Member Fishing (downstream and upstream of the site)	1. Are there known member fishing sites near the alternative? 2. What is the noise and atmosphere like near the alternative? Could construction change this?

	3. Are there spawning beds upstream or downstream that could be affected? 4. Could any of the alternatives affect navigation or access to fishing sites? 5. How should this value be protected? Would the alternatives require different measures?
The AOPFN Protection and Stewardship of Water (quality and quantity)	1. What is the baseline water quality? ● Does the water look clean/normal? ● Does the water smell clean/normal? 2. Are there signs of existing contamination? 3. Do any of the proposed locations have a higher risk/greater potential for spills? 4. What is the water flow like? Are changes of flow in this area a concern? 5. How should this value be protected? Would the alternatives require different measures?
Access and Navigation on Ottawa River	1.What is it like on the water near each proposed location? What is the sensory experience? Are there any noises or smells? 2. Would a bridge at this location change your feelings of safety on the water? Would you take your family on the water here? 3. Would a bridge at this location change your access to the River? 4. How should this value be protected? Would the alternatives require different measures?
The AOPFN Governance and Autonomy	1. Based on what you've seen during this site assessment so far, how might the different alternatives hinder the AOPFN's ability to steward the land?

	2. How should this value be protected? Would the alternatives require different measures?

2.3 LIMITATIONS OF THE AOPFN-LED AMA

The alternative means assessment conducted by the AOPFN has the following limitations:

- The traditional use of the area by the AOPFN is already heavily impacted by development on and beside the Kichi Sibi. Any option chosen is still likely to exacerbate negative impacts already experienced by the AOPFN members. Recommendations developed from the AOPFN Cumulative Effects Study must also be equally considered for the Project.

- The AAC is a robust cross-section of member perspectives within the AOPFN; however, it is not a complete representation of the AOPFN perspectives. The AAC has up to 20 members currently, which cannot fully represent the perspectives of over 2000 the AOPFN members. Complete community engagement would require additional costs and time, which the AOPFN did not have. Limited capacity funding combined with decades of dispossession of land, culture and Algonquin knowledge, imply that not all Algonquin values relevant to the project area may have been identified, explored, or ranked.

- This report is based on the analyses and understanding of the AOPFN and is reflective of the values and knowledge shared by the AAC. It is **not intended as a complete depiction of the dynamic way of life, living systems and knowledge maintained by AOPFN members.**
- The conversations had by the AAC reflected their holistic understanding of the world, which recognizes that all things are connected. This AMA attempted to evaluate each option (alternative) as it would affect eight discrete values, which are in fact, highly interrelated and overlapping. The AOPFN's decision making is based on a balance of factors and not on an understanding of impacts on discrete values. In the final session, AAC members were asked to provide an overall ranking.
- At the time of the study, detailed design for the project had not been completed such as materials to be used for the cofferdams. The AOPFN will need to be involved in future design considerations.

2.4 THE AOPFN VALUES USED IN THE TQDRP AMA

Following the first three meetings and the site visit, members of the AAC selected eight values to be considered in evaluating alternative means for the TQDRP. In meeting 1, a ninth value had been identified for the harvesting of medicines, separate from the stewardship of culturally important plant species; however, this value was subsequently merged into a single value for culturally important plants and medicines. Value statements or goals were identified for each value in the initial AAC meetings, while comparison factors were identified during the site visit and confirmed in AAC meeting 4. Values, value statements, and comparison factors are provided in Table 3. The AOPFN values are examined in further detail in each sub-section in Chapter 4. The eight values for the AMA represent key resources, spaces, activities, and connections tied to conditions that strongly support the ability of the AOPFN to practice their rights. These values have been cumulatively impacted by the consequences of colonization and development and are, therefore, important to consider beyond this study because of their potential to be further impacted by the proposed TQDRP.

Table 3 Summary of values, value statements and comparison factors for the AOPFN TDQRP AMA

Value	**Value statement(s)**	**Comparison Factors**
The AOPFN Protection and Stewardship of Culturally Important Plant Species, including Member Harvesting of Plants and Medicines	• Culturally important plant species must not be harmed or destroyed • Any culturally important plant species that are harmed or destroyed must be offset at a higher amount than what was harmed / destroyed. • The right to harvest culturally important plants using the AOPFN stewardship responsibilities, sustainability, and accessibility (including ceremonies and trading) will remain intact.	• Cofferdam + bridge location that lead to terrestrial disturbed areas • Quality of riparian area being disturbed / need replacement • Length of construction
The AOPFN Protection and Stewardship of Wildlife Habitat and Species	• Wildlife access to water must be maintained • Wildlife habitat must not be altered or destroyed • Threat to wildlife by illegal hunting / accidental death must be decreased / eliminated.	• Location of dam and coffer dam • Size of coffer dam • Length of time of construction • Size of terrestrial area disturbed

		• Quality of riparian area
The AOPFN Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces	• Archaeological assessments must be done, with the AOPFN • Objects of spiritual, cultural, or archaeological value must not be disturbed or removed without the AOPFN permission and respecting the AOPFN protocols • The AOPFN protocols must be followed and respected at Spiritual, Cultural, Historic, Archaeological, and sacred spaces • The AOPFN access to Spiritual, Cultural, Historic, Archaeological, and sacred spaces must be maintained or improved.	• Size of coffer dam (dewatering) • The installation of a cofferdam for any of the options will allow for part of the river to be dried out, enabling archaeologists to conduct digs when construction work begins • Length of time of construction • Area disturbed along the Kichi-Sìbì
The AOPFN Protection and Stewardship of Fish habitat and fish species	• Fish habitat alteration or destruction (for all habitats for all life cycles) must be avoided • Fish habitat and species must be monitored, documented, and reported • Fish deaths must be avoided • Any fish species at risk, must be protected	• Proportion of spawning area impacted • Size of area for dewatering and coffer dam • Size of disturbed area from new dam + infrastructure • Quality of fish habitat • Length of time of construction • Placement of coffer dam + risks
The AOPFN Member Fishing (downstream and upstream of the site)	• Access to member fishing site is maintained • The right to fish using the AOPFN stewardship responsibilities, sustainability, and accessibility (including ceremonies and trading) will remain intact.	• Access (tied to fish and fish habitat value) • Construction time

	• Threat to fish by illegal fishing must be decreased / eliminated	
The AOPFN Protection and Stewardship of Water (quality and quantity)	• Water is life; water protection is paramount • Water quality and quantity must be monitored, documented, and reported, including before, after, upstream and downstream, from the construction of the dam according to best practice • No harmful or deleterious substances can enter the water (including from the land or from stirring bottom sediment) • Water flow must protect water habitat and species • Water flow must be respected and flow management be adapted to climate change	• Configuration of dams with respect to water flow to potentially decrease risk of contamination • Specs of dams (in relation to water flow – risk of breach / contamination) • Length of construction time • Water quality upstream vs downstream
Access and Navigation on Ottawa River	• Access and navigation on the Ottawa river should be maintained but in balance with decreasing and eliminating illegal fishing • Safe and personal enjoyment of the river must be protected or improved • Respectful relationships with the river must be promoted • Sensory disturbances (smells, sounds) must be avoided or reduced.	• Length of time for construction • Disruption to traffic /ambience
The AOPFN Governance and Autonomy	• There should be no loss or degradation of the AOPFN unceded unsurrendered Algonquin Territory • The AOPFN must be involved in the stewardship, protection and conservation of the AOPFN	• Biggest difference between alternatives for the AAC is the impact on fish and fish habitat. • Tied to all other values.

	unceded unsurrendered Algonquin Territory	

2.5 THE AOPFN'S WEIGHTING METHOD

In order to conduct a scoring exercise, the weight put in each of the values used in the AMA needed to be established. At the second meeting, the AAC discussed various weighting options. Initially nine values were identified with the AAC and given the importance of water, the protection and stewardship of water was given the greatest weight at 12%, while the remaining were evenly split at 11%. In meeting 3, the values were condensed to eight and the AAC agreed to revisit the weighting, following the site assessment. The discussion of the site assessment parameters prompted the AAC to adjust weightings for the values, as shown in Table 4. The AAC decided that the value, fish habitat and fish species, was of the greatest priority for the three sites and should have the highest weighting. Other values with higher priority were assigned rankings of 12%, while values of lower priority were assigned rankings of 10%.

Table 4: AOPFN Weighting by Value

Value	Initial Weighting	Final Weighting
The AOPFN protection and stewardship of culturally important plant species, including member harvesting of plants and medicines	11%	10%
Member harvesting of plants and medicines **(now grouped with culturally important plant species)**	11%	0% (grouped with above)
The AOPFN protection and stewardship of wildlife habitat and species	11%	10%
The AOPFN protection and stewardship of spiritual, cultural, historic, archaeological relationships and sacred spaces	11%	12%
The AOPFN protection and stewardship of fish habitat and fish species	11%	22%
The AOPFN member fishing (downstream and upstream of the site)	11%	12%
The AOPFN protection and stewardship of water (quality and quantity)	12%	12%
Access and navigation on Kichi Sìbì	11%	10%
The AOPFN Governance and Autonomy	11%	12%

3. Scoring Alternative Means Against The AOPFN Values

3.1 Protection and Stewardship of Culturally Important Plant Species

3.1.1 Background

Table 5 Value Statements for Protection and Stewardship of Culturally Important Plants

Value Statements for Protection and Stewardship of Culturally Important Plants
1. Culturally important plant species must not be harmed or destroyed. 2. Any culturally important plant species that are harmed or destroyed must be offset at a higher amount than what was harmed or destroyed. 3. The right to harvest culturally important plants using the AOPFN stewardship responsibilities, sustainability, and accessibility (including ceremonies and trading) will remain intact.

Members of the AOPFN consider wild plants to be inherently valuable and important for their key ecological functions, such as forage and shelter for wildlife. As such, the AOPFN's stewardship of plant species is of service beyond the AOPFN membership, benefiting all parts of the ecosystem including humans.

Several plant species are harvested and used by members for food, medicine, crafting, cleansing ceremonies, construction, and other purposes. Specifically, the AOPFN members have pointed out tree species in the TQDRP area that are important for birds and bird nesting, as well as flowering plants that provide food for bees and other pollinators that, in turn, carry out important ecological roles (see AKLUS for TQDRP). That said, during AAC sessions for the AMA, the committee stated that one community member harvesting in the Project area was sufficient to warrant the protection of culturally important plants. An AAC member said:

> *"I just think that if there is just one person that harvests anything from the portion of land, that's good enough." (January 20, 2023)*

As noted in the CES for the Project, AOPFN members face constraints in the harvest and use of culturally important plants, due to reduced access to plant species and preferred harvesting areas, and declining availability of key species. Members also have reduced confidence that plants are safe for consumption and suitable for traditional uses (e.g., medicinal, ceremonial),

for which purity and cleanliness of the plants are critical. Despite growing restrictions to access throughout the territory, AOPFN members continue to harvest and consume culturally important plants.

As such, it is important to the AOPFN that the option chosen for the TQDRP allows for continued or improved access to healthy and sufficient culturally important plants in preferred harvesting areas. Further, it is the AOPFN's responsibility to ensure that these plants are available for future generations of members. The AAC expressed particular concern about certain plant species that are unable to return once a habitat is severely disturbed, or the quality of the plant being impacted following disturbance. A member noted:

> *"There's some plants that they get really disturbed they won't come back, you know" (September 26, 2023)*

3.1.2 Scoring for Protection and Stewardship of Culturally Important Plants

AAC members selected option C as the alternative most supportive of AOPFN's stewardship and access to culturally important plants. The next preferred option was A, and the least preferred, B.

Table 6 AAC Scoring for Protection and Stewardship of Culturally Important Plants

Protection and Stewardship of Culturally Important Plants	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#2 Ranking	#3 Ranking (least preferred)	#1 Ranking (most preferred)
**Colours in Tables provide a visual reference for AAC ranking results. The colour green indicates the most preferred alternative; the colour red indicates the least preferred alternative, and the colour orange indicates the alternative in between.*			

3.1.3 The AAC Proposed Mitigations for Protection and Stewardship of Culturally Important Plants

- Offsetting for Vegetation Loss: Planning and implementation of offsetting must be done in collaboration with AOPFN. The AAC noted that, at minimum, offsetting should be done at a minimum of a 3:1 ratio, though preferably higher. The AAC also noted that the scope of area

currently proposed for offsetting is inadequate to support plant species to thrive and is looking forward to engaging in offset planning with PSPC.

- Pre-construction surveys**:** Support should be provided by the Proponent for the AOPFN Guardians to conduct pre-construction surveys.

- Use of Native Plants**:** The AOPFN is requesting a commitment from the Proponent to creating a wider "natural" riparian zone (as opposed to manicured lawn), by utilizing native plants. A "greener" shoreline should also be utilized (e.g., gentler slope, as opposed to shoreline hardening with riprap).

3.2 PROTECTION AND STEWARDSHIP OF WILDLIFE HABITAT AND SPECIES

3.2.1 Background

Table 7 Value Statements for Protection and Stewardship of Wildlife Habitat and Species

Value Statements for Protection and Stewardship of Wildlife Habitat and Species
1. Wildlife access to water must be maintained. 2. Wildlife habitat must not be altered or destroyed. 3. Threat to wildlife by illegal hunting or accidental death must be decreased or eliminated.

Members of the AOPFN have a fundamental responsibility of caring for all living things within its unceded unsurrendered Traditional territory. Members consider all living things to be interconnected, such that without wildlife habitat, there is no wildlife. Many non-subsistence wildlife species are considered to be inherently valuable and are essential components of a connected ecological system.

During AMA sessions, the AAC raised concerns about Project-related impacts to habitat areas (e.g., bat, swallow habitats) that are relied upon by culturally important species. The committee also discussed the safety of wildlife with regard to vehicular traffic related to the Project. Concerning turtles, a member noted:

> *"The other thing is, like I said, it's a high traffic area going through there, so even if you have turtles – this goes back to the wildlife part now – if you do have turtles and stuff like that up there crossing the road, they didn't have turtle fencing or anything like that." (January 20, 2033)*

Additionally, the AAC expressed concerns over water supply for wildlife due to impeded access to the river:

> *"are they keeping it open so that they can get to the river when they need to, not necessarily aquatic? The deer and raccoon, whatever. Sometimes you see around dams that they close off so that wildlife can't get to the water." (January 20, 203)*

3.2.2 Scoring for Protection and Stewardship of Wildlife Habitat and Species

AAC members selected option C as the most preferred alternative. Their next preferred option was A, and the least preferred option, B.

Table 8 AAC Scoring for Protection and Stewardship of Wildlife Habitat and Species

Protection and Stewardship of Wildlife Habitat and Species	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#2 Ranking	#3 Ranking (least preferred)	#1 Ranking (most preferred)

3.2.3 The AAC Proposed Mitigations for Protection and Stewardship of Wildlife Habitat and Species

- Commitment to involve and support the AOPFN in co-developing wildlife management plans – including determining the location of protective fencing (e.g. for turtles)
- Commitment to offset and Include the AOPFN in planning and implementation of offsetting for wildlife habitats including bat and swallow habitat
- Commitment to support the AOPFN Guardians in Wildlife monitoring and adaptive management

3.3 PROTECTION AND STEWARDSHIP OF SPIRITUAL, CULTURAL, HISTORIC, ARCHAEOLOGICAL RELATIONSHIPS AND SACRED SPACES

3.3.1 Background

Table 9 Value Statements for Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces

Value Statements for Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces
1. Archaeological assessments must be done with the AOPFN. 2. Objects of spiritual, cultural, or archaeological value must not be disturbed or removed without the AOPFN permission and adherence to AOPFN protocols. 3. The AOPFN protocols must be followed and respected at spiritual, cultural, historic, archaeological, and sacred spaces. 4. The AOPFN access to spiritual, cultural, historic, archaeological, and sacred spaces must be maintained or improved.

The AOPFN's culture and heritage resources reflect the cultural, ancestral, and historical relationships of its members to the unceded unsurrendered Algonquin territory. The AAC explained that the protection and stewardship of these spaces are important, as these resources are humble reminders of the Creator, and allow for spiritual connections. For the AOPFN members, a sense of place and connection to Algonquin lands is part of their identity.

Unfortunately, the AOPFN cultural and heritage values have been disturbed by settlement and development on unceded unsurrendered Algonquin territory. Consequently, AOPFN members experience alienation from the land and limited opportunities to engage in traditional practices integral to sense of place, cultural continuity and knowledge transmission. During AMA discussions, the AAC made it clear that the alternative means chosen for the Project must ensure that access to spiritual, cultural, historic, archaeological, and sacred spaces is maintained or improved. The AAC noted that healthy cultural and spiritual relationships with the land must be preserved. To this end, the committee discussed which Project alternatives would further disturb buried artifacts, as well as the possibility of artifacts and other objects being washed down with spring freshets.

The AAC also discussed the need for the AOPFN to assert its right to self-determination, in having the AOPFN culture and heritage recognized, especially as settlement and development expands across its unceded unsurrendered Traditional territory. For instance, the AOPFN must be involved early in developments with the potential to negatively affect the AOPFN culture and heritage. An AAC member stated:

"In number seven, you have AOPFN protection and stewardship of AOPFN spiritual, cultural, historical, of archaeological resources. But protecting our Algonquin autonomy – and that comes down to being involved very early in the game so with any other projects… we need to be involved, …we have to be able to make decisions and… consult with people about… alternatives here, not just at the end of the game." (Jan 11, 2023)

3.3.2 Scoring for Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces

With this value, AAC members again selected option C as the most preferred alternative. Their next preferred option was A, and the least preferred option, B.

Table 10 AAC Scoring for Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces

Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#2 Ranking	#3 Ranking (least preferred)	#1 Ranking (most preferred)

3.3.3 The AAC Proposed Mitigations for Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces

- The AOPFN Involvement in Culture and Heritage Studies: To support the AOPFN's right to self-determination, PSPC needs to provide opportunities and funding for the AOPFN archaeological team to conduct surveys, in addition to involvement in all PSPC-led studies.
- The AOPFN Chance-Find Procedure: The Proponent (and contractors) must respect and adhere to the AOPFN's chance-find procedure.
- Funding for the AOPFN Cultural Programming: PSPC should make a financial contribution to the AOPFN cultural programming that has been established to mitigate

the loss of Algonquin culture and heritage. This contribution should be through untied funds.

3.4 THE AOPFN PROTECTION AND STEWARDSHIP OF FISH HABITAT AND FISH SPECIES

3.4.1 Background

It is crucial to the AOPFN that the Project assessment, including the AMA are conducted through the lens of members' deep relationships with fish, water, and aquatic habitat. Over the years, AOPFN members have experienced declines in the populations, sizes and quality of culturally important fish species in the Kichi Sìbì. Fish, water, and aquatic habitat are currently challenged by numerous stressors on the river, with impacts on water quantity and quality and associated health concerns for fish and other aquatic species. These observations are corroborated by past studies that the AOPFN has collaborated on (Flanders et al. 2021; Malone et al. 2021a; 2021b; Taylor et al. 2021). The studies reveal a state of degradation of aquatic habitat from the cumulative effects arising from existing dams and water control structures (in addition to other stressors) on the Kichi Sìbì. In fact, two highly important fish species to Algonquins, American eel and lake sturgeon, are currently listed as species at risk in Canada. Value statements established reflect the need to avoid harm to fish habitat and fish species at risk.

Table 11 Value Statements for AOPFN Protection and Stewardship of Fish Habitat and Fish Species

Value Statements for the AOPFN Protection and Stewardship of Fish Habitat and Fish Species
1. Fish habitat alteration or destruction (for all habitats, for all life cycles) must be avoided. 2. Fish habitat and species must be monitored, documented, and reported. 3. Fish deaths must be avoided. *4.* Any fish species at risk, must be protected.

The AOPFN Knowledge and Land Use Study (AKLUS) for the TQDRP reported that baseline studies revealed preferred fish spawning habitat for several species within the "Project Aquatic Study Area." During AMA AAC sessions, members expressed strong concerns over impacts to fish and fish habitat from the Project:

> *"Yes, I was just wondering, if that is fish habitat – if it is destroying that much fish habitat – and so much will come back – but what is it doing to fish population? Is it going to go down significantly by allowing them to repair the dam? And will it ever revive?" (January 11, 2023)*

> *"Whether they have to redo it somewhere else and do it at a ratio of 3:1 or whatever, to ensure that the fish habitat does come back." (February 8, 2023).*

AOPFN members were especially worried about impacts to fish habitat from the construction of a cofferdam, and questioned why no alternatives to the use of a cofferdam were proposed by the Proponent.

> *"My main concern is that most damage done to fish and fish habitat is because of that cofferdam." (August 29, 2023)*

> *"The thing is it's the cofferdam that is causing all the issues about the fish habitat and spawning area. The riprap is destroying it. That's what's killing it. And we mentioned it at the last meeting, that if they put a steel-plated cofferdam instead, that would eliminate a lot issues. Number A would have been my preferred. However, because they have not introduced that much [inaudible – 0:28:30.9] or even the Bailey bridge. Because they didn't look that inward, they haven't [inaudible – 0:28:36.0] the information." (September 26, 2023)*

The protection and stewardship of fish and fish habitat as a value, is also inevitably tied to water protection and stewardship, which is discussed in section 3.6. Healthy water quality and quantity is fundamentally linked to the health of all species including fish, as well as aquatic habitats. One AAC member summed it this way:

> *"I guess to summarize what you are saying – like I mean it's the protection of fish habitat and fish species. I think is a big value for us…] As well as water, protection of the water up there." (January 11, 2023)*

The AAC also found it unsatisfactory that the scopes of regulatory processes for the Project did not include the assessment of specific impacts of the cofferdam, as the design to be used depends on the contractor selected for construction. A member remarked regarding the cofferdam specifications:

> *"They haven't provided any information about why, or how they are going to do it…They are asking us to fish for information – well we don't have enough information yet to respond to it." (September 26, 2023)*

The AAC was clear that regardless of the alternative means used (and choice of contractor), the AOPFN must be consulted in designing specifications for the cofferdam. Engaging the AOPFN

is key, considering the extent of damage predicted to occur to fish and spawning habitat due to the installation and removal of a cofferdam.

While the AAC was concerned about impacts to spawning habitat, the committee found PSPC's concentration on spawning areas to be inadequate. The AAC, instead, evaluated all fish habitat (across all life cycles) in its assessment of alternatives for the Project.

3.4.2 Scoring for The AOPFN Protection and Stewardship of Fish Habitat and Fish Species

AAC members identified option C as the most preferred option, in part, due to the total spawning habitat predicted to be lost that includes temporary and permanent losses.

Table 12 AAC Scoring for AOPFN Protection and Stewardship of Fish Habitat and Fish Species

The AOPFN Protection and Stewardship of Fish Habitat and Fish Species	**Option A (Downstream)**	**Option B (Upstream)**	**Option C (In-place)**
Majority Score	#3 Ranking (least preferred)	#2 Ranking	#1 Ranking (most preferred)

3.4.3 The AAC Proposed Mitigations for Protection and Stewardship of Fish Habitat and Fish Species

- Appropriate Habitat Offsetting: Considering the amount of fish spawning habitat (and consequently fish populations) that would be destroyed, the AAC asserted that the minimum replacement ratio needs to be 3:1. A minimum of 3:1 ratio would provide a greater probability of the habitat being established and able to support thriving fish spawn. The AAC also noted that this offsetting needs to occur on the Ontario side of the dam-bridge, prior to the start of construction, for a greater chance of shortening the recovery time for fish species to be lost.
- The AOPFN Engagement on Cofferdam Design: The AAC identified the cofferdam (construction, dismantling and material(s) used) as having a huge detrimental effect on fish habitat and fish species. Since the cofferdam design is pending the selection of a contractor, the AAC is seeking a commitment from PSPC that the AOPFN will be engaged by the contractor on the specific design of the cofferdam, as well as on alternatives to the use of a cofferdam. For instance, members discussed the need to explore using a Bailey bridge or steel-plated cofferdam as an alternative.

- Support for the AOPFN Guardian Program: The AAC emphasized the need for the AOPFN Guardians to be involved in all stages of the Project, in order to support the AOPFN's stewardship roles towards fish and fish habitat.

3.5 THE AOPFN MEMBER FISHING

3.5.1 Background

Certain key resources must be sufficiently available for the AOPFN to practice their harvesting rights and engage in traditional activities within the AOPFN's unceded unsurrendered Algonquin Territory. These resources include healthy populations of fish in the AOPFN unceded unsurrendered Algonquin Territory. Due to impacts to fish and fish habitat, AOPFN members are experiencing reduced access to, and confidence in the water and fish in the Kichi Sìbì. These impacts have led to infringements on members' harvesting rights and continuity of the AOPFN cultural practices.

Despite constraints on access, fish remains a staple food source for AOPFN members. A variety of fish are harvested throughout the year within the Algonquin seasonal round. Members who participated in the Project-specific AKLUS reported twenty-one fish harvesting sites within the 25 km Project study area (Flanders et al. 2021).

During the AAC sessions for the AMA, members stressed that access to fish must be maintained for AOPFN member harvesting. The committee established the following value statements that speak to the need to protect the AOPFN harvesting rights:

Table 13 Value Statements for the AOPFN Member Fishing

Value Statements for AOPFN Member Fishing
1. Access to member fishing sites is maintained. 2. The right to fish using AOPFN stewardship responsibilities, sustainability, and accessibility (including ceremonies and trading) will remain intact. 3. Threat to fish by illegal fishing must be decreased / eliminated.

At the AAC sessions, members further noted the necessity of protecting the right to fish using Algonquin Knowledge and tradition.

> *"Yes, along the lines that fishing was used for – the fish themselves were used in ceremonies and celebrations and actually even trading and bartering with other peoples." (January 20, 2023)*

Algonquin Knowledge includes the understanding of fish spawning habitats and the patterns and preferences of specific fish species. As such, it is imperative to incorporate Algonquin Knowledge not only in the selection of alternative means for the Project, but also in the detailed design, as well as in planning and implementing appropriate mitigation measures.

Several AAC members also expressed concern over access to fishing in the Project area by non-Indigenous people.

In assessing alternative means, the AAC discussed how the different construction timelines would impact fish and the AOPFN harvesting rights.

The AAC discussed prospects of PSPC offsetting the loss of fish prior to construction, considering how long it takes to achieve productivity and the need to maintain access for harvesting by AOPFN members.

3.5.2 Scoring for the AOPFN Member Fishing

As with protection and stewardship of fish habitat and fish species, AAC members identified option C is the most preferred alternative. However, the next preferred option was A, and the least, B, in view of support for member harvesting.

Table 14 The AAC Scoring for AOPFN Member Fishing

The AOPFN Member Fishing	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#2 Ranking	#3 Ranking (least preferred)	#1 Ranking (most preferred)

3.5.3 The AAC Proposed Mitigations for AOPFN Member Fishing

- Monitoring and Enforcement: AAC members expressed concerns over threats to endangered or threatened fish species, and to AOPFN member harvesting from illegal fishing on the river. The committee spoke to the need for monitoring to ensure compliance with conservation regulations. This monitoring could involve responsible government authorities stationing a game warden or conducting digital surveillance of such areas to enforce current regulations. The AOPFN's role would involve the participation of the AOPFN Guardian monitors in compliance monitoring and reporting.

- Improving Awareness: On curbing illegal fishing, members noted that current signage in the conservation areas is not sufficient and does not contain sufficient information, as well, what signage exists is currently not in good repair. Signage on restrictions to fishing need to be updated with the AOPFN input. For instance, signage should contain supporting information, such as penalties for non-compliance, objectives, and scope of restrictions, etc.

3.6 THE AOPFN PROTECTION AND STEWARDSHIP OF WATER

3.6.1 Background

The Kichi Sìbì is an important ecological, as well as cultural landscape to Algonquin Nations, including the AOPFN. Members consider healthy water quantity and quality to be fundamental to the wellbeing of all species. As all living things depend on water, the condition of water, in turn, influences AOPFN members' way of life and is linked to Algonquin traditional practices, e.g., ceremonies, and knowledge transmission.

Table 15 Value Statements for Protection and Stewardship of Water

Value Statements for Protection and Stewardship of Water
1. Water is life, water protection is paramount. 2. Water quality and quantity must be monitored, documented, and reported, including before, after, upstream and downstream, from the construction of the dam according to best practice* 3. No harmful or deleterious substances can enter the water (including from the land or from stirring bottom sediment). 4. Water flow must protect water habitat and species. 5. Water flow must be respected and flow management be adapted to climate change.

The current Timiskaming dam-bridge is one of several water control structures on the Kichi Sìbì, that has had long-term impacts on water levels and flow. The river is currently highly impacted and the AOPFN is apprehensive about further alterations to the water level and flow as well as effects on the Ontario side due to the redirection of flow during construction. An AAC member explained:

> *"Also I'm very concerned, …once they put the cofferdam in there, …the volume and the velocity of the water on the Ontario side is humongous. …we went there in summertime, and they have cement guards to deflect the water a little bit. And they weigh tons… So – that's in the summertime. But in springtime, when it has*

excess water, what would be the mitigation, what's in place for them to go divert some water back to the Quebec side? Because the Ontario side may not be able to take all of it. What is their plan B for that?" (September 26, 2023)

A member also noted the potential for associated impacts to fish from increased flow on the Ontario side:

"I don't know how it would impact the fish because the proposed one – Quebec side… So, there is going to be more water coming out there [Ontario Side] *and that would affect fish" (August 29, 2023)*

Additionally, the Kichi Sìbì is greatly impacted by anthropogenic contamination attributed to several sources, including (but not limited to) contaminant seepage from industrial and agricultural activities. The AOPFN has repeatedly expressed its concerns over the pollution of the *Kichi Sìbì's east shoreline* by Rayonier AM Canada Industries' activities. During the AAC sessions, a member noted their concern about the TQDRP creating a direct path to this key source of pollution as well as the potential of stirring up the contaminants that may be buried or settled on the bottom of the Kichi Sìbì:

"Because, like I said, this roadway is creating – you know – a pathway to – you know that pulp plant." (January 20, 2023)

Another member spoke to the potential for degradation of cofferdam materials over time and consequent pollution of the water:

*"*So, like I said, if we are focusing specifically on the dam, *definitely the quantity and the quality of the water. So, during construction and after because, we talked about with this concrete right? Like, you know, as it starts to break down and dissolve in the water, what are the long-term consequences right?" (January 11, 2023)*

With the adverse effects of climate change increasing in prevalence, the AAC also discussed the risk of future interactions with the Project. The committee questioned the extent to which climate change informed the Proponent's assessment of alternatives. A member stated the need to ensure that the new bridge structure is durable and built to withstand extreme weather events:

"So, we know that climate change is a big factor and … when I watch the news that some infrastructure …get demolished … the headwaters can't handle the flow of stuff. Now, is this a concern? Because it will wreck whatever they are trying to build if they don't construct it high enough or good enough to withstand the flooding that might take place." (January 20, 2023)

"Because I see it happen more frequent now – that climate change is a huge factor. And I just don't want them to build it and then all of the sudden, there's an event that happens and it's gone again. And then we are starting all over from scratch again. So I don't know

how to prevent that, but I think that if you try to forecast that – climate change is real and if there is headwaters above this that can't handle, what happens? And if it totally destroys this infrastructure, then, I don't want to see that happen when we could get it done or fixed the first time." (January 20, 2023)

3.6.2 Scoring for Protection and Stewardship of Water

The AAC members selected option C as the alternative most supportive of the AOPFN's protection and stewardship of water. The next preferred option was A, and the least preferred, B.

Table 16 The AAC Scoring for Protection and Stewardship of Water

Protection and Stewardship of Water	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#2 Ranking	#3 Ranking (least preferred)	#1 Ranking (most preferred)

3.6.3 The AAC Proposed Mitigations for Protection and Stewardship of Water

A member summed the AAC's approach to managing impacts to water as follows:

"And like I said, negligible, that is a term that I just find highly offensive when we are talking about long-term projects that are going to be sitting in a waterway breaking down over time. So, I would like – you know – a little bit more information on that from them to show me long term – that it has no consequences, period. Because, like I said, even if it's an insignificant amount, it is still an amount." (January 20, 2023)

- Cofferdam Material**:** As previously mentioned, the AOPFN has serious concerns about the impacts of the proposed cofferdam, including the potential degradation of the material utilized. If a cofferdam is to be used, the material should be selected (with the AOPFN involvement) to avoid or minimize pollution and/or sedimentation.
- Water Quality and Quantity Monitoring: To support water quality and quantity monitoring following construction, sampling must be done before, during and after construction, as well as upstream and downstream of the Project site. This data is key to creating a robust and useful dataset on water quality that would, in turn, inform appropriate mitigations and water management planning. Additionally, the Proponent should support and provide funding for

the AOPFN Guardians to build capacity as they see fit and to participate in ongoing monitoring.

- Water Flow Management: The AOPFN understands that water flow planning is managed by PSPC and permitting authorities (e.g., DFO), and would like to emphasize that water flow must be protective of aquatic life and habitat. Further, the AOPFN must be involved in the planning and discussions on flow rate and flow management, as well as in monitoring and follow up.

- Climate Change Forecasting: During the detailed design for the Project, PSPC should ensure and clearly demonstrate that the durability and life expectancy of the dam-bridge are adaptive to climate change. The AOPFN notes that it is important to build a structure that is secure from increasingly frequent extreme weather events. This approach would prevent avoidable impacts on the environment and on AOPFN members, from having to rebuild due to the collapse of the structure.

- The AOPFN Water Ceremonies: In order to respect the AOPFN's stewardship role, PSPC should support the AOPFN to conduct water ceremonies, as required by Algonquin traditions.

3.7 ACCESS AND NAVIGATION ON OTTAWA RIVER

3.7.1 Background

Table 17 Value Statements for Access and Navigation on Ottawa River

Value Statements for Access and Navigation on Ottawa River
1. Access and navigation on the Ottawa river should be maintained but in balance with decreasing and eliminating illegal fishing. 2. Safe and personal enjoyment of the river must be protected or improved. 3. Respectful relationships with the river must be promoted. 4. Sensory disturbances (smells, sounds) must be avoided or reduced.

The Kichi Sìbì is a critically important site and resource for Algonquin peoples, including the AOPFN. For millennia, AOPFN members have respected and relied on the river for various needs, such as traditional harvesting, location for cultural practices, transfer of Algonquin Knowledge, etc. It goes without saying that the Kichi Sìbì is a key defining element of AOPFN's members.

As previously mentioned, the Kichi Sìbì watershed has been altered by the creation of numerous water control structures on the river. The functioning of these structures (ie., alterations of natural water flow and quantity) have inadvertently impacted the ability of AOPFN members (and other users) to navigate the river.

While this was an AOPFN-led study, AAC members repeatedly noted that we are looking out for all inhabitants and people who rely on the Kichi Sìbì.

> *"its downriver it's all the outfitting's [outfitting] people that rely on outfitting – that rely on the resources of the river. That have businesses on the river. And it's about us but it's for all those people…who rely on the Ottawa river." (January 11, 2023)*

This perspective underscored the committee's assessment of alternatives for the Project. Similarly, the AAC considered the ability of future generations of the AOPFN to access and enjoy the river.

The AAC also discussed the conditions necessary for holistic access to (and enjoyment of) the river, such as feelings of safety and security while out on the water. A member had this to say:

> *"if you go on the Ottawa river anywhere, and you just look at what we have, all people have, like the beauty, the solitude, like the solace, it's just so peaceful. I don't know how we can word it – or even a word to put in – but something like, some kind of word like respect..." (January 20, 2023)*

On safety, another member explained:

> *"I think you want to keep it safe too because you don't want to be getting hit by something coming downstream or whatever while they are constructing this right? So I think yeah, personal enjoyment kind of puts it in perspective, that whatever anybody's personal feelings are – you know – if you aren't content up there and you don't find it peaceful you are going to leave right? So, like I said, if some people are feeling like it's good like that, then your own personal enjoyment is probably good. But safety I think we have to include too because we don't want concrete like rolling down there or toxic chemicals – you know what I mean – as they are building or whatever. You don't want to be bathing in them if you happen to be swimming out there." (January 20, 2023)*

3.7.2 Scoring for Access and Navigation on Ottawa River

For access and navigation, AAC members chose option A as the most supportive of this value. Option B was the next preferred alternative, while C was the least preferred alternative.

Table 18 The AAC Scoring for Access and Navigation on Ottawa River

Access and Navigation on Ottawa River	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#1 Ranking (most preferred)	#2 Ranking	#3 Ranking (least preferred)

3.7.3 The AAC Proposed Mitigations for Access and Navigation on Ottawa River

- Support for the AOPFN Navigation and River Access: To mitigate ongoing impacts to the AOPFN access, PSPC should make a financial contribution (through untied funds) that would support the acquisition of community boats, and programs targeted at improving members' access and use of the river.

3.8 THE AOPFN GOVERNANCE AND AUTONOMY

3.8.1 Background

Table 19 Value Statements for AOPFN Governance and Autonomy

Value Statements for the AOPFN Governance and Autonomy
1. There should be no loss or degradation of AOPFN unceded Algonquin Territory. 2. The AOPFN must be involved in the stewardship, protection and conservation of the AOPFN unceded unsurrendered Algonquin Territory.

The self-governance rights of the AOPFN are defined by its ability to maintain traditional governance, land tenure, and stewardship systems, as well as participate in decision-making

processes regarding its unceded territory. Unfortunately, these inherent roles have been severely impacted and undermined by colonization and systematic dispossession of AOPFN from Algonquin lands.

During sessions for the AMA, the AAC expressed displeasure over the inadequate involvement of AOPFN in the Proponent's AMA. AOPFN appreciates the opportunity to conduct its own study as a remedy but notes that meaningful consultation means involvement right at the beginning. An AAC member had this to say:

> *"But protecting our Algonquin autonomy – and that comes down to being involved very early in the game so with any other projects, you know, we need to be involved, like you know, we have to be able to make decisions and, you know, and consult with people about, you know, alternatives here, not just at the end of the game. So, in there somewhere our autonomy is very important as a value to us so that we are not just another tick box, you know, and that we come in always at the end of the story." (January 11, 2023)*

Another member spoke to the systemic loss of land by AOPFN:

> *"I don't see anywhere in here that there's any compensation or perhaps giving other land to us for the land that they're using. Just a just a thought there. We're losing a lot of territory by granting everybody everything to build and create but we're not gaining any territory." (January 11, 2023)*

3.8.2 Scoring for AOPFN Governance and Autonomy

With AOPFN Governance and Autonomy, AAC members chose option C as the most supportive of this value. Option A was the next preferred alternative, and C the least preferred.

Table 20 The AAC Scoring for AOPFN Governance and Autonomy

The AOPFN Governance and Autonomy	Option A (Downstream)	Option B (Upstream)	Option C (In-place)
Majority Score	#2 Ranking	#3 Ranking (least preferred)	#1 Ranking (most preferred)

3.8.3 The AAC Proposed Mitigations for AOPFN Governance and Autonomy

- AOPFN Involvement in Management and Monitoring Planning: AOPFN must be involved in all planning for management and monitoring done outside of the committee. To support AOPFN's role, PSPC should ensure that adequate capacity support is negotiated with and provided to AOPFN.
- AOPFN Involvement in Contractor Selection: The AAC also emphasized the need for AOPFN to be part of the process for selecting contractors for the project, including but not limited to input in the Requests for Proposal to be done, ie., a statement outlining the need for the contractor to work with AOPFN to determine the most suitable material to be used to build the cofferdam.

4. CALCULATION OF AOPFN OVERALL RANKINGS

4.1 RANKINGS USING VALUE-SPECIFIC SCORING AND WEIGHTING

The technical team converted the rankings into numerical "points" in order to complete the weighted scoring exercise. The total score was calculated by adding up the weighted points for each alternative means. The results are shown in Table 21 below, which shows the points for each alternative means scored for each value in the grey row, and each score with the weights applied in the blue row. A number closer to one represents a preferred option while numbers approaching three represent the least preferred option.

Table 21 The AOPFN Weighted Scores for Alternative Means to Undertake the Timiskaming Dam Bridge Replacement Project

		Alternative A (Downstream)	**Alternative B (Upstream)**	**Alternative C (In-Place)**
1. Protection / Stewardship of Fish Habitat and Fish Species	Points	3	2	1
	Weighted Points: 22%	0.66	0.44	0.22
2. AOPFN Member Fishing (downstream and upstream of the site)	Points	2	3	1
	Weighted Points: 12%	0.24	0.36	0.12
3. Protection / Stewardship of Water Quality / Quantity	Points	2	3	1
	Weighted Points: 12%	0.3	0.36	0.12
4. Access and Navigation on the Kichi-Sìbì	Points	1	2	3
	Weighted Points: 10%	0.1	0.2	0.3
	Points	2	3	1

		Alternative A (Downstream)	Alternative B (Upstream)	Alternative C (In-Place)
5. Protection / Stewardship of Culturally Important Plant Species, including Member Harvesting of Plants and Medicines	Weighted Points: 10%	0.2	0.3	0.1
6. Protection / Stewardship of Wildlife Habitat and Species	Points	2	3	1
	Weighted Points: 10%	0.2	0.3	0.1
7. Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces	Points	2	3	1
	Weighted Points: 12%	0.24	0.36	0.12
8. AOPFN Governance and Autonomy	Points	2	3	1
	Weighted Points: 12%	0.24	0.36	0.12
Total		2.18	2.68	1.2

5. CONCLUSION

5.1 SUMMARY AND RECOMMENDATIONS

The AOPFN's focused review of the alternatives which included strong consideration of Algonquin Knowledge as well as consideration of the western science available has identified Option- C as the most protective of AOPFN values and AOPFN's preferred alternative. The AOPFN is supportive of Option C. If the ultimate location differs from AOPFN's preferred option, The AOPFN have included a non-exhaustive list of necessary mitigations to ensure protection for critical AOPFN values. Proposed mitigation measures are summarized in Table 22.

Table 22 Summary of AOPFN Comments and Recommendations for the TQDR Project

Values	**Value statement(s)**	**AOPFN Comments and Recommended Mitigations**

AOPFN Protection and Stewardship of Fish habitat and fish species	• Fish habitat alteration or destruction (for all habitats for all life cycles) must be avoided
	• Fish habitat and species must be monitored, documented, and reported
	• Fish deaths must be avoided
	• Any fish species at risk, must be protected
		"The coffer dam they are proposing, is basically touching spawning grounds of fish coming out of – out of Gordon creek. And that is, and I forget if you wrote it somewhere, is a very important spawning ground for that specific area. So that's where the coffer dam I've been saying it's a very destructive, and unnecessary."
		• **Greater Habitat Offsetting:**
		  ○ **Commitment for Minimum 3:1 offsetting of fish spawning habitat**
		  ○ **Add more habitat on Ontario side BEFORE construction begins**
		• **Commitment that PSPC will facilitate engagement with Contractor on cofferdam design to minimize disturbance on fish and fish habitat**
		•
		• **Support for AOPFN Guardians Program**

Values	Value statement(s)	AOPFN Comments and Recommended Mitigations
AOPFN Member Fishing (downstream and upstream of the site)	• Access to member fishing site is maintained • The right to fish using AOPFN stewardship responsibilities, sustainability, and accessibility (including ceremonies and trading) will remain intact. • Threat to fish by illegal fishing must be decreased/eliminated.	• **Guardian participation in preventing illegal fishing** ○ **During the site-visit, we saw illegal fishing. "If we want to really crack down on things - we need to have someone like a game warden stationed there or remote way of reporting and enforcing…"** • **Signage for restricted fishing needs to be updated with AOPFN input:** ○ **There is a signage, but it just says "restricted fishing" with no explanation of the penalty - needs to be changed to deter folks** •
AOPFN Protection and Stewardship of Water (quality and quantity)	• Water is life, water protection is paramount. • Water quality and quantity must be monitored, documented, and reported, including before, after, upstream and downstream, from the construction of the dam according to best practice • No harmful or deleterious substances can enter the water (including from the land or from stirring bottom sediment)	*Even though PSPC considers impact to water to be negligible this is not adequate to AOPFN. It is offensive - this is an infrastructure that will be there for a long time. Even if it isn't a significant amount it is still an amount* • **Capacity and funding support for AOPFN Guardians to participate in water monitoring measures:** ○ **Before, during, after, upstream and downstream water quality and quantity**

Values	Value statement(s)	AOPFN Comments and Recommended Mitigations
	• Water flow must protect water habitat and species • Water flow must respect and be adapted to climate change	**sampling at least three times annually. This needs to happen before the dam is in place and long after to help build a better dataset about water quality both upstream and downstream.** ○ **Funding for water sampling and capacity development for Guardians as they see fit.** • **Commitment to ensure climate change is addressed in detailed design and used to evaluate the life expectancy of the dam.** • **Flow Management: PSPC does work with DFO to determine flow. They are advised to maintain the protection of fish. It is under a management plan and AOPFN needs to be involved in these discussions** • **PSPC support for Water ceremony or ceremonies**
AOPFN Protection and Stewardship of Culturally Important Plant Species, including Member Harvesting of	• Culturally important plant species must not be harmed or destroyed • Any culturally important plant species that are harmed or destroyed must be offset at a higher amount than what was harmed / destroyed.	*Mother Earth gave us all these medicinal plants for our mind, body and soul. Sacred plants are our unique pathway with the creator.* *As long as it is available, it provides value.*

Values	Value statement(s)	AOPFN Comments and Recommended Mitigations
Plants and Medicines	• The right to harvest culturally important plants using AOPFN stewardship responsibilities, sustainability, and accessibility (including ceremonies and trading) will remain intact.	• **Monitoring of culturally important plants: Support for AOPFN Guardian pre-construction surveys** • **Offsetting for wetlands and plant life loss with collaboration with AOPFN on offsetting planning and implementation** • **PSPC commitment for native planting, creation of wider "natural" riparian zone (avoid manicured lawn) supportive of a "greener" shoreline (e.g., gentler slope perhaps with less shoreline hardening with riprap).**
AOPFN Protection and Stewardship of Wildlife Habitat and Species	• Wildlife access to water must be maintained • Wildlife habitat must not be altered or destroyed • Threat to wildlife by illegal hunting / accidental death must be decreased/eliminated.	*The Algonquin people fully understand the concept that all living things are intertwined with each other. Without wildlife habitat, no wildlife.* • **Commitment to involve and support AOPFN in co-developing wildlife management plans – including locating protective fencing (e.g. for turtles)** • **Commitment to offset and Include AOPFN in planning and implementation of offsetting for wildlife habitats including but not limited to, bat and swallow habitat.**

Values	Value statement(s)	AOPFN Comments and Recommended Mitigations
		• **Commitment to support AOPFN Guardians in Wildlife monitoring and adaptive management**
AOPFN Protection and Stewardship of Spiritual, Cultural, Historic, Archaeological Relationships and Sacred Spaces	• Archaeological assessments must be done, with AOPFN • Objects of spiritual, cultural, or archaeological value must not be disturbed, removed without AOPFN permission and respecting AOPFN protocols • AOPFN protocols must be followed and respected at Spiritual, Cultural, Historic, Archaeological, and sacred spaces • AOPFN access to Spiritual, Cultural, Historic, Archaeological, and sacred spaces must be maintained or improved.	*The protection and especially the stewardship of these spaces is a humble reminder of Who created us, and where we find spiritual places to give thanks. Archeological places are physical and tangible proof that our ancestors were indeed here, and our ceremonies and celebrations originated from them. It's a continuous reminder that what we have today was only possible through their lives and deaths.* • **Support for AOPFN involvement in Culture and Heritage studies** • **Respect for and implementation of AOPFN's Chance Find Procedure** • **Capacity for AOPFN cultural programming through untied funds**
AOPFN Governance and Autonomy	• There should be no loss or degradation of AOPFN unceded unsurrendered Algonquin Territory • AOPFN must be involved in the stewardship, protection and conservation of AOPFN unceded Algonquin Territory	*The necessity of proponent's engagement in AOPFN Cultural and Sensitivity training to promote respectful relations.* [AOPFN governance and history need to be respected] • **Support for involvement of AOPFN in development and**

Values	Value statement(s)	AOPFN Comments and Recommended Mitigations
		implementation of all management and monitoring plans. • **Involve AOPFN in Contractor selection process**
Access and Navigation on Ottawa River	• Access and navigation on the Ottawa river should be maintained but in balance with decreasing and eliminating illegal fishing • Safe and personal enjoyment of the river must be protected or improved • Respectful relationships with the river must be promoted • Sensory disturbances (smells, sounds) must be avoided or reduced.	*Navigation on the Ottawa River gives the Algonquin people a deep understanding, not only of the magnitude of traditional lands but more importantly its sheer beauty. One must experience it by navigating it by canoe or a kayak. By doing so, we are once again connected with the Creator and Mother Earth with all its splendor.* • **Capacity for AOPFN navigation and river access through untied funds which could support community boats, youth river programs or other programs supporting community use of the river.**

5.2 CLOSURE

Should you wish to discuss any aspect of this Report further, please do not hesitate to contact Michelle Galoni, Project Coordinator for The Algonquins of Pikwakanagan First Nation.

6. REFERENCES

Flanders, Dave, Wakely, Michael, and Urban Systems Ltd. 2021. “Report for Algonquins of Pikwakanagan First Nation AOPFN Knowledge and Land Use Study.”

Malone, Molly, Firelight Research Inc., and Algonquins of Pikwakanagan First Nation. 2021a. “Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories’ Near Surface Disposal Facility Project [NSDF].”

Malone, Molly, Firelight Research Inc., and Algonquins of Pikwakanagan First Nation. 2021b. “Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories’ Nuclear Power Demonstration [NPD] Closure Project.”

Morrison, James. “Algonquin history in the Ottawa River watershed.” *Cultural Heritage* (2005): 17-32. https://new-wordpress.algonquinnation.ca/wp-content/uploads/2015/08/algonquin-history-james-morrison-sicani-oct-2006-revisedpublic.pdf

Taylor, Laura, Mayberry, Allie, Culver, Leah, Shantz, Joanne, Benson, Swayze, Ken, and Holmes, Joan. 2021. “Algonquin Knowledge and Land Use Study for the NPD and NSDF Projects Community Report”.

APPENDIX L – AOPFN STUDIES

L-2: AOPFN Socio-economic Impact Assessment

THE ALGONQUINS OF PIKWAKANAGAN FIRST NATION TIMISKAMING QUÉBEC DAM-BRIDGE REPLACEMENT PROJECT SOCIO-ECONOMIC IMPACT ASSESSMENT

November 14, 2023

Non-Confidential Report by the Algonquins of Pikwakanagan First Nation

Algonquins of Pikwakanagan First Nation

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The Algonquins of Pikwakanagan First Nation Timiskaming Québec Dam-Bridge Replacement Project Socio-Economic Impact Assessment

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With Assistance From:

Firelight Research Inc.

Submitted to:

Public Services and Procurement Canada

Thanks and acknowledgements go to Algonquins of Pikwakanagan First Nation members, Elders, Knowledge Holders, staff, and leadership who contributed. This report could not have been completed without their support and expert knowledge.

Disclaimer:

The information contained in this report is based on research as well as published works and archival research. It reflects the understandings of the lead authors and is not intended to be a complete depiction of the dynamic and living socio-economic and cultural systems or local knowledge regarding community conditions maintained by AOPFN members. It may be updated, refined, or changed as new information becomes available. All information from primary data is based on surveys, interviews, and correspondence with AOPFN members, conducted within the limits of time, budget and scope. The information contained herein should not be construed as to define, limit, or otherwise constrain the Aboriginal rights of the Algonquins of Pikwakanagan First Nation or any other First Nations or Indigenous peoples.

EXECUTIVE SUMMARY

The Algonquins of Pikwakanagan First Nation (the AOPFN) retained Firelight Research Inc. to work with the AOPFN staff to conduct an independent Socio-Economic Impact Assessment (the Study) in relation to Public Services and Procurement Canada's (PSPC) proposed Timiskaming Québec Dam-Bridge Replacement Project (the Project) on the AOPFN's unceded unsurrendered Traditional Territory. The purpose of the Study is to ensure that the AOPFN's socio-economic, health and wellbeing conditions; potential impacts to these conditions; desired mitigation and enhancement measures and strategies are accurately portrayed and accounted for in the federal impact assessment process. The Report will be attached as an addendum to the Socio-Economic Impact Assessment (SEIA) for the Project's Environmental Impact Statement (EIS).

This Report presents the background, methods, and findings of the Study, which focus on:

- Identification of potential socio-economic impact pathways and their implications
- Identification of programs, policies, strategies, and actions that can be taken to manage adverse socio-economic impacts; and
- Identification of potential social and economic benefits of the Project and strategies for maximizing these benefits.

This was achieved through a review of Project documents and the AOPFN's socio-economic baseline data to-date; meetings with the AOPFN Project Oversight Committee; and key informant interviews with the AOPFN staff and service providers. Capacity building of the AOPFN Consultation Office staff was a key part of this process which involved mentorship and training on interview facilitation, note-taking, and interview coding.

A summary of the findings is presented below.

Summary of Potential Project Interactions and Related Needs of the AOPFN

Employment, Training, and Procurement

- Potential Project interactions:
    - The AOPFN agreed that the project could potentially benefit The First Nation and its members through employment, procurement, and training opportunities. However, many barriers exist that need to be addressed to be able to access those benefits.
- Key needs voiced by the AOPFN:
    - Building the capacity of the AOPFN departments to support long-term goals;
    - Realizing long term benefits for training and employment, beyond the Project period;
    - Addressing barriers to employment and procurement contracting, such as accommodation, transport, discrimination, childcare, and training and

capacity, which affect recruitment, retention, and advancement; or, for businesses who faces barriers such as capacity and distance;
- Engagement with the AOPFN in all stages and aspects of planning and implementation of mitigations/enhancements to ensure their specific needs are prioritized and addressed; and
- Funding to address these needs.

Housing

- Potential Project interactions:
  - There were concerns related to housing which were mostly focused on accommodation for workers as a barrier to employment;
  - The AOPFN identified potential indirect benefits to their housing conditions through skill building and experience in construction gained through Project related training and employment;
  - Employment with the Project could also potentially indirectly benefit AOPFN member housing through increased income from Project employment which could support member's ability to pay for rent or repairs, as well as mortgage qualification and payments; and
  - There was some concern around skill or "brain drain"; that members with housing construction and repair skills could be drawn away from the community by Project employment opportunities.

- Key needs voiced by the AOPFN:
  - Building the capacity of the AOPFN Housing Department to support long-term goals; and
  - Building members skills through training and employment with the Project, which could then be brought to the community to support the AOPFN housing repairs and construction.

Culture

- Potential Project interactions:
  - The AOPFN's cultural baseline is already heavily impacted. The Project could further negatively impact culture through further damage to the land, reducing access to the land, and reducing abundance and diversity of culturally important species;
  - Harvesting and knowledge transfer could be impacted by the above;
  - Increased fishing by workers could impact species and affect ability to harvest and related knowledge transfer;
  - Destruction of archaeological resources;
  - Changes in aesthetics to Long Sault Island, could negatively impact cultural value and use; and
  - Contamination and perceived contamination of the Kichi-Sìbì, which could cause avoidance of the Kichi-Sìbì or certain areas of the river for cultural practice.

- Key needs voiced by the AOPFN:

- Protection of fish, fish habitat, aquatic species, wildlife, culturally important plants and medicines;
- Recognition of the cultural importance of Long Sault Island and the Kichi-Sìbì;
- Funding and space for ceremony;
- Support for cultural revitalization projects and the Manidò Chìmàn Museum;
- Following the AOPFN Archeological protocols and involvement in studies;
- Compensation for cumulative effects;

Health

- Potential Project interactions:
    - Wellness of the AOPFN member's is inseparable from culture and spiritual health. Impacts and needs related to culture are intertwined.
    - Damage to the land can negatively affect mental and physical health which can have further negative spinoffs around addiction, lateral violence, etc.;
    - Reduction of species diversity and abundance may impact diet;
    - Construction activities may release contaminants into the water leading to negative health impacts';
    - Perceived water contamination could increase stress and negatively impact mental wellness; and
    - There may be opportunities to benefit from the Project if the proponent agrees to support the AOPFN's health services and programs and offer employment opportunities to members experiencing mental wellness issues, addictions, or trauma.

- Key needs voiced by the AOPFN:
    - Proponent recognition of cumulative losses and commitments to compensate for them through supporting health and cultural services and programs;
    - Address transportation barriers for members living outside of Pikwakanagan to access services, programs, and events;
    - Monitoring and reporting of water quality and quantity;
    - Support for safe drinking water in Pikwakanagan; and
    - Employment for members experiencing mental wellness issues, addictions, trauma.

Summary of Recommended Mitigation and Enhancement Measures and Strategies

Mitigation and enhancement measures identified by the AOPFN are aimed at addressing potential Project impacts and needs identified above and supporting the AOPFN to maximize benefits around training, employment, procurement, and support long-term goals through funding and capacity building.

The study findings in Section 6 of the report detail mitigation and enhancement measures for each valued component (VC). The measures related to each of the VC's have a long-term focus and can be summarized into the following six key areas:

- Capacity Building: through training and skill-building of the AOPFN members; capital investments for the AOPFN departments and businesses; and support for the AOPFN programs and services;

- Barrier Reduction: through addressing access to employment and means to improve socio-economic wellbeing; unbundling of contracts for smaller businesses; and Cultural Awareness Training for PSPC, contractors, and subcontractors;
- Collaboration: through co-development, joint management and monitoring of mitigation and enhancement measures between the AOPFN, PSPC, contractors, and the DFO;
- Protection: to preserve and promote culture; archaeological resources; and the natural environment; and
- Monitoring and reporting: ranging across all VC's, including joint monitoring and reporting of employment, as well as, procurement targets and participation; skill and career development initiatives, success rates, and outcomes; environmental monitoring and integration of Algonquin Knowledge; and capacity building initiatives and outcomes for the AOPFN departments and programs.

The AOPFN intends to review these project interactions, mitigations and monitoring approaches in collaboration with PSPC. There needs to be strong collaboration and proactive planning to ensure that barriers are addressed, and impacts planned for. The AOPFN requires that every project in our territory result in net benefits to our people.

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ACRONYMS AND ABBREVIATIONS

AAC	AOPFN Advisory Committee
AOPFN	Algonquins of Pikwakanagan First Nation
AKLUS	Algonquin Knowledge and Land Use Study
CCP	Comprehensive Community Plan
CMHC	Canada Mortgage and Housing Corporation
EIA	Environmental impact Assessment
EIS	Environmental Impact Statement
GBA+	Gender-based analysis plus
IAAC	Impact Assessment Agency of Canada
IBP	Indigenous Benefits Plan
Firelight	Firelight Research Inc./The Firelight Group
OC	Oversight Committee
PSPC	Public Services and Procurement Canada
SEIA	Socio-economic Impact Assessment
SEWB	Socio-economic and Well-being Study
TQDRP	Timiskaming Québec Dam-Bridge Replacement Project
TK	Traditional Knowledge
TEK	Traditional Ecological Knowledge
VC	Valued Component

1. INTRODUCTION

1.1 OVERVIEW

The Algonquins of Pikwakanagan First Nation (the AOPFN) are pleased to provide this report (the Report) to Public Services and Procurement Canada (PSPC) to inform PSPC of the potential socio-economic impacts of the proposed Timiskaming Québec Dam-Bridge Replacement Project (the Project) to the AOPFN, and of the AOPFN's desired management measures. The Report documents the background, methods, and findings of the Timiskaming Québec Dam-Bridge Replacement Project Socio-Economic Impact Assessment (the Study). The Study focusses on the socio-economic impact assessment of the Timiskaming Québec Dam-Bridge Replacement Project (the Project), recommendations on mitigating the Project's impacts, and on how the AOPFN can leverage the Project to maximize its benefits, from the AOPFN's perspective.

This Report is organized into seven sections:

- Section 1 provides an introduction to the Study;
- Section 2 provides an overview of the proposed Project, as relevant to the AOPFN;
- Section 3 provides an overview of the intention and goals of the Study, including the scope of work, limitations, and methods;
- Section 4 provides an overview of the Algonquins of Pikwakanagan First Nation, including its history, geography, governance system, and culture;
- Section 5 establishes the Algonquins of Pikwakanagan First Nation's social, economic, cultural, and wellbeing values as defined by the AOPFN;
- Section 6 details the results of the Study, including the identification of project pathways and potential interactions between the AOPFN socio-economic and well-being baseline conditions and the Project, and recommendations on measures and strategies to mitigate negative Project impacts and enhance benefits;
- Section 7 concludes the study, and summarizes recommended mitigation and enhancement measures and strategies, as well as potential next steps.

2. TIMISKAMING QUÉBEC DAM-BRIDGE REPLACEMENT PROJECT BACKGROUND

Since time immemorial, Algonquin people, including the Algonquins of Pikwakanagan First Nation (the AOPFN), have occupied the unceded unsurrendered Algonquin Traditional Territory, an area which roughly corresponds with the Kichi-Sìbì (Ottawa River) watershed. AOPFN members have a strong connection to the land and waters of the Traditional Territory, including the area around what is now known as Long Sault Island. In particular, the Kichi-Sìbì remains an important location for AOPFN members with respect to spiritual significance and to carrying out traditional activities, building and maintaining family and social ties, and transferring cultural knowledge.

The Timiskaming Dam Complex was originally constructed in the early 1900s. The site is made up of two structurally independent dams adjacent to Long Sault Island: a Quebec Dam and an Ontario Dam. The Quebec Dam was reconstructed in the 1930s, while the Ontario Dam was replaced between 2014 and 2017.

The structure as a whole regulates water without generating electrical power and includes a deck that supports a two-lane roadway connecting two highways (Route 101 and Highway 63) within the provinces of Quebec and Ontario and a natural gas pipeline. Consisting of nine reinforced concrete piers, and two abutments, the Quebec portion of the dam-bridge has ten bays that can be partially or completely opened or closed to regulate water flow.

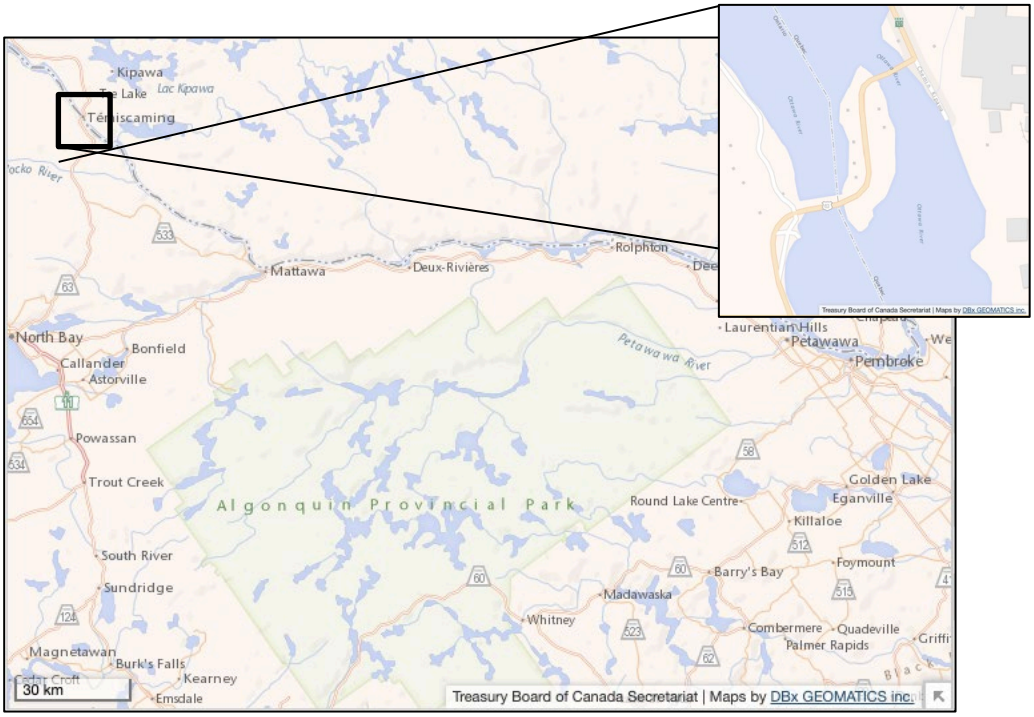


Figure 1: Location of Long Sault Island

Currently, Public Services and Procurement Canada (PSCP, or the Proponent) is in the process of rebuilding the Quebec Dam-Bridge (the Project). The Proponent is considering three alternatives for the site of the new structure: 1) upstream, 2) downstream, or 3) on the same layout as the existing dam. The AOPFN is currently providing input to assess the alternatives.

The plans for the new dam include ten bays with sluice gates to regulate water flow on the river. The Project will also require the relocation of the 2-lane roadway connecting the provinces of Quebec and Ontario (Highway 63). The Proponent is also considering the construction of a fish ladder to assist fish to freely pass the new dam. The Project is currently in the design phase. Construction is anticipated to begin in 2026 and take approximately 30 months to complete.

In 2018, the Impact Assessment Agency of Canada (IAAC) initiated an *Environmental Assessment* (EA) of the Project. The AOPFN, on its own and through its members, has provided comments at many stages along the EA process. These comments have been provided both in writing and through in-community meetings facilitated by the Proponent.

The AOPFN has and continues to express concerns about the EA process in terms of inadequacies around integration with Algonquin knowledge and assessing impacts to Aboriginal rights. Concerns have also been raised around the assessment of baseline socio-economic conditions and impact significance ratings, including those related to cumulative effects.

3. STUDY BACKGROUND

3.1 IMPACT ASSESSMENT

On April 3, 2023, IAAC issued its *Environmental Impact Statement* (EIS) for the Project. The EIS includes a description of the potential environmental effects of the Project, including to water quality, air quality, vegetation, and wildlife habitat, as well as to cultural, health, and socio-economic conditions.

To develop a socio-economic baseline, the Proponent and their consultants completed a baseline through document review and interviews with the AOPFN Economic Development staff in 2019. The information and data utilized was revisited following a meeting with the AOPFN Advisory Committee (AAC) in August 2021. The AOPFN and the AAC met with the Proponent on two separate occasions to discuss the socio-economic and health baseline (August 2021) and the Proponent's determination of impacts and mitigations (Spring/Summer 2022).

The primary concerns to come out of these engagements was the degree to which the AOPFN was consulted, the representativeness of data, and the degree to which the AOPFN was able to determine how the project would impact social, economic, health and cultural values. PSPC agreed to support a Socio-economic baseline study led by the AOPFN to fill these gaps. As the EIS has already been accepted by IAAC, study results will be filed as an addendum during the environmental assessment phase.

3.2 STUDY SCOPE

The AOPFN retained Firelight to work with the AOPFN staff to conduct an independent socio-economic and well-being study of the Project's impacts. The purpose of the Study is to ensure that the AOPFN's baseline data related to the AOPFN's socio-economic, health and wellbeing conditions are accurately portrayed and potential impacts, mitigations, and benefits to the AOPFN are accounted for in the federal impact assessment process. The Report will be attached as an addendum to the Socio-Economic Impact Assessment (SEIA) for the Project's Environmental Impact Statement (EIS).

This work had three intended outcomes:

- Outcome 1: Review the Project and identify the socio-economic impacts and their implications;
- Outcome 2: Identify programs, policies, strategies and actions that can be taken to manage socio-economic impacts; and
- Outcome 3: Identify benefits of the Project and how these can be maximized.

To achieve these outcomes, the AOPFN Consultation Office with assistance from Firelight performed the following:

1. Background research from relevant reports, the AOPFN-specific documents, and publicly available data;
2. Met with, presented to, and received guidance from the AOPFN Socio-Economic Oversight Committee (OC);
3. Received training on interview facilitation and note-taking, and interview coding;
4. Developed community-driven methodology, including engagement approaches, as well as focus of questions and wording;
5. Collected data through four (4) key informant interviews;
6. Analyzed interview data, and developed a report based on this and existing information collected from other studies, reports and publicly available data; and
7. Presented the findings to the OC, and Chief and Council for review and verification.

3.3 METHODS

The following section summarizes the methods employed to achieve the Study goals.

All methods were developed by the AOPFN Consultation Office staff with assistance from Firelight. Meetings were held with the Firelight research team on an *ad hoc* basis.

This study is based on primary and secondary data sources, which were collected through the following means:

- Document review;

- Documents sourced from internally from the AOPFN staff, and the Proponent's Environmental Impact Statement (EIS);
- The AOPFN Oversight Committee meetings; and
- Key informant interviews with the AOPFN staff and socio-economic and wellbeing topical experts.

3.3.1 Capacity Building

One of the goals of this work was the continued support in capacity building for the AOPFN with respect to the Impact Assessment process. In this context, capacity was developed in relation to skills, and community engagement.

With respect to skills, the proposal for this study was developed on the condition that meetings, interviews, and parts of data analysis would be led by the AOPFN. Therefore, Firelight supported the development of materials for the above (i.e., slides for meetings, interview guides and interview coding tables), as well as provided training on the following:

- Interview facilitation and note-taking; and
- Interview coding.

Guides were developed for the above training, and recordings were made for training sessions, as they were held virtually, as a resource for this study and future work in socio-economic impact assessment interviews and data analysis.

3.3.2 Document Review

A primary concern from the AOPFN to the Proponent was the inadequacy of the baseline data collection undertaken for the EIS, which affects the assessment of potential impacts. Part of the work for this study was to review the AOPFN's comments to the Proponent and assess what relevant, available information the AOPFN has, and what other data sources are available to address gaps.

A full list of resources is included in Appendix 1, and a Baseline Data Gap Analysis is found in Appendix 7.

3.3.3 The AOPFN Oversight Committee

An Oversight Committee was established by the AOPFN for this study and future socio-economic and wellbeing impact assessments that the AOPFN are involved in, in a regulatory context. This standing committee is composed of a cross-section of AOPFN members (youth, elders, men, women, and those living on/off reserve).

Their purpose may vary by study, but for this work, the Oversight Committee was met with to:

- Comment on the adequacy of impact pathway identification, mitigation and monitoring, and significance of impacts, as determined by the Proponent;

- Recommend key informant interviewees; and
- Verify recommendations determined from data analysis.

The Oversight Committee has 9 active members. What follows is a list of meetings, their topical focus, date, and attendees.

Table 1: List of Oversite Committee meetings

the AOPFN Oversight Committee meeting topic	**Date**	**Number of committee members present**
Introduction to the study, and the consultation process between the AOPFN and PSPC.	June 16, 2023	7
Discussion on impact pathways, monitoring and mitigation and significance of impact determinations: Employment, training, and procurement.	June 23, 2023	4
Discussion on impact pathways, monitoring and mitigation and significance of impact determinations: Connections to land and culture	July 13, 2023	3
Discussion on impact pathways, monitoring and mitigation and significance of impact determinations: Traditional economy, activities, and subsistence	July 20, 2023	3
Verification of recommendations	October 11, 2023	3*

*OC members who were absent were sent a full list of mitigations and enhancement measures to review and provide comment on.

3.3.4 Key Informant Interviews

Key informant interviews with the AOPFN staff and services providers were implemented for this study to inform baseline data gaps; the AOPFN needs by valued component or service area (e.g., housing); and identify potential impacts, existing services or programming in place to maximize positive impacts and minimize negative ones, and other mitigations or enhancements that should be in place.

Given interviews were with specific service providers or departmental staff, individual interview questions were developed and tailored to each interviewees line of work and the related valued components to the AOPFN regarding the proposed Project. The interview Guide is included in Appendix 6.

A total of five (5) interviews were held across August to September 2023 with key informants in the knowledge areas of housing, land stewardship and monitoring, health, and economic development. Interviews were facilitated by the AOPFN Consultation Office staff, and note-taking as well, when possible. In the absence of staff for notetaking, transcription was performed by the AOPFN Consultation Office staff.

3.3.5 Coding

Following key informant interviews, a coding table was developed to analyze interview notes and transcripts.

The coding table was developed through a deductive approach (i.e., a top-down approach), where previously identified the AOPFN Socio-Economic and Wellbeing values informed the coding table, as described in Section 5. A high-level of categories were used to classify data as ‘baseline’, and project or non-project specific ‘opportunities’. Sub-categories, applicable to all of the higher-order coding categories applied to either the AOPFN valued components or ‘resources’ or ‘mitigations’.

3.3.6 Verification

For this study, verification was performed with the Oversight Committee. A meeting on October 11th took place to present and review all mitigation and enhancement measures that had come out of the coding and analysis of meeting notes and key informant interview notes.

A total of three (3) Oversight Committee members were present for this meeting. However, a handout of all mitigation and enhancement measures were sent to OC members who were unavailable that day, for review and comment.

On October 27th findings of this study were presented to the AOPFN Chief and Council for their review, comment and approval. Direction was received to take these findings to the Proponent to inform mitigations and enhancements that need to be in place for this proposed Project from the AOPFN perspective.

3.3.7 Limitations

This study investigates and evaluates impacts on the AOPFN valued components that are relevant to the proposed Project. Therefore, not all valued components relevant to the AOPFN are included in this study, which also applies to the AOPFN socio-economic and wellbeing valued components. For a broader scope of the AOPFN socio-economic and wellbeing valued components please see the AOPFN Socio-Economic and Well-Being Baseline Study (2023), the AOPFN Comprehensive Community Plan (2021), and Appendix 4. Baseline, in the context of this study is a reflection of current or modern conditions and does not reflect a pre-industrial or preferred baseline. For further information on cumulative effects with respect to this proposed project, refer to the 2022 Cumulative Effects Study by the AOPFN.

Information gathered is based on data and knowledge from relevant AOPFN-specific sources, secondary sources, as well as the members of the OC and Key Informant Interviews (i.e., the methods employed in this study). Interviews, committee meetings and literature reviews were the methods used to collect information, from which recommendations and findings were developed. Due to budgets and timelines for this study and the regulatory process it is operating within, there is a limit to knowledge and information gathered from AOPFN members and staff that could further inform the baseline, impact pathways, and mitigations and enhancement measures. Therefore, relevant data or information may be missing as a result of an absence of reporting, methods employed, and members included in this study.

Nothing in this report should be construed as to waive, reduce, or otherwise constrain the AOPFNs rights within, or outside of, regulatory processes. Nor should this Report be construed as to define, limit, or otherwise constrain the Aboriginal or Treaty rights of other First Nations or Aboriginal peoples. It should not be relied upon to inform other projects or initiatives without the written consent of the AOPFN.

This report is non-confidential and intended for consideration by PSPC. All data included in this Report is the property of the AOPFN and may not be used or reproduced without the written consent of the AOPFN.

4. THE ALGONQUINS OF PIKWAKANAGAN FIRST NATION BACKGROUND

4.1 BACKGROUND/HISTORY

The Algonquins of Pikwakanagan First Nation call themselves Omàmiwinini in their language, meaning “down-river people”. Another term used to describe them is Anishinabek, meaning “original peoples” or the “good humans” (Dick, n.d.).

Since time immemorial, Algonquin people, including the Algonquins of Pikwakanagan First Nation (the AOPFN), have occupied The Algonquin Traditional and unceded unsurrendered Territory, an area which roughly corresponds with the Kichi-Sìbì (Ottawa River) watershed. Historically and today, Algonquins lived on both sides of the Kichi-Sìbì, now delineated by the political boundary between Ontario and Quebec.

The AOPFN members have a strong connection to the land and waters of the Traditional Territory, including the area around what is now known as Long Sault Island. In particular, the Kichi-Sìbì remains an important location for The Algonquin people with respect to spiritual significance and to carrying out traditional activities, building and maintaining family and social ties, and transferring cultural knowledge.

Algonquin peoples traditionally lived by fishing, hunting, and gathering, organized in small family-based groups, practicing seasonal round within their territory and coming together in larger groups in the summer (Holmes 1993; Morrison 2005).

> *“They took what they needed and displayed gratitude. Climate and available materials dictated clothing. The Algonquin people prepared hides for clothing, made birch bark containers for cooking and food storage, and built homes for shelter. Hide,*

sinew, fur and quillwork were used in clothing production with the addition of cloth and glass beads post-contact. We formed tools to make canoes, snowshoes and toboggans for transport, and to make bows, arrows, snares, spears, hooks, and nets for trapping, hunting, fishing and defense, all out of the natural materials in the surrounding environment, with the exception of those materials that were traded from neighbouring Nations. During the summer months we would gather in groups along the river to fish, hunt and socialize. When winter arrived, we separated and spread out into small hunting camps made up of large related families." (Dick, n.d., 6).

First contact with settlers occurred in the early 1600s when the Algonquin peoples met French explorer Samuel de Champlain on the Kichi-Sìbì near the present city of Pembroke (Howe n.d.). Early relations were highly motivated by the competitive fur trade, as well as rapidly developing alliances between neighbouring Indigenous groups and arriving English and Dutch colonists (Howe n.d.). This led to an initial alliance between the Algonquins and French colonists that protected Algonquin travelling along the Kichi-Sìbì from the Iroquois Confederacy (Mohawks, Oneida, Onondaga, Cayuga, and Seneca) and which precluded competition for the French from Dutch and English traders (Howe n.d.).

After the French were defeated (1759), the British specified in the 1763 Royal Proclamation that 'the Indians should not be molested on their hunting grounds' and asserted "Dominion" lands could only be occupied or used by non-Aboriginals if there was a treaty in place. Despite this promise, by the late 1800s, many Algonquins ended up settling at Pikwakanagan (now the AOPFN), a summer village site, due to ongoing privatization of the land (Holmes 1993).

Algonquins survived many decades of oppression, discrimination, land dispossession, disease, and crimes against them brought by European colonialism since first contact in Algonquin lands nearly 500 years ago. Despite experiencing decades of devastation, the AOPFN remains strong and proud, realizing and continuing to work towards many positive developments for its membership. The AOPFN claims Aboriginal Title and Rights throughout Algonquin territory, and has never ceded, surrendered, or released any Algonquin Title and Rights. The AOPFN actively represents the interests of over 3,000 members in modern-day treaty negotiations.

4.2 GEOGRAPHY

Algonquins of Pikwakanagan First Nation is located on the southeast shore of Golden Lake, and on the Bonnechere River in Renfrew County, Ontario. It is located off Highway 60, 1.5 hours west of Ottawa and 1.5 hours east of Algonquin Park. It is the only federally registered Algonquin First Nation community in Ontario. Internal AOPFN records identify the registered population as 3,592, with approximately 10% of members living at Pikwakanagan. Many members who live outside of Pikwakanagan reside in communities including Eganville, Bonnechere, Antoine, Mattawa/North Bay, Deep River, Pembroke, Eganville, Renfrew, Mississippi Mills, Ottawa, Sharbot Lake, Smith Falls, Ardoch, Bancroft, and Whitney.

The original Pikwakanagan reserve was established in 1873 in a purchase from Ontario by Canada after persistent petitioning by the Algonquin people. An additional 78 hectares of private land was purchased and added to the reserve by the Department of Indian Affairs in 1948. Algonquins of Pikwakanagan was formerly known as Golden Lake

reserve #39. The official name change to the Algonquins of Pikwakanagan was made on January 31st, 2012, and the addition of "First Nation" was made on February 10th, 2015 (Dick, n.d.).

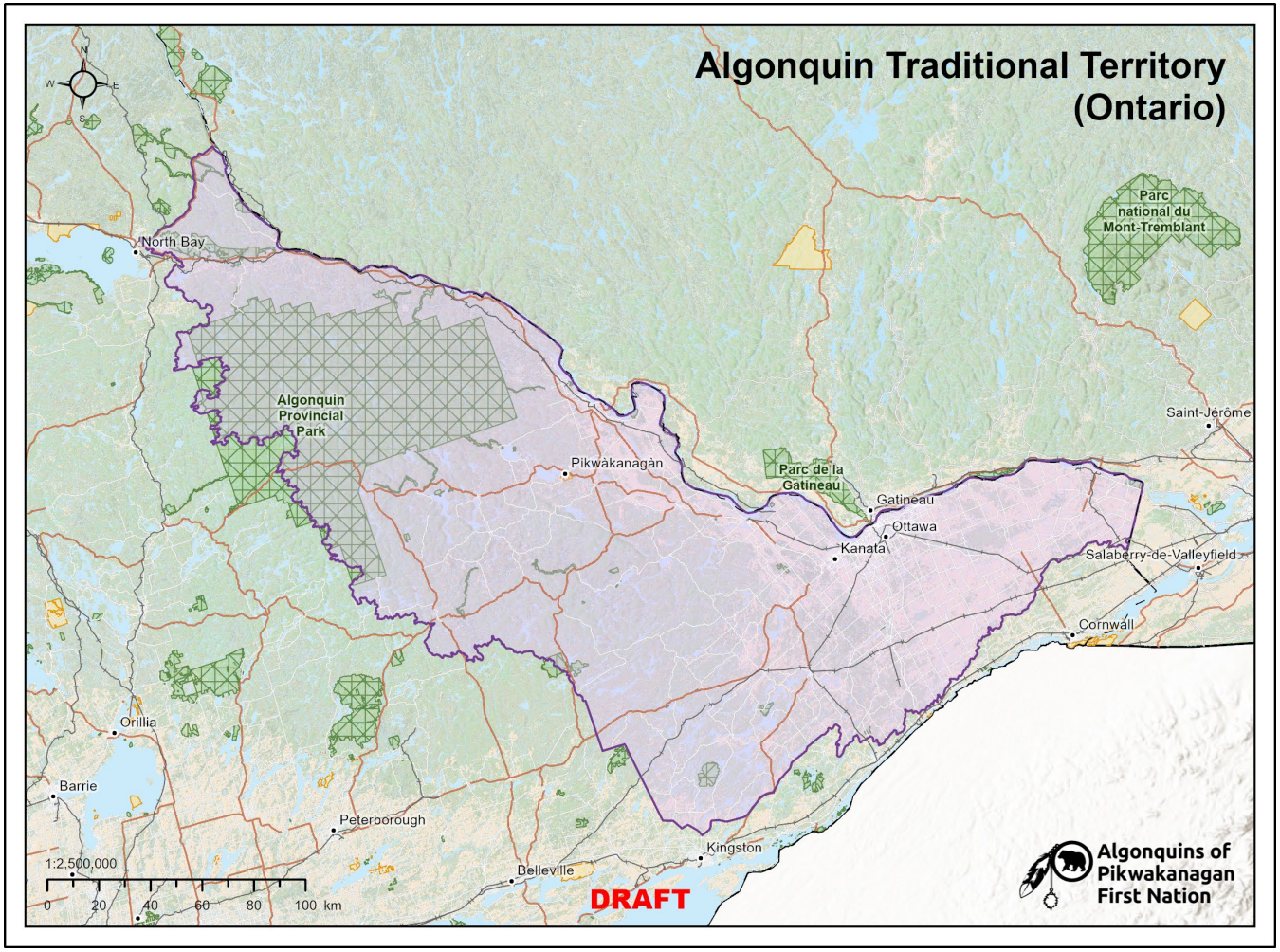


Figure 2: Map of the AOPFN Unceded Unsurrendered Traditional Territory

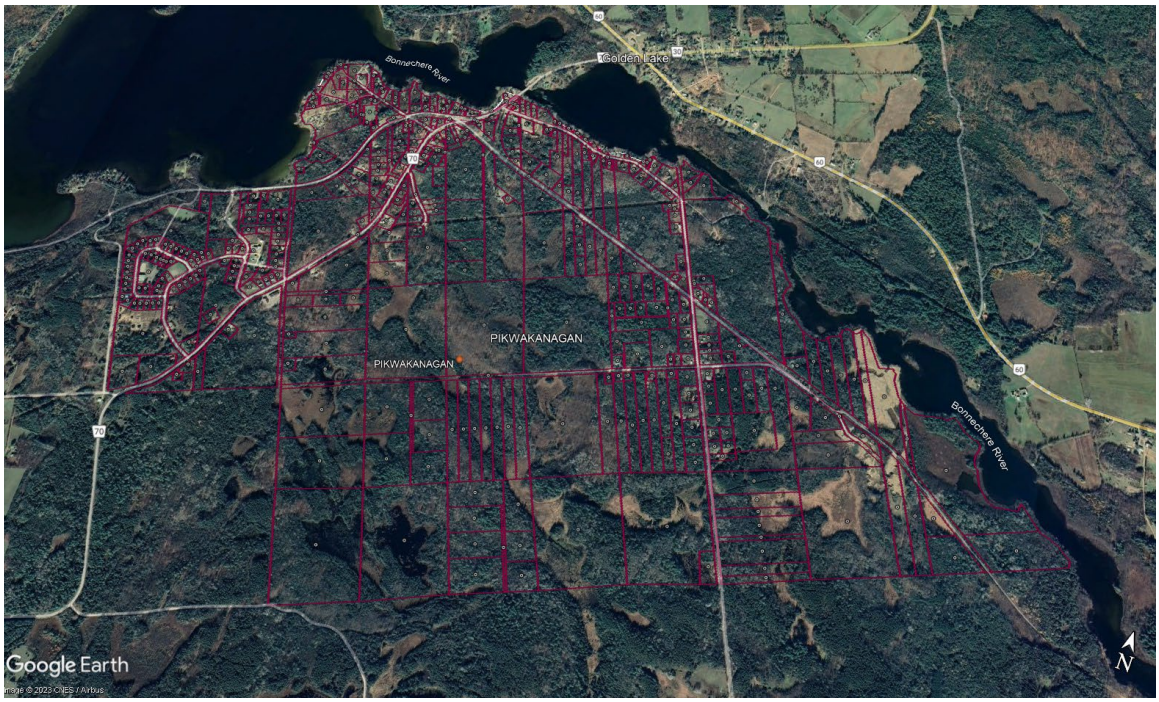


Figure 3: Map of the AOPFN

4.3 INDIAN DAY SCHOOL AND RESIDENTIAL SCHOOLS

Residential schools were built across Ontario and Canada. Some children from the AOPFN attended these schools, as there was a national policy in which each Indigenous child was forced to attend, in an attempt to assimilate Indigenous people into the Canadian mainstream society. In some cases, AOPFN members did not attend formalized schooling at all, in order to avoid residential school.

> *"Some of our children were sent away to the Catholic residential school at Spanish and were subjected to the physical and sexual abuse and isolation that residential school is now known for. In this school system, they cut off our hair, separated the boys from the girls, punished us for speaking our language, and for waving at brothers or sisters from our own families. We were dressed in the way they believed white children should dress, and the girls were trained to be kitchen help and boys to be farm hands. We were always hungry there, and some of us took apples from the root cellar to eat because we were never given any. We were cut off from our families, their caring, and the experience and stories that could teach us our traditions and history. Some of us stayed a long time, came back, and are sad remembering those times." (Dick, n.d., 26).*

These attempted assimilation processes, among others, have undoubtedly affected and continue to affect socio-economic conditions, well-being, and cultural continuity for the AOPFN members and presumably all First Nations today.

4.4 GOVERNANCE

Algonquin governance practices extend back to the time prior to and around early settlement. The following characteristics, as documented by Malone et al. (2021), are of note and provide context for how the AOPFN members currently view their governance and stewardship rights:

- Algonquin ancestors moved about their territories seasonally to various permanent sites;
- Territories were divided by family-based landholdings, the boundaries of which citizens understood and respected, and descendants in present day have noted that accessing allocated family hunting grounds for Algonquin foods is part of their heritage, and a practice passed on from generation to generation.
- These family-based land tenures included, besides access to hunting and harvesting, the duty to steward the land to ensure continuity of resources for future generations, protect against encroachment, and manage who had permission to travel through the lands;
- Algonquin ancestors charged tolls for passage along the Kichi-Sìbì, and issued leases and collected rents from settlers; and
- Algonquin ancestors never surrendered or ceded title to their traditional territories.

Today, Pikwakanagan is governed by one Chief and six Councillors, which are elected every three years by the voting membership of the AOPFN, under a custom election code passed by referendum in 2009. The Chief and Council are accountable and report to the members of the AOPFN. The Chief and Council's mission is "To provide effective and fair Algonquin Government for the benefit of the First Nation." (AOPFN website, 2023). Pikwakanagan's programs and services are overseen by the Executive Director of Operations, under direction of the Chief and Council. All persons must apply for membership to be eligible for benefits related to such services. Membership is managed by The Manager of Band Governance, who acts as a Registrar for the Membership Code and Residency Law (AOPFN website, 2023).

The AOPFN members have a cohesive understanding of Algonquin governance, stewardship principles, and visions for how these principles can be incorporated into contemporary practices. This understanding is grounded in the Seven Grandfather Teachings (also known as the Seven Sacred Teachings; see Section 4.5 and Appendix 2) and is also outlined in the AOPFN's "Vision Statement" (Appendix 3), which demonstrates the AOPFN vision for governance and stewardship under the principles for Algonquin Land, Rights, and Jurisdiction; Algonquin Government; Self-sufficiency and Self-determination; and A Healthy, Natural, Sustainable Environment.

4.5 CULTURE

Algonquin culture is grounded in an Anishinaabe philosophy that provides principles and values for good governance known as the Seven Grandfather Teachings. The Seven

Grandfather Teachings are respected by Algonquin leadership, whose duties and responsibilities are guided by the spirit and intent of the teachings.

Table 2: Seven Grandfather Teachings

Gwayakwaadiziwin (honesty)	Honesty in facing a situation is to be brave.
Dabaadendiziwin (humility)	Humility is to know yourself as a sacred part of Creation.
Minaadendamowin (respect)	To honour all Creation is to have respect.
Aakode'ewin (bravery)	Bravery is to face the foe with integrity.
Nibwaakaawin (wisdom)	To cherish knowledge is to know wisdom.
Zaagi'idiwin (love)	To know Love is to know peace.
Debwewin (truth)	Truth is to know all of these things.

In accordance with their teachings, Algonquin people ensured that the lands and waters within their territory were healthy and continued to provide for them by actively looking after and protecting the waterways, habitat, plants, birds, fish, and land animals. This philosophy is still maintained today. As stated on the AOPFN website (2023):

"Our philosophy is to only take what you need; give in order to receive; recognize that you are an equal part of all that is; be thankful for everything that you get."

AOPFN members traditionally speak Anishinaabemowin, a Central Algonquin language similar to other Algonquin languages like Cree and Shawnee. Anishinaabemowin is spoken throughout the unceded unsurrendered Algonquin territory with varying dialects.

The history of colonization including the dispossession of Algonquin lands and cultural rights has significantly impacted AOPFN member's abilities to maintain an Algonquin way of life and is intrinsically intertwined with current day socio-economic and well-being conditions. For a more complete ethnohistory of the Algonquins of Pikwakanagan, including historical governance structure and experience with colonization, please see the Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Closure Project, prepared by Malone et al. (2021), and the Algonquins of Pikwakanagan First Nation Diet and Harvest Study by Fediuk et al. (2021).

5. ESTABLISHING THE AOPFN VALUES FOR THE STUDY

The AOPFN completed a Comprehensive Community Plan (CCP) in 2021. The CCP is a strategic planning document that addresses a range of important planning themes and outlines the current needs and aspirations of AOPFN members, as well as establishing priorities, goals, and actions and initiatives needed to achieve those goals within the next 10 to 20 years. AOPFN members living within and outside Pikwakanagan were engaged throughout the CCP development process to ensure its contents are representative of its membership. A summary of values and priorities listed in the CCP is included in Appendix 4.

In April 2023, the AOPFN completed a Socio-economic and Well-being Baseline study (SEWB) in which the research team extracted community values and priorities from the CCP relevant to socio-economic and well-being conditions. The selected values were verified by the AOPFN Consultation Department staff, Economic Development staff, and the AAC to ensure that values and related indicators used captured what the AOPFN found meaningful within the scope of the SEWB. The values identified in the SEWB were cross referenced with what was noted by the AOPFN in consultation and review of the TQDRP and were also used to inform this Study.

The final list of priority values derived from the CCP and considered in the Study are:

- Education and training
- Economic prosperity and employment
- Housing and infrastructure
- Culture and language
- Social well-being
- Health
- Community safety
- Unity and communication

For data collection purposes, and for the organization of this Report, the topics above were themed into the categories listed in Table 2.

Table 3: The AOPFN priority values

Valued Components	Values listed in the CCP
Employment, Training, and Procurement	Education and training; Economic prosperity and employment

Housing	Housing and infrastructure
Culture	Culture and language; Social well-being
Health and Wellness	Health; Social well-being; Community safety; Unity and communication

A valued component (VC) is "defined as any part of the environment (natural or human) that is considered important by the Proponent, Indigenous groups, public, scientists, and governments involved in the assessment process. Importance may be determined on the basis of values as identified by Indigenous groups' interests, scientific literature, and regulatory standards or requirements, biodiversity, and sensitivity to project effects" (BC EAO 2020, p. 37). VCs are critical pieces to any assessment as they form the basis for determining the potential impacts of proposed projects. The values and priorities identified above serve as VCs and provide a way to focus on what is most important to the AOPFN in the context of this study.

6. FINDINGS: PROJECT IMPLICATIONS AND RECOMMENDATIONS FOR MITIGATION / ENHANCEMENT

This section summarizes Project interactions and potential impacts to the AOPFN's VCs based on relevant baseline conditions, and presents recommended mitigation and enhancement measures and strategies to manage impacts and maximize benefits, as identified by the AOPFN.

The Proponent has identified what they understand the impacts of the project to the AOPFN might be and have proposed mitigation/enhancement measures in the Project EIS Part D – Baseline Conditions and Impact Statement, Chapter 13 – Indigenous Peoples of the Project[i] submitted by PSPC to IAAC, based on baseline information they collected.

Information contained in the following tables uses the AOPFN social, economic, health, and cultural values to consider the Project. It should be used to enhance understanding of potential project interactions and to add to and improve mitigations and enhancements proposed by the Proponent. These were identified by AOPFN members in relation to the AOPFN identified baseline conditions, to inform the federal impact assessment process. While the AOPFN values used have their own approach in the tables in this section, there are many similarities and overlaps with those contained in the EIS.

6.1 EMPLOYMENT, TRAINING, AND PROCUREMENT

Table 4: Project Impacts and Recommended Mitigation/Enhancement Measures: Employment, Training, and Procurement

Employment, Training, and Procurement	
Relevant Baseline Conditions	**Potential Project Interactions**
the AOPFN's Economic Development Department is responsible for creating or increasing opportunities for business development and supporting members in finding and securing employment and training opportunities. This includes networking and partnerships with industrial projects on or near unceded unsurrendered Algonquin territory, to ensure benefits will reach the community (AOPFN website, 2023).	1. the AOPFN could benefit from education and training opportunities from the Project, though considering the project is relatively short-term, it is important that measures are taken to ensure that education and training opportunities are aimed not only at

The four priorities for economic prosperity as described in the AOPFN CCP (2021, p.54) are: 1. Enhance the AOPFN's capacity to generate economic prosperity and a self-sustaining economy. 2. Support the growth and development of member and community-owned businesses. 3. Enhance the employment readiness of members through education and training. 4. Develop strategic partnerships with Indigenous and non-Indigenous businesses and organizations that are mutually beneficial. The community labour force is not fully employed (48% on-reserve members are employed and, 56% of members living outside of Pikwakanagan) (Statistics Canada, 2021), and many are seeking new employment opportunities (34%, AOPFN SEWB, 2023). the AOPFN desires to and is optimistic about benefiting from project related employment and business opportunities, including training. (AOPFN SEWB, 2023; OC meetings, 2023; key informant interviews, 2023). Meaningful employment is important to the AOPFN. There is desire for education and training leading to employment in higher skilled jobs, in addition to labour positions (AOPFN SEWB, 2023; OC meetings). Members desire to gain education and build skills and experience that will not only allow them to benefit from employment opportunities related to the TQDRP but to facilitate sustainable employment in meaningful careers and higher-skilled jobs (OC meetings, 2023; key informant interviews, 2023). Barriers to employment, affecting recruitment, retention, and advancement, include not having adequate skills or education to meet job requirements; competition from non-members in the job-market; lack of career guidance, information, skills related to job applications, and other supports to facilitate finding and maintaining meaningful employment; lack of Indigenous cultural understanding in the workplace and workplace stereotyping and	meeting job requirements but also towards overall skill/career building to support sustainable and meaningful employment over the long-term. 2. The Project is located over 200km away from Pikwakanagan and has a maximum of 50 potential positions at its peak during the 3-year construction phase. There are limited employment and contracting opportunities related to operation, maintenance, and environmental monitoring (only a few days during spring-fall). This is a relatively short-term pulse of employment, located far from community, and runs the risk of not touching down in the community without significant attention to employment and procurement. 3. The project has the potential to create meaningful employment and business opportunities and partnerships for the AOPFN. However, the AOPFN may not be able to benefit from these opportunities unless hiring and procurement address the specific barriers identified by the AOPFN regarding recruitment, retention, and advancement; there is preferential hiring of AOPFN members, which includes higher skilled positions (and related training), and consideration of vulnerable groups in employment through a Gender-based analysis plus (GBA+) approach which assess how diverse groups of women,

discrimination, and lack and affordability of transport, accommodation, and childcare (AOPFN SEWB, 2023; OC meetings, 2023; key informant interviews, 2023). Census data shows that income levels for members living outside of Pikwakanagan are higher ($47,280 annual average) compared to those living in Pikwakanagan ($32,400 annual average) (Statistics Canada, 2021) who may require additional support to cover annual expenses and costs, including transportation and accommodation which are barriers to gaining and retaining meaningful employment (OC meetings, 2023; key informant interviews, 2023). There are 61 active AOPFN member businesses (38 on-reserve and 23 off-reserve). Of these businesses, 49 are Sole Partnerships, 5 are Partnerships, and 6 are Incorporated; none are PSAB compliant; 19 are CRA registered; there are 4 with HEO and/or DZ licenses; and 21 businesses can service outside of Pikwakanagan. The AOPFN construction related businesses exist both on and off-reserve (Skills and Proficiency Collection Summary, Oct 2021). There is a desire for members and their businesses to benefit from partnerships and financial support for business ventures, including business training/capacity building opportunities to ensure they are able to competitively and successfully bid on contracts. Challenges for businesses in obtaining contracting or procurement opportunities include size, capacity, and credentials such as certification and insurance (key informant interviews, 2023).	men, and people of all genders may experience may experience employment initiatives; and a commitment to preferential procurement/contracting strategies and business development, through training, partnerships, and joint ventures with the AOPFN and AOPFN member owned businesses (allowing small and medium business to gain capacity and compete). 4. The Project has the potential to be a potential benefit at the family level (from employment), and at the community level for skill building.
Recommendations for Mitigation and Enhancement Measures and Strategies	
Employment and Training	

1. Commit to incorporating the AOPFN and PSPC Indigenous Benefits Plan (IBP) into all aspects of employment, contracting, and procurement, following the AOPFN guidelines for IBPs with PSPC. This will include capacity building for departmental staff; employees/contractors/businesses; and funding to departments for staff time and efforts spent, to ensure long-term benefits.

2. Develop a strategy and employment committee or similar working group with the AOPFN and other local First Nations, to set targets for recruitment, retention, and advancement of First Nations workers, for unskilled and skilled positions. This would include training and fast-tracking for those positions for First Nations hires.

3. Adjust employment and contracting/procurement requirements and review them first with the AOPFN Economic Development department so they are favourable to First Nations member procurement and employment (e.g., lack of high school education vs. long experience, or lack of certification).

4. Commit to supporting the AOPFN Economic Development Department with capacity building and career development initiatives including for higher-level training, both related to and separate from project-related jobs in areas in line with the broader sustainable First Nations community development strategies, plans, and goals, as defined by the AOPFN, through a Skills Development Plan. This could include apprenticeship programs and education programs; pre-professional programs; college programs; on the job training, shadowing, and mentoring; and in-house training programs.

5. Commit to actively recruiting and reaching out early in each new year for First Nations summer student employment and co-op opportunities for First Nations graduates needing work experience. This includes commitments to support the unionization to enhance job security. Set targets annually for this and celebrate them when achieved.

6. Commit to developing culturally appropriate policies for employment, including anti-racism and harassment policies, GBA+ analysis, and flex scheduling with First Nations employees to accommodate community and cultural activities, as well as grievance mechanisms for managing concerns in the workforce, and commit to reviewing and verifying these policies with the AOPFN and other potentially affected First Nations communities.

7. Ensure all PSPC staff and contractors have been certified in the AOPFN cultural awareness workshops.

8. Commit to supporting then AOPFN in the identification and implementation of a suitable transport system for workers, which will facilitate removing transportation barriers to employment for this Project, other PSPC projects on unceded unsurrendered Algonquin territory, and in general.

9. Commit to supporting the AOPFN in developing and implementing an accommodation strategy for employees working away from home, which will facilitate removing accommodation barriers to employment for this Project, other PSPC projects on unceded unsurrendered Algonquin territory, and in general.

10. Commit to providing safety equipment for direct and indirect employees as well as a safety equipment allowance for those materials not provided.

11. Commit to working with the AOPFN to ensure affordable daycare is available and accessible around the shiftwork that is being considered. This could include commitments to provide financial and capacity building support to the AOPFN's childcare services (Mindiwin Manido) to increase staff and operating hours. Include a daycare stipend for employee families. Funding is not to be tied to stipulations or require reporting, as the use of informal childcare services will likely be necessary.

12. Ensure employers and contractors are flexible in scheduling shiftwork in consideration of shift work impacts on families and realities of travel. Include monitoring of retention and success of flexible policies.

13. Provide capacity building for the AOPFN Economic Development Department to hold workshops and/or career events to ensure members are aware of employment, contracting, and training opportunities, and participate in these events.

14. Commit to developing an environmental monitoring training and funding strategy with the AOPFN and other potentially affected First Nations communities which supports long-term development and sustained use of Guardians programs and on the land monitoring by guardians. Funding needs to be flexible to support long-term development and sustainability of the Guardians Program (i.e., not to be tied to Project-specific goals and activities).

Procurement

15. Ensure procurement preference for the AOPFN's joint venture, Pikwakanagan-Sullivan Construction, in lieu of AOPFN businesses.

16. Commit to and provide capacity building for AOPFN businesses to ensure they have space to operate and meet requirements for contracting and procurement opportunities for this project and in the long-term, including additional certifications to meet industry standards. Capacity building includes funding for start-up, support for office spaces and land acquisition (rental, lease, or purchase), and other needs as identified by the AOPFN.

17. Support the AOPFN in interdepartmental capacity building through committing funding towards infrastructure for an AOPFN departmental building which would allow for additional space for hiring and training staff.

18. Provide contracts at an appropriate scale by the unbundling of procurement contracts so that they are smaller and more manageable for First Nations owned businesses to bid on.

19. Commit to capacity building of the AOPFN Natural Resources Department to develop and implement reclamation and other non-destructive activities on the land. Funding is not only to be tied to Project-specific goals and activities, but flexible to support long-term development and sustainability of the department and its activities.

20. Commit to developing a resource revenue sharing agreement with the AOPFN and other potentially affected local First Nations to ensure that a percent of any profits made by non-local Indigenous contractors and other businesses operating on unceded unsurrendered Algonquin territory are shared.

Community based programs

21. Commit to providing financial literacy and management courses for employees and other groups coming into newfound wealth.

Monitoring and reporting

22. Develop a monitoring and reporting system with the AOPFN, which is transparent and publicly available to the AOPFN and commit to benchmarking, monitoring, and reporting of:

- First Nations hires employment, retention, and job satisfaction, as well as success of employee recruitment / retention programs, and implementation and reporting of employee/contractor grievances and exit reviews.

- First Nations skill and career development initiatives, successes rates, and outcomes.

- First Nations participation in the: contract bid process, contracts awarded, subcontracts work.

- Environmental monitoring results and success of the Guardians Program, including tracking funding and capacity building initiatives.

- Capacity building and other support to the AOPFN various departments and programs.

23. Include monitoring of employment and business commitments and outcomes and training commitments and outcomes as a condition of the IBP and / or Socio-economic Management Plan (SEMP) and commit to reporting results and tangible benefits to the AOPFN on a regular basis as agreed between PSCP and the AOPFN. Reporting methods and platforms must also be agreed between PSPC and the AOPFN to facilitate transparency, accessibility, and public availability for AOPFN members.

24. Include mitigation and enhancement measures listed above in the IBP.

6.2 HOUSING

Table 5: Project Impacts and Recommended Mitigation/Enhancement Measures: Housing

Housing	
Relevant Baseline Conditions	**Potential Project Interactions**
the AOPFN identifies it has 3,592 registered members, with approximately 90% of members living outside of Pikwakanagan. 1,840 members are male, 1,752 members are female; and 2,781 members are above the age of 18 (AOPFN SEWB, 2023). Housing is a top concern and top priority for the AOPFN. The AOPFN's Public Works Department is responsible for developing and servicing community housing and infrastructure. The AOPFN have established 4 priorities for Housing and Infrastructure: 1. Expand and diversify the housing stock to meet the evolving needs of members at all stages of life. 2. Develop energy self-sufficiency through clean, sustainable, and reliable energy initiatives. 3. Maintain physical infrastructure, housing, and community	5. Direct project impacts on housing are not anticipated, as the project is located over 200km away from Pikwakanagan and will only employ a small labour force over a relatively short period of time. However, the project could indirectly benefit the AOPFN housing conditions by building members skills in trades through training and experience as part of project employment. These skills could be brought back to the community which could then be utilized to support housing construction and repair projects, both at an

facilities in good working condition. 4. Enhance community infrastructural capacity to meet current and future needs (AOPFN CCP, 2021). Many AOPFN members living outside of Pikwakanagan desire to move to the reserve. However, availability of on-reserve housing does not meet current needs or demand. Major barriers are funding and lack of available land (AOPFN SEWB, 2023; key informant interviews, 2023). In 2022, there were 217 single-family homes located on reserve which are composed of a mix of Canada Mortgage and Housing Corporation (CMHC, community and member-owned homes. Of these homes, there are 40 rental units available to AOPFN members, which only met half of the demand in 2022 (AOPFN Economic Development Strategy, 2022). 27% of member households (on and off-reserve) are in need of minor repair and 24% are in need of major repair and renters voiced dissatisfaction with quality and upkeep of rentals (AOPFN SEWB, 2023). While rent is low in Pikwakanagan, wages and employment opportunities are also low, and while there are more employment opportunities including opportunities for higher wages living outside of Pikwakanagan, the cost of living, including rent, is relatively higher. Both situations lead to issues around affordability and add to members experiencing financial pressure (AOPFN SEWB, 2023; key informant interviews 2023). Many members are interested in building skills in basic home repairs. Building capacity in this area can support house repairs and increase employment opportunities for members. If means to increase housing construction, such as funding and land are found, it also presents employment opportunities for members in the construction of new builds (AOPFN SEWB, 2023; key informant interviews, 2023).	individual level and as part of employment through the AOPFN housing projects. 6. There is concern that members who have construction skills may be drawn away from Pikwakanagan to obtain employment with the Project, thus reducing the in-community skilled labour force available for community house repair/construction. 7. Ability to pay for rent and repairs could be positively impacted for those earning income from the Project, as well as the ability to qualify for a mortgage, especially for those in higher-skilled positions.
Recommendations for Mitigation and Enhancement Measures and Strategies	

Training and capacity development

25. Commit to developing a training strategy with the AOPFN which not only supports Project employment but focuses on long-term benefits to the AOPFN through skill building in construction and trades.

26. Commit to funding and developing capacity development within the AOPFN Housing Department

Monitoring and reporting

27. Include monitoring of training commitments and outcomes and employment trends, including tracking of the relevant skilled labour force as a condition of the IBP and/or Socio-economic Management Plan (SEMP).

28. Commit to reporting results and tangible benefits to the AOPFN on a regular basis as agreed between PSPC and the AOPFN. Reporting methods and platforms must also be agreed between PSPC and the AOPFN to facilitate transparency, accessibility, and public availability for AOPFN members.

6.3 CULTURE

Table 6: Project Impacts and Recommended Mitigation/Enhancement Measures: Culture

Culture	
Relevant Baseline Conditions	**Potential Project Interactions**
The Seven Grandfather teachings are sacred and integral to the Algonquin culture and Algonquin way of life (AOPFN CCP, 2021, p. 15); and the basis of the AOPFN's cultural philosophy and teachings rest on four fundamentals gifted to the people from the Creator: • Take only what you need; • Give in order to receive; • Recognize that you are an equal part of all that is; and	8. the AOPFN's cultural baseline is already heavily impacted. Cumulative effects of colonialism and industrial development within traditional unceded unsurrendered Algonquin territory (including construction and operation of the original and existing TQDB), have impacted the ability for the

• Be thankful for everything that you receive. The historic legacy of colonialism has resulted in cultural loss for AOPFN members and negatively affected the AOPFN's connection to culture throughout multiple generations. However, there is a strong desire for members to re-connect with their culture through learning and participating in cultural activities, as well as the desire to understand the cultural meaning behind those activities, ceremonies, and regalia. Cultural connection is identified by the AOPFN as an important positive factor in strengthening membership identity and supporting positive healing and mental wellness outcomes (AOPFN SEWB, 2023). The most practiced traditional activities by AOPFN members are fishing (56%), beading (35%), and traditional ceremonies (34%). The top activities members are currently learning are oral history and storytelling (29%), knowledge of traditional territory (29%), and traditional ceremonies (25%), and the activities members are most interested in learning are knowledge of hereditary governance practices (53%), gathering traditional food and medicines (46%), and knowledge of traditional territories (44%) (AOPFN SEWB, 2023). The most important factors influencing connection to culture and learning and participation in traditional activities are cultural immersion through household and family, connecting with Knowledge Holders, and the availability of organized cultural events, workshops, and programs. Main barriers to connecting with culture and learning and participating in cultural activities include lack of funding, lack of connection with Elders and Knowledge Holders, and lack of community activities and supports, particularly for certain age groups such as young or middle-aged adults, and for AOPFN members living outside of Pikwakanagan. Desired supports and services to support cultural connection include virtual/remote learning opportunities, access to teachers, Elders, and Knowledge Holders, more community events,	AOPFN to connect to culture through reducing access to the land and reducing species abundance, diversity, and perceived health, which have limited the AOPFN's ability to practice cultural activities and related knowledge transfer. Further, the original dam/bridge construction contributed to loss of fish habitat and loss of cultural values that have not been adequately considered or compensated for (the AOPFN Review of the Draft EIS, 2022). Construction and operation activities could further reduce AOPFN member's connection to culture through further damaging the land, reducing access to the land, and reducing abundance and diversity of culturally important species (as detailed by the Proponent in chapter 12 of the EIS regarding disturbance to and impacts on specific types of vegetation, fish and fish/spawning habitat, and wildlife and wildlife habitat - and should also include impacts to reptiles and amphibians such as turtles and frogs, particularly during drying out of the river bed). These impacts would further reduce the AOPFNs connection to the land in the Project area as well as the ability to practice land-based cultural activities including harvesting in the long-term. Further, disruption of and/or loss of opportunity for knowledge transfer and of critical teaching areas, as a result of the

programs, and activities, and connecting with other Algonquin communities who have maintained strong cultural traditions (AOPFN SEWB, 2023). The AOPFN culture and identity are intricately connected to the land. Significance of cultural activities that have been practiced for thousands of years (e.g., hunting, trapping, fishing) extend beyond subsistence or economic values, as they are important factors in building and maintaining cultural and familial connections and for Knowledge transfer (AOPFN AKLUS, 2021). There are deep-rooted cultural and spiritual connections to the area around the Project site, going back through generations of AOPFN members, and the area around the Project site is essential to the exercise of AOPFN members rights (AOPFN Review of Draft EIS, 2022). Related to land-based cultural activities, AOPFN members experience multiple barriers to harvesting practices, including conservation and quality concerns (due to industrial and biological contaminants) for traditional foods, along with the concomitant issues of insufficient habitat, over-development, access limitations, government regulations, and competition from non-Indigenous harvesters. (AOPFN Diet and Harvest Study, 2021). Desired capacity to support members connection to the land to include more traditional ceremonies held in community, more land-based programs and activities, connecting with Knowledge Holders, and travel assistance for members living outside of Pikwakanagan to come to the community (AOPFN SEWB, 2023). Language loss is also a major concern that affects connection to culture. Knowledge of language has been lost, and there are a limited number of opportunities to learn language. There is a strong desire for language re-vitalization, to communicate fluently, and to see common use of traditional language in the community. Members identified opportunities to re-vitalize language through working with Omàmiwininì Pimàdjwowin: The Algonquin Way Cultural Centre, connecting learners with language speakers, and	above would impact cultural heritage of present and future generations. 9. Increased land use by workers during the construction period (as already noted by the Proponent in chapter 13 of the EIS, p.13-134) may also contribute to a reduction in species abundance and diversity which would also impact the AOPFNs long-term access to fish and wildlife, and impact their ability to practice cultural activities related to harvesting and opportunities for knowledge transfer. 10. Destruction of archaeological artefacts on Long Sault Island and in the Kichi-Sìbì could potentially be destroyed by Project construction and operation (as already noted by the Proponent in chapter 13 of the EIS, p.13-135-138) which would negatively impact cultural heritage and cultural health and well-being for AOPFN members. 11. There are deep-rooted cultural and spiritual connections to Long Sault Island, it is a sacred and culturally important place for AOPFN members and other Algonquin people. Changes to the natural environment and aesthetics of Long Sault Island as a result of Project construction and operation may negatively impact its cultural value and use. As already stated by the Proponent “the altered natural

expanding this connection to other Algonquin communities (AOPFN SEWB, 2023). The desire to develop stronger cultural connections, and interest and participation in traditional activities has been increasing in recent years, as have programs, events, and activities to support growing interest. The AOPFN cultural revitalization efforts include successful land-based learning programs which have worked to increase members connection to land and to culture (AOPFN SEWB, 2023). The AOPFN is determined to ensure that language, culture, and traditions are strengthened, shared, and transferred to future generations. the AOPFN's four culture and language priorities are: 1. Strengthen knowledge of our culture, traditions, and history among all members. 2. Revitalize knowledge and use of our Algonquin language. 3. Enhance the advocacy, promotion, and management of cultural related activities in Pikwakanagan and the entirety of the unceded unsurrendered Algonquin territory. 4. Preserve, protect, and showcase important community artifacts and sacred items. (AOPFN CCP, 2021, p.50).	aesthetic of the island [Long Sault Island] creates real and perceived barriers for its value and use for the purposes of practicing Indigenous culture which in turn, impacts the health and well-being of Indigenous groups" (EIS, p.13-139). 12. Construction activities may release contaminants from dam construction materials and from sediments. This includes potential release of contaminants on the river bottom deposited from the mill, if the option to reconstruct the bridge near the mill is chosen. Contamination or perceived contamination of the Kichi-Sìbì could result in avoidance of the river or parts of it for cultural practices, which in turn could result in a decrease in the ability to access the land, practice culture, and transfer traditional knowledge. 13. The Project has the potential to benefit the AOPFN cultural conditions and enhance members cultural and spiritual connections if measures are taken by the Proponent to mitigate Project impacts and compensate for cumulative cultural loss through supporting the AOPFN's culture and language goals, services, and programs.
Recommendations for Mitigation and Enhancement Measures and Strategies	

Fish and aquatic life

29. Commit to working with DFO to adjust fishing regulations to prohibit or limit fishing during Project pre-construction (1-2 years prior), construction, and post-construction (1 -2 years post) phases, in consultation with the AOPFN. Ensure information about rules and regulations is disseminated to all workers and permanent signage on and around the bridge is in place. Include a monitoring program to monitor and enforce agreed upon rules and regulations. This could potentially include cameras and/or in-person monitoring by law-enforcement.

30. Commit to a co-management approach between PSPC, DFO, and the AOPFN to protecting aquatic species (including fish, reptiles, amphibians, mollusks, etc.). This includes co-development and implementation of a strategy which includes filling knowledge gaps in fish habitats, including spawning grounds, to further understand the potential for loss of habitats and how losses should be mitigated; protection measures and habitat creation for spawning grounds; protection, relocation and re-stocking of aquatic species (3:1 ratio minimum) (including fish, reptiles, amphibians, and mollusks), and funding a hatchery system); water-craft inspection and cleaning to ensure protection from invasive species (e.g. zebra mussels); as well as regular monitoring, compensation measures for losses incurred as determined by the AOPFN, and funding obligations.

Plants and plant medicines

31. Commit to assessing and protecting wild rice planting grounds and plant medicine harvesting grounds from changes in water levels in consultation with the AOPFN.

32. In areas which will be disturbed and/or flooded, commit to funding and working with the AOPFN to transplant plants and plant medicines (3:1 minimum offset ratio) in appropriate areas, and developing appropriate ecological areas for transplanting, as identified by the AOPFN using Traditional Ecological Knowledge (TEK).

33. Commit to re-establishing natural vegetation and any plants deemed as important in the project area (offset ratio 3:1 minimum) as identified by the AOPFN.

34. Allow for and invite affected AOPFN members to harvest potentially affected trees and plants with cultural and/or economic value prior to Project-start.

35. Develop a timber salvage plan with the AOPFN for any areas needing timber clearing for Project construction, including those utilized for equipment, storage, turn-arounds, etc. if any.

Cultural heritage and ceremony

36. Commit to involving the AOPFN in "the planning, design, siting, installation and maintenance of a plaque or other permanent structure that provides the history of the Kichi-Sìbì and Long Sault Island and their importance to Algonquin cultural and physical heritage, recognition of the Project on unceded unsurrendered Algonquin territory" (EIS, 2023, p. 13-139), and protocols for accessing and respecting ceremonial space with contact information for related questions. Ensure that Anishinaabemowin language is included in any wording used in signage or other text.

37. Commit to funding, respecting, and allowing space for AOPFN members to conduct cultural ceremonies prior to and post Project construction, following the AOPFN protocols.

38. Commit to funding, securing, and developing a cultural space on Long Sault Island for AOPFN members to practice their culture, in consultation with the AOPFN.

Cultural and spiritual connections and protocols

39. Commit to financially contributing to the AOPFN cultural activities and revitalization programming, through developing a strategic plan with the AOPFN aimed at making meaningful strides to compensate for cumulative cultural losses incurred, and to ensure cultural continuity for future generations.

40. Commit to ensuring all PSPC staff and contractors participate in cultural awareness training workshops through the AOPFN in order to enhance understanding of the AOPFN values and worldviews, especially in regard to Algonquin relationships to the land and natural resources.

Archeological resources

41. Commit to following the AOPFN Chance Find Procedures for archaeological finds.

42. Commit to involving the AOPFN in archaeological studies.

43. Protect Project area from disturbance and flooding until all archeological studies have been completed and verification has taken place with the AOPFN.

44. Provide funding for the Manidò Chìmàn Museum as the AOPFN sees fit. The museum is crucial to the community in maintaining and preserving AOPFN culture and traditions and does not yet have a cultural building available to manage and share collections and support cultural teachings and events.

Water quantity and quality of the Kichi-Sìbì

45. Commit to monitoring and reporting water quality and quantity data including any changes, before, during, and post-construction and operation activities. Providing this data to the AOPFN on a quarterly basis and ensuring all information regarding material safety of dam components (regarding water quality), is disseminated, and understood by these communities, to ensure members are able to confidently access the Kichi-Sìbì for cultural and other practices based on data. Any abnormalities in water quality or quantity that indicate potential environmental and/or health risks must be reported urgently to and in consultation with the AOPFN.

46. Commit to funding either 1 full-time or 2 part-time Guardian Monitors to monitor the quality and quantity of the water and land along the Kichi-Sibi in proximity to the project area as well as funding for any samples, travel, lodging, and any other expenses as deemed necessary by the AOPFN's Guardian Coordinator to ensure the health of the Kichi-Sìbì and its tributaries.

Compensation

47. Commit to developing a habitat offsetting/compensation plan with the AOPFN that considers cumulative effects as well as the additional impacts of proposed works, in order to address the heavily impacted baseline conditions in the proposed Project area. Cultural values are to be considered as part of this plan (i.e., the value of the area from a cultural perspective, and the accumulated loss of those values in the aquatic study area). the AOPFN understands that this work is necessary to replace the bridge and dam at this time but emphasizes that the original dam/bridge construction contributed to loss of fish habitat and cultural values that have not been adequately considered or compensated. While the AOPFN does not expect that these losses will be fully mitigated or compensated through the currently proposed construction, this context must be appropriately considered by the Proponent.

Monitoring and reporting

48. Commit to developing a joint monitoring committee with the AOPFN, which includes TEK, funding and capacity building for environmental monitoring by Indigenous guardians; and down-stream monitoring of water, water quality, and aquatic and non-aquatic wildlife during and post-construction.

49. Commit to building trust with the AOPFN regarding the protection of land and water, through building a communications strategy with the AOPFN that sufficiently addresses gaps in knowledge, consultation, and understanding, to ensure community members are well-informed about the Project on a regular basis. This includes funding for membership meetings and participation of contractors in meetings in Pikwakanagan.

50. Commit to identifying the use of TEK in reports and acknowledging the importance of TEK to protecting culture.

51. Include monitoring of mitigation and enhancement measures as a condition of the IBP and / or Socio-economic Management Plan (SEMP) and commit to reporting results and tangible benefits to the AOPFN on a regular basis as agreed between PSPC and the AOPFN. Reporting methods and platforms must also be agreed on between PSPC and the AOPFN to facilitate transparency, accessibility, and public availability for AOPFN members.

6.4 HEALTH AND WELLNESS

Table 7: Project Impacts and Recommended Mitigation/Enhancement Measures: Health and Wellness

Health and Wellness	
Relevant Baseline Conditions	**Potential Project Interactions**
For the purposes of this work, health and wellness is broadly understood as a combination of people's mental, physical, emotional, spiritual experiences and elements.	14. Health and wellness for the AOPFN is intrinsically linked to cultural and spiritual connections, which are inseparable from connections to the land. Potential impacts on culture indicated in the Cultural

Wellness and healing for AOPFN members are intrinsically connected to cultural connection and community connection. Positive trends in cultural and community connection lead to positive impacts on wellness outcomes for members. Recognizing that connection to culture, land, and community are important factors in strengthening membership identity and supporting positive healing and mental wellness outcomes, the AOPFN strives to integrate culturally based approaches to health and healing. The AOPFN's top health priorities and actions as described in the AOPFN CCP (2021, p.44), are: 1. Address substance abuse challenges in the AOPFN. 2. Integrate culturally based approaches into health services. 3. Enhance the Health Department's capacity to deliver programs, services and supports to AOPFN members. 4. Ensure Elders have the support and necessary programs to live a high quality of life and the ability to age-in-place. 5. Enhance the mental health programs and services to members. To support these priorities the AOPFN provides health programs and services in Pikwakanagan including a family health team, a community health nurse, a community health representative, home and community care, a physical fitness trainer, and a registered dietitian and certified diabetes educator, as well as a foot care clinic and children's oral health services. Provision of single and group counselling services for mental health, addictions and trauma are provided off-reserve, as well as sharing circles for men women and youth. There are also multiple programs and services for Indigenous Peoples off-reserve that members have access to both in and outside of Renfrew County. (AOPFN website, 2023; key informant interview, 2023). Despite the positive outcomes of these services, AOPFN members report that access to health and mental wellness services is still not adequate (especially after working hours), and quality of services does not meet member needs. Further, access to culturally safe services is a concern, with 46% of the	Conditions table are to be considered here, with the additional potential impacts listed below. 15. Additional disturbance and damage to the land and species residing within the project area during construction and operation periods will likely trigger unresolved trauma and further contribute to poor mental wellness conditions for AOPFN members, furthering issues of addictions, lateral violence, and other spin-off effects that negatively impact individual and community wellness, strength, and cohesion. 16. Additional disturbance and damage to the land during construction and operation, potentially resulting in a decline in species abundance and diversity, would impact the AOPFN members ability to harvest traditional foods for sustenance, and further reduce members ability to maintain a traditional diet, contributing to existing food insecurity experienced by some households, which has been documented to negatively impact health outcomes. It could also impact the ability to collect and use plant medicines which would impact health outcomes for members. 17. Construction activities may release contaminants from dam construction materials and from sediments.

AOPFN SEWB respondents rating access to culturally safe services as only fair (25%) or poor (21%) (AOPFN SEWB, 2023). Main challenges and barriers to wellness include limited funding for supports and services, limited access to quality and culturally safe services (especially after working hours), lack of AOPFN health workers, lack of confidentiality, systemic racism, limited supports related to addressing intergenerational trauma and its effects, and lack of awareness about available supports. A further challenge for members living outside of Pikwakanagan is transportation, which limits members access to on-reserve services as well as to connecting with culture and with community (AOPFN SEWB, 2023; key informant interviews, 2023). Desired improvements include improved access to health services and improved access to Indigenous health workers and culturally-led services, improved confidentiality, supports for addressing intergenerational trauma, better availability and access to supports and services related to alcohol and drug addictions, supports for lateral violence, support for creating women's support groups, improved information sharing regarding supports available in Pikwakanagan for members living outside of Pikwakanagan, community intermediaries to support people to access available health services and federal and provincial funding for those services through supporting the application processes (AOPFN SEWB, 2023; key informant interviews, 2023). Wellness for AOPFN members is closely tied to their ability to be on the land and water, to harvest plants, animals, and fish for sustenance and cultural practices. Changes to the environment, land, traditional diet, and displacement have significantly impacted the health and wellbeing of AOPFN members over time (AKLUS, 2021) For the AOPFN, there is a significant amount of grief experienced surrounding the loss of land and culture due to the legacy of colonialism and continued environmental degradation to Algonquin unceded unsurrendered Traditional territory. This contributes to AOPFN member's challenges around	Contamination or perceived contamination of the Kichi-Sìbì could result in physical and/or mental stress. 18. The Project has the potential to benefit the AOPFN health and wellness conditions if measures are taken by the Proponent to mitigate Project impacts and compensate for cumulative cultural loss and its related health impacts through supporting the AOPFN's health goals, services, programs, culture and language goals, services, and programs, as well as providing employment and training opportunities for members experiencing mental wellness issues, addictions, or trauma.

mental health, which in turn contributes to problems around addiction and lateral violence which are top health and safety concerns for the AOPFN. Re-connecting with the land, with culture, and with ceremony are fundamental to healing (key informant interviews, 2023). Beyond programs and services directly related to health, the AOPFN strives to improve wellness and community cohesion through cultural programs and activities including those based on the land. There are successful cultural and land-based learning programs which have worked to increase members connection to the land and to culture. Further detail about culture, cultural connection, programs and services, barriers, and desired supports is included in the Cultural Conditions section. These are important to consider here as cultural connection is intrinsically linked to wellness outcomes for members of AOPFN. Food security is a significant issue affecting AOPFN members living both in and outside of Pikwakanagan. Colonialism, privatization, and the transformation of the landscape in the AOPFN's unceded unsurrendered Traditional territory have negatively impacted harvesting activities and reliance on Algonquin foods. This has resulted in negative health outcomes and negatively impacted food security. Despite this, there is still deep and ongoing connection to and reliance on the land and water within the AOPFN's unceded unsurrendered Traditional territory for food and medicinal purposes, and the practice of harvesting, processing, and eating Algonquin foods continues to serve important social, knowledge transmission, cultural, nutritional, and food security/sovereignty needs (AOPFN Diet and Harvest Study, 2021; key informant interview, 2023). Drinking water and drinking water safety is also a significant community issue, with many on-reserve members unable to safely drink water from their own wells. There are currently plans for a new water treatment plant in place.	

Recommendations for Mitigation and Enhancement Measures and Strategies
Health and wellness for AOPFN members is intrinsically linked to cultural and spiritual connections, which are inseparable from connections to the land. Mitigation and enhancement recommendations found in the Cultural Conditions table also therefore effect health and wellness conditions and are to be considered with the additional recommendations below. **Community Programs** 52. Commit to financially contributing to the AOPFN health services and programs. 53. Commit to contributing to travel assistance for members living outside of Pikwakanagan to travel to their community to access health and cultural services, programs, and activities. **Water** 54. Commit to monitoring and reporting water quality data and changes, before, during, and post-construction and operation activities, and providing this data to the AOPFN on a quarterly basis, and to ensuring information about material safety of dam components (regarding water quality), is disseminated and understood by the AOPFN, to mitigate potential physical and mental wellness impacts. Any abnormalities in water quality or quantity that indicate potential environmental and/or health risks must be reported urgently to and in consultation with the AOPFN. 55. Support AOPFN's goals towards providing safe drinking water in Pikwakanagan, in consideration of cumulative and project-related losses. **Employment** 56. Commit to providing employment opportunities for members of the AOPFN experiencing mental health issues, addictions, or trauma, to support healing by providing hope, meaning, belonging, and purpose through employment. **Plant medicines**

57. Commit to assessing and protecting plant medicine harvesting grounds from changes in water levels in consultation with the AOPFN. In areas which will be disturbed and/or flooded, commit to funding and working with the AOPFN to transplant medicinal plants (ratio of 3:1 minimum) in appropriate areas as identified by the AOPFN using TEK.

58. Allow for and invite AOPFN members to harvest potentially affected trees and plants with medicinal value prior to Project-start.

Monitoring and reporting

59. Include monitoring of mitigation and enhancement measures as a condition of the IBP and / or Socio-economic Management Plan (SEMP) and commit to reporting results and tangible benefits to the AOPFN on a quarterly basis as agreed between PSCP and the AOPFN. Reporting methods and platforms must also be agreed between PSPC and the AOPFN to facilitate transparency, accessibility, and public availability for AOPFN members.

7. CONCLUSIONS

The Algonquins of Pikwakanagan's independent Timiskaming Québec Dam-Bridge Replacement Project Socio-Economic Impact Assessment (the Study) focusses on socio-economic impact assessment of the Timiskaming Québec Dam-Bridge Replacement Project; recommendations on mitigating the Project's impacts; and on how the AOPFN can leverage the Project to maximize its benefits.

The Study involved a review of Project documents and the AOPFN socio-economic baseline data to-date; meetings with the AOPFN Project Oversight Committee; and key informant interviews with the AOPFN staff and service providers. Capacity building of the AOPFN Consultation Office staff was also a key part of this process which involved mentorship and training on interview facilitation, note-taking, and interview coding.

The Report will be attached as an addendum to the Socio-Economic Impact Assessment (SEIA) for the Project's Environmental Impact Statement (EIS) to ensure that the AOPFNs views are appropriately accounted for in the federal impact assessment process.

This Report uses the AOPFN social, economic, health, and cultural values to consider the Project. It should be used to enhance understanding of potential project interactions and to add to and improve mitigations and enhancements proposed by the Proponent. These were identified by the AOPFN in relation to the AOPFN identified baseline conditions, to inform the federal impact assessment process. While the AOPFN values used in this Study have their own approach, there are similarities and overlaps with those contained in the EIS.

7.1 SUMMARY OF RECOMMENDED MITIGATION AND ENHANCEMENT MEASURES AND STRATEGIES

Mitigation and enhancement measures identified by the AOPFN are aimed at addressing potential Project impacts and the AOPFN needs in relation to the AOPFN baseline conditions, and supporting the AOPFN to maximize benefits around training, employment, procurement, and support long term goals through funding and capacity building. The study findings in Section 6 of the report detail mitigation and enhancement measures for each VC. The measures related to each of the VC's have a long-term focus and are based on collaborative meaningful engagement between the AOPFN and PSPC during all stages of the Project. Identified measures can be summarized into the following six key areas:

- Capacity Building: through training and skill-building of AOPFN members; capital investments for the AOPFN departments and businesses; and support for the AOPFN programs and services;
- Barrier Reduction: through addressing access to employment and means to improve socio-economic wellbeing; unbundling of contracts for smaller businesses; and Cultural Awareness Training for PSPC, contractors, and subcontractors;

- Collaboration: through co-development, and joint management and monitoring of mitigation and enhancement measures between the AOPFN, PSPC, contractors, and the DFO;
- Protection: to preserve and promote culture; archaeological resources; and the natural environment; and
- Monitoring and reporting: ranging across all VC's and including joint monitoring and reporting of employment and procurement targets and participation; skill and career development initiatives, success rates, and outcomes; environmental monitoring and integration of Algonquin Knowledge; and capacity building initiatives and outcomes for the AOPFNs various departments and programs.

7.2 RECOMMENDATIONS

This report considers the effect of this Project on an already impacted baseline. The project interactions and the mitigations have been generated through dialogue, review and community-based discussion. They are offered forth as a path for the consideration of the impacts in the areas of employment, training and procurement, housing, culture, health and wellness.

Next steps:

- Develop an approach with PCSP to set these measures into an IBP, and determine how IBP conditions can be met over the coming years;

- Work with PCSP to develop a Socio-economic Management Plan to ensure mitigation and enhancement measures are monitored, reported, and adaptively managed appropriately.

7.3 CLOSURE

Should you wish to discuss any aspect of this Report further, please do not hesitate to contact Amanda Two-Axe Kohoko:

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Physical Address: 4-473 Kokomis Inamo, Pikwakanagan, ON K0J 1X0

CITATIONS

Algonquins of Pikwakanagan First Nation (AOPFN). Building the Good Life Together. Comprehensive Community Plan (External Version). 2021.

Algonquins of Pikwakanagan First Nation. 5 Year Economic Development Strategy. Working toward Greater Prosperity. Draft. 2022.

Algonquins of Pikwakanagan First Nation. Diet and Harvest Study: Confidential report specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning project. 2021.

Algonquins of Pikwakanagan First Nation. Knowledge and Land Use Study (External). 2021.

Algonquins of Pikwakanagan First Nation. Socio-Economic and Well-Being Baseline Study. 2023

Algonquins of Pikwakanagan First Nation. Skills and Proficiency Collection summary. 2021.

Algonquins of Pikwakanagan First Nation. Review of Draft EIS: Review of Section 13.4.3 Baseline conditions for AOPFN and Section 13.4.4.1 Health and Socio-economic Assessment. 2022.

BC EAO. 2020. EAO User Guide: Introduction to environmental assessment under the provincial Environmental Assessment Act (2018). Version 1.01. 30 March 2020.

Dick, W. "Algonquins of Pikwakanagan First Nation". n.d.

Fediuk, K. et al. Algonquins of Pikwakanagan First Nation Diet and Harvest Study. Report Prepared for Algonquins of Pikwakanagan. 10 August 2021.

Holmes, J. Algonquins of Golden Lake Claim Executive Summary. 1993. https://publications.gc.ca/site/eng/9.853164/publication.html?wbdisable=true

Malone, M. et al. Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Closure Project. Report Prepared for Algonquins of Pikwakanagan. 9 Aug, 2021.

Morrison, J. Algonquin History in the Ottawa River Watershed. Report prepared by James Morrison, Legal and Historical Research for Sicani Research & Advisory Services. Winnipeg. Draft. 2005.http://new-wordpress.algonquinnation.ca/wp-content/uploads/2015/08/algonquin-history-james-morrison-sicani-oct-2006-revisedpublic.pdf

Public Services and Procurement Canada (PSPC), Tetra Tech QI Inc.. Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec) Environmental Impact Statement PART D – Baseline Conditions and Impact Assessment Chapter 13 Indigenous Peoples. 2023.

Statistics Canada. Aboriginal Population Profile 2021Census – Algonquins of Pikwakanagan First Nation, Membership in a First nation or Indian band. 2021.

APPENDIX 1: SUMMARY OF RESOURCES CONSULTED FOR THIS STUDY

Resources consulted for this report, along with identifying information and where it was sourced from.

Document title	Document author(s)	Year of Publication	Public link (if available)
A History of the Algonquins	JP Howe	n.d.	http://www.tanakiwin.com/wp-system/uploads/2013/10/a-History-of-the-Algonquins.pdf
Aboriginal Population Profile, 2016 Census - Algonquins of Pikwakanagan First Nation [First Nation/Indian Band or Tribal Council Area], Ontario	Statistics Canada	2018	https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/abpopprof/details/page.cfm?Lang=E&Geo1=AB&Code1=2016C1005201&Data=Count&SearchText=Algonquins%20of%20Pikwakanagan%20First%20Nation&SearchType=Begins&B1=All&C1=All&SEX_ID=1&AGE_ID=1&RESGEO_ID=1&TABID=2.
Aboriginal Population Profile 2021Census – Algonquins of Pikwakanagan First Nation, Membership in a First nation or Indian band.	Statistics Canada	2021	n/a
Algonquins of Golden Lake Claim: Executive Summary	Joan Holmes	1993	https://publications.gc.ca/site/eng/9.853164/publication.html?wbdisable=true
Algonquin History in the Ottawa River Watershed	James Morrison	28-Nov-05	http://new-wordpress.algonquinnation.ca/wp-content/uploads/2015/08/algonquin-history-james-morrison-sicani-oct-2006-revisedpublic.pdf

Document title	**Document author(s)**	**Year of Publication**	**Public link (if available)**
Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Closure Project	AOPFN, The Firelight Group	2021	n/a
Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential report specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning project	AOPFN, The Firelight Group	10-Aug-21	n/a
Algonquins of Pikwakanagan First Nation Building the Good Life Together: Comprehensive Community Plan (External Version)	AOPFN, Urban Systems Ltd.	2021	n/a
Algonquins of Pikwakanagan First Nation Cumulative Effects Study for the Timiskaming Quebec Dam Bridge Replacement Project	AOPFN, The Firelight Group	2022	n/a
Algonquins of Pikwakanagan Economic Development Strategy: Working toward greater prosperity (DRAFT)	AOPFN, Urban Systems Ltd.	2022	n/a
Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential report specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning project	AOPFN, The Firelight Group	2021	n/a

Document title	Document author(s)	Year of Publication	Public link (if available)
Algonquins of Pikwakanagan First Nation Knowledge and Land Use Study (External)	AOPFN, Urban Systems Ltd.	2021	n/a
Algonquins of Pikwakanagan First Nation Land Use Plan	AOPFN, Urban Systems Ltd.	2022	n/a
Algonquins of Pikwakanagan First Nation Skills and Proficiency Collection summary	AOPFN	2021	n/a
Algonquins of Pikwakanagan First Nation Socio-Economic and Well-Being Baseline Study	AOPFN, The Firelight Group	2023	n/a
AOPFN Review of Draft EIS: Review of Section 13.4.3 Baseline conditions for AOPFN and Section 13.4.4.1 Health and Socio-economic Assessment	AOPFN	2022	n/a
AOPFN Temiskaming Dam Draft EIS Review, Socio-economic and health assessment Meeting Notes	The Firelight Group	2022	n/a
Recommendations concerning Project Design, Mitigations, Monitoring for Timiskaming Quebec Dam-Bridge Replacement Project	AOPFN; The Firelight Group	n.d. (working document)	n/a

Document title	**Document author(s)**	**Year of Publication**	**Public link (if available)**
Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec) Environmental Impact Statement PART D – Baseline Conditions and Impact Assessment Chapter 9 General Context	PSPC, Tetra Tech Inc.	2023	https://iaac-aeic.gc.ca/050/documents/p80151/147187E.pdf
Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec) Environmental Impact Statement PART D – Baseline Conditions and Impact Assessment Chapter 13 Indigenous Peoples	PSPC, Tetra Tech Inc.	2023	https://iaac-aeic.gc.ca/050/documents/p80151/147183E.pdf
Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec) Environmental Impact Statement PART G – Follow-up and Monitoring Programs Chapter 22 Monitoring Chapter 23 Follow-up	PSPC, Tetra Tech Inc.	2023	https://iaac-aeic.gc.ca/050/documents/p80151/147174E.PDF

APPENDIX 2: THE SEVEN GRANDFATHER TEACHINGS

The Seven Grandfather Teachings

Among the Anishinaabe people, the Seven Grandfather Teachings, also known as the Seven Sacred Teachings, or simply as the Seven Teachings, is a set of teachings on human conduct towards others. These teachings are guiding principles and or values that the AOPFN applies as a touchstone for guiding, shaping, and measuring actions and behaviour for themselves and others.

Nibwaakaawin—Wisdom: To cherish knowledge is to know Wisdom. Wisdom is given by the Creator to be used for the good of the people. In the Anishinaabe language, this word expresses not only “wisdom,” but also means “prudence,” “intelligence”, or “knowledge".

Zaagi’idiwin—Love: To know Love is to know peace. Love must be unconditional. When people are weak they need love the most. In the Anishinaabe language, this word with the reciprocal theme indicates that this form of love is mutual.

Minaadendamowin—Respect: To honor all creation is to have Respect. All of creation should be treated with respect. You must give respect if you wish to be respected.

Aakode’ewin—Bravery/Courage: Bravery is to face the foe with integrity. In the Anishinaabe language, this word literally means “state of having a fearless heart.” To do what is right even when the consequences are unpleasant.

Gwayakwaadiziwin—Honesty: Honesty in facing a situation is to be brave. Always be honest in words and actions. Be honest first with yourself, and you will more easily be able to be honest with others. In the Anishinaabe language, this word can also mean “righteousness.”

Dabaadendiziwin—Humility: Humility is to know yourself as a sacred part of Creation. In the Anishinaabe language, this word can also mean “compassion.” You are equal to others, but you are not better. In addition to “humility” can also be translated as “calmness,” “meekness,” “gentility” or “patience.”

Debwewin—Truth: Truth is to know all these things. Speak the truth. Do not deceive yourself or others.

APPENDIX 3: THE AOPFN VISION STATEMENT

ALGONQUINS OF PIKWAKANAGAN "VISION STATEMENT"

Our "Vision" as Algonquin People is the Path to our future. Along the way, we shall strive for faith in our children, unity in our families, security in our identity, and safety and health in our community, both today and for future generations.

We will achieve our "Vision" through wisdom, unity, respect and living according to our traditional values.

The following values are fundamental elements of our "Vision":

Algonquin Identity and Cultural Heritage:

Ours is a First Nation where the People honour and foster pride in our Algonquin identity and culture.

Our People assume their full responsibility for the celebration, knowledge, preservation and transmission of our culture, its spirituality, beliefs, language, values, traditions and teachings.

Living in harmony with our cultural values enables our People to live in a healthy, natural environment, and to participate productively in modem society.

Algonquin Land, Rights and Jurisdiction:

Ours is a First Nation where the People enjoy full security, jurisdiction and control over their Algonquin Lands and Rights.

The Algonquin People know and cherish their Rights: they protect their Rights by exercising them in their daily lives.

Algonquin Government:

Our Government is a capable, fair and Algonquin government, fully accountable to the Algonquin People and our Algonquin Constitution.

Our People fulfill their roles and responsibilities to our self-governing process with pride and respect.

Our Government represents us with pride and respect in all our dealings with other governments and agencies.

A Strong, Healthy, Happy and Secure Algonquin Family and Community:

The healthy, happy, sharing Algonquin family remains the essential unit in our Algonquin culture and community. It is the family that assumes primary responsibility for fostering

the Algonquin culture, and for ensuring that our culture is passed on to future generations.

Our "Vision" is of a strong, healthy, safe and thriving First Nation Community. Our Community is unified in its values and strives for harmony within the First Nation, and with our neighbours.

A Caring People:

We are a caring People, and those in need will always be our first priority.

Our "Vision" includes adequate housing and full services and facilities to meet our basic needs.

Self-Sufficiency and Self-determination:

The Algonquin "Vision" is of an able People who are in control of their destiny, both individually and collectively. Our citizens seek to contribute to the collective wellbeing, not to be its dependents.

An Algonquin Education:

Our People value competence and the ability to be self-sufficient. The education of our children must be Algonquin. It must enable them to have opportunities and to make choices about their futures, as well as to participate with full confidence in our culture and that of the broader Canadian society.

Sustainable Employment:

We are a responsible People who seek to contribute. Our "Vision" is one of sustainable employment for our People, with challenge for their talents and adequate remuneration to meet their needs; and those of the people who depend on them.

We strive to create sustainable employment in and near, the Golden Lake community of the First Nation.

A Healthy, Natural, Sustainable Environment:

The protection, preservation and enjoyment of the lands; its life, waters and resources are a fundamental value of First Nation People. Respect for this value guides our decisions, actions and behaviour as individuals and as a First Nation.

We have a responsibility to preserve a healthy, natural, self-sustaining environment which will be enjoyed by "our generations yet unborn".

APPENDIX 4: SUMMARY OF VALUES AND PRIORITIES LISTED IN THE AOPFN COMPREHENSIVE COMMUNITY PLAN 2021

Community safety

1. Improve emergency and first response in community
2. Enhance community safety through a balance of by-law enforcement, protective services partnerships, and restorative justice

Social wellbeing

1. Expand the AOPFN's authority and responsibility for Family wellbeing and child welfare
2. Enhance the capacity of Social Services to deliver programs and services to members
3. Clarify the burial process and improve funeral services in the AOPFN

Economic prosperity

1. Enhance the AOPFN's capacity to generate economic prosperity and a self-sustaining economy
2. Support the growth and development of member and community owned businesses
3. Enhance the employment readiness of members through education and training
4. Develop strategic partnerships with Indigenous and non-Indigenous businesses and organizations that are mutually beneficial

Housing and infrastructure

1. Expand and diversify the housing stock to meet the evolving needs of members at all stages of life
2. Develop our energy self-sufficiency through clean, sustainable, and reliable energy initiatives
3. Maintain our physical infrastructure, housing, and community facilities in good working condition
4. Enhance our community infrastructural capacity to meet current and future needs

Education and training

1. Continue to support students from Kindergarten to grade 12 attain their academic goals and pursue their career choices
2. Work toward enhancing the education resources and services available to members
3. Enhance training services and programs to support the employment goals of members
4. Encourage and support skills training in areas that will help build the capacity of the AOPFN

Culture and language

1. Strengthen knowledge of our culture, traditions, and history among all members
2. Revitalize knowledge and use of our Algonquin language
3. Enhance the advocacy, promotion, and management of cultural related activities in the AOPFN and the unceded traditional territory
4. Preserve, protect, and showcase important community artifacts and scared items

Health

1. Address substance use challenges in the AOPFN
2. Integrate culturally based approaches into health services
3. Enhance the health department's capacity to deliver programs, services and supports to AOPFN members
4. Ensure Elders have the support and necessary programs to live a high quality of life and the ability to age – in – place
5. Enhance the mental health programs and services to members

Lands Resources and environment

1. Expand the AOPFN's land base for community and economic development
2. Grow the capacity of the Lands Department to effectively manage the AOPFN's lands and the environment
3. Strengthen the AOPFN's position and capacity in managing resources and development within the territory
4. Articulate the AOPFN's interests within the traditional territory for cultural, traditional and economic activities

Unity and communication

1. Nurture and promote a sense of unity and inclusion among all AOPFN members
2. Improve communications between members, leadership, and staff

Governance and administration

1. Negotiate and advance a Comprehensive Self Government agreement
2. Undertake governance in a transparent, modern, and culturally informed manner
3. Strengthen the AOPFN's administration and departments into a full capacity, modern and professional organization
4. Foster an interconnected and collaborative organization for efficient and effective program and service delivery to members
5. Increase the AOPFN's financial capacity

Community events and recreation

1. Enhance sports and recreation services and infrastructure
2. Provide community spaces that are accessible and safe for members of all ages and abilities

APPENDIX 5: THE AOPFN SOCIO-ECONOMIC AND WELL-BEING BASELINE STUDY PROJECT INFORMATION AND CONSENT FORM

Project Information

The Algonquins of Pikwakanagan First Nation (AOPFN) is undertaking a research study, with support from The Firelight Group, an Indigenous consultant and research group. With respect the to the proposed Timiskaming Quebec Dam-Bridge Replacement Project ("the Project"), there are three goals of the study:

1. Review the Project and identify the socio-economic impacts;

2. Identify programs, policies, strategies and actions that can be taken to manage socio-economic benefits.

3. Identify benefits of the Project and how these can be mobilized for social and economic enhancement

Your Involvement

The purpose of the participant consent process is to document for our records that you have been made aware of, and agree to the following:

- You have attended this interview voluntarily
- You acknowledge that an honorarium is being provided by AOPFN out of respect for your time, expertise and knowledge
- You understand that during this meeting we will be asking questions about AOPFN socio-economic and wellbeing conditions, potential impacts upon these conditions, and programs and services that could mitigate or improve these impacts.

AOPFN and Firelight Commitments

AOPFN makes the following commitment to you:

- All information recorded will be kept confidential
- No personal information will be attributed to your statements in the final product
- unless you give us explicit permission to do so
- The information shared here will only be used for the expressed purpose outlined
- If at the end of this meeting, you decide that you do not wish to have your
- statements included for any reason, you are free to withdraw or withhold your
- consent. To do that, please contact the meeting organizer to discuss your concerns, if comfortable.

Consent

I (name) _____, on this day (complete date) _____, give permission for AOPFN and Firelight Research Inc. to interview me for the AOPFN Timiskaming Quebec Dam-Bridge Replacement Project: Addressing Gaps in Socio-Economic Baseline study.

I understand that this study is being conducted AOPFN with research support from Firelight Research Inc. The purpose of the study is to:

- Identify the socio-economic impacts in relation to the Project;
- Identify programs, policies, strategies and actions that can be taken to manage socio-economic benefits.
- Identify benefits of the Project and how these can be mobilized for social and economic enhancement

By agreeing to participate, I indicate my understanding that:

(a) I consent to have my words and responses recorded in notes, and using audio recording equipment.

(b) I am free to not respond to questions that may be asked and I am free to end the interview at any time I wish.

(c) All records and notes collected through my participation will be securely held by Firelight Research Inc. for the purpose of this project, and then provided back to AOPFN**.**

(d) AOPFN will ask permission from me before using my information for purposes not indicated above

(e) I consent to have my name included in the report.

For more information, please contact Valerie Taggart at projectco3@pikwakanagan.ca

Signature of participant Date

_____ _____

APPENDIX 6: KEY INFORMANT INTERVIEW GUIDES

PRE-INTERVIEW CHECKLIST

Before formally beginning the interview, ensure the following steps have been completed:

1. Introductions
   - Introduce yourself and the research team – department, position, role in the project. Introduce note-taker as well.

2. Give the participant an overview of the proposed project
   - In advance of the interview, the research team will have developed a 1-2 page summary of the project and its components.

3. Explain the interview process and goals of the research. Read the following:
   - The purpose of this study is to understand the socio-economic and well-being conditions of AOPFN, and to support an understanding of how the proposed project may further impact socio-economic and well-being conditions for AOPFN.
   - We will write a public report about the impacts of the proposed Project.

4. Provide an opportunity for the participant to ask questions
   - Providing accurate answers to participants' questions is an important aspect of free, prior and informed consent.
   - Technical questions relating to the proposed project should only be answered if you have the necessary project information from the proponent or regulator.
   - Questions that you cannot answer should be directed to the community coordinator, principal investigator, or proponent contact, as appropriate.

5. Review the consent form
   - Read the consent form aloud to the participant, if requested.
   - Ask the participant if they have any questions.
   - Get each participant to sign the consent form
   - For obtaining verbal consent, ensure the audio recorders are on, read through the consent form, and have the participant provide their verbal consent for the recording. Read the date, who you are interviewing, and names of interviewers.
   - If the participant does not provide written or verbal consent, do not continue with the interview.

6. Provide participant with honorarium or tobacco where appropriate.

7. Inform the participant that you will now turn on audio recorders to confirm consent and begin the interview.

INTERVIEW STRUCTURE

The interview questions will focus on individual and community socio-economics and well-being components and will be tailored to the interviewee. Not all interviewees may be asked questions on every topic. For example, questions on education would be more focussed on for an informant who works in an education-related position. Questions are used as guides and are intended to be semi-structured. Not all questions may be asked, but additional questions may be asked as the conversation progresses, and participants may end up responding to other questions before they are asked.

Questions are very broad to allow for organic conversation to develop.

Key data we are trying to gather include:

- Current day socio-economic and well-being baseline conditions;
- Potential impacts on people, their families, and their communities that may result from the proposed project; and
- Community needs, and needs in relation to maximizing project benefits, and preventing or minimizing negative impacts.

Also to consider are:

- Community goals and aspirations;
- Available and desired facilities, services, and supports; and
- Community capacity to meet members' needs.

Questions will be presented to cover two distinct time periods:

1. Current socio-economic and well-being conditions

2. Potential (future) project impacts (e.g., during construction and during operation)

INTRODUCTION

[Complete the interview checklist and pre-interview section, above, then read the text below with AUDIO & VIDEO RECORDERS ON at the start of each interview.]

Today is [date]. We are interviewing [participant name] for the Algonquins of Pikwakanagan First Nation Socio-economic and Well-Being Assessment study for the Timiskaming Québec Dam-Bridge Replacement Project (the proposed project). Thank you for coming.

My name is [name] and my co-researcher(s) is/are [name]. We're at the [building/office/location] in [location] in [region/province]. [participant name & ID] has read and signed the consent form, and we have assigned him/her participant ID [number]. We have explained the purpose of the study and interview plan.

The goal of the interview is to understand socio-economic, health and well-being conditions in your community today, as well as potential future impacts related to the proposed project.

OPENING QUESTIONS (for all interviews)

Personal information, background, and experience

1. What is your full name?
2. Are you a member of AOPFN?
3. Can you tell me about your role/position at AOPFN/Department/Service?
4. How long have you been in this role?

- Next, we will ask a series of questions related to key topics that you feel comfortable speaking to. We will ask you a number of questions, feel free to let us know if you wish to speak to a certain topic or pass.

- ***Questions***
- It is important not to ask "leading" questions. A question may be leading if it suggests a particular answer or assumes a particular answer or reality. Ask yourself if the questions you are asking encourages a particular answer over other possible responses?
- DON'T ASK: "The proposed project will impact transportation. How does that make you feel?"

  DO ASK: "Do you think the proposed project will affect transportation? How?"
- DON'T ASK: "You think mental wellness is important to the community, right?"

  DO ASK: "Do you think mental wellness is important to the community?"

Note: The numbered questions are the main interview questions, with the letter's (a,b,c) being probing questions. Not all probing questions may be asked in the interview.

EMPLOYMENT AND ECONOMIC DEVELOPMENT

Current Conditions

1. Currently how would you describe the employment situation for AOPFN and its members?
    a. What are employment rates like for AOPFN members in Pikwakanagan?
    b. What is job security or availability like for AOPFN members?
        i. What about access to specific lines of work like apprenticeships and trades?
    c. What about for specific groups? (Women, men, youth, Elders, or members living off-reserve)
        i. E.g., are there differences in employment among these groups? Are there barriers that specific groups face?
    d. When was the AOPFN skills and proficiency database last updated?
        i. How is it being used?
        ii. Has it been helpful or effective?

2. Have there been changes in the health of local businesses? AOPFN member-owned businesses?

   a. What about AOPFN member-owned businesses outside of AOPFN?
   b. When was the business part of the skills and proficiency database last updated?
      i. How is it being used?
      ii. Has it been helpful or effective?

3. How are opportunities for employment, training, and contracts shared with community members? Is it effective?

4. How are opportunities for joint ventures communicated to/received by AOPFN? Is it effective?

Barriers and opportunities

5. Are there any employment barriers AOPFN members face in the job market?
   a. How do you think these challenges and barriers might be reduced?

6. Are there any barriers AOPFN member-owned businesses face?
   a. How do you think these challenges and barriers might be reduced?

7. What are AOPFN goals related to building job skills for community members?
   a. What types of supports and services are available for community members to support these goals? How have these supports, and services changed over time?
   b. What are the barriers/challenges to achieving these goals?
   c. What would you like to see in terms of supports and services to help community members gain and maintain meaningful employment?

8. What are AOPFN goals related to business development and procurement?
   a. What types of supports and services are available for community members to support these goals? How have these supports, and services changed over time?
   b. What are the barriers/challenges to achieving these goals?

Project Impacts

9. Do you see any employment opportunities for community members in the region as a result of the proposed project?
   a. If so, what are they?
   b. Do you think these opportunities will address existing employment challenges in the community?

10. Do you see any procurement opportunities for AOPFN member-owned businesses in the region as a result of the proposed project?
    a. If so, what are they?

b. Do you think these opportunities will address existing challenges or barriers these businesses are facing?

11. Do you have any concerns that the proposed project might NEGATIVELY impact the employment or procurement situation in the community? What are they?
    a. How might this affect employment/AOPFN businesses today? In the future?
    b. How could these impacts be avoided/reduced/addressed?

Proponent determined project impacts

The proponent has proposed the following mitigations to reduce negative impacts and maximize benefits to AOPFN. We would like your thoughts on these, and how they could be improved.

12. The Proponent have proposed prioritizing local and Indigenous employment and procurement for project construction, how can AOPFN members meaningfully benefit from this?
    a. How should the proponent or contractors work with AOPFN/your department to support:
        i. Cultural liaisons?
        ii. Recruitment?
        iii. Sub-contracting?
        iv. Training and skill-building?
        v. Monitoring employment, or acting as a liaison between contractor and AOPFN?

13. The proponent has suggested encouraging joint ventures when local capacity does not exist to create benefits for local and Indigenous communities.
    a. Does AOPFN have the capacity and experience to participate in joint ventures?
    b. Would this be of benefit to AOPFN? How?

14. The proponent has proposed support for monitoring training and use of local Indigenous Guardianship initiatives. What needs to be in place to ensure AOPFN meaningfully benefits from this?

15. Are there any policies, training, or other considerations in place or that should be considered to create a safe working space for AOPFN members if working on site? To reduce barriers to their employment?
    a. Prompts: with respect to racism or sexism, reporting, cultural awareness training.
    b. Prompts: with respect to accessing the workplace – e.g., transport, equipment, or housing.

EDUCATION AND TRAINING

Current Conditions

1. Currently: How would you describe the education situation for AOPFN and its members?
    a. For children and youth (K-12)?
        - Has the situation changed over time?
        - What is working well within the school environment? What is not working well?

b. What about for post-secondary enrollment?
    - How many AOPFN members are attending school at a post-secondary level?
    - How many graduates (i.e., have professional degrees or diplomas)?

c. What about available supports and services for education?

a. Specific prompts from baseline gaps:
    - What about for specific groups?
        - Women, men, youth, Elders, or members living off-reserve.
        - E.g., are there differences in education levels among these groups? Are there barriers that specific groups face?
    - What type of apprenticeship programs are available?
    - What scholarship or funding programs are available for students?

2. Currently: What do you see as some of the challenges or barriers to students in pursuing their education?
    a. In K-12?
    b. In post-secondary?
    c. What additional supports and services would be helpful to address these challenges and barriers?

Project Impacts

3. Do you see any opportunities for the proposed project to POSITIVELY contribute to education or educational programming and services in Pikwakanagan?
    a. How?
    b. Why or why not?
    c. What could the project do to maximize these benefits for Pikwakanagan?

4. Do you have any concerns that the proposed project might NEGATIVELY impact education or educational programming in Pikwakanagan?
    a. What are they?
    b. What do you think the project could do to reduce or address these impacts?

Proponent determined project impacts

The proponent has proposed the following mitigations to reduce negative impacts and maximize benefits to AOPFN. We would like your thoughts on these, and how they could be improved.

5. The proponent has proposed prioritizing local and Indigenous employment for project construction.
    a. How can AOPFN members meaningfully benefit from this?
    b. How should the proponent or its contractors work with AOPFN/your department to support:
        - Recruitment?
        - Training and skill-building?
        - Supporting education programs?
        - Scholarships?
        - Apprenticeship opportunities?
        - Acting as a liaison between contractor and AOPFN?
6. The proponent is proposing an Indigenous Participation Plan to support economic benefits, and to encourage contractors to provide training and apprenticeship opportunities.
    a. How should the proponent or its contractors work with AOPFN/your department to support:
        - Training and skill-building
        - Apprenticeships and job-shadowing

- Scholarships

7. The proponent is proposing to support environmental monitoring training to local, impacted Indigenous groups, as well as supporting the creation and long-term sustained use of local Indigenous Guardianship initiatives.
    a. From your perspective, what needs to be in place to support training and long-term use of these initiatives?

HOUSING

Current Conditions

1. How would you describe the current housing situation in Pikwakanagan?
    a. What about housing situation among members living off-reserve?
    b. What about affordability?
    c. What about housing conditions (e.g., overcrowding, need of repair etc.)?
    d. Are most people satisfied with their housing?
    e. Are there enough suitable housing options to meet current and/or future demand?
    f. How were issues related to housing dealt with?
    g. Does housing situation vary by group (e.g., men, women, youth, Elders, etc.)?

2. Currently, what do you see as some of the main issues or challenges related to housing for community members?
    a. Does housing situation vary by group (e.g., men, women, youth, Elders, etc.)?
    b. What about members living outside of Pikwakanagan

3. Currently, what types of housing related supports and services are available for community members to support their housing goals? What would you like to see in place?
    a. What are the barriers/challenges to achieving these goals?

Project Impacts

4. Do you see any opportunities for the Timiskaming Dam Project to POSITIVELY contribute to the housing situation of AOPFN members?
    a. How?
    b. Why or why not?
    c. What could the Project do to maximize these benefits for your community?

5. Do you have any concerns that the Timiskaming Dam project might NEGATIVELY impact the housing situation of AOPFN members?
    a. What are they?
    b. Do you think it make the situation worse? How so?
    c. What do you think the project could do to reduce or address these impacts?

Proponent determined project impacts

The proponent has proposed the following mitigations to reduce negative impacts and maximize benefits to AOPFN. We would like your thoughts on these, and how they could be improved.

6. The proponent has proposed prioritizing local and Indigenous employment for project construction.
    c. How should the proponent or its contractors work with AOPFN/your department to reduce barriers to housing and accommodation near the project area?

CONNECTION TO LAND AND CULTURE

Current Conditions

1. Currently: How would you describe Pikwakanagan members connection to culture?
    a. What are the main ways that community members connect with their culture?
    b. What are some of the main factors that support community members to connect with their culture?
    c. What about for specific groups (e.g., women, men, members living outside of Pikwakanagan, Elders, youth, etc.)?

2. Currently: How would you describe Pikwakanagan members connection to the land?
    a. What are the main ways that community members connect with the land?
    b. What are some of the main factors that support community members to connect with the land?
    c. What about for specific groups (e.g., women, men, members living outside of Pikwakanagan, Elders, youth, etc.)?

3. What do you see as the main barriers or challenges to cultural connection and connection to the land for community members?
    a. Are these barriers and challenges different than challenges faced in the past? If so, how?
    b. How do you think these challenges and barriers might be reduced?

4. What types of resources, facilities, services, or supports are provided by the community to support community priorities for connecting to the land and culture?
    a. How have these supports, and services changed over time?
    b. Are resources sufficient to meet community needs/demand?
    c. How does this compare to the past?
    d. What would you like to see to support these goals?

Project Impacts

5. Do you see any opportunities for the Timiskaming Dam project to POSITIVELY impact cultural connection of community members? What about AOPFN members' connection to the land?
    a. What are they?
    b. How?
    c. What could the Project do to maximize these benefits for the community?

6. Do you have any concerns that the Timiskaming Dam Project might NEGATIVELY impact cultural connection of community members? What about AOPFN members' connection to the land?
    a. What are they? How would they occur?
    b. Is there a potential for impacts on known or unknown archaeological resources? If so, how?
    c. Is there a potential for impacts on cultural activities?
    d. What do you think the Project could do to address these impacts?

Proponent determined project impacts

The proponent has proposed the following mitigations to reduce negative impacts and maximize benefits to AOPFN. We would like your thoughts on these, and how they could be improved.

7. Regarding skills and capacity development, the proponent has proposed to support creation and long-term sustained use of local Indigenous guardianship initiatives.

a. How should the proponent work with you and AOPFN Guardians to ensure this commitment is met?
b. Are there specific areas of monitoring and stewardship Guardians should be involved in, with respect to the project?
c. Are there resources Guardians need to be successful in their involvement?

8. The proponent has proposed Indigenous groups be involved in archaeological studies, and to work with them prior to construction to prepare protocols and management of any recovered artifacts found during archaeological assessments.
    d. How can AOPFN members meaningfully benefit from this?
    e. How should the proponent or its contractors work with AOPFN Guardians to support archaeological assessments?

9. The proponent has assessed that the project will lead to negative, but overall not significant, impacts to the physical and cultural heritage value of the Ottawa River.
    a. Do you agree with this assessment?
    b. How could the Guardians play a role in reducing the negative impact of the project, and ensure they are not significant?

10. The proponent is proposing to support environmental monitoring training to local, impacted Indigenous groups, as well as supporting the creation and long-term sustained use of local Indigenous Guardianship initiatives.
    a. From your perspective, what needs to be in place to support training and long-term use of these initiatives?

HEALTH AND WELLNESS

Mental wellness is a balance of the mental, physical, spiritual, and emotional. This balance is enriched as individuals have: PURPOSE in their daily lives whether it is through education, employment, care-giving activities, or cultural ways of being and doing; HOPE for their future and those of their families that is grounded in a sense of identity, unique Indigenous values, and having a belief in spirit; a sense of BELONGING and connectedness within their families, to community, and to culture; and finally a sense of MEANING and an understanding of how their lives and those of their families and communities are part of creation and a rich history." (First Nations Mental Wellness Continuum Framework, 2021)

The definition of Indigenous mental health and wellness, and the factors that affect it, are specific to communities and their culture. As such, there is no one definition of Indigenous mental health or wellness, nor of the factors that affect Indigenous wellness.

Current Conditions

1. Currently, how would you describe the current health and mental wellness situation of community members?
    a. How would you describe food security and nutrition among AOPFN members
        i. What about off-reserve members?
    b. Are there any health and mental wellness resources or services offered by the community? If, so how were these working (well, not well)?
    c. How is the situation different now than compared to the past?
    d. What are the main issues and challenges?
    e. Are issues and challenges different than challenges faced than in the past? If so, how?
    f. What about for specific groups: Women? Men? Off-reserve members?

i. Other specific groups include: Elders, youth, people with health impairments, single parents.

2. Currently, what are the top health and mental wellness priorities in the community?
    a. What types of resources, services, or supports are provided by the community to support these priorities now? Are they sufficient to meet community needs/demand?
    b. What are the barriers/challenges to improving health and wellness in the community?
    c. Are these barriers and challenges different than challenges faced than in the past? If so, how?
    d. How can the community's mental and health goals be better supported?

Project Impacts

3. Do you see any opportunities for the Timiskaming Dam project to POSITIVELY contribute to the health and mental wellness of Pikwakanagan members or programs and services?
    a. How?
    b. Why or why not?
    c. What could the Project do to maximize these benefits for Pikwakanagan

4. Do you have any concerns that the Timiskaming Dam project might NEGATIVELY impact the health and mental wellness of Pikwakanagan?
    a. What are they?
    b. Are you concerned about the project's impacts to water, including contamination, and traditional medicines?
    c. Are you concerned about the project's impacts on food sources through impacts to plants, fish, and other wildlife, including habitat?
    d. Would it make the situation worse? How so?
    e. What do you think the Project could do to address these impacts?

Proponent determined project impacts

The proponent has proposed the following mitigations to reduce negative impacts and maximize benefits to AOPFN. We would like your thoughts on these, and how they could be improved.

5. With respect to use of the Ottawa River, the proponent is proposing monitoring water quality changes during Project construction and operation, providing water quality data to communities, and material safety information about dam components to AOPFN.
    a. From your perspective, should there be any other considerations with respect to health and water contamination?
    b. How should the Proponent work with the community/your department regarding monitoring of water quality and potential contamination of water ways?

CONCLUDING REMARKS

1. Is there anything else about the Project you would like to discuss?

2. Is there anything else you think is important for us to know?

CONCLUSION

Read with audio & video recorders on after every session.

Today is [date]. My name is [name], my co-researcher is [name] and we are here at [office/building] in [community/town]. We have just finished interviewing [participant name and ID] for the AOPFN socio-economic baseline study for the proposed project. We've recorded a total of [#] tracks on the digital recorders. Notes are recorded in/on [notebook/computer]. This interview has taken approximately [#] hours [#] minutes. Thank you again for coming.

Interview Closing

1. Ask the participant if there is anything else they think is important for us to know.

2. Inform the participant that you have finished your questions and ask them if they have any questions about the study or project.

3. Ask them if there is anyone else they think we should be speaking with (record their name and contact information).

4. Ask them if there are any documents they could share or recommend for us to read to get a better understanding of the topic situation they are most familiar with / expert in.

5.. When finished, state the date, names of participants and interviewees for the audio recording.

6. Turn off the recorders and thank the participant for their time.

7. Make sure to leave your contact information with the participant.

APPENDIX 7: BASELINE DATA GAP ANALYSIS

General Comments on Review of Draft EIS by AOPFN (2022):

- Heavy reliance on secondary data sources
  - *lack of community-based research*
  - *huge information gaps*
  - *AOPFN-led SEIA as addendum to EIS*
- Inadequate characterization of baseline conditions, affecting assessment of impacts on AOPFN
  - *E.g., inadequate characterization of traditional land use & impacts, Rights impacts*
- AKLUS results were not sufficiently integrated
- Lacks GBA+ approach that would allow for the consideration of vulnerable groups
- Emphasis on socio-economic conditions, and not on health and cultural conditions/ impacts
- Poor portrayal of cultural/ socio-economic/ rights contexts around biophysical impacts (e.g., declines in abundance of American eel and sturgeon)
- Barriers to accessing benefits not assessed
- Lower-skill employment opportunities offered
- Impacts to participation in cultural events due to employment not adequately addressed
  - *AOP recommendations - implementation of co-developed culturally appropriate policies and cultural leave/ flex scheduling for Indigenous employees*
  - *Lack of clear commitment to implement*

Value	PSPC data sources	PSPC identified indicators	AOPFN 203 data sources	AOPFN 203 potential indicators	Ongoing gaps in baseline data and indicators, and recommendations from Oversight Committee meetings

Employment	1. Statistics Canada. 2018. Algonquins of Pikwakanagan First Nation [First Nation/Indian band or Tribal Council area], Ontario (table). Aboriginal Population Profile. 2016 Census. Statistics Canada Catalogue no. 98-510 X2016001)
	2. Statistics Canada. (2022). Labour force characteristics by province, monthly, seasonally adjusted.
		• Employment rate of members living in Pikwakanagan (comparison between genders, compared to Ontario, Federal)	1. AOPFN SEWB (2023)	• Employment status
				• Industry or sector of work (and opportunities)
				• Employment in Pikwakanagan
				• Income comparison between in/outside of Pikwakanagan.
				• Strengths and opportunities related to employment
				• Vulnerabilities or barriers
					• Apprenticeship and skilled trades member data (noted in Skills and Proficiency Database presentation (2021)
					• Update to skills and proficiency database
					• State of Guardians program (source of employment)
					• From SEWB verification: Understanding who is receiving pension
					• From SEWB verification: Consult the self-government documents, community plan, and strategic plan for direction on what jobs, skills, and trainings will be needed, what opportunities will be coming up
					• From OC meeting #2:
					  ○ How will the Proponent provide meaningful employment (not just labour)?
					  ○ Desire to see training offered in place of employment where there is no one to fill that position.
					  ○ Transportation costs, housing costs, and options are major barriers to employment

	3. CIRNAC, Crown-Indigenous Relations and Northern Affairs Canada. (2021). First Nation Profiles 4. Statistics Canada. 2018. Algonquins of Pikwakanagan First Nation [First Nation/Indian band or Tribal Council area],	• Median income (AOPFN members, AOPFN household, comparison between gender, to Canadian and Provincial average)	2. AOPFN Skills and Proficiency Database (2021)	• Existing areas of employment • Member skills and experience • Barriers and opportunities for employment.	

	Ontario (table). Aboriginal Population Profile. 2016 Census. Statistics Canada Catalogue no				○ Need for wages to be able to cover expenses (like the above barriers) ○ Contracts need to be offered through friendship centres and things like that. • From June, 2022 AAC meeting: ○ Even if jobs are available – how do we fill them? ○ Sponsor higher-level training for those interested in employment or gaining meaningful skills (not just entry level work), inclusive of middle-aged people (e.g., not just youth). ○ Need for AOPFN liaison in monitoring and reporting on employment, skills and training, etc. at project site. ○ Need for exit interviews • GBA+ approach to understanding health and wellness • From AOPFN comments on PD (2020): ○ For the Labour force and Employment VCs considered in the report, can PSPC provide the following information: ○ Considerations of how AOPFN members and businesses will be able to access economic benefits resulting from the Project. ○ How much of AOPFN's Labour force will be employed by the project? ○ Any barriers to accessing employment or other economic opportunities arising from the Project? • From AAC/AKLUS comments (n.d.): ○ Mentorship opportunities needed ○ ensuring contracts hire Indigenous employees ○ monitoring & training included in all aspects going forward ○ proponent to share tangible benefits to AOPFN in their presentations ○ Recruiting young people into sciences ○ recruiting biologists/techs for proponents to hire and provide scientific knowledge. • From OC meeting #3: ○ Guardians on the land, costs for them covered
	5. AOPFN CCP (2021)	• AOPFN-specific goals for employment	3. AOPFN Land Use Plan (2022)	• Policy guidance to provide opportunities to generate economic development, community revenue and employment (on reserve) • Existing and proposed future use of lands (i.e., commercial)	
			4. AOPFN Economic Development Strategic Plan (2021)	• Business development (and priority areas) • Training opportunities • Regional economic scan • Barriers to job seekers • Industry growth in the region	
			5. Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential Report Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning Project (Final Report) (2021)	• Employment status (household)	

					○ Remote work location of the project, transportation to site, and accommodations near the site are barriers to employment. ○ Pay (i.e., low wages) and hiring Indigenous people in non-meaningful positions are a barrier. ○
Economic Development	1. AOPFN Website	• Services offered by Ec. Dev Department	1. AOPFN Land Use Plan (2022)	• Required area of land for proposed land uses (including commercial and residential-commercial) • Goals, policy directions and actions for: ○ residential-commercial land use ○ commercial land use	• Website information: Up to date LP investment or joint ventures (i.e., opportunities for joint ventures, or investments). • Updated businesses list from Economic development staff, Skills and proficiency database • From AAC meeting, June 2022: ○ Joint ventures can be a positive thing if done properly (i.e. a percentage needs to go to AOPFN, the community, the infrastructure) • From OC meeting #2: ○ Contracts need to be offered through friendship centres and things like that. ○
	2. AOPFN Economic Development Staff Interviews (2019)	• Business list	2. AOPFN Economic Development Strategic Plan (2021)	• Mission statement and guiding principles • List of existing joint ventures • Economic development structure • Reserve land analysis (commercial land use, fee simple lands) • Potential development of fee simple lands • Regional labour market and supply chains (Ontario, Renfrew County) • Key economic sectors for AOPFN • Indigenous business procurement process and strategy • Economic development readiness assessment and recommendations • Strategic focus areas and goals for economic development	
	3. AOPFN Algonquin Knowledge and Land Use Study for the Timiskaming Dam Project (2021)	• Traditional economy interconnected with environment			
	4. AOPFN CCP (2021)	• AOPFN's economic development priorities	3. Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential Report Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning Project (Final Report) (2021)	• Economic development department profile (e.g., services, programming) • Regional/associated programming (e.g., Kagita Mikam)	

Education	1. AOPFN website (2021a) – Education department	• Access to education for on-reserve members
		• Educational services for on-reserve members
			1. AOPFN SEWB (2023)	• Education level of AOPFN members
				• Education goals and areas of interest
				• Certificates/training held by members
				• Job-related skills, and other skills
				• Supports or services required to pursue education/training
					• From SEWB verification
					  ○ Number of students and graduates to see where job opportunities might be useful in the future
					• From June 2022 AAC meeting:
					  ○ "…we have a lot of bright people, a lot of students who are gung-ho to do their part in helping us, but they're lacking opportunities like scholarships — well it's going to be down the tube. So, I like the idea of business opportunities, but if we cannot fulfil them, what can we do instead?"
					  ○ Priority on needs for the future, training up and supporting youth education
					  ○ Understanding scholarships or sponsorship of post-secondary students (AOPFN members)
					  ○ Financial support and services for training and education (gap in support for students/education)
					  ○ "instead of using compensation, they should be told "you have to set up a program whereby you would be willing to fund the schooling, the education for one of our people, in the various jobs that would be available. If some of our people are interested in becoming a heavy equipment operator, we will fund them in a program where they will be certified as a heavy equipment operator. Our people are artists by nature because they've learned from nature, why couldn't one of these projects fund someone to become a designer of bridges, a designer of dams, a designer of buildings? This should be written into all our dealings with proponents on different projects."
					  ○ On use of the word "encouraged" – too loose and forgiving – needs to be "will", committal.
					  ○ Obligation to follow-up on attempts to enable skill building and employment (e.g., reporting, monitoring)

	2. Statistics Canada. 2018. Algonquins of Pikwakanagan First Nation [First Nation/Indian band or Tribal Council area], Ontario (table). Aboriginal Population Profile. 2016 Census. Statistics Canada Catalogue no. 98-510 X2016001)	• On-reserve education levels (2016, 2006)	2. Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential Report Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning Project (Final Report) (2021)	• Education services profile overview	

					○ Need to offer apprenticeships • From 2020 meeting between AOPFN and Odonaterra: ○ Youth graduation rates ○
Community services and housing	1. AOPFN Economic Development Staff Interviews (2019)	• Community services in Pikwakanagan	1. AOPFN Land Use Plan (2022)	• Current land uses in Pikwakanagan • Community infrastructure • Housing projections • Residential land needs • Persons per unit (based on 2016 census data) • Vision for land use and guiding principles • Required area of land for proposed land uses • Goals, policy directions and actions for ○ general land use planning ○ infrastructure and transportation ○ residential land use ○ residential-commercial land use ○ commercial land use ○ Community use ○ Cultural land use ○ Recreation ○ Wetland areas ○ Natural areas • Current Pikwakangan Reserve area description • Current fee simple lands description	• From SEWB verification: ○ Housing; overcrowding; accuracy of data ○ Include data on existing housing in Pikwakanagan (freehold, SF, Duplex, etc.) ○ Consult Land Use Plan for how land will be used w/in AOPFN • From June, 2022 AAC meeting: ○ Concern regarding flooding, and overlap with other projects in the traditional territory ○ Need for by-law enforcement in AOPFN • From OC meeting #2: ○ Housing may be a barrier to employment (at project site) • From OC meeting #3: ○ Connecting students in engineering or construction with work opportunities here ○ Students experience barriers and a co-op could be beneficial ○ Accommodations need to be provided to students
	2. CIRNAC. (2021). First Nation Profiles.	• State of Indigenous reserve housing			
	3. Statistics Canada. 2018. Algonquins of Pikwakanagan First Nation [First Nation/Indian band or Tribal Council area], Ontario (table). Aboriginal Population Profile. 2016 Census. Statistics Canada Catalogue no. 98-510 X2016001)	• AOPFN dwelling characteristics in Pikwakanagan (2016, 2006)			
		• Suitability of housing in Pikwakanagan based on crowding	2. AOPFN SEWB (2023)	• Housing status and composition • Crowding • Goals with respect to living in Pikwakanagan • Supports or services needed with respect to housing	
	4. AOPFN CCP (2021)	• Housing goals	3. AOPFN Economic Development Strategic Plan (2021)	• Community infrastructure (roads, water and wastewater, drainage, housing) •	
Health	1. AOPFN Economic Development Staff Interviews (2019)	• meaning of health • factors affecting individual and community health	1. AOPFN SEWB (2023)	• Access to health services • Access to culturally safe services • Mental wellness of members	• GBA+ approach to understanding health and wellness • From 2020 meeting between AOPFN and Odonaterra

	2. AOPFN website (2018)	• Services offered in Pikwakanagan		• Barriers to accessing health services • Services or supports required to improve community health and mental wellness outcomes • Perceptions of community connection and social cohesion	○ Ensure all social services are included (overall what, from the website) is out of date? ○ Off-reserve health and well-being baseline • What are indicators for health and wellbeing for AOPFN? • From AAC/AKLUS comments (n.d.): ○ Study/Plan to understand worst case spill scenario during construction ○ Compensation: Clean drinking water for loss of land, a lot of people on the reserve can't drink from their own wells. • From OC meeting #3 ○ Need to protect wild rice planting grounds ○ Need for water testing for presence of bacteria or other organisms
	3. AOPFN CCP (2021)	• meaning of health, • health-related priorities and actions			
	4. Community Wellbeing Index (ISC, 2020	• comparison of AOPFN (on-reserve) health and WB to other FN communities; comparison to non-indigenous Canadians			
	5. Champlain Home and Community Care Support Services	• services offered to the region			
	6. First Nations Food, Nutrition and Environment Study	• Indigenous household food security rate			
	7. AOPFN AKLUS (2021)	• water sources • Algonquin foods and their uses • impacts to traditional food sources (fish and fish habitat) • connection between health and wellbeing and ability to be on the land and water and harvest animals, fish and plants for sustenance and cultural practices. • connection between environmental change and diet			
	8. Public Health Ontario (2021)	• Social determinants of health map	Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential Report Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning Project (Final Report) (2021)	• Dietary patterns (e.g., frequency of use of Algonquin foods; agricultural products) • Use of Algonquin medicines • Water source, quality and consumption • Water use (e.g., bathing) • Food security • Perceptions of individual health (overall, physical, mental) • Community wellness challenges • Health and Social services (in AOPFN) overview	
	9. Statistics Canada. (2019). Health characteristics, two-year period estimates	• general health conditions (perceived) by health unit. • physical health conditions by health unit • mental health by health unit			
	10. Wabano Centre for Aboriginal Health mental wellness study (2014)	• Indigenous mental health, substance use			

	11. Pembroke Regional Hospital (2021)	• hospital catchment area		• Cumulative effects w respect to water, land, plants, and animals.	
	12. IAAC 2021/OFNTSC 2019	• AOPFN water treatment plant funding and details	Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Closure Project Final Report (Confidential) (2021)	• Contamination of fish and waterways (Ottawa River – may be applicable to the project, but large focus on RSA of NPD project) • External pressures (non-AOPFN hunters, logging) on moose populations	
	13. Government of Canada (2021)	• Water quality – history of boil advisories			
	14. AOPFN CES (2021)	• importance of Algonquin foods to food security, health and cultural wellbeing			
	15. Council of Canadian Academies (2014). Aboriginal food security in Northern Canada: An assessment of the state of knowledge.	• connection between consumption of country foods, food security, and physical and mental health.			
Recreation	1. AOPFN Website – Sports and Recreation Department (2021)	• List of services, events and programs offered in Pikwakanagan	1. AOPFN SEWB (2023)	• Community recreation programming needs and opportunities	
			2. AOPFN CCP (2021)	• List of recreation services in Pikwakanagan • Community priorities for recreation	

			3. AOPFN Land Use Plan (2022)	• Required area of land for proposed land uses (recreational)
				• Goals, policy directions and actions for
				  ○ Community use
				  ○ Recreation	

Connection to Land and Culture (Per the EIS: "Physical and Cultural Heritage")	1. CIRNAC, Crown-Indigenous Relations and Northern Affairs Canada. (2021). First Nation Profiles
	2. Black, M.J. (2018). Algonquin. The Canadian Encyclopedia.
	3. Statistics Canada. 2018. Algonquins of Pikwakanagan First Nation [First Nation/Indian band or Tribal Council area], Ontario (table). Aboriginal
		• Language characteristics
		• Language goals
		• Language training and services
			1. AOPFN SEWB (2023)	• Perceived connection to culture
				• Perceived connection to the land
				• Traditional activity participation
				• Factors affecting cultural connection
				• Supports or services to improve connection to culture
				• Barriers to connection to the land and culture
					• From June, 2022 AAC meeting:
					  ○ Cultural practices -> Cultural and spiritual practices (the latter has been missing in wording and "it's a huge part of who we are and how we've been around this area")
					  ○ Need for financial support for land-based programs;
					  ○ Need for land-based activities
					• From OC meeting #2:
					  ○ Ensure an AOPFN-specific protocol for encountering artifacts is followed
					  ○ (above) may include training for workers.

	Population Profile. 2016 Census. Statistics Canada Catalogue no. 98-510 X2016001)			• Language programs and supports desired • Language learning goals •	• From 2020 comments by AOPFN on project description: ○ The Proponent's response is partially adequate. In regards to the compensation program, the Proponent has confirmed that a specific forum will be convened to discuss other outstanding issues. AOPFN requests that this discussion include consideration of the habitat offsetting / compensation plan and how existing cumulative effects will be considered. There is a need to address the heavily impacted baseline conditions in the proposed Project study area, as well as cultural values (i.e., the value of the area from a cultural perspective, and the accumulated loss of those values in the aquatic study area). with AOPFN to develop an appropriate compensation plan that considers the condition of habitat in the study area, including the additional impact of the proposed works. AOPFN understands that this work is necessary to replace the bridge and dam at this time, but emphasizes that the original dam/bridge construction contributed to loss of fish habitat and cultural values that have not been adequately considered or compensated. While AOPFN does not expect that these losses will be fully mitigated or compensated through the currently proposed construction, this context must be appropriately taken into account by the Proponent. ○ The Proponent has not provided a rationale for sampling deficiencies in spawning grounds. AOPFN would like to discuss a concrete plan for filling knowledge gaps in spawning grounds to further understand the potential for loss of spawning habitat, and how this loss should be mitigated. • From summary of AAC and AKLUS comments (n.d.) ○ Co-management approach to governance to protect fish species. Not just sitting on a committee, but actually partaking ○ fish compensation, when a company destroys a fishery, they should have to compensate for it (put fish in a
	4. AOPFN CCP (2021)				
	5. The Circle of Turtle Lodge. (2022). Language Revitalization 6. Omamwinini PImadjwowin: The Algonquin Way 7. Lakehead University. (2021). About Aboriginal Education.		2. Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Closure Project Final Report (Confidential) (2021)	• Harvesting rights • Sufficiency of resources to practice rights • Regional cumulative effects to AOPFN members ability to practice harvesting rights (may be limited to scope of the report) • Cumulative effect of dams on harvesting and traditional use rights • Impact of logging and fast-moving traffic on knowledge transmission	
	8. Whiteduck, K. (2002). Algonquin Traditional Culture. 9. Holmes, J. (1993). Algonquins of Golden Lake Claim. 10. Morrison, J. (2005). Algonquin History of the Ottawa River Watershed.	• Algonquin anthropological and geographical history (incl. unceded territory claim).			
	11. AOPFN CES for Timiskaming Dam (2022)	• Importance of sense of place.			
	12. AOPFN Algonquin Knowledge and Land Use Study for the Timiskaming Dam Project (2021)	• Significant sites and landscapes to AOPFN • Connection to the land and waters, and its cultural value • Socio-economic value of the land and waters • Knowledge transmission of traditional activities • Cultural, spiritual and historical value of the Kichi-Sibi (Ottawa River) • Protection of sacred areas • Presence or absence of potential artifacts. • Current land use	3. Algonquins of Pikwakanagan First Nation Diet and Harvest Study: Confidential Report Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Decommissioning Project (Final Report) (2021)	• Land access or avoidance • AOPFN harvesting patterns, by activity and area • Barriers to harvest and avoidance • Community strengths and challenges • Participation in cultural/traditional activities	

		• Impacts to eels, other fish as food sources, as well as other wildlife and vegetation • Loss of AOPFN land to projects and lack of land reallocation or compensation • Deterioration of the environment and restrictions to rights and traditional economy • Risk of flooding along Kichi-Sibi • Displacement from harvesting sites during construction phase • Restrictions to navigation on the water • Role as stewards of the land and water • Ability to use traditional conservation system to fulfill roles as stewards •			different place where they cannot be disturbed) ○ hatchery system to help fisheries ○ stocking, or creating good spawning beds ○ Build a plaque honouring the families that lived there ○ Require boat cleaning to ensure there are no invasive species (eg. zebra mussels) transferred across water bodies ○ Member involvement in archaeological studies ○ Creation of joint monitoring committee ○ Cultural Awareness program for contractor employees ○ Before construction, prayer for essence,soul of plants must be done ○ Prayer and Ceremonial opportunity for Members minimum one year ahead of construction ○ Proponents to acknowledge they are on AOPFN traditional territory each time they deliver a presentation. ○ culture, traditions and language to be included in health and socioeconomic assessment ○ Identify the amount of TEK in reports and how important they are to protecting culture.
	13. Archéotec. (2017). Phase I. Archaeological potential assessment for the Témiscamingue Québec Dam Replacement Project.	• Archaeological evidence of the project area • Archaeological potential of the project area.			• From OC Meeting #3: ○ Need to ensure that fish, frogs and turtles are getting through [the dam] ○ Project could impact access to fishing and hunting ○ Impacts to the land and culture are of high priority, communication needs to be improved to build trust. ○ Access and use of waterways: hopefully water on the Ottawa River can be controlled better. Monitoring down stream should occur. ○ Need a piece of property where First Nation communities can come together and events can be held. ○ Need to create and implement a protocol for archaeological assessment (e.g., chance finds) with the inclusion of all Indigenous groups along the Ottawa River. ○ Cultural and historical significance of the Ottawa River ○ Ensure spawning grounds and wild rice fields are protected from changing water levels ○ Need measures in place to relocate, protect and re-stock aquatic species (e.g., mollusks).
	14. Speck, F. G. (1915). Family Hunting Territories and Social Life of Various Algonkian Bands of the Ottawa Valley. Geological Survey.	• Algonquin traditional hunting territories	4. AOPFN Land Use Plan (2022)	• Required area of land for proposed land uses • Goals, policy directions and actions for • ○ Cultural land use ○ Wetland areas ○ Natural areas	
	15. Internal AOPFN scoping session (n.d.)	5. Interconnectedness of environment and maintaining dynamic relationships			
	16. AOPFN AKLUS (2021)	6. Permanent or seasonal/temporal residence in LSA/RSA 7. Negative effects of pollution on lands use by members by external factors			

					○ Long Sault Island is potentially a place of peace, gatherings and solace (if used by communities) ○ Avoidance of fishing during the [construction of] project to limit it's impacts ○ Reducing fishing the year or two before the project ○ Offsetting 3:1 ratio should be in place to mitigate impacts on spawning grounds ○ Increased velocity of water may have negative impact on spawning ground ○ Dedicate space on the island for practicing culture ○
Safety	n/a	n/a	1. Algonquins of Pikwakanagan First Nation Culture and Rights Study Specific to Canadian Nuclear Laboratories' Nuclear Power Demonstration Closure Project Final Report (Confidential) (2021)	• Impact of logging on access and safety while hunting	• From SEWB verification: ○ Fire safety training/support for homeowners and tenants. • From AAC meeting (June 2022): ○ Concern regarding road safety ○ Lack of OPP enforcement (road safety) • From 2020 meeting between AOPFN and Odonaterra: ○ Crime rates (youth)
			2. AOPFN SEWB (2023)	• Perception of safety in Pikwakanagan and for off-reserve members • Safety issues for on/off reserve members • Supports and services desired to increase community safety	
			3. AOPFN CCP (2021)	• Goals and actions for community safety	

APPENDIX M – ARCHEOLOGY STUDIES

M-1: Marine Archeology Assessment Background Research – Task 1

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Marine Archaeological Assessment
Background Research
Timiskaming Dam-Bridge of Quebec
Replacement Project (Quebec) (715-32760TT)
Intersection of Lake Temiskaming and the Ottawa River
Straddling Border of Québec and Ontario

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Licensed under
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Marine Licence #2023-02
ARA File #2022-0574

26/09/2023

Original Report

The following has been adapted from the Assembly of First Nations and demonstrates the importance of water for Indigenous communities (https://www.afn.ca/honoring-water/):

Archaeological Research Associates recognizes the importance of water for Indigenous communities in its many elements including but not limited to the shaping of the land, the rivers, lakes, ice and oceans. We recognize and acknowledge that the Indigenous peoples of North America have a special relationship with water, built on their subsistence ways of life that extends back thousands of years. Traditional activities depend on water for transportation, drinking, cleaning, purification, and provides habitat for the plants and animals gathered as medicines and foods.

EXECUTIVE SUMMARY

Tetra Tech QI Inc. and Public Services and Procurement Canada retained the services of Archaeological Research Associates (ARA) to conduct the marine archaeological background research (equivalent of land-based Stage 1 archaeological assessment) for the Timiskaming Dam-Bridge of Quebec replacement project (Quebec) (715-32760TT) located at the intersection of Lake Temiskaming and the Ottawa River, straddling the Québec and Ontario provincial boundaries. The study area is 3.71 hectares in size, extending 50 metres north of the north face of the existing dam, and approximately 255 metres downstream of the downstream dam face.

Permission to access the study area and to conduct all activities associated with the background research and a property visit was provided by the proponents.

Public Services and Procurement Canada required a marine archaeological assessment for the proposed bridge-dam replacement in-water area. An Ontario archaeological licence was required by the PSPC, rather than one from Quebec. The reasoning behind procuring the Ontario licence was that the border fell mid-dam, and also that the closest Indigenous community requested that an Ontario licence be procured rather than a Quebec licence, citing that regulatory requirements for Ontario reports was higher than those for Quebec licenses. PSPC, therefore, instructed ARA to acquire only an Ontario marine archaeological licence. The archaeological assessment was triggered by the Federal Canadian Environmental Assessment Act, 2012 (CEAA 2012).

Background research indicated that there were no registered archaeological sites within one kilometer of the study area. However, community knowledge shared with ARA suggested that there exists two historic Algonquin settlements/camps within 1 km of the existing bridge-dam. There were several land archaeological assessments conducted on adjacent lands, both on the mainland Quebec side, as well as several assessments on Long Sault Island. A commemorative plaque located on Long Sault Island marks the terminus of Highway 63 (Ontario) and the commencement of Highway 101 (Quebec).

Bathymetry and underwater videos indicate that the lake bottom upstream (north) of the dam face may have evidence of the former cofferdam from the 1934 dam. On the downstream (south) side of the dam, there are indications of the current dam apron, as well as concrete and metal, and possibly remains of a sill. There are few accumulated sediments on the river bottom, but evidence shows that heavier materials such as small rocks, etc. remain on the bottom. There is one large scour hole, reported from between 10 and 19 metres in depth, at the base of the downstream apron. It is unlikely that any in situ cultural remains are present in the scour hole.

The proponents have undertaken Indigenous engagement and there is a clear indication that many of the First Nations, Métis and Indigenous communities have expressed concern regarding possible Indigenous remains in the study area.

The Ontario and Québec dams are collectively known as the Timiskaming Dam Complex located approximately 65 kilometres northeast of North Bay, Ontario. One dam is located on the Ontario side, and the other dam is located on the Quebec side, separated by Long Sault Island on the Ottawa River. The original dam complex was constructed between 1909 and 1913. The Quebec dam was

rebuilt, slightly north of the original dam placement, in the 1930s as a result of foundation failure. The current dam is the 1934 dam and will undergo replacement.

With the absence of well-established roadways or railways, the earliest transportation was over water. The study area and hinterlands are no exception. Often, not even full size ships could pass through waterways, with the exception of the Great Lakes and large lakes, as most lakes, rivers and creeks not only fluctuated depth depending on season and precipitation but were also often encumbered by deadfall and other obstacles preventing easy passage. The Long Sault rapids required either a portage, shooting the rapids with the possibility of canoe or boat spill, and/or tow hauling (system of using pulleys to pull a vessel upstream against the current/rapid). Rapids also, in shallow periods, presented small pools which could harbour fish. Waterways and the riparian landscape would also support herptiles, mammals and birds. Plants would be available both in water and on the shoreline for harvesting. There is no doubt that early Indigenous peoples would have traversed the study area, either through the rapids (the Ontario side reportedly ran dry some years) or on either Ottawa River shoreline, or the Long Sault Island shoreline.

Logging of the area was an important economic pursuit. An 1882 engraving depicts a flume from Gordon Creek exiting into the Ottawa River. The Lumsden mill, operating on Gordon Creek, would most likely send logs down into the river via this creek/flume and to points south.

The historic navigation of the Long Sault rapids began with canoes and small boats. The first steamship on the rapids, towed up the rapids by winch, was the Mattawan. Navigation continued for the area, but only on Lake Temiskaming, and points south of the rapids. The end of active commercial navigation of Lake Temiskaming and the Ottawa River was prompted by the construction of the railway into the area. The Temiskaming Navigation Company sold its assets to the Compagnie de Navigation de Ville-Marie.

There were at least two wharves in the area, but both were located north of the study area. There was also reported that at least one ship was built above the rapids. It is known that alligators were routinely shipped from the factory in Simcoe, Ontario to destination points in pieces, where they would be reconstructed. Alligators are a type of vessel that could work both on the water and on land.

The construction of the dams, both on the Ontario and Quebec sides, effectively put an end to any water transportation from Long Sault Island to points north. A recreational canoe company operates from Long Sault Island present, where canoes and small boats are available for rental.

A property visit conducted in February 2023 observed the 1912 dam remnant on the Quebec shoreline of the Ottawa River but did not observe any other indications of marine infrastructure either above the waterline or along the shorelines. The shorelines were noted as having undergone modification, that is, riprap to halt erosion.

Based on the background research and property visit, the following indicate that there is marine archaeological potential for the study area:

1) There are rapids in the area, and a history of much larger and longer rapids prior to the construction of the dam-bridges on both the Ontario and the Quebec sides;

2) There are several land-based archaeological assessments on the Quebec side of the Study area as well as on Long Sault Island, and a marine archaeological assessment for the Ontario Dam;
3) Indigenous people routinely travelled down Lake Temiskaming, and whether by portage or otherwise, continuing on to the Ottawa River, and the reverse journey as well;
4) Natural resources attractive to both Indigenous and Euro-Canadian peoples included fish, herptiles, birds, mammal and vegetation suitable as foodstuffs and for other types of activity (e.g. weaving mats, baskets, clothing, etc.);
5) There is the remnant of the early dam-bridge located on the east shore on land of the Ottawa River south of the dam-bridge;
6) There is a historically reported "lock" at the Gordon River outlet in 1882 (probably a flume);
7) The Ottawa River and Lake Temiskaming were routinely used by steamboat travel, but also by early European explorers, lumbermen, fur traders, and prior and concurrent with those activities, use of the two waterways by Indigenous peoples;
8) There were two wharves located north of the study area;
9) There was one reported ship built above the dam area;
10) There are reported possible cofferdam remains that were located during the 2017 archaeological land assessment at the north end of what was referred to as Area A (possibly within the study area) (to be field verified as exact location not provided by consultant);
11) Bathymetry of the study area shows possible remnants of a concrete sill and/or sheet piling;
12) The Ottawa River is a Canadian heritage river; and,
13) There have been early reports (circa 1880s) relating the marine history of the area.

The marine archaeological assessment (Task 1, as noted in the RFP) was conducted under license 2023-02 (held by Scarlett Janusas).

Based upon the background research of past and present conditions, the following is recommended:

1. That an in-water marine archaeological assessment be conducted by a licensed marine archaeologist that will include the following:
    a. A visual inspection of the underwater banks from a depth of zero to 3 metres, hand fanning and/or a trowel may be used to remove loose sediments to reveal possible *in situ* materials;
    b. Visual inspection of those parts of Area A (identified by Archéotec) within the study area to confirm or negate presence of planking emerging from the banks,
    c. Visual inspection of the sides of the scour pit for possible *in situ* remains and the examination tree trunks for possible modification for habitation and/or use as transportation (i.e., possible dug-out canoes);
    d. Side scan sonar survey be conducted for the entire study area allowing for detection of targets 50 cm or more in size, and being able to operate in depths of more than 2–3 metres;
    e. A visual survey using a remote operated vehicle and/or drop camera for areas that cannot be accessed using remote sensing;

f. A magnetometer survey of areas (noting that some interference from the dam may prohibit coverage of the entire study area, especially adjacent to the dam);
g. Analysis and cross-interpretation of side scan sonar and magnetometer results to identify targets and where possible assign value of low, medium or high archaeological potential;
h. Ground truthing of targets with medium to high archaeological potential with the ROV and/or drop camera (depth dependent);
i. Verification/evaluation of the archaeological resources identified during the field assessment with respect to their heritage value, and identifying those that will be directly or indirectly impacted by the proposed cofferdam and dam development;
j. Provide a report detailing the methodology employed in the marine archaeological assessment, results, review of background research, description of located artifacts and a detail of the heritage value of the same; analysis and conclusions and recommendations for further work, mitigation, monitoring, etc. including for anomalies that could not be verified in the field; and

2. That no in-water construction work be conducted prior to the completion of the marine archaeological and with a regard to recommendations stemming from the marine archaeological assessment;
3. All marine archaeological in-water work shall be conducted once spawning and other natural in-water concerns have been accommodated. The Ministry of Natural Resources and Forestry typically provides a framework for scheduling of in-water work;
4. That First Nations, Indigenous communities, and the Métis be engaged during all remaining marine archaeological work and reporting; and
5. Compliance legislation must be adhered to in the event of discovery of deeply buried cultural material or features.

This archaeological assessment has been conducted under the 2011 *Standards and Guidelines for Consultant Archaeologists* reporting recommendations and using best practices of ARA (MCM 2011).

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1.0 PROJECT CONTEXT

1.1 Development Context

The proponent retained the services of Archaeological Services Inc. (ARA) to conduct a marine archaeological assessment - background research (referred to as Task 1 in the RFQ) for the Timiskaming Dam-Bridge of Quebec Replacement Project. For the purposes of this report the property will hereafter be referred to as the "study area". Note that measurements are presented in feet and inches to reflect the historic period.

The study area is located on the Ottawa River, the dam-bridge separating the Ottawa River from Lake Temiskaming, on Route 101 in the City of Temiskaming (region of Abitibi-Témiscamingue of Quebec) which becomes Highway 63 in Ontario. It is legally described as being in Gendreau Township, Tèmiscamingue County, some 374 kilometres (km) north of Ottawa (Figure 1–Figure 5). Table 1 provide the center, western and eastern UTM coordinates for the project (Tetra Tech 2023: 4-1).

Table 1: Project UTM Coordinates

Point Location	UTM Zone	Easting	Northing
Centre	17	645181.81m E	5 174 859.18m N
West	17	645 120.44m E	5 174 823.78m N
East	17	645 243.18m E	5 174 859.18m N

Permission to access the study area and to conduct all activities associated with the background research field visit was provided by the proponent. The Timiskaming Dam-Bridge of Quebec is owned by Public Services and Procurement Canada (PSPC). The study area consists of an area upstream and downstream of the Timiskaming Dam-Bridge on the Quebec side (Figure 1–Figure 3). The study area measures approximately 3.7 hectares.

Public Services and Procurement Canada required a marine archaeological assessment for the proposed bridge-dam replacement in-water area. An Ontario archaeological licence was required by the PSPC, rather than one from Quebec. The reasoning behind procuring the Ontario licence was that the border fell mid-dam, and also that the closest Indigenous community requested that an Ontario licence be procured rather than a Quebec licence, citing that regulatory requirements for Ontario reports was higher than those for Quebec licenses. PSPC therefore instructed ARA to acquire only an Ontario marine archaeological licence. The archaeological assessment was triggered by the Federal Canadian Environmental Assessment Act, 2012 (CEAA 2012).

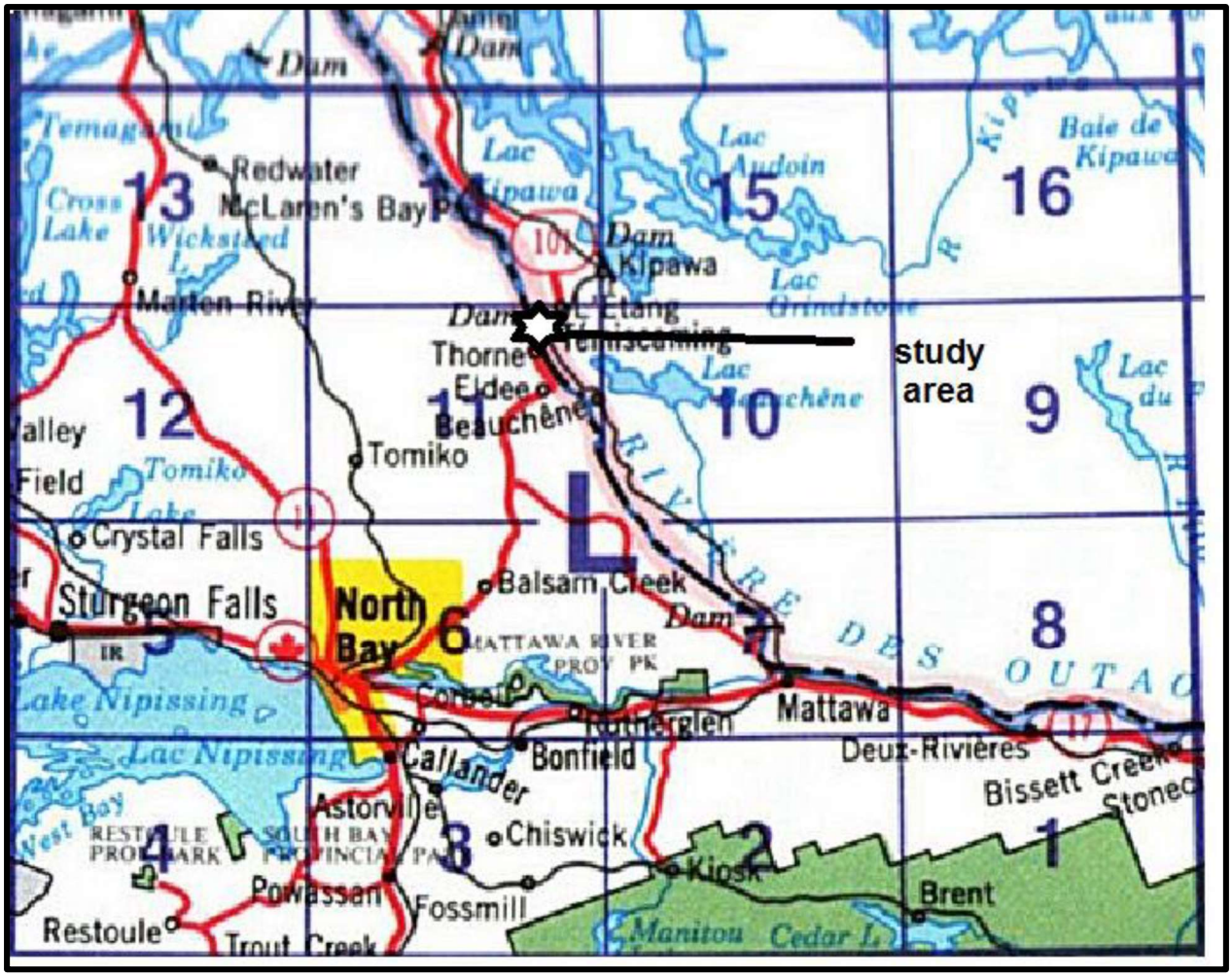


Figure 1: Regional Location of Study Area (No Scale Provided)

Tetra Tech QI Inc. is the consultant for Public Works conducting the Environmental Effects Evaluation on their behalf.

The Ministry of Citizenship and Multiculturalism (MCM) does not have Standards and Guidelines specific to marine archaeology. Therefore, this archaeological assessment has been conducted under the 2011 Standards and Guidelines for Consultant Archaeologists (MCM 2011) and best practices formed by 40 plus years of experience by ARA.

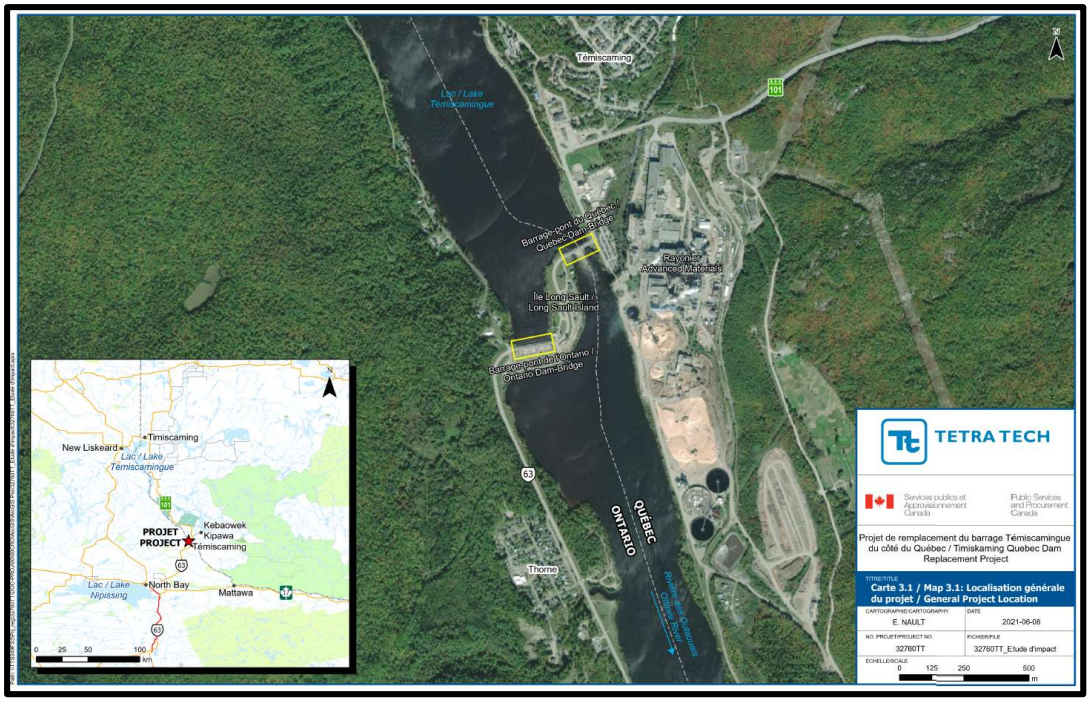


Figure 2: General Location of the Study Area
(Tetra Tech QI Inc. 2023: 3-2)



Figure 3: Satellite Image of Study Area
(Google Earth 2023)

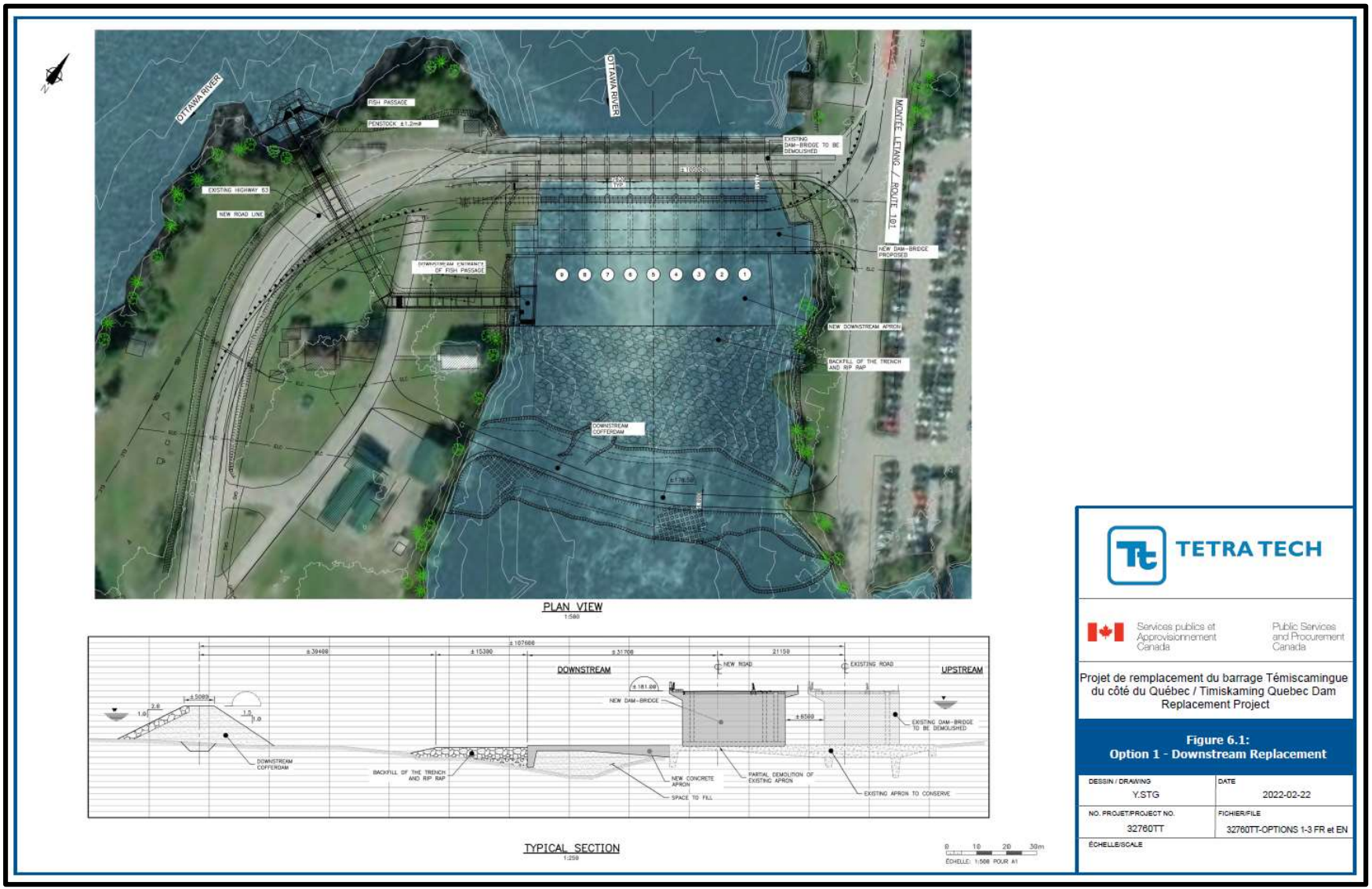


Figure 4: Development Plan
(RFQ Tetra Tech QI Inc. 2023: 16)

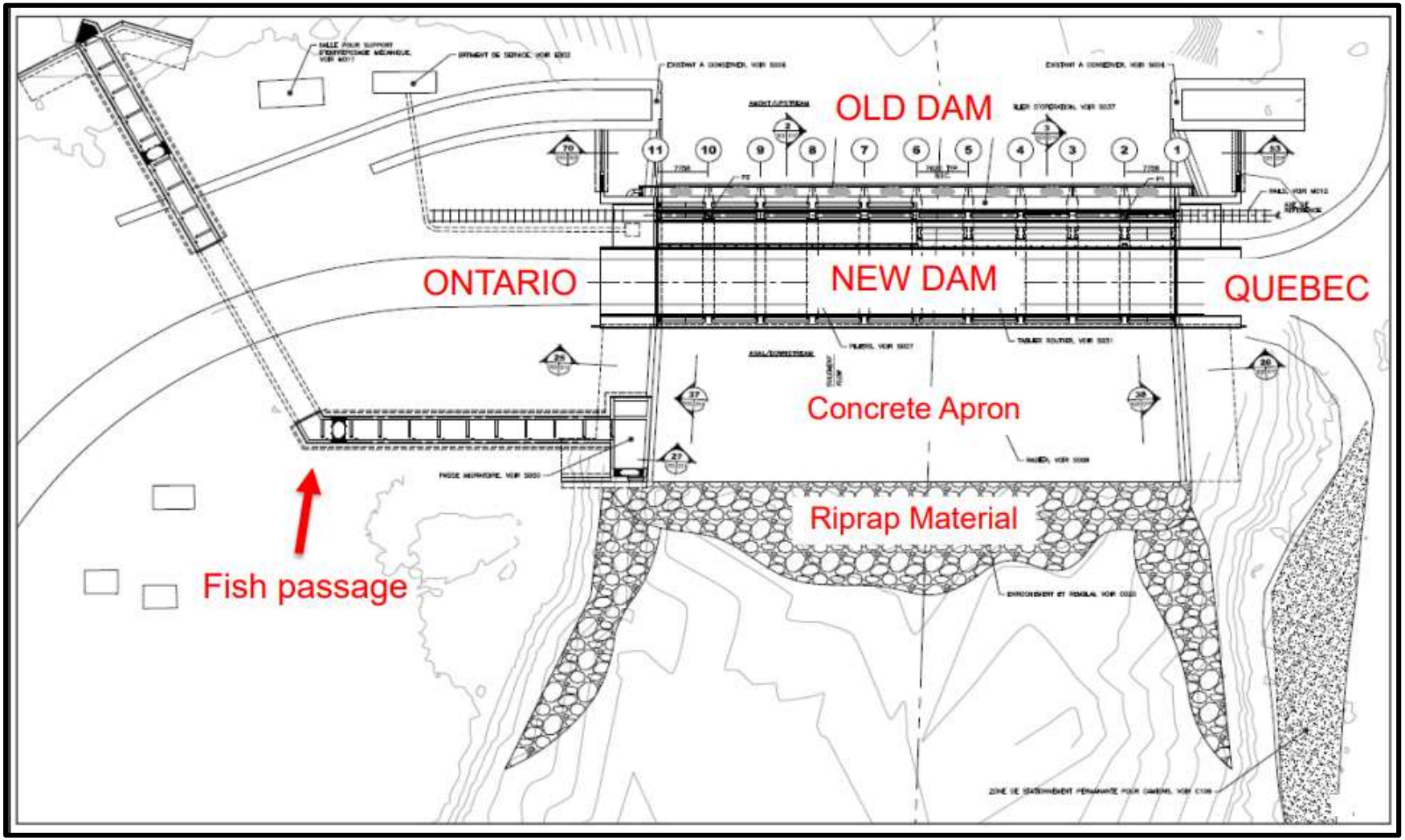


Figure 5: Bird's Eye View of Concept Plan
(http://www.tanakiwin.com/wp-system/uploads/2021/06/Presentation_PSPC_TQDR_AOO-Kick-Off-Session_Final_Website_20210513.pdf)

1.2 Description of the Project

The Timiskaming Quebec Dam Replacement project will replace the existing dam and build a new dam approximately 25 meters downstream of the existing dam. Upon completion of the new dam, the old dam will be demolished.

The Ontario and Quebec dams are collectively known as the Timiskaming Dam Complex, located approximately 65 kilometres northeast of North Bay, Ontario. One dam is located on the Ontario side, and the other dam is located on the Quebec side, separated by Long Sault Island on the Ottawa River. The original dam complex was constructed between 1909 and 1913.

The Quebec dam was rebuilt, slightly north of the original dam placement, in the 1930s as a result of foundation failure. The current dam is the 1934 dam and will undergo replacement.

The dams are essential for the control of the water level in Lake Timiskaming (upstream of the dam) feeding into the Ottawa River (downstream.). The dams collectively also contribute to water storage for hydroelectric generation downstream. The dams support a roadway for the passage of motorists, cyclists, pedestrians and accommodates a natural gas pipeline (https://www.tpsgc-pwgsc.gc.ca/biens-property/pdb-bdd/timiskaming-eng.html#s1).

The new dam (Figure 4) will accommodate a 2-lane roadway allowing for flow of traffic between Quebec and Ontario, abutments, rising sluice gates, a road bridge, a natural gas line (above the river), and landscaped areas and river banks. The new dam will be approximately 75 metres in length and include 10 bays. The bays will have mechanical sluice gates regulating water flow.

The existing dam used logs instead of gates. The new rising sluice gates will allow for ease of management and operation, and a quicker response time to significant weather events. The development plans are considering the construction of a fish ladder. This fish ladder would be about 140 metres in length and located on Long Sault Island (Ibid., Tetra Tech 2023: 3-1).

1.3 Historical Context

1.3.1 Current Environment

The study area measures approximately 332 metres long (approximately north-south) by approximately 148 metres wide (east-west) along the longest and widest parts. The study area is located at the intersection of Lake Temiskaming (alternate spelling is Temiscaming and/or Témiscamingue) (Lake Temiskaming is a widening of the Ottawa River) to the north and the Ottawa River to the south on the east side of Long Sault Island. The bridge-dam is located towards the northern end of Long Sault Island. On the east side of the dam (west bank of Quebec) is a park (north of the dam-bridge) which leads to a marina and promenade. On the south side of the bridge-dam is Rayonier Advanced Materials (who acquired Tembec in 2017) (Image 1). Dam infrastructure is located along the north side of Long Sault Island. Along the east side of Long Sault Island is manicured park/dam-bridge infrastructure.

The Quebec side dam "consists of ten bays equipped with wood weirs (stop logs) operated using a rail-mounted mechanical sluicegate. The dam, which is approximately 15 m wide (footprint on

the riverbed) and 75 m long, is also a roadway for vehicular, pedestrian and snowmobile traffic between the provinces of Quebec and Ontario (Routes 101 and 63, respectively). The dam/bridge roadway consists of a sidewalk (1.52 meter wide), a vehicular roadway (7.32 meters wide) and an operation area to move the stop logs (5.49 meters wide). Work on the dam's roadway was carried out from 2019 to 2021 to ensure its continued unimpeded operation, given the delays in replacing the dam on the Quebec side. Four pipes carrying telephone and power lines are also located below the sidewalk. There is also a natural gas line 0.2 m in diameter across the dam" (Tetra Tech 2023: 3-1).

Along the west bank of Quebec are the remains of the former bridge-dam (Image 2). The corresponding structure on Long Sault Island is non-existent above grade.



Image 1: Rayonier Advanced Materials
(https://ryam.com/operations/facilities/temiscaming/)



Image 2: Remnants of the Former Bridge-Dam – Quebec Side (facing East)

The banks on both the east and west sides of the study area appear to have been modified with slope alteration and added stones along the banks. There does not appear to be any "natural" bank remaining on either east or west sides of the study area.

> "*The assumption of a nonerodible riverbed between the dam and the mouth of Gordon Creek is validated by Mistra's 2016 underwater surveys, which showed that the riverbed in front of the Quebec dam consists exclusively of a glacial till layer of 50 mm to 2000 mm diameter boulders up to 120 m downstream of the existing dam. From the mouth of Gordon Creek, very little information is available on the nature of the riverbed. Geophysical surveys conducted in 2017, however, indicate that the first 2-3 m may be composed of saturated unconsolidated sediment from the creek. ...According to this sampling, these sediments would be composed of approximately 60% clay*" (Tetra Tech 2023: Appendix 8.3).

The strong current flow of the dam during certain times of the year have contributed to the erosion south of the dam-bridge.

The Ryam paper mill (Rayonier) is located on the east bank of the Ottawa River south of the bridge-dam. There is a small creek that empties into the Ottawa River approximately 128 to 170 metres from the south side of the bridge-dam. This is a natural waterway, not man-made, known

as Rivière Gordon or Gordon Creek (Figure 6). While the waterway has not been "made", historically there is some indication of modification at the mouth of the waterway where it flows into the Ottawa River.

The Algonquin Canoe Company (ACC) is located on Long Sault Island adjacent to the study area. The ACC provides tourists the opportunity to boat, canoe, portage and engage in camping excursions. Lodging is also offered. The public boat ramp is located at the tip of the island, accessing the downstream area of the Ottawa River (Tetra Tech 2023: 9-1).

A terrestrial and an aquatic environment survey was conducted which included the study area (Figure 7).

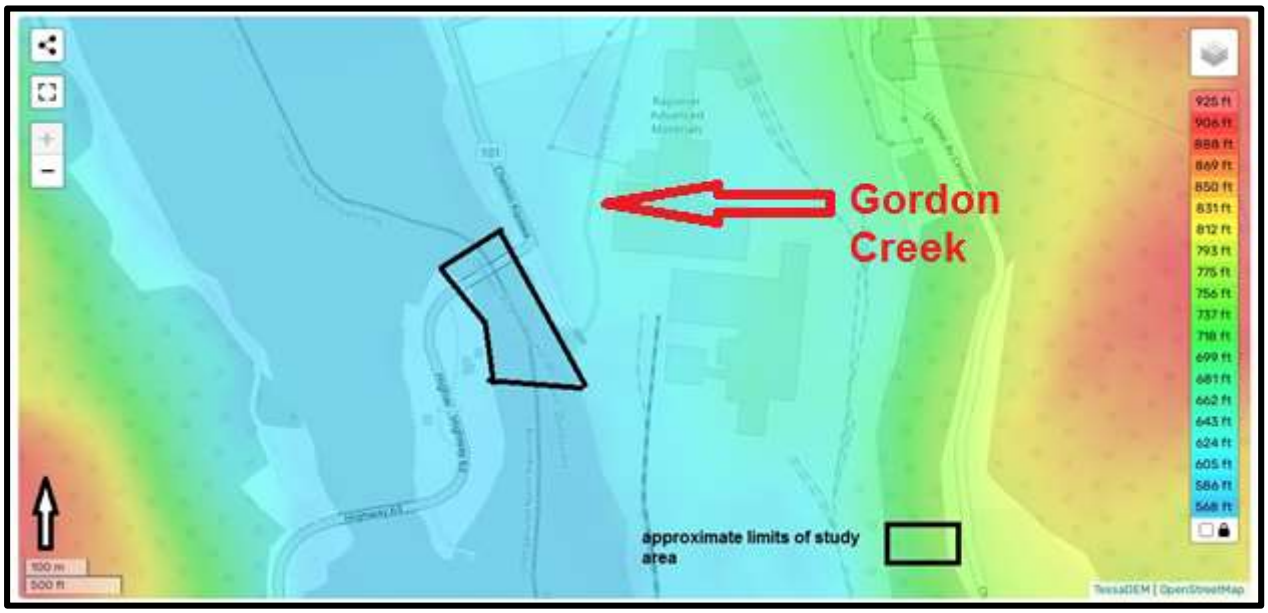


Figure 6: Elevation Map of Study Area
(https://en-us.topographic-map.com/map-v75v51/Beauch%C3%AAne/?center=46.7111%2C-79.09768&zoom=16)

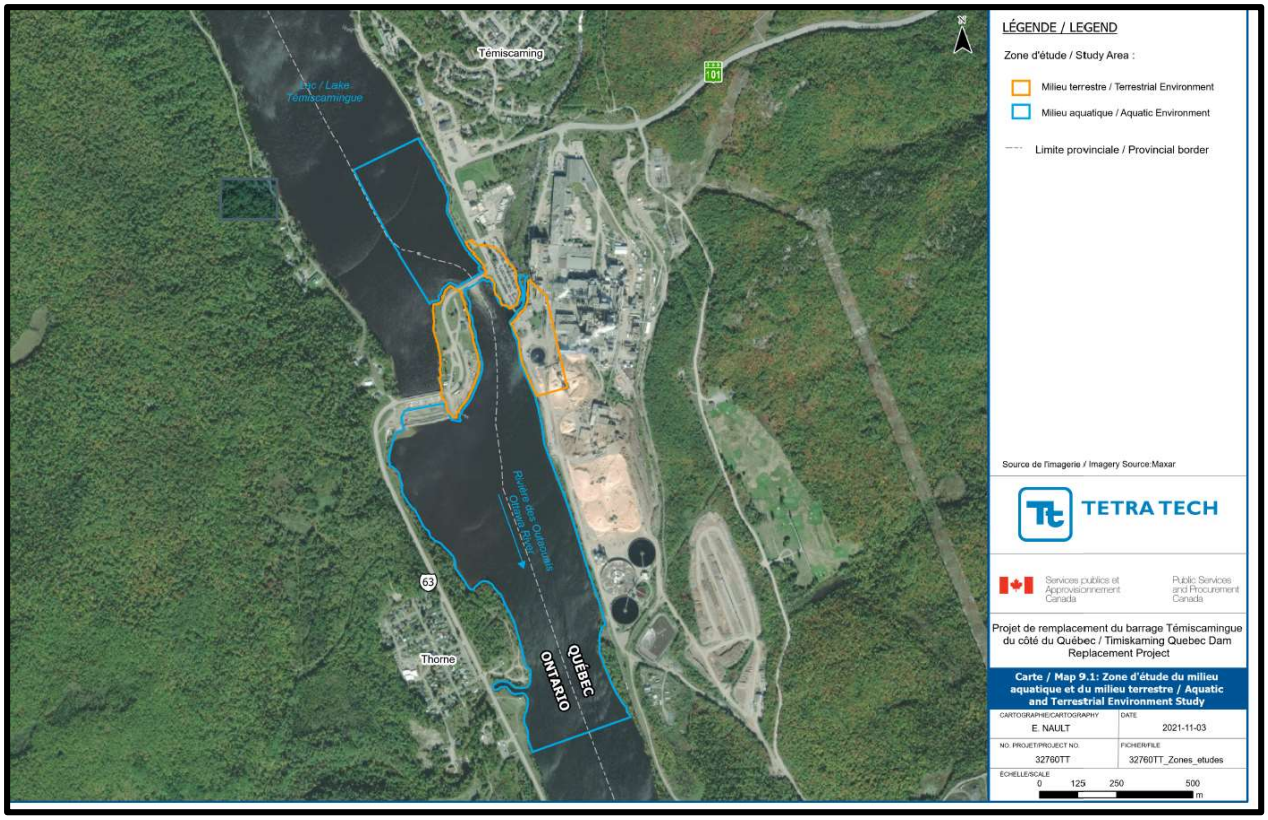


Figure 7: Terrestrial and Aquatic Environment Survey
(Tetra Tech 2023: Map 9.1)

1.3.2 Traditional Indigenous Land and Engagement

Indigenous engagement was undertaken by the proponent.

Table 2 presents the list of all First Nations, Indigenous communities/organizations and Métis engaged by the proponent.

There are three Algonquin First Nations, whose traditional territories and reserves lie wholly or partially within the Ottawa River watershed, who responded collectively to the project: Kebaowek First Nation; Timiskaming First Nation; and Wolf Lake First Nation. Algonquins of Pikwàkanagàn (AOPFN) responded individually.

The Ottawa River watershed is also the traditional territory and Settlement Area of the Algonquins of Ontario (AOO). The AOO make up ten Algonquin communities in Ontario. The closest AOO communities to the project are Antoine and Mattawa/North Bay.

Additional First Nations, Indigenous communities/organizations, and Métis engaged on the project by the proponent include the Métis Nation of Ontario (MNO).

Table 2: Indigenous Communities Engaged and/or Informed by Proponent

Algonquin First Nation Representatives
Wolf Lake First Nation
Kebaowek First Nation
Timiskaming First Nation
Algonquins of Pikwàkanagàn (AOPFN)
Algonquins of Ontario (AOO)
Antoine
Bonnechere
Greater Golden Lake
Kijicho Manito Madaouskarini
Mattawa/North Bay
Ottawa
Shabot Obaadjiwan
Snimikobi
Whitney and area
Métis Nation of Ontario (MNO)
Mattawa Métis Council
North Bay Métis Council
Temiskaming Métis Community Council
Informed Communities
Abitibiwinni First Nation
Alderville First Nation
Algonquin Anishinabeg Nation
Algonquin Nation Programs and Services Secretariat
Algonquins of Barrière Lake
Anicinape Community of Kitcisakik
Atikameksheng Anishnawbek
Batchewana First Nation
Beausoleil First Nation
Chippewas of Georgina Island
Chippewas of Rama First Nation
Curve Lake First Nation
Dokis First Nation
Garden River First Nation
Henvey Inlet First Nation
Hiawatha First Nation
Kitigan Zibi Anishinabeg
Lac Simon Anishnabe Nation
Long Point First Nation
Magnetawan First Nation
Métis National Council
Mississauga First Nation
Mississaugas of Scugog Island First Nation
Nipissing First Nation
Sagamok Anishnawbek
Serpent River First Nation
Shawanaga First Nation
Shesegwaning First Nation
Temegami First Nation
Thessalon First Nation
Wahgoshig First Nation
Wahnapitae First Nation
Wasauksing First Nation

Although engagement was undertaken by the proponent, ARA incorporated all feedback received from the engaged First Nations, Indigenous communities/organizations, and Métis into the current

report. Comments stemming from the engagement regarding archaeology, specifically in relation to the marine/underwater archaeology, include:

- Provision of traditional knowledge and/or oral history specific to the study area, including:
    - Recognition that Long Sault Island is a community event gathering site for many of the Algonquins, both in Quebec and Ontario, and holds potential cultural heritage value or interest both on the surface and underwater;
- Identification of areas of archaeological potential, including:
    - Confirmation from the AOO that, based on their knowledge and experience, there exists archaeological potential at the site of the proposed cofferdam and an underwater archaeological survey should be recommended within its footprint prior to its installation;
- Recommendation from the SART communities that visual survey is used instead of instrumental or robotic surveys during the marine assessment;
- Recommendation for mitigation and design measures that emphasize minimal impact to the study area, particularly the riverbed;
- The expectation for meaningful Indigenous engagement on the project and future archaeological assessments moving forward, up to and including review of reports and workplans as well as in-field participation; and
- The expectation for the repatriation of artifacts, to be made in collaboration with all engaged Nations and communities.

Figure 8 illustrates the territorial boundaries of Indigenous communities and Figure 9 illustrates the First Nation Reserve boundaries.

The following has been extracted from the Tetra Tech (2023:5-3 to 5-4) report to provide context to the marine archaeological background research with respect to treaties and agreements.

> *"Several historic land agreements between various regional Indigenous groups and the Crown signed between the late 18th and early 20th centuries overlap with the ORW, and include the Robinson-Huron Treaty, the Williams Treaties, Crawford's purchases, and Rideau Purchase. The Robinson-Huron treaties were signed with several Ojibwe Chiefs representing their communities on the Huron coast, the Williams Treaty was signed by representatives of seven Anishinaabe First Nations and the Crown, the Crawford's purchases were negotiated with the Mississaugas* [sic]*, and the Rideau purchases were signed with several Anishinaabe groups (Ministry of Indigenous Affairs, 2021). However, none of the Indigenous groups involved in the Project are signatories of these historic treaties. The Algonquin Nation signed treaties of Peace and Friendship and the Royal Proclamation with the British between 1760-1764 as co-operative agreements to protect their peoples and territory (Morrison, 2005).*
>
> *Wolf Lake, Kebaowek, and Timiskaming First Nations have traditional territories that include portions of the ORW in Quebec and Ontario and in which the Project is located. They have never entered into Treaty with Quebec, Ontario or Canada and*

> *have unextinguished Aboriginal (Section 35) rights and title to their territories which span portions of west Quebec and eastern Ontario (Nahwegahblow Corbiere, 2013).*
>
> *Large portions (9 million acres) of the ORW and Mattawa River watershed in eastern Ontario fall within the Ontario Algonquin territory (Algonquin Settlement Area) that is currently the subject of a Treaty being negotiated between the Algonquins of Ontario (the AOO) and the Ontario and Canadian governments. An Agreement In Principle was reached in 2016 and the Final Agreement is currently being negotiated which will clarify Ontario Algonquin rights, and will be the first modern treaty in Ontario when implemented (AOO, 2021).*
>
> *The Métis citizens are represented by the MNO within the Mattawa/Lake Nipissing Consultation Protocol Area. Within this area, citizens are represented by the Mattawa, North Bay and Sudbury Community Councils living in the ORW in Ontario and are not signatories to any Treaty. Métis citizens hold Aboriginal rights that were recognized and affirmed in Section 35 of the Constitution Act (1982). Additionally* [sic]*, the MNO has signed the Framework Agreement on Métis Harvesting with Ontario which provides a degree of recognition related to harvesting rights for rights bearing Métis citizens in the Mattawa/Lake Nipissing Harvesting Area which includes portions of the ORW in which the Project is located. This agreement is not permanent and requires additional negotiation between the MNO and MNRF to fully understand the types and geography of Métis rights."*

During engagement, through the proponent, AOPFN shared that their traditional territory is unceded, as it is separate from and dates before settlement negotiations. ARA includes this here as requested in addition to the background summary provided by Tetra Tech.

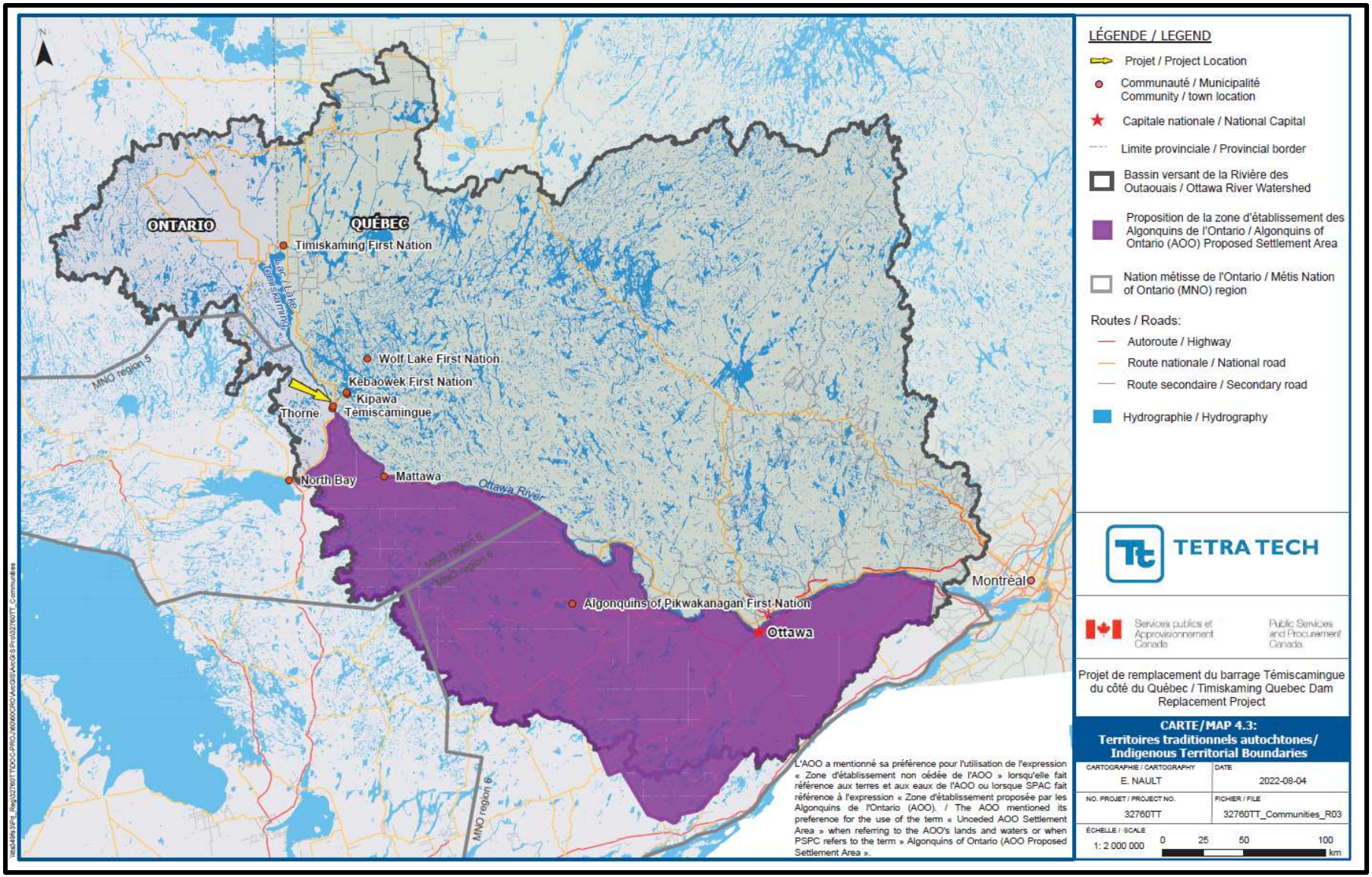


Figure 8: Indigenous Territorial Boundaries
(Tetra Tech 2023: Map 4.3)

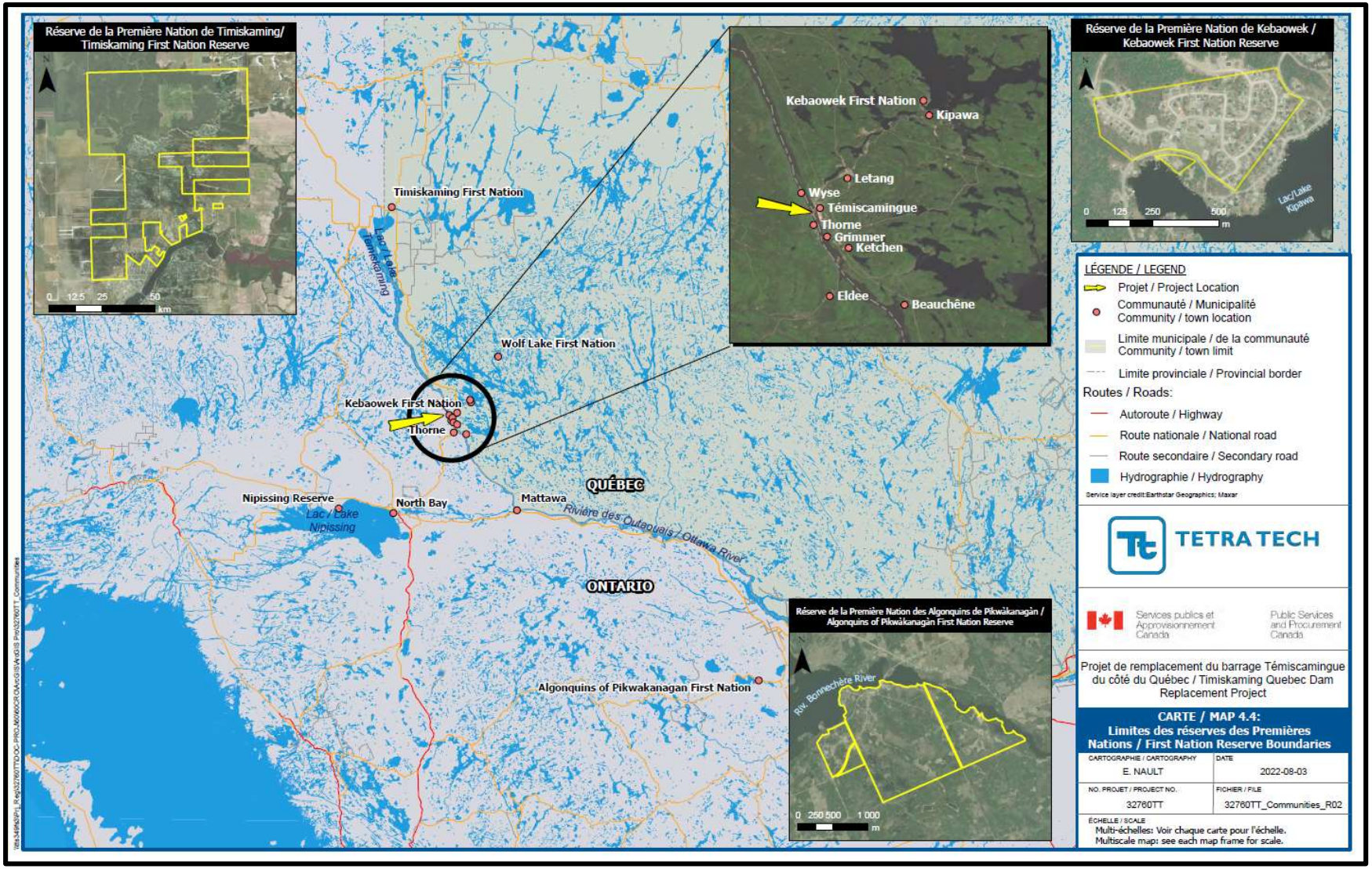


Figure 9: First Nation Reserves Boundaries
(Tetra Tech 2023: Map 4.4)

In the environmental assessment conducted by Tetra Tech (2023), Chapter 13 presents detailed information regarding Indigenous communities in the area. The following are the historical overviews presented in the chapter. The first presented is from the SART Algonquin communities (Wolf Lake First Nation (WLFN), Kebaowek First Nation (KFN), Timiskaming First Nation (TFN)) and the Algonquins of Pikwakanagan First Nation (AOPFN).

> *"WLFN, KFN, TFN and AOPFN are four of eleven communities that constitute the broader Algonquin Nation of Canada. For centuries, the Algonquin Nation occupied the length of the Kichi Sìbì (Ottawa River) watershed, from its headwaters in north central Québec, all the way to its outlet in Montreal.*
>
> *The Algonquin Nation has never ceded its traditional territory, and its rights and title have not been extinguished.*
>
> *The traditional territory of the Algonquin Nation includes the entire Ottawa River watershed in what is now part of the Canadian provinces of Québec and Ontario.*
>
> *The Kitchi Sibi Technical Team would like to acknowledge the Kitchi Sibi watershed and the spirit of our ancestors of the Kitchi Sibi (Ottawa River) and all its tributaries.*
>
> *Our peoples are part of the Anishnaabeg language group, which extends throughout the Great Lakes basin. The term "Anishnaabeg", literally translates as "original man" (Benton-Banai 1979).*
>
> *Algonquin Anishinaabeg emerge from a rich historical legacy deep within the Ottawa River watershed that continues to surface new ideas and insights. The Kitchi Sibi or Ottawa River has been our home and highway since time immemorial. Inherently, our lands and waters are part of the Anishinaabeg Aki a vast territory surrounding the Great Lakes in North America. For centuries we have relied on our lands and waterways for our ability to exercise our inherent rights under our own system of customary law and governance known to us as Ona'ken'age'win.*
>
> *This law is based on our mobility on the landscape, the freedom to hunt, gather and control the sustainable use of our lands and waterways for future generations. That is how the Europeans discovered us – as a well established society in control of the Ottawa River watershed. We had a vast trade network supported by our own economies that included levying tolls on canoe flotillas that descended the Ottawa River from Morrison Island. We were not only the gateway to the continent but the technology provider of the only craft that could navigate the rivers ahead. In no other part of the world have water and the canoe had such a huge influence on both in terms of Algonquin culture and the development of Canada post European contact.*
> *Traditionally, our peoples' social, political and economic organization was based around watersheds, which served as our transportation corridors and family land management units (St. Denis 2009). Speck (1915) notes how members of each regional band traditionally held a territory in common, and this collectively held tenure was recognized in alliance with other bands. The starting point in the TDQRP assessment*

must be in recognising that Algonquins, like all First Nations in Canada, began with both rights to our territories and rights as people governed under customary laws. As Roark-Calnek (2013:13) explains, "Mutuality, respect and consultation are integral to Algonquin social and political organization on a number of levels: family to family, band to band, and nation to nation."

Today, WLFN, KFN, and TFN are three of eleven communities recognized under the Indian Act representing the Algonquin Nation in Canada. Nine communities are located in Québec and two are located in Ontario. Together we form the Algonquin Nation, as a people we regard ourselves as 'keepers of the land', with 'seven generations' worth of responsibilities for livelihood security, cultural identity, territoriality, and biodiversity.

Memberships combined our SART communities have a total of 3,879 people living on and off reserve.

WLFN membership is made up of 227 people governed by an elected Chief and Council. All WLFN members live on their traditional un-ceded Algonquin Nation lands within both the Provinces of Québec and Ontario. WLFN has a band office in Temiskaming Quebec and a building location on Long Sault Island where it has an Ontario office location and as well conducts tourism business on the Ottawa River under the name Algonquin Canoe Company.

Represented by an elected Chief and council KFN has a membership of 1130 with 240 living on reserve on the shores of Lake Kipawa at Kebaowek Quebec. KFN also has an office downstream on the Ottawa River in Mattawa Ontario for its members.

TFN membership is also represented by an elected Chief and Council. TFN membership is 2,762 of which 470 live on reserve at the head of Lake Timiskaming in Notre Dame du Nord Québec. TFN also has an administration office in New Liskeard Ontario.

KFN and TFN off reserve members generally live within the Algonquin Nation in what is now the Provinces of Québec and Ontario. All SART community members continue to occupy, manage, safeguard and intensively use their territory as they carry out traditional and contemporary activities. All such initiatives are based on a model of self-determination and a history of Algonquin traditional knowledge, eco-logical sustainability and land governance.
WLFN, KFN and TFN traditional territory has been established, documented and substantiated through both historical research and professional current land use and occupancy mapping projects.

On January 23, 2013, WLFN, KFN, and TFN jointly released a Statement of Asserted Rights and Title (SART) which summarizes the Aboriginal rights, including title, that the three First Nations assert and provides detailed evidence to substantiate it. Copies of the SART, maps and background documentation were transmitted to the

> *governments of Canada, Québec and Ontario in January 2013. In summary, our communities have not relinquished Aboriginal rights and title, over lands that straddle the Ottawa River basin on both sides of the Québec-Ontario boundary including the location of the Timiskaming Dam Complex.*
>
> *Our communities, with other First Nations in Canada, have advocated for the implementation of the United Nation Declaration on the Rights of Indigenous Peoples (UNDRIP 2008) for advancing our rights, dignity, survival, security and well-being. (Tetra Tech 2023: 13–6 to 13–8).*

During engagement, through the proponent, AOPFN shared their expectation that additional information regarding the AOPFN traditional territory should be included in the report. As such, ARA includes this information here as requested in addition to the background summary provided by Tetra Tech.

> *Algonquins of Pikwàkanagàn First Nation (AOPFN) is an Algonquin community situated on the shores of Bonnechere River in Renfrew County approximately 184 km southeast of the Project (Map 13.6). As Algonquin people, Algonquins of Pikwàkanagàn First Nation (AOPFN) members have occupied the Algonquin traditional territory since time immemorial and have used the Kichi Sibi (Ottawa River) as an important travel route to access important locations for their traditional activities (AOPFN, 2021). Traditional territory refers to Indigenous historically and contemporarily occupied and used lands before they were dispossessed and limited to reserve lands established in 1873 by colonial policies. (…) The traditional territory of AOPFN corresponds roughly with the Ottawa River watershed (..).*

The next historical overview is from the Antoine Nation.

> *"Antoine Nation or Matawasìbi anìcenàbi (Mouth of the river people), is an Algonquin community centred in the Mattawa area, approximately 250 km northwest of Ottawa, Ontario and 50 km (78 km by road) southeast of the Project. AN's traditional territory roughly encompasses the lands and waters between Temiscaming in the north, Deep River in the southeast, and Sundridge in the southwest, although AN land use also extends across the Ottawa River into Quebec, and south into Algonquin Provincial Park. AN has occupied, travelled, and harvested these lands and waters since time immemorial, and they continue to be the foundation of AN social, cultural and spiritual life. AN is not currently a federally recognized First Nation, and thus, does not have reserve lands, nor the financial support associated with them.*
>
> *Algonquin peoples have occupied the Ottawa River watershed since time immemorial. The earliest archeological evidence of human occupancy in the Ottawa Valley dates from between 10,000 to 8000 years before present (BP), after the Champlain Sea, a large inland sea formed by the retreat of the Laurentide ice sheet, drained and the Ottawa River began to take shape (Morrison, 2005). There is uncertainty about the location of the shorelines of the historic enlarged Ottawa River and the glacial lakes Agassiz and Barlow-Ojibway that fed it, contributing to modern challenges for finding*

archaeological evidence of where these early inhabitants would have lived (Morrison, 2005). The earliest evidence from this period indicates that Paleo-Indian peoples were occupying the shores of the Champlain Sea by about 8000 BP (Whiteduck, 2002). The evidence of human occupation becomes more abundant from 8,000 years ago onwards, perhaps due to the stabilization of the geography to a state resembling that of today. These populations continued to grow throughout the early, middle, and late Archaic periods from 10,000 to 3000 BP with one of the most important archaeological sites from this period located at Morrison's and Allumette Islands in the Ottawa River (Whiteduck, 2002).

The Woodland period extended from 2800 years BP until the period of contact between Indigenous Peoples and Europeans in the early 1600s. This period was marked by the arrival of pottery in the archaeological record, an expansion of population sizes from the Archaic period, changes in funerary practices, and the introduction of cultivated food crops later in the Woodland period like corn, beans, and squash (Whiteduck, 2002). Oral histories of Indigenous groups from the area, as well as the similarity of physical tools, butchered animal remains, and trade-goods in the archaeological record to those in use by the Indigenous Peoples first encountered by Europeans, suggest a strong ethnic and cultural continuity from that historical period.

During the period of European contact from the early 1600s, the Algonquins and the French maintained an alliance, until the capitulation of Montreal in 1760. Despite the Royal Proclamation of 1763 guaranteeing that the Indigenous allies of the French "should not be molested on their hunting grounds" and having never surrendering their land, Algonquin territory was infringed upon by the 1774 Quebec Act, and the 1791 Constitution Act, as well as competing land claims with other Indigenous groups (Holmes, 1993). Despite the pressures exerted by successive colonial governments, Algonquin peoples did not surrender or cede their land. This continuity of Algonquin title is the basis of the Ontario Algonquin land claim, currently being negotiated between the Algonquins of Ontario (the political organization of Algonquin communities including AN) that is administering the land claim, Ontario, and Canada" Tetra Tech 2023:13-12 to 13-13).

The historical overview of the Algonquins of Ontario is presented below.

> *"The Algonquin people have occupied their territory since time immemorial. Much of this area is located along the Ottawa River and its tributaries (The Canadian Encyclopedia, 2018). Archaeological evidence of occupation dates to the Paleoindian period, specifically between 12,800 and 10,000 BP (before present) after the retreat of the ice sheets (Whiteduck, 2002). The earliest evidence from this period indicates that Paleo-Indian Peoples were occupying the shores of the Champlain Sea, which was receding from its highest levels by 10,000 BP, allowing the land and water bodies to assume their present configuration by about 8,000 BP (Whiteduck, 2002). These populations continued to grow throughout the early, middle, and late Archaic periods from 10,000 B.P. to 3,000 BP with one of the most important archaeological sites from this period located at Morrison's and Allumette Islands in the Ottawa River (Whiteduck, 2002).*
>
> *The Woodland period extended from 2,800 years BP until the period of contact between Indigenous Peoples and Europeans in the early 1600s. This period was marked by the arrival of pottery in the archaeological record, an expansion of population sizes from the Archaic period, changes in funerary practices, and the introduction of cultivated food crops later in the Woodland period like corn, beans, and squash (Whiteduck, 2002).*
>
> *During the period of European contact from the early 1600s, the Algonquins allied with the French, until the capitulation of Montreal in 1760. At the time of the capitulation the British agreed that Indian allies of the French would not be interfered with, and they could continue to exercise the rights and privileges they enjoyed prior to the hostilities. The Royal Proclamation of 1763 declared that tribal hunting grounds were to be protected and could only be ceded to the British Crown with the agreement of the nation at a public meeting. The AOO states that the Algonquin Peoples never surrendered or ceded their land to any government, which is the basis of the modern treaty negotiations currently underway"* (Tetra Tech 2023: 13-57 to 13-58).

The historical overview of the Métis is presented below.

> *"Métis people have lived in the Ottawa River watershed for centuries as a people resulting from the union of predominantly French, but also Scottish, fur traders with Indigenous women. The Northwest Company (NWC) encouraged these unions for the advantage it gave in trading with First Nation people due to kinship ties and their multilingualism (usually English, French and Algonquin). The NWC employed many Métis people (variously called by others 'Countrymen' or 'Bois Brulés') who settled near fur trading posts established in the region including at Temiscaming, Mattawa, and North Bay. The Ottawa River was a main transportation route for the fur trade to the north via Lake Timiskaming to James Bay and to the west via the Mattawa River into Lake Nipissing, the French River, and onto the Great Lakes. In 1821, when the NWC was amalgamated with the Hudson Bay Company, some Métis, from the Red River settlement and other fur trading posts, retired in the Mattawa area (Jones, 1999;*

> *StoneCircle Consulting & Know History, 2014) further solidifying a Métis presence in this region. As the fur trade waned in the early nineteenth century, logging became the primary industry in the region and Métis people settled in the region were employed in that industry. Hunting and fishing were a way of life and contributed to an important part of the Métis people's diet. Depending on the season, Métis citizens were also occupied in guiding, trapping, canoe manufacturing, farming, and maple syrup*" (Tetra Tech 2023: 13-152 to 13-153).

During engagement, through the proponent, MNO shared their expectation that additional research regarding Métis archaeology should be included in the report. As such, ARA includes this summary of Métis archaeological research here as requested in addition to the background summary provided by Tetra Tech.

Dr. Kisha Supernant is Métis, an associate professor of anthropology at the University of Alberta, and the director of the University of Alberta's Institute for Prairie and Indigenous Archaeology (IPIA). She has researched the relationships between artifact assemblages and cultural identities noting that they are complex and difficult to disentangle.

While using the Canadian west during the 1800s as a basis for study of Métis culture and archaeology, these insights are applicable for most, possibly all, Métis communities. Her focus on historical and archaeological studies explores the dynamics of settlement, material culture and the mobility of the Métis people. As in Ontario, the material culture of the Métis has proven to be difficult to assess compared to the available historic records. The early historic Euro-Canadian and Métis cultures often occurred contemporaneously, therefore, making the discrete identification of a Métis family over that of an early settler not always clear, definable or having a clear associative value with either Métis or Euro-Canadian.

Supernant studied the overwintering practices of Métis in Alberta and Saskatchewan, using both the archaeological record and the Métis "identity". Her study used "artifact analysis and spatial analysis to examine the ways in which ….make sense of the complex geographies, kinship networks and identities of the Métis in the 19th century and today" (McMaster 2021).

Archaeology attempts to use material culture to define short and long term processes about a culture, in order to identify a culture. It can also be used to define an emerging culture, such as that of the Métis (through the material culture). However, Supernant (2018:1) notes that material culture is formed by social and cultural elements that "contribute to the emergence of a new people. A constellation of factors, including economy, social constructions of race, political tensions, kin relationships, and social practice, are necessary for ethnogenesis" (ibid).

Supernant (ibid: 2) examined records of Métis archaeological sites/excavations in Western Canada. Papers produced by researchers focused on "the Métis as a new cultural identity and whether the archaeological record can be used" to define the culture. Included in this analysis was an examination of lithic tools, ceramics, and use of space".

In 1869, when the Dominion of Canada took over Rupertsland, a major "transformation" in the Métis took place, marked by the Northwest Rebellion in 1885. With the hanging of Louis Riel,

another passage of time and circumstance occurred. The government established what is called the Métis scrip system, which was to settle the land issues of the Métis/government conflict. Post scrip, the Métis "were disenfranchised and the culture went underground, as it became *impolitic and sometimes dangerous for Métis to self-identify publicly* (ibid: 4). It took almost until 1995 for the "Métis to assert their rights and identify as an Aboriginal people" (ibid).

While it may not be an exact parallel to sites in Ontario, Supernant's paper (ibid: 6) suggests that material culture associated with the Métis in Western Canada would have included materials procured from the Hudson's Bay Company such as architectural materials (nails, glass, etc.); daily use wares (ceramics, kettles, cutlery); personal items (artifacts associated with hygiene, clothing, beads, etc.); arms and ammunition; and transportation items (harness, horseshoes, etc.). Mission sites and early forts in the Temiskaming area would have been a substitute for the Hudson's Bay Company for the local Métis in the project area. Faunal material would be reflected in the available wildlife in the local area and included moose, possibly deer (deer and moose rarely cohabit the same area due to a parasite which affects one and not the other); bear, fox, rabbit, etc. As with the western Métis, the dominant religion was Catholic, and material culture would likely reflect religious items such as crucifix, rosaries, etc. The Métis in the study area would have initially, at least, been heavily involved as with other Indigenous groups and Euro-Canadians, with the fur trade.

Researchers have conducted statistical analysis in an effort to delineate a unique Métis in material culture analysis, but the studies failed to produce "statistically valid material patterns". It has been argued, however, that both ceramics and beads are indicative of Métis lifeways (ibid). It has also been suggested that lithic materials may be able to be conclusively linked to Métis occupations. Burley et al. (1992) researched overwintering sites in Western Canada and identified some broad trends in material culture use. He identified a "distinct lack of architectural materials such as nails, window glass, and so on, …" (ibid: 7) and attritubed this to the termporay nature of the cabin and scavenging and reuse of materials. Domestic and activity related materials wer under represented, which was interpreted to mean a lack of "investment in household items for traveling out onto the prarie". Overrepresented in the material culture were clothing and firearms and ammunition, as well as beads.

Supernant critques the analysis of beads in the Métis material culture, as speaking only to quantity, where she indicates Métis beading is distinctive and a key part of clothing worn by the Métis (ibid: 8).

Supernant suggests that the number and distribution of fine ceramics might be an indicator of Métis tea ceremonies, which were used to elevate their status. Their has also been a suggestion by researchers that the presence of lithis on a Métis site are "intrusive" rather than part of the material culture. Supernant also suggests that this interpretation may be short sighted (ibid: 8).

In addition to trying to differentiate the material culture of the Métis as a distint cultural phenonmena, researchers in Western Canada have looked at "space", that is, studying the geographic/spatical distribution of structures and groups of structures. Researchers suggested that there was a "lack of formal layout" and that this tied in directly with the seasonal mobility of the

Métis which would not have garnered the "need" for patterns associated with long-term land tenure.

Métis cabins are both single and multi-roomed, and in some cases spread widely apart, and in other cases, closely together, the latter possibly being indicative of family groupings (ibid: 10).

> *"The Métis of the nineteenth century negotiated their identified through a series of relationships with political, economic, social, and ethnic structures. Previous work that associated use of European material culture or butchery patterns witih higher status within the Métis community assumes that Métis wanted to be European rather than First Nations, a clamim which masks the distinctiveness of being Métis in the nineteenth century. However, not all Métis people at this time thought of themselves in the same ways, although there is historical evidence for some degree of choesiveness"* (ibid: 11).

In the same way, the limited archaeological data and comparative data does not necessiarly allow for the same conclusions to be drawn from one geographic locale to another. What applies and is understood in Western Canada, is not necessarily the same as for the current study area. Ceratinly, similarities can and should be drawn, however, a distinct local identity will emerge based on resources, contact with others, etc.

Through research at the IPIA, Supernant is developing a database which is based in Métis knowledge of cultural heritage. This involves working with knowledge holders and Elders and their way of interpreting material culture. Supernant indicates that the way that archaeologists interpret artifacts is not the way in which the Métis interpret artifacts. The strong emphasis for Métis is "kin and family". The premise is that one wants to know where family members were – "connecting family to place" and then discussing/evaluating the belongings that were found at that location. Stemming from the discussion on artifacts, is the premise that these artifacts should remain within the Métis community, allowing communities to recount their own story.

Supernant is quoted as saying "Archaeology can be a powerful part of helping support Indigenous rights. It can help to reconnect Indigenous peoples with lands and places that may have been lost due to colonial processes. As opposed to the deficit view of Indigenous communities, we can really celebrate this rich and vibrant history" (McMaster 2021).

1.3.3 Pre-Contact Indigenous History of the Study Area

The history of human occupation in this area of Ontario possibly dates back to between 9,000 and 7,000 BC after the retreat of the Laurentide Ice Sheet. This was known as the Paleo Indigenous period. The earliest people known to have occupied Ontario at that time have been assigned the name "Clovis" and believed that they crossed over to North America from Asia via an ancient land bridge that once existed where the Bering Strait is now located. They were probably nomadic caribou hunters who changed locations often as they followed the herds. The Clovis evolved into the "Plano" culture and also hunted game. Evidence of their existence has been found around the northern Great Lakes where there existed suitable stone to fashion tools. These tools included darts, knives and scrapers. However, there is no current evidence to indicate that they ever occupied any land around the study area.

During the following Archaic period (5000–1000 BC), the Plano culture developed into two separate groups occupying Ontario. The "Laurentian Archaic" people occupied the south while the "Shield Archaic" existed in the north. The "Shield" people were so named since they seemed to exist throughout the Canadian Shield area of the north. Their culture appeared to be similar to the Plano except that they had watercraft, possibly the birch bark canoe. Toward the end of the period, there is evidence that they used primitive style bow and arrows. Their way of life seems similar to that recorded of the northern Algonquin speaking people at the time of European contact and were probably ancestors of the Ojibwa, Cree, Algonquin and Montagnais.

Although daily life probably remained relatively the same, there were at least two changes earmarking the subsequent Early Woodland period (1000–400 BC). During this period, ceramics appear to have come into use and very elaborate burial practices made an appearance that included the burial of precious and ornate objects with the dead. The Middle Woodland period saw an increase in the trading of these objects and limited agricultural practices coupled with longer site occupations made an appearance during the transitional Woodland period (900–600 AD).

During the Late Woodland (900AD–1650 AD), there was a major shift to agriculture as well as the establishment of more permanent camps and villages. The social structure of communities also changed with the development of political systems based on families and the need for alliances with other groups of people. The early villages were small while later ones housed larger groups of people and had very entrenched political structures.

Knickinick Heritage Consulting (KHC 2014) has raised the importance of islands in the Ottawa River to the Algonquin—especially when they lie beside rapids. KHC highlights that Morrison and Allumette Islands are examples of archaeological sites similarly situated, where fisheries and "toll booths" were important. KHC also suggests that portage trails and campsites may have existed on the island and the shores.

In a report by ArchéoTec (2017: Figure 1.4), "hypothetical" portage, trails and historic hunting grounds are delineated and presented here as Figure 10. The portage route at Long Sault rapids begins at the north end of the island (at the start of the rapids) and ends at the south end. There is another portage route on the Quebec side of the Ottawa River which also begins just north of the current dam-bridge and exits about 3.5–4 kilometres South of the south end of Long Sault Island.

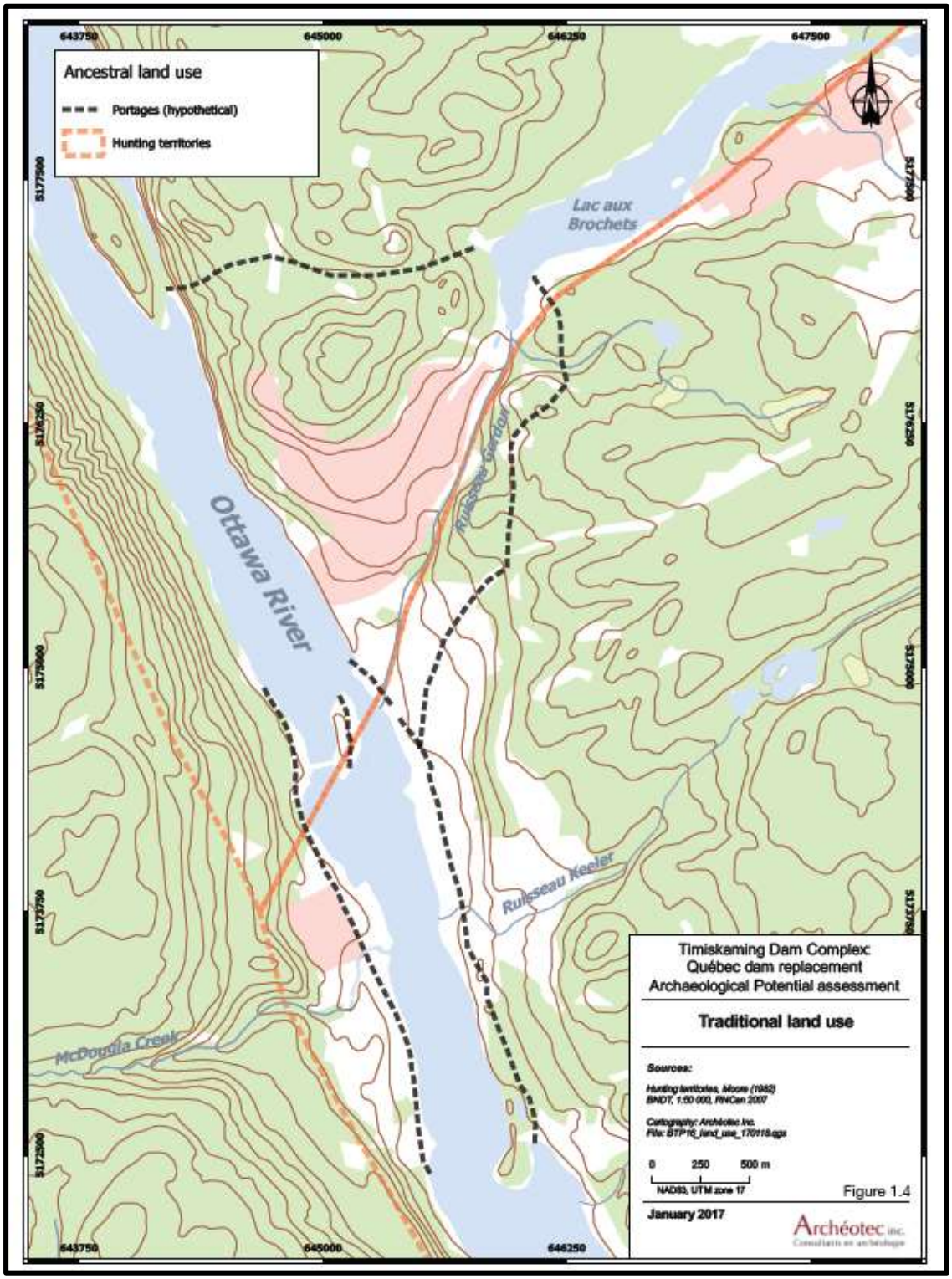


Figure 10: Ancestral Land Use
(ArchéoTec 2017: Figure 1.4)

Although hypothetical, portage routes projected by ArchéoTec may well have been situated in these locales. If any canoe spills were to happen, they might be represented at the north end of the study area. There is also the possibility that Indigenous people may have attempted to "shoot" the rapids and if there was an accident (canoe spill), it too may be represented in the study area.

It is ARA's understanding that some of the engaged First Nations, Indigenous communities/organizations, and/or Métis do in fact hold traditional knowledge of the extensive use of this area. Additionally, it is ARA's understanding that some of the engaged First Nations, Indigenous communities/organizations, and/or Métis continue to travel on and near the river today.

1.3.4 Post-Contact Indigenous History of the Study Area

The first known white man to come through the Nipissing region was the explorer Etienne Brulé sent by Samuel de Champlain in 1615 to explore the new lands. Brulé embarked from present day Toronto at Lake Ontario and came up the Toronto Carrying-Place Trail, also known as the Humber Trail, to Simcoe via present day York Region. He then proceeded to explore the Ottawa River and possibly sailed right next to the study area. There were probably earlier white "couriers de bois" explorers who came through but there is no written record before Brulé's visit. Brulé reported Ontario's rich resources to Champlain who relayed the news to the French monarch and collective aristocracy. The French began moving into areas all over Ontario and Quebec in an effort to obtain furs which were valuable in European commerce. They engaged many Indigenous peoples in a trade for furs that would benefit both parties. However, fur trade wars erupted between various Indigenous groups resulting in the dispersal of a number of communities.

Looking beyond just the Ottawa River and Lake Temiskaming are other water bodies that form part of the navigation highway for Indigenous peoples. Lakes, such as Kipawa Lake, were connected to Gordon Creek which lead to the Ottawa River. Gordon Creek (also sometimes referred to as River) is located within the traditional hunting area of ancestral Kipawa Algonquins (Speck 1915; Moore 1982).

The Kipawa Algonquins also interacted with their neighbouring Algonquin groups; the Timagami Band (northwest) and the Mattawa Band (southwest). Figure 10 illustrates traditional hunting areas.

By the time of European contact, people of both Ojibwa and Algonquin heritage were settled in the area around Lake Nipissing, possibly including land in the vicinity of the study area. Since tributaries of Lake Nipissing drained into both Georgian Bay and the Ottawa River, the study area existed geographically at the crossroads of two watersheds, making it a very important area for trade. Given their proximity to the study area, the Algonquin speaking peoples were the key to trade in all directions. Although they obtained food primarily through hunting and fishing, their proximity to the trade routes made it possible to obtain beans, squash and corn from Indigenous people to the south. As a side note, the Algonquin First Nations have indicated that Lake Nipissing has not drained into the Ottawa Valley for some 7,000 year and that the portage for the area occurs through Lac Vase Portage at Trout Lake for the Ottawa watershed.

In the early 1640s, competition between various Indigenous communities regarding fur trade supremacy began to affect the Algonquins. The Iroquois based south of Lake Ontario initiated

military attacks between the Huron and the Algonquin speaking people of the north in competition for furs. Although the Algonquin moved further west around 1647, they continued to use their traditional trade routes in spite of the growing danger of attack. However, by 1670, they had returned to the Lake Nipissing area.Figure 11 illustrates the distribution of Algonquin and neighbouring Indigenous peoples in the 17th century.

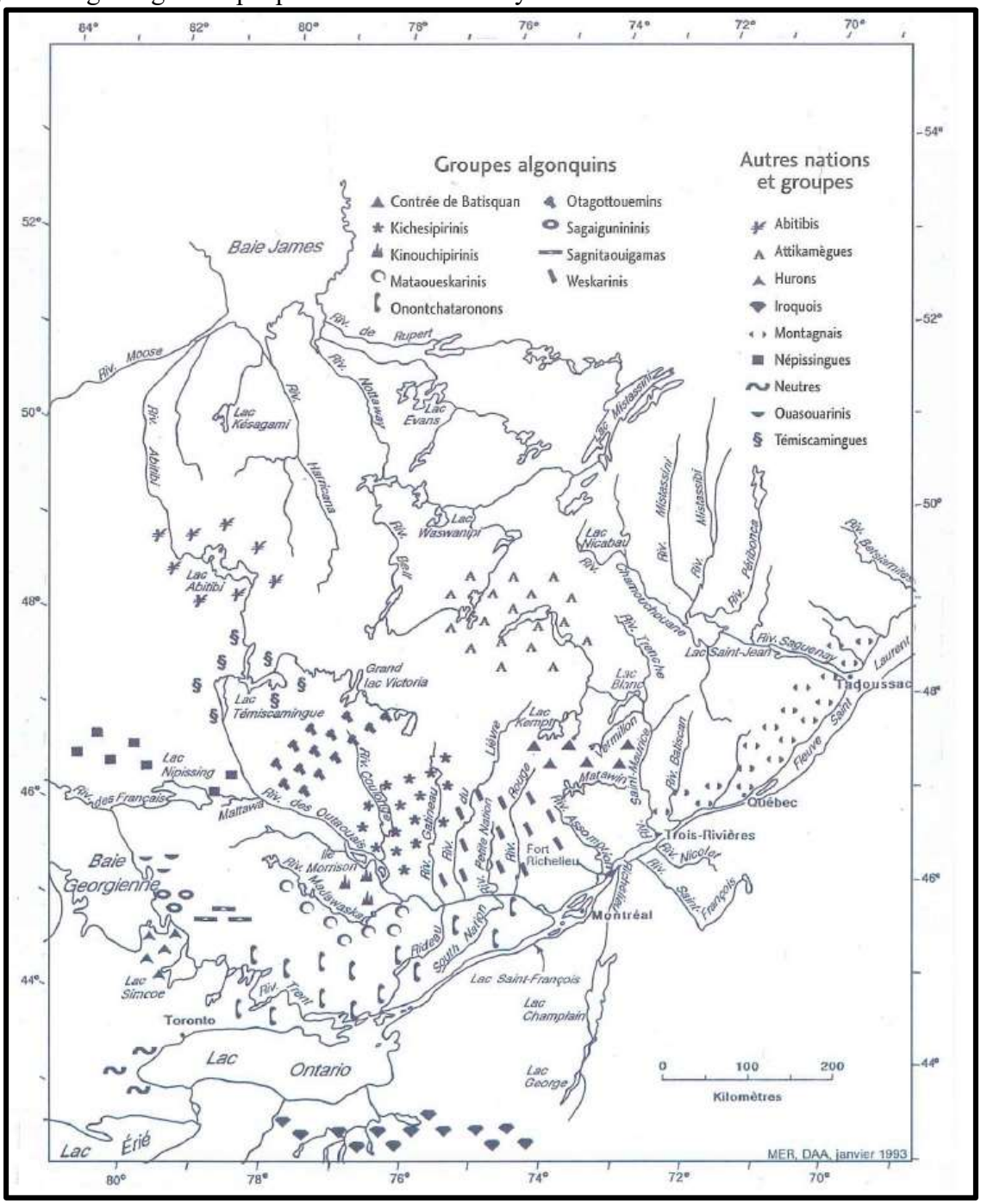


Figure 11: Approximate Location of Early 17th Algonquin and Neighbouring Indigenous Groups
(Archéotec 2017b: Figure 4.1)

There were two important routes used by Indigenous and Euro-Canadians at this time.

> "*The first of these routes connects the James Bay Basin to the Great Lakes–St. Lawrence River Basin. This route, which takes the Abitibi River from James Bay, crosses the drainage divide through Lake Abitibi and then Lac des Quinze, ultimately leading to the Ottawa River, Lake Timiskaming and the Ottawa region further downstream. It was primarily through this route that Fort Timiskaming was supplied from James Bay in the 19th century (Morse 1979). This is also the route taken earlier, in 1686, by chevalier Pierre de Troyes from Montreal to James Bay (Caron 1918).*
>
> *Another important route, running crosswise, was taken by Huron groups towards Montreal to avoid the lower reaches of the Ottawa River, which had become too dangerous since the Iroquois raids in the 1650s (Viau 1995, p. 128). This route takes Lake Nipissing, goes up the Ottawa River and crosses a series of inland lakes to reach the Rouge, Lièvre, Saint-Maurice and even Lac Saint-Jean basins (Morse 1979, p. 69). This route, used at the time as a bypass (Morse 1979: 69), was known since prehistoric times and placed the study area on the copper route (Cadieux 1993, p. 199). This route was widely used by Nipissing and Huron groups, among others. These travel routes therefore place the study area on a major exploration and barter route*" (Archéotec 2017b: 6).

Indigenous groups, during this period of time, were still largely a hunter-gatherer society. They settled in small family groups and would meet other groups usually in the summer on the shores of the larger lakes (McPherson 1930:97; Moore 1982:60).

The trading post situated at Lake Timiskaming utilized the Indigenous groups in the area (Riopel 1991: 7). The location of the post was strategic, lying approximately half-way between James Bay to the north and Montreal to the southeast. The Indigenous people of the Archaic period had been meeting in the area of the trading post long before its strategic location was realized by Euro-Canadians. The location was known as "Obadjiwan" to the Algonquin (Viau 1995: 130; 138-139; Côté 2006: 17). There were other smaller posts established along the major routes, and the closest to the study area is that of Opémican, still quite a distance north. These posts were not only a draw for economic pursuits, but also for religious sects who would often establish missions in or near the same locale.

Major travel routes in the area are illustrated in Figure 12 (Archéotec 2017: Figure 4.2) which depicts Lake Temiskaming and the study area directly on one of these early routes.

1.3.5 Métis and Euro-Canadian Historic Period

Long Sault Island, a Crown owned island, is located completely within Ontario boundaries (refer to Figure 2). The study area encompasses part of the eastern shoreline of Long Sault Island, north and south of the Quebec bridge-dam, and the eastern side of the Ottawa River, both north and south of the Quebec bridge-dam.

"Temiskaming" has many variations in spelling but is rooted in the Algonquin language and specific name of "Temiagamin" which translates to "Deep Lake". Temiskaming Lake was called

"Obadjiwanan Sagahigan" or "Narrowed Current Lake". The French altered the name to "Témiscamingue", later shortened to "Témiscaming", especially as applied to the town located at the study area (Taylor 1993: 7).

The Ottawa River also is rooted in the Algonquin language and is referred to as "Kichi-Sibi", "Kichissippi", "Kitchissippi" and "Kichisppi" (Tetra Tech 2023: 3–1).

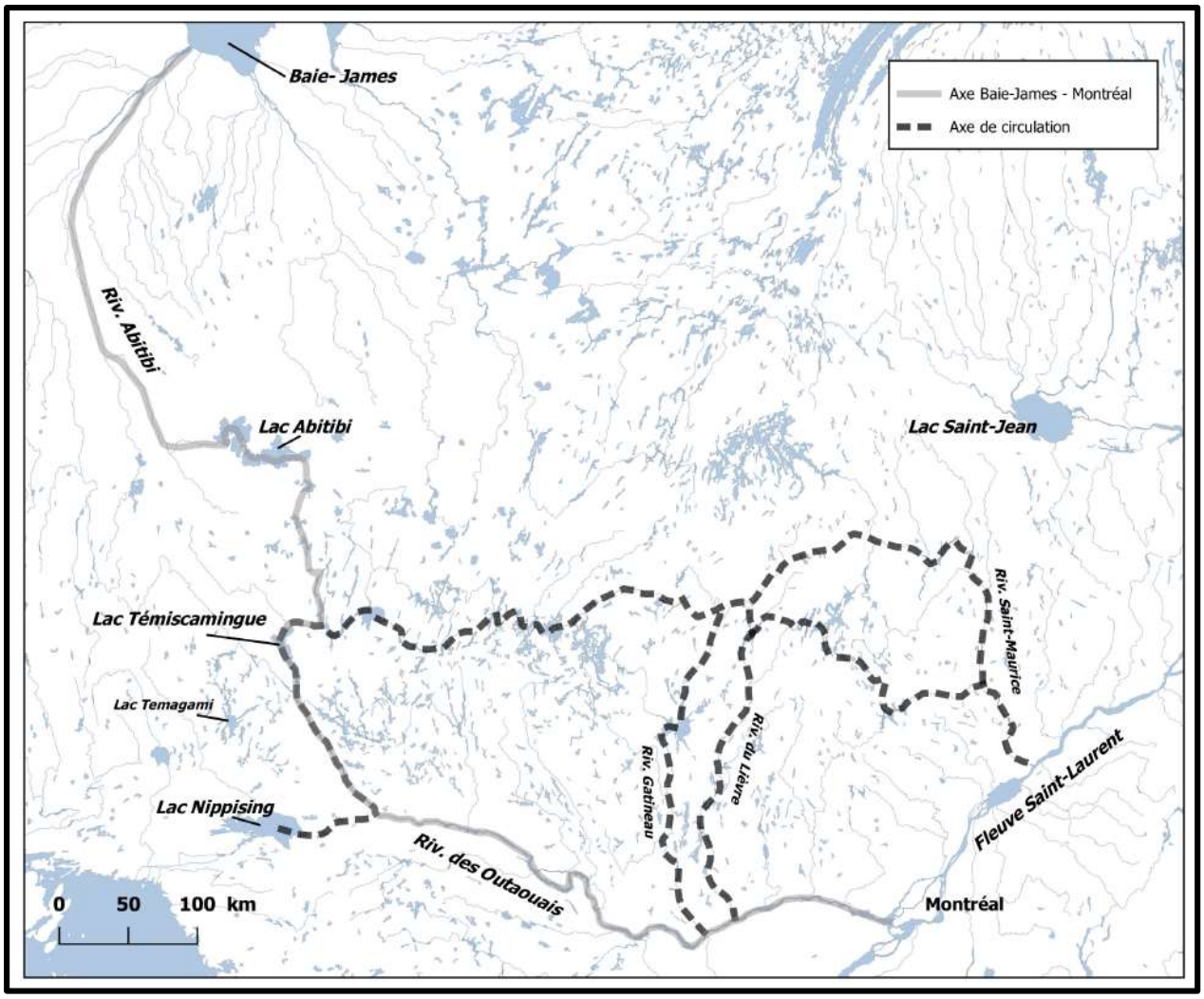


Figure 12: Major Travel Routes
(Archéotec 2017b: Figure 4.2)
Note: Lac Nipissing is spelled incorrectly in the above figure.

The first European known to have settled for any length of time in the area between Lake Nipissing and the Ottawa River was French trader and explorer, Jean Nicolet de Bellborne. Arriving in Quebec in 1618, he worked as a clerk and trained as an interpreter for the "Company of Merchants" a fur trading monopoly owned by French noblemen. In order to learn the Indigenous languages,

the company sent him to live among the Algonquin on the Nipissing shore where, for nearly nine years, he had a cabin and trading house until being recalled to Quebec in 1633.

Captain Pierre Le Moyne, the Sieur De Troyes, Piémont regiment, arrived in Quebec City in 1685. The governor, Brisay de Denonville, required that de Troy "chase" the English from Hudson Bay. De Troy takes with him 30 soldiers and 70 militiamen. They leave Montreal on March 20th, traverse up the Ottawa River, presumably by boat/ship, and pass through the study area. There is no record as to whether they stopped here or continued on without respite.

The importance of the area was not lost among either the English or the French. English traders would come from James Bay where the Hudson's Bay Company had forts and French traders came up the Ottawa River from Quebec and were the first to establish a trading post.

The first fort, albeit north of the study area, was Fort Témiscamingue, built in 1679 on an island near where the Matabitchewan and Montreal rivers flow into Lake Temiskaming.

> "*It was operated by French traders (compangie du Nord) and was active in 1686 when Sieur De Troyes travelled through Lake Temiskaming on his way to capture the English forts on James Bay. The following year, it was wiped out by the Iroquois on one of their raids against the local Indians. A year later, in 1688, the fort was moved to its present location at "the narrows", and was operated intermittently by French-Canadian traders called the "Montreal Merchants", until about 1758…."* (Taylor 1993:3).

Figure 13 illustrates the 1699 map with detail of "Lac Temiscaming" and south of the Lake, "Long Saut" [Long Sault].

During the 18th century, the fur trade was a dominant economic feature in Ontario and Quebec. Archéotec (2017a: 19) was unable to locate any reference to a trading post in or near the study area. The closest trading post is that of Opèmican, located some distance north from the dam.



Figure 13: 1699 Map of North America
(Archéotec 2017a: Figure 1.8)

Towards the end of the 18th century teams of lumbermen were active in this area, arriving in the fall, cutting wood through the winter months, and returning with the spring freshet, with wooden rafts constructed from squared logs, known as lumber rafts.

Father Ouellet, a Roman Catholic missionary, visited the Lake Temiskaming area as early as 1658, but on the whole, the area was not considered a primary area until about 1836, when Father Louis-Charles de Bellefeuille arrived to stake stock of the area and its possibilities. The responsibility to pursue a mission for the Algonquins was transferred to the Oblate order in 1844, under the supervision of Father Leon-Nicholas Laverlochère. In 1863, a mission was established "*that would encourage the local Indians to become sedentary and abandon the nomadic life*" (Taylor 1993: 4). It was soon realized by the order that the mission needed to serve a larger community than just that of the Algonquin peoples but would also include lumbermen and arriving settlers.

The demand for wood came with the start of the 19th century as England was unable to procure wood from its neighbouring allies due to the "Napoleon blockade". An early entrepreneur, Philemon Wright, established a sawmill on the north bank of the Ottawa River, now known as Gatineau. Wood from the Temiskaming area was floated down to Quebec City.

The McConnell brothers opened the first lumber camp north of Temiskaming Lake in 1836 on Opèmican Point (Figure 14). Opèmican Point lies well north of the study area. The study area marked on Figure 11 is noted with the written word beside it, "Rapid". Large red and white pines were in high demand. In 1840, the demand for timber from England dropped significantly, and the emphasis for exporting lumber was redirected to the United States instead.



Figure 14: First Lumber Camp North of Study Area at Opèmican Point 1867
(Archéotec 2017a: Figure 1.9)

The French also traveled the area around the divide of the watersheds to reach the Great Lakes, allowing them considerable contact with the areas Indigenous groups. Relationships and marriage with First Nation women was common, leading to distinct Métis settlements emerging as an outgrowth from the fur trade. Today, the North Bay Métis Council exists as part of the Community Council of the Métis Nation of Ontario and operates in accordance with Charter Agreements allowing the mandate to govern while ensuring accountability, transparency and consistency.

Although there were many treaties negotiated and signed between the First Nations and the British Crown in the early part of the 19th century, it was not until 1850 that any negotiations took place for Indigenous lands in the vicinity of the study area. William Benjamin Robinson led negotiations for Treaty #61, signed on September 9, 1850, whereby Ojibwa/Nipissing along Lake Superior from Batchawana Bay to Sault Sainte Marie and also from the eastern and northern shores of Lake Huron handed over lands to the Crown. Robinson was a former fur trader who also oversaw the

development of the Welland Canal and was later elected to the Legislative Assembly of Upper Canada for followed by the Legislative Assembly for the Province of Canada. Treaty #61 is commonly referred to as the Robinson-Huron Treaty and includes the study area. The nearest treaty to the Study Area is the Robinson-Huron, which affects the Ojibway/Nipissing Nations. The nineteenth century Algonquin request for treaty negotiations were ignored, while on-going negotiations in the 20th and 21st centuries produced an Agreement-In-Principle between the AOO, Canada, and Ontario (AOO personal communication 2023).

Around mid-19th century (1850s), some of the timber barons in the Ottawa Valley had extended their interests to Lake Temiskaming, especially towards the south end of the lake where there were reportedly large stands of pine. The majority of the cut timber, initially, was for saw logs, and later for pulp wood (Taylor 1993:3).

By the 1870s numerous lumber camps began to appear along the shoreline of the Ottawa River, including several within the vicinity of the study area. Toward the end of the decade, Ed Boyce from Manotick set up a depot farm just west of the study area (on the Ontario side) where he provided supplies for occupants of the lumber camps. The locals began referring to the Boyce place as "The Farm". Situated on a steep slope, the Farm supplied fresh produce, meat, dairy products and hay to those in the camps. Ed's brother, James Boyce, later joined the Farm as did Ed's sons, Eldon and Gordon.

By the 1880s the names J.R. Booth, Gillies Bros., Alex Lumsden and others all were running large timber operations on Lake Temiskaming and the area. In that same era, the area of present day Temiskaming began to be settled by a few families. Temporary settlers included trappers, fur traders and lumbermen. During this period, a lumber mill was built by Alex Lumsden (1843–1904) on Gordon Creek. Wood was floated down this creek to the Ottawa River.

Lake Temiskaming and area were slow to open to settlement mainly due to the extreme difficulty in accessing the area. "In [sic] was not until the CPR reached Mattawa in 1881, that settlement of large number of people became a possibility. The energetic Father Paradis and a party of the Oblates examined the area in 1882 and determined that the potential for agriculture was good [northern part of Lake Temiskaming]. The first official settlers arrived that year, and two years later, Father Paradis and the others in the church established the Société de Colonisation du Lac Témiscaming (Colonization Society) to encourage French Canadian settlers to relocate to the area" (Taylor 1993:4).

In an 1882 article, "Tete des Repades du Long-Sault" (L'Opinion Publique, Journal Hebdomadaire Illustre' 1882: 525–526), the author describes, presumably from an eye witness account, that the there is a six mile long rapid, called the Long Sault. It is the first rapid that descends into the Ottawa River moving south from Lake Temiskaming. The engraving (I) illustrates the southern end of Long Sault Island, where the large channel on the left is the Ontario side, and the channel on the right is the Quebec side. The island is described as wooded with firs and pines that divide the river into two. The author notes that the west branch is dry during summer, suggesting a very shallow depth, whereas the channel on the Quebec side allows for navigation.

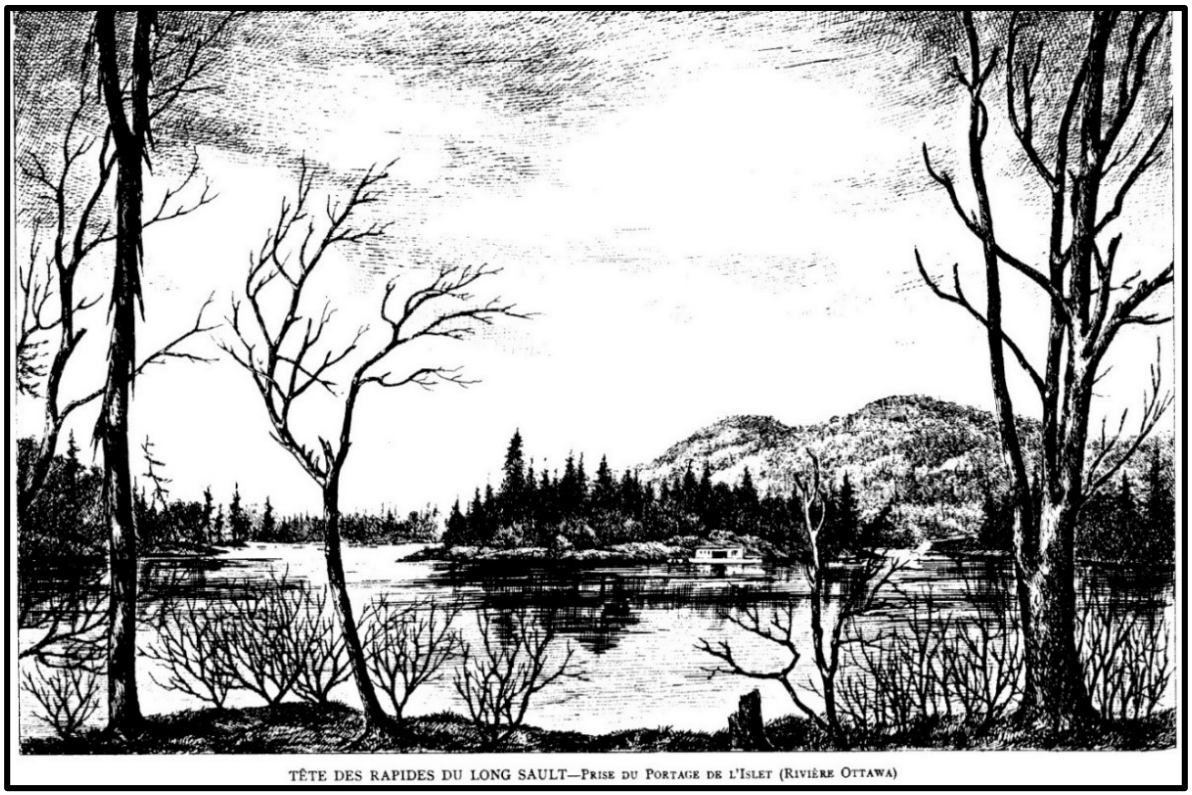
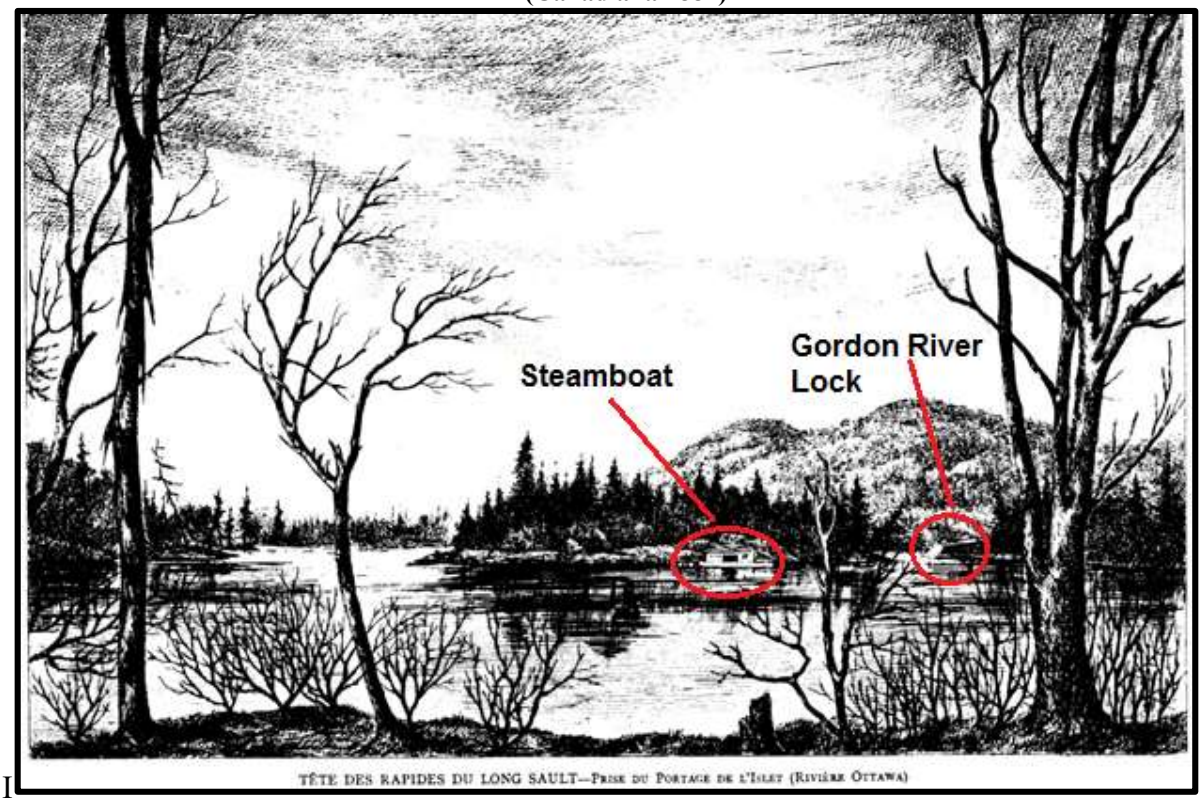


Image 3: 1882 Sketch of the Head of the Long Sault Rapids
(Canadiana 1882)



I

Image 4: Engraving with Isolated Details

(Canadiana 1882)

passage of boats, although still presenting as a rapid. The engraving shows a steamboat in the foreground of the island, which has been identified as the Mattawan. The author also indicates that one can see the Gordon River Lock, "built at great expense" resulting in a great froth of waves. Image 4 illustrates the location of the steamboat and "lock". And while the author calls this a lock, based on the elevation of the water above the Ottawa River, it appears more like a flume. This was no doubt used by lumbermen to put logs into the Ottawa River from Gordon Creek and downriver. The engraving shows no evidence of a saw mill along the shoreline of the Ottawa River but as indicated in the text above, a sawmill was indeed established here east of the Ottawa River, using Gordon Creek, by Alex Lumsden.

In a contradictory account, the sawmill was first established in 1888 on the east bank of the Ottawa River in the vicinity of the study area (https://www.thecanadianencyclopedia.ca/en/article/temiscaming).

The Colonization Society went so far in its pursuit of attracting settlers to the area to purchase small steamboats, improve the portages around the four sets of rapids, between Mattawa and Témiscaming, and eventually building narrow gauge tramways, called the "Moccasin Express Line" (Ibid.: 4). This was also known as the Gendreau Tramway. This was put on narrow gauge/tracks and bypassed all of the rapids. The path presumably followed that of old portage trails. "*The tramways and charabanc pulled by horses were replaced in 1891 by trains that traveled on standard gauge tracks*" (Archéotec 2017a: 18).

By 1891, the Canadian Pacific Railway (CPR), had taken over the "Moccasin Express Line", and was now building a railway between Mattawa and Temiscaming (the town) (Ibid.: 5).

The attraction of the "Little Clay Belt" near New Liskeard to the north, prompted the Ontario government to build a railway that would extend from North Bay to Lake Temiskaming, known as the Temiskaming and the Northern Ontario Railroad (T & N.O. Railway). During the construction of this railway in 1903, there was a discovery of silver, which precipitated a mining rush. By 1914, the mining boom and agricultural settlement was drawing to a close. Available land had been taken up and the mines had developed problems in addition to the dwindling resources (Ibid.: 5).

The original community of Témiscaming was known as Gordon Creek, and also South Temiskaming. The settlement of Témiscaming was established in 1917 by the Riordon Pulp and Paper Company who purchased the sawmill. They wanted a "town" to provide housing for their employees. The new mill was called the Kipawa Mills paper mill. Thomas Adams was retained to plan the town and did so in what is termed a "Garden City" style. In 1920, the town was incorporated under the same name as the mill, Kipawa, but a year later was renamed to Témiscaming.

The hamlet of South Témiscaming was incorporated into Kipawa. It had served as the terminus for the Canadian Pacific Railway for the area, as well as for a steamship port for communities

north of Lake Temiskaming. The original railway station still exists as an historic building. The CPR reached Mattawa in 1881, although still shy of reaching Témiscaming.

The CPR completed the line to Temiskaming Lake in 1895, and by 1903, extended to Lumsden's Mills. Figure 15 shows two wharves situated north of the study area. These are an unnamed wharf and the A. Lumsden's Wharf (in French Quai). The island in Figure 14 is not representative of its' true configuration, but the plan does indicate rapids on either side of the island. Gordon Creek is also inaccurately depicted in the plan, as it appears north of the island, whereas it is in actuality located adjacent to the island. This would normally put in question the location of the wharves, however, the rapids would have prevented any marine infrastructure such as wharves in that exact area. Nor is there any indication of wharves or other related infrastructure south of the island.

The town of Témiscaming was run as a "company town" for many years. It was originally owned by the Riordon Company which operated from 1917–1925. The Riordon Company acquired the Kipewa mill and then sold it to the Canadian International Company (CIP) in 1925. CIP bought not only the mill but the town as well. The economic depression caused economic hardship resulting in a population decline in the town. CIP was forced to close in 1972.

The mill later changed hands and was owned by Tembec following the shutdown of the mill in 1972. Currently the mill is under the management/ownership of Rayonier. The facility has three primary operations: high-purity cellulose, high-yield pulp, and coated paperboard (https://ryam.com/operations/facilities/temiscaming/).

The Temiskaming area economy currently consists mainly of forestry, agriculture, mining and tourism. Tourism is the main thrust of economy for the immediate study area.

1.3.6 The Dam Complex

The dam complex consists of two dams; one on the Ontario side of the Ottawa River, and the second, connecting Long Sault Island to Quebec on the east side.

In 1904, the superintending engineer of the Ottawa River works, G. P. Brophy, was tasked by the Department of Public Works to look into storage possibilities including investigating the control/storage of the spring floods on the Ottawa River. The objective for the storage of water was to reduce water fluctuations, eliminate rapids and dangerous currents, and establish smooth sailing waters for navigation. Figure 16 illustrates the 1904 Public Works Plan of the study area, as well as Long Sault Island, showing depths in the Ottawa River and Lake Temiskaming.

In 1908–1909 Parliament voted that $65,000 be used to start the construction of storage dams as suggested by Brophy. An additional $20,000 was also agreed to augment the on-going studies in the Ottawa River watershed. Plans were well underway in 1909 to construct both the Ontario and Quebec side dams. Figure 17 illustrates the proposed dam construction drawing by Public Works.

Figure 18 illustrates the dam on the Ontario side, but no dam as yet on the Quebec side in 1910. The plan depicts Long Sault Island and both sides of the Ottawa River. The Quebec side of the Ottawa River shows rapids that extends from north to south of Long Sault Island. Figure 19 illustrates the 1911 configuration of the area.

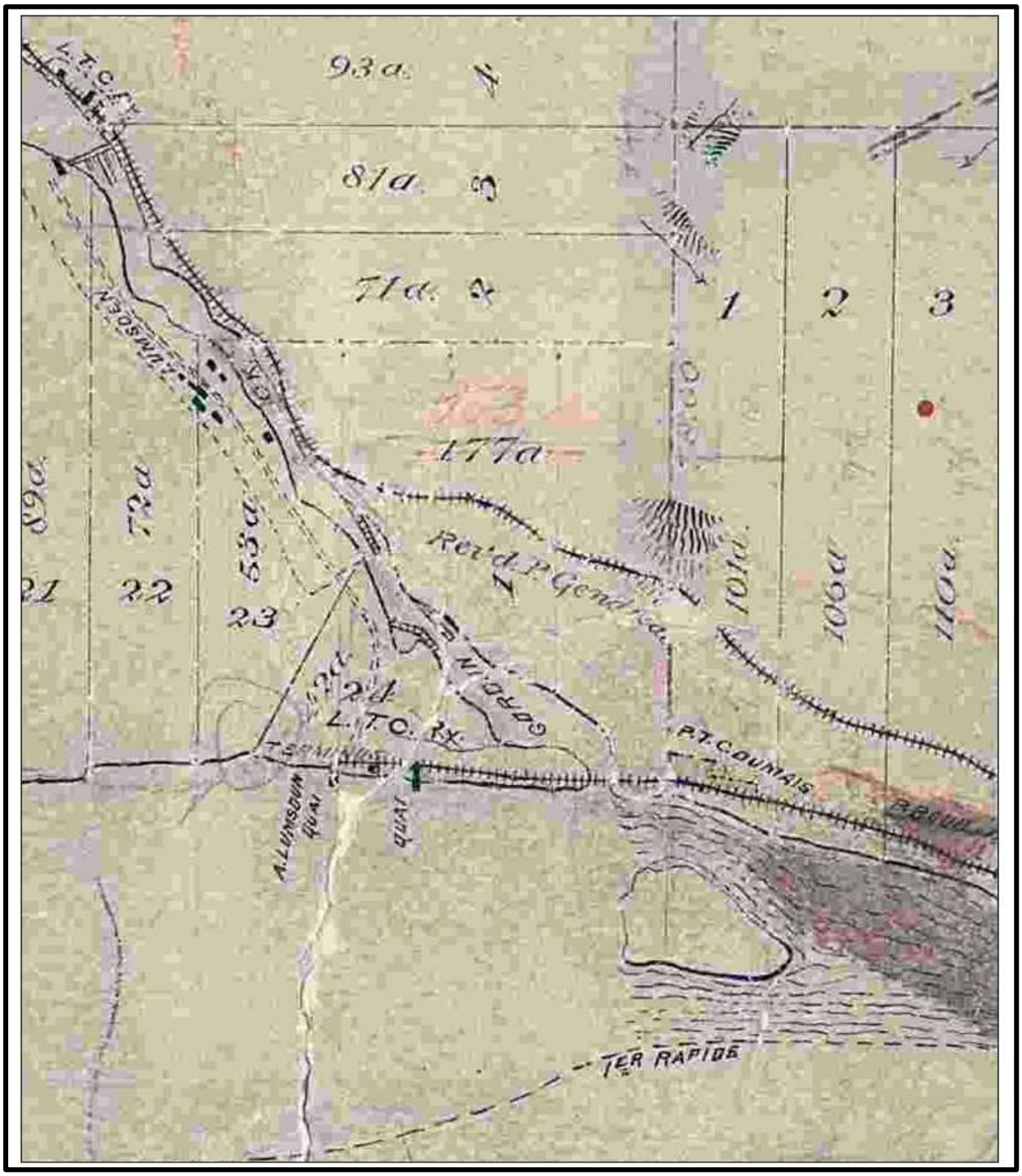


Figure 15: 1890 Plan of the Study Area
(Archéotec 2017: Figure 1:12)

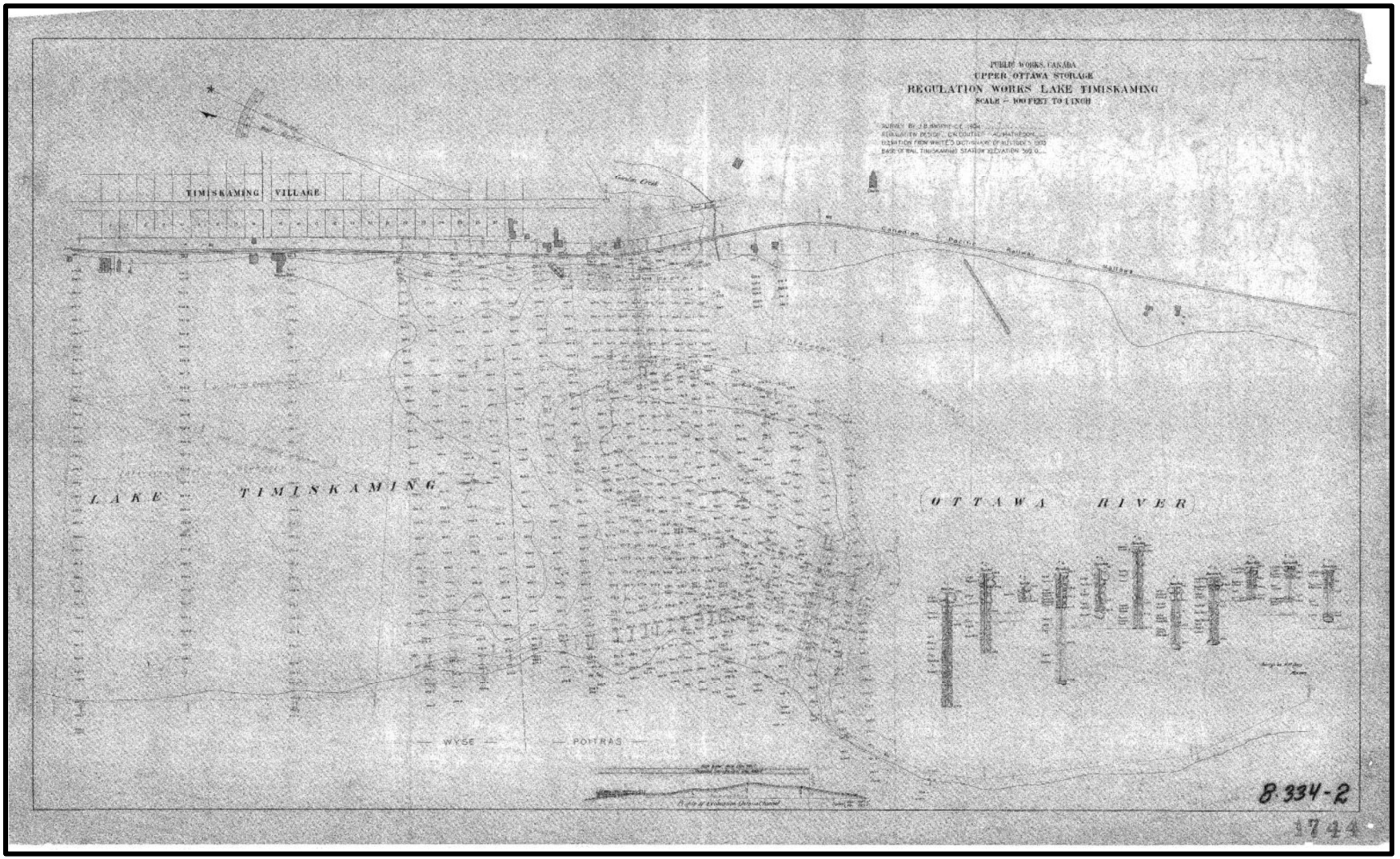


Figure 16: 1904 Regulation Works Lake Timiskaming

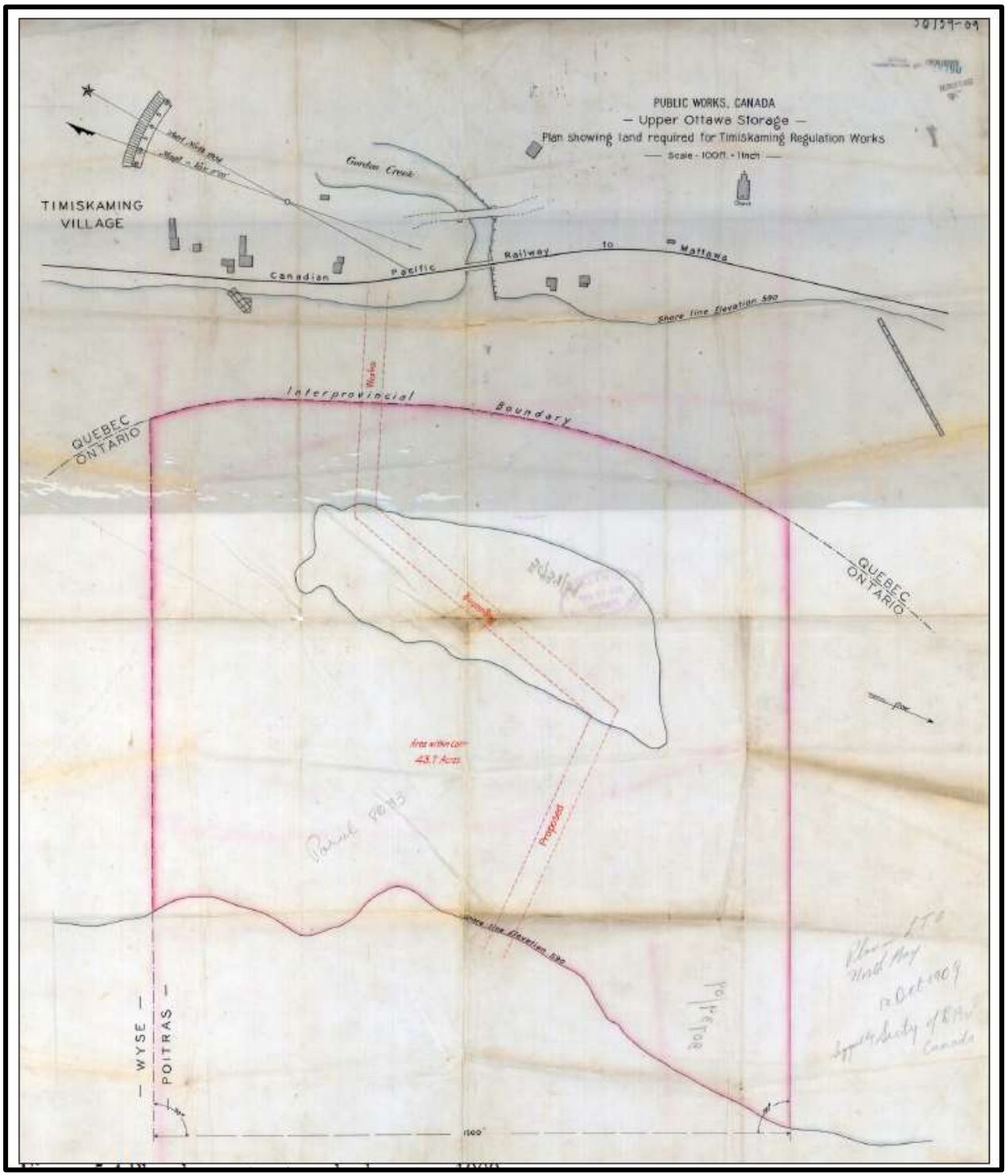


Figure 17: Dam Construction Drawing 1909
(Public Works 1909)



Figure 18: 1910 Plan of Area

(Plan showing Lot J.S. 248, Poitras including study area, 1910, Surveyor General's Office, Ministry of Natural Resources, Peterborough, Ontario.)

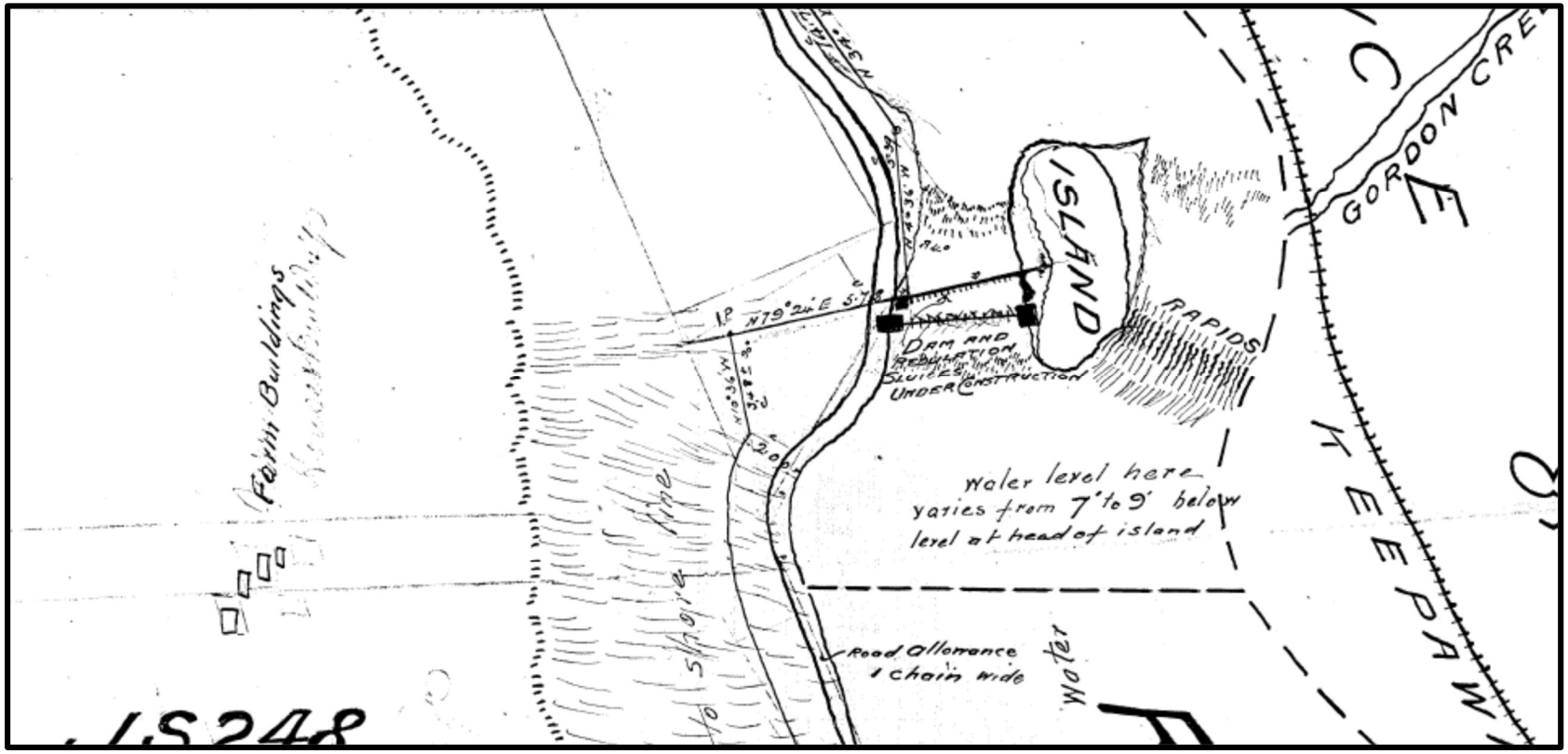


Figure 19: 1911 Sketch of the Study Area

(Part of Survey showing dam under construction and the depot farm "Farm Buildings", 1911, Surveyor General's Office, Ministry of Natural Resources, Peterborough, Ontario.)

Mr. C. R. Coutlée, C.E. was appointed the engineer in charge of the entire storage work under the direction of the chief engineer. Plans were in place for Lake Timiskaming by building a dam (Figure 20). The area of storage would amount to 100 square miles, have depth of 20 feet, and store approximately 2000 square miles feet [sic], the equivalent of 56 billion cubic feet (No Author 1912: 810). The benefits, as described by Mr. Coutlée, are threefold: 1) improved water potability; 2) increased depth for navigation; and, 3) increase and steady flow of water for power generation stations. Dam construction began in 1910 under contract, completed in 1911 and 1912 by the Department of Public Works.

A detailed account of the construction of the Ontario side of the dam in The Canadian Engineer (No Author: 1912) is presented below. The actual construction of the Quebec side of the dam did not begin until mid-September 1910. This work was centered on the construction of the cofferdam.

> The cofferdam *"…stone filled cribwork sunk to place and sheeted along the upstream face with plank. Round timber was procured from the Hawkesbury and Edwards limits near the work, and by the 17th October, the dam was half way across (210 feet). It was intended to unwater only half the channel and about 30 feet of cribwork was built down stream, but heavy rains caused an unusual rise of 5 feet and work had to cease* [Image 5]. *This brought most of the work on the dam to a stand-still, but sand was hauled and stone crushed which still remain stored upon the ground. The cable way was moved to the Quebec channel and put in working order by the middle of November, thus obviation* [sic] *the use of scows to cross material to the island. With a view to laying concrete during cold weather, arrangements were made to build a shed, 400 long and 60 wide, enclosing all the piers. Lumber was delivered for this, but owing to delays with unwatering, the shed could not be erected*" (Ibid.:812).

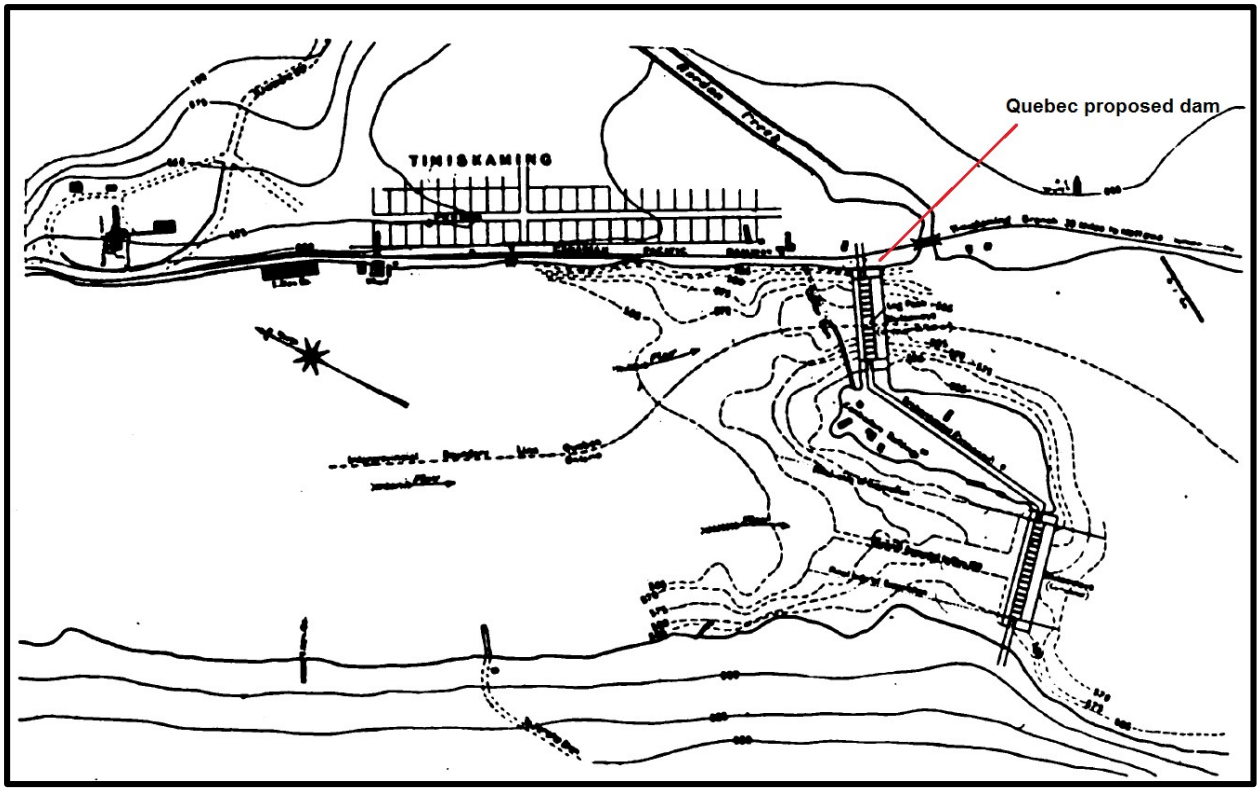


Figure 20: Plan of Proposed Dams at Temiskaming
(No Author 1912: 812)



Image 5: November 1910 Quebec Channel Cofferdam
(No Author 1912: Figure 1)

The steam shovel used for the construction of the Ontario side of the dam was brought over to begin excavations. Excavation was conducted on the island abutment, but flooding stopped work. The Ottawa River seeped through the fine sands, and brought construction to a halt. To rectify this, a sheet pile bulk head was built, and a steam pump installed. Regardless of these actions to nullify the effects of the river seepage, the sides of pits continually collapsed, and finally, on November 20th, the river side of the pit toally collapsed and set back the construction.

The Ottawa River was apparantly quite high that year contributing to the delays. The Ontario side of the dam was opened November 18th and the water fell about two inches per day. Work on the cofferdam was able to start again in January of 1911 when the lake levels had dropped about three feet. The cofferdam height was raised about two feet and track laid on top to facilitate the movement of stone filling and other contruction materials.

The engineers decided to take advantage of this and built the cofferdam across the entire channel. Cribwork was begun from the Quebec shore, allowing "*the foundation slab and cut-off walls to be built without joint. With a cofferdam half way across, the part parallel to the current requires to be a double crib with clay in the middle. Otherwise, the current will scour away staunching material from the exposed face…*". The report includes a description of the river bottom as a boulder bottom, which prevented the driving of sheet pile.

The construction of the cofferdam was not without additional problems. These included the fast water of the rapids, cold windy weather, and an inexperienced work force. Several cribs were lost during the construction, and sometimes took away the tackle (used in the building of the cofferdam).

New cribwork connected to the existing cribwork was laid in October, and by mid-February, the upstream face of the cofferdam was "sheeted with two thicknesses of boards". The boulder bottom made it difficult to place the cribwork flush to the bottom, and it is reported that some cribs were tilted on one or more corners. There were no trenches excavated in the water in which to anchor the planks, as the fast waters prevented divers from working in the channel. To counter this, "*a bank was deposited along the front of the cofferdam, but the only earth available was fine sand that made a slurry in water*".

A counterdam was built across the lower end of the foundation area to protect the pit from the lower pool and was completed in February. The initial contract had only provided two small steam pumps, a 4" and a 6" pump, but these were insufficient to lower the "water below the lower pool". Additional equipment was rented, and a pocket dam built below the main dam. The pocket dam was used to divert and collect runoff/leakage through box flumes and emptied below the counterdam. The pocket dam was described as "*first a small earth bank, the sandy soil alone available, however, dissolved beneath the water, but froze hard in the air, bridging and obscuring leaky places. A sloping dam of planks, pointed and driven like sheet piling, was made but still the leakage kept the pumps fully engaged and water constantly burst beneath*" (Ibid.). The leakage was so intense that even though two more pumps were added to the project in March, they could not hold back the waters. By the end of March, with four large pumps working 24 hours a day, the pit was finally dewatered.

As work had been slowed due to the several complicatons noted above, spring came to the area, and with it, the threat of rising waters. In an effort to compensate, the cofferdam was raised an additional seven feet with "*continuous cribwork*" fill with stone. There was concern that the light framed cofferdam would not be able to withstand the spring flood, but it was "*well strutted*" on the down stream side of the dam. In an effort to ensure that the cofferdam would not be damaged in the spring flood, the Ontario side of the Ottawa River was enlarged through blasting and

scouring to allow for additional discharge of waters downstream, at least while the Quebec channel was blocked with the cofferdam.

The excavation for the dam foundation on the Quebec side was carried out late March until the end of April. The construction again had to pause as the lower pool rose over the counterdam, "*the plant being nearly all removed*". A photograph captured the Quebec Channel work the day before catastrophic failure (Image 6). The problem escalated, when on May 4th , the main dam failed caused by scouring. The water apparantly was more than a foot over the top of the dam. One of the complications with the operations on the Quebec side was not only the Ottawa River and its flooding, but also Gordon Creek which would run fast in the spring freshets.

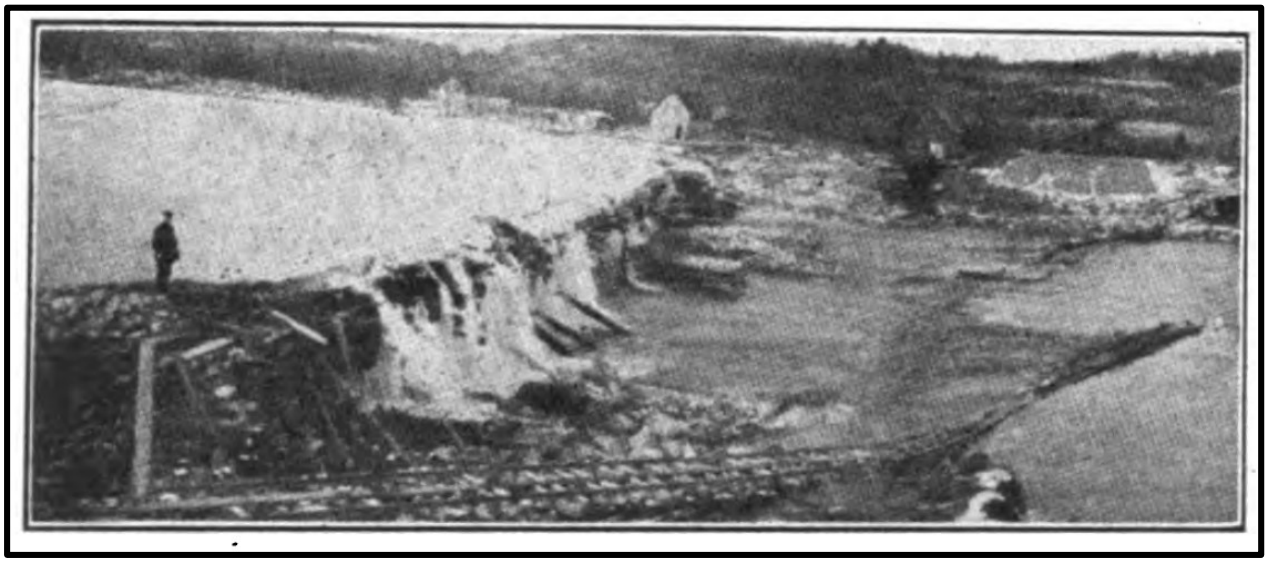


Image 6: Day Before Failure – May 3rd, facing East
(No Author 1912: Figure 2)

As the problems on the Quebec side caused stoppage of work, the work was then transferred to the Ontario side again. The article in The Canadian Engineer (No Author 1912) does not reference the completion of the Quebec dam.

A description of the dam sluice foundations, although not specifically identified as the Quebec dam (probably applicable to both the Ontario and Quebec sides) indicates a three foot thick concrete platform (Figure 21). The thickness and strength of the same was suggested that even if undermined, repairs could be made to the structure. One of the problems faced was the possibility and reality of underscouring of the foundation. To prevent this, "*a cut-off is made 10 feet deep across the upper face and another 5 feet deep across the lower side. In addition, a concrete apron, 25 feet wide, protects the bottom from scouring under the driving water at entry, and a 50 foot wide apron below prevents wearing away of material by the rapidly leaving flow*" (Ibid.: 811). The Quebec side river bottom was described as a hard sand, easily saturated. Noted was the necessity to prevent "leakage" by adding sheet piling beneath the cut-off trench, which would be "*10 feet deep in sand*".

The Ontario dam was completed before the Quebec side, as evidenced in Figure 17 and Figure 18. The Quebec side was started after the Ontario dam was completed and constructed at the head of the first rapid alongside Long Sault Island. The Quebec side dam was completed in 1912 (Archéotec 2017a: 22) but underwent repairs between 1912 and 1921. Figure 22 illustrates a sketch of the dam placement on the Quebec side.

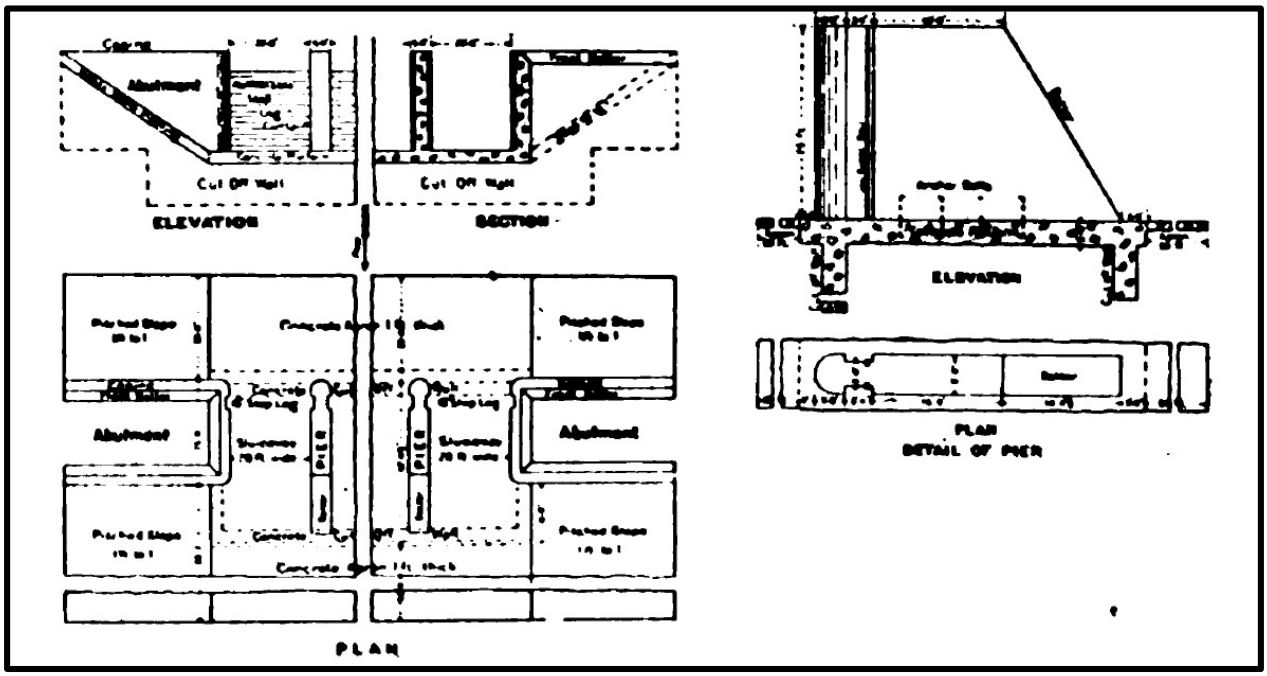


Figure 21: Concrete Suiceways
(No Author: 1912: Figure 5)

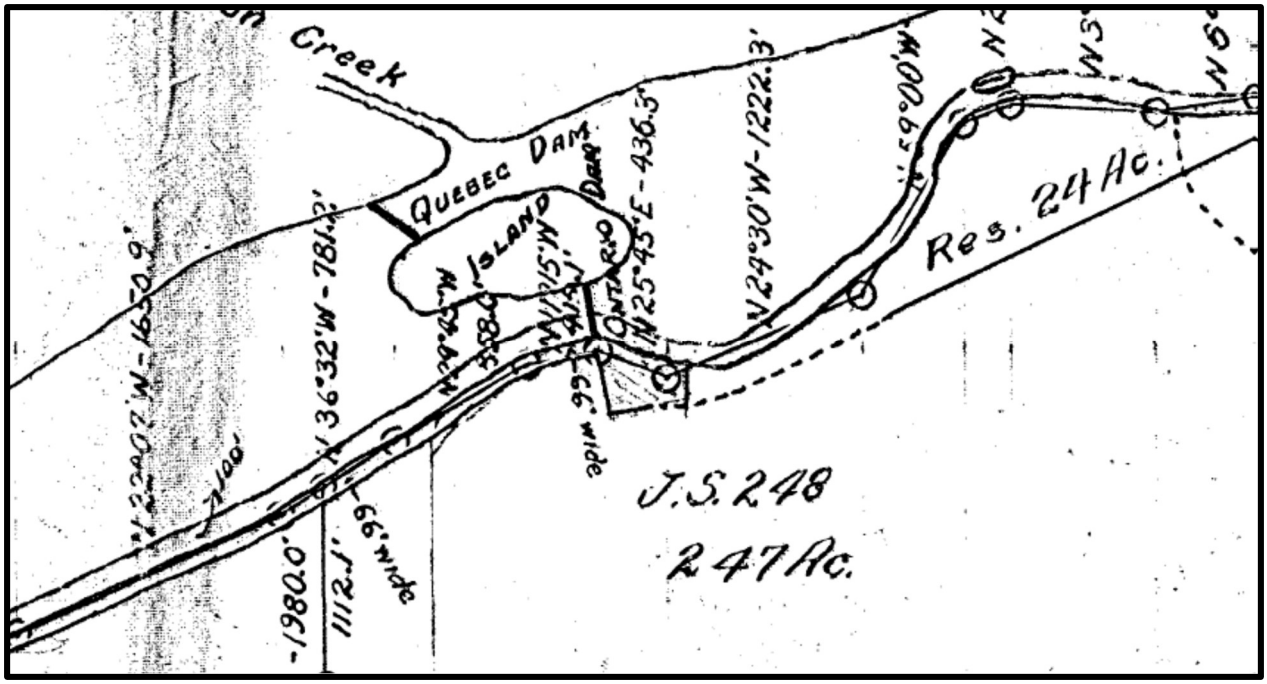


Figure 22: 1918 Timiskaming Dam
(Survey showing Timiskaming Dam – 1918, Surveyor General's Office, Ministry of Natural Resources, Peterborough, Ontario.)

In 1913, it was reported that the two "conservation dams", that of Kippewa and Temiskaming were fully operational (No Author 1913: 543).

Image 7–Image 9 illustrate the early dam. The dam, as mentioned above, experienced faults and required constant repair. Repairs were certainly underway in 1926 as evidenced by the tackle on top of the dam/bridge. Image 7–Image 9 illustrate the tackle. Repair work extended well into 1927.

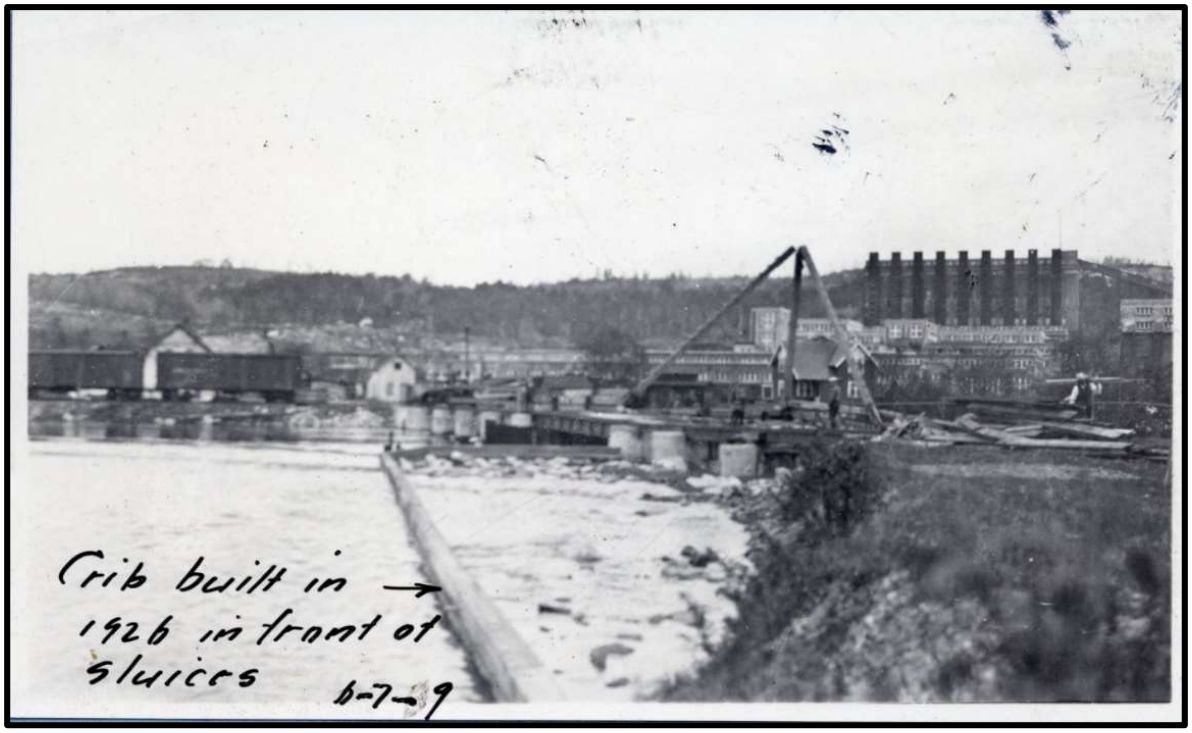


Image 7: Crib Built in 1926 in front of sluices 6, 7 and 9
(1926 BAnQ)



Image 8: 1926 Postcard of Dam
(1926 BAnQ)

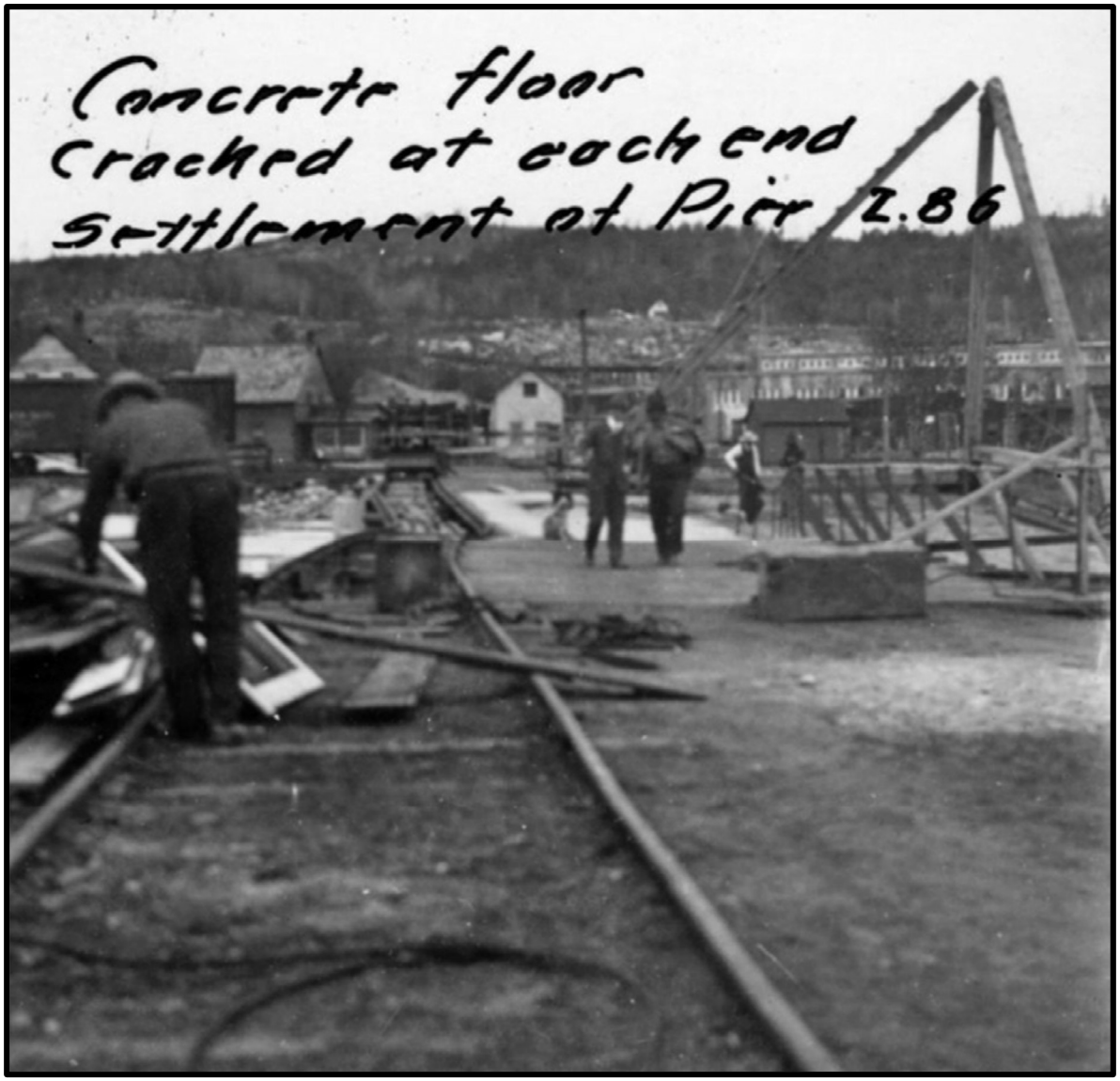


Image 9: Dam Undergoing Repairs, June 6th, 1927
(Archéotec 2017a: Figure 1.14)

Image 9 is labelled as indicating "two cracks" in the concrete slab (foundation) of the dam on June 6th, 1927. Repairs to the dam were insufficient, however, and the dam collapsed on August 6th, 1931 taking away the dam and some piers (Image 10–Image 11). While there may have been initial design and construction flaws that led to the dams' collapse, it is also testimony to the power of the rapids in this area. In an effort to maintain an open connection between the provinces in this location, a suspended bridge (Image 13, referenced with the 1934 dam) was hung from the remaining pillars until such time that a new dam could be constructed. There remains the remnants of an abutment of the 1912 dam on the Quebec side of the Ottawa River (refer to Image 2).

> "*Since the dam was put in operation considerable difficulty has been experienced and expense entailed on account of the nature of the foundation on which it rests. The high*

velocity of the flow through the sluiceways, caused at high discharge levels of the river, produced a scouring action immediately downstream of the lower edge of the horizontal slab or apron. This had the result of working back upstream underneath the apron, leaving sections of the apron unsupported, and those breaking off allowed this action to progress farther upstream Ultimately the natural resistance of the foundation material against being permeated by water above the (?) is so reduced that currents are set up underneath the dam, this dislodges the material in which the boulders are located, and opens channels so that the water travels underneath the dam, scours out the foundation, and finally in 1931, the Quebec section of the dam failed" (Boudreau 1933: 357130).

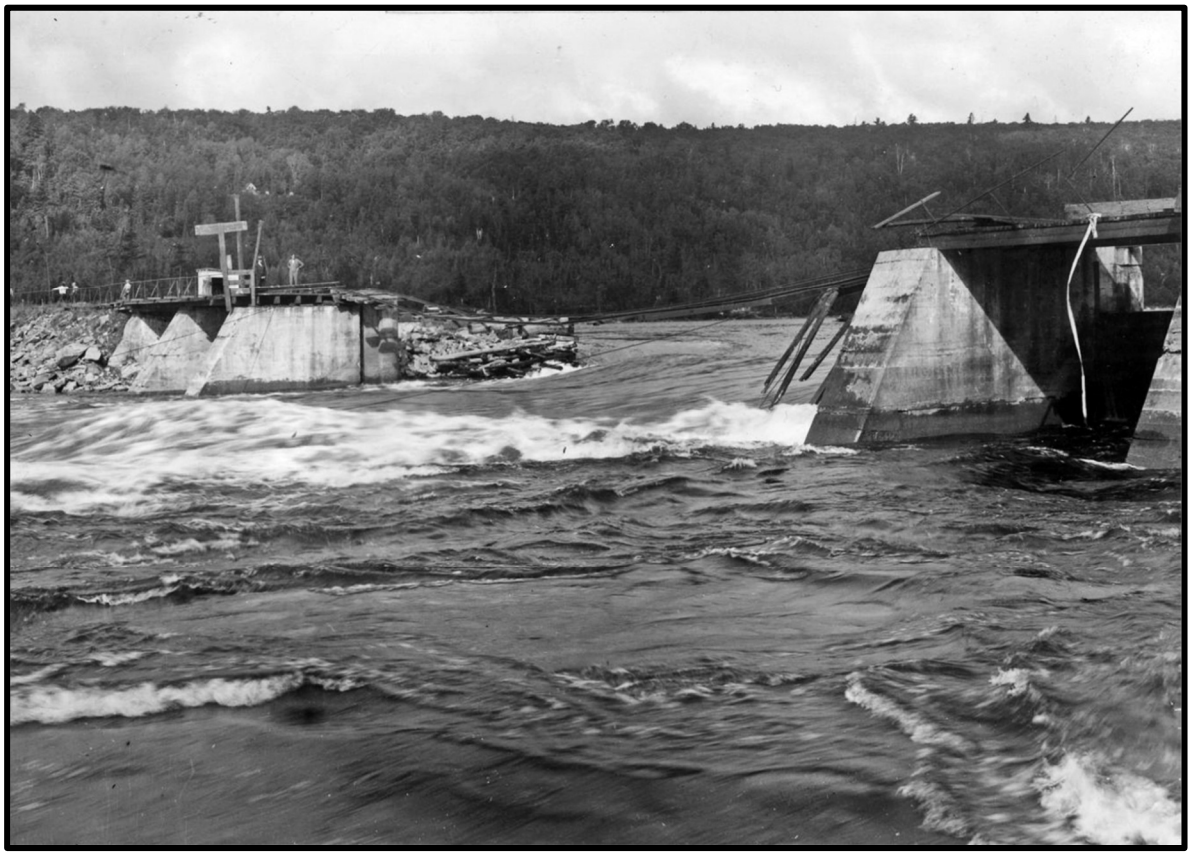


Image 10: August 6th, 1931, facing Westerly
(August 8th 1931 BAnQ; Archéotec 2017a: Figure 1.15)

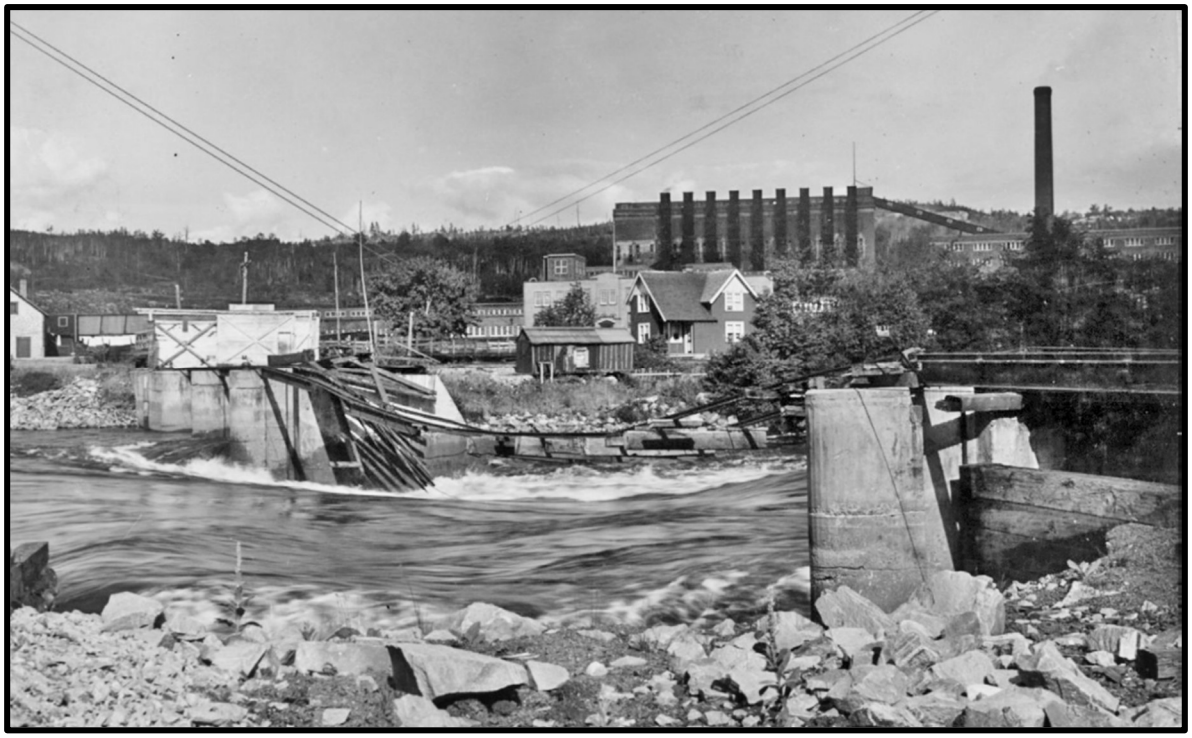


Image 11: August 6th, 1931, facing Easterly
(August 8th 1931 BAnQ; Archéotec 2017a: Figure 1.16)

The dam complex (Ontario and Quebec) was built between 1909 and 1913 and is owned and operated by the Public Works and Government Service Canada. The dam is part of a network of seven dams used to control water levels in the upper reaches of the Ottawa River.

The dam cost $932,320.05 for construction, with maintenance up to March of 1933 amounting to $240,296.39, and land damage of $66,071.16, for a total of $1,248,687.60 (Boudreau 1933). The dam suffered from inadequately experienced staff, poor or lack of equipment, and due to cold weather, rising water levels, and difficult foundation conditions, the contractor was relieved of the job, and Public Works completed the project in 1912.

The 1921 Fire Insurance plan illustrates the 1912 dam. Archéotec (2017a) has marked the 1934 dam location on this figure (Figure 23 with a green line).

Figure 24 and Figure 25 illustrate overlays from the 1921 Fire Insurance map and a 1926 plan showing the position of the dam during those time frames. It is unlikely that there will be any evidence of the booms associated with the early dam, although cribwork may exist north of the study area to have anchored the booms. The 1926 plan shows at least 7 forebays.

Image 12 illustrates a 1925 aerial photograph of the dam complex.

The dam built to replace the 1912 dam was constructed in 1934 and located approximately 70 metres upstream (north) of the previous location. It contains ten sluices, measures 76 metres in length, and is wider than the 1912 dam allowing for two way traffic (Image 13–Image 15). The

foreground of Image 13 illustrates men working on constructing a cofferdam to facilitate the building of the dam. The cofferdam is constructed of squared logs arranged in standard crib fashion, presumably filled with rocks to provide stability. Image 15 presents more of an aerial view of the dam construction, showing the cofferdam to the north, and the dam to the south. Clearly, there was a great deal of modification of the bottom around the cofferdam, the dam, and between the two structures. Cofferdams were usually removed, or at least parts thereof, after construction was completed. It may have been too dangerous, or uneconomical, however, to remove the entire cofferdam and remnants of the same may still exist underwater.

The construction of the 1933/1934 dam was not without its' difficulties. Tenders for the dam were received in 1932 (Department of Public Works 1932). Figure 26 presents a rough sketch of the dam complex, indicating the Gorman Construction Company completed the Ontario side of the dam under sub-contract; the area of the proposed new dam; and, two dashed lines showing where the dam "went out" which was constructed by the Farley Company; and another section of the early dam that the government had to complete as it also went out. In direct correspondence with Prime Minister Bennett (Macdonald 1933a), J. Macdonald indicated that 11 tenders were received for the construction of the Quebec side of the dam which had "washed out" two years previously, that is, in 1931. Nine of tenders ranged in price from $217,537.36 to $576,804.50; another was "on a cost plus basis" and the last was at a fixed or stated fee of $30,000.00. Two of the tenders apparently came in well below the Public Works estimate of project costs. These were from the Stewart Construction Company and the Newton Construction Company for $217,537.38 and $218,937.62, respectively. Macdonald indicates that the two companies did not have "proper knowledge" of the undertaking and immediately withdrew their tenders and requested their deposits returned to them. The next lowest tender was that from the Gorman Construction Company of Montreal. This company appeared to be more favourable to the department, having experience in dam construction (constructed the Ontario side) that "held intact". Their price was $34,816 lower than the next bid.

> "*The Company* [Gorman Construction] *is willing to have its tender accepted on the basis that the preliminary work, represented by the $70,000.00 will be done under the coming year's vote, the balance to be provided for next year…. The Company will proceed with the work and carry same to a successful conclusion without any delay, doing as much as possible of the work this year on the understanding that the balance of the amount of the tender will be paid for next year*" (Macdonald 1933b).

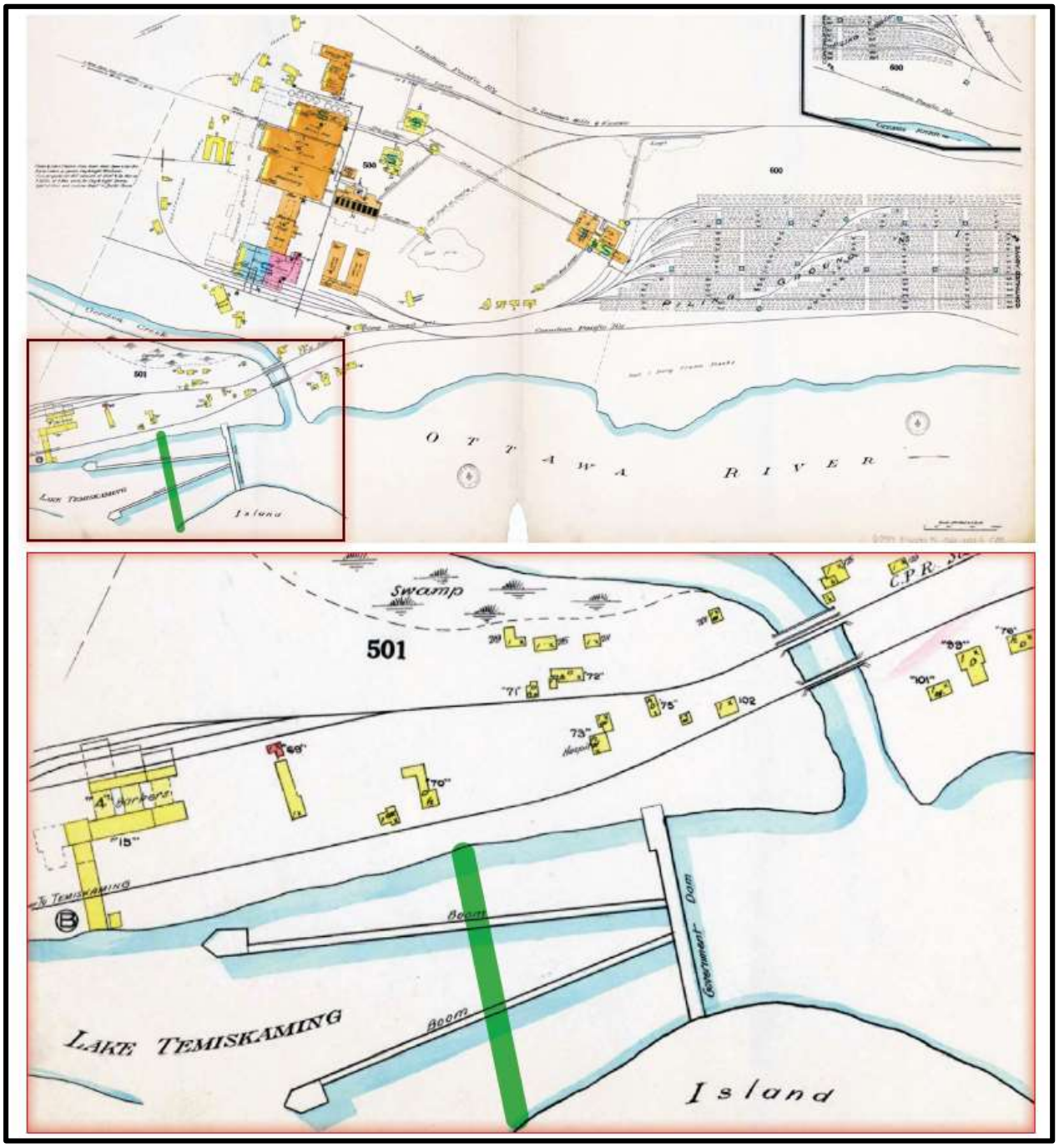


Figure 23: 1921 Fire Insurance Plan
(Underwriters' Survey Bureau BAnQ G/3454/K564G475/1921/U53 DCA, Archéotec 2017a: Figure 1.19)

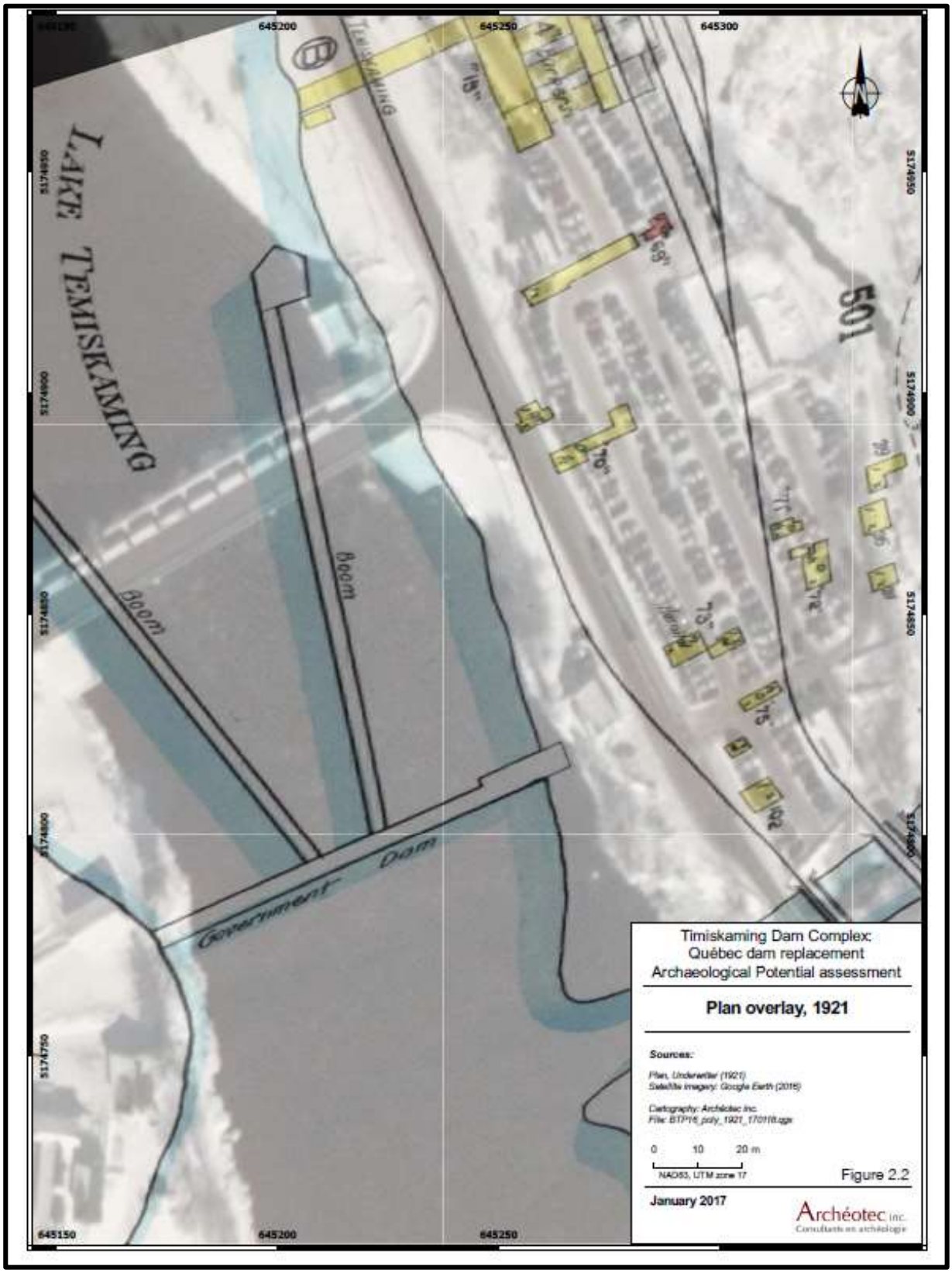


Figure 24: Early Dam Laid over 2017 Imagery from 1921 Fire Insurance Plan
(Archéotec 2017a: Figure 2.2)

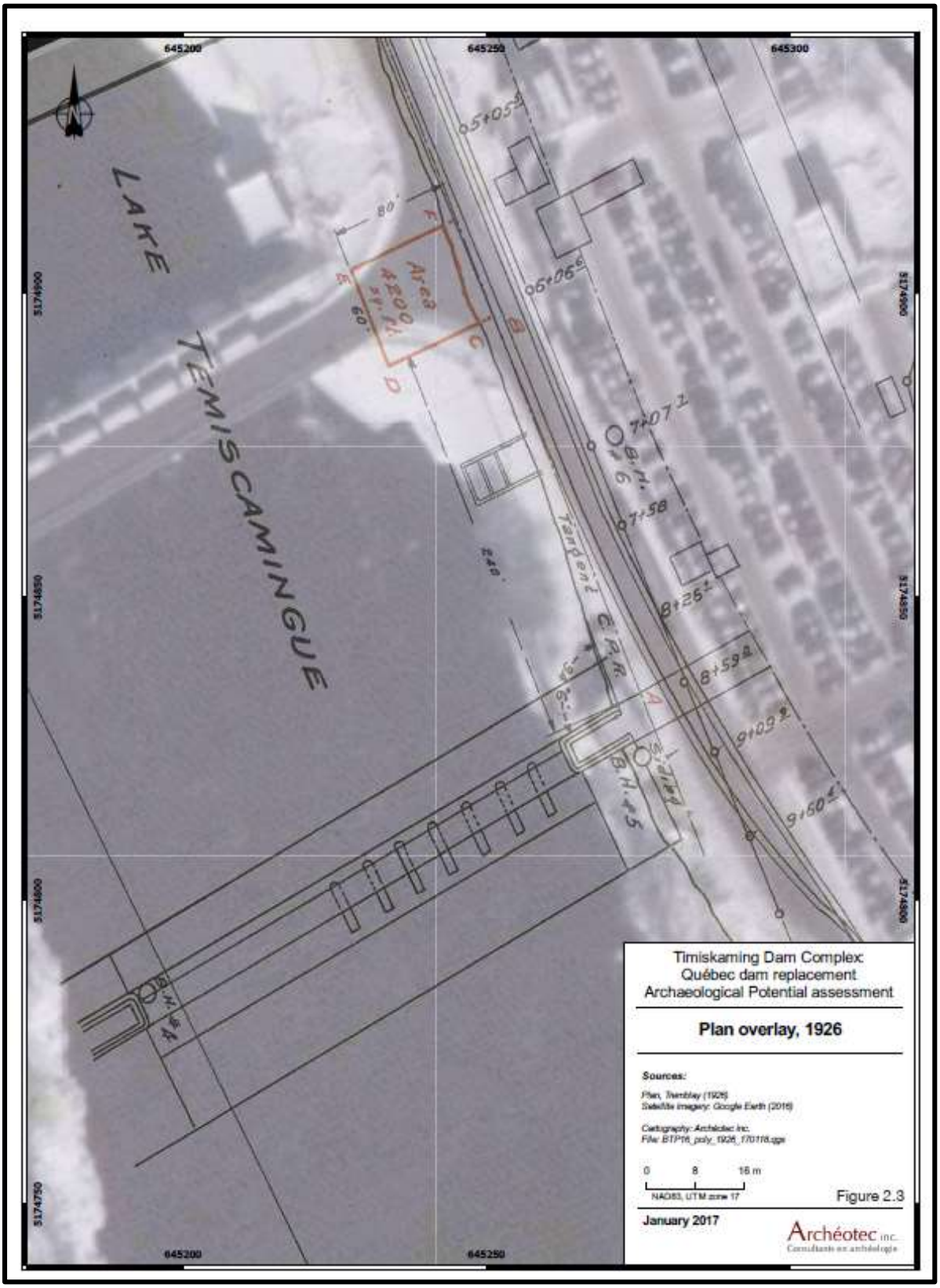


Figure 25: Early Dam Laid over 2017 Imagery from 1926 Plan
(Archéotec 2017a: Figure 2.3)

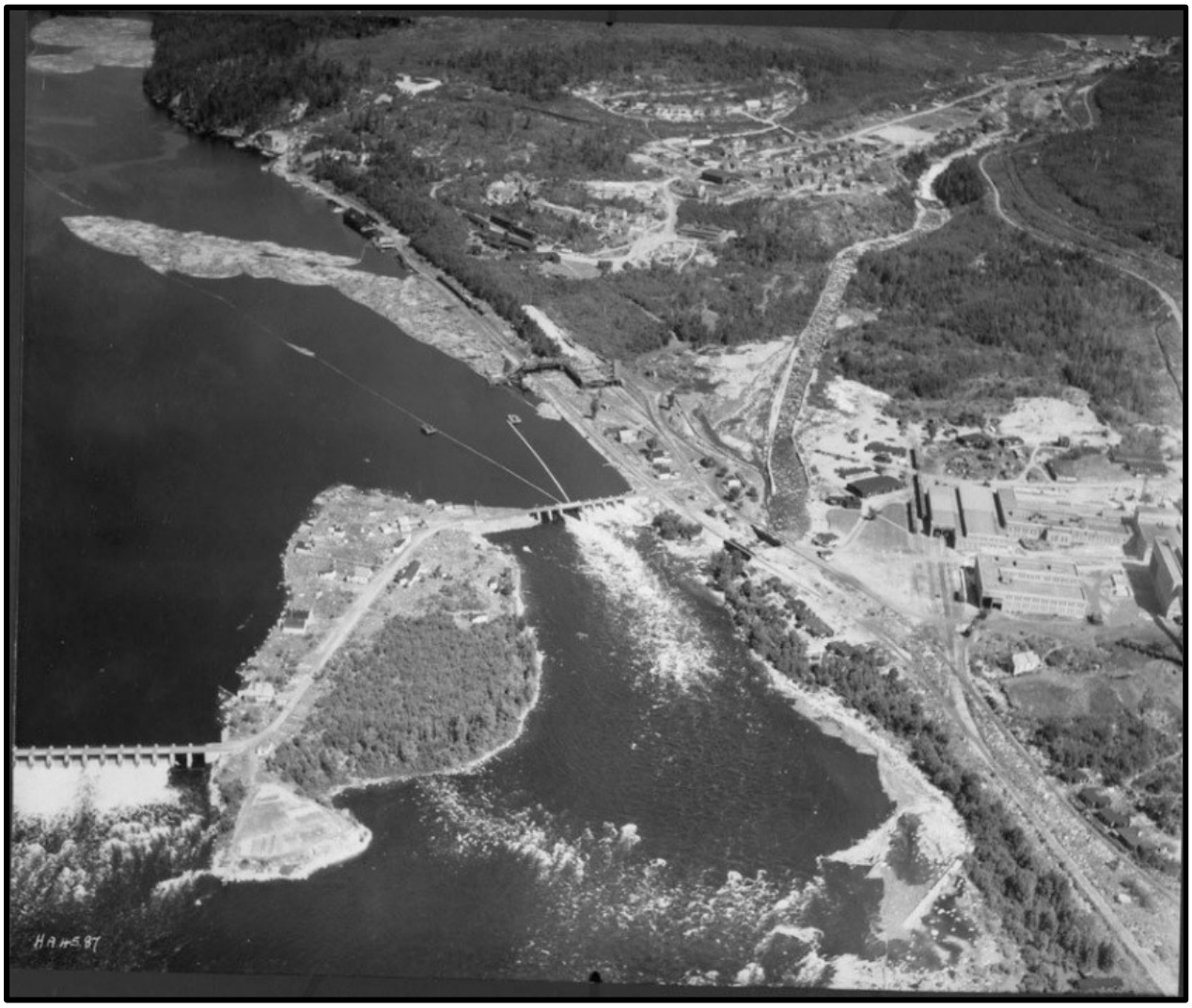


Image 12: 1925 Aerial Photograph
(Library and Archives Canada #268)

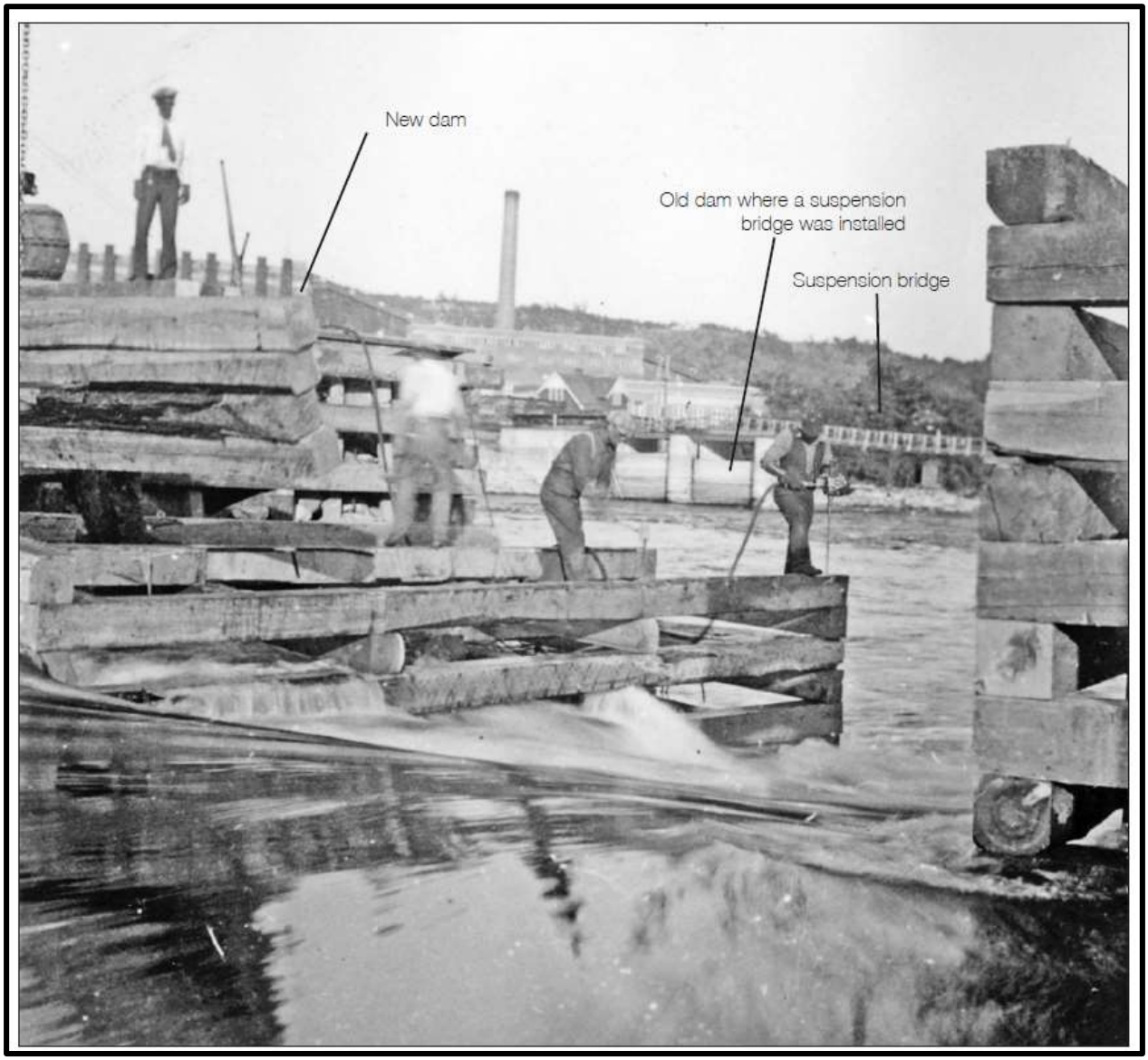


Image 13: Construction of 1934 dam facing East
(Temiskaming dam reconstruction - Quebec dam site - Cofferdam under construction - 22 July 1934 BAnQ E57, S44, SS1, PY-1084-10 Archéotec 2017a: Figure 1.17)

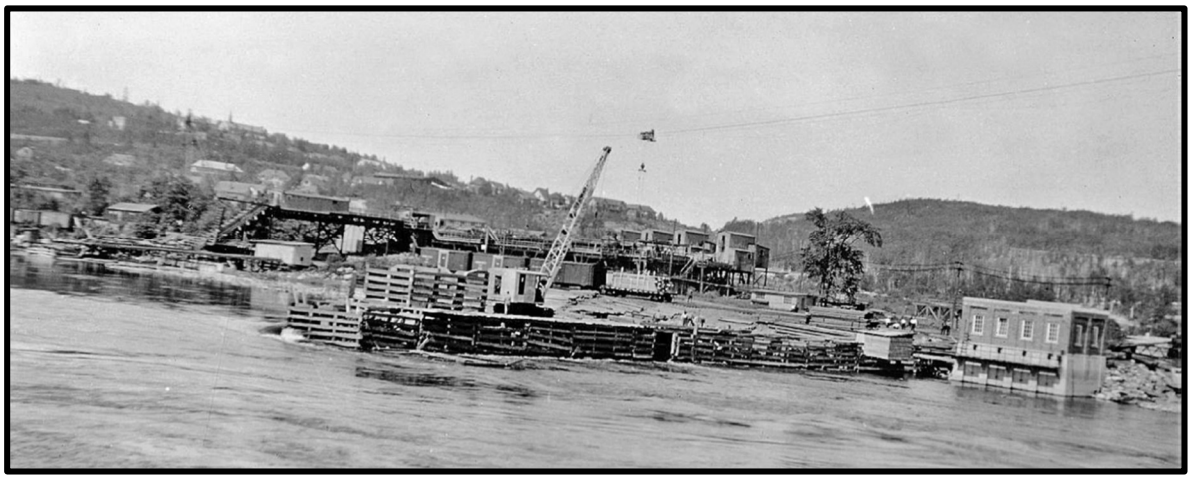


Image 14: 1934 Construction of Cofferdam and Dam facing Southerly
(27 June 1934 BAnQ E57, S44, SS1, PY-1084-3, Archéotec 2017a: Figure 1.18)

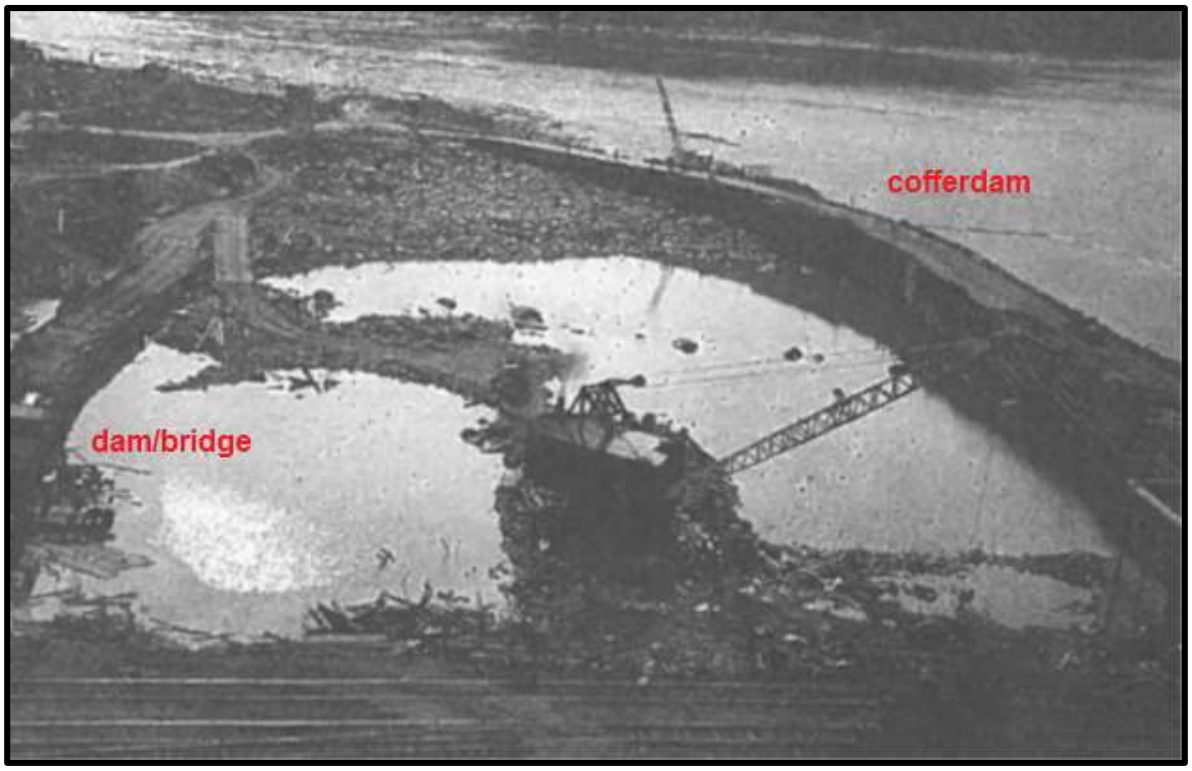


Image 15: Dam Construction ca. 1934 facing West
(Témiscaming, Q. 1996: 38)

So begins the many pleas by Macdonald, representing the Gorman Construction Company, to be chosen to conduct the work.

The government did consider requesting new tenders. Mr. Macdonald appealed to the government stating that this would put the Gorman Construction Company in an "unfair position", citing that other firms were now aware of the amount of the submitted tender (Macdonald 1933c).

In April of 1933, Macdonald appeals to the Hon. H A. Stewart, M.P. at the House of Commons, again reiterating that the Gorman Construction Company is willing and able to do the job, has been competitive in its bid, and are also willing to hire labourers, where suitable, from the locale (Macdonald 1933d).

No doubt the letter from someone in the government (No Author 1933a) responding to Macdonald's many letters, was disheartening, "*I am afraid, however, it would be very difficult to justify proceeding with the work, under existing financial conditions*".

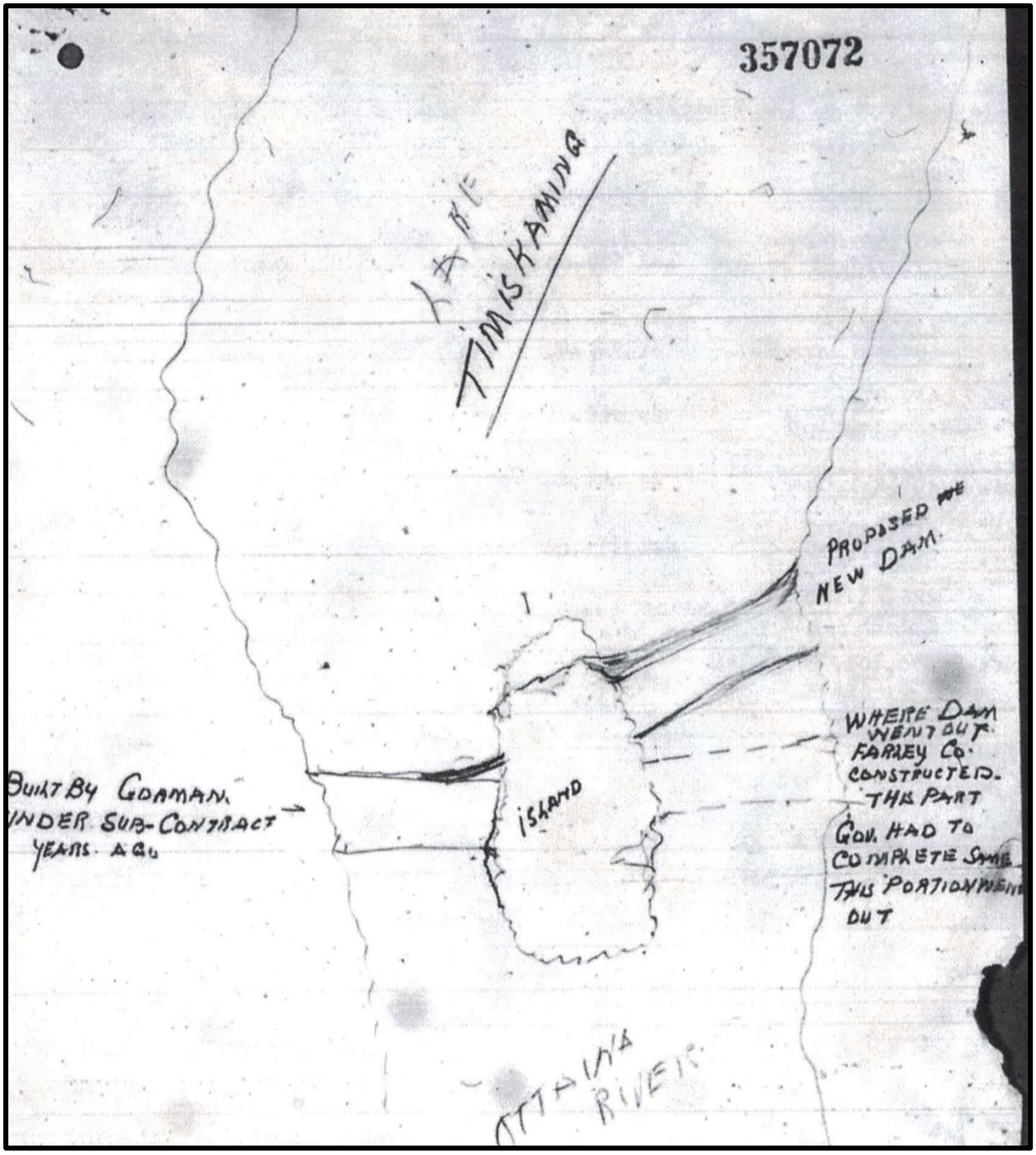


Figure 26: Sketch by Department of Public Works 1932

This construction was to be built during the economic depression of the 1930s, and the relentless pursuit by Macdonald and the Gorman Construction Company should be seen from that perspective.

The deposit cheque must have been returned to the Gormon Construction Company, but again, Macdonald pushes for its acceptance and that the tender will be granted to them. In correspondence dating from April 21st 1933 to Prime Minister Bennett, Macdonald indicates that the Honourable Mr. Stewart has accepted the return of the deposit cheque and that he will bring up the matter in council (Macdonald 1933e).

Macdonald yet again entreats the Prime Minister (Macdonald 1933f), although no specific date is indicated on the letterhead, stating that the construction season will soon be upon them and there are a lot of preparations to be made in anticipation of the start of construction. On May 8th of 1933, Mr. Macdonald is sent a letter from the Prime Minister, indicating that the company will have to rebid the project (Bennett 1933). Macdonald (1933f) responds again to the Prime Minister citing unfair practices by the government and asking them to reconsider.

J.B. Hunter, Deputy Minister, appeals to the Secretary of the Treasury Board (Hunter 1933) to release $70,000 for the Temiskaming Dam project, citing hardships accrued by various industries due to the lack of a dam on the Quebec side.

The Chief Engineer, H.M. Cameron, presumably from the Department of Public Works (Cameron 1933) indicates in a memo for the Deputy Minister that the Quebec dam failed in 1931, and that even though tenders were called and received in 1932–1933, no action was taken. An appeal to the Treasury Board resulted in Vote 117 allocating an additional $70,000 to the project. The Engineer indicates that the total cost of the work was $517,565, but that tenders received in 1932 suggest that work could be done for as little as $400,000. The Chief Engineer encouraged the submission of tenders for the work again, so that the dam would be up and operational in 1935, citing examples of industries in peril if the dam is not constructed. The situation as described in the memorandum (presented below) to the Deputy Minister is indeed dire.

> "*The dam regulates the level of Lake Temiskaming. Since the dam was built, about 1913, the town of Temiskaming, lying immediately at the dam, was built and is dependent on the continuity of the Canadian International Paper Company's bleached sulphite mill there. This mill gets its wood via the Ottawa River and Lake Temiskaming and their operation is based on the maintenance of the regulation of Lake Temiskaming. With the water in that lake expanse unregulated that mill is in grave danger of having to shut down through being unable to get its raw material.*
>
> *Other lumber operators on the Ottawa River under the joint management of the Upper Ottawa Improvement Company handle their logs through works built at the upper end of Lake Temiskaming and at the lower end. They have vessels assigned to handle the booms and of such draft as would be permissible under related conditions of the lake, on which they depend. With the low water condition of the lake these large interests are also adversely affected and also in grave danger of having to discontinue operations on account of low water conditions.*
>
> *The other municipalities on the lake, such as New Liskeard, Haileybury and Ville Marie, are adversely affected by the low water conditions.*

> *Below the dam the lack of storage water has an adverse affect on the driving of logs down to and over the Upper Allumette Lake, on which Pembroke is situated. At that town the Pembroke Lumber Company are in serious difficulties on account of low water. A delegation recently before the Minister represented that unless this condition was overcome, as it would be in part by the reconstruction of the Temiskaming dam, the Canadian Splint and Match Company would shut down and move out, throwing about 400 hands out of employment at Pembroke. The Lumber Company have had to shut down on account of lack of water.*
>
> *Below this reach of the river, the Ontario Hydro-Electric Power Commission and the Chats Falls Power Company have built a joint hydro-electric power development across the Ottawa River at Chats Falls. This plant which acts as a balance load carrier for the hydro-electric plants on the Gatineau River, on the Lievre river, and the Cedars and Beauharnois plants, is adversely affected by lack of a regulated dependable flow at low water.*
>
> *The Ottawa power users at the Chaudiere, who operate so far as the Ontario side is concerned, itself, and to whom they pay rental, also complain of lack of water for their power needs.*
>
> *It is a fact, as you are aware, that the construction of the Temiskaming dam originally was part of an arrangement for this Department by the Dominion Government with the Chaudiere power users, who are also the Dominion Government lessees, the Dominion Government to regulate the flow of the Ottawa river by storage reservoirs at Quinze and Temiskaming, and the Chaudiere power owners and lessees to effect improvement at the Chaudiere in Ottawa.*
>
> *Both parties carried out their parts of the agreement, but the Dominion is not maintaining its part of that agreement now that the Temiskaming dam has ceased to function".*

In that same memorandum, the engineer makes note of a "*constructional feature*".

> "*The foundation conditions at this site are very poor. This accounts for the failure of the first or Quebec section of the dam by undermining. The dam cannot be reconstructed on the same site and there is only sufficient length left up the head of the Island to permit reconstruction of this section. Once the foundation on which it is proposed to build is materially altered it is not possible to buit [sic] on that foundation. If the scouring or under-mining setion [sic] of the flowing water of the Ottawa is allowed to continue for much longer past this section there is serious danger of the remaining foundation-area being so badly altered as to preclude the possibility of the reconstruction of the dam under present plans. An alternative to that would be such an expensive one, involving as it does the excavation in solid rock of the channel of the Ottawa River with the installation therein of control gates at a cost so far above that of the present proposal, as to make the saving by doing the work now an extremely attractive one*" (Ibid).

From a memorandum dated November 6, 1933, it seems that the Chief Engineers report was heeded. The memorandum refers to a meeting in which the following attended: C.N. Simpson – Gatineau Power Co., L. C. Jacobs – Montreal Island Power; G.P. Hawley, Montreal Island Power; O. Lefebvre – Quebec Stream Commission; O. Holden – Hydro Electric Power Commission; Walter Blue – Gatineau Power Co., S. Kidd – E.B. Eddy Co., W.H. Munro – Ottawa Electric Co., T.W. Cluff – Ottawa Electric Co. and Railway; N.C. Neilson and Geo. Claxton – both of J.R. Booth Ltd. In this meeting, it was the unanimous opinion that the plans of the Public Works Department were sound in so much as location and general type of dam structure to be built; but there was some discussion that ensued regarding some specific details.

Details included:

> "*1. The cofferdam to be built should close the Quebec side completely during the period of construction, and be of such height that the water will never flow over it;*
> *2. The design of the apron would be of such that it will resist uplift, by its own weight without distortion;*
> *3. Length of apron;*
> *4. Design of the toe of the apron (indented sills further back from the edge, large riprap);*
> *5. The depth at which the cut off wall is to be sunk;*
> *6. Suitable location for log slide and design of latter*" (No Author 1933b).

In addition to the above suggestions, there were others made regarding tenders and acceptance of same based on qualifications and experience, and also regarding dewatering of the area on a financial basis.

Macdonald representing the T.C. Gorman Contracting Co. Ltd. again raises his voice in a memorandum to the Prime Minister (Macdonald 1933h) dated November 21st, 1933. This was a "Memorandum of Facts". Macdonald provides a concise history of the plans for dam reconstruction beginning with the construction of the original dam in 1910-1912. He reiterates his firm's continued interest in the project and the unfair practices by the government. Macdonald notes that interested parties (noted above in the meeting held on November 6th) reviewed the plans for the dam and that they noted alterations would increase the cost of the dam by between $10,000 and $15,000.

On November 15th, 1933, a Committee of Engineers, appointed at the November 6th meeting, reviewed the plans for the dam and provided the following comments regarding the same (No Author 1933c):

> "*1. The Bligh method should be used to calculate the uplift pressure under the apron of the dam, and the thickness of slab adopted accordingly. (The Committee figured this thickness roughly at the meeting and found that 5 ft. thickness of slab under the toes of the piers was required, but are of opinion that the actual thickness should be 6 ft., and at no place the slab should be less than 3 ft. thick).*

2. There should be no weep holes in the down stream cut off wall.

3. As regards the depth of cut off walls, that wall furthest upstream, as shown on drawing 2577 of depth of 18 ft., could be reduced to 6 ft., but the cut off wall under the noses of the piers, shown on drawing to depth of 12 ft., should, if possible, be increased to a depth of 18 feet plus or minus.

4. The cut off walls need not have vertical sides; they could be tapered from a width of say 5 ft. at the top of 3 ft. at the bottom.
5. The cut off walls should be keyed into the slab, the joint being from 3 to 6 inches deep.

6. No joint is required in the apron on the line of the noses of the piers, but there should be a joint at the toes of the piers. All joints in the slab should be water-tight, but nevertheless the reinforcing should be carried continuously through all joints.

7. The joints between piers and slab should be keyed in two places.

8. Due to high velocity of water immediately downstream from the apron, it may be necessary to add protection to prevent scouring of the river bottom.

9. In reply to the suggestion that an Ambursen type dam might be used, the Committee is of the unanimous opinion that the Ambursen type is not suitable. (The Ambursen dam is a bulkhead or spillway type, whereas a one hundred percent sluiceway dam is required for the Timiskaming side. The Ambursen type does not give any greater advantage in overcoming the main difficulty at the Timiskaming site, which is preventage of seepage or erosion of the bottom of the river."

Another point was made with respect to dewatering and fixed costs, etc.

Obviously, the plan for the new dam was sent out for comment. Mr. Lefebvre of The Quebec Streams Commission (1933) indicates that the calculations made regarding uplift pressure were correct, and that a "*slab six feet thick under the tee of the piers, and tapering to a thickness of three (3) feet at its downstream end would give the required safety*". Lefebvre does suggest that calculating the effective head against the slab at the flow line (line of creep) is not effective, but that it should be calculated instead at the underside of the slab.

The revised plan apparently shows "*a slab seven (7) feet deep where the previous plan provided a slab six (6) feet deep, but in the revised plan the slab thickness tapers to three (3) feet in a distance of fifty-five (55) feet against a similar tapering taking place in a distance of eighty-five (85) feet in the previous plan*" (Ibid).

Lefebvre remarks upon the use of reinforcing steel in the piers and applauds its use to protect against shrinkage. The new plan also shows no weep holes in the slab.

The plans were also sent to Mr. O. Holden, Assistant Hydraulic Engineer with the Hydro Electric Commission of Ontario, for comment (Holden 1933). Holden suggests a different configuration to the reinforcing in the piers.

> "*…it would appear to me that possibly a somewhat different arrangement of the bars might prove effective, with the use of considerably less material than shown in the plan submitted. In view of the fact that the stop-logs tend to push the downstream portion of the pier away from the portion located upstream therefrom, our policy is to provide reinforcing which runs straight through from within about 6 inches of the upstream face to a point at least bond distance downstream from the checks. From the check to within 6 inches of the downstream limit of the piers, it is suggested that two planes of reinforcing be located at about 6 inches from the sides of the piers."*

The pencil sketch of the configuration referred to above is unfortunately not appended to the letter.

Mr. Macdonald remains active in his correspondence with the government (Macdonald 1933i) and appears to have been able to meet in person with the Prime Minister. He is still vigilant in his pursuit of this company acquiring the contract and speaks of the neglect paid to dewatering of the site. With tongue in cheek, he writes,

> "*Moses, it is recorded, unwatered a portion of the Red Sea with apparent ease, but his art seems to have been lost –now other methods have to be used known as the Coffer Dam system*".

A short seven days later, on December 28, Macdonald appeals again to the Prime Minister (Macdonald 1933j) reiterating that his company should be retained. Amidst the now familiar plea is, however, some information relating to the timber required to construct the cofferdam. The letter notes that approximately 500,000 feet of "dimension timber" will be required. Macdonald suggests that if his firm is retained immediately, they can obtain this from the surrounding areas.

Rodolphe Boudreau, Clerk of the Privy Council, prepared a Memorandum for the Minister of Public Works and Prime Minister, dated December 29, 1933 (Boudreau 1933). Boudreau presents a history of the site, other dams and sites affected by the Quebec dam and lack thereof. In addition, he makes note of a number of variables such as that fact that there is no stone/rock located in the bed of the Ottawa River channel within a depth of 100 feet.

Additionally, and specifically regarding the reconstruction of the dam, is the note that the failure of the original dam was due to undercutting of the lower edge of the apron. The suggestions for rectifying this are as follows:

> "*…there has been developed experimentally a system of dentated sills, so-called, and which have been used to overcome a similar action at the plant of the Black River Power Company on the Riviere des Prairics…"*

This was tested at a hydraulics lab in Germany and found sufficient to include the sills in the plan for the dam. The use of the sills is under Canadian patent, and a royalty of $9,823.00 was paid to the Power Corporation of Canada, Limited.

The Public Works estimate for the reconstruction of the dam including cofferdam construction and dewatering was $517,585.00 (of which approximately $250,000 would be for the cofferdam and dewatering).

While the entire plans (Sheet 1, 2 and 3 of Plan 2577) of the dam reconstruction have yet to come to light, a cross-section of the proposed dam (revised to December 15th, 1933) was located and is presented as Figure 27.

Also noteworthy, and in reference to Plan 2577, are specifics that were issued as part of the new tendering process for this project (Public Works 1933). This presented below with the added revision:

1. *"Unwatering, including coffer-dams, and feeding water to the International Pulp, and Paper Co.'s pumping station;*
2. *Partly reinforced concrete, except cement, in apron, cutoff walls, including reinforcing steel;*
3. *Concrete, except cement, in piers, abutments, retaining walls, and slab protecting the river banks, including C.I. pipes for conduits;*
4. *Reinforced concrete, except cement, including reinforcing steel, in slabs and tie rod members;*
5. *Cement in 376 lb. bbls.*
6. *Cement in 376 lb. bbls.*
7. *Structural steel, including I beams in sills and roadway, channels in stop log checks, and bulb tees;*
8. *Iron in anchor rings and bolts, anchor bars in piers and abutments, bolts in channel;*
9. *Steel in expansion joints;*
10. *Handrailing, 427 feet long constructed with crucible cast steel rope, black pipe, U bolts and painting;*
11. *Railway track, complete with clips, bolts, spikes, ties *Rails supplied by the Department to be used)*
12. *Gravel in roadway;*
13. *Excavation (dry) including levelling up, filling, grading and disposal of surplus material;*
14. *Excavation (wet) including levelling up, filling, grading and disposal of surplus material;*
15. *Reinforced concrete, dentated sills, including structural and reinforcing steel, less cement;*
16. *Demolishing of existing structure, excepting excavation of rockfill and cribwork, which shall be paid for under items 12 and 13;*
17. *Anchor pier cribwork, including painting of top ends of 3-inch sheeting;*
18. *Placing and securing hand winch to pier, together with assembling timbers in two booms and placing these booms, 225 feet long, material on hand to be used;*
19. *Passing of logs in Ontario sluiceways, and channel, including all necessary booms ad piers, etc.*
20. *Lamp posts;*

21. Riprap or stone pavements to be placed downstream of concrete apron, if found to be required after unwatering is done; and
22. Reinforcing steel in piers and abutments."

1935 examination of the Bennett papers did not produce any indication of which construction company's tender was finally accepted for the construction of the dam. Orders in Council were also examined for both plans/drawings and additional information, but research was unsuccessful in locating these pieces of information.

Figure 28 illustrates the 1975 topographic map of the Study area, clearly indicating the large amount of shoreline changes from the earlier maps of the area.

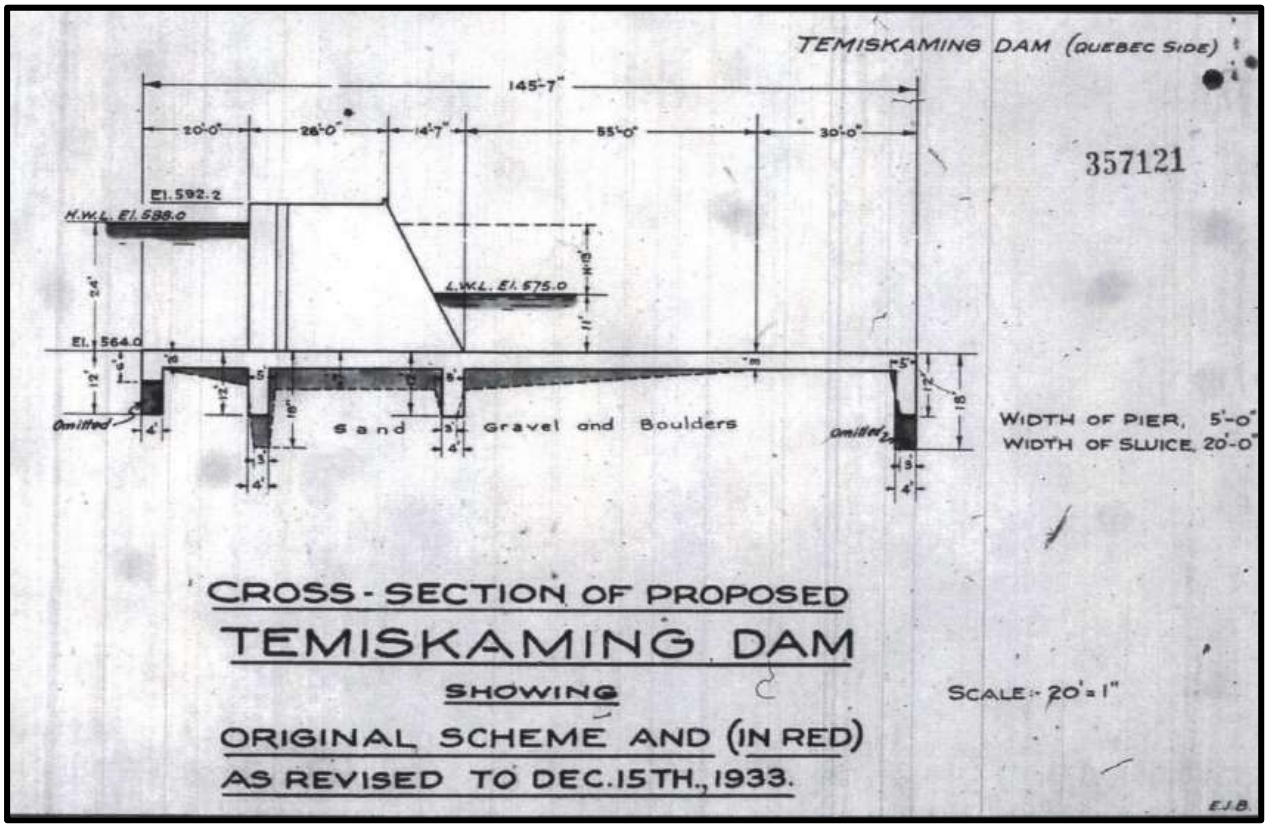


Figure 27: Cross-Section of Proposed Temiskaming Dam
(R.B. Bennett Papers, Page 357121)

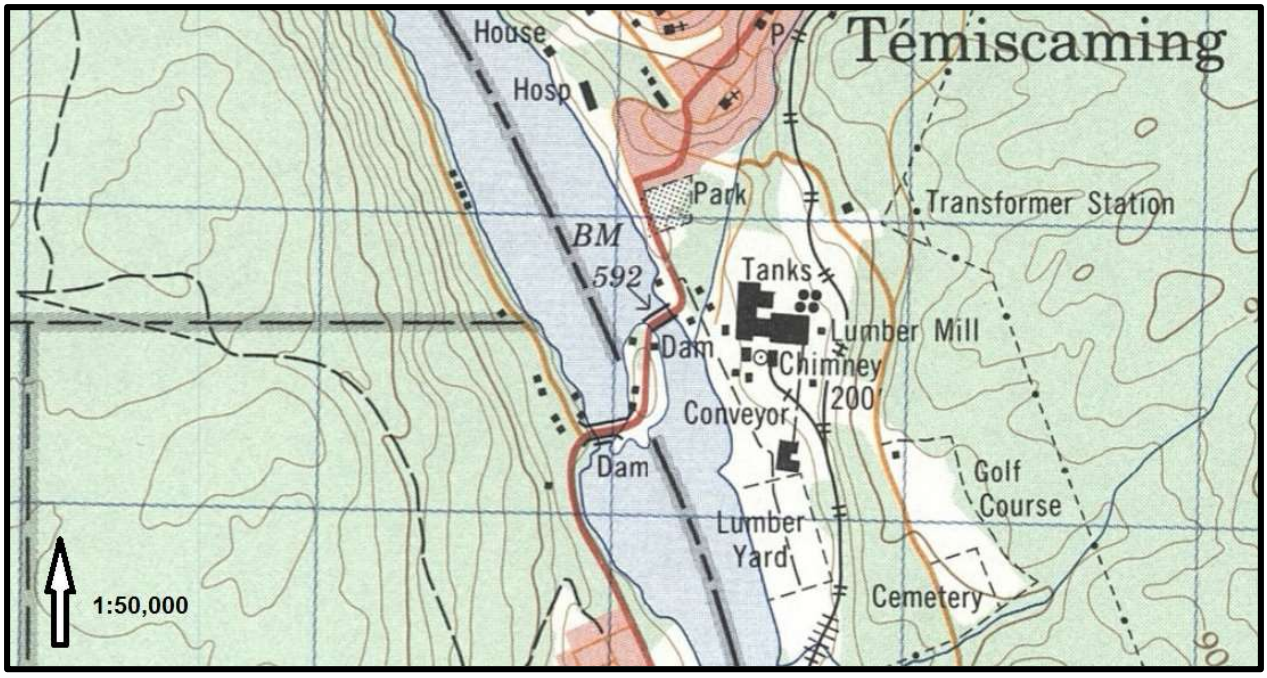


Figure 28: 1975 Topographic Map of the Study Area
(Department of Energy 1975)

1.3.7 Canadian Heritage River

The Ottawa River has been designated a Canadian Heritage River for its natural, cultural and recreational heritage.

"*The 590 km Ontario portion of the Ottawa River from Lake Temiskaming to East Hawkesury was designated as a Canadian Heritage River in 2016 for its cultural heritage values. The cultural heartland of the Algonquin people, the Ottawa River's history also includes its role as an important travel route for explorers and the fur trade, as well as the industrial use for logging and hydro development. The Ottawa Rive was also important to the development of Canada and the choice of Ottawa as the national capital*" (https://chrs.ca/en/rivers/ottawa-river).

The heritage aspect includes archaeological evidence of Indigenous seasonal campsites that date back more than 6000 years, and more permanent settlements along the riverbanks that date to the 17th century.

During the historic period, dams and mills were built up along the river that date back centuries. Along with these are associated settlements.

The river is a known transportation route for both Indigenous and historic peoples alike.

1.3.8 Marine History of the Study Area

With the absence of well-established roadways or railways, the earliest transportation was over water. The study area and hinterlands are no exception. Often, not even full size ships could pass through waterways, with the exception of the Great Lakes and large lakes, as most lakes, rivers and creeks not only fluctuated depth depending on season and precipitation but were also often encumbered by deadfall and other obstacles preventing easy passage. Certainly, rapids can be counted among the obstacles requiring either a portage, shooting the rapids with the possibility of canoe or boat spill, and tow hauling (system of using pulleys to pull a vessel upstream against the current/rapid). Rapids also presented the Indigenous people with possibilities other than just transportation. If the rapids were shallow enough, small pools would often harbour fish; herptiles, mammals and birds would be attracted to the area; and plants would be available both in water and on the shoreline for harvesting. There is no doubt that early Indigenous groups would have traversed the study area, either through the rapids (the Ontario side reportedly ran dry some years), on either Ottawa River shoreline or the Long Sault shoreline. Traditional knowledge supplied by engaged Nations and communities affirms the long-term use of this area.

Long Sault Island was not always high and dry, as it is today. Figure 18 illustrates water levels in 1910. At certain times of the years, the island would have been more wet land than dry. Numerous dams and channelling of Lake Temiskaming and higher waters have altered the elevation of the islands in the Ottawa River, including that of Long Sault. However, being a "wetland" would also make it an attractive area for resource exploitation.

Transportation by Indigenous people may well have been by canoe or raft. Transportation via canoe also extended to the couriers du bois, explorers and early mining and lumbermen.

The government was intent on colonization of the area north of Mattawa (Figure 29). The following account, first in French, and then followed by a Google Translate English version speaks to hauling boats up the rapids.

> *"Depuis le rapide la Montagne jusqu'au pied du Long Sault, distance de 21 milles, la navigation ne présente aucune difficulté. Mais arrivé là, il faut que le colon fasse provision de patience, de foïce et de courage. Le Long Sault est une suite de six rapides, séparés par des remous, et couvrant une distance de sept milles. Le remonter avec des embarcations à rames, surtout si elles sont pesamment chargées, est une tâche qui est loin d'être facile".*
>
> *"From the Montagne Rapids to the foot of the Long Sault, a distance of 21 miles, navigation presents no difficulty. But once there, the settler must stock up on patience, faith and courage. The Long Sault is a series of six separate rapids by eddies, and covering a distance of seven miles. Pull it up with rowing boats, especially if they are heavily laden, is a task that is far from easy* (No Author 1885: 6).

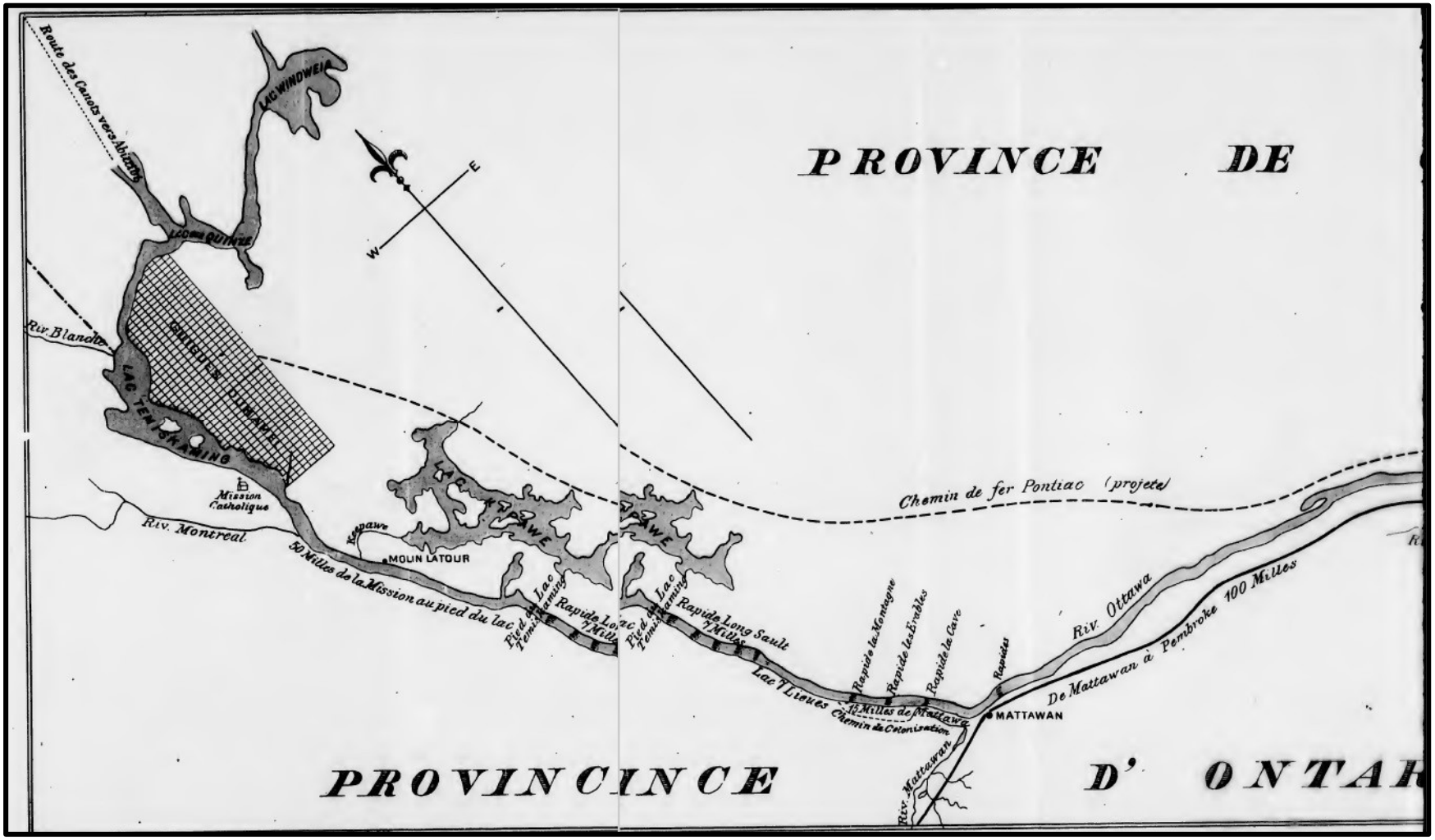


Figure 29: 1885 Map of Long Sault Rapids
(No Author 1885)

The government expressed its intent/hope that the Ottawa River would soon be navigable from Mattawa to Temiskaming. But rather than waiting for that "particular' day, the Colonization Society appealed to the government to install a tramway to circumnavigate the rapids at Long Sault. This appeal was granted (Ibid.). The idea behind the tramway was not only one of circumnavigation, but its establishment would also save effort in the unloading and reloading of boats, and therefore an economic saving in time and avoidance of loss of goods, equipment, boat and people. The tramway would allow for the entire boat and its contents to be moved along the system, saving a great deal of effort and it was conducted much more safely. Once north of the rapids, boats had smooth sailing for about another 30 miles on Lake Temiskaming. Details of the tramway are also presented in Section 1.3.5.

Another account from 1885 details the trip through the rapids, prior to the tramway establishment, and without benefit of pulling the boats through the rapids (Ibid.: 24). The French account is presented first, followed by the English translation.

> "*Le lendemain matin, 5th novembre, dés quatre heures nous sommes sur pieds. Nous préparons le déjeuner, nous empaquetons nos effets et à six heures et demie nous somnies dans notre embarcation qui a dû être débarrassée d'un gros pied de neige avant de pouvoir nous y installer un tant soit peu à l'aiso. Le vent fait toujours rage, la neige tombe toujours en abondance et l'obscurité est encore grande.*
>
> *Nous mettons cependant en route pour le Long Sault que nous atteignons vers les huit heures. Il fait maintenant assez clair pour que nous puissions nous lancer sans trop de danger dans les sept milles de rapides qui vont suivre.*
>
> *Voilà sans doute, un petit bout de navigation qui va donner des émotions à quelqu'un des nôtres. Notre vaisseau est gros, pesamment chargé de personnes, de bagages et de neige; le vent qui nous était favorable sur le lac devient redoutable dans les rapides. Les voiles sont amenées, puis, toutes les précautions prises, nous partons à la grâce de Dieu et confiants dans l'habileté et la prudence de nos capitaines.*
>
> *Dans le premier rapide nous touchons deux fois et deux fois nous nons regardons dans le blanc des yeux, mais nous filons splendidement, et un instant après nous prenons le deuxième rapide que nous déyringolons de même. A la tête du troisième, le vent nous pousse à terre; ce que voyant, nos capitaines, de chacun un vigoureux coup d'aviron, font tourner le vaisseau et nous voilà décrivant un grand cercle audessus môme du rapide. Ce mouvement fait avec promptitude*
> *et d'un poignet solide nous embarque un iestant après dans le tourbillon, à pente très rapide, avec toutes les chances pour nous.*
>
> *Les trois autres rapides sont descendus avec le même bonheur. En quarante minutes, nous avons franchi le Long Sault, c'est-à-dire, parcouru une distance de sept milles, moins de six minutes au mille. La descente de ces rapides, en dépit de ses dangers est réellement belle à faire. Le vent augmente toujours, le fait est qu'il est maintenant en tempête. Nous remettons notre voile pour nous aider à parcourir les vin^ et un milles de distance qui nous séparent des autres rapides et*

nous jouons de la rame, non pas tant pour accélérer la vitesse de notre vaisseau que pour nous réchauffer. Aussi il ne faut pas demander si Hfus descendons bon train,…"

"The next morning, 5th November, at four o'clock we are on feet. We prepare lunch, we pack our belongings and at half past six we dozed off in our boat which must have be cleared of a big foot of snow before we can install it a little at ease. The wind is still raging, the snow is still falling in abundance and the darkness is still great. However, we set off for the Long Sault which we reach about eight o'clock. It is now light enough to so that we can launch without too much danger into the seven miles rapids that will follow.

Here is without doubt, a small piece of navigation which will give emotions to someone of ours. Our ship is big, heavy laden with people, baggage and snow; the wind that was us favorable on the lake becomes formidable in the rapids. The sails are brought, then, all the precautions taken, we go to the grace of God and confident in the skill and prudence of our captains.

In the first rapid we touch twice and twice we look into the whites of our eyes, but we spin splendidly, and a moment later we take the second rapid that we let's unpack the same. At the head of the third, the wind pushes us down; what seeing, our captains, from each one a vigorous blow rowing, turn the ship and here we are describing a great circle above the rapid. This movement made with promptness and with a strong wrist takes us a moment later into the whirlwind, with a very steep slope, with every chance for us.

The other three rapids descended with the same success. In forty minutes, we crossed the Long Sault, that is to say, covered a distance of seven miles, less than six minutes per mile. The descent of these rapids, despite its dangers, is truly beautiful to do. The wind is always increasing, the fact is that it is now in storm. We put on our veil to help us cover the twenty some miles of distance which separate us from the other rapids and we row, not so much to accelerate the speed of our vessel only to warm us. So don't ask if we are going down at a good pace,…"

Various schemes were proposed in the 1880s to overcome the limitations imposed by the Long Sault rapids. Faced with low levels on Lake Temiskaming in 1881, timbermen argued for the construction of a dam at the foot of the lake to provide for a controllable release of the water to facilitate the floating of timber downstream. A dam here would increase the level of the lake by 15 feet and provide sufficient "head" to carry timber to the distant mills in Ottawa. In the meantime, the Society for the Colonization of Temiskaming, seeking to settle lands around the lake, sought to lower the lake by 21 feet and so increase the amount of land available for agriculture. But the most ambitious scheme was to have a dam built at Mattawa which would obliterate the Long Sault rapids entirely and so provide deep water navigation to the head of the lake. The latter scheme never came to fruition, cited as being too expensive (No Author 1885: 29–30).

"*En lisant la narration de M. Laperrière tout le monde comprendra la difficulté pour arriver à cette terre promise. Pour obvier à cet inconvenient le Rév. Père Paradis alors missionnaire à Témiskaming et le premier qui ait attiré l'attention du public sur la richesse de ce pays, avait suggéré le plan de faire coastruire une digne qui en noyant le Long Sault donnerait une navigation pour bateau à vapeur d'au moins 125 milles de longueur sans interruption. Mais dans les circonstances actuelles, le gouvernement n*a pas cru pouvoir entreprend lo ces travaux, dont le coût, d'après les estimés de M. lingéuieur Giiérin, t^élèvoiail à près de deux millions de piastres.*

C'est alors que notre bureau de direction a suggéré le plan de faire construire un chemin à lisse (tramway) sur tout le parcours du Long Sault (7 milles de longueur) puis mettre un bateau à vapeur sur le lac Témiskaming et un autre sur le lac des sept lieues. Ce dernier plan été accepté et je suis heureux de vous annoncer que l'Honorable Ministre des Chemins de fer, (mon ami personnel), secondé par Sir Hector Langevin, le puissant appui de toute entreprise Gauaditîuue-Franciiise, a fait voter par les Chambres Fédérales, un subside de $25,000 pour nous aider à construire un chemin à lisse daus lo Long Sault. L'Honorable J. J. Ross, Premier de Québec, m'avait déjà accordé une somme de $2,000.00 pour commencer les travaux de ce chemin, et je ne doute pas que l'octroi de terrain que je viens de lui demander pour nous aider à terminer ces travaux, ne reçoive une réponse favorable Ainsi le succès nous parait assuré, et nous sommes convaincus qu'avaui un an, nous aurons entre Mattawan et Témiskaming une ligne régulière de transport par navigation et par chemin de 1er qui nors permettra de faire le trajet en une journée."

"*By reading Mr. Laperrière's narration everyone will understand the difficulty of getting to that promised land. To overcome this drawback the Rev. Father Paradis, then a missionary in Témiskaming and the first who drew the attention/tone of the public to the wealth of this country, had suggested the plan to make coastruire [?] a worthy which by drowning the Long Sault would give steamboat navigation of at least 125 miles in uninterrupted length. But under the circumstances present, the government did not believe it could undertake these works, the cost of which, according to the estimates of Mr. Engineer Giierin, it was nearly two million piastres.*

Our management office suggested the construction of a railroad (tramway) along the entire route of the Long Sault (7 miles in length) then put a boat to vapeur (?) on Lake Temiskaming and another on Seven League Lake. This latest plan was accepted and I am pleased to report that the Honorable Minister of the Iron Railway, (my personal friend), assisted by Sir Hector Langevin, the powerful support of any Gauaditîuue-Franciiise, had the Federal Chambers vote a subsidy of $25,000 to help us build a path to smooth the journey Long Sault. The Honorable J. J. Ross, Premier of Quebec, had already granted a sum of $2,000.00 to begin the work of this way, and I have no doubt that the granting of ground that I come from him ask to help us complete this work, does not receive a favorable response. Thus success seems assured to us, and we are convinced that in a year's time, we will have between Mattawan and Témiskaming a regular line of transport by sea and by rail 1st which will make the journey in a day."

The currency, piastre, was used in during the French colonization efforts in Canada. The 2 million piastres in 1885 would be the equivalent of well over $20 million today. It is easy to understand why government officials would baulk at the project of drowning the Long Sault rapids.

An account from Alexander Herkes Telfer, part of a survey party, heading to the west shore of Lake Temiskaming in 1886, recounts an arduous trip. Telfer left Toronto on July 19, 1886, taking a train to Peterborough, and onwards to Carleton Junction (now known as Carleton Place). The next day he boarded a train bound for Mattawa. The trip took eight hours. The next day, he and his men procured supplies. His group included himself and 12 other men, including one Indigenous fellow. They parted Mattawa in "*one large, strong boat and three birch bark canoes*". From his account dated July 21st:

> "*When we get to these rapids, if they are bad ones, we have to land, unload all our stuff and carry it past the rapids, then carry the canoes. In other places a rope is fastened to the bow of the canoe and from 3 to 5 men pull on the rope on shore, while one or two wade by the side of the boat and keep it out of the rocks and boulders till the rapid is passed. At other times, all hands have to plunge in to the water to their waist and pull on the ropes, stumbling over the large, slippery stones, where it would be almost impossible to stand without the rope: by that means, each man helps to hold up his companion.*
> *Made 6 miles today….*
>
> *July 23rd: … a team took us to the commencement of Lake Temiscamingue about 4 pm. The bark canoes were carried over the road; the last mile of that road beat all I ever saw – a wagon load drawn over large boulders, and so close together that the wheels rarely touched the ground. The Frenchmen took the large boat up the rapids [sic]; we then loaded up again. Just then, a steamboat came in sight with a raft of square timber in tow."*

The following account (The Algoma Missionary News 1890) describes the Anglican Bishop's visit to Lake Temiskaming in December 1890:

> *"On the 16th September, 1890, the Bishop arrived at North Bay by the C.P.R., en route for Lake Temiscamingue, and took on board the Chaplain. They travelled along by rail as far at Mattawa, where they alighted, and went to the house of the Rev. Robert W. Samwell ….The following day they continued their journey up the Ottawa River. The first stage was by small steamboat with a scow attached to its side; and then when rapids stopped navigation, the boats were left behind, and all proceeded to portage in the easiest manner by means of a narrow-gauge one-horse tramway, the little rails of which were brought even with similar rails on board the scow by a little draw-bridge dock, and the flat-car with the baggage on the scow was drawn off by the horse, and on to the tramway. This tramway was built by the side of the rapids until navigation again opened, when another little steamboat with scow was in waiting to receive in similar manner the passengers and baggage-car. From Mattawa to the Long Sault at foot of Lake Temiscamingue is about forty miles, which composed the day's journey,*

> *and in that distance they made portages in the manner described, four times. The last portage, however, some six miles, differed from the others in that, instead of the horse, there were a little locomotive engine and two covered cars. Arrived at the head of the Long Sault and at Gordon Creek, they put up in the French [Canadian] boarding-house, and there awaited the return of the steamer Meteor, Captain Percy, which plies upon Lake Temiscamingue. To their great chagrin they found that she would not start up the lake until the day after the morrow…. It is to be feared that the Bishop, when he did retire, must have slept very badly that night, for from the bar-room right underneath ascended the noise and the horrible words, in the French language, common to drinking saloons, and suggestive only of darkness and eternal ruin… The next day, Thursday, they looked around at the beautiful scenery of the Long Sault and Gordon Creek, and thought of going to see the Kippewa also, some nine miles away, but decided there was grand scenery enough on the Ottawa and Temiscamingue for one trip…. The next morning they started on the good steamer Meteor to ascend Lake Temiscamingue…".*

Situated as the study area is, between Lake Temiskaming and the Ottawa River, at a place named for the rapids, it is unlikely that there were any marine related infrastructure located directly in the area of the rapids. Historically, it is known that there were at least two wharfs (quai (Fr.)) located north of the study area, which logically would allow for safe loading and unloading of passengers and freight. There is no evidence of any nearby wharfs located immediately upstream or downstream of the study area from historical records.

The Lake Temiskaming Colonization Railway and its fleet of boats were the first organized to provide transportation through the Lake Temiskaming district. In 1881, the S.S. Mattawan was the first steamer to run Lake Temiskaming. She was constructed by Olivier Latour, a logger in the area. In 1882, she was joined by another steamship, the Argo. The two ships became the workhorses of the lake. They transported people, loggers, freight, but were also engaged in the timber trade, moving large rafts of logs.

Alex Lumsden, owner of a local sawmill, created the Lumsden Steam Boat Line Co. He ordered the construction of and maintained steam boats for the transportation of passengers and goods. A wharf, located in the study area is attributed to him Figure 15.

"*The boats arrived in Témiscamingue in separate pieces and were assembled on site. The biggest steam boat on Temiscaming Lake was La Minerve which would later become Le Meteor*" (Archéotec 2017a: Figure 1.12).

The S.S. Meteor is illustrated in Image 16. This steamboat served communities on Lake Temiskaming for 40 years. She was a passenger steamboat operating during the late 1800s and early 1900s. She had a five foot flywheel, electricity, running water, a second deck lounge fitted out for music and card playing, as well as an observation area. She was the largest steamboat to operate on Lake Temiskaming, and the "*only passenger steamer on the lake until 1899*".

The Meteor, as noted above, started out as La Minerve in 1886. Charles Morin, a local shipwright, built the steamer near Long Sault for the Temiskaming Colonization Society. She was a double-

decker, square sterned with steel frame hull, and planked in tamarack. She measured 104.6 feet in length, had a beam of 23.8 feet, a gross tonnage of 111.5, had a 100 hp engine with the ability to run at 10 to 13 mph. She was powered with a boiler burning cordwood.

After receiving some damage to the ship in 1887 the Temiskaming Colonization Society sold the ship to the Lumsden Steamboat Line. Lumsden had her towed to his shipyard in Opemican for a rebuild and renamed her the SS (Steam Ship) Meteor. A July 1888 newspaper account describes her as having a slimmer keel, an open bow, cabins on the second deck, a round stern. She now measured 105 feet in length, with a beam of 23.8 feet, gross tonnage of 115.7, and was now screw driven. She was licenced to carry 130 passengers.

The steamer was again remodeled and enlarged between 1895 and 1897 in Opemican to accommodate a heavier passenger load. She was lengthened 25 feet to have total length of 130.5 feet; a wider beam of 29 feet, gross tonnage of 203.6, and sported a 165 hp engine that could operate up to 18 mph. She almost tripled her passenger capacity from 130 to 305. The SS Meteor served in the Lumsden Steamboat Line for 18 years. Although important to realize her impact to the study area, she burned in 1926, and there is no evidence of her remaining in the study area.

The steam propeller tug Mattawan was launched at Portsmouth, near Kingston, in 1876. Of 15 net tons and 22 gross tons, she measured in length 50 feet, in breadth 10 feet, and depth of hold 3 feet. It ran for five seasons on the Ottawa River between Deux Rivieres and Mattawa, where it was owned by B.I. Milligan.



Image 16: S.S. Meteor
(https://www.presidentssuites.com/destination-temiskaming-blog/meteor)

In the spring of 1882, the Mattawan was acquired by Olivier Latour, an entrepreneur who had interests in the timber resources of the Lake Temiskaming watershed. To bring the Mattawan to the foot of the lake was a formidable undertaking. The Long Sault was over six miles in length and embraced a number of the Ottawa River's most challenging sequence of rapids.

The engraving in Image 3 and 4 show her sitting at the south end of Long Sault Island. The transfer of the Mattawan up river involved a gang of about 20 men utilizing a capstan or winch to draw the hull in stages through the fast water. Even at low water the Long Sault had a fall of 53.5 feet over a distance of 7 ¼ miles and the entire labour took six days, but not without mishap. The Mattawan broke free of her cables and drifted half a mile downstream before being recovered where she

encountered some rocks. When she made the upper part of the rapids, she came in contact again with rocks, damaging keel and rudder (Taylor 1993: 14) (Image 17).

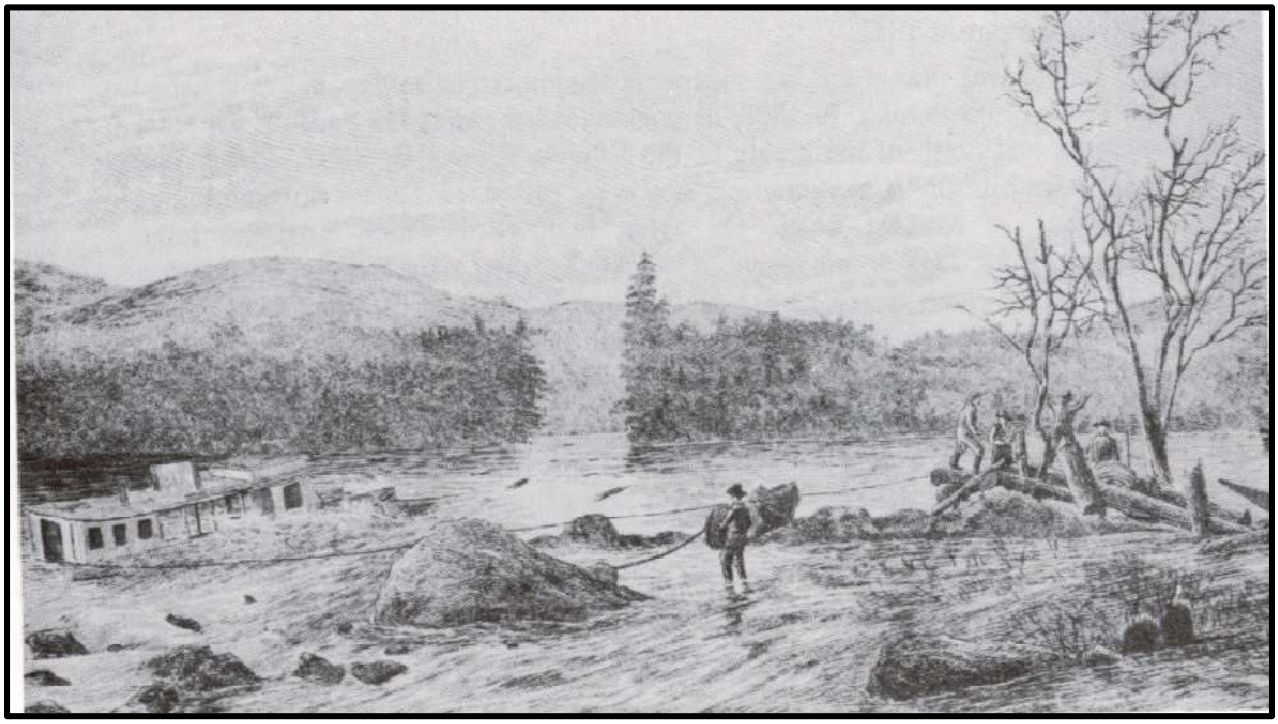


Image 17: Tug steamer Mattawan Being Winched Up Long Sault Rapids 1882
(NAC #C13814)

The Mattawan was finally hauled free of the Long Sault on May 24, 1882, and moored upstream of Long Sault Island. This was temporary arrangement as a landing, with dock and ancillary buildings, was apparently established on the Quebec shore in the slow current well above the threshold to the fast water (that is, outside the study area).

Long Sault Island, described in 1882 as covered with "pine and tall spruce", divided the flow from Lake Temiskaming into two branches, that of the easterly or Quebec side being the principal one. Here the Mattawan was hauled upstream and sawlogs floated down. The western (Ontario) channel was commonly dry during seasons of low discharge from the lake. The emphasis, therefore, in the movement of timber and sawlogs was in the reliable flow and depth of the Quebec side. Here it was joined by the discharge of Gordon Creek, with its harvested wood floated down from Lake Kipawa, and at mid-decade the products of Lumsden's Mills (Figure 30). Alexander Lumsden also operated from the 1880s several tugs and passenger and freight steamboats on Lake Temiskaming with a southern terminus at the head of Long Sault.

Although Henry Perley, chief engineer of the federal Department of Public Works, favoured the dam suggested by the timbering interests, in the event no such project was undertaken in the nineteenth century.



Figure 30: Gordon Creek and Lumsden's Mill 1915
(LAC R/320)

In terms of navigation of the Ottawa River and Lake Temiskaming, the steamer Temiskaming joined Lumsdens' fleet in 1899, and four years later, the Jubilee joined the ranks.

> "*The Lumsden estate sold the ships of the Lumsden Steamboat Line to the Temiskaming Navigation Company, a new company formed by investors from Mattawa, in 1906. The Temiskaming Navigation Company sold its timber tugs to the Upper Ottawa Improvement Company, specializing in the transportation of passengers and goods. Of all the boats navigating on Lake Témiscamingue, the Météor and the Témiscaming are unquestionably the best known and the most used. Between 1887 and 1920, all the settler families who came to Témiscamingue arrived, depending on the period, at the Long-Sault wharf or the Haileybury wharf. From there, they board one of these two boats to reach the Quebec shore and go to their colonization lot*" (Riopel 2002).

This is the only reference to a "Long Sault" wharf. Presumably, this may have been the former Lumsden wharf, or the unnamed wharf nearby.

The end of active commercial navigation of Lake Temiskaming and the Ottawa River was prompted by the construction of the railway into the area. The Temiskaming Navigation Company sold its assets to the Compagnie de Navigation de Ville-Marie.

Figure 15 and Figure 16 show a train bridge over Gordon Creek, which has now been removed and replaced with the western overpass of Road 101 on Rayonier land. The 1882 (Image 3 and 4) engraving of the south end of Long Sault Island does depict what is more likely a flume (referred to as a lock in the 1882 account) emerging from Gordon Creek into the Ottawa River. It is raised and presents what would have been a fall of likely a metre or two into the river.

Logging booms were observed by Archéotec during their 2017 survey (Archéotec 2017a, 2017b) confirming use of this creek for running logs to the Ottawa River. There was no mention of any structures related to a possible flume at the mouth of the Gordon River by Archéotec. Presumably this was removed for the construction of the railway bridge.

There were at least two wharves in the area, but both located north of the study area. There was also reported, at least one ship built above the rapids. It is known that alligators were routinely shipped from the factory in Simcoe, Ontario to destination points in pieces, where they would be reconstructed. Alligators were a vessel that could work both on the water and on land.

There is one recorded incident of shipbuilding; this of the Minto, a steel-hulled tugboat that was built by ICO at Long Sault in 1903. Undoubtedly this was done above the Long Sault rapids, probably near the wharves noted above. It is doubtful that any evidence of the same occurs in the study area.

The construction of the dams, both on the Ontario and Quebec sides, effectively put an end to any water transportation from Long Sault to points north, other than purely recreational.

1.3.9 Plaques, Monuments or Designated Heritage Properties

The Ontario Heritage Trust on line plaque guide was accessed February 2023 but there were no results relating to the study area. There does not appear (from an internet search) to be an equivalent plaque guide for Quebec. There is a stone monument located at the Ontario/Quebec boundary marking the terminus of Highway 63 (Ontario) and the commencement of Highway 101 (Quebec). The monument marks the completion of the North Bay-Temiskaming Highway (Image 18).

1.3.10 Determination of Archaeological Potential

There are a number of variables that are evaluated when determining marine archaeological potential. These include:

- The presence of previously identified archaeological sites;
- The presence of rapids or nearby rapids;
- Prehistoric lakes and rivers;
- Marine related infrastructure on shore;

- Records of shipbuilding in area;
- Resource areas (food or medicinal plants, scarce raw materials, early Euro-Canadian industry);
- Shipwrecks and/or history of navigation both Indigenous and non-Indigenous;
- Early historic transportation routes;
- Canadian heritage river; and
- Properties with cultural heritage value/interest or archaeological potential as identified by First Nations, Indigenous communities, the Métis, local histories, and/or informants.



Image 18: Stone Monument Marking Terminus of Highway 63

Employing these variables, the following are apparent:

1) There are rapids in the area, and a history of much larger and longer rapids prior to the construction of the dam-bridges on both the Ontario and the Quebec sides;
2) There are no registered archaeological sites or site leads reported by the Ontario government within 1 km of the study area;
3) Lake Temiskaming is the post-glacial successor to Lake Barlow and the study area was covered with glacial waters during the early prehistoric period;
4) Indigenous people routinely travelled down Lake Temiskaming, and whether by portage or otherwise, continued to the Ottawa River, as well as the reverse journey;
5) Natural resources attractive to both Indigenous and Euro-Canadian peoples were present and included fish, herptiles, birds, mammal and vegetation suitable as foodstuffs and for other types of activity (e.g. weaving mats, baskets, clothing, etc.);

6) There is the remnant of the early dam-bridge located on the east shore on land of the Ottawa River south of the dam-bridge;
7) There is a historically reported "lock" at the Gordon River outlet in 1882 (likely a flume);
8) The Ottawa River and Lake Temiskaming were routinely used by steamboat travel, but also by early European explorers, lumbermen, fur traders, and prior and concurrent with those activities, use of the two waterways by Indigenous peoples;
9) There were two wharves located north of the study area;
10) There was one reported ship built above the dam area;
11) There are reported possible cofferdam remains that were located during the 2017 archaeological land assessment at the north end of what was referred to as Area A (possibly within the study area) (to be field verified);
12) Bathymetry of the study area shows possible remnants of a concrete sill and/or sheet piling;
13) The Ottawa River is a Canadian heritage river; and
14) there have been early reports (circa 1880s) relating the marine history of the area.

The study area is considered to have marine archaeological potential based on the above.

1.3.11 Rationale for Fieldwork Strategy

The study area required a property visit to assess if there were any above water level archaeological resources; any related marine infrastructure (such as wharf, pier, dock, etc.), any remnants of previous dam-bridge construction; an assessment of slope modification, etc. As this is a marine archaeological assessment, and the water was free flowing, there were no constraints for conducting a property visit in February 2023.

1.4 Archaeological Context

1.4.1 Previously Known Archaeological Resources/Assessments

There have been a number of land and marine archaeological assessments that have been conducted adjacent to the study area. Each of these will be summarized below in chronological order (earliest to most recent).

In May 2013, a land based Stage 1 assessment was conducted for the Timiskaming Ontario Dam Replacement project under project information form (PIF) #P027-211-2013 (SJAI 2013a). This was a land based assessment and the dam and the Ottawa River did not form part of the assessed area. The focus of the Stage 1 assessment was the three proposed areas for laydown (Figure 31). Property inspection determined that approximately 30% of the area had been subject to deep and extensive disturbance due to development, and that the remaining 70% of the property was considered retain archaeological potential. It was recommended that Stage 2 archaeological assessment be conducted for those areas exhibiting archaeological potential.

A Stage 2 assessment was subsequently conducted in 2013 for the project under PIF #P027-0234-2013 (SJAI 2013b). The area of archaeological potential was subjected to test pit survey at an interval of 5 m. Soils were generally sandy, or showed evidence of disturbance from sewer lines, gas lines, and former buildings on the property dating from the 20th century (concrete foundations).

No artifacts predating 1900 were recovered and the property was not recommended for additional archaeological mitigation. Figure 32 illustrates the areas assessed during the Stage 2 assessment.

In 2014, a review of the cultural heritage documentation for the Temiskaming Ontario Dam Replacement project was conducted (KHC 2014). The review raised the importance of islands in the Ottawa River to the Algonquin, especially when they lie beside rapids. The report highlighted that Morrison and Allumette Islands are examples of archaeological sites similarly situated, where fisheries and "toll booths" were important. This report also suggests that portage trails and campsites may have existed on the island and their shores.

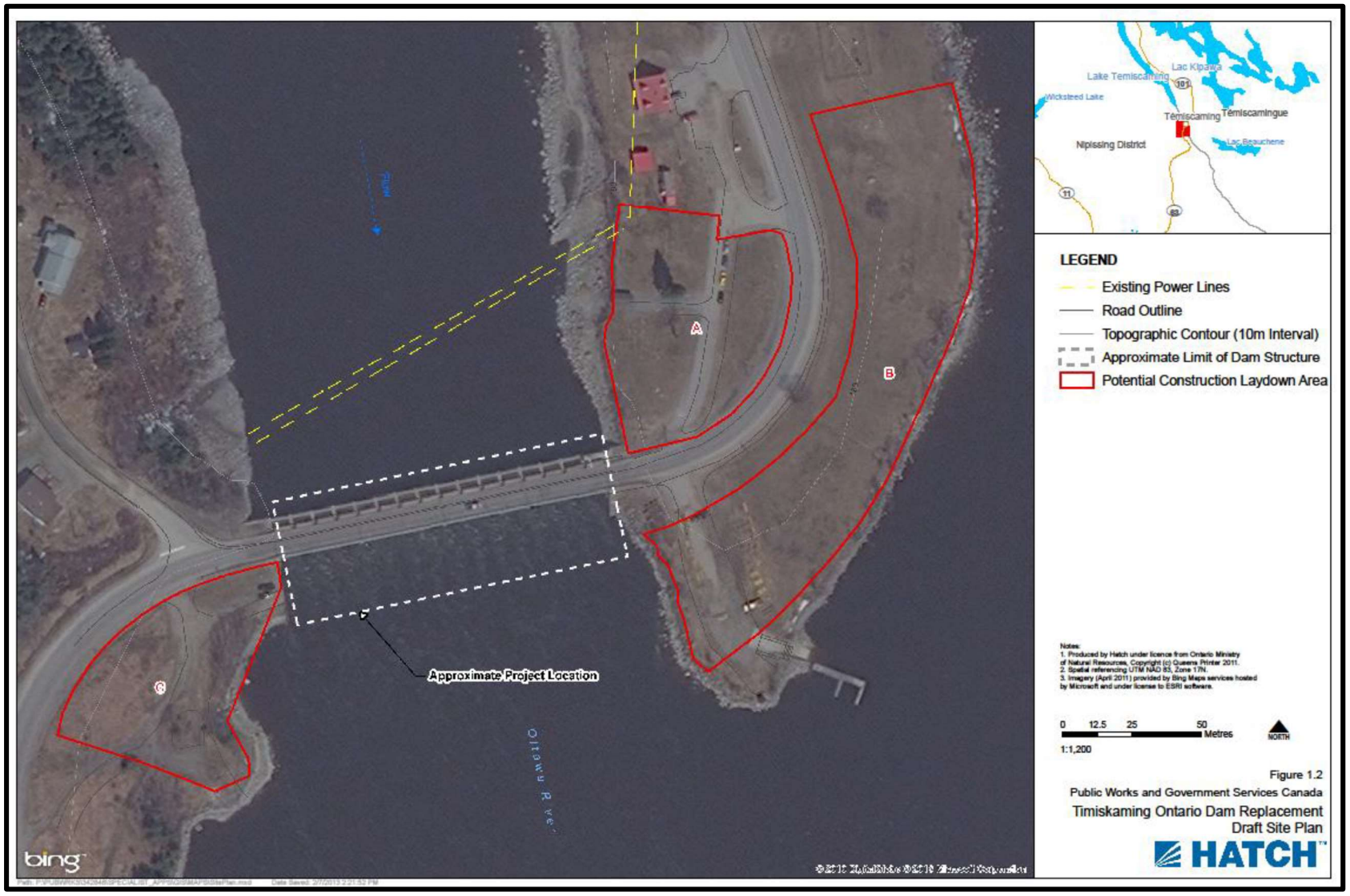


Figure 31: 2013 Stage 1
(SJAI 2013a)

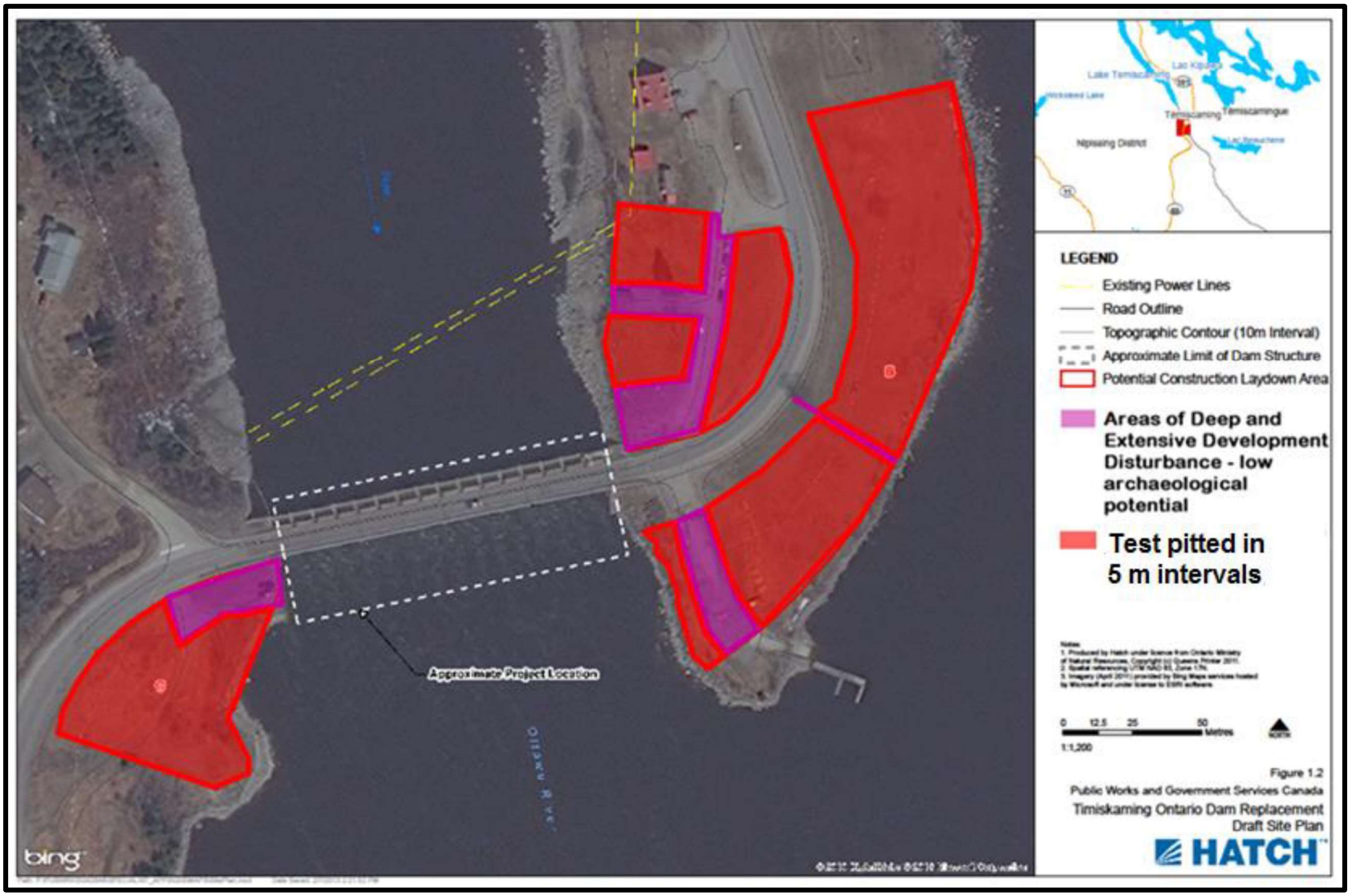


Figure 32: 2013 Stage 2
(SJAI 2013b: Map 7)

In 2014, a marine archaeological assessment was conducted for the Ontario side dam replacement project under License 2014-012 (SJAI. 2015). The investigator alerted the client that the Ontario side study area had been the site of former rapids, and "*as such, had potential for prehistoric archaeological resources associated with possibly fishing, or other resource extraction, or even possible canoe spills*" (SJAI 2015: ii).

The assessment was conducted in concert with the construction of a cofferdam associated with the dam replacement. The majority of the assessed area had been heavily disturbed by construction of the cofferdam, access roads, ditches and ramps. The remaining areas consisted of steep sided boulders, some small rocks and a submerged area. The submerged area was subject to snorkel investigation, and the remaining dry areas, a pedestrian survey.

Despite good observation conditions for areas still retaining archaeological potential, no prehistoric or historic materials were located. There was evidence of modern refuse, but this was not retained. No further archaeological assessment of the assessed area was recommended. Figure 33 illustrates the assessed area investigated during the 2014 marine assessment.

In 2017, an archaeological potential assessment was conducted for the Quebec side of the Temiskaming dam-bridge complex (Archéotec Inc. 2017a). Figure 34 depicts the area subjected to investigation and Figure 35 illustrates the parts of the project lands that were found to have archaeological potential, excluding in-water areas. Figure 36 depicts part of the assessed area along the Quebec shoreline that was developed in the 19th century. Fieldwork during the subject investigation confirmed that this shoreline had been modified. The investigation determined that parts of the assessed area retained archaeological potential and the following recommendations were made:

> "*1. Conduct a visual survey of the zones that could be affected by the dam's replacement work, either for the actual construction of the structure or for the associated work that could impact the archaeological context such as the construction of roads for heavy equipment;*
> *2. Conduct an archaeological survey of the zone located at the northern end of Long-Sault Island (04.2.14.05) if impacted during the construction period; and*
> *3. Plan a visual survey of the riverbed areas that would be drained for the construction of the dam.*" (Archéotec Inc. 2017a: 28).

The recommended land based field work was conducted in October 2017 (Archéotec Inc. 2017b).

The consultant was also tasked with conducting additional research at two locations: 1) Sociéte d'historie du Témiscamingue in Ville-Marie and 2) Musée de la Gare in Temiscaming specifically in the P.E. Gendreau archive. Field work concentrated on the upstream portion of Long Sault Island and the left bank of Lake Temiskaming. As part of the field assessment, an inspection of the banks was

also conducted. The Quebec side bank of the Ottawa River produced the remains of "*an old concrete structure"* situated between the current dam and Gordon Creek. This is located approximately 60 metres downstream of the current dam and is associated with the construction of the early dam circa 1912. This structure was described as in "*a pitiful state*" but indicated that piles of the old dam are visible (Image 19). A clearer image of the larger foundation is presented as Image 2 of this report. Not visible in the 2023 property visit was an in-water concrete portion of the dam. On the opposite bank (Long Sault Island), a service building contains part of the remains of the early dam (Image 20). This information was provided to the consultant by the dam manager, Mr. Dieudonné, but not confirmed by consultant.

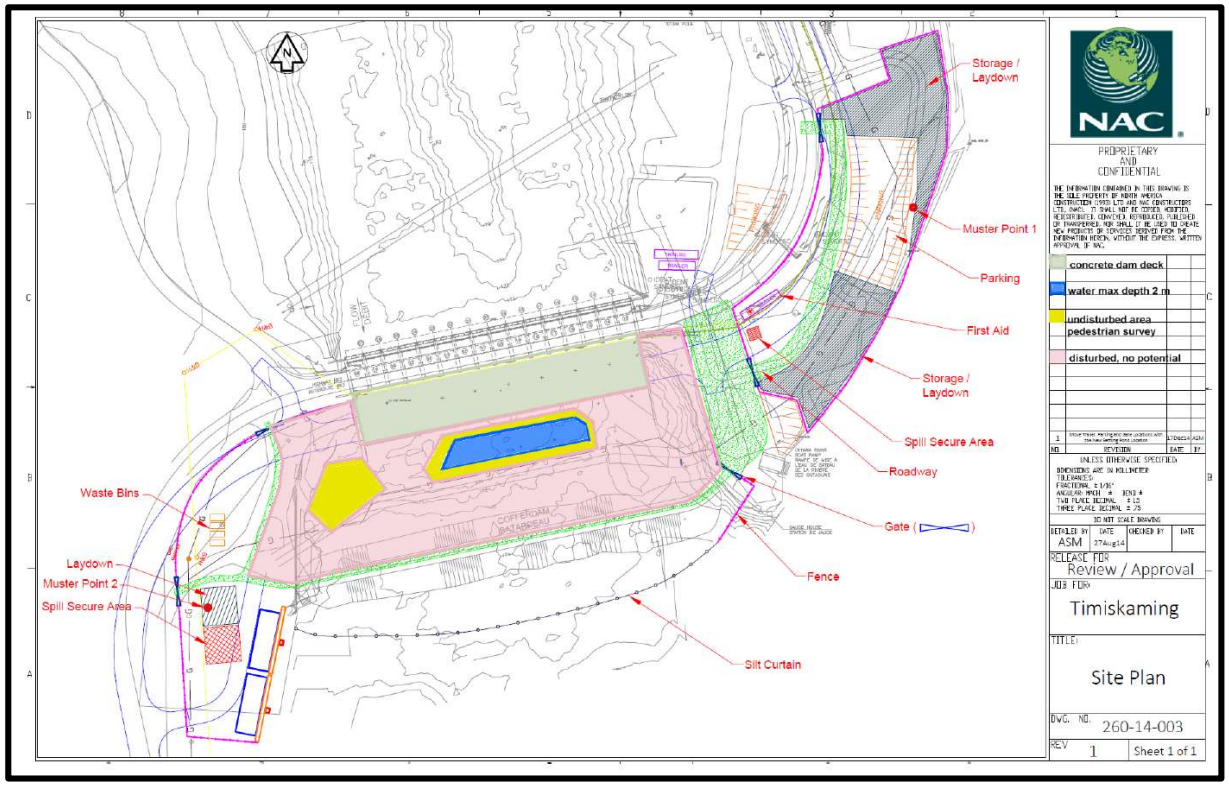


Figure 33: 2014 Marine Archaeological Assessment
(SJAI 2015: Figure 4)

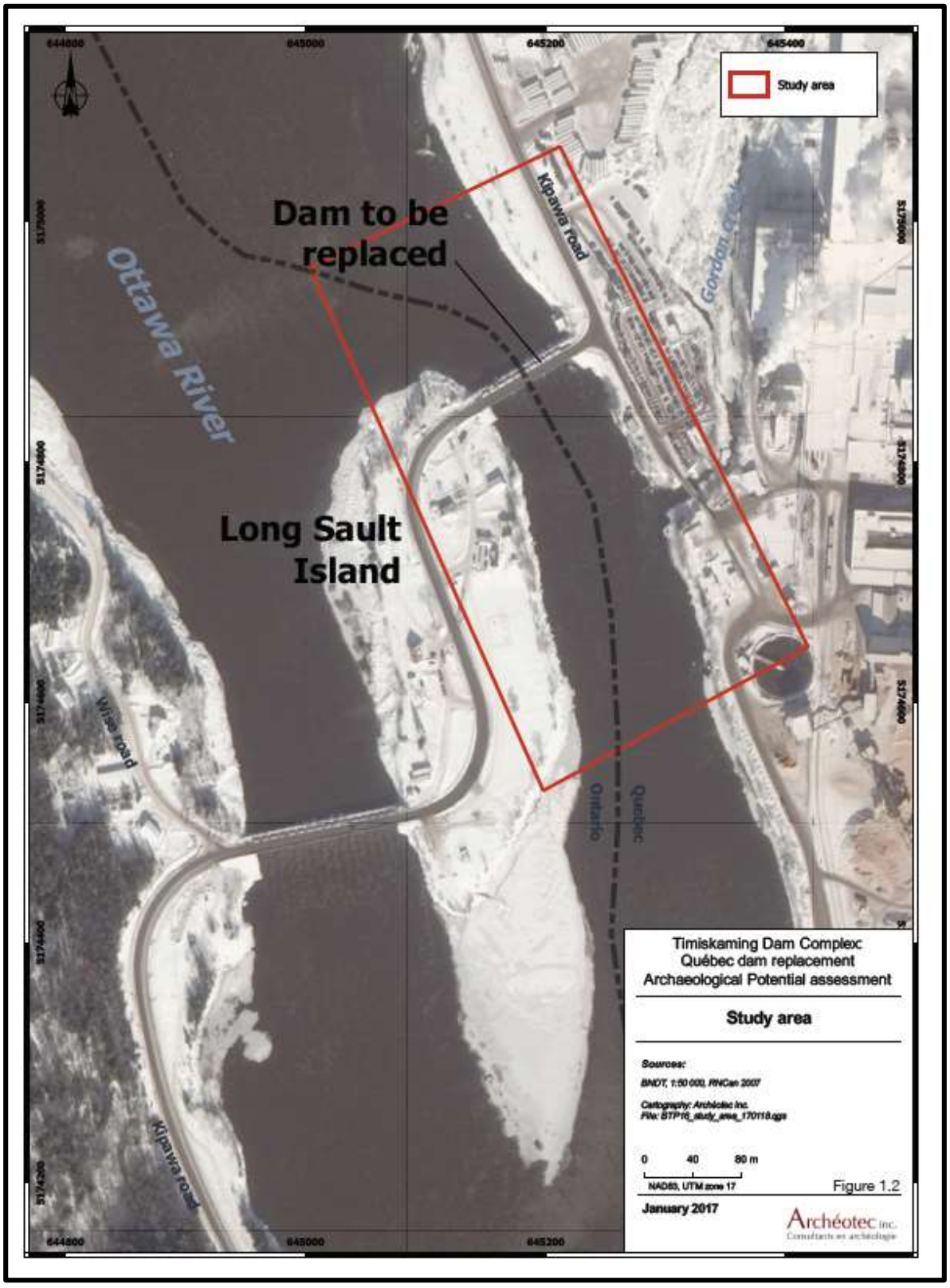


Figure 34: 2017 Archaeological Potential Assessment
(Archéotec 2017a: Figure 1.2)

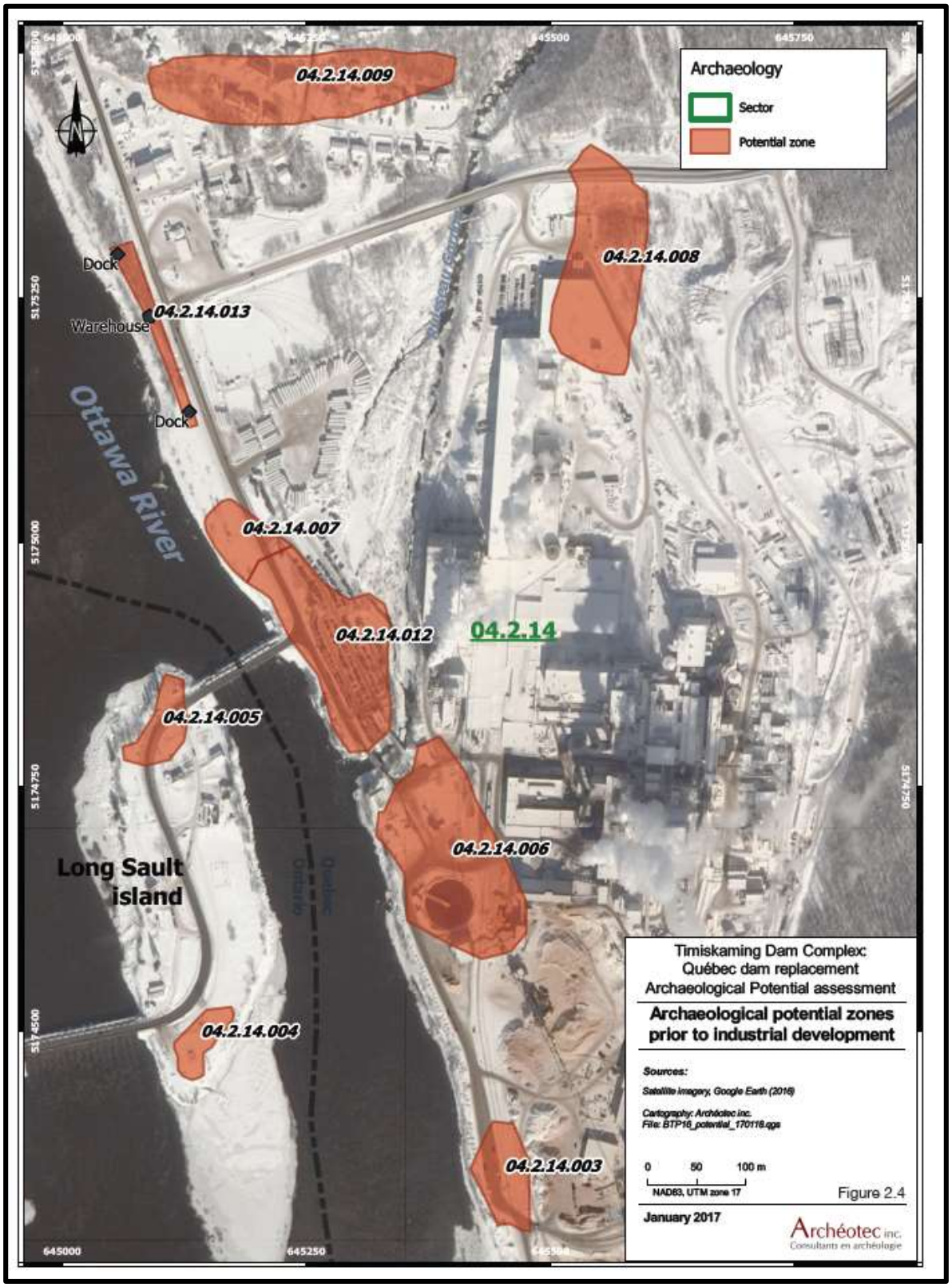


Figure 35: 2017 Areas of Archaeological Potential Assessment
(Archéotec 2017a: Figure 2.4)



Figure 36: 19th Century Development
(Archéotec 2017a: Figure 1.7)

The Quebec side bank of the Ottawa River was reported to be heavily modified, consisting primarily of rip-rap to slow erosion (Image 21). Although not specific as to location, it was reported that remains of timber cribs and the presence of "recent embankments" indicate that the area was developed and that the bank "no longer has its original configuration (Image 22).

> "*An inspection of the banks of Long Sault Island did not yield any results. The large amount of riprap and the substantial embankment on the banks did not make it possible to see any in-situ soil flush with the grade or old remains*" (Archéotec Inc. 2017b:20).

The remainder of the survey (Figure 37) concentrated on an area identified as Area 04.2.14.005, located on the north end of Long Sault Island. No archaeological resources were located during the testing of this area.



Image 19: 2017 Photographs of 1915 Dam Remnant
(Archéotec Inc. 2017b: Figures 5.13 and 5.14)



Image 20: Service Building Said to Contain Part of Dam
(Archéotec Inc. 2017b: Figures 5.15)



Image 21: Rip-rap along shoreline, upstream from dam
(Archéotec Inc. 2017b: Figure 5.10)



Image 22: Remains of Timber Crib and Recent Refuse
(Archéotec Inc. 2017b: Figures 5.11)

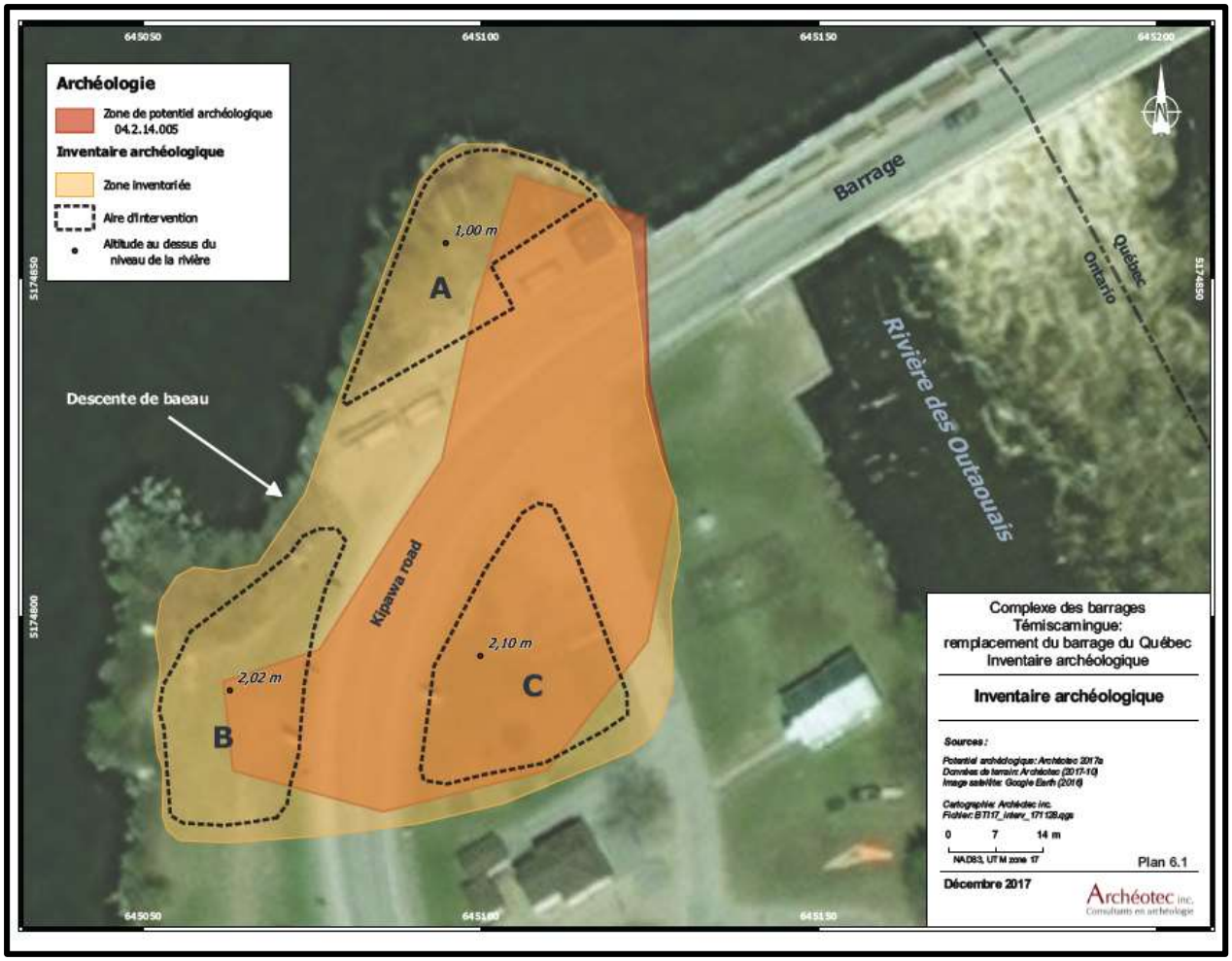


Figure 37: 2017 Field Assessment
(Archéotec 2017b: Plan 6.1)

However, the consultant noted that a wood fragment was located in one of the test trenches in the boulder layer. It was found at a depth of more than 60 cm deep. Archéotec (Ibid.: 25) reports that similar wooden pieces were observed on the bank. They suggested that it was representative of a possible box or retaining structure, associated with fill. These wooden pieces are arranged perpendicular to the bank and overlaid (Image 23). The pieces penetrate inland at a depth of at least three metres, suggesting that the soils above are not original to the area. The wooden pieces were found in Area A (Figure 37). It is not, however, indicated if they were located around the perimeter of the entire Area A or only in a select part of the shoreline. Only Area A is of any concern to the present marine archaeological assessment. The remaining two areas are not located adjacent to a shoreline or in-water.

Archéotec presents the final conclusions from their 2017 field assessment of areas identified in Figure 37 (2017b: 32):

> "*The archaeological intervention carried out in area 04.2.14.005 on Île Long Sault did not lead to the identification of archaeological or heritage remains. Rather, the inventory*

results and the archive consultation show that Île Long Sault saw its configuration modified gradually over time, particularly in connection with the hydrological works conducted there.

The archaeological inventory carried out in area 04.2.14.005 in the north part of the island confirmed, on the ground, that this portion of the island is today overwhelmingly, if not completely, developed and composed of various embankments. These data corroborate the results obtained elsewhere as part of previous interventions on the island (Scarlett Janusas 2013b)".



Image 23: Wooden Longitudinal Pieces at Shoreline
(Archéotec Inc. 2017b: Figure 5.26)

In contradiction to the above, Archéotec, did report on the longitudinal wooden pieces emerging from the bank in Area A of their investigation. These are likely to have been associated with the construction of the 1934 dam, based on their location. Based on their location, and the number of them, it is suggested here that they may have been part of the cofferdam for the dam, as they are located west of the current dam. Alternatively, they could also have been part of a slab dock.

The summation and recommendation of Archéotec (ibid) follow here:

"The work to redevelop the Timiskaming Dam Complex – Quebec Dam in the upstream portion of Île Long Sault will therefore have no impact on archaeological or heritage resources.

> *Nevertheless, it would be appropriate to conduct a survey of the remains of the first dam, which were apparently retained inside the service building (Figure 6.1). Documentation on these remains should include a photographic and planimetric survey. This survey could be carried out during the inspection of the riverbed and help in making a determination on the heritage value of this property."*

A search conducted on February 8th, 2023 by the Ministry of Citizenship and Multiculturalism at the request of ARA indicated that there are no registered archaeological sites located within a one km radius of the study area, nor are there any informal site leads. However, community knowledge was provided to ARA via the proponent from AOPFN that there exists two historic Algonquin settlements/camps within 1 km of the existing bridge-dam.

1.4.2 Current Environment – Existing Features

A bathymetric survey was conducted for the area in 2019 (WSP 2019). The darker colours (blue) represent deeper areas. Figure 38 and Figure 39 illustrate the bottom contours both in elevation and colour banded contour. Figure 40 and Figure 41 present cross sections at the dam apron and 10 metres from the dam apron. Figure 42 presents the bottom profile both upstream and downstream of the dam.

The colour yellow indicates ranges in elevation from 173.2 to 173.8 metres. The colour green ranges from 170.4 to 173 metres. On the south side of the dam, there are two lines of yellow circles in the green colour banding. The first line extends parallel with the dam, out from the east shore of Long Sault Island approximately 240 metres. There is then a separation of about 75 metres where there are no yellow circles, and then the yellow circles continue along the same alignment to the east shore of the Ottawa River, another approximate 125 metres. Another similar line of yellow circles is located on the east side south of the first yellow line of dots 90 metres. It extends out from the shore parallel to the dam for a distance of about 75 metres. With a much larger separation of about 300 metres, the line is joined on the east bank of Long Sault Island with a line of yellow circles for another approximate 90 metres. Without benefit of ground truthing, one can only speculate as to what these represent, but it is suggested here that they may be former pilings and/or sill remains. The first anomaly is located approximately 35 metres from the downstream face of the dam and separated by about 90 metres from the second anomaly. These have been highlighted by arrows in Figure 38.

On the north side of the dam, approximately 140 metres of the current dam, there appear to be some areas of elevation, brown banding, ranging from 174 to 175 metres, which may be indicative of debris from the 1934 cofferdam. Again, without benefit of ground truthing, this cannot at this time be confirmed.

Although not strictly within the study area (the study area being underwater), the presence of part of a foundation for the early dam is evident on the bank of the Quebec side of the Ottawa River. The foundation on Long Sault Island was reported by Archéotec (2017b) as being part of a service building on the island, opposite the visible foundations on the east side, although not field verified by Archéotec.

Archéotec (ibid) also reported the presence of longitudinal pieces of wood emerging from the bank on Long Sault Island in what they assigned as Area A, located on the east side of the existing dam. Archéotec did not indicate the extent or exact location of these timbers. They also did not consider these to be significant, although they are indeed most likely associated with the cofferdam for the construction of the 1934 dam.

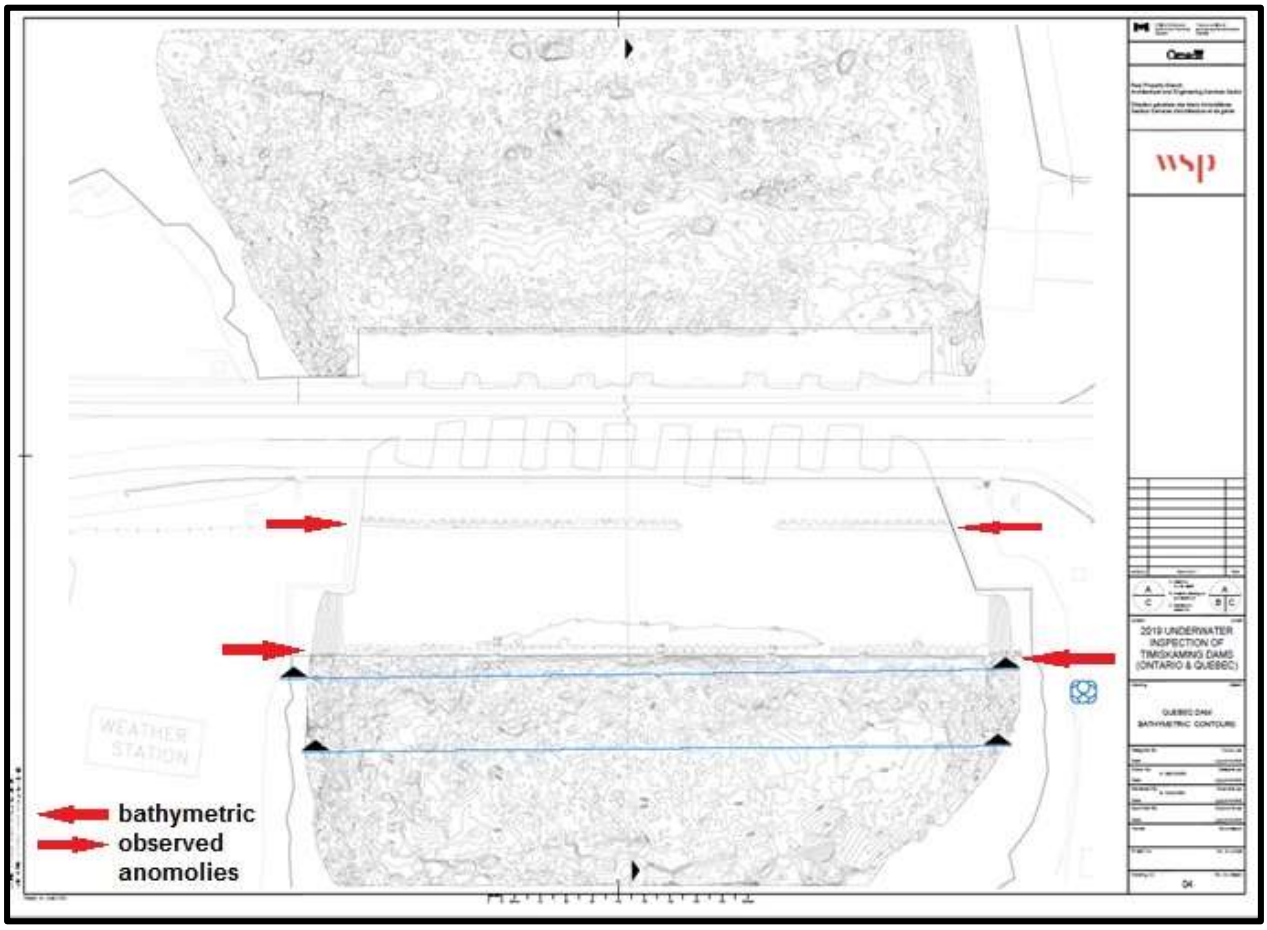


Figure 38: Bathymetry of Part of the Study Area
(WSP 2019)

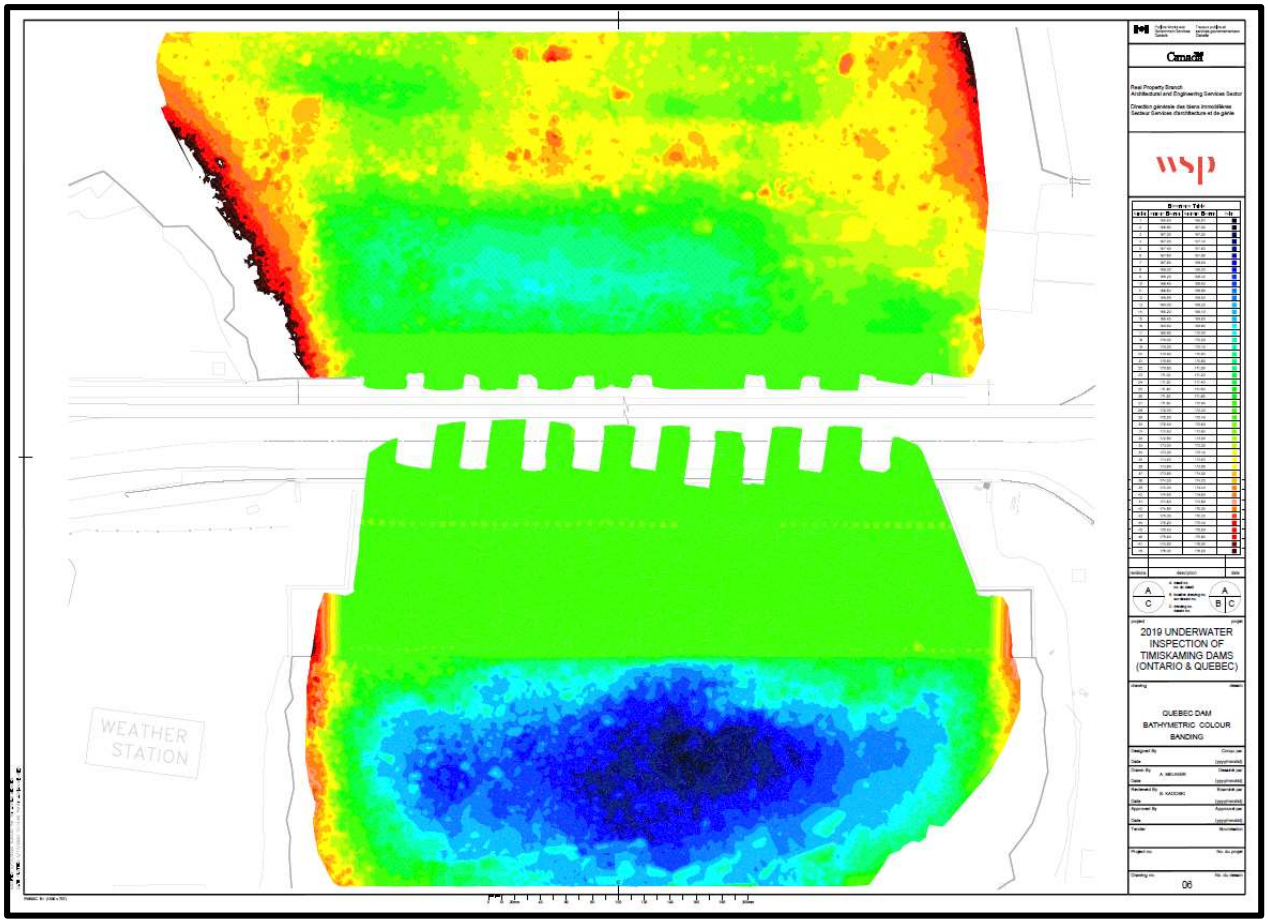


Figure 39: Colour Band Bathymetry
(WSP 2019)

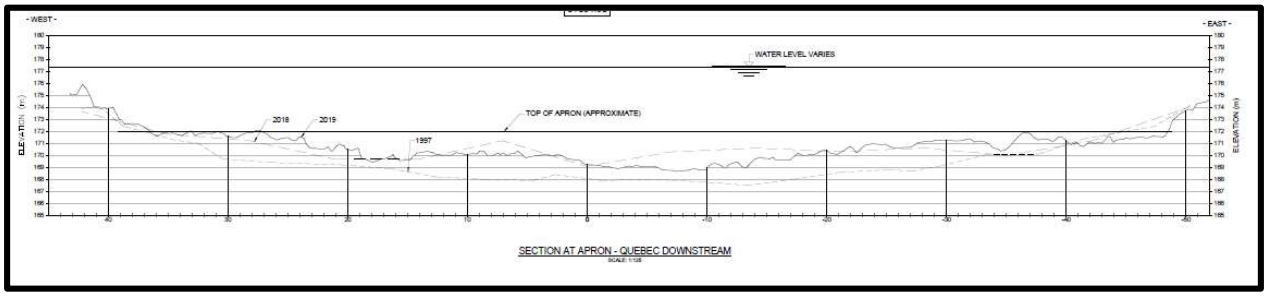


Figure 40: Cross Section at Apron
(WSP 2019)

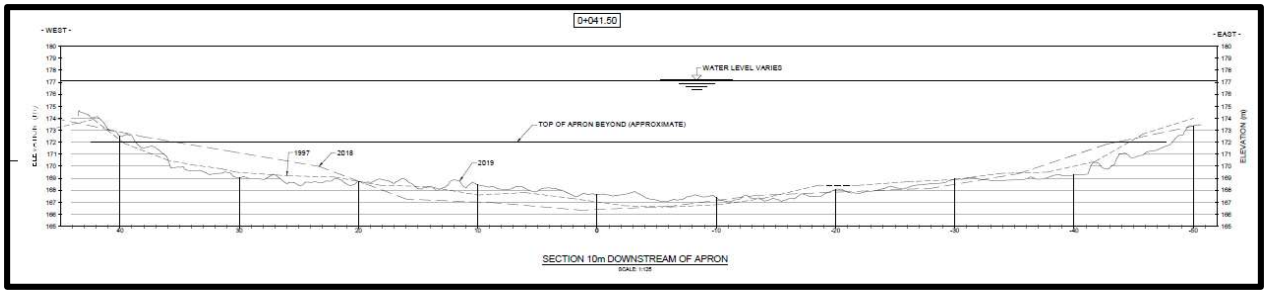


Figure 41: Cross Section 10 m Downstream of Apron
(WSP 2019)

Figure 42: Quebec Dam Profile-Upstream and Downstream (WSP 2019)

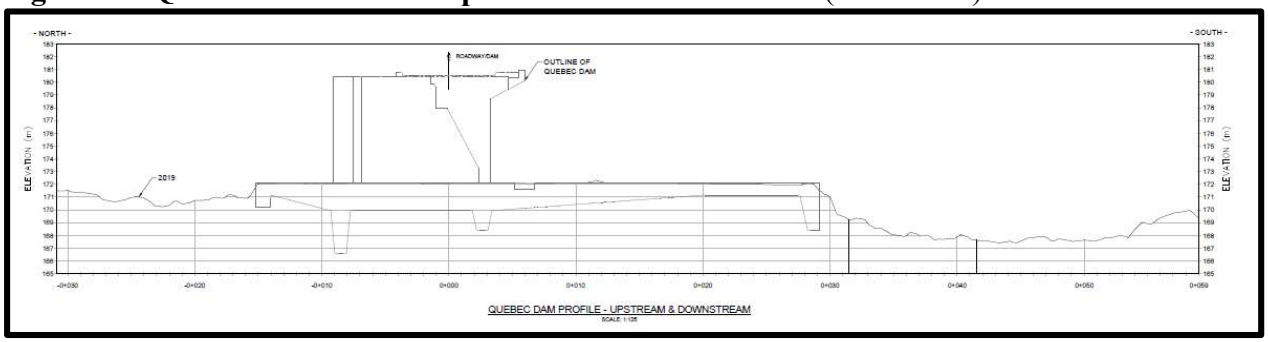


Figure 42: Quebec Dam Profile-Upstream and Downstream
(WSP 2019)

1.4.3 Physiography, Bedrock, and Hydrology

1.4.3.1 Physiography and Bedrock

The Ottawa River flows through the Canadian Shield and the bedrock in the Timiskaming area is of the Precambrian Age consisting mostly of granite gneiss. The depth of the bedrock around the dam complex is currently unknown. The southern part of Long Sault Island has a silt-clay to clay cover under a granular type of soil. Bedrock for the area is Precambrian, and the area lies within the Ottawa River Clay Plains.

The 2017 archaeological potential assessment (land based) indicates that the study area has *"…thin (till veneer) or thick (partly washed out) morainic deposits, glaciolacustrine beach sediments, alluvial fan sediments at the mouth of the brooks and alluvium* (Veillette 1996)" (Archéotec 2017a: 7).

The Timiskaming Graben, lying within the Western Quebec Seismic zone, lies along the border of Ontario and Quebec. This is a *"…prominent 50-km wide fault-bounded morphotectoinc depression partly filled by Lake Timiskaming (ca. 100 km long and 200 m maximum depth)*" (Doughty et. al 2010). The bathymetry of Lake Temiskaming is "*structurally controlled by faulting*" and one of the results if the clay plain onshore.

An M5 earthquake, centered some 60 km northeast of Ottawa, occurred within the Western Quebec Seismic Zone on June 23rd, 2010. It was not the first earthquake in the areas another recorded earthquake occurred on November 1st, 1935 at 1:03 a.m. just ten km east of Temiscaming, Quebec. The earthquake measured M 6.2. Figure 43 and Figure 44 illustrate earthquake epicenters and principal fault lines, one of which occurs in Lake Temiskaming.

Temiscaming reported that "*80% of all chimneys were damaged which indicates a maximum intensity VII on the Modified Mercalli scale*". Some solid brick walls also experienced structural cracks. Pertinent to the study area, "*minor rock falls were observed as well as cracks in the gravel and sand at the edges of islands and borders of lakes*" (https://seismescanada.rncan.gc.ca/historic-historique/events/19351101-en.php). Aftershocks were experienced in the region months following the earthquake.

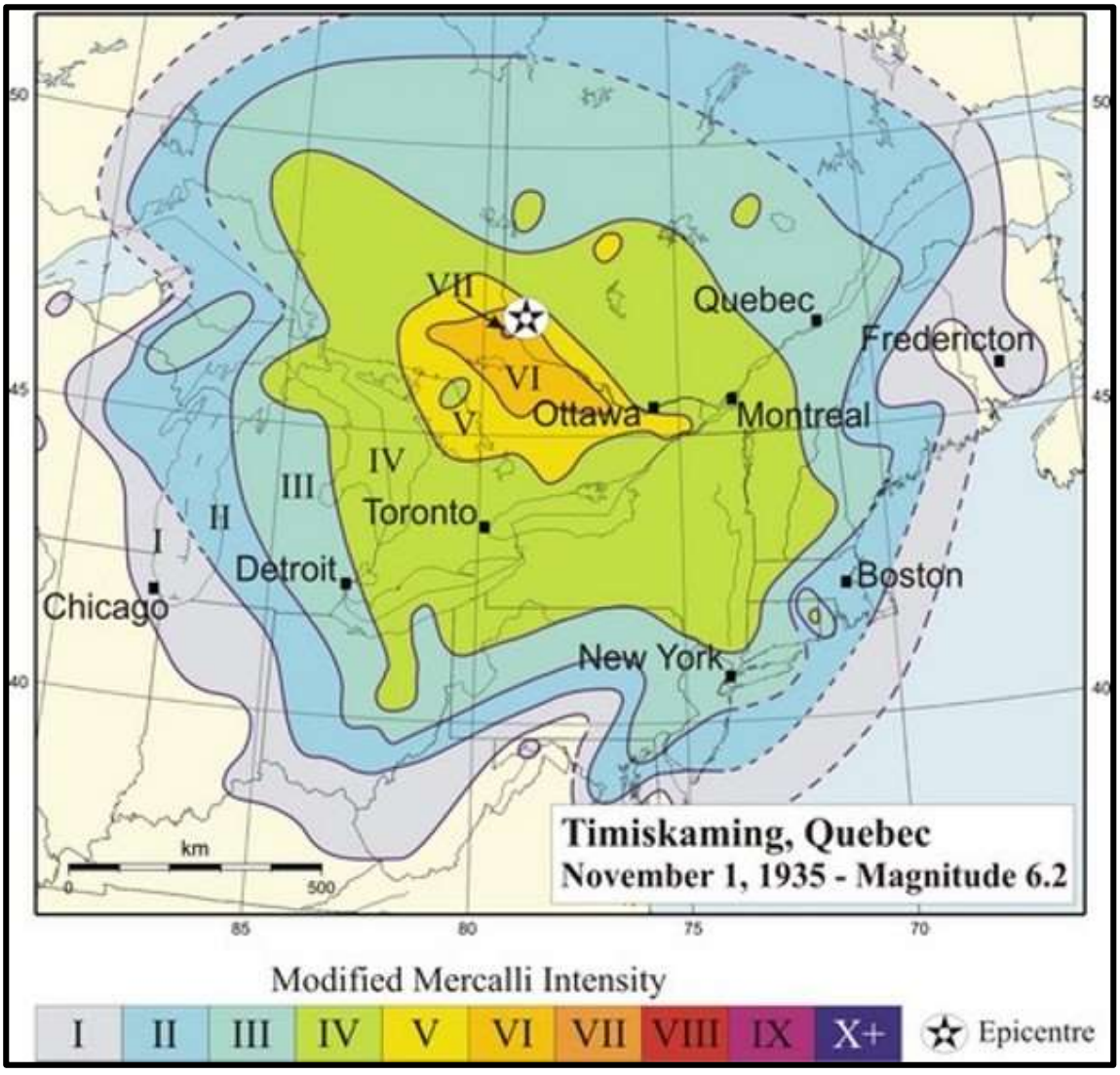


Figure 43: Epicenter of 1935 Earthquake
(https://seismescanada.rncan.gc.ca/historic-historique/events/19351101-en.php)

Given the location of the epicenter, just 10 kms from Temiscaming, and the magnitude of the earthquake, the effects of the same may have contributed weakening the structure of the current dam. As reported, lake and river edges were also affected, losing some integrity from their original configurations.

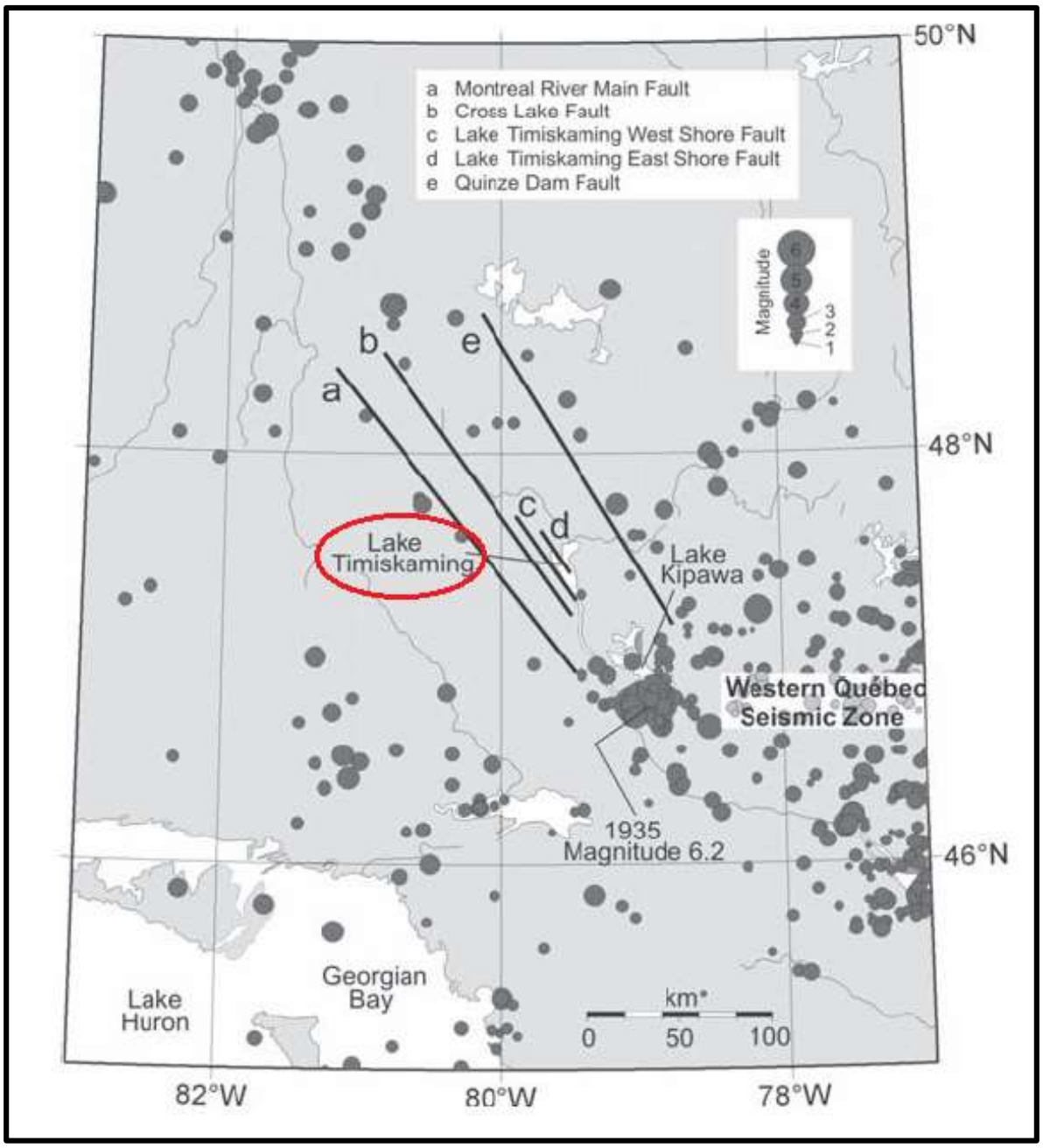


Figure 44: 1935 Earthquake Epicenters and Principal Fault Lines
(Doughty 2010: Figure 1)

1.4.3.2 Sediments

As part of the environmental assessment undertaken by Tetra Tech (2023: Chapter 11), the following is a description of the river, its sediments, etc.

> "*The river is located in a shallow valley. The variations in water levels in the river's floodplain during high water periods are moderate. The elevation of the Ottawa River's banks ranges between 190 and 240 mASL (meter above sea level). The island, at 180 mASL, slopes slightly toward the south* (Figure 45 and Figure 46).
>
> *The channel beds of the Quebec and Ontario dams meet about 800 m downstream of the dams, forming the river's main channel. Downstream of the Quebec dam, the channel bed elevation ranges from 167 mASL immediately downstream of the dam to 173 mASL about 100 m from the dam. Given that the average water level downstream of the dam is maintained at an elevation of around 177 m, a pool approximately 10 m in depth is present downstream of the spillway slab. It is likely that this pool continues to exist at this location because of the increase in flow velocities immediately downstream of the dam, which causes scouring of the riverbed* (Figure 47and Figure 48).
>
> *The shoal (observable at an elevation of about 173 mASL) corresponds to the remains of the former dam complex (1909–1934), and several large, meter-size concrete blocks along with various types of metal debris are still present on the river bottom in this area (Mistras, 2016* (Figure 48)*."*

With respect to possible contamination of the riverbed sediments, Tetra Tech again researched this as part of the environmental assessment.

> "*No data are available on the level of contamination of Ottawa river bottom sediments in the portion of the study area that is likely to be directly impacted by the work. Boreholes were drilled in the terrestrial environment near the dam in 2017 (GHD, 2017). Two of these boreholes (F-2 and F-3, Map 11.3) were located on the shore (in the terrestrial part, not in riverbed sediments). However, no chemical analysis was conducted, given that the boreholes were located on the slab of the dam. Boreholes F-1 and F-4, which were located on the banks but in the terrestrial part, revealed concentrations below Criterion A of the response guide for hydrocarbons C10-C50, BTEX and metals. There is nothing to suggest that the sediments are contaminated, given that there are few sources of contamination upstream and that the downstream area of the dam is not an area of sediment deposition or accumulation because of the very high velocities of the river flow there. However, according to SART, they suggest that contamination from the previous log boom storage upstream of the dam should be studied also downstream of Gordon Creek approximately 20 m at the Rayonier outfall piping.*
>
> *A study conducted as part of a master's degree project by Camilla Arbour (2020) provided some data on sediment quality in areas impacted by human activities, including those occurring at Rayonier. In the study, sediment samples were collected*

> *in 2017 in Gordon Creek and the Ottawa River, in the area affected by effluents from Rayonier. A control sample was also collected about 2 km upstream of the dam, in Lake Timiskaming. Figure 11.14, taken from the report, shows the location of the sampling stations and potential sources of contamination*" (Tetra Tech 2023: 11–26).

Figure 48 relates specifically to the downstream side of the 1934 dam. Immediately below the concrete slab is an area reported as stone (90%) and tree trunks (10%). The large pool (marked as "D" in the figure), is scoured to a depth of 10 metres and is unlikely to retain any in situ materials. Mistra indicates that at this point, there is only stone. Whether this is meant to relay that the stone is bedrock or construction debris is not elaborated. "N" constitutes a high spot in the river bed elevation and is described as "concrete slab with embedded concrete rail". This occurs 40 metres from the downstream face of the apron and is likely to represent the early dam structure or cofferdam. Points "S", "T" and "Y" all are described as having concrete or wood debris. These occur between 70 and 90 metres from the downstream face of the apron. At "BB", 120 m distant from the apron, steel debris is noted on the bottom.



Figure 45: Elevations in the Area
(Tetra Tech 2023: Figure 11.11)

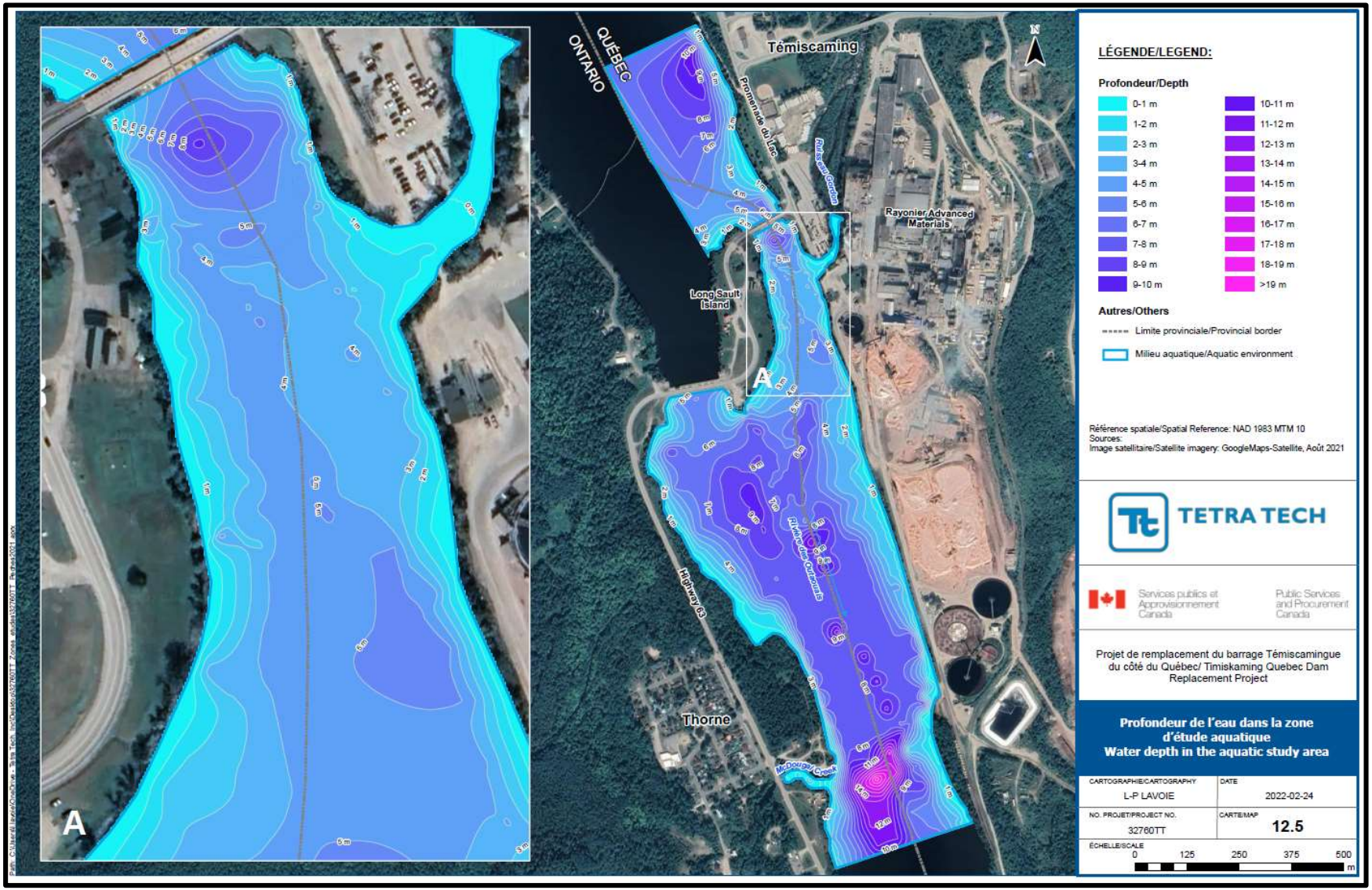


Figure 46: Water Depth
(Tetra Tech 2023: Figure 12.5)

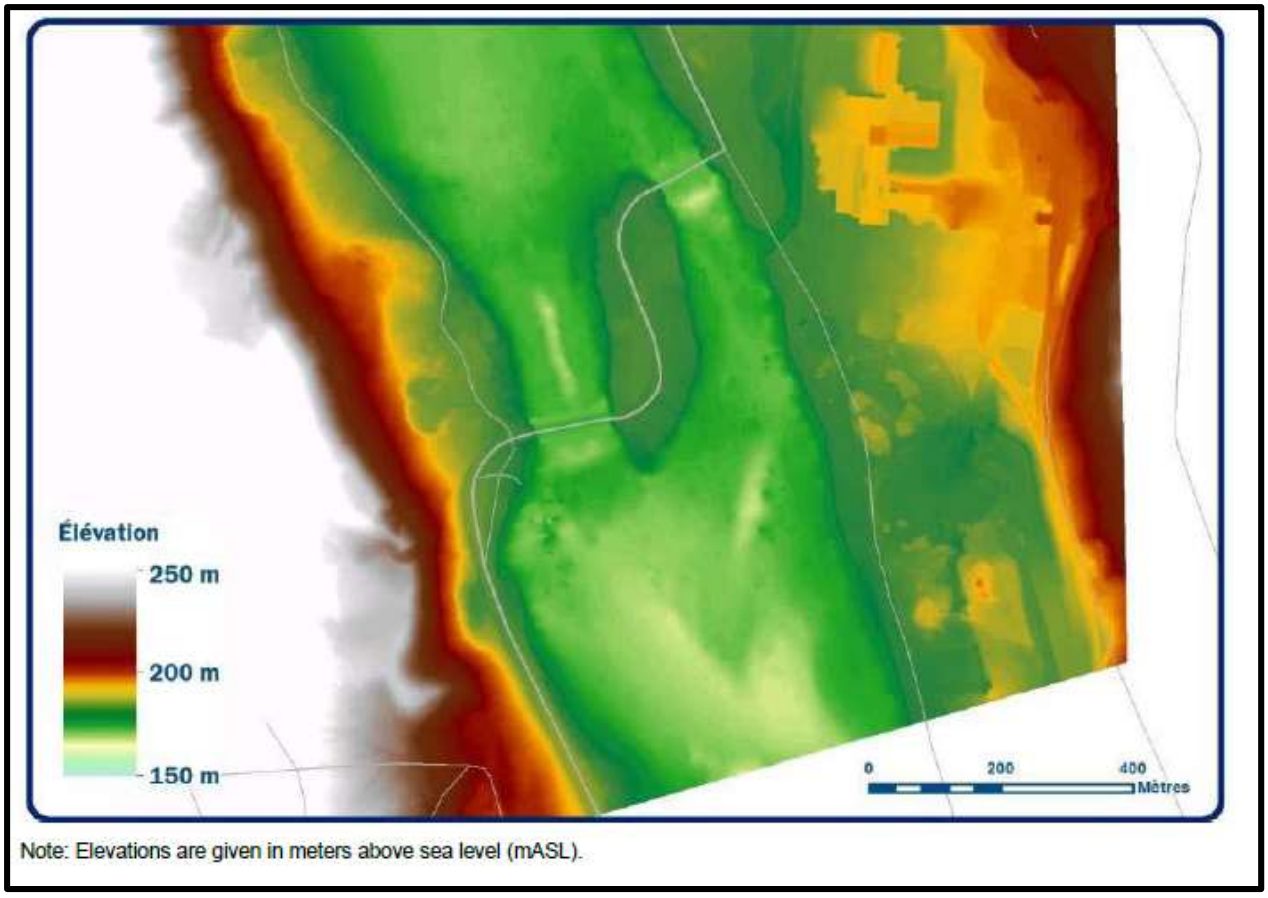


Figure 47: Elevations and Bathymetry
(Tetra Tech 2023: Figure 11.12)

The more recent bathymetry (Section 1.4.2) indicates at least two sections of cofferdam/dam remains located downstream, and an additional section upstream of the dam, where the remains of the cofferdam might be located, based on elevation. The downstream remains are likely associated with the early dam, and the upstream, with the 1934 dam.

Underwater inspections of the study area observed only a small amount of fine sediment veneer. Upstream of the dam, riprap revetments effectively limit shoreline erosion and therefore limit the sediment deposit into the lake. Closer to the dam itself, "…velocities of approximately 1.5 to 2 m/s were observed. At these velocities, clay and silt are transported by the current with sedimentation. Such velocities contribute to erosion and the transport of larger particles. It is not surprising then, that larger particles (course [sic] gravel, boulders, pebbles) that can withstand these velocities are found downstream of the dam…" (Ibid.: 11-46).

Gordon Creek has concrete or riprap revetments along the mouth limiting erosion (Ibid).

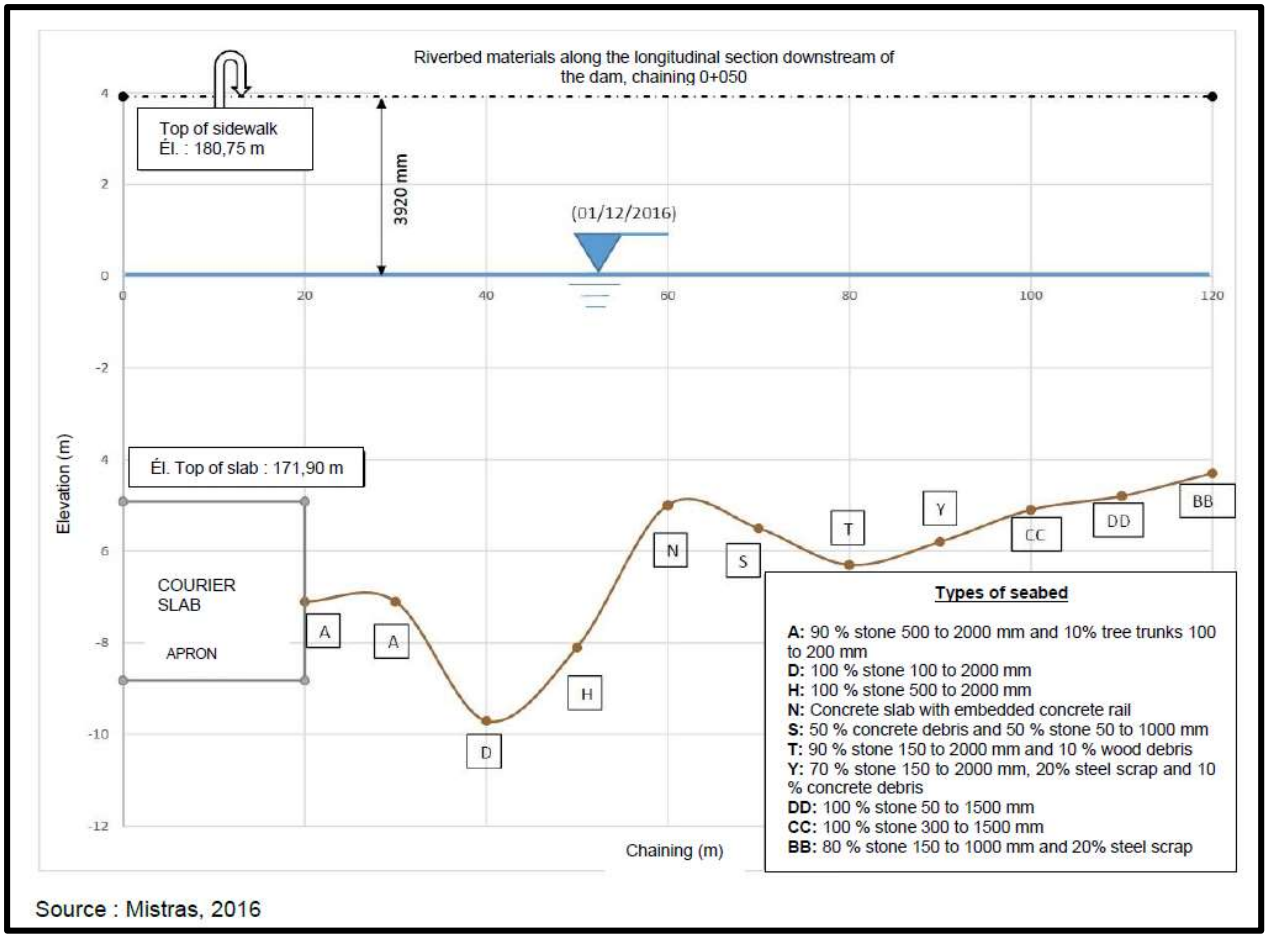


Figure 48: Bathymetric Profile of the Channel Downstream of the Quebec Dam
(Tetra Tech 2023: Figure 11-13)

Ottawa Watershed

The study area lies within the Ottawa watershed, which includes almost 20,000 lakes and other bodies of water (Tetra Tech 2023: 11-31). At the Dam Complex, the Ottawa River drains a 45,740 km² watershed. Gordon Creek, located downstream of the dam, is a major tributary of the area.

Water levels in the Ottawa River and Timiskaming reservoir are measured by the Water Survey of Canada. Station 02JE025, located upstream of Timiskaming, and Station 02JE024, located downstream.

Figure 49 and Figure 50 illustrate the water levels above and below the study area. Water levels are controlled to ensure levels above for navigation and to control for freshets and flooding. Figure 47 presents data from Haileybury, north of the study area, but providing historic data which would closely reflect the elevations of the study area. The year 1947 presents the highest reservoir level of 180.755 m, and the lowest level occurred in the year 2015 at 179.368 m.

As there are no flow monitoring stations located directly at the Timiskaming Dam Complex, the flow was estimated using flow rate at the Otto Holden Dam, located some 50 km downstream from the study area. Data was manipulated by PSPC to calculate the flow at the Dam Complex. Flow rates are available from April of 1911 to 2019 excluding the period of October 1960 to October 1966. Figure 51 illustrates the historic flow rates at the Timiskaming Dam Complex.

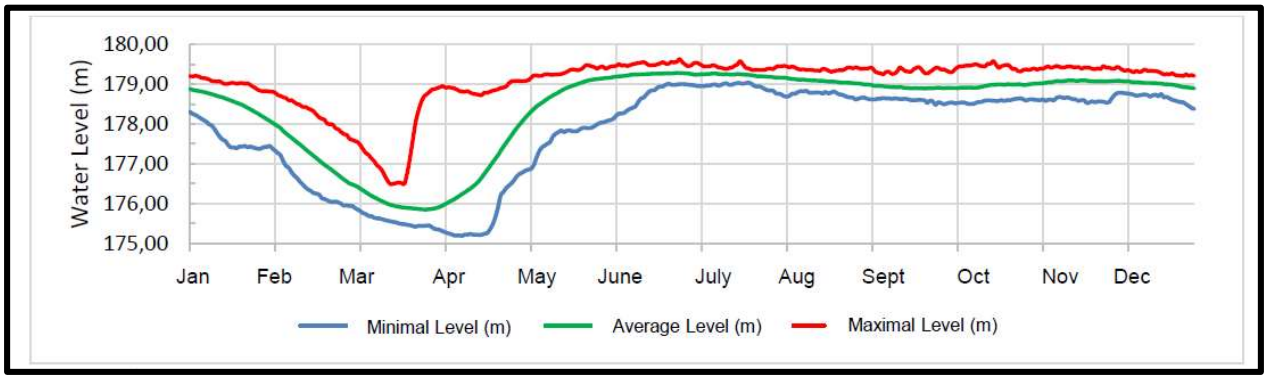


Figure 49: Average Annual Levels Above the Study Area
(Tetra Tech 2023: Figure 11.17)

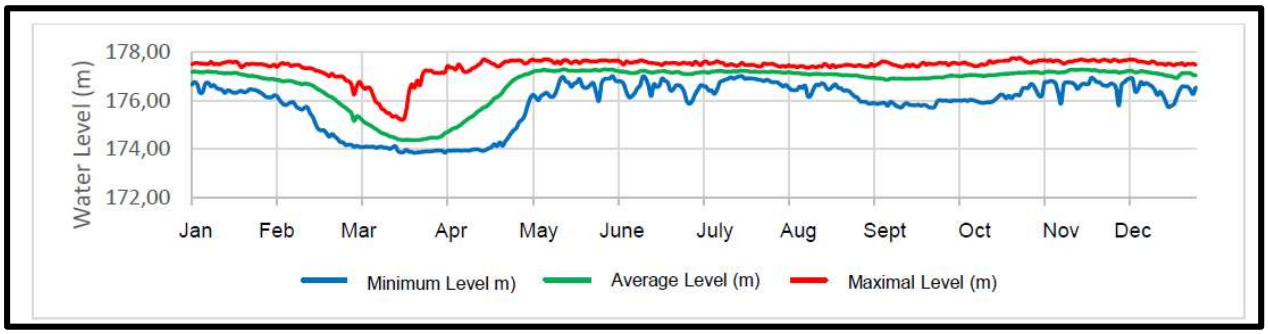


Figure 50: Average Annual Levels Above the Study Area
(Tetra Tech 2023: Figure 11.18)

Table 3: Historic Water Levels Presented Chronologically
(Tetra Tech 2023: Table 11.7)

Rank	Year	Reservoir Level (m)
1	1960	181.044
2	1947	180.755
3	1928	180.700
4	1909	180.496
5	1966	180.249
57	2014	179.487
91	2015	179.368

As Gordon Creek empties into the study area, it is important to understand the hydrography of that waterbody. "*Gordon Creek is a tributary of Lake Kipawa, and its flow is managed by the Lumsden Dam"* (Ibid.: 11-36). Table 4 presents the extrapolated flow rate for Gordon Creek.

Equally important in understanding the flow dynamics through the dam and the channel, is the flow rate during flooding, which has a direct impact of possible archaeological resources on the channel bed. Figure 50 illustrates a flood simulation through the Timiskaming Dam Complex.

Table 4: Return Periods for Inflows to the Timiskaming Reservoir and Safety Check Flood
(Tetra Tech 2023: Table 11.7)

Return Period	Flow rate (m^3/s)
2 years	1 885.3
10 years	2 793.5
100 years	3 995.4
1000 years	5 281.8
1000 years + 1/3 of the Probable Maximum Precipitation (PMP)*	6 532.5

*Design flood for the dam

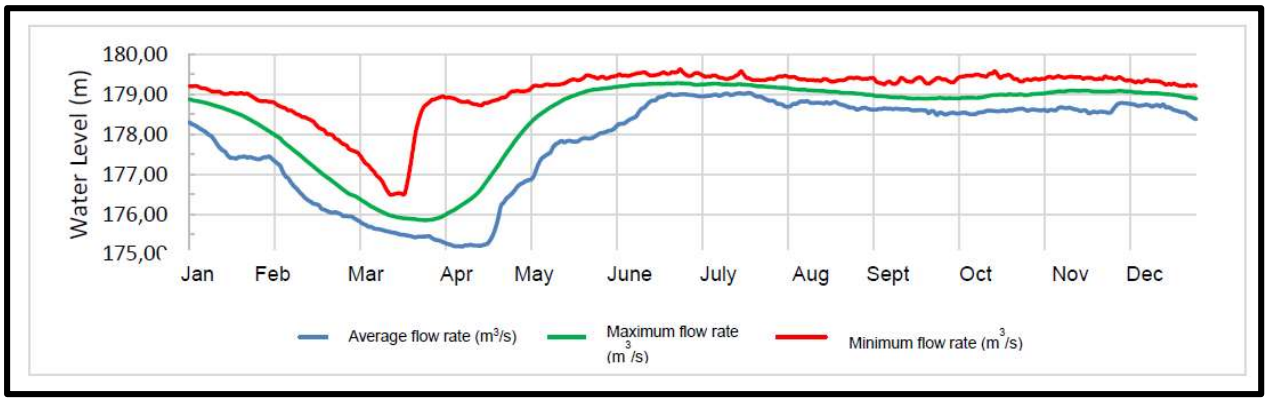


Figure 51: Historic Flow Rate
(Tetra Tech 2023: Figure 11.19)

Figure 52 "*... presents the results of the hydrodynamic simulations for a flood flow of 2,447 m3/s, which is equivalent to a flood slightly less than the 10-year flood. Considering that all the sluice gates of both dams are open, the figure shows the distribution of flows on both sides of the island. At a distance of about 200 m upstream of the dams, flow velocities are less than 1 m/s, increasing to around 2.5 to 3.5 m/s near the dams. It should be noted that these velocities represent the average over the entire water column. Velocities gradually decrease downstream of the dam, reaching 1 m/s again just downstream of the island*" (Ibid.: 11-37).

It is suggested that the early dam construction, subject as it was to high water levels and flooding, experienced flow rates of at least this magnitude, possibly higher. The river edges, indicated in

Figure 52 in blue, had a lower flow rate, which may have protected possible early cofferdam/dam infrastructure and possibly any Indigenous cultural remains, should they occur in the study area. Examination of the banks and undercuts along the river bank edges may provide evidence of cultural materials.

Ice appears not to have an influence either directly upstream or downstream of the dam complex, as the sluice gates are left partially open (Ibid.: 11-38). It is unknown if this is true historically, that is, pre-dam construction. However, rapidly moving waters, such as rapids, tend not to ice over and it is likely that there was no significant ice formation on the river itself, but there may have been some buildup along the river banks, in the slower moving waters.

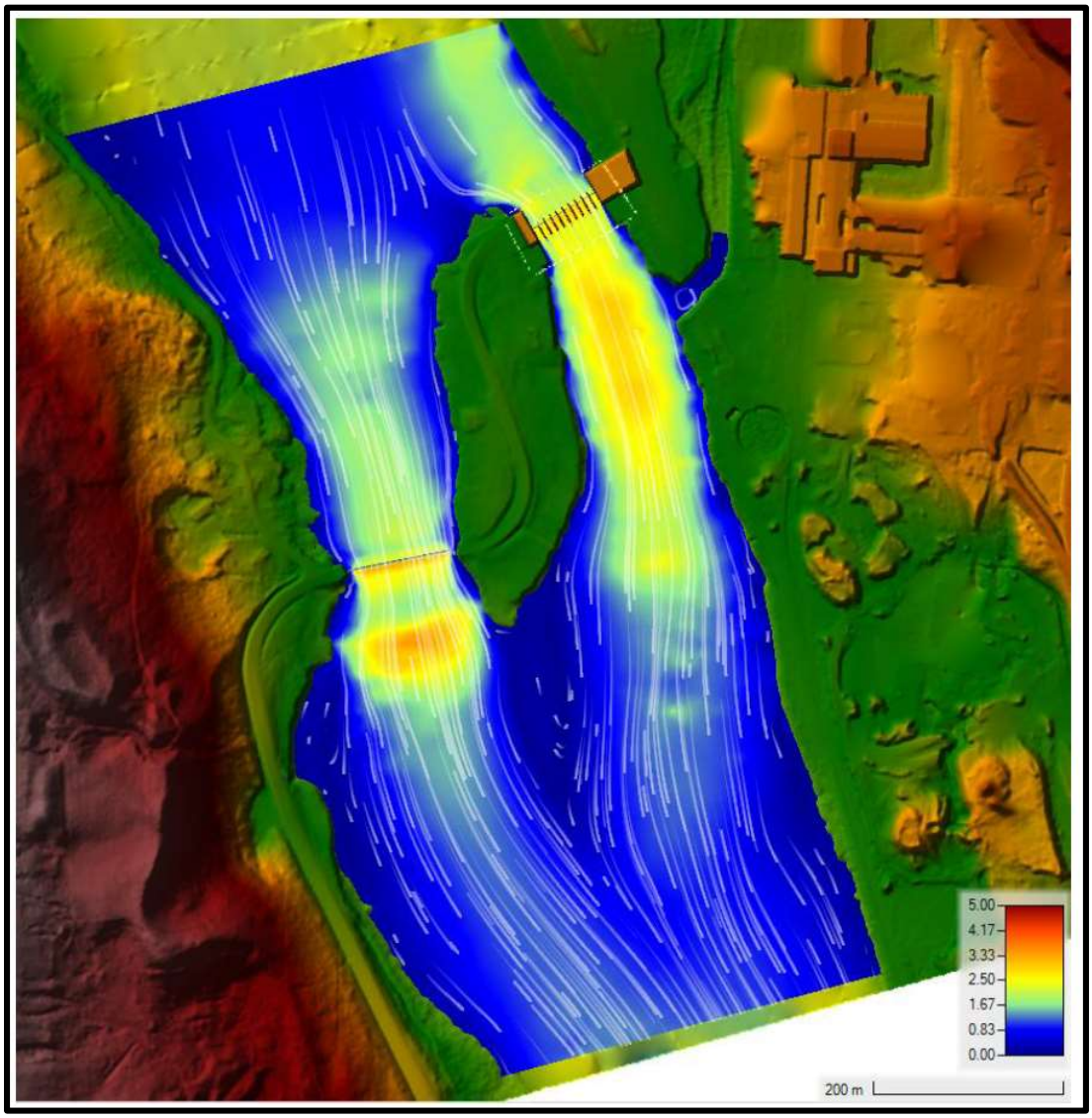


Figure 52: 2D Hydraulic Modeling of the Flow When All the Dam Bays are Open
(Tetra Tech 2023: Figure 11-21)

1.4.4 Prehistoric Shorelines

The 2017 report of the land study area associated with the project (Archéotec 2017a: 7, 11) provides a description of the area relating to prehistoric shorelines.

> "*The deglaciation of the study area occurred circa 10 000 years ago. Water from the melting glaciers ran down the Ottawa River valley as well as other surrounding valleys. In the study area, glacial ice dams and isostatic movements allowed Barlow Lake to raise up to 258 m ASL (Veillette 1996), that is 78 m above the actual Ottawa River level at the height of the Timiskaming Dam. This level was maintained until circa 9 000 years ago. The actual water level was attained circa 7 000 years ago. It is therefore unlikely that this watercourse was traveled upon circa 8500-9000 years ago given its high flow rate…*
>
> *When the flow rate diminished and the Long-Sault rapids started to emerge, the downstream shores could have provided camping grounds during travels or could possibly have been used as procurement areas. Portaging must always have been conducted in order to avoid these rapids."*

Figure 10 illustrates "hypothetical" portage routes to circumnavigate the rapids (Ibid.: Figure 1.4). However, an 1882 engraving and report of Long Sault Island and the two channels, suggests that the western channel, that on the Ontario side, usually was dry, and that it might have been a preferred route over that of the faster, more dangerous albeit more constant water of the Quebec side. This is, of course, dependent on time of year, as meltwaters would have both channels flowing at maximum capacity.

Lake Temiskaming is the post-glacial successor to glacial Lake Barlow, which drained about 8000 years ago, leaving behind what is known as the Little Clay plain (Doughty et al. 2010). The current lake level stabilized to its current elevation about 7000 years ago.

1.4.5 Vegetation, Fish and Wildlife

Nipissing and the North Bay area typically have white, red and pitch pine. In addition, there is black and white birch, white cedar, balsam fir, hemlock, white and black spruce, poplar, tamarack, beech, white oak, maple, elm, basswood and white ash. These species were observed in 1897 (No Author 1897: 22–23). There is a lumber and pulp mill directly across the river from the study area suggesting that trees are an important economic activity both now and in the past.

An aquatic vegetation survey was conducted in 2017 by Biofilia (Biofilia 2018) and in 2021 by Tetra Tech. It was indicated that the riverbed was composed of cobbles and rocks, and not suitable for aquatic plant growth. Divers from Mistra Group (2016) reported that there was no vegetation in the river. The current strength in the river would have prevented plant growth in this area. There were, however, some reports of emergent plant growth (sedges and grasses) along the bank (northern portion of Out-1 spawning site) and on the right bank of the river. In 2021, there were an additional three areas identified with aquatic vegetation. All of these areas were in slower moving water.

The area currently is a breeding ground for fish as shown in Figure 53. Gordon Creek, Lake Temiskaming and the Ottawa River would have been rich in fish, wetland species, and other animals in the pre-contact and contact periods.

Figure 54 illustrates that the study area has a wooded river bank at the east shoreline of Long Sault Island, and along the east bank of the Ottawa River. While there are trees in that area, they are not of any great age or magnitude as observed from the February 2023 property visit.

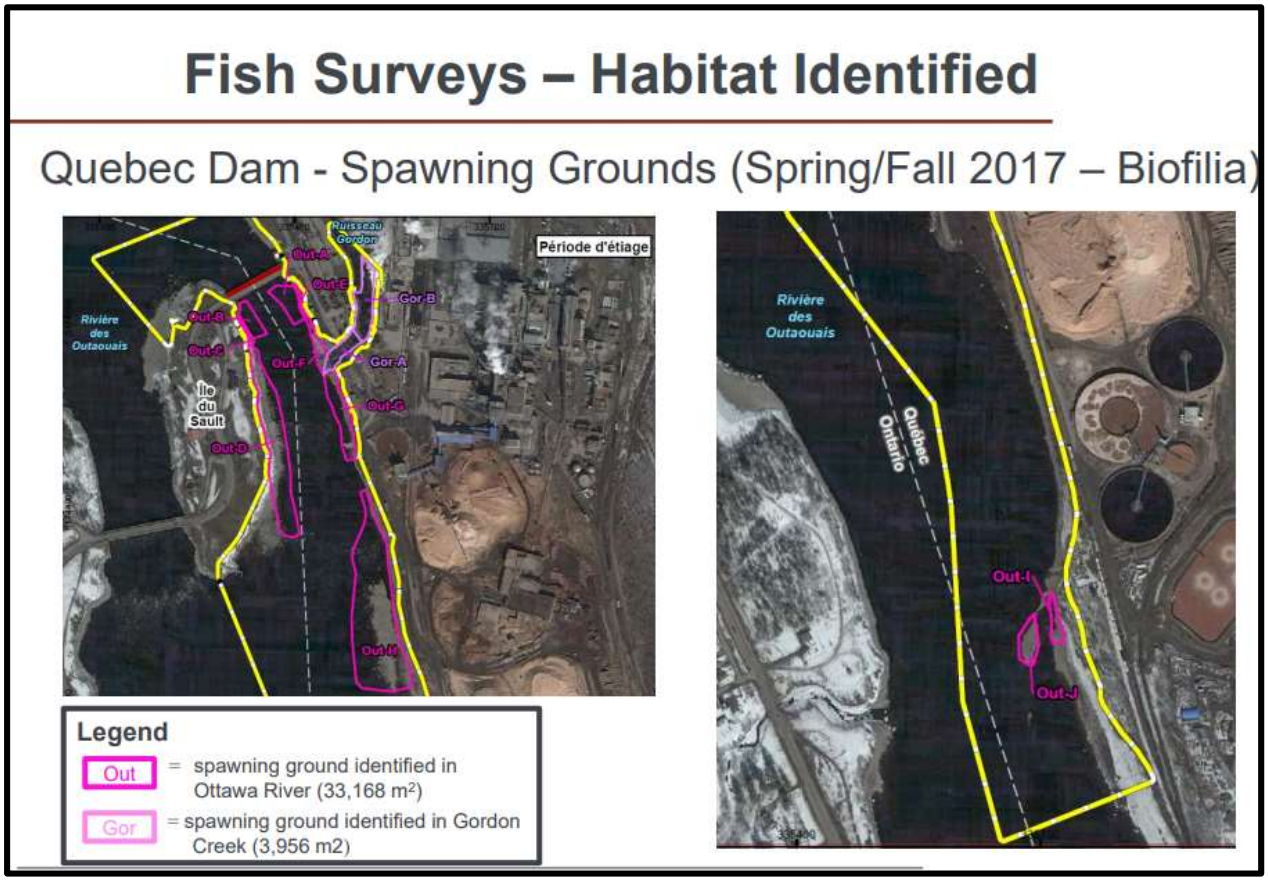


Figure 53: 2017 Spring Fish Surveys
(http://www.tanakiwin.com/wp-system/uploads/2021/06/Presentation_PSPC_TQDR_AOO-Kick-Off-Session_Final_Website_20210513.pdf)

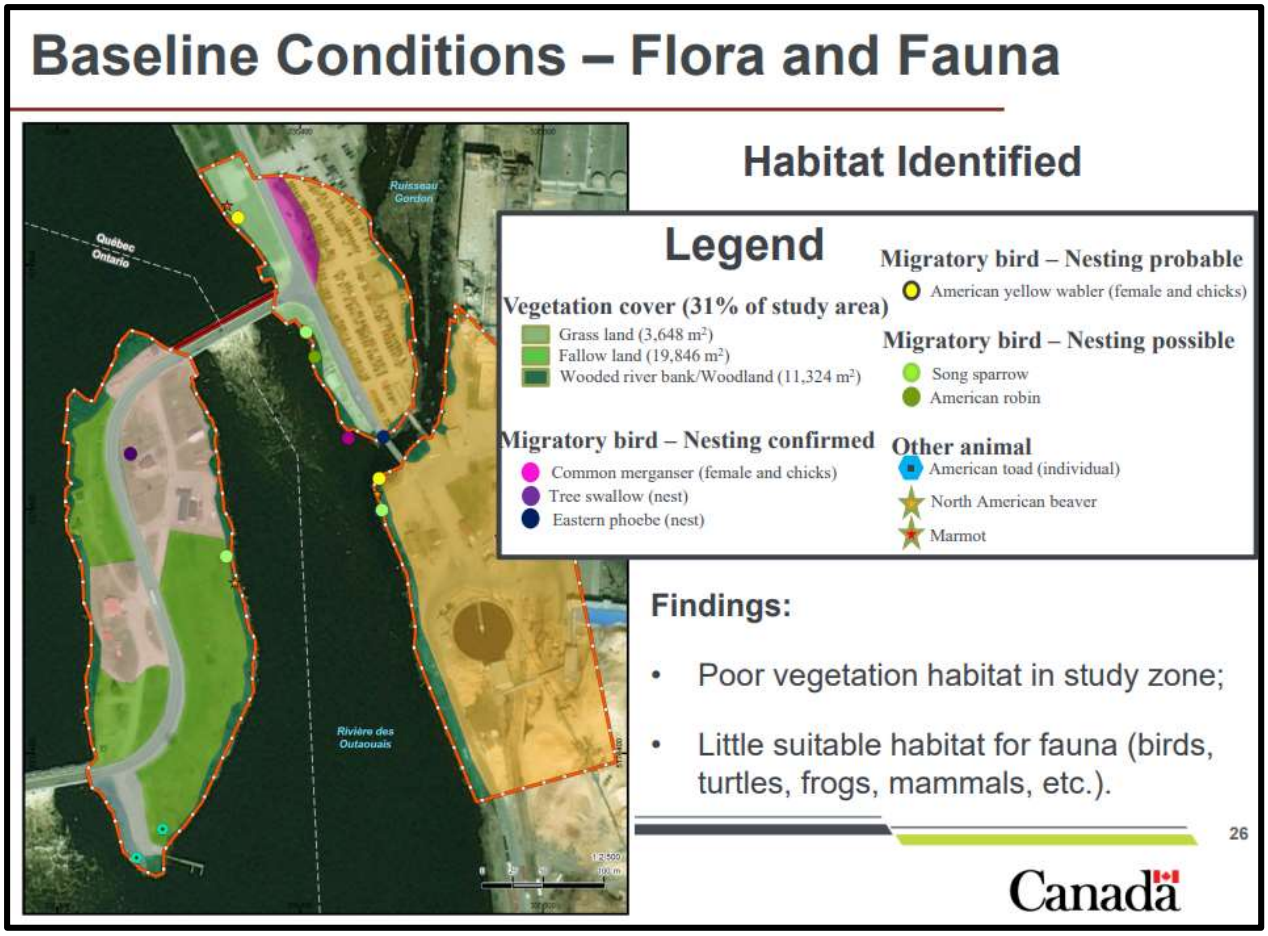


Figure 54: Flora and Fauna Baseline Conditions
(http://www.tanakiwin.com/wp-system/uploads/2021/06/Presentation_PSPC_TQDR_AOO-Kick-Off-Session_Final_Website_20210513.pdf)

Detailed inventory of vegetation, wildlife, fish and birds are provided in Chapter 12 of the Environmental Assessment (Tetra Tech 2023: Chapter 12). Figure 55 illustrates the study area detailing by number and colour depth, substrate, vegetation and spawning ground.

The Kitchi-sibi Technical Team (2022) confirms agreement with the previous assessments of the vegetation in the area, but adds their own Anishinaabe land use and classification report, as follows:

"Prior to the arrival of European settlers, Indigenous Peoples survived using food and materials that they had access to. Over 500 species of wild plants provided food and medicine for Indigenous Peoples in Canada (Turner, Arnason, Hebda and Johns 2012). Indigenous knowledge of plants was gained through years of learning, guided by elders and shared from generation to generation. Indigenous knowledge systems include the knowledge and perspective of our ancestors; and consist of large sets of observations about the past and current environment. Algonquin Anishinaabeg Peoples have been adding to our local Indigenous knowledge base for more than 10,000 years" (Kitch-sibi Technical Team 2022: 6).

The same vegetation report aligns "environmental indicators" to determine spawning season of Lake Sturgeon and suckers; pollution control, bird nesting seasons, etc. The environment provides key indicators for the Indigenous Peoples in understanding the resource, harvesting the resource and respecting the resource, as described here:

"Traditionally, our people relied on environmental indicators to estimate the timing of the Lake Sturgeon spawning season. The size of poplar leaves and monarch butterfly arrival on Anishinaabeg territory from mid May to late June is an indicator of the Sturgeon spawning season… Sucker spawning at Gordon Creek is generally correlated to the peak blooming of dandelion flowers. Cat tails present in the ecosystem produce fluff that is utilized by bird species to make nests. The cat tails also help to lower pollution rates by pulling sedimentation and contaminants from the surrounding water around them… Fish and macroinvertebrates use the vegetation in riparian zones for cover from the hot sun and predatory organisms preying on them. The invertebrates will also eat vegetation that falls into the water bodies…" (ibid: 24-25).

1.4.6 Dates of Site Visit

The property visit was conducted on February 11th and 12th, 2023 under sunny skies. The purpose of the site visit was to ascertain if there were any marine resources visible above the water level or along the shorelines, and to determine if there had been modification of shorelines/banks.

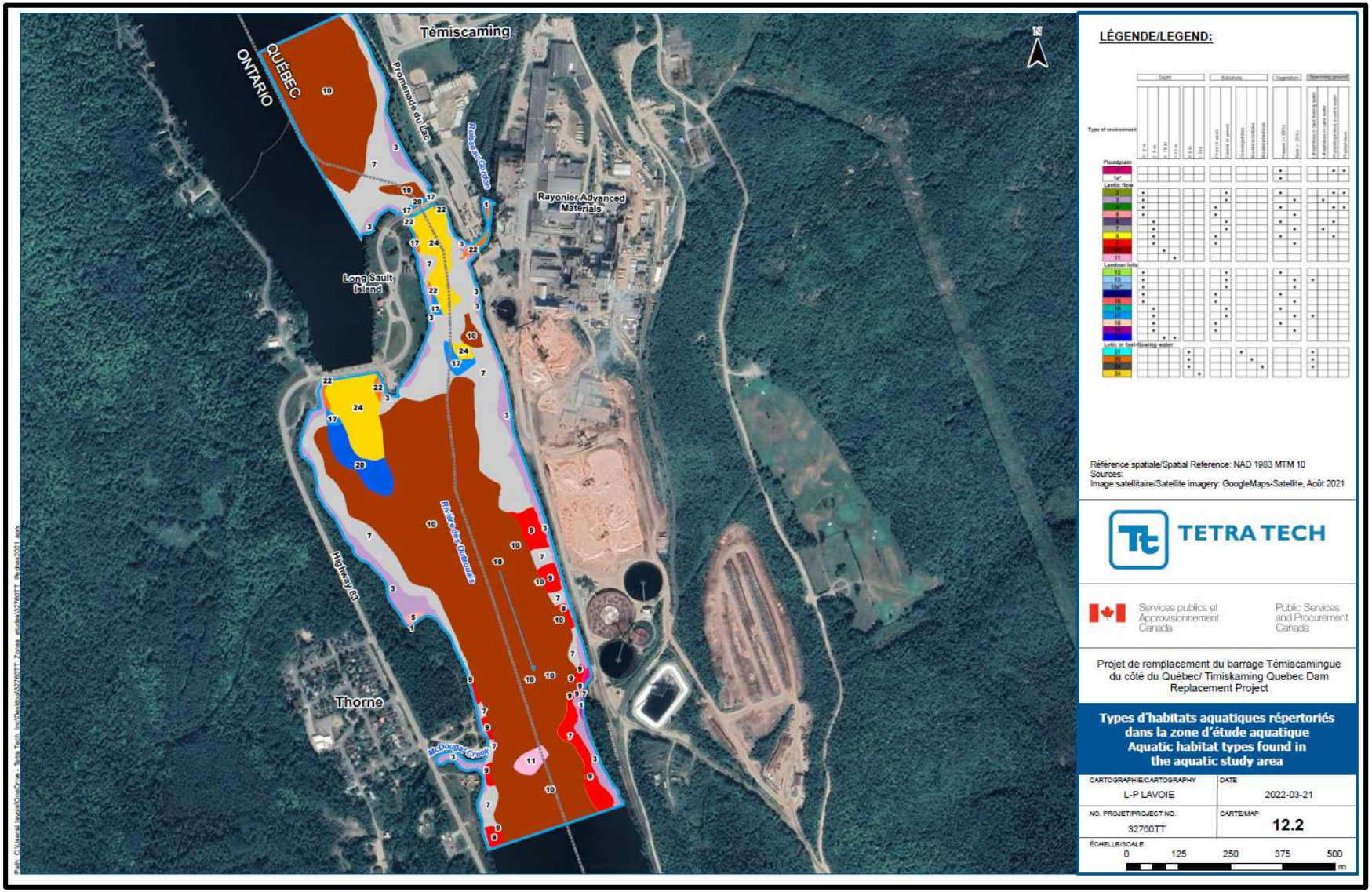


Figure 55: Aquatic Habitats
(Tetra Tech 2023: Figure 12.2)

2.0 METHODOLOGY

2.1 Background Research

As part of the background research, an examination of the following was conducted:

- The Site Registration Database (maintained by the Ontario Ministry of Citizenship and Multiculturalism) was examined for the presence of known archaeological sites in the project area and within a radius of 1 km of the project area by contacting the data coordinator of the Ministry of Citizenship and Multiculturalism;
- Reports of previous archaeological fieldwork within a radius of 50 m around the property were consulted;
- Topographic maps at 1:10 000 (recent and historical) or the most detailed map available were reviewed;
- Historic settlement maps such as the historic atlases were examined;
- Available archaeological management/master plans or archaeological potential mapping were consulted;
- Commemorative plaques or monuments were reviewed; and
- Any other avenues that assist in determining archaeological potential were examined.

2.2 Study Area Visit

The property visit was conducted February 11th and 12th, 2023 under sunny skies. There was snow coverage, but as the study area is underwater, this was of minimal consequence. The Ottawa River was open and ice free. The interface between the water surface and the shoreline was sufficiently free of snow to allow for observations of the type of shoreline and any possible modifications thereof. Photographs were taken of the study area from various aspects to capture the study area.

3.0 RESULTS

3.1 Background Research

The background research was comprehensive but failed to locate all of the blueprints or plans of either the early 1912 or the later 1934 dam. Sketch drawings were available of the former and one of the three page plans of the 1934 dam were located in the National Archives. Regardless, there is sufficient information accumulated from the background research to indicate that the study area does have marine archaeological potential.

The background research indicated that there is the potential for:

1) Locating parts of the cofferdam at the northwest end along the shoreline of the study area [Archéotec 2013 indicated the presence of "wood" at the shoreline in Area A, although there is no mapping to indicate exactly where in Area A this wood emerges from the shoreline];
2) The presence of an early dam in the area (historic records) as well as a foundation structure both on east and west side of Ottawa River – Quebec side of Long Sault Island;
3) Use of the area by Indigenous peoples for transportation;
4) Use of area by Indigenous people for resource exploitation (e.g., AOPFN Algonquin Knowledge Land Use Study indicates use of this area by their ancestors);
5) Use of area by early explorers, missionaries, fur traders and lumbermen;
6) Boats being hauled up through the rapids which may have resulted in occasional loss of goods and/or boat;
7) Two wharfs located upstream of the current dam indicating importance of the Long Sault rapids as a transportation route;
8) Possible cofferdam remains north of the current dam (bathymetry); and
9) Possible remnants of an early dam concrete sill south of downstream face of current dam (bathymetry).

The above constitutes sufficient evidence for the requirement of an in-field assessment of the study area.

3.2 Visual Inspection

There were no visible marine archaeological resources observed above the water line either upstream or downstream of the dam. The ruins of the foundation of the 1911/1912 dam on the Quebec side were observed (Image 2). There were no visible corresponding ruins observed on the Ontario side (on Long Sault Island). Background research has indicated that the dam manager informed Archéotec (2017b) that a portion of these remains have been incorporated into a service building, but this was not confirmed by visual observations by the consultant.

Although the banks of the river were mostly snow covered (from just above the shoreline to the sloped banks), the interface directly between the river and the shoreline were sufficiently free of snow coverage to ascertain that the shorelines had all been modified with rip rap material (large stones/rocks) and that it is unlikely that any of the original shoreline is in situ. Archéotec (2017b), who conducted the land archaeological assessment, included observations of the shoreline and also

indicated that the shorelines had been modified. Comparative examination of historic maps with more recent maps confirms that the shorelines have been altered from their original configuration in the 1880s.

In one instance, Archéotec in their 2017 archaeological investigations noted, but dismissed the importance of planks emerging from the bank in what they designated as Area A. In the February field visit, the north end of Area A, closest to the study area of this report, was subject to observations. There were no visible planks seen during the visit. As Archéotec (2017b) did not provide the exact location of these planks, these remnants may be located on the westerly side of the north point, outside the study area. However, another possibility also exists, if the water levels were higher in the February 2023 property visit compared to the summer Archéotec investigations, the planks may have been submerged during the visit.

Image 2, and Image 24–Image 33 illustrate the study area as observed in February 2023. Image 2 illustrates the ruins of the early dam on the Quebec shoreline. Image 24 and Image 25 illustrate the east bank of the Ottawa River/Quebec side, with a modified shoreline, the ruins of the first dam, and the mouth of Gordon Creek. Image 27 and Image 33 illustrate the upstream and downstream sides of the study area, from approximately the center of the dam/bridge. Image 27 and Image 28 illustrate the west bank of the study area, downstream. Image 24–Image 26 illustrate the east bank of the study area, downstream. Image 30 and Image 31 illustrate the east bank of the study area, upstream and Image 33 and Image 34 illustrate the west bank, upstream. The latter two images also capture part of the area identified by Archéotec (2017b) as Area A. Although there were notes and an image (Image 23 in this report) of planks emerging from the shoreline, there was no indication of the same in this area during the study area visit.

Figure 1–Figure 3 illustrate the location of the study area. Figure 4 illustrates the development plan for the new dam. Figure 56 illustrates the images taken during the study area visit. Figure 58 illustrates the archaeological potential of the study area.

Image 24: East Bank of Ottawa River, Downstream facing SE



Image 25: Ruins of Early Dam, Gordon River and Downstream of Dam facing SE



Image 26: Quebec Side Ottawa River, Downstream, Dam Infrastructure facing ESE

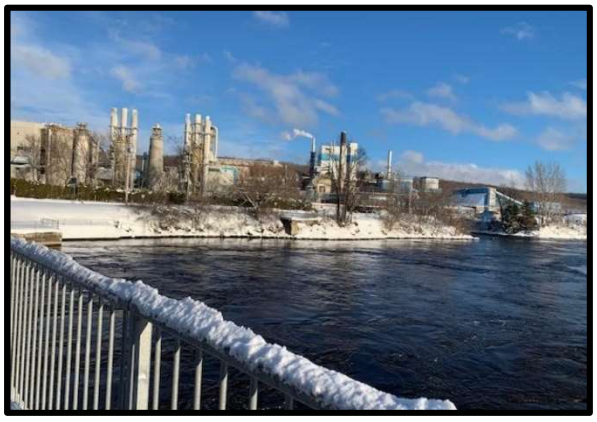


Image 27: Facing Downstream from Centre of Dam/Bridge



Image 28: Facing Downstream, Long Sault Island side of the Study Area



Image 29: Downstream Long Sault Island Side of Dam, Dam Infrastructure



Image 30: Upstream Side of Dam, facing North along East Side of Ottawa River



Image 31: NE side of the Study Area, facing NW, modified shoreline



Image 32: Facing NW from East side of Dam, Dam Infrastructure



Image 33: NW Side of Dam Facing NW (part of Archéotec's 2017 Area A), Dam Infrastructure

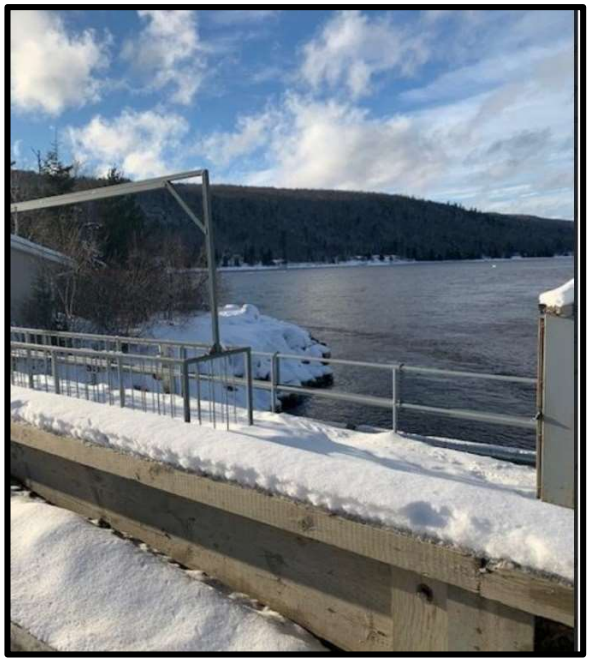


Image 34: Facing WNW from West Side of Dam, (part of Archéotec's 2017 Area A), close up of modified shoreline

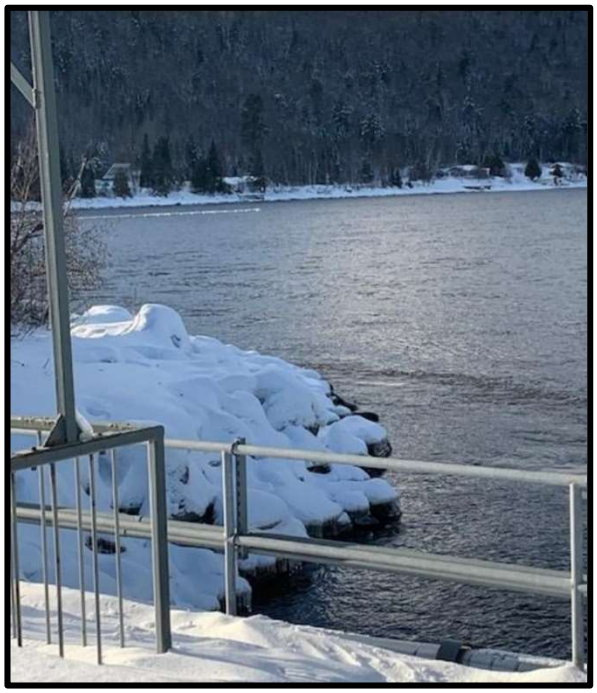




Figure 56: Site Visit Photographs (#24-34)

3.3 Inventory of Documentary Records Made In Field

Documents made in the field include:

- Daily record log and field notes – 1 page (double-sided);
- Image log – 1 page;
- Digital images – 19 colour images; and
- Field map showing location and orientation of images taken – 1 page.



Figure 57: Archaeological Potential of the Study Area

4.0 ANALYSIS AND CONCLUSIONS

The remains of part of the 1912 dam is located on land on the Quebec side of the shoreline. Although noted, its' recording/measurement is not part of the marine archaeological assessment, as it is located on land. Its presence, however, is important as it relates to the possibility of associated remains underwater. The corresponding land foundation occurs apparently on the Ontario side, and has been, allegedly, incorporated into a Service Building. Archéotec reported this possibility through an informant, the dam manager, but did not confirm this through observation. The Service Building is, however, in alignment with the opposite shore structure, so it may be a possibility.

Plans, photographs and drawings of the 1912 structure are included in this report. No detailed structural plans have become known despite an extensive search.

Plans, photographs and drawings of the 1934 dam structure are included in this report. As with the 1912 dam, no detailed structural plans have come to light despite an extensive search. Noted in the historic research is a plan consisting of three pages. Only one page, presented as Figure 24, was located during the background research. There were, however, some specifics regarding the construction of the dam, included within this report.

The 2017 Archéotec archaeological assessment located horizontal timbers, probably planks or boards, extending out from the shoreline at the north end of the island. Other than indicating they were found in Area A of their survey, the consultant did not provide a more detailed location for these timbers. The photograph provided in their report does show that these timbers extend along the shoreline, and are presumably part of the 1934 cofferdam, or alternatively are the remnants of a slab dock. An examination of the shoreline within the study area was made during the February visit but there was no evidence of exposed planks/boards in the limited area of shoreline on the northwest side of the study area. This may either reflect the absence of the same, or, the water depth may be deeper at this time of year than that observed by the consultant during August of 2017, and the boards might be present, but submerged and therefore not observable.

Bathymetry conducted in 2019 illustrates the possibility of cofferdam debris existing downstream of the current dam. This presents as areas of slightly higher contours on the bottom, appearing as two lines, one approximately 35 metres south of the downstream dam face separated by another line of material, approximately 100 metres south. Neither present as great height off the bottom and may be concrete sill remains, possibly from the cofferdam and/or early dam.

AOPFN Algonquin knowledge has identified ancestral fishing sites in the area, as well as historic campsites. Given that the Ontario side was reported dry in some seasons, it is possible that if a fish weir were a consideration by Indigenous people, it might be located on the Ontario side as the flow of water might not present as dangerous or as fast on the Quebec side. This is, however, without direct evidence, only speculation. It is also possible that during these dry episodes there would have been deeper pools wherein fish might have been trapped, and therefore, easier to harvest.

Historic records, photographs, engravings, etc. were used to determine if there were pre-1912 crossing structures in the area. From these records alone, there does not appear to have been any

earlier crossing structures. The island, however, might have been accessed, again, during the low water stages on the Ontario side, by canoe or even walking. It is unlikely that any archaeological evidence would manifest as tangible evidence of the same unless associated with a temporary campsite or processing station.

There is no historical evidence to indicate that there were any accidental or purposeful boat/ship incidents in the area, other than losing the Mattawan when winching her up the river. She was, however, recovered.

There may have been canoe spills, either Indigenous, or Euro-Canadian, but an underwater archaeological assessment would be necessary to make that determination. Unless trapped by rocks or crevices, given the high velocity of the Ottawa River, especially during times of flood, it is unlikely that any remains would still be in situ.

The area was active historically, with some boats riding the rapids, others being towed upstream, and then later others moved via tramway. This area was known historically, and prehistorically as an area of rapids on both sides of the island. Historic records indicate that there were ships built above the dam (at least one, quite possibly more), and that there were at least two wharves north of the dam and study area. Placement of piers and wharves away from rapids is a logical placement of marine infrastructure. Historic records also indicated that in some instances, boats were shipped into the area, in pieces, presumably to avoid the rapids.

Originally a tramway was built on a narrow gauge on the Quebec side to circumnavigate the rapids, and later, the railway facilitated movement of people and goods. There is one account of a traveler in this report that recounts his journey, which included travelling by canoe, unloading the canoe, transporting canoe contents at the other end, going back and bringing the canoe itself on land and around the rapids. This supports the Quebec side "portage". Archéotec has theorized that a similar portage might have existed on the island, but they found no evidence of such during the 2017 field investigation.

The banks of the Ottawa River and lower reaches of Lake Temiskaming that form the study area have undergone modification during the historic period. There may, however, still be evidence of original shoreline and/or marine infrastructure or Indigenous archaeological sites located in the undercut along the banks.

As this report is background research based only, no artifacts were documented, including thorough a review of past archaeological assessments in this area.

The study area is considered to exhibit marine archaeological potential for both possible Indigenous artifacts/sites and/or Euro-Canadian marine infrastructure, specifically related to the dam and early dam construction. It is unlikely that there will be any evidence of boats or boat mishaps in the area, as the force of the river flow and many episodes of extreme flooding, will likely have removed any possibility downstream and out of the study area.

5.0 RECOMMENDATIONS

Based on the background research and current conditions of the study area, the following is recommended:

1. That an in-water marine archaeological assessment be conducted by a licensed marine archaeologist that will include the following:
    a. A visual inspection of the underwater banks from a depth of zero to 3 metres, hand fanning and/or a trowel may be used to remove loose sediments to reveal possible *in situ* materials;
    b. Visual inspection of those parts of Area A (identified by Archéotec) within the study area to confirm or negate presence of planking emerging from the banks,
    c. Visual inspection of the sides of the scour pit for possible *in situ* remains and the examination tree trunks for possible modification for habitation and/or use as transportation (i.e., possible dug-out canoes);
    d. Side scan sonar survey be conducted for the entire study area allowing for detection of targets 50 cm or more in size, and being able to operate in depths of more than 2–3 metres;
    e. A visual survey using a remote operated vehicle and/or drop camera for areas that cannot be accessed using remote sensing;
    f. A magnetometer survey of areas (noting that some interference from the dam may prohibit coverage of the entire study area, especially adjacent to the dam);
    g. Analysis and cross-interpretation of side scan sonar and magnetometer results to identify targets and where possible assign value of low, medium or high archaeological potential;
    h. Ground truthing of targets with medium to high archaeological potential with the ROV and/or drop camera (depth dependent);
    i. Verification/evaluation of the archaeological resources identified during the field assessment with respect to their heritage value, and identifying those that will be directly or indirectly impacted by the proposed cofferdam and dam development;
    j. Provide a report detailing the methodology employed in the marine archaeological assessment, results, review of background research, description of located artifacts and a detail of the heritage value of the same; analysis and conclusions and recommendations for further work, mitigation, monitoring, etc. including for anomalies that could not be verified in the field; and
2. That no in-water construction work be conducted prior to the completion of the marine archaeological and with a regard to recommendations stemming from the marine archaeological assessment;
3. All marine archaeological in-water work shall be conducted once spawning and other natural in-water concerns have been accommodated. The Ministry of Natural Resources and Forestry typically provides a framework for scheduling of in-water work;
4. That First Nations, Indigenous communities, and the Métis be engaged during all remaining marine archaeological work and reporting; and
5. Compliance legislation must be adhered to in the event of discovery of deeply buried cultural material or features.

6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

According to the 2011 *S&Gs* (Section 7.5.9) the following must be stated within this report:

This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the Ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Should previously undocumented archaeological resources be discovered, they may be an archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of *the Ontario Heritage Act*.

The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

7.0 BIBLIOGRAPHY AND SOURCES

Amos, A.
1919 Water Power Policies of the Quebec Government, in *The Canadian Engineer, An Engineering Weekly*, Volume 37 (August 21, 1919).

Arbour, C.
2020 *Assessing inputs of contaminants in the Upper Ottawa River near the Town of Témiscaming, Québec*. A thesis submitted in partial fulfillment of the requirements for the degree pf Master of Environmental Science in the School of Graduate studies. Nipissing University. April 2020.

Archéotec Inc.
1998 *Centrale Tabaret Étude de potential archéologique, Abitibi-Témiscamingue*.
1999 *Remise en éetat des ouvrages de l'aménagement des Rapides-des-Quinze, étude du potentiel archéologique Réservoir des Quinze Abitibi-Témiscaminque.*
2008 *Inventaires archéologiques (été 2002).* Direction de l'Abitibi-Témiscamingue, Ministère des Transports du Québec. Rouyn-Noranda.
2017a *Timiskaming Dam Complex: Québec dam replacement. Archaeological Potential assessment*. On file with Tetra Tech.
2017b *Timiskaming Dams, Quebec Dam Replacement, Archaeological Evaluation, Phase II, Archaeological Intervention 2017*. On file with Tetra Tech.

Bent, A.L.
1996 An improved source mechanism for the 1935 Timiskaming, Quebec earthquake from regional waveforms. In *Pure and Applied Geophysics*, Volume 146, p. 5–20.

Bennett, R.B.
1933 *Correspondence to Mr. John A. Macdonald, Gorman Construction Company, May 8th, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, pages 357125–357139, R.B. Bennett Papers.

Benton-Banai, E.
1979 *The Mishomis book: The voice of the Ojibway*. University of Minnesota Press, Minneapolis.

Biofilia/BBA (Biofilia)
2018 *Timiskaming Dam-Bridge of Quebec Replacement. Environmental Impact Assessment – Biological Environment.* Report prepared for Tetra Tech. 124 p.+ appendices.

Boudreau, R.
1933 *Memorandum for the Honourable The Minister: historical summary, affected businesses/communities; reconstruction; plans for reconstruction; cofferdam and dewatering; proceeding with existing tenders; December 29, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357084, R.B. Bennett Papers.

Burley, D.V., G.A. Horsfall and J. Brandon
1992 *Structural Considerations of Métis Ethnicity: An Archaeological, Architectural, and Historical Study*. Vermillion, SD: University of South Dakota Press.

Cadieux, D.
1993 "L'Abitibi et la route du cuivre," pp. 189–204. *Traces du passé, images du présent: Anthropologie amérindienne du Moyen-Nord québécois*. Cégep-Éditeur. Marc Côté and Gaétan Lessard, Rouyn-Noranda.

Cameron, H.M.
1933 *Memorandum for Deputy Minister from H.M. Cameron, Chief Engineer, October 15, 1933*. Details difficulties of businesses regarding lack of water storage/dam on Quebec site; speaks to increased cost if further delays ensure. Public Archives of Canada, MG26-K, tile p. 350-T, 1933-34, reel M-1286, page 357091–357093, R.B. Bennett papers.

Canada
2012 *Canadian Environmental Assessment Act*. Government of Canada.

Chenier, A.
1980 *Historical Notes on Témiscamingue*. Ville-Marie, Témiscamingue Historical Society, 2nd edition.

Chignecto Research
2006 *Aboriginal Use and Occupancy Report*. Long Sault Island for Sault Island in Poitras and Wyse Townships, Ontario. Prepared for Public Works and Government Services Canada.

Commission de toponymie
1996 *Noms et lieux du Québec*, Dictionnaire illustré, Quebec.

CÔTÉ, M.
1993 "Préhistoire de l'Abitibi-Témiscamingue." *Recherches amérindiennes au Québec*, vol. 23 (2-3), pp. 5–24.
2006 "L'occupation amérindienne au Témiscamingue: l'exemple du lieu historique national du Canada du Fort-Témiscamingue (Obadjiwan), une présence multimillénaire." *Recherches amérindiennes au Québec*, vol. 36 (1), pp. 7–22.

Department of Energy
1975 *Topographic Map 31L/11*, edition 3. Mines and Resources, Surveys and Mapping Branch, Ottawa. 1:50,000.

Department of Public Works
1932 *Re: Timiskaming Dams Showing the relative position of the tenders*. Public Archives of Canada, MG26-K, file P-350-T, 1933-34, reel M-1286, R.B. Bennett Papers. Pages 357069–357072.

Doughty, M., N. Eyles and L. Daurio
2010 *Ongoing Neotectonic Activity in the Timiskaming-Kipawa Area of Ontario and Québec*. Accessed online at https://journals.lib.unb.ca/index.php/gc/article/view/18397/19865.

Dumais, P.T.
1890 *Plan d'une partie du Canton Gendreau Comté Pontiac, Province de Québec, Mar 1890*. PTC Dumais, PL01G017 Greffe de l'arpenteur general, ministère des Resources naturelles.

Ellis, R.W.
1901 Ancient Channels of the Ottawa River, reprinted from *The Ottawa Naturalist*, Volume XV, No. 1 pp. 17–30.

Gaudet-Breault, J.
1981 *Temi Kami "deep waters"*. Val d'Or, Témiscamingue Historical Society, 1981. 90 p.

GHD
2017 *Reconnaissance des sols et caractérisation environnementale préliminaire – replacement du barrage Témiscamingue, Témiscaming, Québec,* 11133230, A1, rapport n°1, septembre 2017.

Government of Canada
2012 Canadian Environmental Assessment Act.

Government of Ontario
1990a *The Ontario Heritage Act R.S.O. 1990.* Ontario Regulation 9/06, made under the Ontario Heritage Act. Criteria for Determining Cultural Heritage Value or Interest. Queen's Printer, Toronto.
1990b *The Environmental Assessment Act. R.S.O. 1990, C. E18*.

Hodgson, E.A.
1936a Preliminary report of the earthquake of November 1, 1935. *Earthquake Notes*, Volume 7, No. 4: 1–4.
1936b The Timiskaming earthquake of November 1st, 1925. The location of epicentre and determination of focal depth. *Royal Astronomical Society of Canada Journal*, Volume 30 No. 4: 113–123.

Haxton, T. and D. Chubbuck
2002 *Review of the historical and existing natural environment and resource uses on the Ottawa River.* Ontario Ministry of Natural Resources Division, Science and Information Branch, Southcentral Science and Information Section, SCSI Technical Report #119, 76 p.

Hodgetts, L., K. Supernant, N. Lyons, and J.R. Welch.
2020 Broadening #MeToo: Tracking Dynamics in Canadian Archaeology Through a Survey on Experiences Within the Discipline. *Canadian Journal of Archaeology* 44(1): 20–47.

Holden, O.
1933 *Correspondence to J. St. Laurent, District Engineer, Department of Public Works to O. Holden, Assistant Hydraulic Engineer, Hydro Electric Power Commission of Ontario – comments re: reconstruction plans for 1934 dam. December 20, 1933*. Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, R.B. Bennett papers, pages 357117–357118.

Hunter, J.B.
1933 *Correspondence to The Secretary of the Treasury Board, requesting sums of $70,000, October 17, 1933*. Public Archives of Canada, MG26-K, tile p. 350-T, 1933-34, reel M-1286, pages 357094–359576, R.B. Bennett papers.

Jones, Gwyneth C.D.
1999 *Historical Populations of Mixed Aboriginal/non-Aboriginal Ancestry in Ontario, Mattawa and Environs.* Prepared for the Ontario Ministry of Natural Resources.

Kinickinick Heritage Consulting (KHC)
2014 *A Review of the Cultural Heritage Documentation of the Temiskaming Ontario Dam Replacement*. Conducted for the Algonquins of Ontario.

Kitchi-Sibi Technical Team
2022 *Vegetation Study Report.* Study for the Timiskaming Dam-Quebec Replacement Project.

Lefebvre, O.
1933 *Correspondence to J. St. Laurent, District Engineer, Public Works from O. Lefebvre, Quebec Streams Commission, Quebec re: new plans for dam reconstruction, December 20th, 1933*. Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, R.B. Bennett papers, 357115–357116.

Lower, A.R.M.
1938 *The North American Assault On The Canadian Forest, A History Of The Lumber Trade Between Canada And The United States.* The Ryerson Press, Toronto.

Macdonald, J.
1933a *Correspondence to Prime Minister Bennett, January 17th, 1933 re: Timiskaming Dam, dam tenders*. Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, R.B. Bennett papers.
1933b *Correspondence to Mr. Merriam regarding withdrawal of tenders. February 10, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357061–357064, R.B. Bennett papers.
1933c *Correspondence to Prime Minister Bennet, March 31, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357073–357074, R.B. Bennett Papers.
1933d *Correspondence to Hon. H.A. Stewart, MP, House of Commons re: Gorman Construction Company and its bid to build the dam, April 1st, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357073–357074, R.B. Bennett Papers.
1933e *Correspondence to Prime Minister Bennet, April 21st, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357079, R.B. Bennett Papers.
1933f *Correspondence to Prime Minister Bennet, no date, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357083, R.B. Bennett Papers.
1933g *Correspondence to Hon. H.A. Stewart, Minister of Public Works, May 9th, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357086–357090, R.B. Bennett Papers.
1933h *Memorandum of Facts to Hon. R.B. Bennett, Prime Minister, from Macdonald pleading for acceptance of T.C. Gormon Construction Companys tender, Nov 21, 1933*. Public Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357101–357110, R.B. Bennett Papers.
1933i *Correspondence to Prime Minister Bennett from Macdonald re: reconstruction of the dam and dewatering, December 21, 1933*. Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357152–357154.
1933j *Correspondence to Prime Minister Bennett from Macdonald re: timber required for cofferdam, December 28, 1933*. Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357160–357161.

MacLean, A.D.
1933 *Correspondence to Harold H. Williams regarding acknowledgement of suggestion re: dam footings*. Archives of Canada, MG26-K, file P.230-T, 1933-34, reel M01286, page 357064.

McMaster, G.
2021 *Archaeology can play a powerful role for Indigenous rights.* Accessed online at: https://troymedia.com/education/archeology-can-play-a-powerful-role-for-indigenous-rights/.

MacPherson, J.T.
1930 *An Ethnological Study of the Abitibi Indians.* Ojibway Cree Resource Centre, Timmins, Ontario, 206 p.

Métis Nation of Ontario
2021 Métis Nation of Ontario Website: https://www.Métisnation.org/governance/governing-structure/.

Mistras
2016 Submarine videos.

Ministry of Citizenship and Multiculturalism (MCM)
2011 *Standards and Guidelines for Consulting Archaeologists*. Ministry of Citizenship and Multiculturalism.
2023 *Archaeological Data Base Files*. Ministry of Citizenship and Multiculturalism. Communication with Data Co-orindator Robert von Bitter, February 8th, 2023. Via email.

Moore, K.A.
1982 *Kipawa: Portrait of a People.* Highway Book Shop, Cobalt (Ontario).

Morse, E. W.
1979 CANADA, and PARKS CANADA. 1979. *Fur Trade Canoe Routes of Canada / Then and Now.* University of Toronto Press, Toronto, 124 p.

Mitchell, E.A.
1977 *Fort Temiskaming and the Fur Trade.* University of Toronto Press, Toronto.

National Archives Collection
2023 *Watercolour by Oblate Priest, Father Paradis of steamer Mattawan, 1882*. NAC #C13814.

Nelles, H.V.
1974 *The Politics of Development: Forests, Mines & Hydro Electric Power in Ontario, 1849-1941.* Macmillan of Canada, Toronto.

No Author
1881a "An Interesting Pastoral Tours, The Bishop of Ottawa in the Far North", in *The Catholic Record*, Volume 3, No. 154 (September 23, 1881), London, Ontario.
1881b "Church Chimes", in *The Catholic Record*, Volume 1, No. 6 (October 1881), London, Ontario.
1882 Lettre D'Un Missionaire" in "*L'Opinion Publique, Journal Hebdomadaire Illustre",* Volume XIII, No. 28 (July 13, 1882).

1882 "Lettre D'Un Missionaire" in"*L'Opinion Publique, Journal Hebdomadaire Illustre"*, Volume XIII, No. 29 (July 20, 1882).
1882 "Vue sure le village de Mattawan," "Tete des Rapides du Long-Sault", in "*L'Opinion Publique, Journal Hebdomadaire Illustre"*, Volume XIII, No. 44 (November 2, 1882).
1882 *Voyage au lac Abbitibi on Visite pastorale de Mgr. J. Th. Duhamel, danas le haut de l'Ottawa.* Montreal.
1885 *Au Lac Temiskaming!* Société du Colonisation du Lac Temiskaming, Sous le haut patronage du Nos Seigneurs les Eveques d'Ottawa et de Pontiac. Ottawa.
1897 *The Nipissing District and the Town of North Bay.* Board of Trade, North Bay, Ontario.
1898 *Illustrated And Descriptive Work Of Many Popular Canadian Summer Resorts And Historic Points.* Balmoral Castle Hotel, Montreal.
1912 The Temiskaming Dam in *The Canadian Engineer: An Engineering Weekly*, Volume 22. June 20th, pp. 809–814.
1933a *Correspondence to Mr. John A. Macdonald, T.C. Gorman Construction Co., re: difficult to justify proceeding with project, April 7, 1933*. Public Archives of Canada, MG26-K, tile p. 350-T, 1933-34, reel M-1286, page 357076, R.B. Bennett papers.
1933b *Memorandum regarding meeting for Quebec Dam, November 6, 1933*. Public Archives of Canada, MG26-K, tile p. 350-T, 1933-34, reel M-1286, page 357097–357098, R.B. Bennett papers.
1933c *Memorandum of Quebec Side; report by Committee of Engineers, Public Works Department, November 15, 1933*. Public Archives of Canada, MG26-K, tile p. 350-T, 1933-34, reel M-1286, page 357099–357100, R.B. Bennett papers.
n.d. *Upper Canada and the First Nations, 1780s*. Accessed online at: www.canata.ca.

OHP (Ontario's Historic Plaques)
2023 *Ontario's Historic Plaques*. Accessed online at: http://www.ontarioplaques.com/.

OHT (Ontario Heritage Trust)
2023 *Ontario Heritage Trust Plaque Guide.* Accessed online at: http://www.heritagetrust.on.ca/.

Odonaterra
2021 *Antoine Nation Algonquin Knowledge and Land Use Study for the Temiskaming Quebec Dam Replacement Project*.

Pelletier, M.L.
2014 *Histoire des chemins de fer du Québec*. Québec, Les Éditions GID.

Pimadjowowan, O.
2009 *An Historical Summary of the Algonquin People of Pikwakanagan.* Accessed online at: www.thealgonquinway.ca.

Public Works
1909 Dam Construction Drawing. *Plan Showing land required for Timiskaming Regulation Works.* Scale 100' = 1 inch. Public Works, Canada. Ontario Ministry of Natural Resources and Forestry. Officer of the Surveyor General, Plan No. 28790.

1933 *Referring to Plan No. 2577, Tender for the re-construction of the Quebec side of the Timiskaming Dam*. Public Archives of Canada, MG26-K, tile p. 350-T, 1933-34, reel M-1286, page 357121–357124, R.B. Bennett papers.

Rattelle, M.
1993 *Description sommaire des groupes autochtones avoisinant Kipawa de 1615 à nos jours*. Ministère de l'Énergie et des Resources, Coll. Les études autochtones, Québec.

Richard, P., J.J. Veillette et A. Larouche
1989 Palynostratigraphie et chronologiedu retrait glaciaire au Témiscamingue : évaluation des âges 14C et implications paléoenvironnementales. *Canadian Journal of Earth Sciences,* vol. 26: 627–641.

Riopel, M.
1991 *Sur les traces des Robes noires au Témiscamingue.* Société d'histoire du Témiscamingue, Ville-Marie, 64 p.
2002 *Le Témiscamingue: son histoire et ses habitants.* Les Éditions Fidès, Montréal
2002 *Navigation on Lake Timiskaming and the Lumsden Steamboat Line Company, 1882-1926.* Through Time Enr., Hudson.

Rogers, E.S. and D.B. Smith
1994 *Aboriginal Ontario.* Dundurn Press Limited, Toronto.

Rorke, L.V.
1911 *Untitled.* Sketch map of dam Ontario side and rapids. Scale 5 chains to 1 inch. Ministry of Natural Resources and Forestry, Office of the Surveyor General, Plan No. 28789.

Roark-Calnek, Sue
2013 *Cultural Impacts Assessment*. Document prepared for Wolf Lake First Nation and Eagle Village First Nation-Kipawa, Quebec.

Ruggles, R.I.
1991 *A country so interesting. The Hudson's Bay Company and Two Centuries of Mapping,* 1670–1870. McGill - Queen's University Press.

Scarlett Janusas Archaeology Inc. (SJAI)
2013a *Stage 1 Archaeological Assessment, Timiskaming Ontario Dam Replacement, Part of Long Sault Island and West Shoreline Ottawa River, Township of Poitras, District of Nipissing*. PIF #P027-211-2013. SJAI.
2013b *Stage 2 Archaeological Assessment, Timiskaming Ontario Dam Replacement, Part of Long Sault Island and West Shoreline of Ottawa River, Township of Poitras, District of Nipissing*, Original Report. PIF #P027-0234-2013. SJAI.
2015 *Marine Archaeological Assessment, Timiskaming Ontario Dam Replacement, Poitras Township, District of Nipissing, Ontario.* License 2014-012. SJAI.

Sessional Papers
1886 Appendix 6, Reports of Messrs. H.F. Perley and Thos. Guerin, As To The Works Respecting Which Application Has Been Made, On the River Ottawa and Lake Temiscamingue, Together With The Memorandum Of The Rev. Fater Paradis, O.M.I., March 18, 1885, Ottawa.

Services publics et Approvisionnement Canada (SPAC)
2022 *Environmental Impact Statement. Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec)*. Services publics et Approvisionnement Canada, Ottawa.

Speck, F.G.
1915 Family Hunting Territories and Social Life of Various Algonkian Bands of the Ottawa Valley. Geological Survey, *Department of Mines Memoir 70***,** Anthropological Series No. 8, Ottawa.
1915 Myths and Folk-Lore of the Timiskaming Algonquin and Timagami Ojibwa. *Geological Survey, Department of Mines Memoir 71*, Anthropological Series No. 9, Ottawa.

St. Denis, H.
2009 Fish Out of Water (TV Interview) Aboriginal Peoples Television Network Series. InterINDigital Entertainment (Ottawa Ontario) Joe Media Group (Calgary Alberta).

Supernant, K.
2017 *Mapping Métis Cultural Landscapes: Using GIS and archaeology to understand Métis history in western Canada.* A talk by Dr. K. Supernant at the University of Saskatchewan: College of Arts and Science.
2018 *Archaeology of the Métis.* Accessed online at: https://doi.org/10.1093/oxfordhb/9780199935413.013.70.
2020 Archaeological Pedagogy, Indigenous Histories, and Reconciliation in Canada. *Journal of Archaeological Education* 4(3): 1–22.

Surtees, R.J.
1992 *The Northern Connection. Ontario Northland Since 1902*. Captus Press, North York, Ontario.

Tatley, R.
1996 *Northern Steamboats, Timiskaming, Nipissing & Abitibi.* The Boston Mills Press, Erin, Ontario.

Taylor, B.W.
1993 *The Age of Steam on Lake Temiskaming*. Cobalt, Highway Book Shop, 1993. 155 p.

Témiscaming, Q.
1996 *Témiscaming, 1921-1996.* Ville Témiscaming, Témiscaming, Québec O–CLC : 36839646. Book Committee.

Tetra Tech QI inc.

2023 *Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec), Environmental Impact Statement.* Prepared for Public Service and Procurement Canada

Thomson, D.W.
1966 *Men and Meridians, The History of Surveying and Mapping in Canada.* Volume 1, Prior to 1867. Department of Mines & Technical Surveys, Ottawa.

The Algoma Missionary News
1890 Description of Anglican Bishop's Visit to Temiskaming. *Algoma Missionary News***.**

The Canadian Engineer
1912 The Temiskaming Dam. *The Canadian Engineer; an Engineering Weekly*. Volume 22, June 1912. Pp. 809–814.
1913 Coast to Coast, Ottawa, Ont. *The Canadian Engineer; an Engineering Weekly*. Volume 25, No. 14, page 543.

Viau, R.
1995 "L'autopsie d'un contact: 1600-1900." *Histoire de l'Abitibi-Témiscamingue***,** pp. 123–60. Institut québécois de recherche sur la culture. Québec.

Veillette, J.J.
1996 Géomorphologie et géologie du Quaternaire du Témiscamingue, Québec et Ontario. *Commission géologique du Canada, Bulletin 476***,** Ottawa.

WSP
2019 *Bathymetric Mapping of the Ontario and Quebec Timiskaming Dams.* On file with Tetra Tech.

On-line and Archival Sources

Project Background. Accessed online at: https://www.tpsgc-pwgsc.gc.ca/biens-property/pdb-bdd/timiskaming-eng.html#s1.

Elevation Map of Temiscaming Quebec. Accessed online at: https://en-us.topographic-map.com/map-v75v51/Beauch%C3%AAne/?center=46.7111%2C-79.09768&zoom=16.

Canadian Heritage Rivers. Accessed online at: https://chrs.ca/en/rivers/ottawa-river.

Algonquin Canoe Company (ACC)
2023 *Algonquin Canoe Company.* Accessed online at: http://www.algonquincanoe.com/.

Algonquins of Greater Golden Lake
2023 Algonquins of Greater Golden Lake. Accessed online at: https://algonquinsofgreatergoldenlakefirstnation.ca/about/Algonquin Nation Secretariat. 2001.

Algonquins of Ontario (AOO). Accessed online at: http://www.tanakiwin.com/our-treaty-negotiations/agreement-in-principle/.

Ryam

Temiscaming Plant. Accessed online at: https://ryam.com/operations/facilities/temiscaming/.

Temiskaming. Accessed online at: https://www.thecanadianencyclopedia.ca/en/article/temiscaming.

Epicentre of 1935 Earthquake. Accessed online at: https://seismescanada.rncan.gc.ca/historic-historique/events/19351101-en.php.

Quebec Archives. Accessed online at: https://numerique.banq.qc.ca/aucunresultat.

RG2, Privy Council Office, Series A-1-a, "Dam on the Ottawa River at foot of Lake Temiscamingue under contract with Kirby and Stewart – payt [payment] to contractors actual cost of cofferdamming and unwatering necessary to complete dam across the Quebec Channel and agreement to continue concrete, 1911/01/24

[Public Works – Temiskaming Dam] Bennett, Richard Bedford Public Works – Temiskaming Dam 1933-1934, MG26-K, Microfilm reel number: M-1286

[Public Works – Temiskaming Dam] Bennett, Richard Bedford Public Works – Temiskaming Dam 1935, MG26-K, Microfilm reel number: M-1286

Department of Public Works – Temiskaming Dam, R182, Volume number: 5691, File number: 1224-104, File part:5, 1938-1939

Department of Public Works – Lake Temiskaming Dam, 1949-1950; R182, Volume number: 5691, File number: 1224-104, File part: 7

Department of Public Works – Lake Temiskaming Dam, Department of Public Works – Photographic Record – Temiskaming Dam Reconstruction, 1934, R182, Volume Number 5691, File number: 1224-104, File part: 6

Department of Public Works – Lake Temiskaming Dam, 1932, R182, Volume Number 5691, File number: 1224-104, File part 1

Department of Public Works – Lake Temiskaming – dam, 1934, R182, Volume Number 5690, File number: 1224-104, File part: 2

Department of Public Works – Temiskaming Dam, Temiskaming Ontario – Specification for Repairs to the Concrete Piers and Gains on the Ontario Dam; 1941, R182, Volume Number 5692, File number: 1224-104, File part: 1

Department of Public Works – Temiskaming dam, maintenance of, 1934/0201934/04, RG13-A-2, Volume Number 398, File number: 1934-303

UN (United Nations). 2008. United Nations Declaration on the Rights of Indigenous Peoples. 18 pp. http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf

APPENDIX M – ARCHEOLOGY STUDIES

M-2: Marine Archeology Assessment - Task 2

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Marine Archaeological Assessment
Task 2
Timiskaming Dam-Bridge of Quebec
Replacement Project (Quebec) (715-32760TT)
Intersection of Lake Temiskaming and the Ottawa River
Straddling Border of Québec and Ontario

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ARA File #2022-0574

12/01/2024

Original Report

ACKNOWLEDGEMENT

The following has been adapted from the Assembly of First Nations and demonstrates the importance of water for Indigenous communities (https://www.afn.ca/honoring-water/):

Archaeological Research Associates recognizes the importance of water for Indigenous communities in its many elements including but not limited to the shaping of the land, the rivers, lakes, ice and oceans. We recognize and acknowledge that the First Nations peoples of North America have a special relationship with water, built on their subsistence ways of life that extends back thousands of years. Traditional activities depend on water for transportation, drinking, cleaning, purification, and provides habitat for the plants and animals gathered as medicines and foods.

EXECUTIVE SUMMARY

Under a contract awarded in February of 2023, Archaeological Research Associates Ltd. (ARA) carried out the marine archaeological assessment for the in-water portion of the proposed Timiskaming Dam-Bridge of Quebec, Replacement Project (Quebec) (715-32760TT), which straddles the Ontario and Quebec provincial borders, and the water bodies of Lake Temiskaming and the Ottawa River. This report documents the marine archaeological in-water assessment of the study area and presents conclusions and recommendations pertaining to archaeological concerns.

The marine archaeological assessment was conducted on July 16th and 17th, 2023. The background research was completed under marine archaeological licence 2023-02 and in-water work adhered to the mandate of the Ministry of Natural Resource and Forestry (MNRF) regarding schedule to conduct in-water work. The in-water work was conducted under marine archaeological licence #2023-10 held by Scarlett Janusas. The marine archaeological assessment encompassed an area 50 metres north of the existing dam and an area south of the existing dam, south of Gordon Creek, on the east side of Long Sault Island. Legal permission to enter and conduct all necessary fieldwork activities within the study area was arranged by the proponent, and by an informal request to access areas by security at Rayonier. The bottom of the study area is under provincial jurisdiction. By way of the archaeological licence, permission from the province was also in place.

Based on the background research and property visit conducted under licence 2023-02, the following indicate that there is marine archaeological potential for the study area:

1) There are rapids in the area, and a history of much larger and longer rapids prior to the construction of the dam-bridges on both the Ontario and the Quebec sides;
2) There are several land-based archaeological assessments on the Quebec side of the Study area as well as on Long Sault Island, and a marine archaeological assessment for the Ontario Dam;
3) Indigenous people routinely travelled down Lake Temiskaming, and whether by portage or otherwise, continuing on to the Ottawa River, and the reverse journey as well;
4) Natural resources attractive to both Indigenous and Euro-Canadian peoples included fish, herptiles, birds, mammal and vegetation suitable as foodstuffs and for other types of activity (e.g. weaving mats, baskets, clothing, etc.);
5) There is the remnant of the early dam-bridge located on the east shore on land of the Ottawa River south of the dam-bridge;
6) There is a historically reported “lock” at the Gordon River outlet in 1882 (probably a flume);
7) The Ottawa River and Lake Temiskaming were routinely used by steamboat travel, but also by early European explorers, lumbermen, fur traders, and prior and concurrent with those activities, use of the two waterways by Indigenous peoples;
8) There were two wharves located north of the study area;
9) There was one reported ship built above the dam area;

10) There are reported possible cofferdam remains that were located during the 2017 archaeological land assessment at the north end of what was referred to as Area A (possibly within the study area) (to be field verified as exact location not provided by consultant);
11) Bathymetry of the study area shows possible remnants of a concrete sill and/or sheet piling;
12) The Ottawa River is a Canadian heritage river; and,
13) There have been early reports (circa 1880s) relating the marine history of the area.

Indigenous communities were invited to participate in the marine archaeological assessment. Due to the dangerous conditions and scheduling conflicts, none of the Indigenous communities participated directly in the in-water marine archaeological assessment. All communities were provided with a draft and final version of the in-water archaeological assessment report.

The in-water marine archaeological assessment was conducted on July 16th and 17th, under good overall conditions. When conditions deteriorated (thunderstorms) on the 17th, work was temporarily halted until the storm passed. The in-water marine archaeological assessment included side scan sonar survey, magnetometer survey (where magnetic interference was minimal), ground truthing with a remote operated vehicle (ROV), a video of all the shorelines at the three metre depth, in-water snorkel survey of all shorelines to a depth of three metres, photography and georeferencing of any significant or noteworthy finds/conditions.

For purposes of the snorkel survey, the study area was divided into five sections: northeast above the dam, northwest above the dam, southwest below the dam, southeast below the dam to Gordon Creek, and southeast below the dam and south of Gordon Creek to southernmost part of study area. The sluice gates were closed to allow for safety of personnel and equipment, however, flow was still significant in the middle of the channel leading to and away from the dam, and from the outflow of Gordon Creek. Additional safety measures (lines tied to snorkeler for safety) were taken to conduct the necessary in-water work.

Results from the side scan sonar survey and snorkel survey above the dam (Lake Temiskaming) indicated that the entire bottom was covered with rocks and boulders. The shoreline on the northeast shore had smaller rocks on shore, and these same rock types extended into the water, becoming boulder sized with depth. The shoreline on the northwest shore was lined with boulders and these also extended into the water. The southeast (north of Gordon Creek) and southwest sides were also lined with boulders above and below the water line. On the southeast side, below Gordon Creek, a more natural appearance, although still very stony, was observed. This was evidenced by remnants of drowned trees with roots still visible. Side scan sonar, as indicated above, with ground truthing, showed the entire bottom to be rock and boulder covered north of Gordon Creek, and very rocky south of Gordon Creek.

The snorkel survey of the southwest shoreline showed the shore to be lined with boulders on shore and to a depth of below three metres. There was evidence of concrete rubble and rounded logs. The latter were inspected for any signs of modification, but none were present. There were occasional pieces of random metal along the southwest submerged shoreline and are likely associated with the destruction of the early dam and/or the building of the second dam. The remnants of the old dam could be seen from the water facing upwards from the water, and this corresponded with the metal and concrete debris found in the water. Background research had

indicated that Archéotec had been informed that the remnants were in one of the outbuildings on Long Sault, but the marine archaeological assessment clearly shows the remnants as seen from the water facing west on the slope. These are considered land archaeological evidence and not documented in this assessment.

Snorkel survey along the northeast side north of Gordon Creek confirmed that the shoreline had also been modified with large boulders that extended to depths greater than three metres. In and around the area of the dam ruins on shore, the in-water observations were of a jumble of metal, concrete and rubble debris. South of the southern entrance of Gordon Creek, the snorkel team found evidence of a wooden crib located near the southernmost end of the study area.

The side scan sonar survey noted that presence of boulders, south of the dam apron. In addition, there was a large amount of concrete, metal and general construction debris (or debris from the destruction of the early dam and/or cofferdam) littered on the bottom and in the plunge pool.

Several Indigenous communities had requested that the plunge pool (indicated in the 2019 WSP bathymetry – see background research report) be investigated along the sides for possible exposed materials and also for materials that may have been relocated into the plunge pool by fast moving water. A ROV was used to ground truth the plunge pool and carry out these requests. According to bathymetry, the plunge pool was nine or more metres in depth. The plunge pool was observed during this marine archaeological assessment to be filled with car sized concrete rubble to the top and over the edge of the plunge pool. It was impossible to investigate the sides of the plunge pool due to its being infilled. It has been surmised that based on the 2019 bathymetry, that these large concrete pieces were deliberately put in this location to prevent further scouring below the dam sill after the bathymetry had been conducted in 2019. No record of this infilling has come to light as yet.

In addition, the 2019 WSP bathymetry, when reviewed in the background research report, appeared to present rows of possible posts across most of the width of the Ottawa River. Side scan sonar and ROV ground truthing determined that these were not posts, but in fact, apron concrete baffles, part of the dam construction used to dissipate flow and slow erosion.

The side scan sonar survey, magnetometer survey and ROV ground truthing found the crib on the south side of Gordon Creek, and towards the south of the study area along the southeast shore below the dam (same location as found by the snorkel team). Extending out from the mouth of Gordon Creek, a long (over 8 metres) I – shaped single piece (confirmed with the magnetometer to be metal) was located by forward looking sonar and magnetometer. As Gordon Creek had many bridges crossing it at this location, this may be a remnant of a rebuild.

The marine archaeological assessment tracked concrete and metal debris on both sides of the river below the dam in varying degrees. These are a product of the early dam failure and are not in situ and therefore of lesser significance. The crib below (south) Gordon Creek will not be impacted by the proposed cofferdam or rebuilt of the dam. The long I – shaped single piece is located south of the proposed cofferdam, and while it might be impacted, is not considered to be of cultural significance.

The sidescan sonar survey, magnetometer survey and snorkel survey are effective methods of capturing possible cultural resources, but each has its own limitations. Sidescan sonar survey was meant to capture targets that were 50 cms or more in size. Magnetometer was hampered by the large quantity of rebar and other metals in the area. And snorkel survey was limited to a depth of three metres. There may be cultural objects that could not be located using these methods. In addition, the bottom and shorelines have been modified for erosion control measures, and effectively eliminate any possibility of viewing the original river or lake bottom in the study area. If there are archaeological resources under these rocks/boulders, they cannot be identified with the current technology available.

A discussion was had prior to the in-water assessment with regards to the possibility of conducting pedestrian transect observations once the cofferdam had been established and the area dewatered. If the bottom had been unmodified, this may have been possible, but the presence of rocks/boulders and concrete on the bottom of both the lake and river bed in the study area have buried the original bottom and made it inaccessible. The proposal of a visual survey following dewatering is not possible with the current conditions of the study area.

Based on the background research, current conditions, and in-water geotechnical and snorkel survey of the study area, the following is recommended:

1. The crib located on the northeast shore south of Gordon Creek be mapped in detail should there be any possible impact from the dam/cofferdam development planned for the study area;
2. That a plan be in place for the construction of the cofferdam and dam to avoid any possible cultural materials and to cease construction should any cultural materials be located during the construction phase;
3. Compliance legislation must be adhered to in the event of discovery of deeply buried cultural material or features.

This archaeological assessment has been conducted under the 2011 *Standards and Guidelines for Consultant Archaeologists* reporting recommendations and using best practices of ARA (MCM 2011).

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1.0 PROJECT CONTEXT

1.1 Development Context

Under a contract awarded in February of 2023, Archaeological Research Associates Ltd. (ARA) carried out the marine archaeological assessment for the in-water portion of the proposed Timiskaming Dam-Bridge of Quebec, Replacement Project (Quebec) (715-32760TT), which straddles the Ontario and Quebec provincial borders, and the water bodies of Lake Temiskaming and the Ottawa River. The study area is 3.71 hectares in size, extending 50 metres north of the north face of the existing dam, and approximately 255 metres downstream of the downstream dam face (Figures 1 – 5).

Public Services and Procurement Canada required a marine archaeological assessment for the proposed bridge-dam replacement in-water area. An Ontario archaeological licence was required by the PSPC, rather than one from Quebec. The reasoning behind procuring the Ontario licence was that the border fell mid-dam, and also that the closest Indigenous community requested that an Ontario licence be procured rather than a Quebec licence, citing that regulatory requirements for Ontario reports was higher than those for Quebec licenses. PSPC, therefore, instructed ARA to acquire only an Ontario marine archaeological licence. The archaeological assessment was triggered by the Federal Canadian Environmental Assessment Act, 2012 (CEAA 2012).

There are three options for the Timiskaming Dam-Bridge of Quebec Replacement Project. Option 1 consists of building a new dam downstream of the existing dam (Figure 4). A cofferdam would be built approximately 70 metres downstream of the old dam, and upstream of Gordon Creek. This is the preferred option. Option 2 involves the construction of a new dam upstream of the existing dam and demolition of the existing dam (Figure 6). A cofferdam would be built upstream of the existing dam. Option 3 involves reconstruction of the dam on the same layout as the existing dam and demolition of the existing dam (Figure 7). The cofferdam would be built approximately 100 metres downstream of the old dam and upstream of Gordon Creek (Tetratech 2023: 6-2 to 6-7).

The Ontario and Québec dams are collectively known as the Timiskaming Dam Complex located approximately 65 kilometres northeast of North Bay, Ontario. One dam is located on the Ontario side, and the other dam is located on the Quebec side, separated by Long Sault Island on the Ottawa River. The original dam complex was constructed between 1909 and 1913. The Quebec dam was rebuilt, slightly north of the original dam placement, in the 1930s as a result of foundation failure. The current dam is the 1934 dam and will undergo replacement.

The Ministry of Citizenship and Multiculturalism (MCM) does not have Standards and Guidelines specific to marine archaeology. Therefore, this archaeological assessment has been adapted from the 2011 Standards and Guidelines for Consultant Archaeologists (MCM 2011) and best practices for marine archaeology formed by 40 plus years of experience by ARA and its associates.

Table 1 provides the center, western and eastern UTM coordinates for the project (Tetra Tech 2023: 4-1).

Table 1: Project UTM Coordinates

Point Location	UTM Zone	Easting	Northing
Centre	17	645181.81m E	5 174 859.18m N
West	17	645 120.44m E	5 174 823.78m N
East	17	645 243.18m E	5 174 859.18m N

The marine archaeological assessment was conducted on July 16th and 17th, 2023. The background research was completed under marine archaeological licence 2023-02 and in-water work adhered to the mandate of the Ministry of Natural Resource and Forestry (MNRF) regarding schedule to conduct in-water work. The in-water work was conducted under marine archaeological licence #2023-10 held by Scarlett Janusas.

This report documents the marine archaeological in-water assessment of the study area and presents conclusions and recommendations pertaining to archaeological concerns.

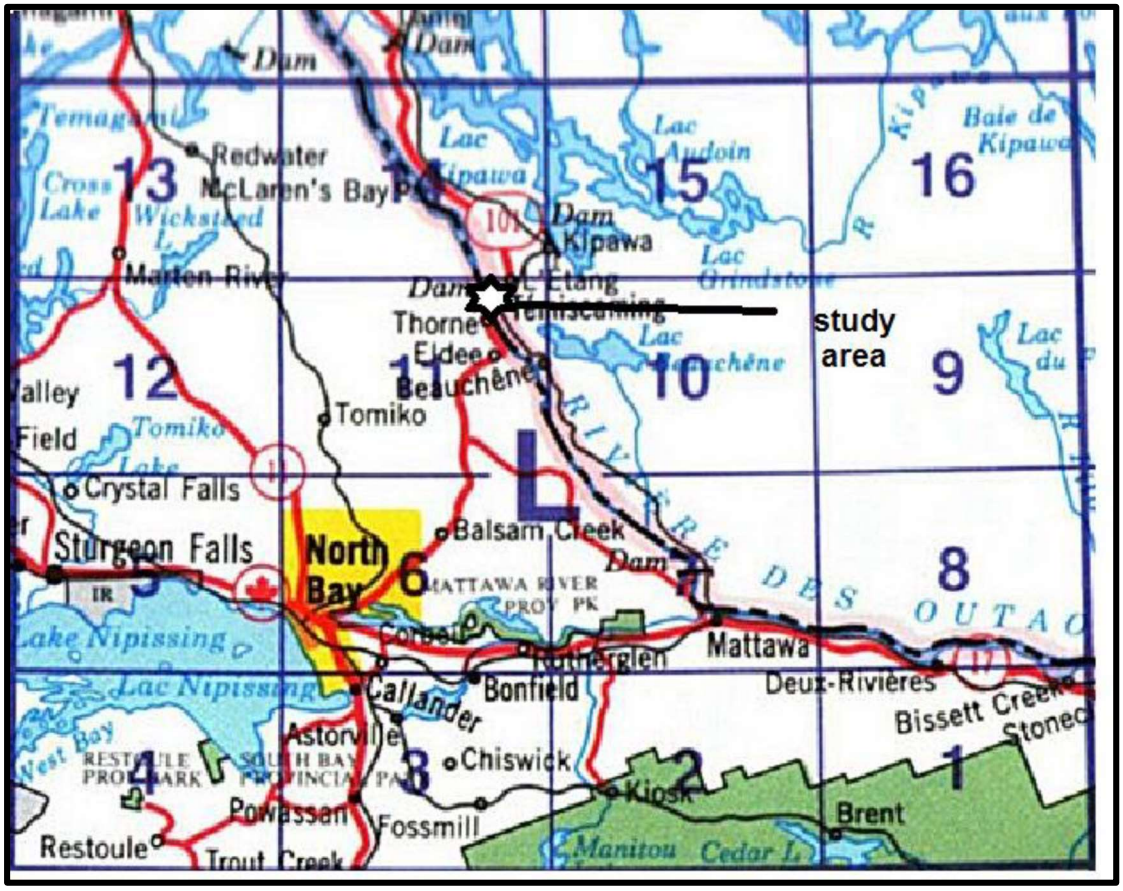


Figure 1: Regional Location of Study Area (No Scale Provided)

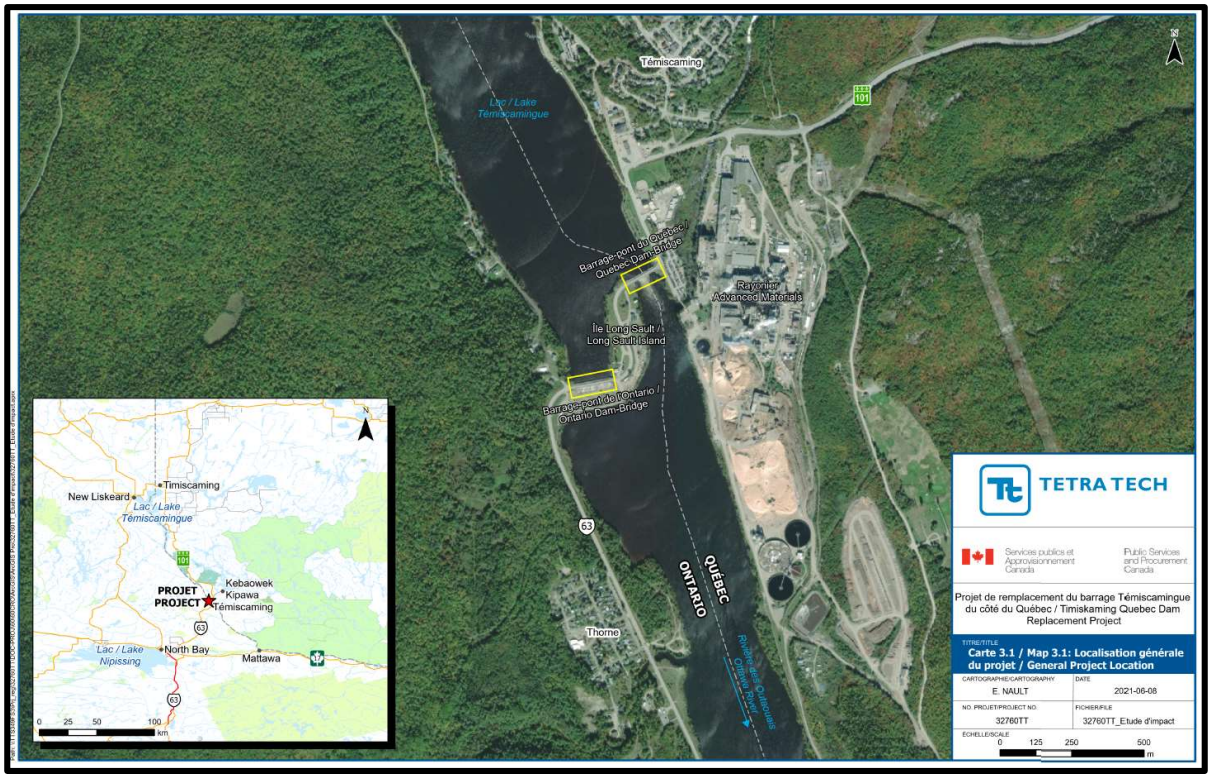


Figure 2: General Location of the Study Area
(Tetra Tech QI Inc. 2023: 3-2)



Figure 3: Satellite Image of Study Area
(Google Earth 2023)

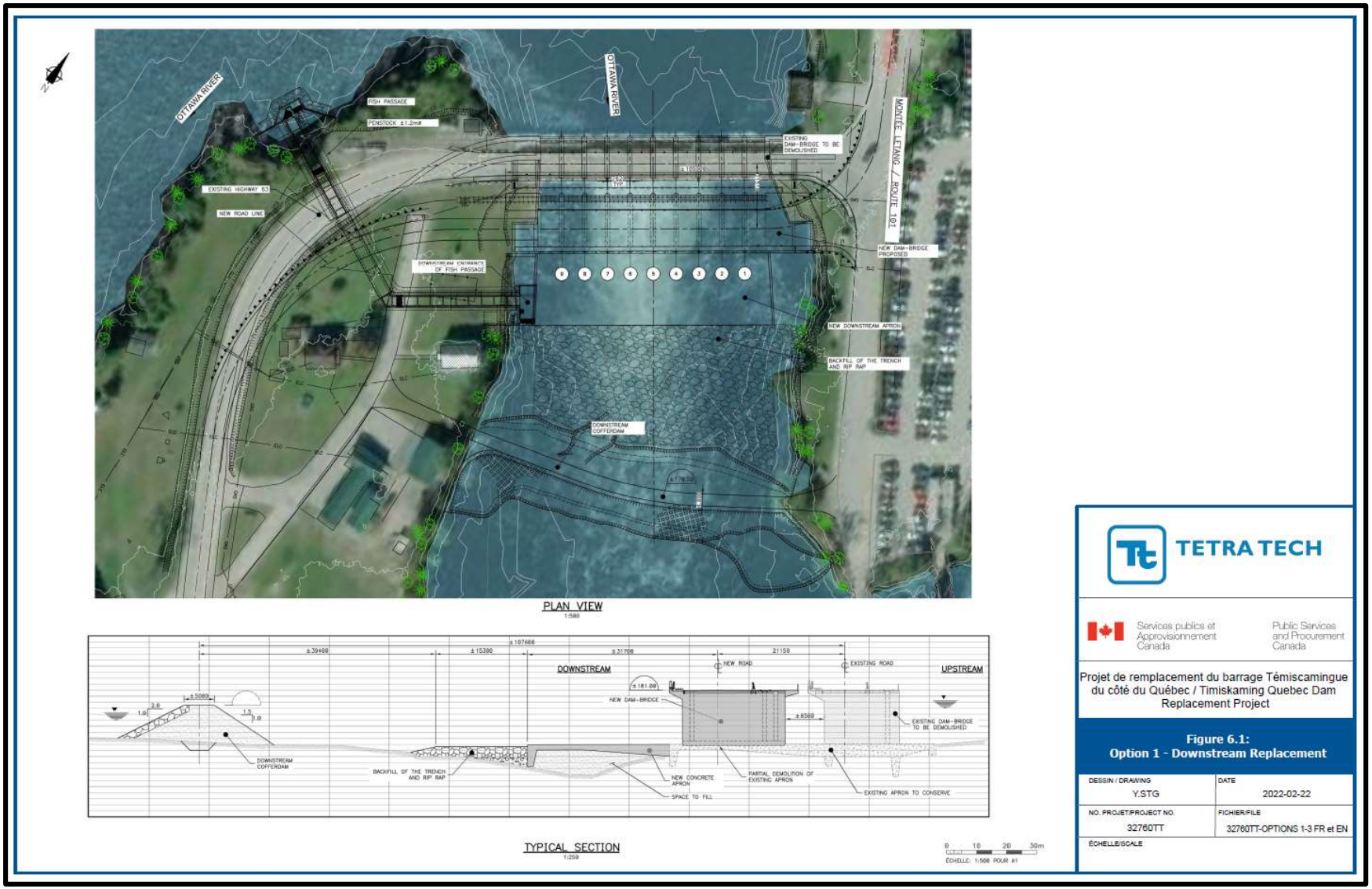


Figure 4: Development Plan – Preferred Option 1
(RFQ Tetra Tech QI Inc. 2023: 16)

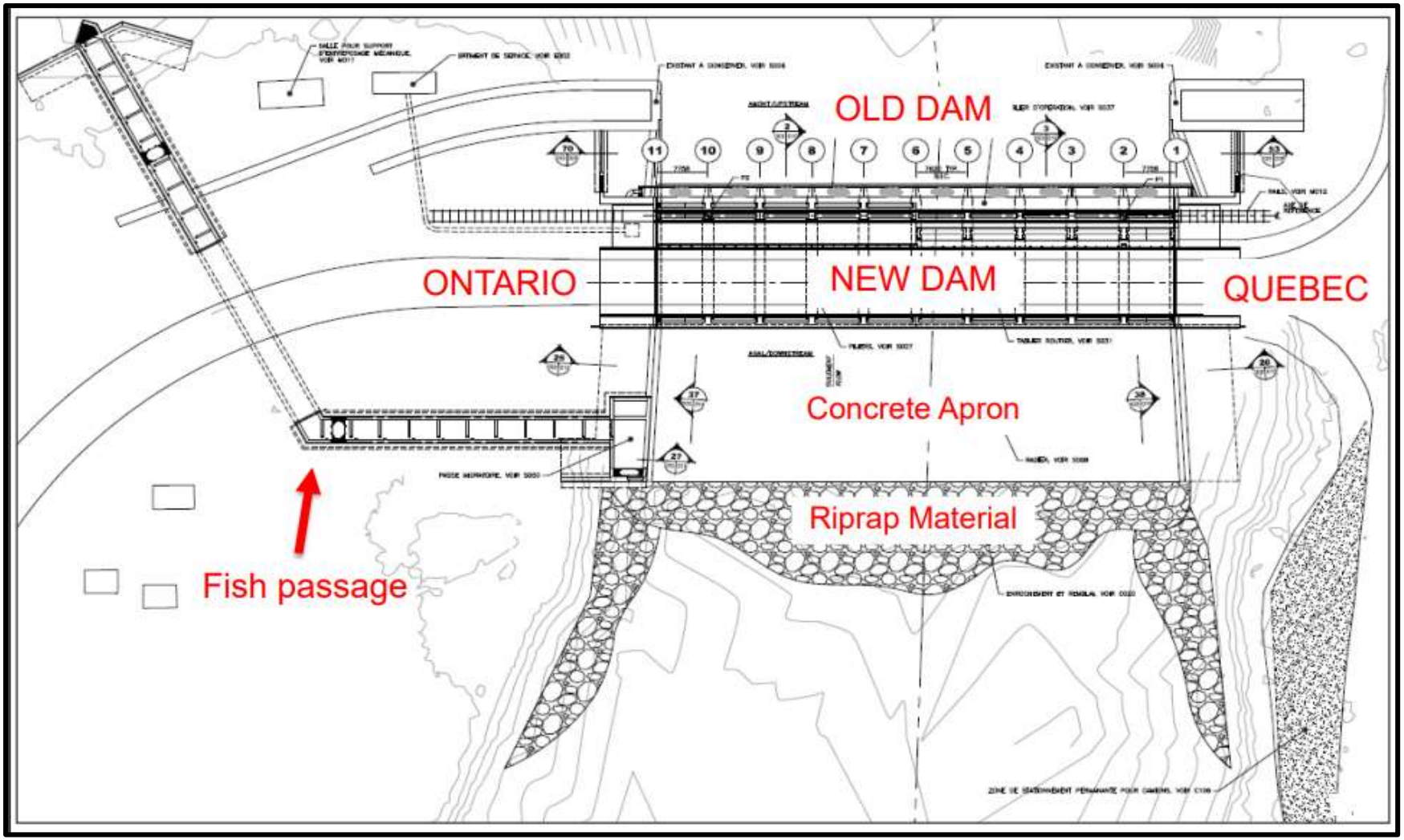


Figure 5: Bird's Concept Plan Eye View of Concept Plan
(http://www.tanakiwin.com/wp-system/uploads/2021/06/Presentation_PSPC_TQDR_AOO-Kick-Off-Session_Final_Website_20210513.pdf)

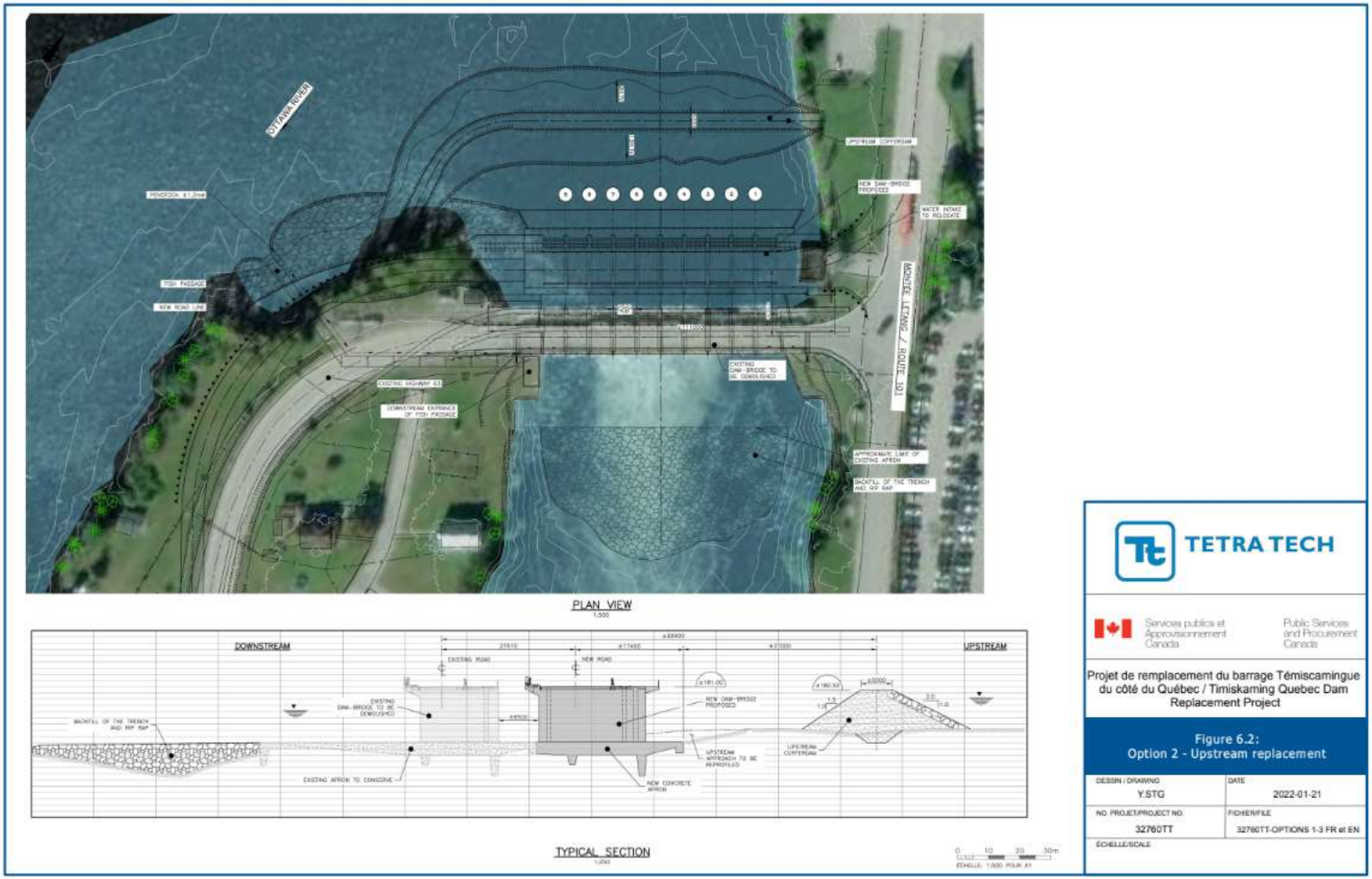


Figure 6: Option 2 (Tetratech 2023: 6-5)

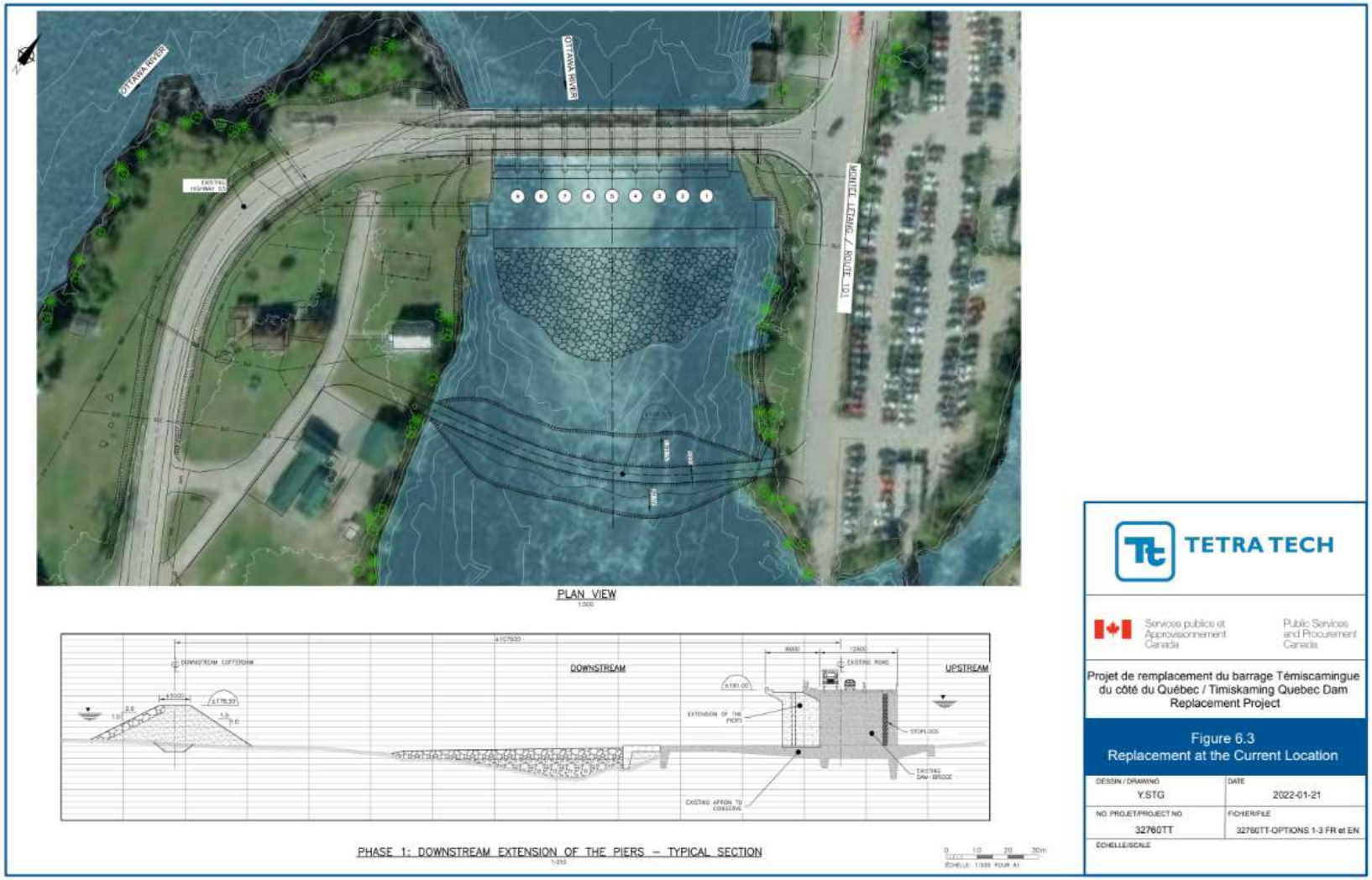


Figure 7: Option 3 (Tetratech 2023:6-7)

1.2 Summary of Background Research

Background research (2023-02) indicated that there were no registered archaeological sites within one kilometer of the study area. However, community knowledge shared with ARA suggested that there exists two historic Algonquin settlements/camps within one km of the existing bridge-dam. There were several land archaeological assessments conducted on adjacent lands, both on the mainland Quebec side (Archéotec Inc. 1998, 1999, 2008, 2017a, 2017b), as well as several assessments on Long Sault Island (Scarlett Janusas Archaeology Inc. (2013a, 2013b, 2015). A commemorative plaque located on Long Sault Island marks the terminus of Highway 63 (Ontario) and the commencement of Highway 101 (Quebec).

Bathymetry and underwater videos indicate that the lake bottom upstream (north) of the dam face may have evidence of the former cofferdam from the 1934 dam. On the downstream (south) side of the dam, there are indications of the current dam apron, as well as concrete and metal, and possibly remains of a sill. There are few accumulated sediments on the river bottom, but evidence shows that heavier materials such as small rocks, etc. remain on the bottom. There is one large scour hole, reported from between 10 and 19 metres in depth, at the base of the downstream apron. It is unlikely that any in situ cultural remains are present in the scour hole.

The proponents have undertaken Indigenous engagement and there is a clear indication that many of the First Nations, Indigenous communities, and Métis have expressed concern regarding possible Indigenous remains in the study area.

Based on the background research and associated property visit, the following indicate that there is marine archaeological potential for the study area:

1) There are rapids in the area, and a history of much larger and longer rapids prior to the construction of the dam-bridges on both the Ontario and the Quebec sides;
2) There are several land-based archaeological assessments on the Quebec side of the Study area as well as on Long Sault Island, and a marine archaeological assessment for the Ontario Dam;
3) Indigenous people routinely travelled down Lake Temiskaming, and whether by portage or otherwise, continuing on to the Ottawa River, and the reverse journey as well;
4) Natural resources attractive to both Indigenous and Euro-Canadian peoples included fish, herptiles, birds, mammal and vegetation suitable as foodstuffs and for other types of activity (e.g. weaving mats, baskets, clothing, etc.);
5) There is the remnant of the early dam-bridge located on the east shore on land of the Ottawa River south of the dam-bridge;
6) There is a historically reported “lock” at the Gordon River outlet in 1882 (probably a flume);
7) The Ottawa River and Lake Temiskaming were routinely used by steamboat travel, but also by early European explorers, lumbermen, fur traders, and prior and concurrent with those activities, use of the two waterways by Indigenous peoples;
8) There were two wharves located north of the study area;
9) There was one reported ship built above the dam area;

10) There are reported possible cofferdam remains that were located during the 2017 archaeological land assessment at the north end of what was referred to as Area A (possibly within the study area) (to be field verified as exact location not provided by consultant);
11) Bathymetry of the study area shows possible remnants of a concrete sill and/or sheet piling;
12) The Ottawa River is a Canadian heritage river; and,
13) There have been early reports (circa 1880s) relating the marine history of the area.

PSPC consulted with Parks Canada Marine Archaeology Unit to arrive at protocols and methodologies for in-water archaeological assessment. These were provided to the consultant during the request for proposal. These protocols were informed by Task 1 (background research) data, and together form the following:

1. That an in-water marine archaeological assessment be conducted by a licensed marine archaeologist that will include the following:
    a. A visual inspection of the underwater banks from a depth of zero to 3 metres, hand fanning and/or a trowel may be used to remove loose sediments to reveal possible *in situ* materials;
    b. Visual inspection of those parts of Area A (identified by Archéotec) within the study area to confirm or negate presence of planking emerging from the banks,
    c. Visual inspection of the sides of the scour pit for possible *in situ* remains and the examination tree trunks for possible modification for habitation and/or use as transportation (i.e., possible dug-out canoes);
    d. Side scan sonar survey be conducted for the entire study area allowing for detection of targets 50 cm or more in size, and being able to operate in depths of more than 2–3 metres;
    e. A visual survey using a remote operated vehicle and/or drop camera for areas that cannot be accessed using remote sensing;
    f. A magnetometer survey of areas (noting that some interference from the dam may prohibit coverage of the entire study area, especially adjacent to the dam);
    g. Analysis and cross-interpretation of side scan sonar and magnetometer results to identify targets and where possible assign value of low, medium or high archaeological potential;
    h. Ground truthing of targets with medium to high archaeological potential with the ROV and/or drop camera (depth dependent);
    i. Verification/evaluation of the archaeological resources identified during the field assessment with respect to their heritage value, and identifying those that will be directly or indirectly impacted by the proposed cofferdam and dam development;
    j. Provide a report detailing the methodology employed in the marine archaeological assessment, results, review of background research, description of located artifacts and a detail of the heritage value of the same; analysis and conclusions and recommendations for further work, mitigation, monitoring, etc. including for anomalies that could not be verified in the field;
2. That no in-water construction work be conducted prior to the completion of the marine archaeological and with a regard to recommendations stemming from the marine archaeological assessment;

3. All marine archaeological in-water work shall be conducted once spawning and other natural in-water concerns have been accommodated. The Ministry of Natural Resources and Forestry typically provides a framework for scheduling of in-water work;
4. That First Nations, Indigenous communities, and the Métis be engaged during all remaining marine archaeological work and reporting; and
5. Compliance legislation must be adhered to in the event of discovery of deeply buried cultural material or features.

2.0 METHODOLOGY

2.1 Snorkel Survey

The snorkel team consisted of one in-water person and two safety persons on shore with one of the safety person equipped to enter water if necessary. The in-water snorkel person, on the north side of the dam (Lake Temiskaming) was equipped with a safety harness and carbineers that had two lines attached to the snorkeler. Each of these lines was tended by an on-shore safety person and also tied to a tree or other anchor. The in-water person equipped with a Go-Pro camera conducted a survey of the shoreline up to a depth of three metres. The three metre depth was marked using a tape measure from shore and to the bottom, and repeated periodically to maintain vertical and horizontal control. The depth of three metres was achieved by the snorkeler wearing a weight belt and diving to the bottom. No SCUBA or surface supplied air was used in this project. General bottom photographs were taken and specific photographs were taken of any possible cultural feature. The in-water person also reported on visibility in the water, and any other items of note.

For the downstream portion of the study area, a slightly different method was used as the flow on this side of the dam was not as dangerous as above the dam. This change in methodology was determined on site after assessing conditions. The in-water snorkeler was not tethered by harness and safety lines, but there was the second in-water person who paralleled the course of the in-water person with safety line. The second safety person walked the top of the shoreline, and accessed closer to shore where vegetation allowed. The slopes on the downstream side of the dam for all of the study area were extremely steep (80-90% slope) and heavily vegetated prohibiting good observation conditions from the top of the slope and little to no access to the shoreline. The solution was to have the second in-water person on stand-by in the water with the safety lines.

Gordon Creek flow was appreciable and the in-water personnel exited the water and crossed over the Gordon Creek bridge to access the remaining study area.

Snorkeling was conducted in 50 cms – two metre intervals (depending on visibility) along the shorelines to a depth of three metres. In areas where visibility was lower, the intervals decreased to 50 cms to one metre.

The background research recommendations included hand fanning or lightly scraping of shore soils to reveal possible eroding material. As there was no soil – only rocks and boulders – this was not possible.

2.2 Sidescan Sonar Survey

A ten foot inflatable survey craft was used to allow for easy insertion and close access to the shore and shallow water areas of the study area. This craft was used for boat mounted sonar investigations and magnetometer investigations.
Side scan sonar used a Blueview M900/2250 with real time acquisition through Shark Marine DiveLog software. It has a frequency of 900 kHz/2250 kHz nominal, and a range of up to 100 metres.
The forward looking sonar was mounted to the survey vessel and followed a predetermined route within the predetermined survey area (above and below the dam) set to a 20 metre range. This allowed objects of 50 cms or more to be easily detected, as per the original parameters of the project.

2.3 Magnetometer Survey

The inflatable was also used for the magnetometer survey. The magnetometer is capable of measuring very small variations in the Earth's magnetic field allowing ferrous objects to be detected as "anomalies". A Shark Marine ProMag magnetometer was used to complete the survey. It has a sensitivity of 0.02 nT, accuracy of 0.1 nT, and a gradient tolerance of over 10,000 nT/meter.

The magnetometer was towed behind the survey vessel to prevent any ferrous components on the vessel from influencing its readings. The magnetometer was towed along a 10 metre grid throughout the survey area. The data is collected with corresponding georeferencing (that is, latitude/longitude position) from a GPS and processed to create a map. The resulting contour map (see results section) displays the magnetism of the survey area and potential targets are seen as steep gradients, displayed on a colour spectrum, or rapid changes in magnetism. The magnetometer can detect both objects above the river/lake bottom and also can detect objects through any bottom sediment. Ground truthing follows the magnetometer survey to determine the nature of the "targets".

2.4 Ground Truthing

Due to a technical issue with the inflatable boat, the ground truthing was conducted from the shore, rather than from the boat. All areas of the study area were accessed from the shorelines as there was ample cable. The remote operated vehicle, tethered to the cable, was moved to two different positions to capture the study area; one upstream and one downstream of the dam. The ROV is a Barracuda with a camera (colour zoom, 470 tvl, 1.5 lux mn illumination), lighting (2x 1850 lumen LED lights), a depth rating of 300 metres, and forward looking sonar with a frequency of 900/2250 kHz.

2.5 Dates of Site Visit

The marine archaeological assessment was conducted on July 16th and 17th, 2023. The background research was completed under marine archaeological licence 2023-02 and in-water work adhered to the mandate of the Ministry of Natural Resource and Forestry (MNRF) regarding schedule to

conduct in-water work. The in-water work was conducted under marine archaeological licence #2023-10 held by Scarlett Janusas.

July 16th was sunny with a high of 23 degrees C, and July 17th started out sunny, became overcast, light rain, and then heavy thunderstorm, followed by clearing and sunny skies with a high of 24 degrees C. No work was conducted during the thunderstorm.

3.0 RESULTS

Understanding the dam structure is integral to the interpretation of the results from the geotechnical survey. Figure 8 illustrates a basic drawing of a concrete dam. During the marine archaeological assessment, the apron and the plunge pool were investigated. Reference to this drawing will guide the reader with the location of various elements observed during the assessment.

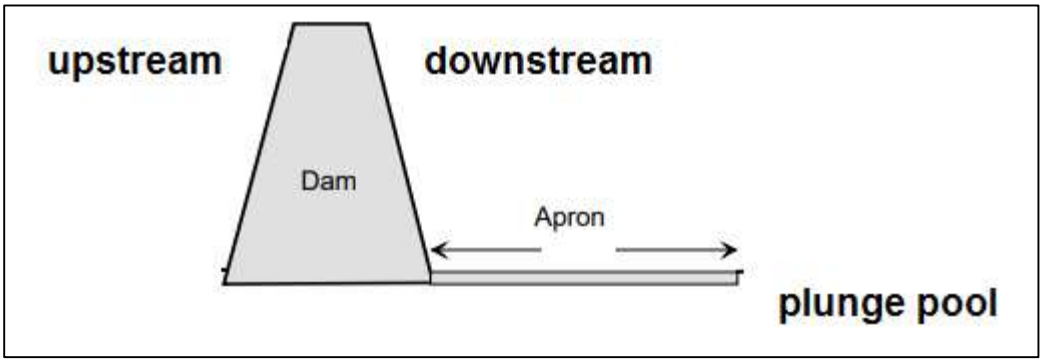


Figure 8: Basic Drawing of a Concrete Dam

3.1 Snorkel Survey

Northeast Section

The northeast section of the study area is located above the dam in Lake Temiskaming and extends from the northern edge of an in-water utility building to the northernmost point of the study area (50 metres from the dam face). The three metre depth was achieved at 6.4 metres perpendicular to the shore at the northernmost end. Visibility in this area was just over one metre. At the southernmost end of this section, the three metre depth was achieved much closer to shore, reducing perpendicular distance from shore from over 6 metres to 1.1 metres.

The rocks (defined as being less than 25.4 cms in diameter) along the shoreline (above the waterline) extended below the water line as well. The material at greater depth changed to a mix of rocks and boulders and then boulders. Boulders were also more prevalent towards the south end of the section both in the water and on shore. The same rock fill on the surface extending into the waterline are evidence of a modified shoreline that was used most certainly as an erosion control measure to stabilize the bank. There is no evidence of any original shoreline in this section. Images 1, 2 and 14 illustrate the safety system in place for the area above the dam. Images 1, 2, 5

and 14 illustrate the shoreline rock infill, and Image 13 and 14 illustrate the change in material from rock to boulders. Images 6 – 10 illustrate underwater conditions in this section, with rock, a mix of boulders and rock, and boulders.

Modern refuse (garbage) was observed in this section, but there was no evidence of any historic or Indigenous artifact. There was one unusual observation made of an upright stick. Intensified observations around this area failed to produce any additional sticks/stakes. Images 10 illustrates the upright stick. When examined, the stick was observed as part of a larger branch. No roots are visible and it is probable that this stick/branch was forced into the upright position by ice or current. It has not been modified and is not considered to be significant.
A drain was located north of the utility building that fed into Lake Temiskaming. This drain produced fine sandy sediments that extended under the waterline, but was clearly on top of the erosion control rock fill. Images 3, 4, 11 and 12 illustrate the drain from both shore and from the water looking to the shore.

Northwest Section

The northwest section of the study area is located above the dam in Lake Temiskaming and extends from the tip of Long Sault Island west of the dam face to the dam face. The 50 metre study area extending from the dam face was fully investigated by side scan sonar survey, etc. Only the area accessible to the shoreline was the subject of the snorkel survey. Boulders, defined as having a diameter larger than 25.5 cms, lined the shoreline edge. The boulders extended down from above the waterline into the water. The three metre depth was achieved at the northernmost tip a distance of 2 metres perpendicular to the shoreline. This distance decreased upon approach to the dam where the perpendicular distance decreased to 1.1 metres. Crevices/spaces between the boulders were investigated for possible cultural material.

Image 15 illustrates the water clarity at the surface. Visibility ranged from 50 cms to two metres depending on flow. Image 17 illustrates boulders with spaces between them which were subject to investigation. Images 16, 19 – 21 illustrate the shoreline and large boulders. The occasional unmodified branch and wire rope was located (Image 16 and 18, but there was no evidence of any significant cultural material in the northwest section.

One of the recommendations stemming from the background research was to investigate the possibility of planks emerging from the shoreline as detailed (albeit without any specific georeferencing) by Archéotec in 2017. This was conjectured by ARA in the background research as possibly being associated with an early cofferdam. There was no evidence of any emerging planks along the shoreline or below the waterline. The planks are likely to be located further to the west of this section, and are outside the study area.

Downstream Sections

On the downstream section of the dam, closest to the dam, the entire shorelines had been modified and were all concrete faced. No snorkel survey was conducted in these areas.



Image 1: Northernmost End of northeast Section facing southwest



Image 2: Northeast Section facing southwest



Image 3: Drain facing southwest



Image 4: Image 4: Drain, Utility Building and Dam facing southwest



Image 5: Shoreline rocks and visibility facing west



Image 6: Boulders in northeast section



Image 7: Boulders at about midway point of northeast section

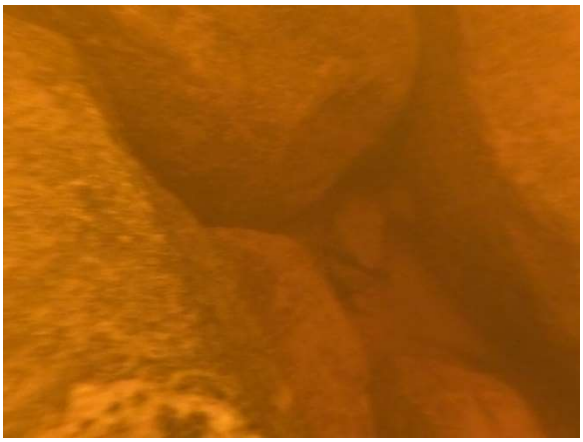


Image 8: Small rocks in spaces between boulders



Image 9: Small rocks closer to shore



Image 10: Upright stick



Image 11: Drain facing east towards shore



Image 12: Accumulated sediments from drain facing east



Image 13: Southern end of NE section facing southeast



Image 14: Southern end of NE section



Image 15: Water Visibility facing NE at northernmost point of Long Sault Island



Image 16: Boulders along shore facing southwest from northernmost point of Long Sault Island



Image 17: Wire rope among boulders



Image 18: Large boulders



Image 19: Occasional loose stick among boulders



Image 20: Northwest section shoreline facing northwest



Image 21: Northwest shoreline facing northwest

Southwest Section

The southwest section of the study area is located below the dam in the Ottawa River and extends from the concrete dam approximately 100 metres along the Long Sault Island, east shore. As the water flow was significantly less on the downstream side of the dam, adjusted for the in-water archaeological assessment by closing the dam sluice gates, an alternate approach to the snorkel survey was taken. The snorkeler was not tethered, however, the safety person walked along the boulders at the shoreline (sometimes directly in the water as there was no walkable shoreline) with safety line. In addition, two shore personnel constantly monitored the two in-water persons at all times from the top of bank. The shoreline was very steep in this location and heavily vegetated, sometimes obscuring direct visual observation, so the team constantly communicated orally to ensure safety was maintained at all times, but also to allow for in-water observations to be made and georeferenced.

The shoreline was similar to that of the northwest section comprised of large boulders that extended above the waterline and into the water. The three metre depth was achieved at the northern end at a distance of 2 metres perpendicular to the shoreline. This distance decreased upon approach to the dam where the perpendicular distance decreased to 1.1 metres.

The boulders extended beyond the 3 metre depth and obscure any evidence of original shoreline. The spaces between the boulders were investigated but there was no evidence of any Indigenous cultural material. There was evidence of random metal, associated with the early dam, cofferdam and/or construction of the current dam. There were also rounded logs observed. Ends of the logs, where exposed, were checked to see if there were any logging stamps, or signs of alteration suggesting Indigenous or Euro-Canadian use. Possible signs of alteration would include adze or other tool marks, carving, etching, intentional burning, and any other unnatural modification. None were observed. Metal and wood debris were located below the remnants of the west side of the old dam (Image 25). Images 22 – 25 illustrate the snorkel survey of the southwest bank.

Southeast Section – North of Gordon Creek

The southeast section of the study area is located below the dam in the Ottawa River and extends from the concrete dam (which covers the shoreline) to the north end of the Gordon Creek outlet. The shoreline was similar to that on the west side of the Ottawa River in the study area consisting of large boulders extending from above the water line to depths deeper than three metres. The original shoreline is completely obscured by these boulders. The depth of three metres was achieved at an average distance of three metres from the edge of shoreline.

At the area of the old dam remnants still in situ on shore, there was a large quantity of rubble observed including large quantities of concrete rubble, round logs, and a jumble of wreckage, both metal and wooden, from the original dam. The logs were checked to signs of possible modification for Indigenous use, but no signs were observed on the logs to suggest an association.

Near the mouth of the Gordon Creek on the north side, a jumble of metal, gears, wooden pieces, squared and round, occur. This debris, being located so close to Gordon Creek, may either be

additional refuse from the original dam, or, from construction of a number of bridges crossing Gordon Creek (the railway bridge and current roadway bridge).



Image 22: Southwest Section facing south along shoreline



Image 24: Steep slope on southwest section



Image 23: Start of snorkel survey southwest section



Image 25: Remnants of Old Dam on west side of Ottawa River

Due to the strong flow coming from Gordon Creek, and that Gordon Creek itself is not part of the study area, the snorkel team emerged from the water at the north end of the mouth, crossing over the existing bridge, to continue the survey on the south side of Gordon Creek.

As with all other areas, spaces between the boulders were examined for possible cultural material. Other than the rubble noted above, no other items of cultural material were observed.

Images 26 to 36 illustrate the findings along the southeast section of the study area, north of Gordon Creek.

Southeast Section – South of Gordon Creek

The southeast section of the study area is located below the dam in the Ottawa River and extends from the south side of Gordon Creek to approximately an additional 150 metres. The shoreline was similar to that on the west side of the Ottawa River in the study area consisting of large boulders extending from above the water line to depths deeper than three metres. The original shoreline is completely obscured by these boulders, except at the extreme southern end. The depth of three metres was achieved at a distance of 6.1 metres from the shoreline at the northern end, reducing to 1.3 metres at the southernmost end.

There were two areas of note observed during the survey. A grouping of at least seven squared and notched timbers (Image 40-42) were observed and represent another crib. This crib is some distance from the one located at the north end of the Gordon Creek. Between the crib and the next cultural object, a culvert leaks some unknown material into the river. On the other side of the culvert a loose (that is, not in situ) stake fragment was located. This was temporarily lifted from the water, as it was not in situ, for purposes of photography. The fragment measures approximately 30 cms in length (incomplete), has been modified to have one pointed end, and metal with a bolt



Image 26: Southeast shoreline facing south from dam



Image 27: Top of Old Dam facing westerly



Image 28: Boulder submerged shoreline and bottom



Image 29: Metal Fence Post



Image 30: Metal Machinery Debris near old dam ruins



Image 31: Miscellaneous metal debris near old dam ruins



Image 32: Logs located near old dam ruins



Image 33: Facing north towards old dam foundation (note machinery on shoreline)



Image 34: Lots of Metal Debris on Shoreline



Image 35: Associated Underwater Metal Debris (see Image 35)



Image 36: At north side of Mouth of Gordon Creek – jumble of debris



Image 37: Northeast Section – south of Gordon Creek



Image 40: Crib at south end of study area



Image 38: Metal Machinery at Mouth of Gordon Creek, south side



Image 41: Interlocking crib logs



Image 39: Head on view of Image 37 machinery



Image 42: Side view of crib



Image 43: In situ tree at south end



Image 44: Metal Stake (not in situ)



Image 45: Metal Bolt on top of stake



Image 46: Stone used as anchor

at the top (Image 44 and 45). The piece was replaced in the same location following the photography. At the extreme southern end, remnants of in situ trees (drowned) were located (Image 43). Investigation around the exposed roots did not produce any evidence of cultural material. The area has also been used for recreation, as evidenced by a rock entwined with rope, and used presumably as a temporary anchor (Image 46).

Aside from those finds noted above, no other cultural materials were located. Visibility in this section was on average one metre, as with all other areas, unless otherwise noted in the section descriptions. Images 38 to 47 are representative of the northeast section – south of Gordon Creek.

3.2 Side Scan Sonar Survey

Side scan sonar survey was conducted from a small inflatable and covered both upstream (lake bottom) and downstream (river bottom) parts of the study area (Figure 9-11). The upstream side was demonstrated to be composed of large rocks and boulders, and any original lake bottom in this area was buried under the same. The downstream side showed two rows of baffles sitting on top of a relatively flat apron, the plunge pool filled with slabs of concrete and large boulders, and the rest of the area covered with boulders and rocks, obscuring any bottom features. There were four areas that were considered significant to investigate further with ground truthing (Figures 15-18). These are discussed further in the ground truthing section.

3.3 Magnetometer Survey

As expected, there was interference from the existing infrastructure, that is the dam and roadway, which contain large amounts of metal such as rebar, etc. The poor results of the data close to the dam due to influence from the ferrous elements in and around the dam on the upstream side of the study area, influenced the decision to not conduct magnetometer survey in the area. There was interference downstream as well, but as the proposed development was concentrated in this area, magnetometer survey was conducted. It is cautioned that results here are also skewed. The ROV investigation verified certain larger components such as the large “I” beam and the apron area and also a lot of broken concrete with rebar used as fill and in with the rocks on the side walls.

Figure 12 illustrates the types of reading obtained from the lower right side where there is less ferrous materials and a more stable reading compared to the left side where there are numerous ferrous targets causing a very unstable field making it impossible to define individual targets.

The magnetometer data is displayed first as a Gradient map (Figure 13) which shows the change in gamma or nanotesias between readings, and secondly as a Gamma map (Figure 14) which shows the absolute values of the earth’s magnetic field.

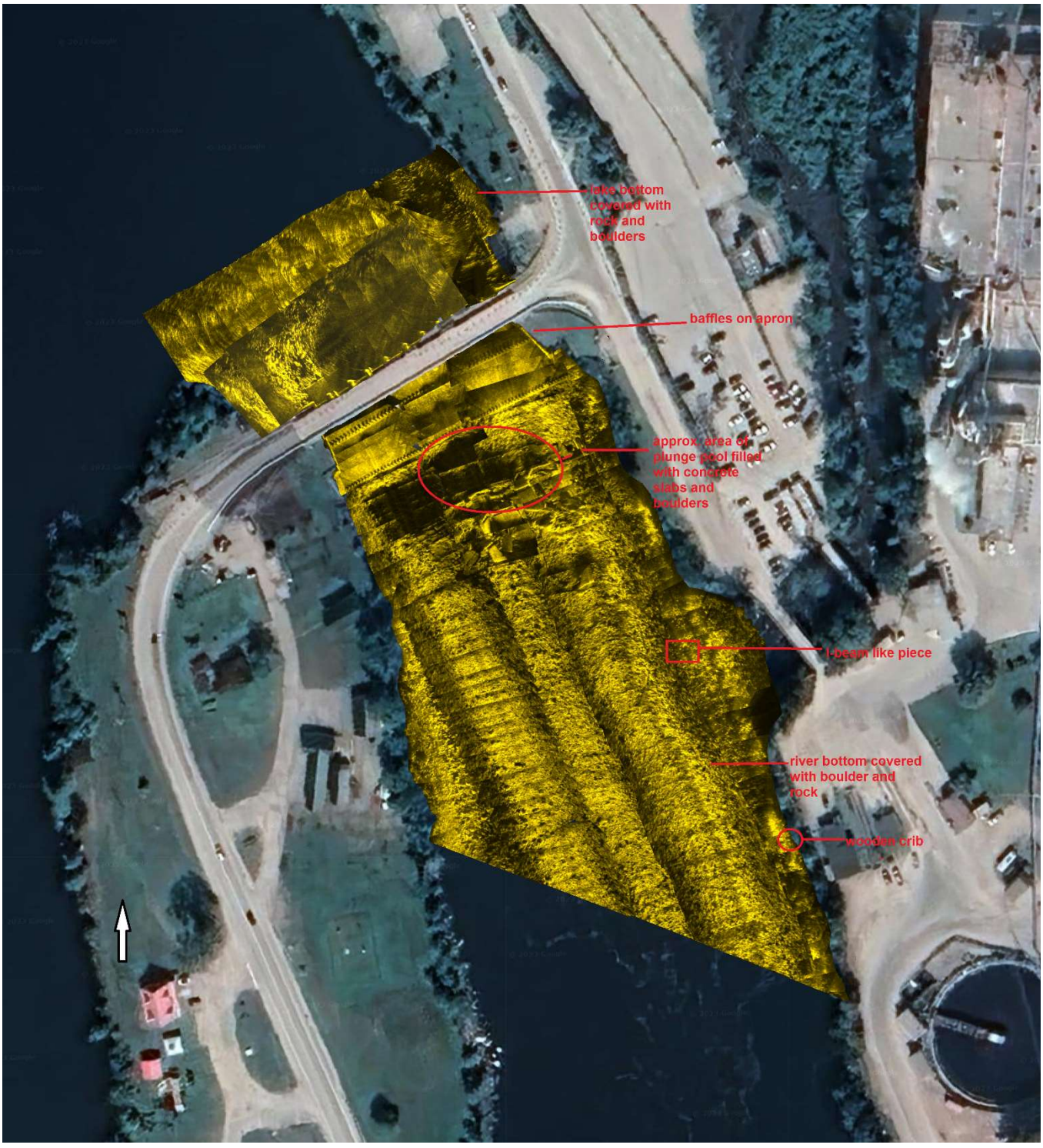


Figure 9: Forward Looking Side Scan Mosaic

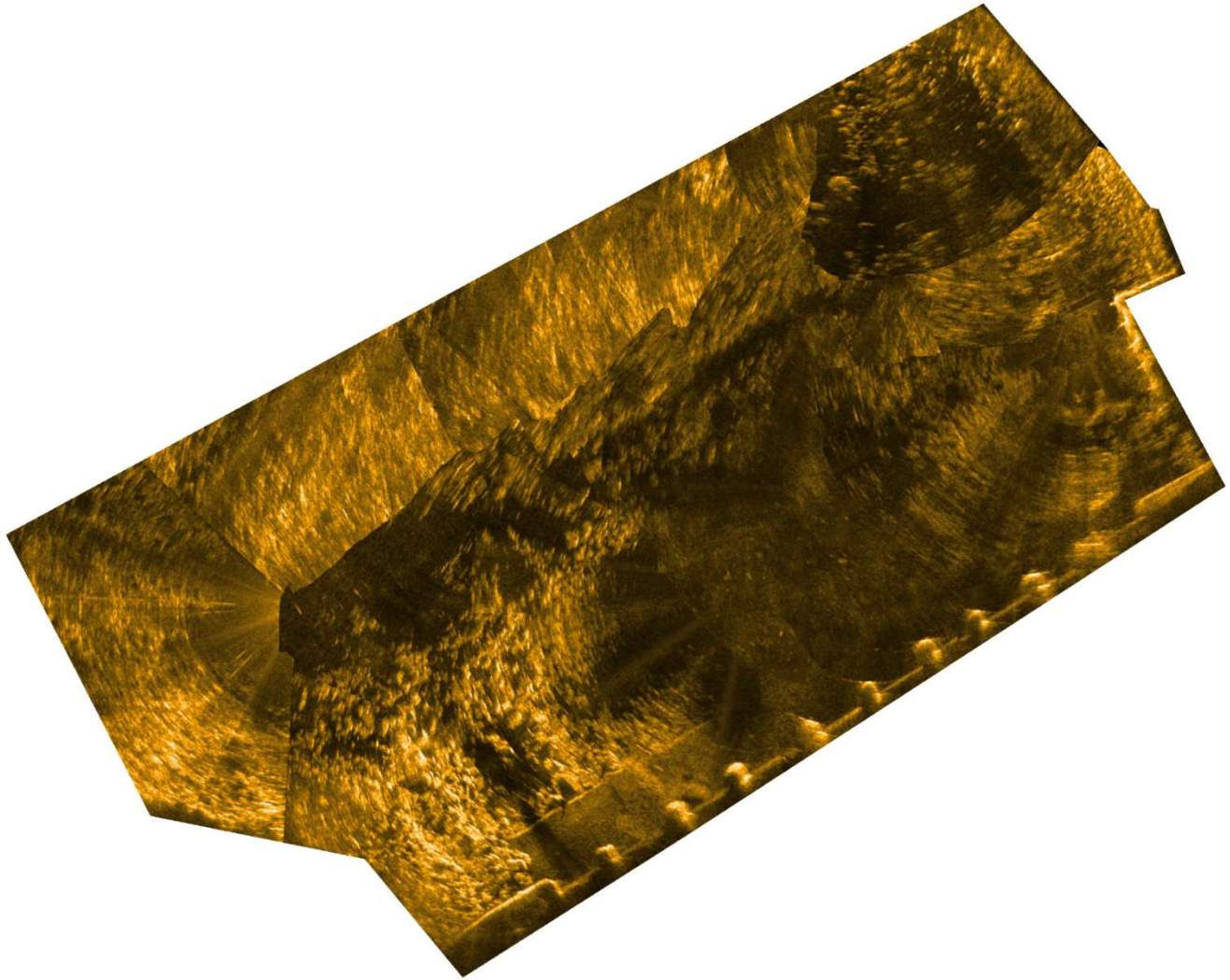


Figure 10: Side Scan Sonar Mosaic of North Side of Dam

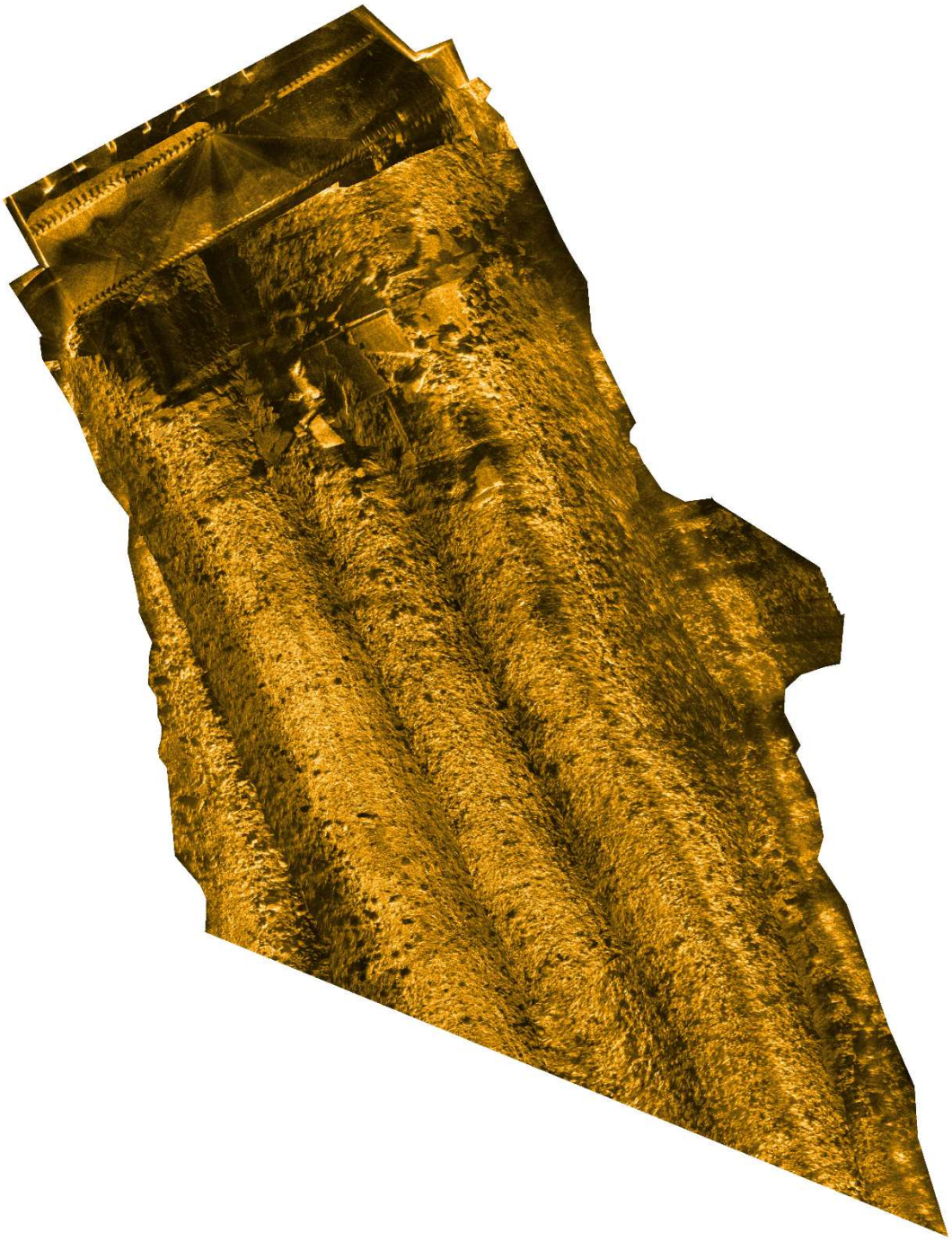


Figure 11: Side Scan Sonar Mosaic of South Side of Dam

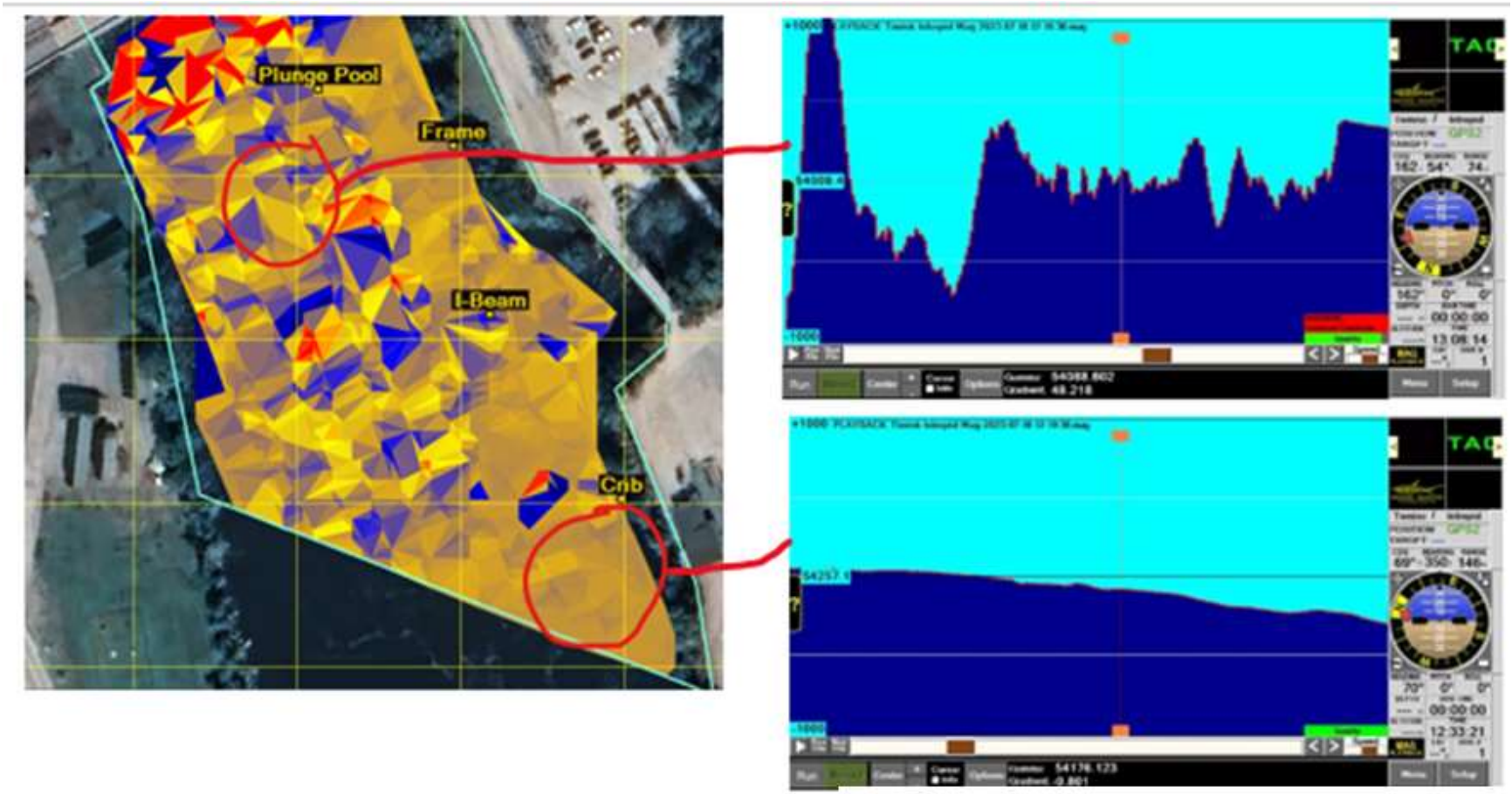


Figure 12: Example of Level of Magnetic Interference

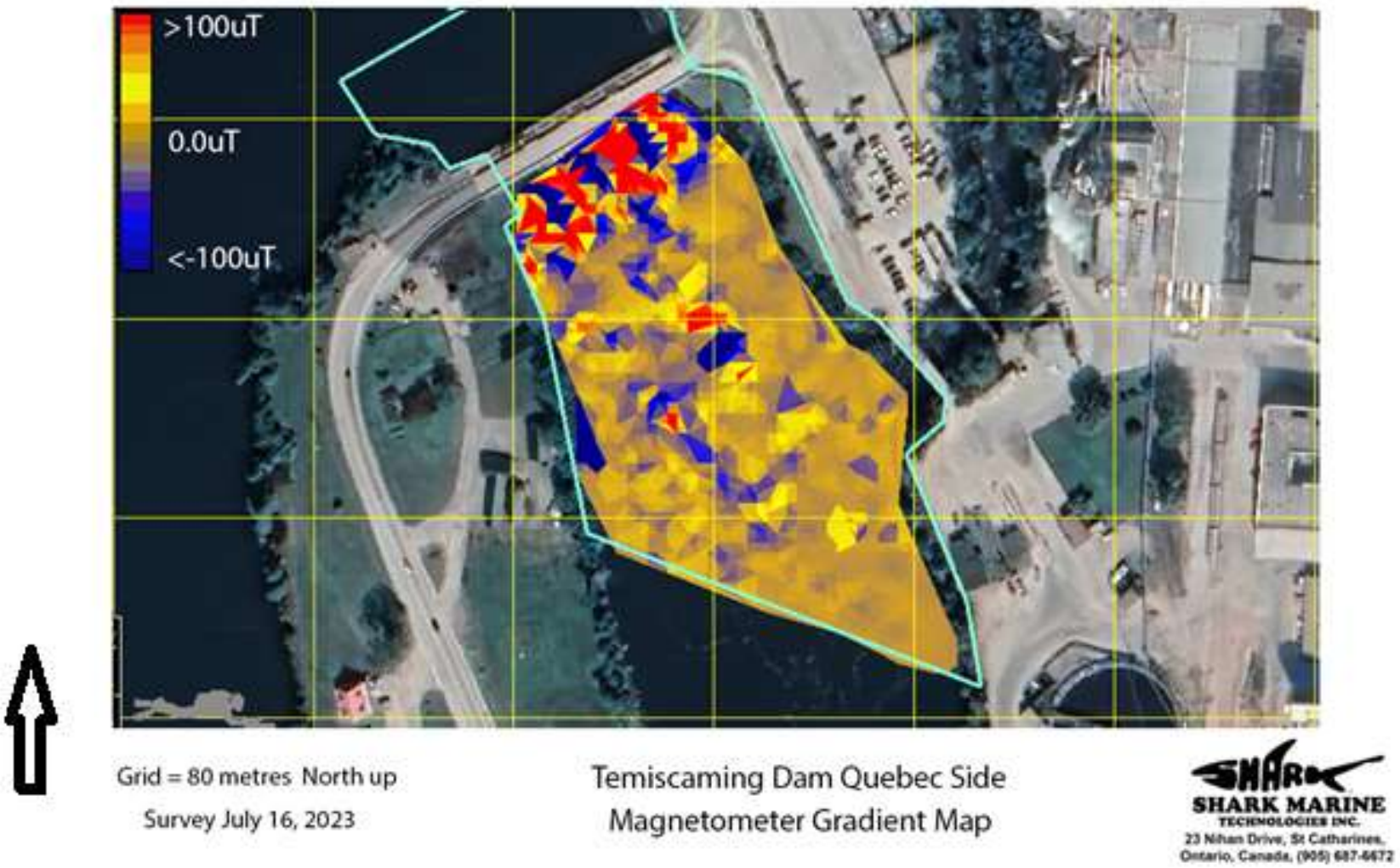


Figure 13: Gradient Map of Downstream Side of Dam

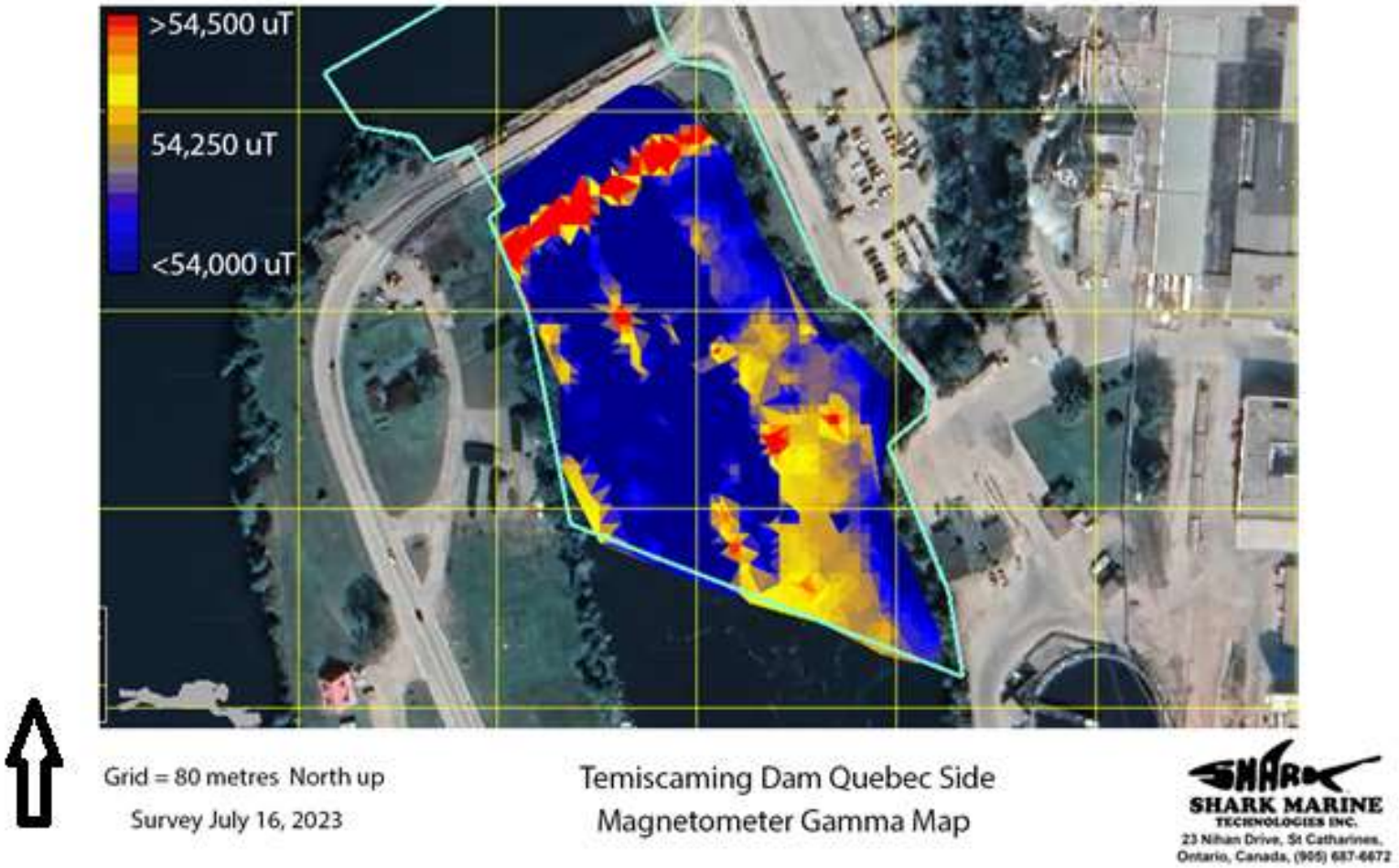


Figure 14: Gamma Map of Downstream Side of Dam

The raw data for the magnetometer are included in the digital data accompanying this report. PNG files are included in the digital data, as are KMZ files (can be opened using Google Earth).

The data from the magnetometer shows a considerable amount of ferrous metals throughout the survey area. The latter was confirmed through ground truthing.

3.4 Ground Truthing

The ROV investigation of the magnetometer survey confirmed certain larger components such as the large "I-beam" and the apron area of the dam and also large amounts of broken concrete that was used as fill for the scour hole, but was also found in and among the rocks lining the side walls of the river (downstream side of dam) and side walls of Lake Temiskaming (upstream side of dam).

As part of the visual survey, the geotechnical team was asked to use the ROV and camera along the three metre depth along the study area, upstream and downstream, to ensure coverage of areas that might have been missed by the snorkel team at this depth. The track displayed in Figure 15 illustrates the 3 metre contour line of the study area. A video of the corresponding track detailed the bottom. Figure 14 illustrates the tracks of the ROV (with video) for both upstream and downstream. Through Indigenous engagement, a request was made to investigate the sides of the plunge pool for possible eroding materials from the sides. The downstream video captured this area.

Seven separate video recordings were made by the ROV for the project areas. These are included in the digital data, and are labelled as:

Temiscaming-Lower East Side South to North-2023-07-17-09-45-17.avi
Temiscaming-Lower East Side South to North-cont-2023-07-17-09-50-22.avi
Temiscaming-Lower West Side North to South-2023—7-17-11-05-44.avi
Temiscaming-Lower Center South to North-2023—07-11-48-54.avi
Temiscaming-Upper West Side South to North-2023-07-17-14-34-004.avi
Temiscaming-Upper East Side North to South-2023-07-17-14-08-29.avi
Temiscaming-Upper Center North to South-2023-07-17-14-49-44.avi

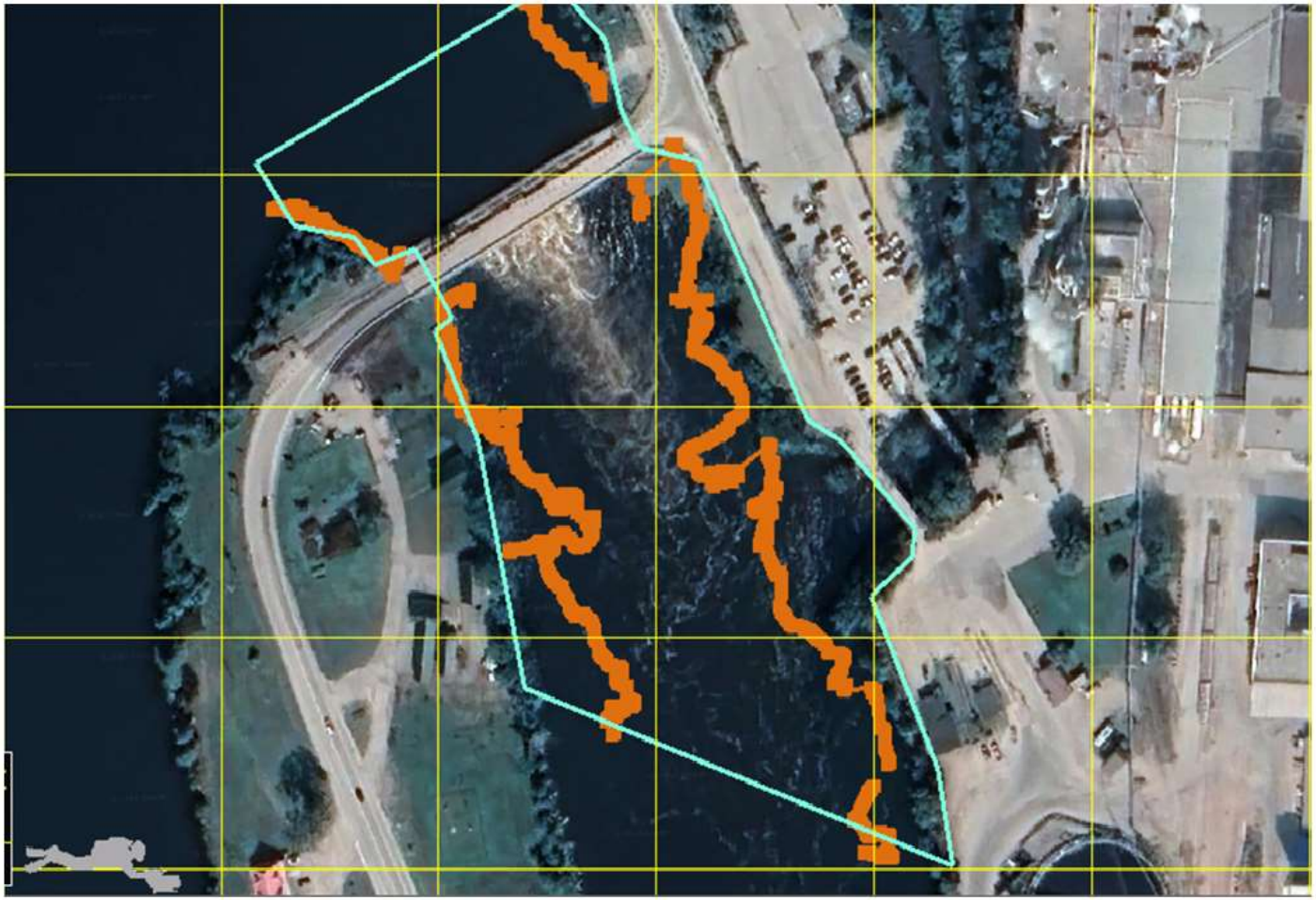


Figure 15: 3 Metre Depth Contour Line Survey

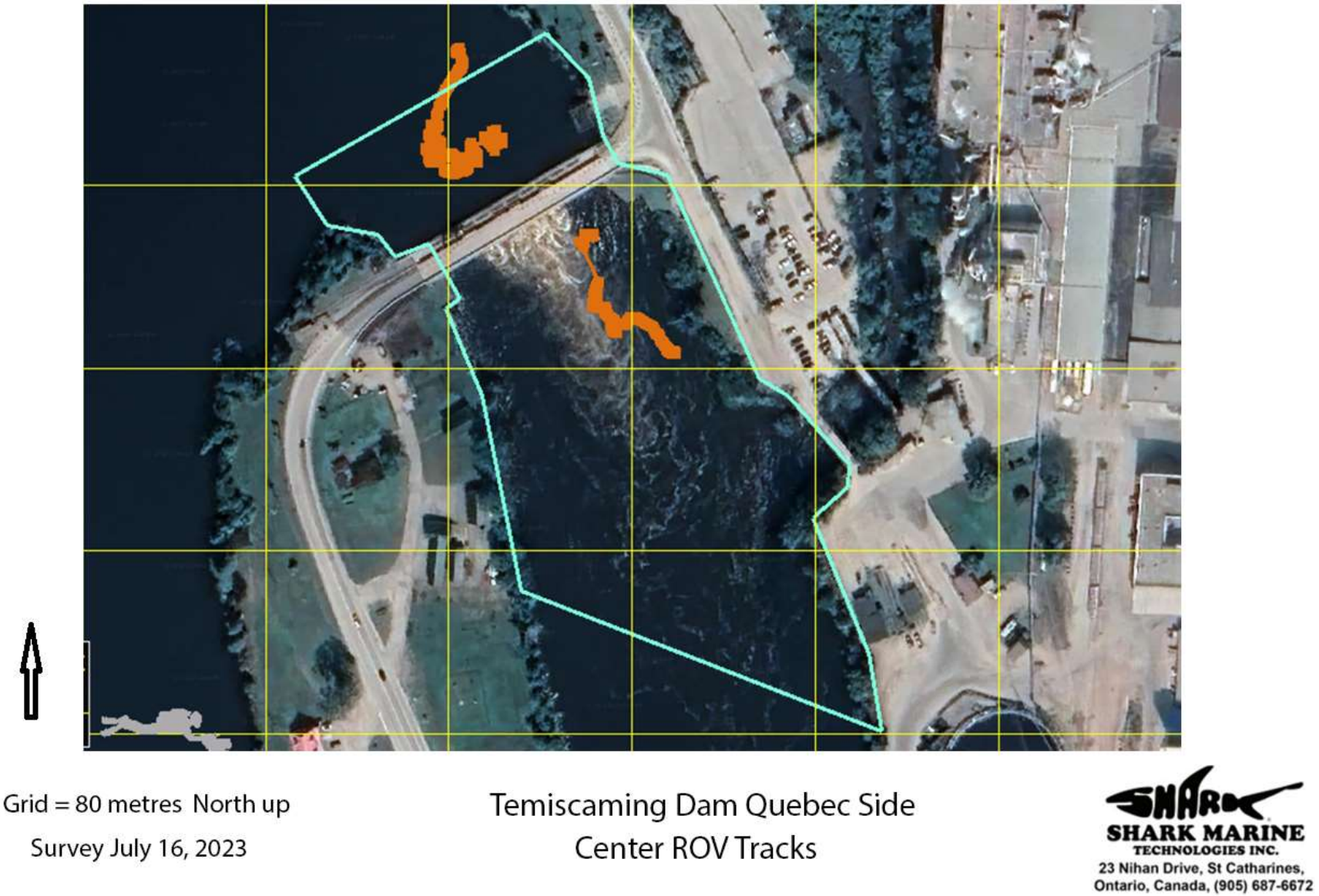


Figure 16: ROV Tracks for Centre of Study Area

Each of the above videos were monitored live while on site by the marine archaeologist, but also reviewed in detail back in the office. The forward looking sonar was also used in conjunction with the ROV which provided additional detail as the visibility for the area was often less than .5 metres. The ROV is brought to the surface periodically to check the GPS readings to ensure there are no errors, especially when surveying close to rocks (boulders) to ensure no inaccuracies in the sonar (forward looking). The following are the highlights from each of the videos with the time stamp as a reference.

Table 2: Video of Lower East Side, South to North

Time on Video (upper left)	Detail	Interpretation/significance	Latitude/latitude	Depth (metres)
09:46:09	Large boulders	Non-cultural. Very little of actual bottom can be seen, large boulders, one on top of the other	4642.5772N, 07905.9323W	2.9
end	Large and smaller boulders	Non-cultural. Very little of actual bottom can be seen, large boulders, one on top of the other		3.1

Table 3: Video of Lower East Side, South to North, continued

Time on Video (upper left)	Detail	Interpretation/significance	Latitude/longitude	Depth (metres)	Image
09:50	Start				
09:50:57	Boulders, two sticks	Non-cultural, actual bottom of river bed cannot be seen as there are boulders upon boulders. Obvious major modification of shoreline and bottom.	4642.5950N, 07905.9297W	3.1	47
09:54:00	Wooden Crib	Wooden crib with notched interlocking pieces. The crib structure (from sonar imagery) appears to measure approximately 8 m in length by 3-4 m in width	4642.6081N, 07905.9329W	Top 2.6, bottom	48
09:57:24	Boulders	Just south of Gordon Creek, non-cultural	4642.6152N, 07905.9428W	3	
09:58:15	Boulders and stick	Non-cultural. Sediment in water shows strength of current from Gordon Creek	4642.6174N, 07905.9470W	3	

09:58:41	Stick or cable	If stick, natural. If cable, debris from previous dam	4642.6187N, 07905.9500W	3	
09:59:03	Metal	Flat on one side, debris from previous dam	4642.6209N, 07905.9555W	3	
10:00:41	Natural wood	Non-cultural	4642.6301N, 07905.9577W	3	
10:01:58	Start of I-beam shaped object	2 sides that rise up, has a bottom, and intermittent cross member	4642.6382N, 07905.9637W	3	
10:02:38	I-beam shape with cross member	Possible I-beam, approximately 6.4 m in length, and 0.6 m in width	4642.6360N, 07905.9659W	3.1	49
10:03:12	I-beam shaped object	I-beam shaped object showing cross member and full width	4642.6386N, 07905.9649W	3.2	50
10:03:34	I-beam shaped object	Possible I-beam disappears at this location	4642.6419N, 07905.9621W	3	
10:04:33	Wooden board	Flat-sided, possible debris from previous dam	4642.6469N, 07905.9610W	3	51
10:06:35	boulders	North side of Gordon Creek, non-cultural	4642.6547N, 07905.9618W	3.1	
10:12:42	Large slab of concrete	Non-cultural, among boulders	4642.6571W, 07905.9854	4.4	
10:16:32	Metal grid	Probably scaffolding or other similar piece of equipment, related to previous dam or dam rebuild	4642.6670N, 07905.9716W	2.9	52
10:22:46	Concrete	Very large concrete slab/block, sharp man-made edges, considered recent	4642.6784N, 07905.9797W	3.4 to 4.4	
10:26:22	Sticks, loose wood	Non-cultural – all lying above boulders.	4642.6894N, 07905.9839W	3.1	
10:26:53	Iron	Stake, or fencing	4642.6906N, 07905.9840W	2.8	53
10:28:29	Metal	Debris from previous dam, buried under the boulders	4642.6950N, 07905.9821W	2.8	
10:35:54	Concrete dam structure	All concrete faced to dam from this point north – all natural materials will be encased/buried in concrete	4642.6991N, 070905.9979W	Surface to bottom	



Image 47: Two non-cultural sticks overlying boulders



Image 48: Wooden Crib

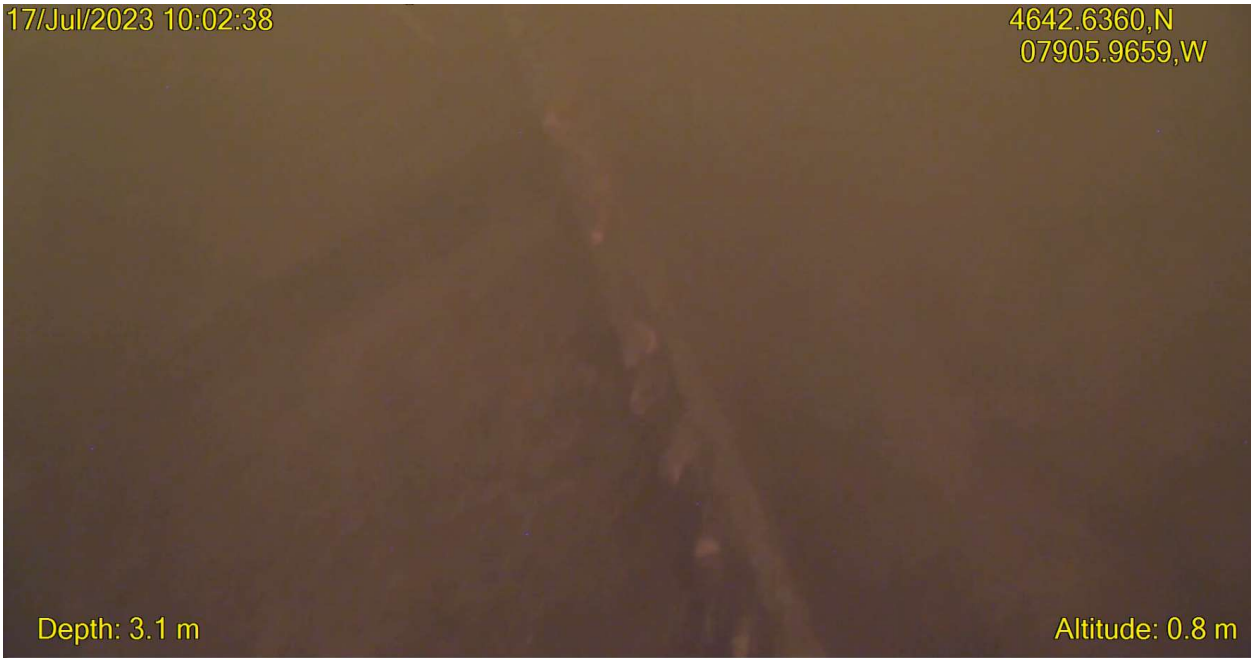


Image 49: Possible I-beam



Image 50: I-beam shaped object



Image 51: Wooden board



Image 52: Metal Grid (possible scaffolding)



Image 53: Iron

Table 4: Video of Lower West Side North to South

Time on Video (upper left)	Detail	Interpretation/ Significance	Latitude/Longitude	Depth (m)	Image #
		N.B. narrator says east side – it is in fact west side			
11:09:09	Edge of concrete from dam	Dam wall, southern edge	4642.6772N, 07906.0547W	3	
Throughout video	Large boulders	Modified shoreline			
11:33:39	Metal fence post, flange style	Debris from past dam/cofferdam, considered recent and not significant, wedged under boulders	4642.6310N, 07906.0260W	3	54
11:34:18	Metal pipe	Debris from past dam/cofferdam, wedged under and over boulders	4642.6294N, 07906.0238W	3	
11:43:21	Southern end	Boulders, varying sizes	4642.6041N, 07906.0102W	3.1	



Image 54: Metal Fence Post amid Boulders

Table 5: Video of Centre South to North

Time on Video (upper left)	Detail	Interpretation/ Significance	Latitude/Longitude	Depth (m)	Image #
11:49:25	Centre near plunge pool	Beginning of video	4642.6662N, 07905.9802W	5.3	
11:50:03	Boulders, metal	Fill and debris, not significant	4642.6667N, 07905.9823W	4.8	55
11:51:01	Wood branches	Non-cultural among boulders	4642.6685N, 07905.9842	4	
11:53:25	Large flat slabs of concrete	Non cultural, these slabs and large boulders fill the plunge pool Concrete flat with seams.	4642.6723N, 07906.0008W	5.2	56
11:55:23	Large boulders and concrete	Pieces fill the plunge pool – no access to interior of the plunge pool	4642.6709N, 07905.9999W	6.9	57
11:59:50	Large boulders	Boulders at 8.4 m	4642.6733N, 07906.0013W	8.4	58
12:00”53	Depth in plunge pool	Max depth reached is 9 m – all boulders and concrete	4642.6733N, 07906.0013W	9	
12:01:58	Rounded log	Log wedged between boulders – later addition	4642.6760N, 07906.0034W	8	59
12:02:22	Another log	Rounded log on top of previous rounded log - later addition, no noticeable markings on either log	4642.6764N, 07906.0034W	8.1	
12:05:11	Concrete blocks	Straight edges, not significant	4642.6801N, 07906.0063W	4.7	
12:05:52	Sonar image of apron	ROV image not clear but sonar image shows the two rows of uprights seen in bathymetry background research – turn out to be concrete step	4642.6798N, 07906.0059W	3.8	
12:07:05	On apron facing dam	Flat, nothing on top of apron	4642.6943N, 07906.0098W	5	
12:07:20	Concrete seam	Concrete seam – feature of the apron	GPS not reading)	5	60
12:08:04	Dentate pattern at	Sloped dentate pattern at edge of apron – part of existing dam. This created	(GPS not reading)	4.6	61*

	edge of apron	the optical illusion on the bathymetry of individual posts. Some of the concrete dentates are broken having crumbled away			
12:12:08	Dentate pattern at edge of apron, south side of dam	Sloped dentate pattern at edge of apron – part of existing dam. Triangular shaped blocks.	(GPS not reading)	5.1	62

*baffles are blocks with height and spacing constructed to absorb flow impact and dissipate flow velocity

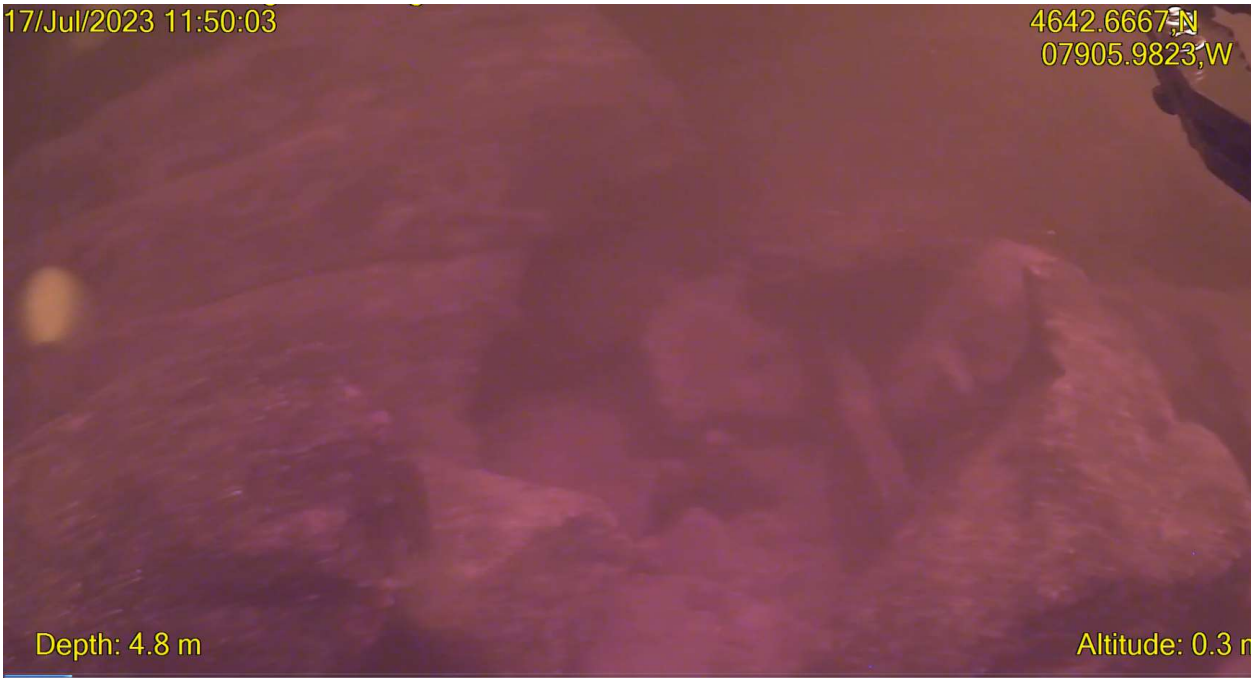


Image 55: Centre Bottom

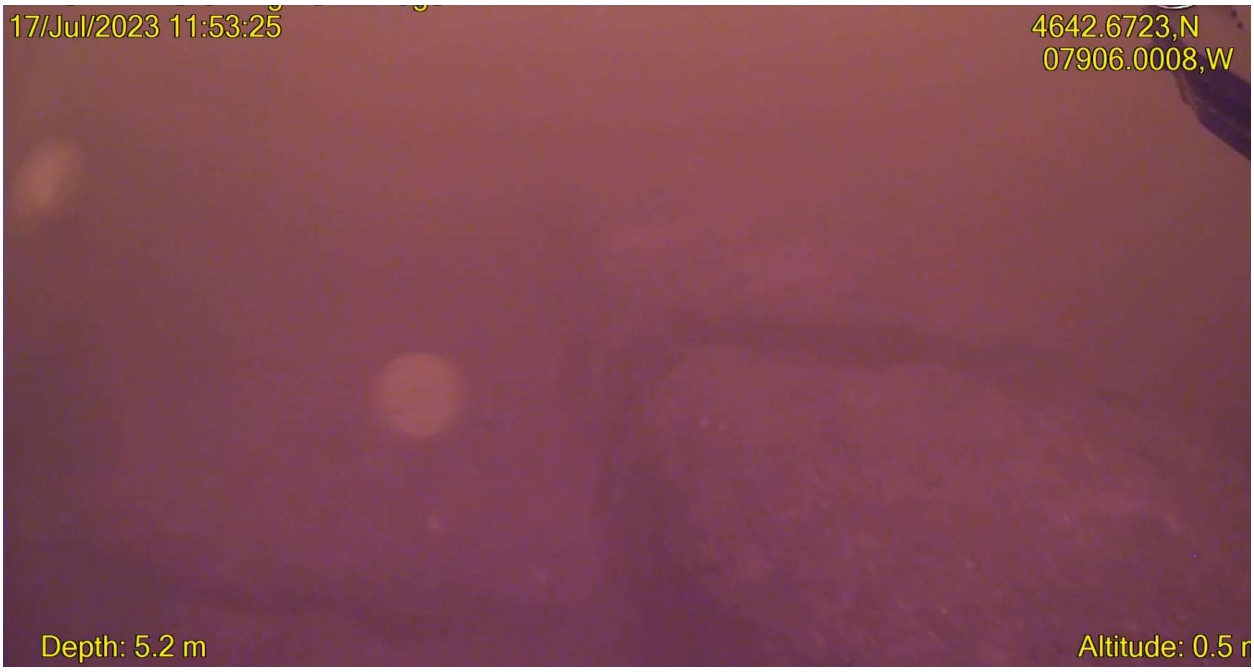


Image 56: Contents of Plunge Pool

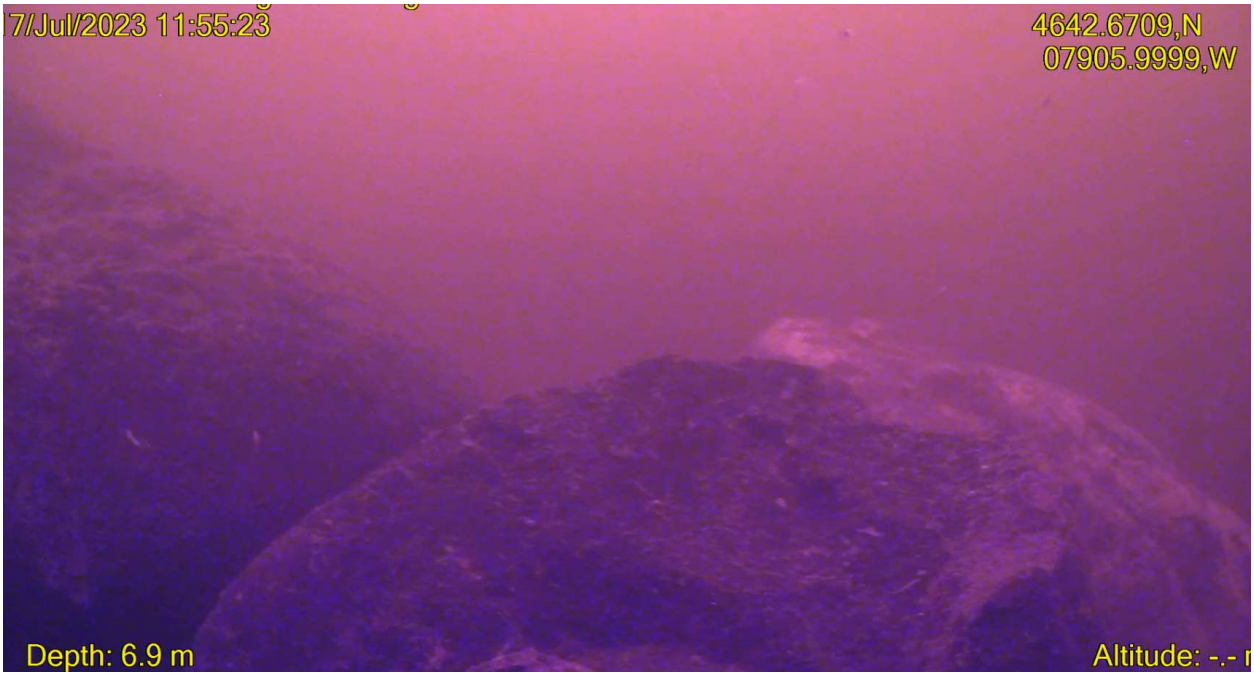


Image 57: Contents of Plunge Pool at 6.9 m



Image 58: Plunge Pool at 8.4 m

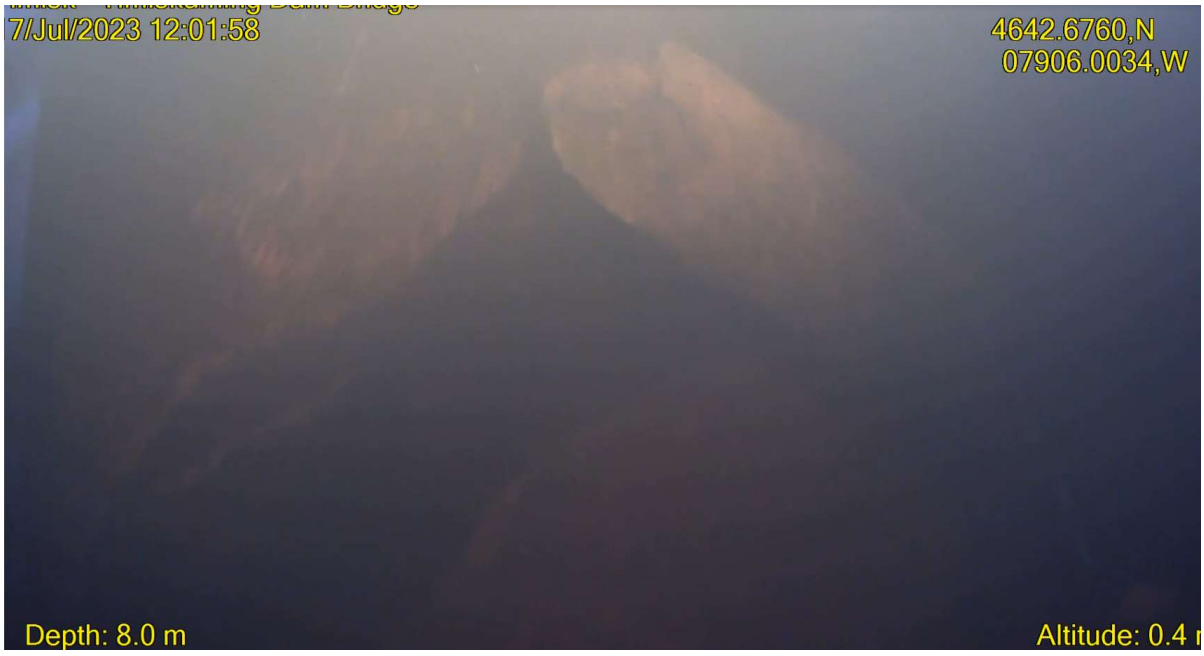


Image 59: Rounded Log Wedged Between Boulders

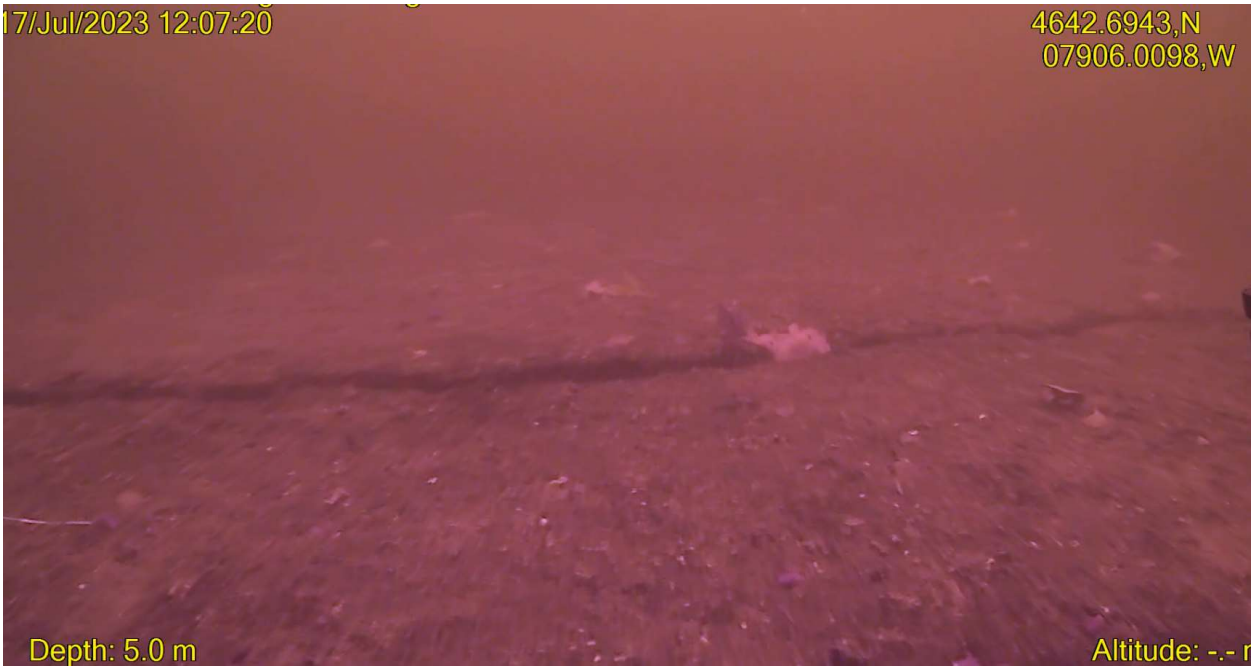


Image 60: Concrete Seam on Apron



Image 61: Baffle Sitting on Apron

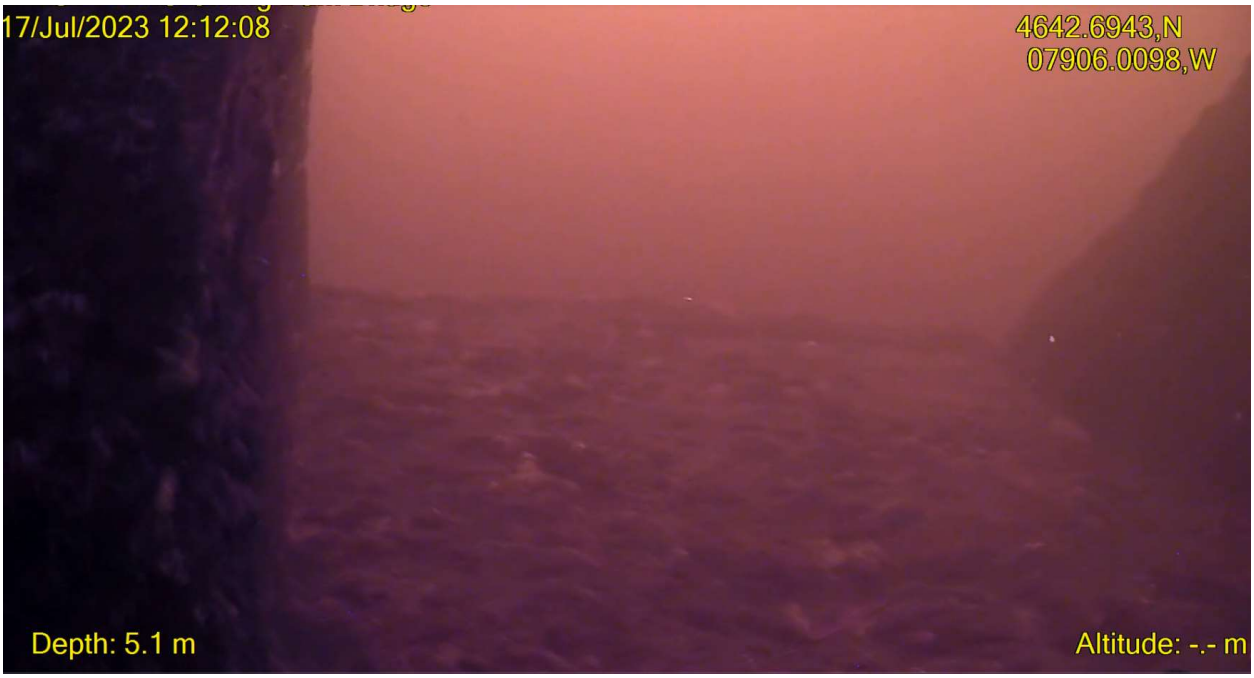


Image 62: Baffle Sitting on Apron on south side of dam

Table 6: Video of Upper West Side South to North

Time on Video (upper left)	Detail	Interpretation/ Significance	Latitude/Longitude	Depth (m)	Image #
		Narrator at beginning of video says "east" side – it is actually the west side			
14:34:29	Boulders	Non-cultural, start of video close to dam, all boulders right up to edge of dam	4642.6882N, 07906.0706W	3	
14:35:35	Sticks	On top of boulders, later additional. Numerous loose sticks	4642.6916N, 07906.0730W	3	
End	Boulders	Around the point of land – just boulders with random sticks not in situ		3	

Table 7: Video of Upper East Side North to South

Time on Video (upper left)	Detail	Interpretation/ Significance	Latitude/Longitude	Depth (m)	Image #
14:09:05	Start	Boulders	4642.7435N, 07906.0386W	2.7	
14:09:42	Wood	Wood with wire nails, not significant	4642.7420N, 07906.0362W	3	63
14:10:34	Brick	Complete, but sitting on top of boulders, numerous loose and incomplete fragments of additional brick in this area – recent addition, not significant	4642.7400N, 07906.0325W	3	
14:15:15	Utility building wall	Utility building concrete foundation in water	4642.7257N, 07906.0112W	3	64



Image 63: Wire Nails in Wood, Not In Situ



Image 64: North edge of utility building at NE corner of dam

Table 8: Video of Upper Centre North to South

Time on Video (upper left)	Detail	Interpretation/ Significance	Latitude/Longitude	Depth (m)	Image #
14:50:21	Boulders and loose stick	Bottom type – not significant	4642.7388N, 07906.0522W	4.8	65
14:52:56	Boulder bottom	Boulders in centre of study area	4642.7224N, 07906.0597W	5.1	
15:02:40	Log	Beaver chewed, not significant	4642.7119N, 07906.0459	7.5	

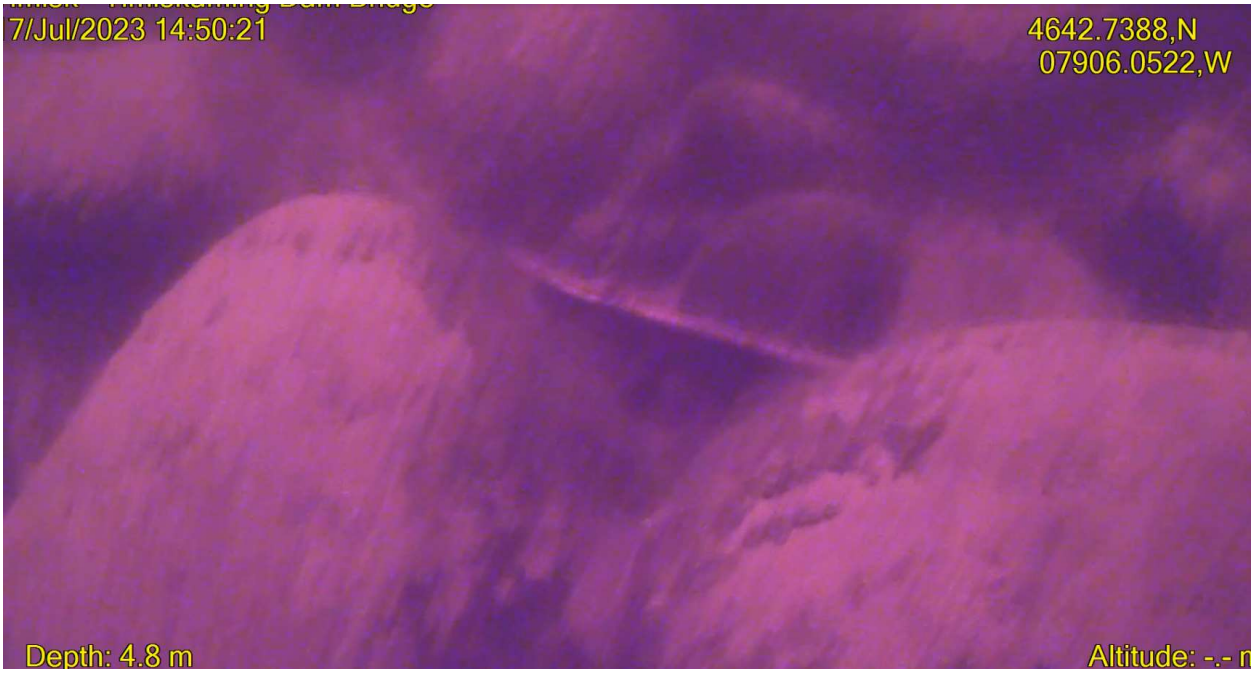


Image 65: Centre on north side of dam

There were four targets that were ground truthed in further detail with the ROV, some of them captured in still photographs from the video descriptions above. Figure 17 illustrates the four targets, which include the crib, the I-beam, the metal frame, and the plunge pool. Table 9 presents data on the four targets. Only one, the crib, is considered to be of cultural significance. Figures 18 to 21 illustrate each of the individual four targets providing recorded real time data as well as still photographs from the ROV, and images of the target on forward looking sonar.

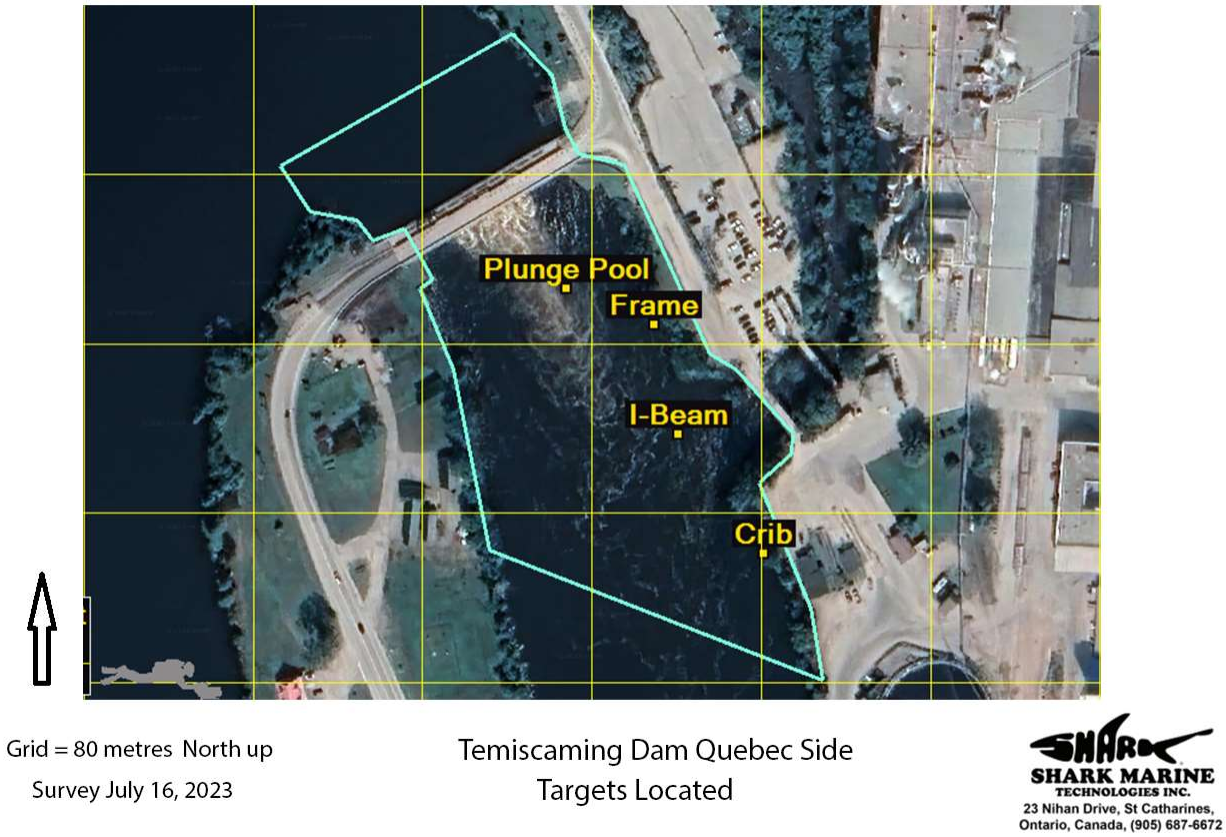


Figure 17: Four Targets Subject to ROV Ground Truthing

Table 9: Target Details

ID by Shark	Target Name	UTM 17T	Descriptor
S1	Crib	645311.7E 5174708.4N	Wooden crib structure measuring approximately 4 by 3.5 m, at least six horizontal members, notched, at least 4 logs in depth on the vertical axis (latter confirmed by snorkeler)
S2	I-beam	645271.3E 5174764.7N	I beam shape with approx. 6.4 m length, 0.6 m width, cross members visible, ferrous
S3	Frame	645260.2E 5174816.3N	Metal framework similar to scaffolding
S4	Plunge pool	645218.7E 5174833.6N	8+ metres deep and filled with large boulders and large concrete slabs



Figure 18: Target S1 – Crib

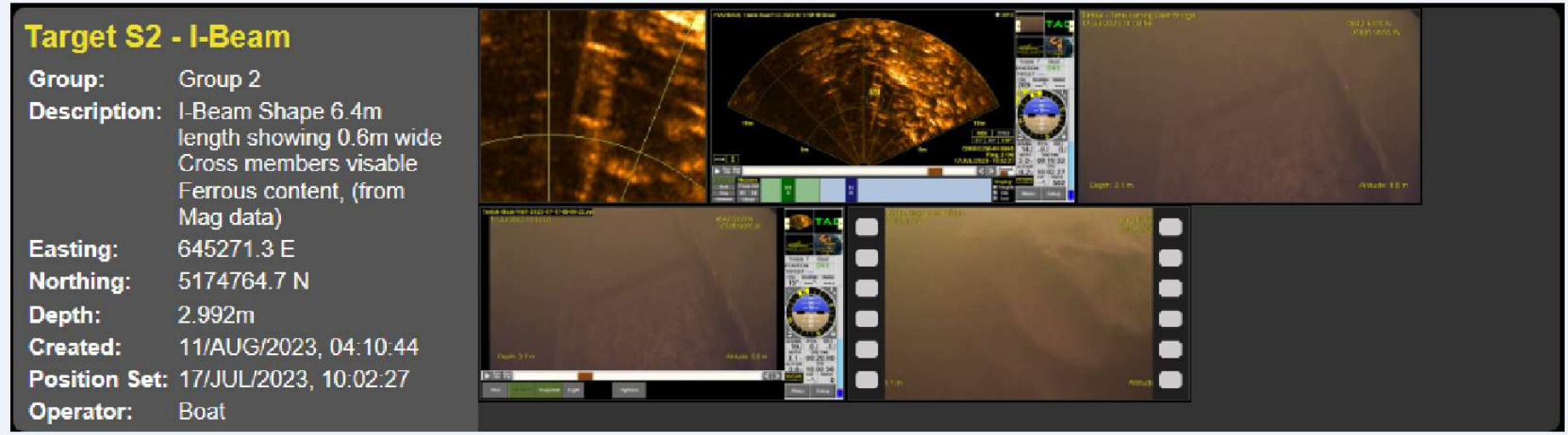


Figure 19: Target S2: I-beam like structure



Figure 20: Target S3 – Metal Frame

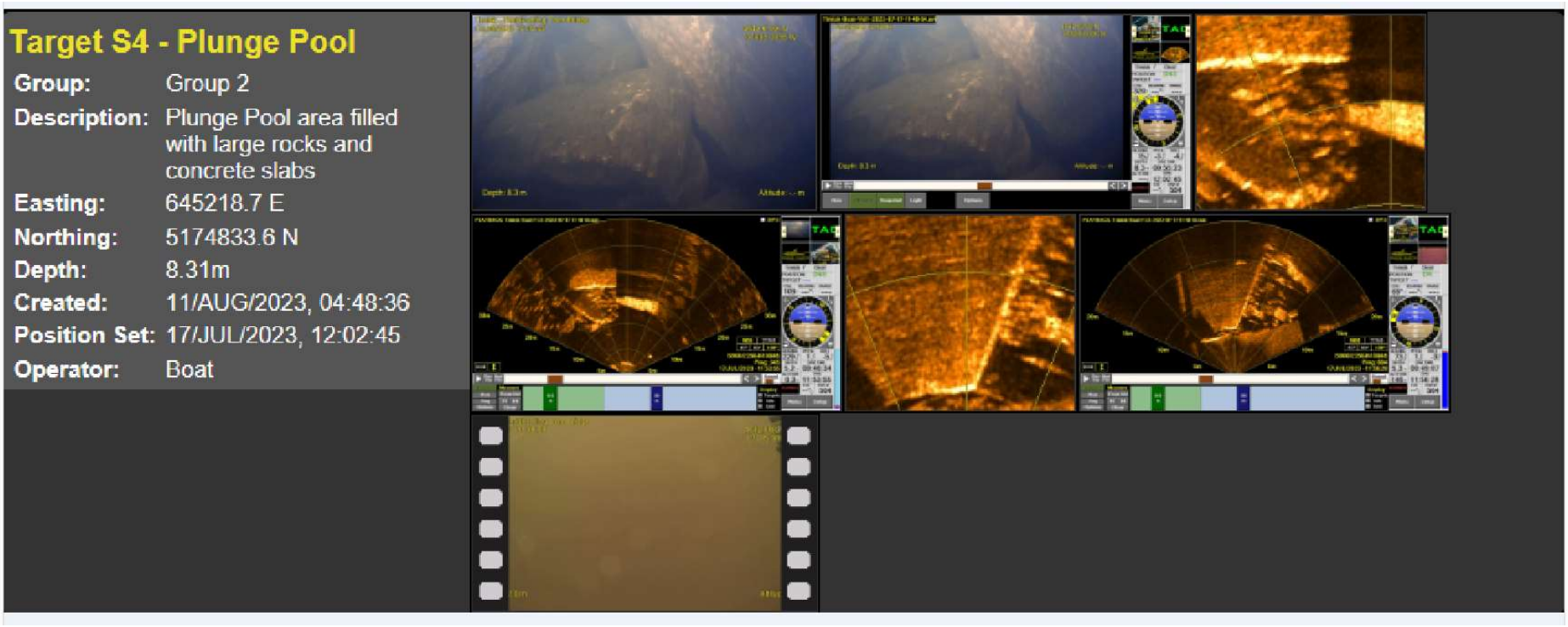


Figure 21: Target S4 –Plunge Pool

3.4 Inventory of Documentary Records Made In Field

Documents made in the field include:

- Daily record log and field notes – 2 pages (double-sided) and field log book;
- Digital images – 190 colour images; land and underwater
- GPS readings for finds;
- 7 videos
- Side scan sonar image – data, and
- Magnetometer: gradient and gamma map data.

4.0 ANALYSIS AND CONCLUSIONS

The background research has shown that the area has been subject to natural and man-made extremes, those of the rapids themselves which flowed through this area prior to the dam, and the number of attempts made by man to harness the waters of Lake Temiskaming as they flow into the Ottawa River. A combination of natural forces, such as freshets, ice jams, and flooding have contributed to the modification of the original lake/river bottom. The man made manipulation of the lake/river to erect dams in this location met with disaster caused by these same periods of flooding. Added to that, the erection of cofferdam and dams, and their destruction has added huge amounts of man-made materials to the river, generally in the form of twisted metal and concrete slabs. In an effort to stabilize the banks of the lake and river, a combination of rocks (primarily on the northeast side of the study area) and boulders, some as large as cars, were added to the river to lessen erosion along the banks.

It was hoped that some original shoreline might still be evident during the marine archaeological investigation, but there was no evidence of this along any of the four examined shorelines. The boulder rip rap extended above the shoreline and well below the water line. The side scan sonar and ROV visual assessment confirmed that these boulders (and large concrete slabs) covered the entire study area, with the exception of the dam apron, which was essentially devoid of any rock/boulder cover, and presented as a flat surface, and the rock fill was less towards the southern end of the study area., although it too was still very rocky.

The background research included bathymetry that was conducted in 2019, which indicated a very deep, 8+m, plunge pool. Examination of the plunge pool was conducted in the hopes of examining eroding sides, which possibly might have evidence of material culture, although this was a remote possibility given the natural forces on the bottom of the river. The 2023 survey found that the plunge pool was full of large concrete blocks and large boulders, allowing no access into the plunge pool. During the background research, there was no indication of when this infilling had been conducted, but based on the bathymetry date of 2019 and the current survey date of 2023, it is certain that the infilling occurred after the bathymetry had been conducted. It is assumed that the infilling occurred to assist in halting the further erosion of the plunge pool.

While there is no doubt that some of the rock and boulders in the study area formed part of the original rapids, the sheer quantity and size of the boulders, is indicative that they were purposefully placed here, as noted previously, as an erosion control measure. There were some loose sticks and logs (squared and round), twisted metal and gears, and miscellaneous metal that were located lying on top, or in between boulders, not under the boulders. This stratigraphy indicates that these materials arrived after the deposition of the rock fill. Wooden pieces were nonetheless examined for possible modification. Aside from the one metal stake (not in situ) found south of Gordon Creek by the snorkel team, and one plank with wire nails found by the ROV, none of the other wooden elements were modified. There was evidence at the extreme southern end of the study area of in situ trees that had died during a flooding episode.

The ROV and the snorkel team both found evidence of bricks, but these were loose and located on top of the boulders/rocks, suggesting a dump episode post rock filling.

The metal was primarily recent materials (fence posts, gears, framework, metal gears, and twisted miscellaneous metal). Most of the metal was found in the vicinity of the old dam foundations on the southeast and southwest side of the dam, north of Gordon Creek.

The snorkel survey located a wooden crib, later confirmed as a target by the geotechnical team. This wooden crib, technically lies outside the area of proposed construction for the dam.

The snorkel team did not find any significant cultural resources along any of the shorelines down to the depth of 3 metres, aside from the wooden crib. All of the shorelines had been heavily modified with rock fill. To ensure that the depth of 3 metres had been completely assessed, the geotechnical team was instructed to conduct a visual track of the 3 metre contour along all four shorelines. They also confirmed the crib, but found no other culturally significant material culture or features. They did come across what resembles an I-beam, at the mouth of Gordon Creek and extending out into the Ottawa River. This might be refuse that was lost during the Gordon Creek bridge construction (there were several, including the railway bridge).

While visibility was limited to between 50 centimeters and one metre (changed based on current, sediment, depth), even the use of various filters on the ROV did not improve visibility. The snorkel team was able to visually survey all the shorelines without any real handicap as increments for the survey team were generally less than one metre. The ROV sometimes had to get very close to objects (which added value to the survey) but an overall distance view of perspective was often not accessible, as distance away from an area (which would provide a larger picture) decreased the visibility. Overall, visibility, although limited in some regard, was compensated by smaller intervals and closer imagery. Additional survey on different days was considered, but flow from the dam stream (even with dam blocked) produced some current stirring up loose sediments. Snorkel intervals were decreased from the usual two to three metres, to less than one metre to compensate for reduced visibility. It is highly unlikely that conducting survey on a different day would have improved visibility.

Side scan sonar was conducted using a forward looking sonar. Areas of interest identified the plunge pool, the I-beam shaped object, and the crib at the southeast end of the study area. These items were further ground truthed with the ROV. The bottom was shown both above and below the dam to be covered entirely with rocks, boulders, large slabs of concrete, which totally obscured any possible remaining natural bottom.

The geotechnical survey and the snorkel survey were completed satisfactorily, and only one cultural feature of any archaeological significance was noted, that is, the crib. The crib is located outside the area of proposed construction, south of Gordon Creek, and is unlikely to be impacted at this time. The remainder of the study area has been demonstrated have no original shoreline or bottom, all modified either by dam infrastructure (existing dam, apron, etc.) and by rock and boulder infilling of plunge pool, shorelines and general bottom. All materials found on top or not in situ are considered to be recent material and are not considered to have any archaeological significance. The probability of any cultural material still being found in the study area is low. Given the boulder fill, it would also be of no benefit to enter the study area once the new cofferdam has been built, for any further assessment.

Based on background research, geotechnical and snorkel survey findings, the crib, if it will be impacted, will require detailed drawings prior to any impact. The remainder of the area is considered to have low potential for the discovery of any archaeological materials/features, based on the rock fill and heavy development impact of the river/lake bottom and adjacent shorelines.

5.0 RECOMMENDATIONS

Based on the background research, current conditions, and in-water geotechnical and snorkel survey of the study area, the following is recommended:

1. The crib located on the northeast shore south of Gordon Creek be mapped in detail should there be any possible impact from the dam/cofferdam development planned for the study area;
2. That a plan be in place for the construction of the cofferdam and dam to avoid any possible cultural materials and to cease construction should any cultural materials be located during the construction phase;
3. Compliance legislation must be adhered to in the event of discovery of deeply buried cultural material or features.

6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

According to the 2011 *S&Gs* (Section 7.5.9) the following must be stated within this report:

This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the Ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Should previously undocumented archaeological resources be discovered, they may be an archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of *the Ontario Heritage Act*.

The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

7.0 BIBLIOGRAPHY AND SOURCES

Archaeological Research Associates (ARA)
2023 *Marine Archaeological Assessment, Background Research, Timiskaming Dam-Bridge of Quebec, Replacement Project (Quebec) (715-32760TT), Intersection of Lake Temiskaming and the Ottawa River Straddling Border of Quebec and Ontario.* Marine Licence #2023-02. On file with Ministry of Citizenship and Multiculturalism.

Archéotec Inc.
1998 *Centrale Tabaret Étude de potential archéologique, Abitibi-Témiscamingue*.
1999 *Remise en éetat des ouvrages de l'aménagement des Rapides-des-Quinze, étude du potentiel archéologique Réservoir des Quinze Abitibi-Témiscaminque.*
2008 *Inventaires archéologiques (été 2002).* Direction de l'Abitibi-Témiscamingue, Ministère des Transports du Québec. Rouyn-Noranda.
2017a *Timiskaming Dam Complex: Québec dam replacement. Archaeological Potential assessment*. On file with Tetra Tech.
2017b *Timiskaming Dams, Quebec Dam Replacement, Archaeological Evaluation, Phase II, Archaeological Intervention 2017*. On file with Tetra Tech.

Rhone, Thomas .J.
1977 "A Baffled Apron as a Spillway Energy Dissipator". **Journal of the Hydraulics Division, ASCE**, December. https://www.usbr.gov/tsc/techreferences/hydraulics_lab/pubs/PAP/PAP-0340.pdf Accessed August 24, 2023

Scarlett Janusas Archaeology Inc. (SJAI)
2013a *Stage 1 Archaeological Assessment, Timiskaming Ontario Dam Replacement, Part of Long Sault Island and West Shoreline Ottawa River, Township of Poitras, District of Nipissing.* PIF #P027-211-2013. SJAI.
2013b *Stage 2 Archaeological Assessment, Timiskaming Ontario Dam Replacement, Part of Long Sault Island and West Shoreline of Ottawa River, Township of Poitras, District of Nipissing, Original Report*. PIF #P027-0234-2013. SJAI.
2015 *Marine Archaeological Assessment, Timiskaming Ontario Dam Replacement, Poitras Township, District of Nipissing, Ontario.* License 2014-012. SJAI.

Tetratech
2023 *Environmental Impact Statement: Temiskaming Dam-Bridge of Quebec Replacement Project (Quebec).* On file with PSPC.

Wegmann, Edward
1908 *The Design And Construction of Dams Including Masonry, Earth, Rock-Fill, Timber, And Steel Structures Also The Principal Types of Moveable Dams***.** John Wiley & Sons, London.

APPENDIX M – ARCHEOLOGY STUDIES

M-3: Technical Note - Marine Archeology Assessment – Task 3

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Technical Note: Marine Archaeological Assessment
Timiskaming Dam-Bridge of Quebec
Replacement Project (Quebec) (715-32760TT)
Intersection of Lake Temiskaming and the Ottawa River
Straddling Border of Québec and Ontario

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ARA File #2022-0574

05/03/2024

Introduction

Tetra Tech QI Inc. (Tetra Tech) and Public Services and Procurement Canada (PSPC) retained the services of Archaeological Research Associates (ARA) to conduct the marine archaeological background research (equivalent of land-based Stage 1 archaeological assessment) and the in-water marine archaeological assessment for the Timiskaming Dam-Bridge of Quebec replacement project (Quebec) (715-32760TT) located at the intersection of Lake Temiskaming and the Ottawa River, straddling the Québec and Ontario provincial boundaries. The study area is 3.71 hectares in size, extending 50 metres north of the north face of the existing dam, and approximately 255 metres downstream of the downstream dam face.

The results of the background research were used to evaluate the marine archaeological potential of the area, resulting in the in-water marine archaeological assessment.

Background research and in-water archaeological assessment was conducted with Indigenous engagement. The background research and property visit were initiated in February of 2023 and the in-water archaeological assessment was conducted in July of 2023. Background research was completed under licence 2023-02 held by Scarlett Janusas and in-water archaeological assessment was completed under licence 2023-10, by the same licence holder.

Equipment and Methodology

Background Research

Indigenous engagement had already been undertaken by the proponent.

The background research was conducted by a marine archaeologist and a marine historian to search, gather and interpret available archival information, including reports and previous studies/investigations (Indigenous engagement, previous archaeological assessments, bathymetry, underwater videos, etc.) from Tetra Tech and PSPC (2023). A property visit was conducted to ascertain the presence of above water level resources and determine their nature. The Ministry of Citizenship and Multiculturalism (MCM) provided known registered archaeological site data and reports from previous Ontario archaeological assessments. Numerous archive repositories from Quebec and Ontario were utilized to gather data for the project.

All the data were synthesized into a chronological format (earliest to most recent). Archaeological potential was then evaluated based on the available information. It was determined in the background research report that an in-water assessment would be required to identify any archaeological resources present.

In-Water Archaeological Assessment

Indigenous and Métis communities were invited to participate in the marine archaeological assessment. Due to the dangerous conditions and scheduling conflicts, none of the communities participated directly in the in-water marine archaeological assessment. All communities were provided with a draft and final version of the in-water archaeological assessment report.

The in-water archaeological assessment consisted of a multi-fold approach predicated on the instructions provided to the proponent from Parks Canada (PC). These included side scan sonar survey, magnetometer survey (where magnetic interference was minimal), ground truthing with a remote operated vehicle (ROV), a video of all the shorelines at the three-metre depth, in-water snorkel survey of all shorelines to a depth of three metres, photography and georeferencing of any significant or noteworthy finds/conditions.

For purposes of the snorkel survey, the study area was divided into five sections: northeast above the dam, northwest above the dam, southwest below the dam, southeast below the dam to Gordon Creek, and southeast below the dam and south of Gordon Creek to southernmost part of study area. The dam was closed to allow for safety of personnel and equipment; however, flow was still significant in the middle of the channel leading to and away from the dam, and from the outflow of Gordon Creek. Additional safety measures (lines tied to snorkeler for safety) were taken to conduct the necessary in-water work.

A ten-foot inflatable survey craft was used to allow for easy insertion and close access to the shore and shallow water areas of the study area, and sonar investigations and magnetometer investigations.

Side scan sonar used a Blueview M900/2250 with real time acquisition through Shark Marine DiveLog software. It has a frequency of 900 kHz/2250 kHz nominal, and a range of up to 100 metres. The forward-looking sonar was mounted to the survey vessel and followed a predetermined route within the predetermined survey area (above and below the dam) set to a 20-metre range. This allowed objects of 50 cms or more to be easily detected, as per the original parameters of the project.

The magnetometer can measure very small variations in the Earth's magnetic field allowing ferrous objects to be detected as "anomalies". A Shark Marine ProMag magnetometer was used to complete the survey. It has a sensitivity of 0.02 nT, accuracy of 0.1 nT, and a gradient tolerance of over 10,000 nT/meter. The magnetometer was towed behind the survey vessel in 10 metre intervals to prevent any ferrous components on the vessel from influencing its readings. The data was collected with corresponding georeferencing and processed creating a map. Ground truthing was conducted on targets located during the geotechnical survey.
Ground truthing used the ROV is a Barracuda with a camera (colour zoom, 470 tvl, 1.5 lux mn illumination), lighting (2x 1850 lumen LED lights), a depth rating of 300 metres, and forward-looking sonar with a frequency of 900/2250 kHz.

Results

Background Research

There were no registered archaeological sites within one kilometer of the study area. However, community knowledge shared with ARA suggested the presence of two historic Algonquin settlements/camps within one km of the existing bridge-dam. There were several land archaeological assessments conducted on adjacent lands, both on the mainland Quebec side, as well as several assessments on Long Sault Island.

Bathymetry and underwater videos indicated that the lake bottom upstream (north) of the dam face may have remnants of the former 1934 cofferdam. On the downstream (south) side of the dam, there are indications of the current dam apron, as well as concrete and metal, and possibly remains of a sill (baffles). There are few accumulated sediments on the river bottom, but evidence shows that heavier materials such as small rocks, etc. remain on the bottom. A large scour hole, reported from 2019 bathymetry, measures between 10 and 19 metres in depth, and is located at the base of the downstream apron.

Indigenous engagement provided clear indication that many of the First Nations, Métis and Indigenous communities have concern regarding possible Indigenous remains in the study area.
The original dam complex was constructed between 1909 and 1913. The Quebec dam was rebuilt, slightly north of the original dam placement, in the 1930s as a result of foundation failure. The current dam is the 1934 dam and will undergo replacement.

With the absence of well-established roadways or railways, the earliest transportation was over water. The study area is no exception. The Long Sault rapids required passage using a portage, shooting the rapids with the possibility of canoe or boat spill, and/or tow hauling. Rapids also, in shallow periods, presented small pools which could harbour fish. Waterways and the riparian landscape would also support herptiles, mammals and birds. Plants were available both in water and on the shoreline for harvesting. Indigenous peoples would have traversed the study area, either through the rapids, on either Ottawa River shoreline, or the Long Sault Island shoreline.

Logging of the area was an important economic pursuit. An 1882 engraving depicts a flume from Gordon Creek exiting into the Ottawa River. The Lumsden mill, operating on Gordon Creek, would most likely send logs down into the river via this creek/flume and to points south.
The historic navigation of the Long Sault rapids began with canoes and small boats. The first steamship on the rapids, towed up the rapids by winch, was the MATTAWAN. Navigation continued for the area, but only on Lake Temiskaming, and points south of the rapids. The end of active commercial navigation of Lake Temiskaming and the Ottawa River was prompted by the construction of the railway into the area.

There were at least two wharves in the area, but both were located north of the study area.
The construction of the dams, both on the Ontario and Quebec sides, effectively put an end to any water transportation from Long Sault Island to points north.

A property visit conducted in February 2023 observed the 1912 dam remnant on the Quebec shoreline of the Ottawa River but did not observe any other indications of marine infrastructure either above the waterline or along the shorelines. The shorelines had undergone modification, that is, riprap to halt erosion.

In-water Assessment

The side scan sonar survey and snorkel survey above the dam (Lake Temiskaming) indicated that the entire bottom was covered with rocks and boulders. The shoreline on the northeast shore had smaller rocks on shore, and these same rock types extended into the water, becoming boulder sized with depth. The shoreline on the northwest shore was lined with boulders and these also extended into the water. The southeast (north of Gordon Creek) and southwest sides were also lined with boulders above and below the water line. On the southeast side, below Gordon Creek, a more natural appearance, although still very stony, was observed. This was evidenced by remnants of drowned trees with roots still visible. Side scan sonar and video showed the entire bottom to be rock and boulder covered north of Gordon Creek, and very rocky south of Gordon Creek.

The snorkel survey of the southwest shoreline showed the shore to be lined with boulders on shore and to a depth of below three metres. There was evidence of concrete rubble and rounded logs. The latter showed no signs modification. There were occasional pieces of random metal along the southwest submerged shoreline, likely associated with the destruction of the early dam and/or the building of the second dam. The remnants of the old dam could be seen from the water facing up, and this corresponded with the metal and concrete debris found in the water.

Snorkel survey along the northeast side north of Gordon Creek confirmed a modified shoreline with large boulders that extended deeper than three metres. In and around the area of the dam ruins on shore, the in-water observations were of a jumble of metal, concrete and rubble debris. South of the southern entrance of Gordon Creek, the snorkel team found evidence of a crib located near the southernmost end of the study area. The crib does not have any known direct association with any of the previous or current dam structures. In all probability, based on its location, it was used as support for a temporary dock or wharf.

The side scan sonar survey noted that presence of boulders south of the dam, below the dam apron. In addition, there was a large amount of concrete, metal and general construction debris (or debris from the destruction of the early dam) littered on the bottom and in the plunge pool. The plunge pool was observed during the marine archaeological assessment to be filled with car sized concrete rubble to the top and over the edge of the plunge pool. It was impossible to investigate the sides of the plunge pool due to its being infilled. It has been surmised that based on the 2019 bathymetry, that these large concrete pieces were deliberately put in this location to prevent further scouring below the dam sill after the bathymetry had been conducted in 2019. No record of this infilling has come to light as yet.

The side scan sonar survey, magnetometer survey and ROV ground truthing found the crib on the south side of Gordon Creek, and towards the south of the study area along the southeast shore below the dam. Extending out from the mouth of Gordon Creek, a long (over 8 metres) I – shaped single piece (confirmed with the magnetometer to be metal) was located by forward looking sonar and magnetometer. As Gordon Creek had many bridges crossing it at this location, this may be a remnant of a rebuilt.

The marine archaeological assessment tracked concrete and metal debris on both sides of the river below the dam in varying degrees. These are a product of the early dam failure and are not in situ and therefore of lesser significance. The crib below (south) Gordon Creek will not be impacted

by the proposed cofferdam or rebuilt of the dam. The long I – shaped single piece is located south of the proposed cofferdam, and while it might be impacted, is not considered to be of cultural significance.

Discussion

Background Research

The area was determined to have archaeological potential and recommended for in-water marine archaeological assessment, based on the presence of rapids; Indigenous use of the area; available natural resources for Indigenous and Euro-Canadian use; possible circa 1880s flume at Gordon Creek and Ottawa River; possible cofferdam and early dam remnants; Ottawa River is a Canadian Heritage River.

In-water Archaeological Assessment

The sidescan sonar survey, magnetometer survey and snorkel survey are effective methods of capturing possible cultural resources, but each has its own limitations. Sidescan sonar survey was meant to capture targets that were 50 cms or more in size. Magnetometer was hampered by the large quantity of rebar and other metals in the area. Snorkel survey was limited to a depth of three metres. There may be cultural objects that could not be located using these methods. In addition, the bottom and shorelines have been modified for erosion control measures, and effectively eliminate any possibility of viewing the original river or lake bottom in the study area. If there are archaeological resources under these rocks/boulders, they cannot be identified with the current technology available.

A discussion was had with the client, various Indigenous communities and ARA prior to the in-water assessment with regards to the possibility of conducting pedestrian transect observations once the cofferdam had been established and the area dewatered. If the bottom had been unmodified, this may have been possible, but the presence of rocks/boulders and concrete on the bottom of both the lake and river bed in the study area have buried the original bottom and made it inaccessible. The proposal of a visual survey following dewatering is not feasible given the current conditions of the study area.

Only one marine archaeological resource, still in situ, was located in the study area and this is the crib located south of the mouth of Gordon Creek. It lies outside the proposed area of development.

Conclusion

Based on the results of the background research and the in-water archaeological assessment of the study area, the following are noted:

There are remnants of machinery and general construction/demolition debris including metal, wood and concrete, that likely derives from the construction of the early and current dam and cofferdams. These are represented by a mass of indeterminate metals, sometimes scaffolding, some modern metal as evidenced by machine cut nails, re-bar, angle bar, and even an I-beam.

These are not in situ, and do not provide any significant value to interpreting the site or previous activities.

Only one marine archaeological resource of significance was located during the assessment – a crib, but this is located outside the area of proposed development. This site has been registered under the Borden system with the number CeGs-3.

Although located south of the proposed cofferdam construction, avoidance and protection of this resource must be conducted to ensure that indirect impacts do not compromise the resource. If avoidance and protection is not possible, then detailed in-situ documentation of the crib must be conducted prior to any impact, direct or indirect.

Avoidance can be achieved for the crib (CeGs-3) by ensuring that all construction plans include both a visual and georeferenced for the location of the crib; ensuring that the protection of the crib is relayed to all managers and their crew through initial briefs/meetings; and, place buoys at the location of the crib as a visual marker for avoidance. Avoidance should be a minimum of 10 metres distant from the crib.

Shorelines have been heavily modified through erosion control measures and the extant and historic dam have heavily altered the original study area configuration. While no Indigenous artifacts or features were located during the marine archaeological assessment, it is recommended that an interpretative display or signage be established to highlight the significance of this area to the Indigenous communities, especially highlighting resource use and temporary campsites. In addition, an interpretative display or signage should be established to highlight the first ship, the MATTAWAN, to successfully be transported up the rapids by tow hauling.

References Cited

Archéotec Inc.

1998 *Centrale Tabaret Étude de potential archéologique, Abitibi-Témiscamingue*.

1999 *Remise en éetat des ouvrages de l'aménagement des Rapides-des-Quinze, étude du potentiel archéologique Réservoir des Quinze Abitibi-Témiscaminque.*

2008 *Inventaires archéologiques (été 2002).* Direction de l'Abitibi-Témiscamingue, Ministère des Transports du Québec. Rouyn-Noranda.

2017a *Timiskaming Dam Complex: Québec dam replacement. Archaeological Potential assessment*. On file with Tetra Tech.

2017b *Timiskaming Dams, Quebec Dam Replacement, Archaeological Evaluation, Phase II, Archaeological Intervention 2017*. On file with Tetra Tech.

Archaeological Research Associates Inc. (ARA)

2023 *Marine Archaeological Assessment, Background Research, Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec) (715-32760TT), Intersection of Lake Temiskaming and the Ottawa River Straddling Border of Québec and Ontario.* Licence 2023-02. On file with PSPC and MCM.

2023 *Marine Archaeological Assessment, Task 2, Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec) (715-32760TT), Intersection of Lake Temiskaming and the Ottawa River Straddling Border of Québec and Ontario*. Licence 2023-10. In review.

Biofilia/BBA (Biofilia)

2018 *Timiskaming Dam-Bridge of Quebec Replacement. Environmental Impact Assessment – Biological Environment.* Report prepared for Tetra Tech. 124 p.+ appendices.

Haxton, T. and D. Chubbuck

2002 *Review of the historical and existing natural environment and resource uses on the Ottawa River.* Ontario Ministry of Natural Resources Division, Science and Information Branch, Southcentral Science and Information Section, SCSI Technical Report #119, 76 p.

Mistras

2016 Submarine videos.

Services publics et Approvisionnement Canada (SPAC)

2022 *Environmental Impact Statement. Timiskaming Dam-Bridge of Quebec Replacement*

Tetra Tech QI Inc.

2023 *Timiskaming Dam-Bridge of Quebec Replacement Project (Quebec), Environmental Impact Statement*. Prepared for Public Service and Procurement Canada

APPENDIX M – ARCHEOLOGY STUDIES

M-4: Chance Find Protocol – Task 4 (to come – under First Nation review)

APPENDIX N – TECHNICAL NOTE ON HYDRAULIC ISSUES



Gouvernement du Canada

Services publics et Approvisionnement Canada

Remplacement du barrage Témiscamingue situé sur la rivière des Outaouais

SR.2.2.H – Analyse des aspects hydrauliques

TETRA TECH

N/Réf. Tt : 32760TT

V/Réf. : R.073116.307

13 mars 2017

Remplacement du barrage Témiscamingue situé sur la rivière des Outaouais

SR.2.2.H – Analyse des aspects hydrauliques

N/Réf. Tt : 32760TT V/Réf. : R.073116.307

13 mars 2017

Révision : 00

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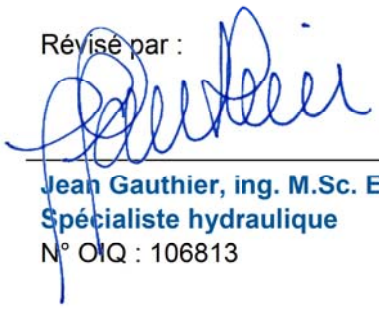
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ANNEXE

Annexe A Carte topographique et bathymétrique

1.0 MISE EN SITUATION

Historiquement, la rivière des Outaouais était la route principale qu'empruntaient les explorateurs et les commerçants pour passer du fleuve Saint-Laurent à l'intérieur des terres. Les premiers barrages ont donc été construits pour faciliter la navigation. Rapidement, la capacité d'entreposage des réservoirs a également permis de régulariser le débit et ainsi contrôler les risques d'inondation au printemps et augmenter le débit des rivières en période de sécheresse. Également, la production hydro-électrique et l'industrie des pâtes et papiers ont bénéficié de la présence de ces barrages. Le barrage Témiscamingue s'inscrit donc dans ce contexte.

1.1 OBJECTIF DU MANDAT

De façon générale, l'objectif du mandat confié à Tetra Tech est de fournir la gamme complète de services professionnels, techniques et de génie dans le cadre du projet de remplacement complet de la portion québécoise du complexe du barrage Témiscamingue.

De façon spécifique, ce rapport présente les analyses hydrauliques effectuées dans le cadre des travaux de remplacement. En regard de la gestion des eaux, rappelons les objectifs suivants :

- Le nouveau barrage Témiscamingue de Québec doit être conçu pour favoriser une gestion efficace et sécuritaire du débit et des niveaux d'eau de la rivière des Outaouais en regard des obligations identifiées par la Commission de planification de la régularisation de la rivière des Outaouais.
- L'étude hydraulique doit permettre de déterminer la capacité d'évacuation et le temps de réaction des ouvrages proposés de manière à déterminer si le nombre de pertuis actuel est suffisant, compte tenu des dimensions (hauteur, largeur) fixées par les équipements spécifiés par Services publics et Approvisionnement Canada (SPAC) pour son opération.
- Le lac Témiscamingue a une capacité de laminage des crues importantes et la majorité des tributaires en amont sont contrôlés par des ouvrages régulateurs (Kipawa à Laniel, des Quinze, Rapide-des-Îles, R2 et R7 sur l'Outaouais supérieur). L'analyse hydraulique effectuée tiendra compte de la capacité d'emmagasinement de ce réservoir.
- Déterminer les besoins en termes de phasage des travaux. À priori, un minimum de deux étapes de travaux est prévu de manière à ce qu'au moins la moitié de la capacité d'évacuation du barrage Québec soit disponible pendant les travaux.
- Déterminer la capacité d'atteindre les niveaux de gestion souhaités en période de travaux.
- Fournir la documentation suffisante permettant d'effectuer les calculs d'évacuation par pertuis à toutes les configurations possibles de poutrelles et pour toutes les combinaisons de niveaux d'eau amont et aval.
- Déterminer les paramètres hydrauliques en aval du barrage en regard des problématiques d'érosion et d'affouillement sous différentes conditions d'écoulement.
- Procéder à la classification préliminaire du barrage conformément aux exigences des Directives pour la sécurité des barrages 2007.
- Le système de contrôle du débit doit pouvoir répondre assez rapidement pour réduire au minimum les dommages en cas d'inondation en amont ou en aval du barrage. Dans ce contexte, il est nécessaire d'évaluer la nécessité d'intégrer une ou plusieurs portes levantes si leur présence est nécessaire pour respecter les temps de réponse fixés en cas d'inondation.

1.2 DESCRIPTION GÉNÉRALE

La Commission de planification de la régularisation de la rivière des Outaouais a été mise sur pied en 1983 par les gouvernements du Canada, du Québec et de l'Ontario afin de gérer de manière intégrée les réservoirs principaux du bassin de la rivière des Outaouais.

De cette façon, les différents opérateurs de barrage dans le bassin coordonnent l'exploitation de leurs installations avec les autres opérateurs. Tous les propriétaires de barrage connaissent donc et sont sensibles aux conséquences de leurs décisions opérationnelles sur les activités de leurs homologues. Une telle coordination permet de prévoir le comportement des réservoirs du bassin et d'atténuer le débit de crue, et donc de réduire les dommages dans les cas où les inondations sont inévitables.

En dehors des périodes d'inondation, la Commission gère le bassin dans l'intérêt des différents usagers, particulièrement en ce qui concerne la production d'énergie hydroélectrique.

La Commission étudie tous les changements proposés aux politiques opérationnelles ou aux installations des réservoirs principaux afin d'intégrer les changements proposés au système, de déterminer les effets de ces changements, le cas échéant, sur les politiques et procédures en place, de déterminer les effets nets possibles sur les intervenants des deux provinces.

En 1870, le ministère fédéral des Travaux publics est devenu responsable de la régularisation des eaux et de la navigation sur la rivière des Outaouais en vertu de *l'Acte concernant certains travaux sur la rivière Ottawa.* Entre 1909 et 1914, le Ministère a construit le complexe du barrage Témiscamingue afin d'améliorer la navigation dans le cadre du plan de canal maritime de la baie Georgienne. Le barrage Témiscamingue contrôle le niveau et le débit d'eau provenant du lac Témiscamingue, lequel est le réservoir principal de la rivière des Outaouais avant qu'elle rejoigne le fleuve Saint-Laurent à Montréal.

Le complexe du barrage Témiscamingue se situe sur la rivière des Outaouais au lac Témiscamingue, à environ 65 km au nord-est de North Bay en Ontario, sur la frontière entre le Québec et l'Ontario. Il comprend deux barrages structurellement indépendants, les barrages Québec et Ontario, situés chacun sur leur côté de l'île Sault dans la rivière des Outaouais. L'île Sault appartient également à l'État et fait entièrement partie de la province d'Ontario.

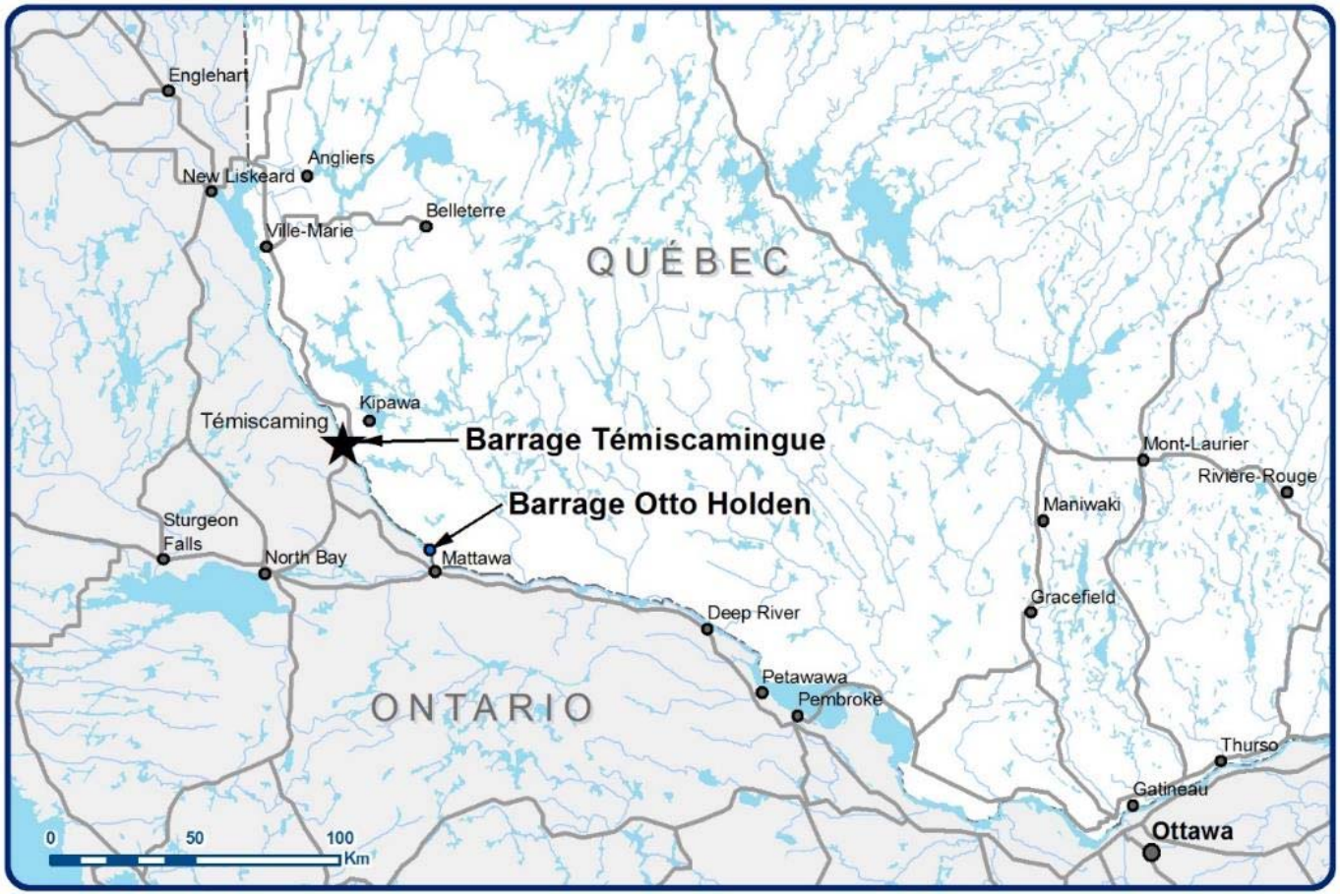


Figure 1-1 : Localisation générale du site à l'étude

Les barrages de l'Ontario et du Québec sont construits de façon similaire : ils comportent une série de pertuis à poutrelles entre des piliers-poids en béton armé pour soutenir la pression de l'eau. Le débit de l'eau est contrôlé par l'empilage ou le retrait de poutrelles en bois de construction équarri dans les pertuis; ce processus permet de régulariser la quantité d'eau passant dans le barrage.

- Le barrage du Québec compte 10 pertuis et mesure 94 m de longueur.
- Le barrage de l'Ontario compte 16 pertuis et a 121 m de longueur.

Malgré la différence de largeur entre les deux barrages, la capacité d'évacuation de ces derniers est presque identique en raison du canal naturel plus profond et des pertuis du barrage du Québec.

2.0 INFORMATIONS EXISTANTES

Pour la réalisation de cette étude hydraulique, SPAC a fourni à Tetra Tech une série de documents et études antécédents décrivant en détail les modes de gestion des ouvrages ainsi que les différents travaux et changements apportés au complexe Témiscamingue depuis sa construction. Une revue de ces documents a été réalisée afin de synthétiser les informations hydrauliques pertinentes pouvant servir à la présente étude.

2.1 LISTE DES ÉTUDES FOURNIES (CLASSÉES PAR DATE DE PUBLICATION)

- Rivière des Outaouais, augmentation de la débitance du barrage Témiscamingue en période de bas niveau du réservoir (Ministère de l'Environnement du Québec, 1987);
- A study of the increase in storage and flood reserves at Baskatong, Temiscamingue, Des Quinzes and Kipawa (Ministère de l'Environnement du Québec, 1988);
- Réservoir Témiscamingue : Faisabilité de la réduction du niveau d'exploitation maximum, étude hydrologique préliminaire (Ageos Sciences, 1993);
- Évaluation du rapport intitulé: « Réservoir du barrage Témiscamingue: Faisabilité de la réduction du niveau d'exploitation maximum, étude hydrologique préliminaire » préparée par la firme AGEOS Sciences (Ouellet & Llamas, 1994);
- Érosion des berges liée au mode de gestion des niveaux d'eau du réservoir Témiscamingue (Ageos Sciences, 1996);
- Operations of the water control structure at lake Timiskaming (Ogden Beeman & Associates, 1997);
- The effects of reservoir operation on shore erosion along lake Timiskaming (J.W. Kamphuis Associates, 1997);
- Érosion des berges du lac Témiscamingue, rapport d'expertise (Ouellet, 1997);
- Investigation of Timiskaming dams discharge at low reservoir levels (Way, 1999);
- Hydraulic model study of scour and erosion protection at the east Témiscaming dam (CHC, 2004);
- Hydraulic study and analysis report for Timiskaming Ontario dam replacement (HATCH, 2013).

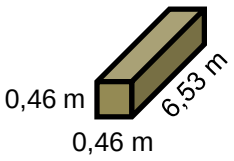
2.2 DESCRIPTION DU BARRAGE EXISTANT

2.2.1 Géométrie

Le barrage Témiscamingue côté Québec est une structure en béton armé constituée de neuf piliers et de deux culées en béton séparées par dix pertuis à poutrelles. Un tablier de béton, possédant une longueur de 6,10 m en amont du barrage et une longueur de 25,91 m en aval, forme la base de la structure. Les piliers possèdent une épaisseur de 1,524 m et les pertuis possèdent une largeur de 6,10 m. La longueur totale du barrage est de 74,71 m entre les deux culées.

2.2.2 Appareil d'évacuation

Les débits évacués au barrage Témiscamingue sont gérés à l'aide de dix pertuis du barrage Témiscamingue côté Québec opérés à l'aide de poutrelles de bois possédant une longueur de 6,527 m et une largeur/hauteur de 0,457 m. Ces poutrelles sont ajoutées ou retirées des pertuis à l'aide d'un appareil de levage hydraulique monté sur des rails le long du tablier du barrage. Il n'est possible d'opérer qu'un seul pertuis à la fois à l'aide de cet appareil et les poutrelles sont retirées par groupe de deux.



Le nombre maximal de poutrelles pouvant être ajoutées aux pertuis est de 16, ce qui correspond à une hauteur totale de 7,2 m. SPAC a fixé le nombre de poutrelles minimal dans les pertuis à six afin de réduire les risques de flottaison des poutrelles, ce qui peut causer un coincement ou la perte de ces dernières et complexifier les opérations des pertuis. Lorsque le niveau aval est suffisamment bas, le nombre minimal de poutrelles peut être réduit à quatre. En conditions estivales, les temps d'opération requis pour ouvrir et fermer un seul pertuis varient entre 30 minutes et une heure. Les temps d'opération requis en période hivernale grimpent entre une heure trente et deux heures trente en raison des travaux de dégivrage.

2.3 DONNÉES GÉOGRAPHIQUES

2.3.1 Bathymétrie

SPAC a fourni à Tetra Tech les relevés bathymétriques réalisés par la firme Hatch dans le cadre de leur étude hydraulique pour le remplacement du barrage Témiscamingue du côté ontarien (Hatch, 2012). Ces relevés couvrent les deux branches de la rivière des Outaouais de chaque côté de l'île du Sault et s'étendent jusqu'à 200 m en amont et 800 m en aval du barrage à l'étude du côté Québec. La figure 2-1 présente les relevés bathymétriques réalisés dans le cadre des études antérieures. La carte de l'annexe A présente les courbes topographiques et bathymétriques qui ont été créées à partir de ces données.

Des données bathymétriques complémentaires couvrant l'ensemble du réservoir Témiscamingue, mesurées en 2001 et 2002, ont été fournies par SPAC. Ces données ont servi à valider la courbe d'emmagasinement utilisée par SPAC pour réaliser les bilans volumétriques du réservoir.



Figure 2-1 : Étendue des relevés bathymétriques réalisés par HACTH en 2012

SPAC a également fourni les relevés bathymétriques qu'elle a réalisés en 2008 en amont et en aval du barrage Témiscamingue, du côté québécois. Ces relevés possèdent une résolution supérieure et permettent d'identifier les secteurs présentant une problématique d'affouillement. Après analyse, et considérant la qualité de l'ensemble des données bathymétriques disponibles, aucun relevé supplémentaire n'a été réalisé.

2.3.2 Relevés topographiques complémentaires

2.3.2.1 Relevés LiDAR

Les données topographiques utilisées pour cette étude proviennent des feuillets de relevés aéroportés (LiDAR) préparés par Géoboutique Québec. Ces feuillets couvrent un territoire s'étendant jusqu'à 2 000 m en amont et 1 500 m en aval du barrage à l'étude et offrent une densité de points atteignant 5 points par m^2 et une précision verticale d'environ 10 cm. Ces données ont servi principalement à caractériser les berges de la rivière des Outaouais ainsi qu'à préparer un modèle numérique de terrain complémentaire aux données bathymétriques disponibles.

2.3.2.2 Relevés topographiques

Le 30 novembre 2016, une équipe d'arpentage de Tetra Tech a effectué des relevés topographiques complémentaires sur le site du barrage Témiscamingue afin de localiser les différents éléments d'infrastructures. Ces relevés ont servi à raffiner les élévations de ces éléments intégrés au modèle hydraulique.

2.3.2.3 Modèle numérique de terrain

L'ensemble des données topographiques et bathymétriques recueillies a été combiné afin de créer un modèle numérique de terrain (MNT) servant de base à la modélisation hydraulique. Le MNT a été créé sous un format de type « raster » avec une résolution de 1 m par 1 m à l'aide du logiciel ArcGIS 10.4.1.

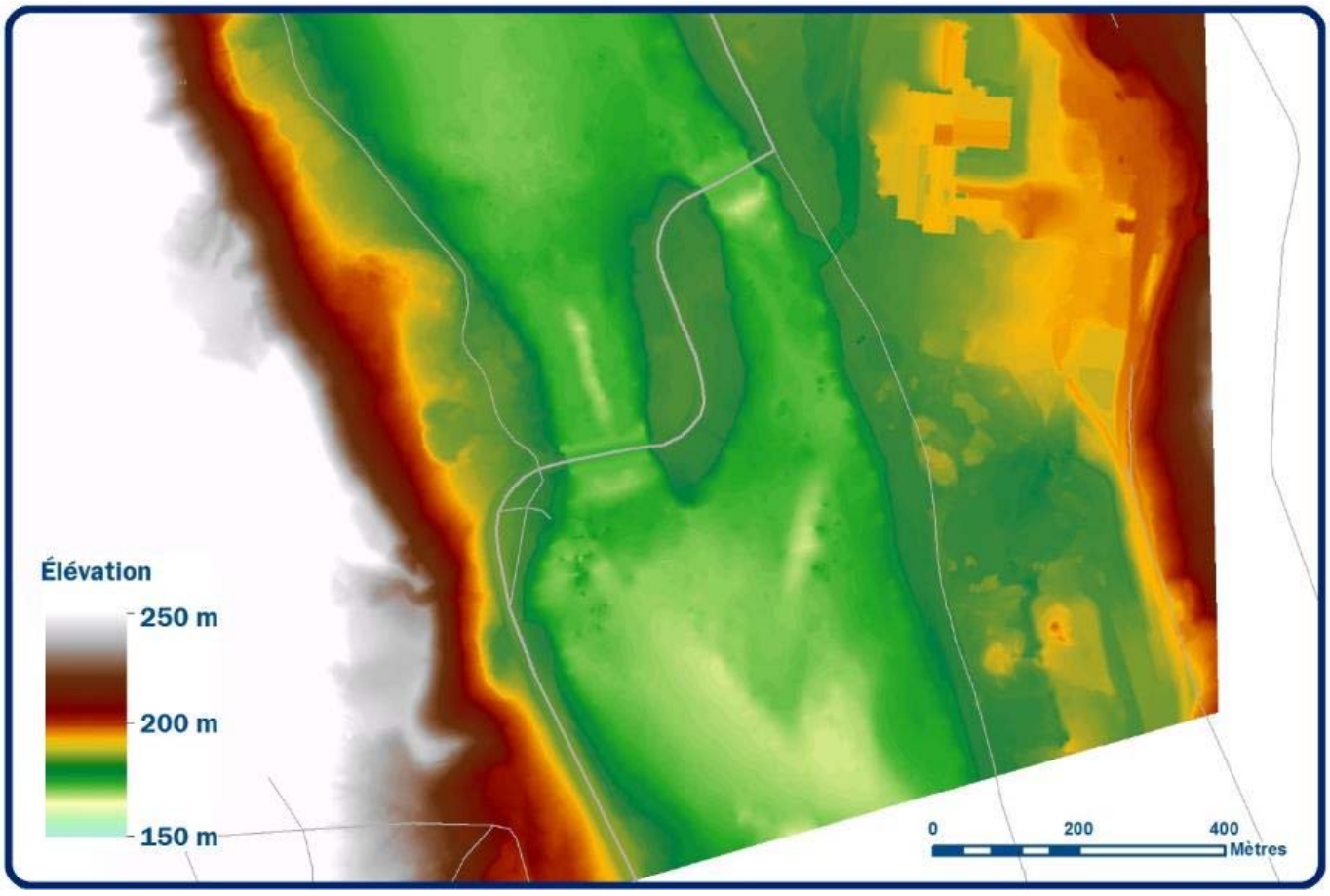


Figure 2-2 : Aperçu du modèle numérique de terrain réalisé à partir des données disponibles

2.3.3 Série des débits

2.3.3.1 Débits sortants

Aucune station de mesure de débits n'est installée au droit des barrages Témiscamingue. Le débit transitant par les deux barrages est estimé à partir des débits calculés au barrage Otto Holden et fournis par Ontario Power Generation (OPG). Cet ouvrage est localisé à environ 50 km à l'aval du site à l'étude. Afin d'obtenir les débits au droit des barrages Témiscamingue, SPAC soustrait aux débits calculés à Otto Holden, les débits des tributaires se jetant dans la rivière des Outaouais entre ce barrage et le complexe Témiscamingue. Ces débits sont estimés à partir des modèles hydrologiques de SPAC et ne sont pas mesurés sur le terrain.

Les débits quotidiens sortants à Témiscamingue sont disponibles pour la période d'avril 1911 à aujourd'hui. Aucune donnée n'est disponible pour la période du 1er octobre 1960 au 1er octobre 1966. Il est à noter que les débits sont calculés à partir des niveaux d'eau mesurés à Otto Holden à minuit et ne représentent pas les débits moyens journaliers. Toutefois, en raison de la grande superficie du bassin versant de la rivière des Outaouais et de son grand temps de réponse, les données disponibles sont jugées adéquates à des fins d'analyse statistique journalière. La figure 2-3 présente les débits sortants moyens journaliers calculés pour les barrages Témiscamingue.

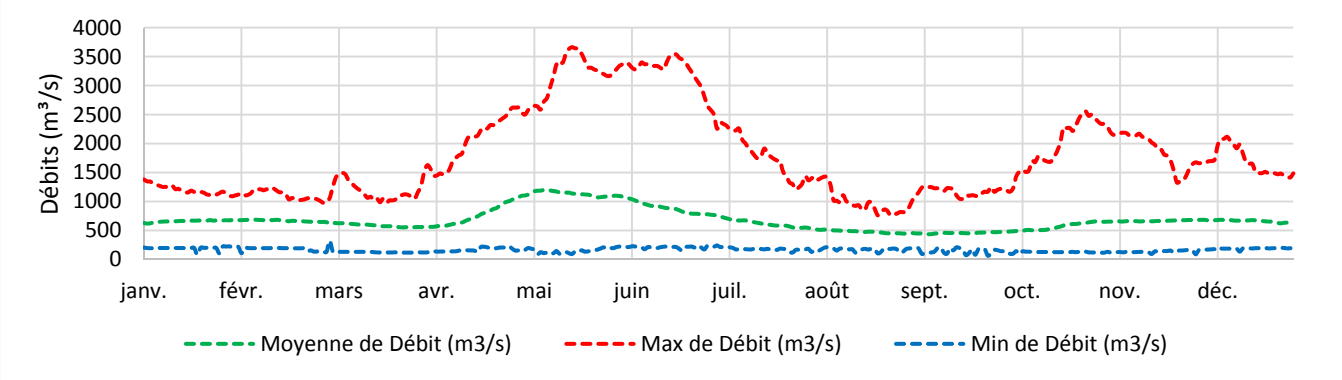


Figure 2-3 : Débits sortants moyens des barrages Témiscamingue

2.3.3.2 Débits entrants

Les débits moyens quotidiens entrants dans le réservoir Témiscamingue sont estimés par SPAC à partir des variations du niveau d'eau du réservoir et des débits sortants aux barrages Témiscamingue calculés à partir des données disponibles au barrage Otto Holden. Les données de débits entrants dans le réservoir sont disponibles pour la période de juillet 1997 à aujourd'hui. Notons qu'aucune validation de ces débits n'est disponible et que ceux-ci sont basés sur des calculs théoriques.

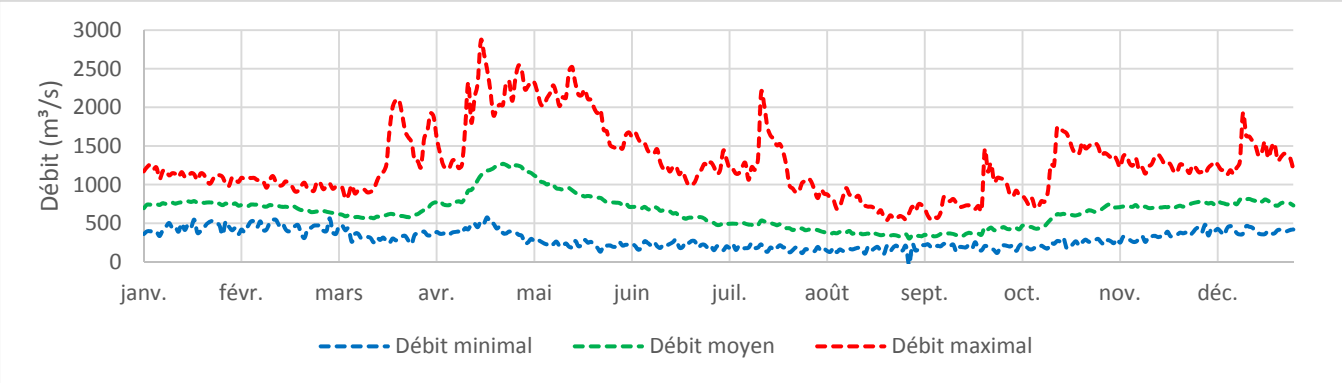


Figure 2-4 : Débits entrants moyens dans le réservoir Témiscamingue

2.3.4 Série des niveaux d'eau

Les niveaux d'eau de la rivière des Outaouais et du réservoir Témiscamingue sont mesurés aux stations opérées par le service de Relevés hydrologiques du Canada. Trois stations mesurent actuellement les niveaux du réservoir :

- Station 02JE011 au droit de la municipalité de Haileybury (1908-2016);
- Station 02JE025 en amont du barrage Témiscamingue (1987-2016);
- Station 02JE026 au droit de la municipalité de Ville-Marie (1987-2016).

Les niveaux d'eau à l'aval du barrage sont mesurés à la station 02JE024 située à la pointe sud de l'île du Sault, entre les barrages des côtés ontarien et québécois. La figure 2-5 présente la localisation des stations hydrométriques utilisées pour l'étude hydraulique.

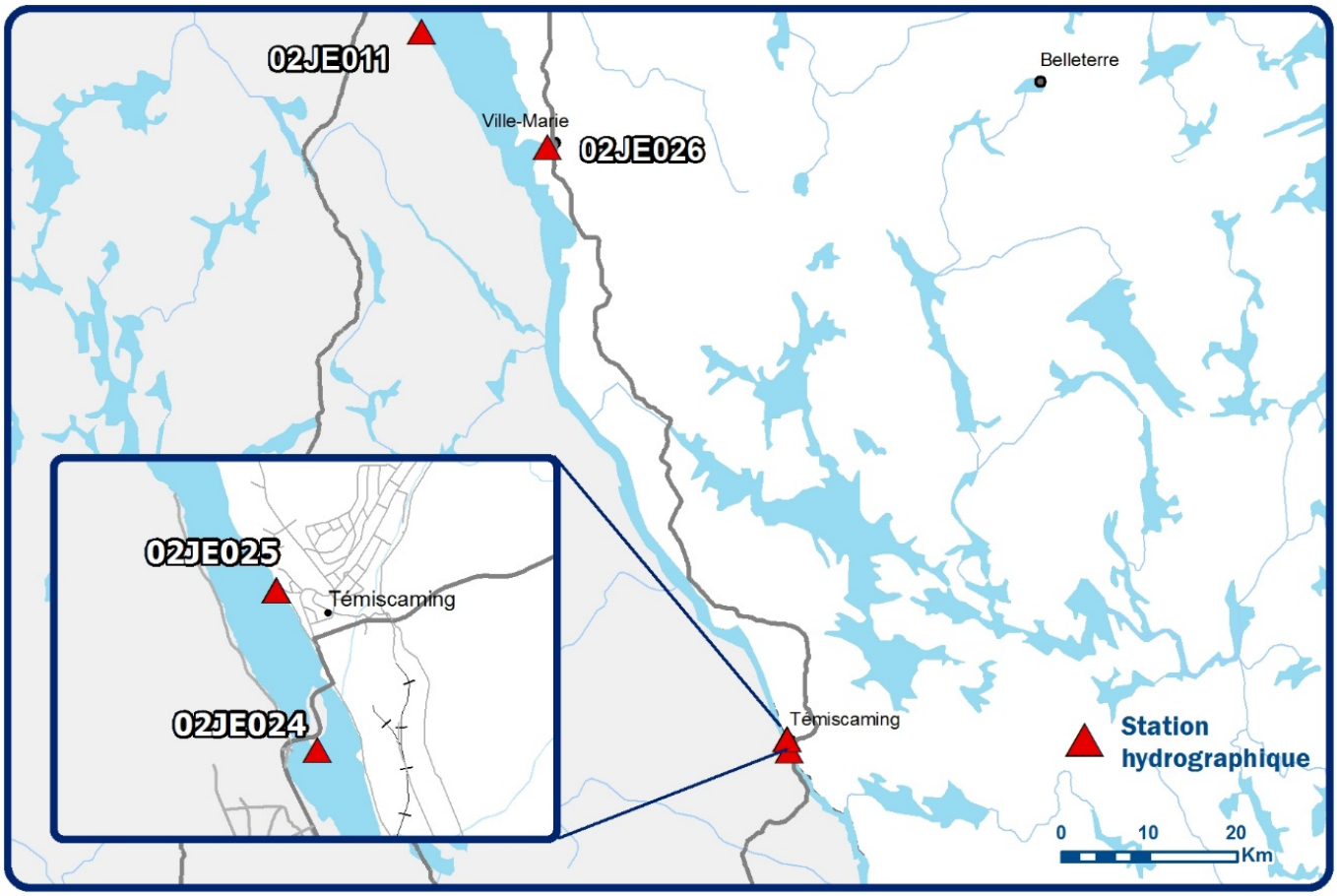


Figure 2-5 : Localisation des stations hydrographiques utilisées

Les niveaux d'eau moyens journaliers enregistrés à ces stations sont disponibles pour la période de 1987 à 2016. La figure 2-6 et la figure 2-7 présentent les niveaux moyen, maximal et minimal journaliers du réservoir Témiscamingue et à l'aval du barrage à partir des données des stations 02JE025 et 02JE24.

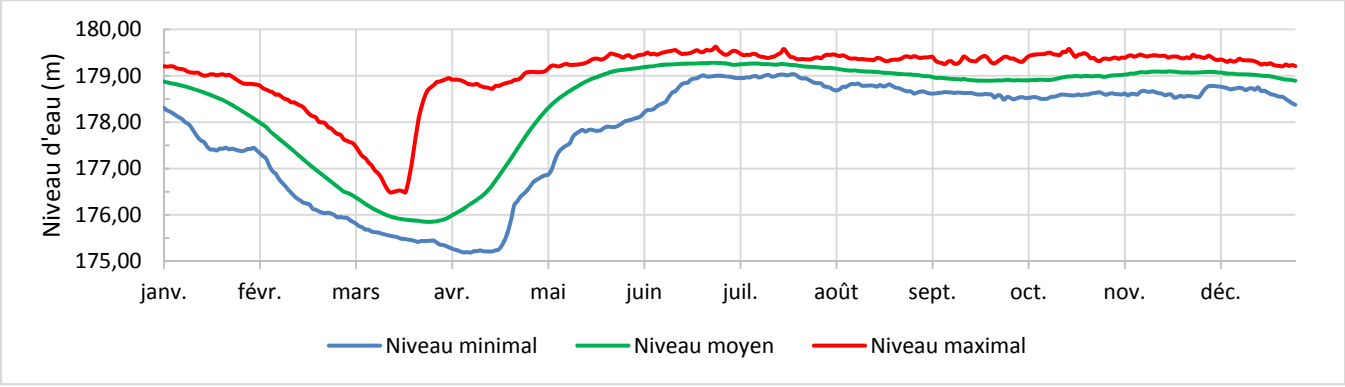


Figure 2-6 : Niveaux moyens annuels du réservoir Témiscamingue

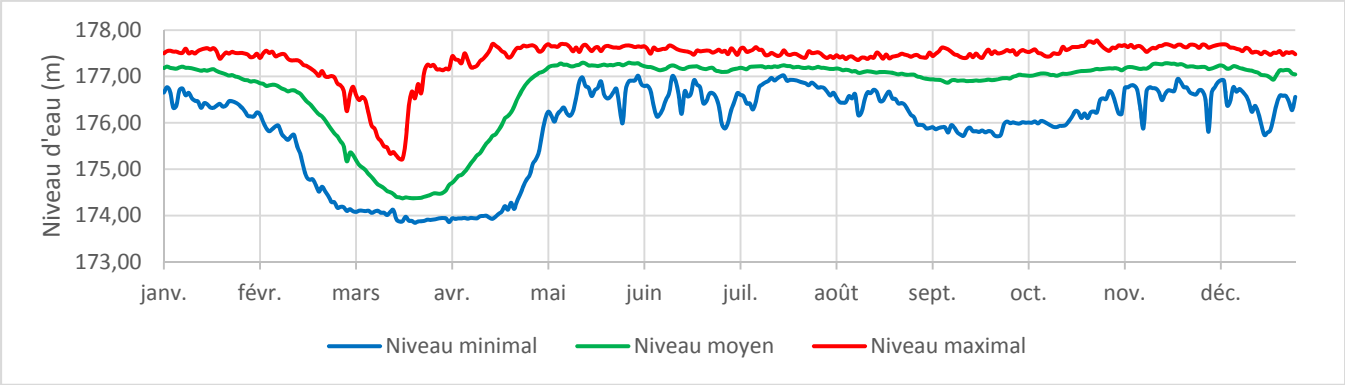


Figure 2-7 : Niveaux moyens annuels à l'aval du barrage Témiscamingue

2.3.5 Série des ouvertures des pertuis des barrages ontarien et québécois

SPAC a fourni à Tetra Tech les registres d'ouverture des pertuis des barrages ontarien et québécois pour la période de décembre 1999 à aujourd'hui. Ces registres contiennent le nombre de poutrelles présentes dans chacun des pertuis à la fin de chaque journée. Ces registres ne contiennent pas de précisions concernant les heures où les opérations de pertuis ont été effectuées ni concernant les temps d'opération.

2.3.6 Capacité d'évacuation des ouvrages

Les débits évacués aux barrages Témiscamingue dépendent de plusieurs facteurs, incluant les niveaux du réservoir, le nombre de poutrelles installées dans les pertuis ainsi que les niveaux d'eau à l'aval des barrages, lesquels sont influencés par l'opération du barrage Otto Holden. En effet, il a été démontré que la capacité d'évacuation des barrages Témiscamingue est réduite lorsque les niveaux d'eau imposés par Otto Holden sont supérieurs à l'élévation des pertuis (Way, 1999). De ce fait, les capacités d'évacuation des ouvrages ne peuvent être calculées uniquement par les équations théoriques standards. Les débits transitant par le complexe Témiscamingue sont plutôt estimés à partir des débits calculés au barrage Otto Holden, tel que décrit à la section 2.3.3.1.

2.3.6.1 Influence du barrage Otto Holden

Le barrage Otto Holden est situé à environ 50 km en aval des barrages à l'étude. La localisation de ce dernier est présentée à la figure 1-1. Le niveau maximal d'exploitation de cet ouvrage hydroélectrique est à une élévation de 177,70 m. Rappelons que les élévations des radiers des pertuis des barrages Témiscamingue sont de 171,91 m pour le côté québécois et de 173,28 m pour le côté ontarien. Le niveau d'eau à Otto Holden peut donc être supérieur à l'élévation des poutrelles des barrages Témiscamingue réduisant ainsi la capacité d'évacuation des ouvrages.

2.3.7 Capacité de retenue du réservoir Témiscamingue

Le réservoir Témiscamingue possède une superficie de 319 km^2. SPAC a fourni à Tetra Tech, les courbes d'emmagasinement du réservoir afin de considérer l'effet de laminage d'onde de crue de ce dernier lors des différentes simulations hydrauliques. À son niveau maximal d'exploitation, le réservoir contient un volume de 1 250 millions de m^3. La figure 2-8 présente la courbe d'emmagasinement utilisée telle que fournie par SPAC.

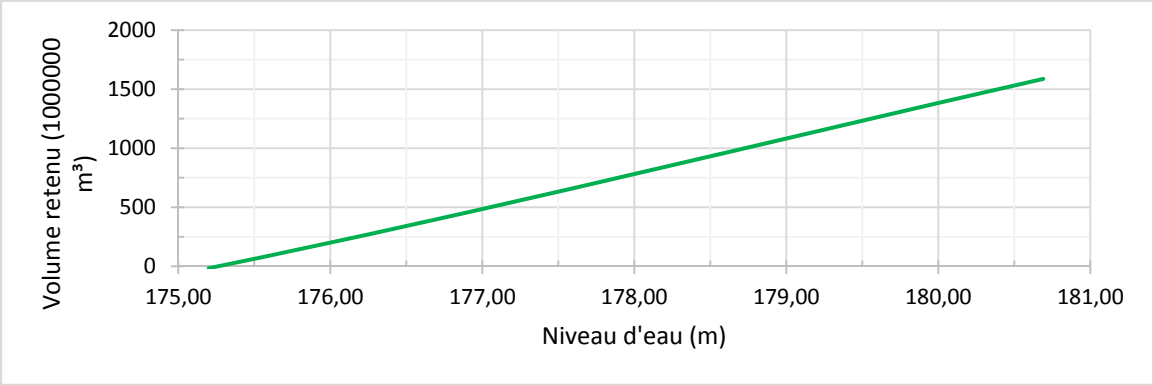


Figure 2-8 : Courbe d'emmagasinement du réservoir Témiscamingue

3.0 CONTRAINTES DE GESTION DU BARRAGE ET EXIGENCES

3.1 GESTION DES NIVEAUX D'EAU DU LAC

Les barrages Témiscamingue sont opérés de façon à retarder l'onde de crue associée à la fonte des neiges au printemps et aux événements météorologiques importants. La gestion des barrages est faite de façon à maintenir des niveaux d'eau spécifiques qui varient en fonction des saisons. Ces cibles ont été établies par la Commission de planification de la régularisation de la rivière des Outaouais, conjointement avec les municipalités dont les territoires englobent le réservoir Témiscamingue.

3.1.1 Niveaux d'eau estivaux

En période estivale, le niveau maximal d'exploitation du réservoir Témiscamingue est de 179,56 m afin de protéger les riverains contre les inondations. Ce niveau est situé 1,2 m sous le niveau d'eau maximal atteint en 1909 avant la construction des barrages (Ogden Beeman & Associates, 1997).

Le niveau minimal exigé pour la navigation est de 178,65 m. Ce niveau est maintenu au cours de la période estivale, soit à partir de la mi-mai jusqu'à la mi-octobre afin d'assurer la navigabilité pour cette période. De façon générale, le niveau du réservoir est maintenu à environ 179,35 m et n'est abaissé qu'en cas d'étiage lorsque les débits des différents tributaires sont réduits afin de maintenir un débit sortant minimal souhaité de 300 m³/s (Ogden Beeman & Associates, 1997).

3.1.2 Niveaux d'eau hivernaux

À partir du mois de janvier, les pertuis des barrages québécois et ontarien sont ouverts graduellement afin d'abaisser le niveau d'eau du réservoir à l'élévation 175,50 m. Une fois que le niveau d'eau du réservoir a atteint l'élévation 177,70 m et que la crue printanière est débutée, les pertuis sont fermés afin de reprendre le contrôle hydraulique des ouvrages et préparer l'emmagasinement de la crue printanière. Comme l'emmagasinement débute à partir de la mi-avril, les opérations des barrages visent à abaisser le plus possible le niveau du réservoir Témiscamingue afin d'assurer le plus grand volume d'emmagasinement de la crue printanière. Cet emmagasinement permet de réduire les débits de pointe dans les tronçons situés au centre et au sud du bassin versant de la rivière des Outaouais.

3.2 GESTION DES DÉBITS

3.2.1 Crue de sécurité

Selon la Directive pour la sécurité des barrages, le nouveau barrage Témiscamingue côté Québec devra être en mesure de résister à la crue de sécurité associée à son niveau de conséquence. L'étude de Hatch (2013) avait établi que le niveau de conséquences en cas de rupture du barrage Ontario est faible et que la crue de sécurité est de récurrence 100 ans. L'étude recommande toutefois l'utilisation d'une crue de récurrence 1 000 ans en tant que crue de conception. Une analyse de rupture préliminaire du barrage Québec sera réalisée pour cette étude afin de valider le niveau de conséquences du barrage et déterminer la crue de sécurité.

Suite à des discussions avec SPAC, l'événement météorologique de juillet 2004 a été identifié comme événement critique durant lequel les niveaux du lac Témiscamingue ont presque atteint le seuil maximal d'exploitation. Cet événement sera utilisé à des fins de validation et afin de vérifier la capacité hydraulique des barrages Témiscamingue lors de la période des travaux. Pour ce faire, une reproduction de l'événement sera réalisée à l'aide d'un modèle hydraulique en considérant différents scénarios d'ouverture des pertuis.

3.2.2 Capacité d'évacuation pendant les travaux

En accord avec les exigences de SPAC, les travaux de reconstruction du barrage Témiscamingue devront être minimalement réalisés en deux phases afin d'assurer qu'au moins la moitié des pertuis du barrage soient opérationnels en cas de crue et lors de la vidange du réservoir en période hivernale. L'objectif est de permettre une gestion des débits respectant les contraintes de niveaux d'eau associées au réservoir.

Dans la mesure où la capacité d'évacuation du nouveau barrage ontarien combinée à celle des pertuis en opération du côté québécois n'est pas suffisante, le nombre de pertuis disponibles devra être ajusté et des phases de travaux supplémentaires seront prévues.

3.2.3 Capacité d'évacuation du nouveau barrage Ontario

Les plans préparés par Hatch (2016) montrent que les pertuis du barrage Ontario ont été élargis de 0,32 m, passant de 6,1 m à 6,42 m. Il est considéré que cet élargissement augmente la capacité d'évacuation des pertuis ontariens et cette nouvelle capacité sera intégrée dans les activités de modélisation hydraulique.

De plus, les plans de Hatch montrent que les radiers des pertuis du barrage Ontario ont été rehaussés de 0,14 m, soit de l'élévation 173,74 m à 173,88 m. L'hypothèse retenue est que ce rehaussement ne nécessite pas de modifications au niveau des poutrelles dans le pertuis ontarien afin de maintenir les niveaux d'opération ciblés pour le réservoir Témiscamingue. Le nombre de poutrelles maximales dans les pertuis reste donc à 13.

3.2.4 Contrôle de l'érosion

Une étude du Centre Hydraulique Canadien (CHC, 2004) a démontré que les opérations des pertuis centraux du barrage Québec au cours des années 1990 avaient entrainé l'érosion du lit de la rivière des Outaouais aux pieds du tablier de béton. En effet, les résultats de l'étude démontrent que les vitesses d'écoulement à la sortie des pertuis atteignent 6-7 m/s en conditions d'opération normales et 8 m/s en conditions extrêmes.

L'analyse des modes d'opération du nouveau barrage Québec devra tenir compte des problématiques d'érosion en aval du barrage et des mesures de protection devront être prévues afin de limiter l'affouillement aux pieds des nouvelles structures. Une attention particulière sera aussi portée à la protection des surfaces bétonnées des appareils d'évacuation afin d'assurer leur résistance face aux actions érosives de l'eau en condition de forts débits.

3.2.5 Utilisation des poutrelles existantes

SPAC souhaite que les pertuis du nouveau barrage Témiscamingue côté Québec soient opérés à l'aide des mêmes poutrelles que celles actuellement utilisées. L'ouverture effective des nouveaux pertuis reste donc à 6,10 m.

3.3 PÉRIODE DES TRAVAUX

Tel qu'exigé par SPAC, la période des travaux dans l'eau est limitée du 15 juillet au 1er septembre en raison des considérations environnementales exigées par MPO. Cette limitation vise tous travaux qui ne sont pas réalisés « à sec » et qui ne touchent pas directement à la structure du barrage. Les travaux nécessitant d'être effectués « à sec » ne sont pas contraints à ce calendrier, dans la mesure où la gestion des eaux par les barrages côtés Québec et Ontario permet de respecter les exigences de SPAC.

Tel qu'expliqué plus loin, cette contrainte de date constitue un enjeu important du projet et devra faire l'objet de discussions avec les autorités responsables.

3.4 EXIGENCES MPO

En avril 2016, SPAC a préparé un document préliminaire présentant les modes de gestions prévus pour les nouveaux barrages Témiscamingue de façon à offrir des conditions d'écoulement favorables pour différentes espèces de poisson présentes dans la rivière des Outaouais. Ces conditions d'écoulement sont atteintes en alternant l'ouverture et la fermeture des pertuis selon les conditions de débit et la période de l'année (Public Services and Procurement Canada 2016).

3.4.1 Mode de gestion pour la période du 1er octobre à la mi-février

Pour cette période, le plan de gestion prévoit l'opération des pertuis latéraux afin d'offrir des vitesses d'écoulement de l'ordre de 0,5 à 1,0 m/s. En conditions de crue ou lors d'étiage plus sévère, il est prévu de concentrer les opérations d'ouverture et de fermeture aux pertuis centraux afin de préserver les vitesses d'écoulement plus faibles aux pertuis latéraux. Les vitesses d'écoulement des pertuis centraux pour cette période peuvent varier entre 0 et 5 m/s.

3.4.2 Mode de gestion pour la période de la mi-avril au 15 juillet

Pour cette période, le plan de gestion prévoit l'opération des pertuis latéraux afin d'offrir des vitesses d'écoulement plus importantes, de l'ordre de 1,0 à 2,0 m/s. En conditions de crue ou lors d'étiage plus sévère, il est prévu de concentrer les opérations d'ouverture et de fermeture aux pertuis centraux afin de préserver les vitesses d'écoulement souhaitées aux pertuis latéraux. Les vitesses d'écoulement des pertuis centraux pour cette période peuvent varier entre 2 et 5 m/s.

4.0 HYDROLOGIE

4.1 DESCRIPTION DE LA RIVIÈRE DES OUTAOUAIS

La rivière des Outaouais possède un bassin versant d'une superficie de 45 740 km^2 au droit du complexe Témiscamingue. Les débits de la rivière sont influencés par la gestion de nombreux ouvrages, notamment le barrage des Quinze à Angliers ainsi que le barrage Laniel sur la rivière Kipawa. La figure 4-1 présente le bassin versant de la rivière des Outaouais au droit du site à l'étude ainsi que les sous-bassins versants des barrages des Quinze et Laniel.

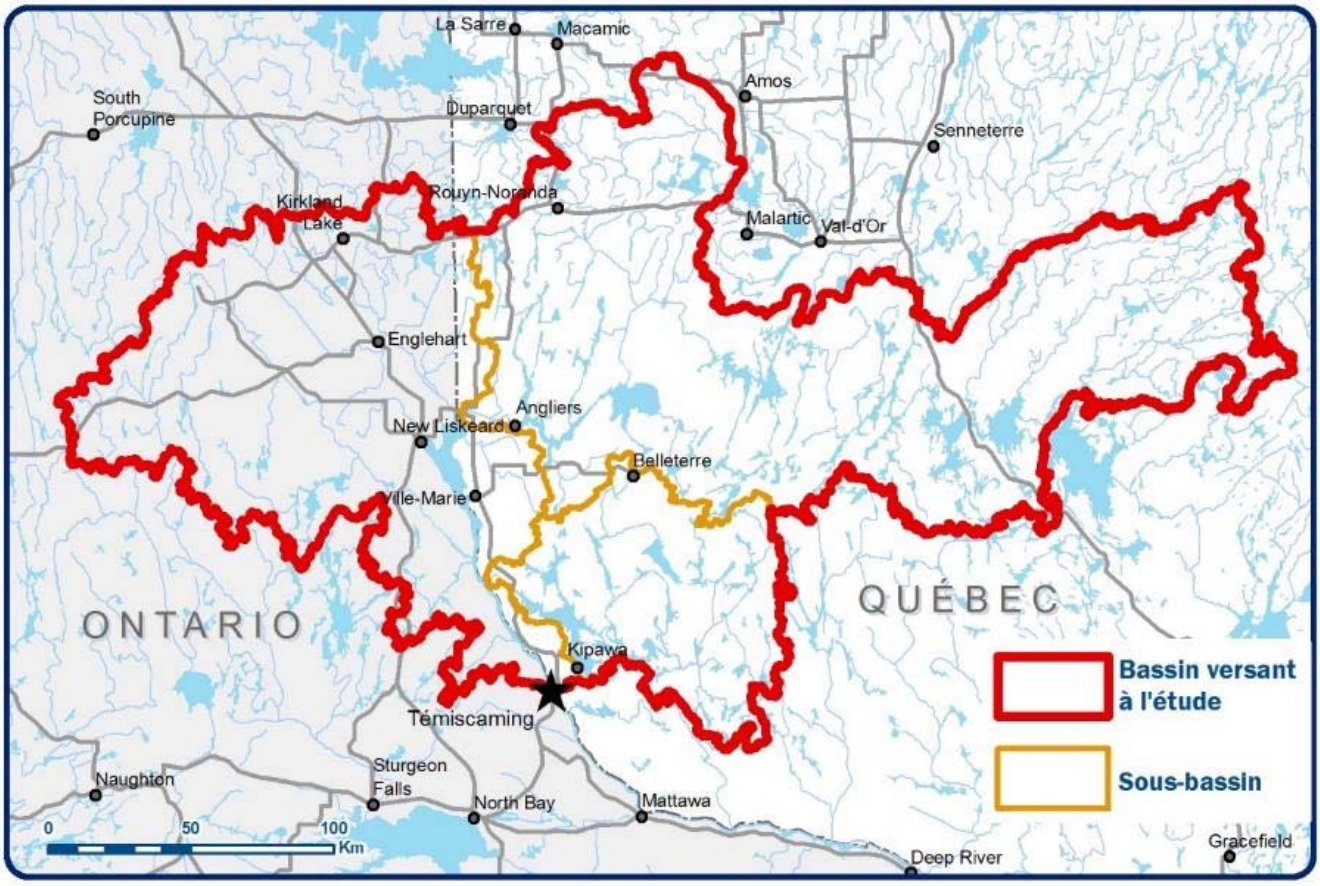


Figure 4-1 : Bassin versant de la rivière des Outaouais au droit du barrage Témiscamingue

4.2 ANALYSE STATISTIQUE DES DÉBITS

4.2.1 Débits sortants à Témiscamingue

Une analyse statistique des débits calculés à partir des données enregistrées à Otto Holden a été effectuée afin de dresser un portrait des débits sortants des barrages Témiscamingue. Une analyse des débits classés a été réalisée pour les 99 années de données disponibles. La figure 4-2 montre la courbe des débits classés sortants des barrages Témiscamingue. Comme ces débits résultent non seulement des apports au réservoir, mais aussi des opérations des pertuis des deux ouvrages, ces données doivent être utilisées avec précautions. En effet, ces débits calculés sont limités par la capacité d'évacuation des ouvrages ainsi que l'effet de laminage créé par le réservoir. Il n'est donc pas recommandé d'extrapoler ces données afin d'estimer les débits d'une récurrence supérieure aux nombres d'années disponibles dans l'échantillon.

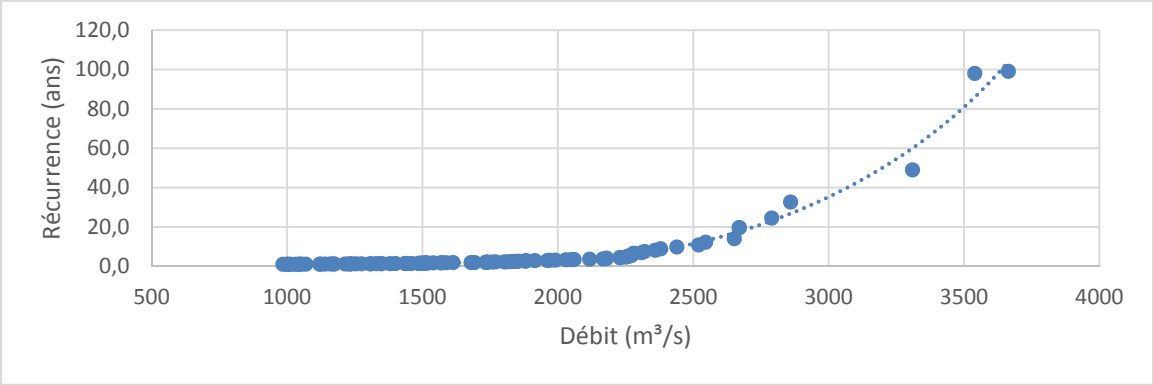


Figure 4-2 : Courbe des débits classés sortants des barrages Témiscamingue

Les données disponibles démontrent que le plus important débit calculé pour les barrages Témiscamingue a été évacué lors de l'événement du 16 mai 1960. Pour cet événement, le débit sortant des barrages Québec et Ontario était de 3 664 m³/s pour un niveau de réservoir de 181,04 m. Le tableau 4-1 présente la classification des années pour lesquelles les débits sortants les plus importants ont été calculés ainsi que la classification des deux dernières années.

Tableau 4-1 : Débits sortants historiques en ordre d'importance

Rang	Année	Débit sortant (m³/s)
1	1960	3 664
2	1947	3 540
3	1928	3 310
4	1922	2 860
5	1945	2 790
22	2014	2 251
59	2015	1 512

4.2.2 Débits entrants dans le réservoir Témiscamingue

Tel que décrit à la section 2.3.3.2, les débits entrants dans le réservoir Témiscamingue sont estimés par SPAC à partir des débits sortants calculés à Otto Holden ainsi que la variation du niveau d'eau du réservoir. Ces débits entrants sont disponibles pour la période de 1997 à aujourd'hui et représentent un échantillon de 20 années. Le Tableau 4-2 présente les cinq événements les plus importants en termes de débits entrants dans le réservoir Témiscamingue au cours de la période 1997-2016.

Tableau 4-2 : Débits entrants en ordre d'importance (cinq plus importants événements)

Rang	Année	Débit entrant (m³/s)
1	2002	2 864
2	2013	2 545
3	2014	2 523
4	2009	2 383
5	2001	2 325

Une analyse statistique de l'ensemble des données a été effectuée à l'aide du logiciel HYFRAN afin de déterminer les débits de récurrences 2 ans à 1 000 ans, lesquels sont présentés au tableau 4-3. C'est la méthode par distribution Weibull qui a été utilisée pour l'analyse, car cette dernière représente le plus fidèlement les données disponibles tel que démontré à la figure 4-3.

Tableau 4-3 : Récurrence des débits de crues entrants dans le réservoir Témiscamingue

Récurrence (ans)	Débit (m³/s)
2	1 938
10	2 564
20	2 726
50	2 901
100	3 013
1000	3 311

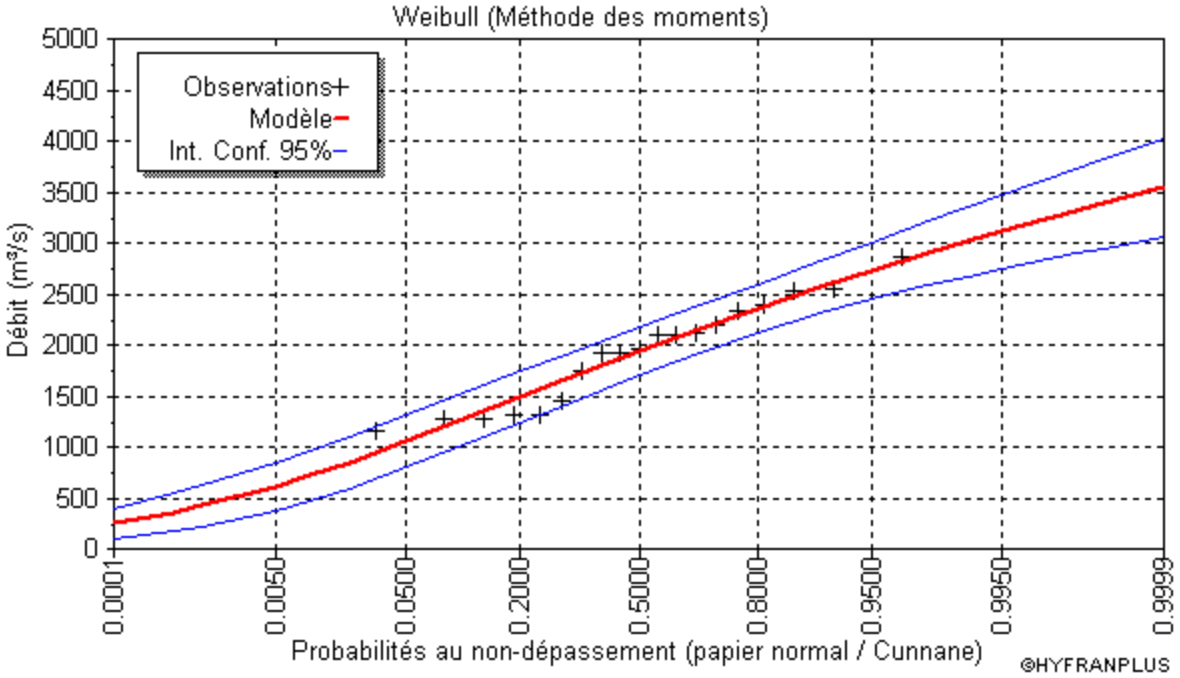


Figure 4-3 : Distribution Weibull des débits entrants dans le réservoir Témiscamingue

4.3 ANALYSES STATISTIQUES DES NIVEAUX DU LAC TÉMISCAMINGUE

Les niveaux du réservoir Témiscamingue mesurés à la station 02JE011 située à Haileybury sont disponibles pour la période de 1908 à aujourd'hui. Bien que cette station soit plus éloignée du site à l'étude que les autres stations disponibles, celle-ci couvre la plus longue période, soit 106 années de données disponibles au total. C'est donc cette station qui a été utilisée afin d'évaluer les niveaux d'eau historiques du réservoir.

Tableau 4-4 : Niveaux historiques du réservoir en ordre d'importance

Rang	Année	Niveau réservoir (m)
1	1960	181,044
2	1947	180,755
3	1928	180,700
4	1909	180,496
5	1966	180,249
57	2014	179,487
91	2015	179,368

5.0 MODÉLISATION HYDRAULIQUE

5.1 APPROCHE MÉTHODOLOGIQUE

Le module de modélisation bidimensionnel (2D) du logiciel HEC-RAS version 5.0.3 a été utilisé pour modéliser le tronçon de la rivière des Outaouais à l'étude. L'utilisation d'un modèle 2D permet de mieux représenter les patrons d'écoulement de la rivière en amont et en aval de l'île du Sault. Un modèle 2D permet aussi de mieux caractériser les impacts de la gestion d'un des barrages sur le second et permet de déterminer les débits acheminés par chacun des ouvrages.

5.2 GÉOMÉTRIE DU MODÈLE

5.2.1 Description générale du tronçon modélisé

La rivière des Outaouais, à Témiscamingue, possède une largeur totale de 430 m avant de se diviser de part et d'autre de l'île du Sault. Le canal Est, du côté québécois de l'île, possède une largeur moyenne de 125 m, tandis que le canal Ouest, du côté ontarien, possède une largeur de 143 m. Les deux canaux se rejoignent à l'aval de l'île du Sault où la rivière possède une largeur totale moyenne de 490 m.

5.2.2 Maillage

Le modèle hydraulique 2D est constitué d'un maillage possédant 15 222 cellules s'étendant jusqu'à 200 m en amont et 800 m en aval du barrage à l'étude du côté québécois. Le maillage couvre les deux côtés de l'île du Sault et possède une résolution moyenne de 10 m. Une densité de maillage plus fine est utilisée aux droits des barrages ontarien et québécois où les cellules possèdent une résolution de 1 m. Le maillage est associé au modèle numérique de terrain construit à partir des relevés topographiques et bathymétriques décrits à la section 2.3. La figure 5-1 présente un extrait du maillage de simulation au droit du barrage Québec.

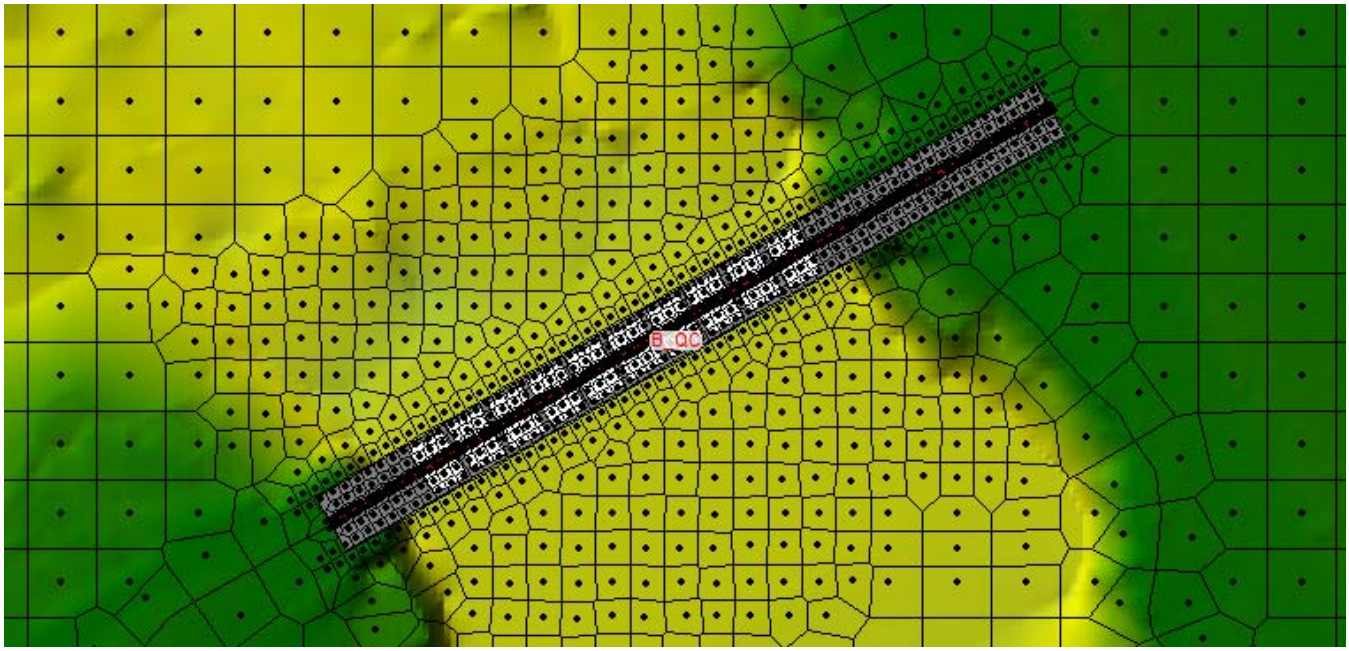


Figure 5-1 : Extrait du maillage de simulation au droit du barrage Québec

5.2.3 Réservoir Témiscamingue

Afin de simplifier les étapes de calculs du modèle hydraulique, la totalité du réservoir Témiscamingue n'a pas été intégrée au maillage 2D. Le réservoir a plutôt été intégré en tant que relation niveau-volume à l'amont du maillage et agit en tant que condition limite amont du modèle. Cet artifice de simulation permet de considérer l'effet d'emmagasinement du réservoir et l'impact des modes de gestion des barrages, tout en réduisant les efforts de calcul du modèle 2D.

Les relevés bathymétriques de l'ensemble du réservoir, réalisés par SPAC en 2001 et 2002, ont été utilisés afin de valider les courbes d'emmagasinement du réservoir Témiscamingue. Pour ce faire, un modèle numérique de terrain a été réalisé pour l'ensemble du réservoir et intégré dans le logiciel HEC-RAS à partir duquel la relation niveau-volume a été établie. Cette relation considère que le niveau minimal d'influence du barrage Otto Holden est 175,26 m, niveau pour lequel le volume d'emmagasinement du réservoir est considéré nul. L'équation ci-dessous présente la relation niveau-volume basée sur les relevés bathymétriques complets du réservoir Témiscamingue.

$$V\ (1000\ m^3) = -223.4095321987 * Z^4 + 156766.048005018 * Z^3 - 41234488.3271451 * Z^2 + 4818762485.65239 * Z - 211111623712.349$$

La figure 5-2 compare la relation niveau-volume utilisée par SPAC à la relation établie à l'aide des données bathymétriques de 2001-2002. L'analyse démontre que l'écart entre les deux relations est inférieur à 1 % pour les niveaux du réservoir entre 178,50 m et 179,30 m, ce qui correspond aux niveaux d'opération moyens. L'écart grimpe à 1,5 % entre 179,30 m et 180,00 m, tandis qu'il atteint -2,0 % entre 177,70 m et 178,50 m. Entre 175,26 m et 177,70 m, l'écart entre les relations niveau-volume varie entre -9 % et -2 %, ce qui laisse supposer que la relation niveau-volume utilisée par SPAC surestime la capacité d'emmagasinement du réservoir pour des niveaux inférieurs à 177,70 m. Toutefois, comme l'écart observé pour les niveaux moyens de gestion est minime et que les données de débits entrants sont calculées à partir de la relation niveau-débit actuellement utilisée par SPAC, l'utilisation de cette dernière est justifiable pour cette étude.

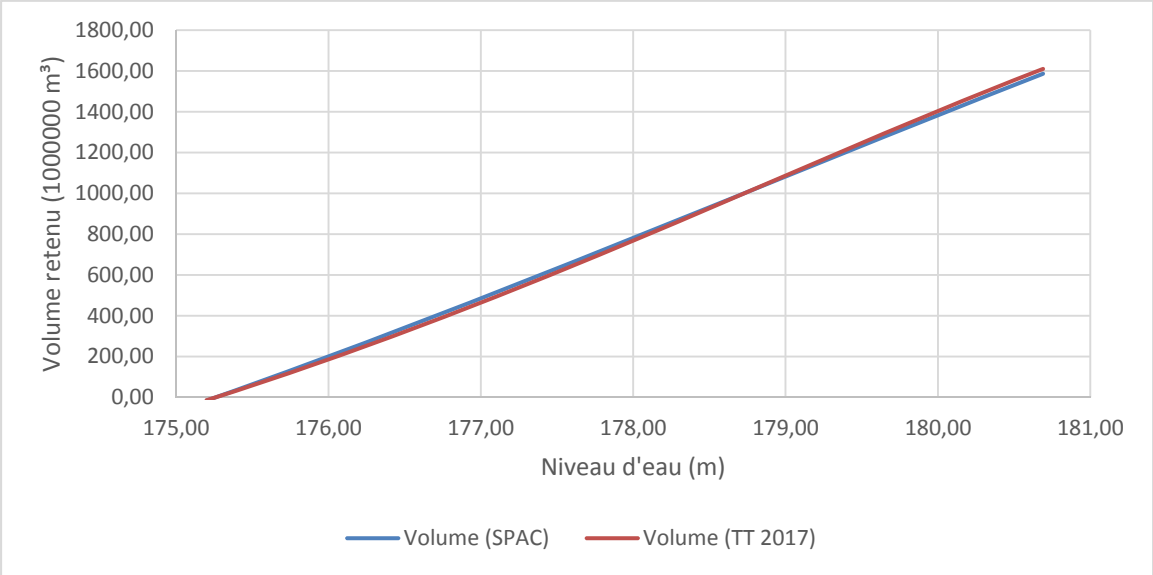


Figure 5-2 : Comparaison des relations niveau-volume du réservoir Témiscamingue

5.2.4 Intégration des ouvrages actuels

5.2.4.1 Barrage Ontario

Les plans du nouveau et de l'ancien barrage Ontario, préparés par HATCH en 2014, ont été utilisés afin d'intégrer les dimensions et les élévations des différents éléments de structure dans le modèle hydraulique 2D. La structure originale du barrage Ontario a été intégrée au modèle afin de représenter les conditions d'écoulement lors des différents événements de calibration choisis; lesquels se sont produits avant les travaux de réfection.

Le barrage Ontario possède une longueur approximative de 121 m et une hauteur de 7,47 m. Dans sa configuration originale, ce barrage possédait 16 pertuis à poutrelles séparés par des piliers de béton ayant une épaisseur de 1,5 m. Le radier des pertuis était à l'élévation 173,74 m et leur largeur était de 6,10 m (HATCH, 2014). Au total, 13 poutrelles, possédant chacune une hauteur de 0,457 m, pouvaient être installées dans ces pertuis.

Les plans de HATCH montrent que les 16 pertuis du nouvel ouvrage possèdent une largeur de 6,42 m et que les piliers possèdent une épaisseur de 1,2 m. Ceci représente un élargissement des pertuis de l'ordre de 0,32 m. Leur radier a aussi été rehaussé à l'élévation de 173,88 m, un rehaussement de 0,14 m par rapport à la structure originale. Malgré ce rehaussement, SPAC confirme que le nombre de poutrelles pouvant être installées dans les pertuis reste le même. La figure 5-3 montre le nouveau barrage Ontario tel qu'intégré au modèle hydraulique 2D. Notons que seuls les appareils d'évacuation sont représentés dans le modèle hydraulique et que le tablier du pont routier au-dessus de la structure n'y est pas représenté.

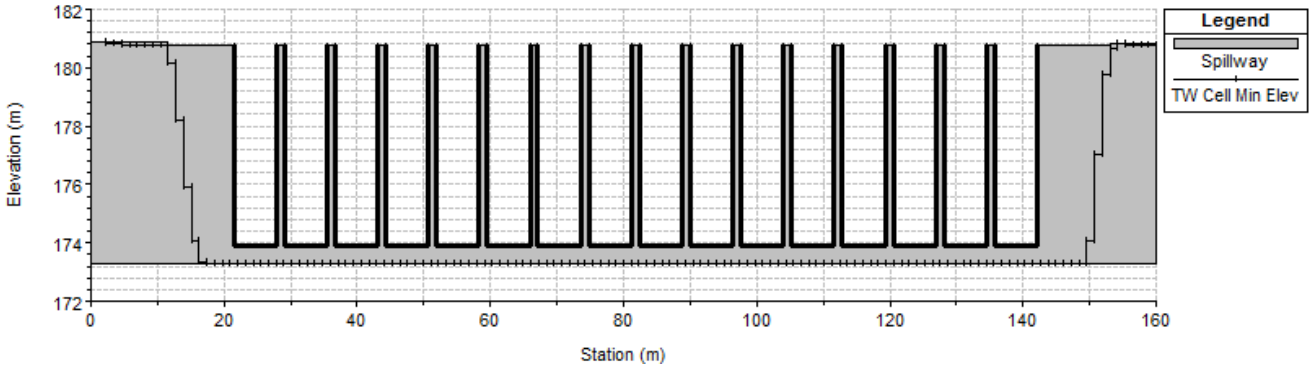


Figure 5-3 : Intégration du barrage Ontario dans le modèle hydraulique

5.2.4.2 Barrage Québec

Les plans du barrage Québec, préparés par GÉNIVAR en 2011, ont été utilisés afin d'intégrer la structure au modèle hydraulique 2D. Le barrage Québec possède une longueur totale approximative de 94 m en travers de la rivière et une hauteur de 8,36 m. Dans sa configuration actuelle, le barrage possède dix pertuis ayant une largeur de 6,10 m et un radier ayant une élévation de 171,91 m. Au total, 16 poutrelles possédant chacune une hauteur de 0,457 m, peuvent être installées dans ces pertuis. La figure 5-4 montre le barrage Québec tel qu'intégré au modèle hydraulique 2D.

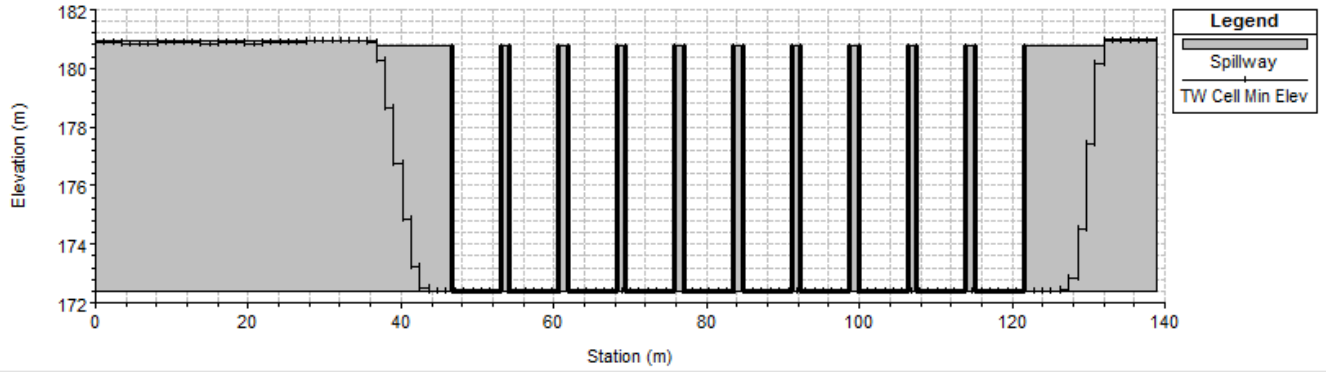


Figure 5-4 : Intégration du barrage Québec dans le modèle hydraulique

5.3 CALIBRATION

5.3.1 Scénario choisi

L'événement de juillet 2004 a été identifié par SPAC en tant qu'événement critique pour lequel les niveaux du réservoir Témiscamingue ont presque atteint les seuils d'opération maximums. La figure 5-5 présente les débits calculés lors de cet événement ainsi que les niveaux d'eau du réservoir mesurés pour la même période. Lors de cet événement, plusieurs opérations ont été effectuées sur les pertuis des barrages Ontario et Québec donnant ainsi un scénario de calibration offrant des conditions de simulation variées. Afin de bien représenter ce scénario, Tetra Tech a demandé à SPAC de fournir les registres d'opérations quotidiennes des deux ouvrages afin d'établir l'horaire d'ouverture des pertuis.

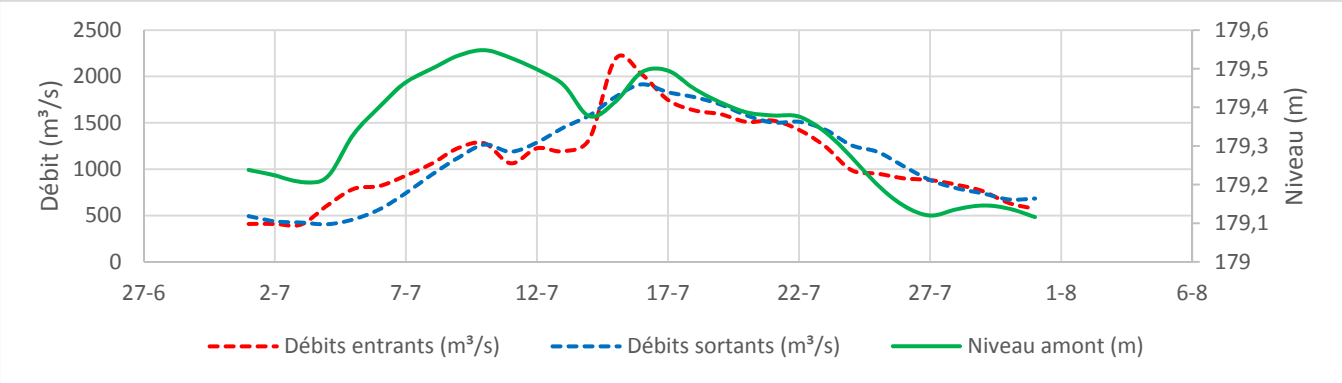


Figure 5-5 : Niveaux d'eau et débits pour l'événement de juillet 2004

5.3.2 Paramètres de calibration

Les paramètres ayant été ajustés lors des étapes de calibration incluent les coefficients de rugosité du lit de la rivière (coefficient de Manning) ainsi que les coefficients d'écoulement des pertuis pour les barrages Ontario et Québec. Les coefficients de Manning ont été établis à partir de la littérature ainsi que des photos aériennes du site. Les coefficients varient entre 0,035 et 0,045 pour le lit de la rivière et 0,05 et 0,10 pour le dessus des berges et de l'île du Sault.

Comme les coefficients d'écoulement des pertuis varient en fonction des hauteurs d'eau, ces derniers sont estimés à chaque pas de calcul par le logiciel de modélisation HEC-RAS à l'aide de l'équation Kindsvater-Carter qui est applicable aux seuils à parois verticales (Fenton, 2015).

5.3.3 Résultats

La figure 5-6 compare les niveaux du réservoir Témiscamingue observés à Ville-Marie aux niveaux d'eau obtenus à l'aide du modèle hydraulique pour l'événement de juillet 2004. L'écart moyen entre les niveaux est de 0,04 cm, ce qui est jugé acceptable pour les besoins de simulation.

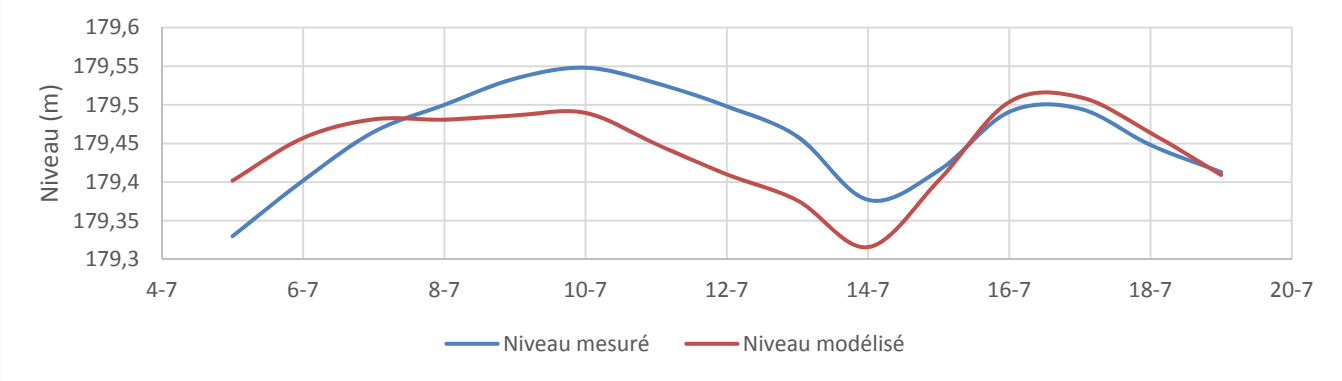


Figure 5-6 : Comparaison des niveaux d'eau du réservoir Témiscamingue pour l'événement de juillet 2004

La figure 5-7 compare les débits sortants des barrages Témiscamingue tels que simulés avec les débits calculés à partir des données du barrage Otto Holden. L'écart moyen entre les deux séries de débits est de 9 % pour l'ensemble de la période simulée et se limite à 3 % en ce qui a trait aux débits de pointes. Ces écarts sont jugés adéquats.

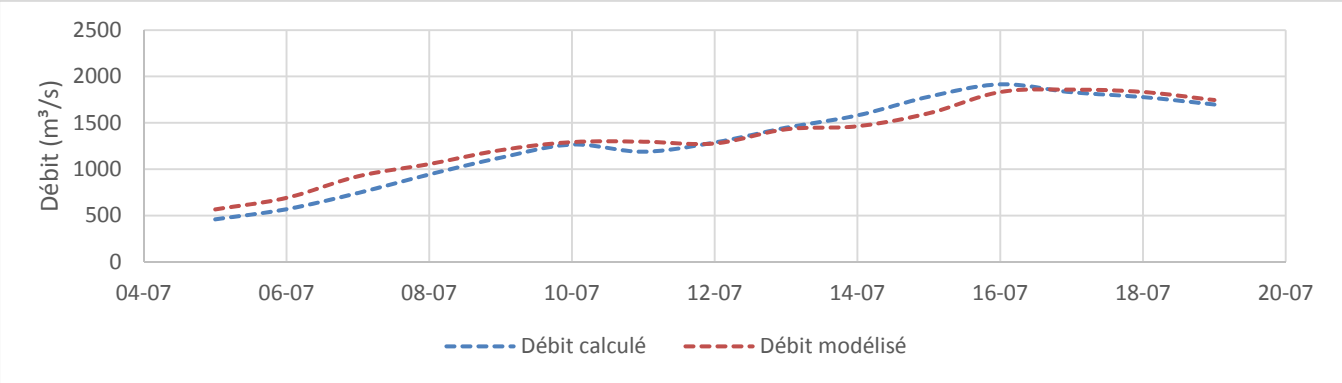


Figure 5-7 : Comparaison des débits sortants à Témiscamingue pour l'événement de juillet 2004

5.3.4 Limites et sources d'erreur

Les écarts entre les valeurs mesurées ou calculées sur le terrain et les résultats de simulation peuvent être attribués aux incertitudes associées aux débits entrants utilisés dans le modèle. En effet, aucun débit n'est actuellement mesuré au droit du barrage Témiscamingue. Les débits sortants sont plutôt estimés à partir des débits calculés à Otto Holden, auxquels sont soustraits les apports des tributaires. Ces débits estimés sont ensuite utilisés pour approximer les apports au réservoir Témiscamingue et obtenir les débits entrants moyens journaliers à partir des bilans volumétriques quotidiens du réservoir.

Tel que mentionné à la section 5.2.3, le réservoir Témiscamingue a été intégré à l'amont du modèle hydraulique en tant que relation niveau/volume. Cette méthode ne considère pas les apports individuels des différents tributaires, ni leur proximité à l'exutoire du réservoir. Seul le débit entrant moyen pour l'ensemble du réservoir est considéré.

6.0 ANALYSE ET RÉSULTATS

6.1 CAPACITÉS D'ÉVACUATION DU COMPLEXE TÉMISCAMINGUE

Le modèle hydraulique a été utilisé afin d'évaluer la capacité maximale d'évacuation des barrages Témiscamingue lorsque tous les pertuis sont complètement ouverts en temps de crue. Pour ce faire, divers niveaux de réservoir ont été imposés en tant que conditions limites à l'amont du modèle pour des niveaux aval maintenus à 177,39 m et 176,78 m. Ces niveaux aval sont basés sur les niveaux utilisés par SPAC dans l'établissement de leurs courbes d'évacuation théoriques pour les barrages Québec et Ontario (HATCH, 2013).

Tableau 6-1 : Capacité d'évacuation du barrage Québec pour différents niveaux du réservoir

Niveau amont (m)	Débit (m³/s) niveau aval à 177,39 m			Débit (m³/s) niveau aval à 176,78 m		
	ON	QC	Total	ON	QC	Total
179,56	1 940	1 585	3 525	2 086	1 670	3 756
180,00	2 269	1 825	4 094	2 407	1 898	4 305
180,75*	2 868	2 247	5 115	2 993	2 306	5 299

* Correspond au niveau du tablier du pont-route au-dessus du barrage Québec

6.2 ANALYSE DES MODES D'OPÉRATION

6.2.1 Mode d'opération actuel



Actuellement, au barrage Québec, le contrôle du débit dans chaque pertuis fonctionne avec un système à poutrelles de bois insérées dans des glissières à l'aide d'un leveur de poutrelles permettant la pose et l'enlèvement de ces dernières (voir la photo de droite). Les poutrelles sont ajoutées ou retirées par groupe de deux. De manière générale, le nombre de poutrelles minimales dans les pertuis est de six, car selon SPAC, un nombre inférieur entraine un effet de flottaison des poutrelles pouvant entrainer la perte de ces dernières. Lorsque le mode de gestion requiert une plus grande capacité d'évacuation, on préfère retirer l'ensemble des six dernières poutrelles.

La figure 6-1 présente une synthèse du mode d'opération des poutrelles pour la période de 1999 à 2016. On y présente la moyenne quotidienne du nombre de poutrelles observables dans chacun des pertuis pour la période donnée. Les principales observations sont les suivantes :

- Les pertuis 4-5-6 sont ceux généralement utilisés le plus souvent pour l'évacuation des débits;
- À l'inverse, les pertuis 1-2-9-10 sont ceux les moins sollicités pour l'évacuation des débits;
- Les pertuis sont pratiquement tous ouverts de la mi-février à la mi-mai;
- Les mois de juillet et août sont ceux avec le plus de poutrelles dans les pertuis.

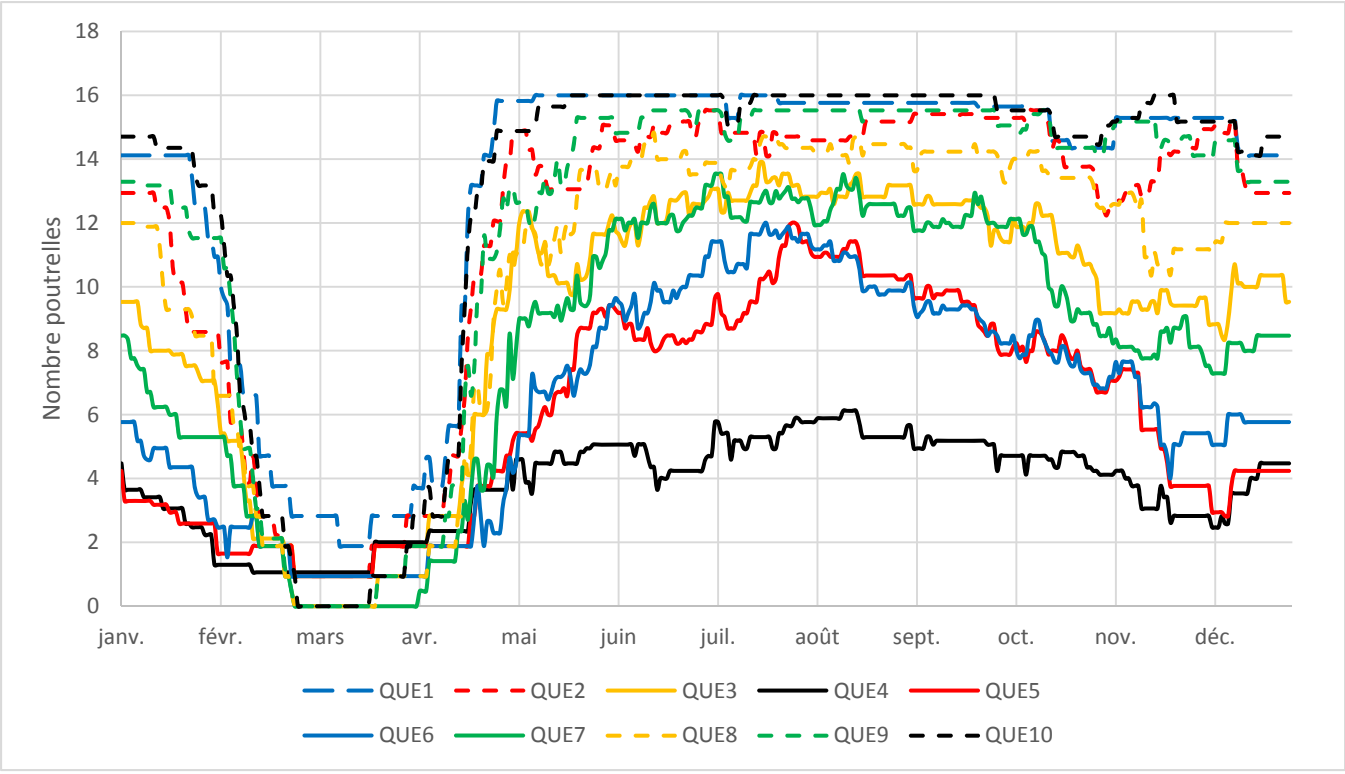


Figure 6-1 : Ouvertures moyennes annuelles des pertuis du barrage Québec

6.2.2 Analyse de la mécanisation des vannes

Tel que spécifié par SPAC, un des objectifs de l'étude hydraulique est d'évaluer si une ou plusieurs portes levantes (vanne d'évacuation mécanisée) doivent être intégrées au futur barrage Québec de manière à respecter les temps de réponse fixés en cas d'inondation. Notons cependant qu'aucun paramètre de temps minimum ou maximum n'est spécifié comme objectif à atteindre. Dans ce contexte, cette section présente les principaux impacts hydrauliques d'un scénario de mécanisation de vannes.

Le concept préliminaire proposé consiste au remplacement de cinq pertuis à poutrelles par des pertuis avec des vannes guillotines mécanisées ayant les caractéristiques préliminaires suivantes (hypothèses réalistes effectuées aux fins d'analyse hydraulique seulement) :

- Largeur de 6,10 m et hauteur de 6,09 m;
- Capacité d'évacuation maximale similaire à celle des pertuis actuels;
- Opération à l'aide de treuils installés sur le tablier du barrage, lesquels seraient attachés au bas des vannes et actionnés manuellement à l'aide d'interrupteurs;
- Les vitesses d'ouverture et de fermeture de ce type de vanne sont de l'ordre de 1,6 m/min. De façon préliminaire, les temps d'ouverture et de fermeture complète de vannes mécanisées seraient d'environ 3 min;
- Le type de mécanisme spécifié par SPAC, tel que proposé par Tetra Tech, ne permet pas une ouverture complète des vannes. En effet, le point d'attache des câbles servant à lever les vannes mécanisées est plus élevé que la base de ces dernières, ce qui limite la hauteur d'ouverture. Dans la mesure où l'élévation du tablier et du soffite du barrage restent les mêmes, l'élévation maximale de la base des vannes en position ouverte est fixée à 178,0 m. Cette élévation pourra être augmentée lors de la conception finale de l'appareil de levage;
- Pour des considérations d'ordre pratique liées à la construction et à l'opération d'un système double (vanne mécanique et leveur de poutrelles), mentionnons que les vannes mécaniques devraient toutes être contigües à partir de l'une des rives.

6.2.2.1 Analyse de la mécanisation de vannes sur la débitance

L'analyse de l'impact sur la capacité d'évacuation de la mécanisation de vannes selon le scénario identifié ci-haut a été réalisée. La figure 6-2 présente les résultats obtenus pour une modélisation d'un événement synthétique d'une durée de 12 heures pour lequel le niveau amont est maintenu à 179,56 m et le niveau aval à 177,39 m. Les principales observations sont les suivantes :

- La mécanisation de vannes permet d'ouvrir plus rapidement les pertuis qui en sont équipés;
- Le débit d'évacuation de pointe demeure évidemment le même à terme, mais il est possible de l'atteindre beaucoup plus rapidement. À titre indicatif, il serait théoriquement possible de devancer la pointe d'environ 5-6 heures selon le scénario d'ouverture;
- Cela permet l'évacuation d'environ 15 Mm^3 d'eau supplémentaire pendant cette période de temps. Cela représente un abaissement du réservoir d'environ 5 cm;
- Le cas échéant, ce type d'ouverture rapide d'un certain nombre de vannes mécanisées doit cependant être effectué en prenant les mesures de sécurité nécessaires dans le bief aval au barrage, principalement en regard des activités de navigation de plaisance.

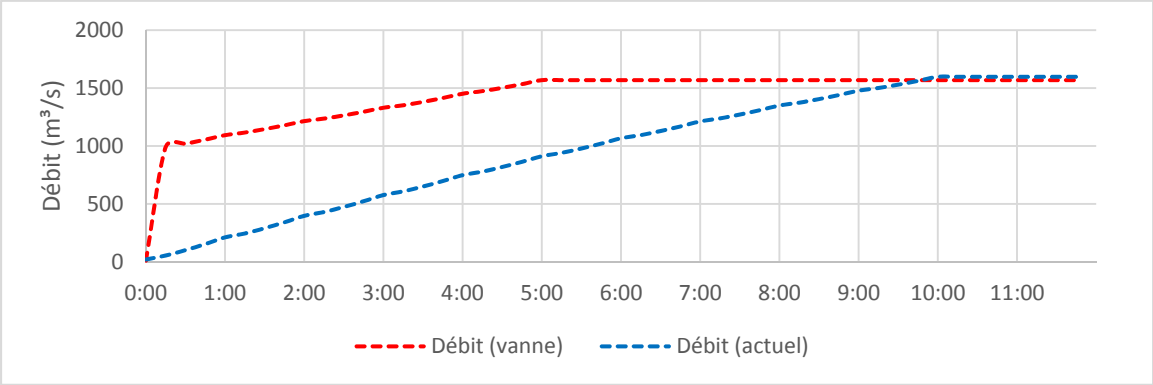


Figure 6-2 : Comparaison de la débitance entre le système actuel et le système mécanisé proposé

6.2.2.2 Analyse de la mécanisation de vannes pour un évènement critique réel (juillet 2004)

L'analyse de l'impact de la mécanisation de vannes a été réalisée pour un évènement réel et critique pour lequel une problématique de haut niveau du réservoir a été rencontrée, soit l'évènement de juillet 2004. Les données météorologiques recueillies à la station n° 7080468 d'Environnement Canada montrent que l'événement de juillet 2004 se caractérise par deux épisodes de précipitations distincts ayant eu lieu du 4 au 9 juillet (47,4 mm) ainsi que du 14 au 16 juillet (147,4 mm). Bien que cet événement ne constitue pas un événement hydrologique historique, le mode de gestion appliqué a fait en sorte que le niveau du réservoir a atteint un maximum de 179,55 m, ce qui correspond au niveau maximal d'opération du lac tel que mentionné à la section 3.1.1 (179,56 m). Le débit de pointe entrant dans le réservoir a été estimé à 2 193 m³/s pour cet événement, ce qui correspond approximativement à une crue de récurrence 5 ans. Toutefois, les registres d'ouverture des vannes montrent que des travaux d'inspection du barrage Ontario ont nécessité la fermeture complète des pertuis de cet ouvrage du 8 au 12 juillet, période durant laquelle seul le barrage Québec restait opérationnel réduisant ainsi la capacité d'évacuation totale des deux ouvrages.

En début d'événement, lorsque les débits entrants dans le réservoir ont commencé à augmenter, le niveau du réservoir a monté jusqu'à l'élévation 179,55 m avant que les opérateurs ouvrent davantage les pertuis du barrage Québec. Une fois les niveaux stabilisés et les travaux d'inspection complétés, il a été décidé d'ouvrir les pertuis du barrage ontarien en prévision des importantes précipitations prévues les 14 et 15 juillet. Le niveau du lac a par la suite augmenté jusqu'à 179,50 m le 16 juillet avant de redescendre au niveau normal d'opération autour du 20 juillet.

Le graphique de la figure 6-3 présente les résultats du niveau d'eau au réservoir et du débit évacué du réservoir pour ce même évènement (juillet), mais en considérant l'opération de vannes mécanisées avec un seuil de niveau haut (élévation 179,45 m) et un seuil de niveau bas (élévation 179,25 m). Bien que ce scénario ne soit pas optimisé en termes de logique d'opération, il démontre qu'il aurait été possible de gérer l'évènement hydrologique en restant à l'intérieur des limites normales d'exploitation du réservoir.

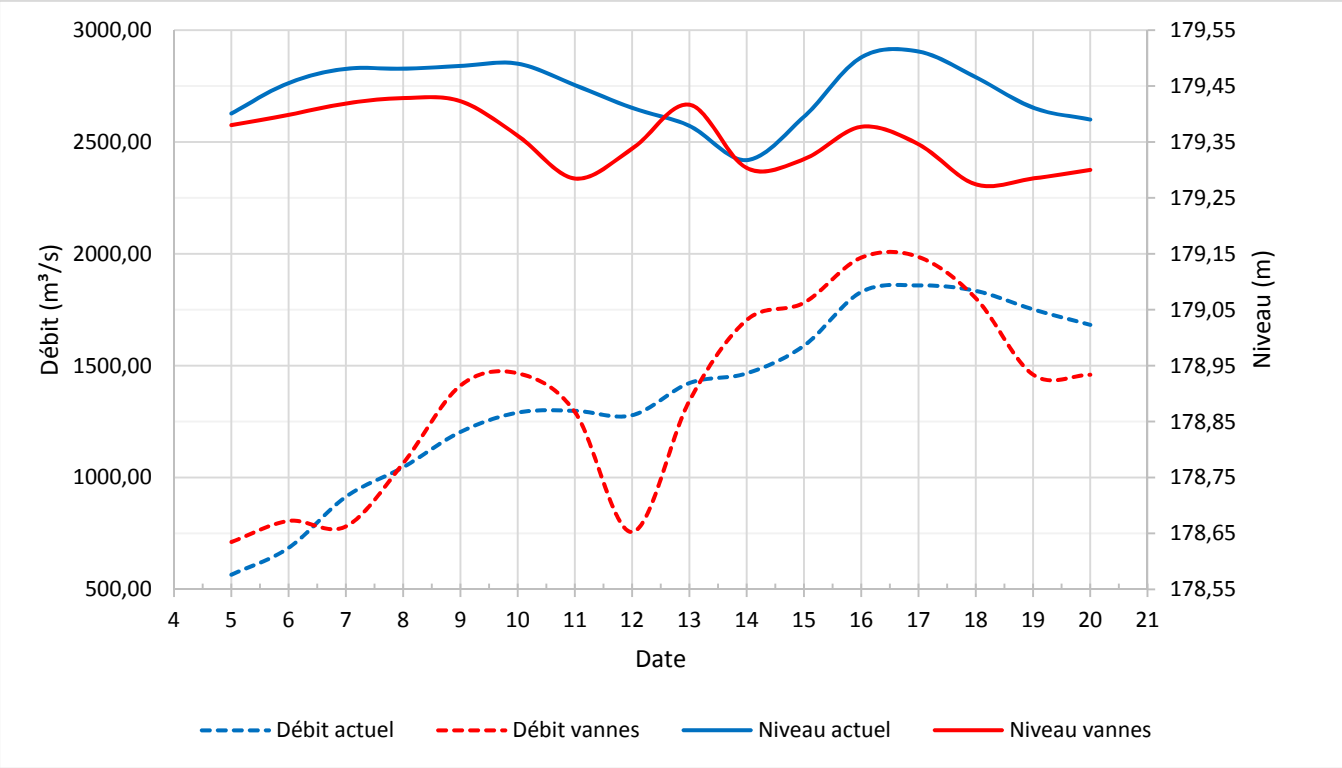


Figure 6-3 : Comparaison des niveaux et débits pour l'événement de juillet 2004

6.2.3 Synthèse de l'analyse de vannes mécanisées

Les analyses effectuées ci-haut démontrent que la mise en place de cinq vannes mécanisées permet une plus grande flexibilité et une meilleure gestion des niveaux d'eau et débits d'évacuation, en permettant des opérations plus rapides sur le barrage Québec. De plus, l'ouverture et la fermeture de vannes mécanisées nécessiteraient un effort moindre de la part des opérateurs, réduisant ainsi la charge de travail lors de campagnes nécessitant de nombreuses manœuvres.

Le concept préliminaire prévoit le remplacement de cinq pertuis uniquement, mais ce nombre pourrait être ajusté afin d'atteindre les objectifs budgétaires et opérationnels de SPAC. Cependant, nous croyons que la mécanisation de pertuis perd de son intérêt à mesure qu'on en diminue le nombre.

Également, une analyse avantage-coût devrait être réalisée en intégrant la nécessité de maintenir un système mixte à long terme (vanne mécanisée et leveur de poutrelles). Notons que le concept proposé à cette étape est préliminaire et sert à évaluer les gains d'opération possibles pour la gestion du réservoir Témiscamingue dans la mesure où la capacité d'évacuation des vannes mécanisées est similaire à celle des pertuis actuels.

Notons que la mise en place de vannes mécanisées est à notre avis une étape permettant d'atteindre de façon plus efficace et optimale les objectifs d'une gestion dynamique/prédictive du bassin versant de la rivière des Outaouais. En effet, l'accélération des opérations d'ouverture et de fermeture permet de réagir plus rapidement aux changements de conditions hydrauliques à travers le bassin versant de la rivière des Outaouais et permet notamment de réduire les pointes de crues lors d'événements importants.

6.3 ANALYSE DU PHASAGE DES TRAVAUX

L'analyse du nombre de phases de batardage nécessaires à la réalisation des travaux est un enjeu important dans le cadre du projet de reconstruction du barrage Témiscamingue. Cela a d'ailleurs été identifié comme un des principaux éléments de l'analyse de risques.

En effet, la construction d'un ouvrage temporaire de contrôle des eaux (batardeau) est rarement simple et généralement couteuse. L'expérience récente lors des travaux de reconstruction de la portion ontarienne du barrage Témiscamingue vient s'ajouter à la liste des exemples.

6.3.1 Rappel du mode de gestion souhaité du barrage

Selon les documents d'appel d'offres, SPAC souhaite que les travaux de reconstruction du barrage Témiscamingue soient réalisés en un minimum de deux phases afin d'assurer qu'au moins la moitié des pertuis du barrage soient opérationnels en cas de crue et lors de la vidange du réservoir en période hivernale. Cette contrainte vise à assurer la capacité de SPAC à atteindre les objectifs de gestion du réservoir et éviter que les niveaux d'eau dépassent les seuils minimaux pour la navigation en été ou les seuils maximaux entrainant des inondations en période de crues. À titre indicatif, voici un rappel des principaux objectifs de gestion, tels que présentés à la section 3.0 :

- Niveau maximum d'opération du réservoir en période estivale de manière à protéger les riverains contre les inondations : **179,56 m**;
- Niveau minimum d'opération du réservoir en période estivale (mi-mai à mi-oct.) de manière à permettre les activités de navigation : **178,65 m**;
- Niveau normal d'exploitation du réservoir en période estivale : **179,35 m**;
- Niveau de vidange souhaité à la fin de l'hiver : **175,25 m**;
- Débit minimum sortant du réservoir en période d'étiage : **300 m^3/s**.

6.3.2 Analyse et résultats du nombre de phases

La première analyse réalisée a été de vérifier la capacité hydraulique du système à répondre aux contraintes de gestion en considérant que le barrage côté ontarien est complètement disponible et que seulement la moitié des pertuis (5 sur 10) est disponible du côté du Québec.

Le graphique de la figure 6-4 présente les résultats de simulation pour les conditions suivantes :

- Niveau du réservoir au début du mois de janvier à 179,30 m;
- 100 % de capacité d'évacuation du barrage côté ontarien;
- 50 % de capacité d'évacuation du barrage côté québécois;
- Hydrogramme synthétique entrant dans le réservoir égal au lissage de la courbe des débits quotidiens moyens de chaque jour sur la période 1997-2016 tel que présenté à la figure 2-4. Notons que le débit de pointe de cette crue synthétique est de 1 270 m^3/s;
- Niveau aval du barrage correspondant au niveau aval quotidien moyen pour la période tel que présenté à la figure 2-7. Cette approche permet de considérer l'impact potentiel de la gestion effectuée à Otto Holden lors de la période simulée.

Les résultats de simulation démontrent que ce scénario permet de respecter les limites de gestion souhaitées lors de la vidange. En effet, le niveau de vidange minimum du réservoir est de 175,85 m et est atteint à partir de la fin du mois de mars. Les résultats démontrent aussi que ce scénario permet d'évacuer la crue printanière synthétique sans causer de débordement du réservoir, lorsque tous les pertuis disponibles sont ouverts. En effet, le niveau maximal du réservoir lors de la crue simulée atteint 177,75 m.

Notons toutefois que le scénario simulé considère l'ouverture complète de tous les pertuis du barrage Ontario et des cinq pertuis disponibles du côté Québec pour la période printanière et que ce mode de gestion ne représente pas un mode de gestion réel. En effet, lors de la vidange hivernale, lorsque le niveau du réservoir atteint 177,70 m, les opérateurs de SPAC reprennent graduellement le contrôle hydraulique des barrages afin de préparer l'emmagasinement de la crue printanière et réduire les débits de pointes sortant à Témiscamingue. Ainsi, les niveaux du réservoir sont rétablis à la limite minimale pour la navigation (178,65 m) à partir de la mi-mai. Ce mode de gestion est dynamique et varie en fonction des conditions hydrauliques aux droits des différents ouvrages à travers le bassin versant de la rivière des Outaouais. Cette gestion n'a pas été intégrée au modèle afin de simplifier les travaux de simulation, mais les résultats permettent de conclure qu'il est possible de gérer la période de vidange et de crue printanière avec la moitié des pertuis côté Québec disponible.

Notons que la capacité théorique d'évacuation totale de cette configuration est de 2 846 m³/s en considérant un niveau du réservoir de 179,56 m et un niveau aval au barrage de 177,39 m. Cette capacité d'évacuation correspond à une crue de récurrence 25 ans sur la base de l'analyse présentée à la section 4.2.

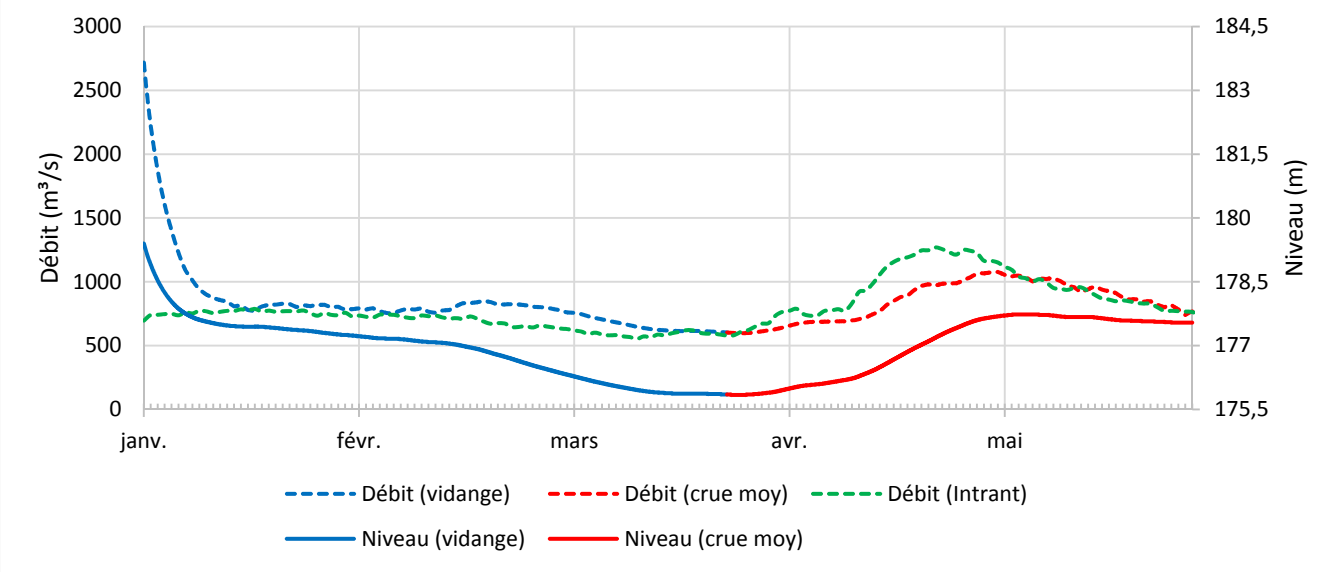


Figure 6-4 : Niveaux et débits modélisés pour les périodes hivernale et printanière moyennes

À titre indicatif, une deuxième analyse a été réalisée en considérant un évènement hydrologique plus critique, soit un hydrogramme synthétique entrant dans le réservoir égal au lissage de la courbe des débits quotidiens maximums de chaque jour sur la période 1997-2016 tel que présenté à la figure 6-5. Notons que le débit de pointe de cette crue synthétique est de 2 485 m³/s, soit un évènement de récurrence de l'ordre de 10 ans.

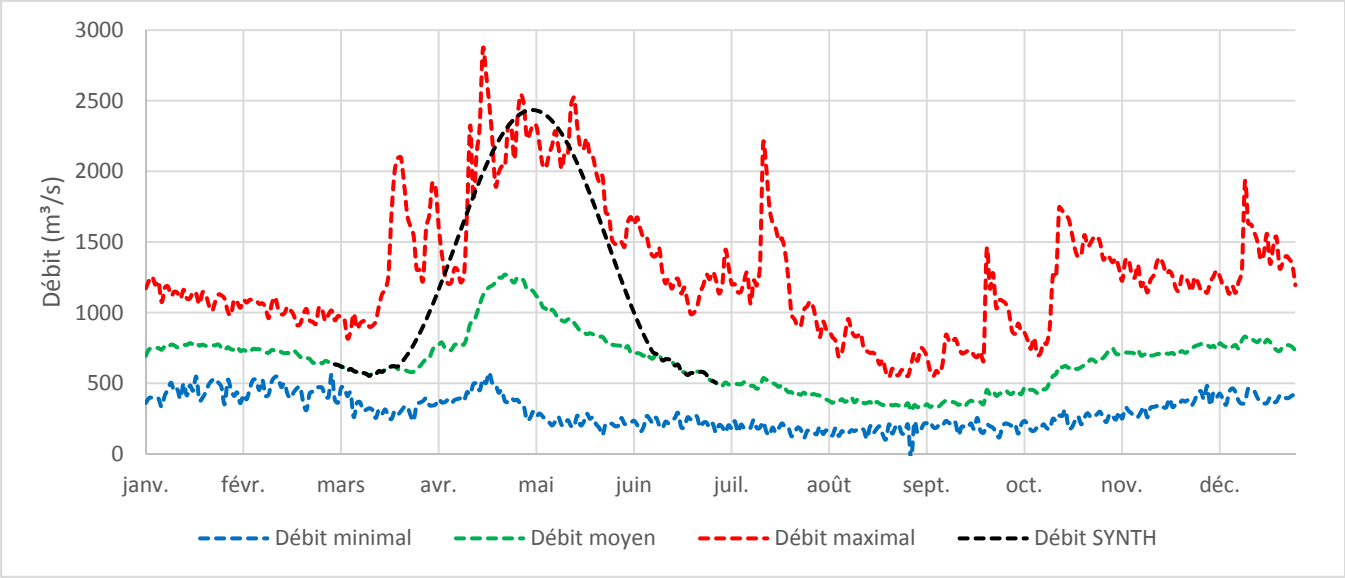


Figure 6-5 : Crue printanière synthétique créée à partir des débits entrants maximaux

Les résultats de simulation, présentés à la figure 6-6 ci-dessous, démontrent que ce scénario permet d'atteindre les objectifs de gestion souhaités.

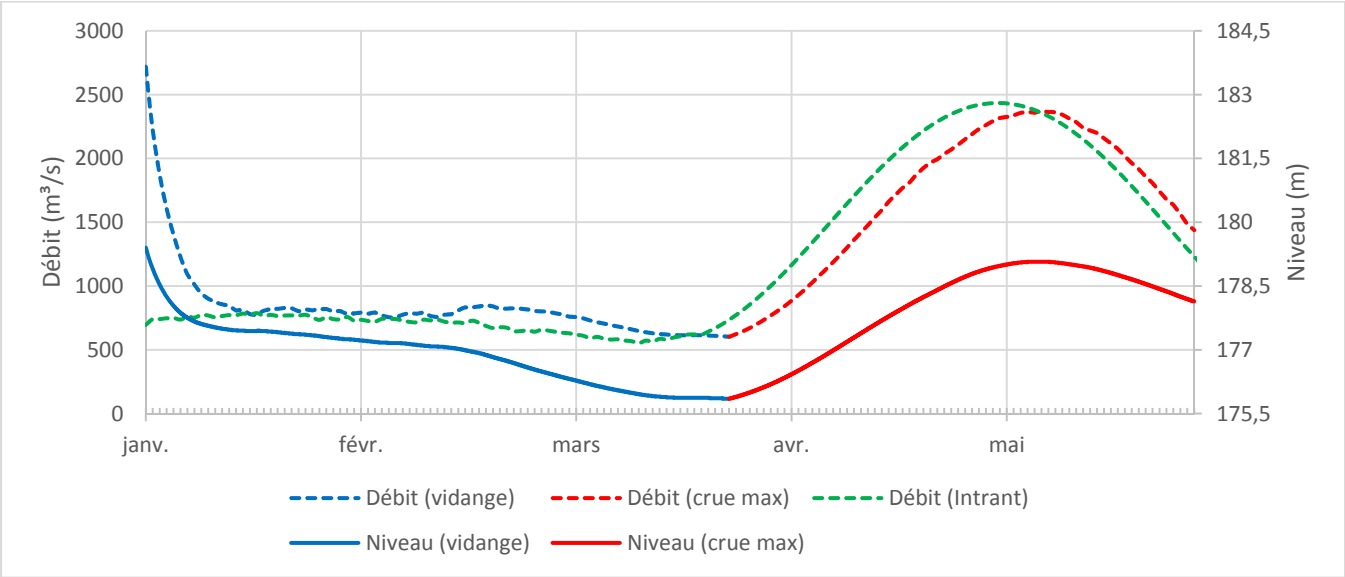


Figure 6-6 : Niveaux et débits modélisés pour les périodes hivernale et printanière maximales

Les calculs effectués à ce jour démontrent qu'il serait possible de réaliser les travaux en considérant deux phases de batardeaux. Cependant, certaines considérations d'ordre technique doivent également être considérées et feront l'objet d'une analyse plus détaillée aux prochaines étapes du projet (SR.3):

- Pour laisser cinq pertuis sur dix disponibles pour l'évacuation des eaux en deux phases de travaux nécessite de venir fermer le batardeau sur le pilier localisé entre les pertuis n° 5 et n° 6, ce qui est un élément de complexité non négligeable en terme de constructibilité;
- Pour faciliter la réalisation des travaux tout en maintenant deux phases de batardeau, il faudrait diminuer à quatre le nombre de pertuis disponibles pour l'évacuation des eaux. Les validations hydrauliques associées à ce scénario seront réalisées à l'étape SR.3.

Dans tous les cas de figure, il est nécessaire d'obtenir les autorisations de travailler dans le cours d'eau pendant les périodes de restriction initialement mentionnée dans les documents d'appel d'offres (aucuns travaux dans le cours d'eau entre le 1er septembre et le 15 juillet). Cette contrainte jumelée à l'obligation de réaliser les travaux en deux phases est incompatible avec une durée de projet de 18 mois. Cet élément a d'ailleurs été mentionné dans l'analyse de risque du projet.

6.4 CLASSIFICATION PRÉLIMINAIRE DU BARRAGE

6.4.1 Directives de l'Association Canadienne des Barrages (ACB)

Les barrages Témiscamingue ne possèdent pas de classification officielle de leur niveau de conséquences. Pour leur étude hydraulique dans le cadre du projet de reconstruction du barrage Ontario, HATCH a réalisé une analyse préliminaire du niveau de conséquences en cas de rupture du barrage en temps sec et en temps de crue. Les conclusions de HATCH démontrent que le niveau de conséquences pour le barrage Ontario est « faible » dans les deux cas. Dans le cadre de la présente étude, Tetra Tech a également évalué, de façon préliminaire, le niveau de conséquences pour la rupture du barrage Québec selon les directives et recommandations présentées par l'Association Canadienne des Barrages (ACB, 2007). Ce niveau est évalué à partir de critères incluant la perte de vies humaines, les impacts environnementaux, les impacts économiques ainsi que les impacts sur les infrastructures.

Selon les directives de l'ACB, deux scénarios de rupture doivent être étudiés pour établir les niveaux de conséquences de la rupture d'un ouvrage. Le premier scénario consiste en l'analyse d'une rupture causée par les pressions hydrauliques appliquées à l'ouvrage en période de crue. Le second scénario consiste en l'analyse d'une rupture causée par une défaillance, une secousse sismique ou autre événement non prévisible.

6.4.2 Dimensionnement de la brèche

Claude Marche (2004), stipule que la largeur de la brèche en cas de rupture d'un ouvrage de type béton-poids correspond à quatre fois sa hauteur. Dans le cas du barrage Québec, la largeur de la brèche est estimée à 35,36 m (pour une hauteur d'ouvrage de 8,84 m). Cette brèche inclut la rupture de quatre piliers du barrage, entrainant ainsi la rupture de cinq pertuis. L'élévation du radier de la brèche correspond au radier des pertuis, soit 171,91 m. Toujours selon Marche, la brèche d'un barrage de type béton-poids se forme en six minutes.

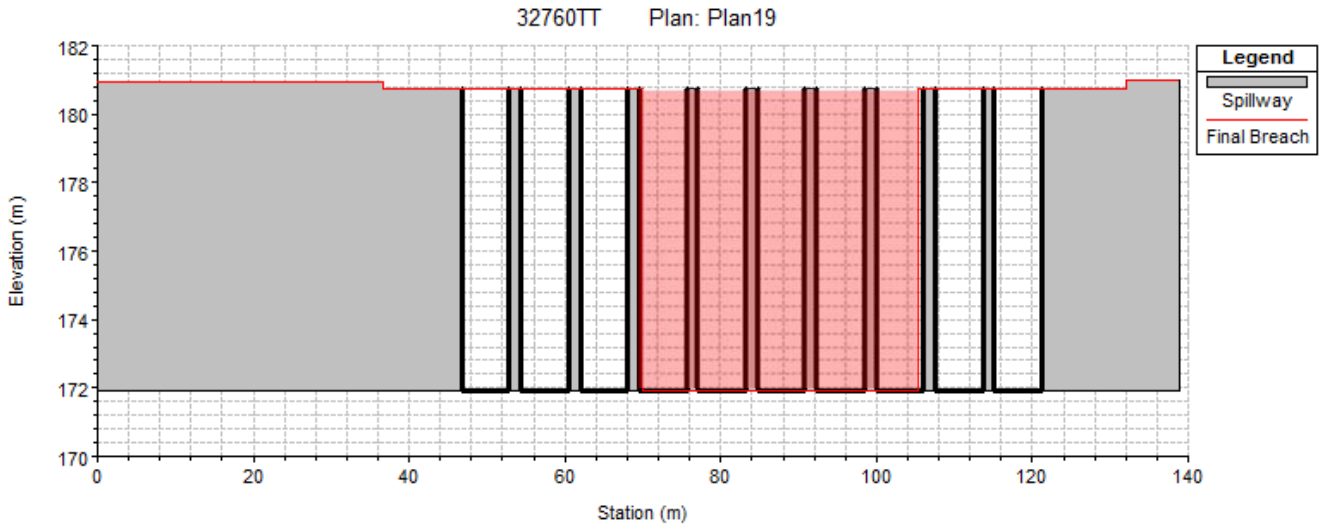


Figure 6-7 : Dimensionnement de la brèche de rupture

6.4.3 Éléments à risques

Afin de déterminer de façon préliminaire les impacts de l'augmentation du débit de la rivière suite à la rupture, des relations débits/dommages fournies par SPAC ont été utilisées. Ces relations présentent les seuils de débits causant des inondations le long de la rivière des Outaouais ainsi que les seuils pour lesquels ces inondations causent d'importants dommages. Notons qu'à la demande de SPAC, les informations des relations débits/dommages ne peuvent être divulguées dans le présent rapport.

6.4.4 Analyse en temps de crue

Le modèle hydraulique 2D a été utilisé afin d'évaluer le débit associé à une rupture en période de crue. Un niveau de réservoir correspondant au niveau maximal d'exploitation (179,56 m) a été imposé comme condition limite à l'amont du modèle et un niveau de 177,39 m a été imposé en tant que condition limite aval. Les ouvertures de pertuis utilisées pour ce scénario sont présentées au Tableau 6-2.

Tableau 6-2 : Ouverture des pertuis pour le scénario de rupture en temps de crue

	Québec		Ontario	
Pertuis	**1, 2, 9, 10**	**3 à 8**	**1, 2, 15, 16**	**3 à 14**
Nombre de poutrelles	12	9	11	7

Pour ces conditions, le débit sortant à Témiscamingue est de 1 025 m³/s (Québec : 450 m³/s et Ontario : 575 m³/s), ce qui correspond à un scénario pour lequel une pointe de la crue serait laminée dans le réservoir afin d'éviter les inondations le long des tronçons aval de la rivière des Outaouais lesquels auraient déjà atteint leurs seuils d'inondations mineurs. Pour ce scénario, la rupture survient lorsque le niveau du réservoir atteint le niveau maximal d'exploitation, soit 179,56 m. Ce scénario de rupture en temps de crue est jugé critique et a été établi suite à des discussions avec SPAC.

Tableau 6-3 : Résultats de l'analyse de rupture préliminaire du barrage Québec en temps de crue

Scénario	Valeur (m³/s)
Débit avant rupture (barrage Québec)	450
Débit avant rupture (total)	1 025
Débit après rupture (barrage Québec)	1 228
Débit après rupture (total)	1 803

Les résultats de l'analyse préliminaire montrent que le débit de rupture en cas de crue est de l'ordre de 778 m³/s, ce qui entraine une augmentation de 76 % du débit total de la rivière des Outaouais. Dans la mesure où les débits avant la rupture dans les tronçons aval de la rivière des Outaouais atteignent le seuil d'inondation mineur, le débit de rupture est jugé insuffisant pour atteindre les seuils de débits entrainant des dommages importants évalués aux barrages Pembrooke et Britannia. Notons toutefois qu'il est possible qu'une rupture du barrage Québec, en cas de crue plus élevée, entraine des dommages plus importants aux infrastructures le long de la rivière des Outaouais et qu'une analyse détaillée est nécessaire afin de caractériser de façon adéquate les impacts d'une telle rupture. De plus, il est jugé que le barrage Otto Holden possède la capacité d'évacuation nécessaire afin de soutenir l'augmentation de débit de 778 m³/s. Cette hypothèse devra toutefois être validée lors d'une étude de rupture de barrage détaillée.

Comme la rupture des piliers de l'ouvrage entraine l'effondrement du tablier de la route 101 et considérant le risque de dommages importants aux infrastructures le long de la rivière des Outaouais, le niveau de conséquences préliminaire en cas de rupture en période de crue est **« important »**. Le tableau 6-4 présente un résumé des niveaux de conséquences associés aux différents critères établis par l'ACB.

Tableau 6-4 : Niveau de conséquences préliminaire pour une rupture en temps de crue

	Population à risque	Pertes incrémentales		
		Perte de vie	Environnement / Social	Infrastructures / Économie
Niveau de conséquences	**Important**	**Important**	Faible	**Important**

6.4.5 Analyse en temps sec

Le même modèle a été utilisé afin d'évaluer le débit associé à une rupture en temps sec, soit une période où le réservoir Témiscamingue est maintenu à son niveau normal d'exploitation (179,35 m) et le niveau aval est maintenu à 176,78 m. Les ouvertures de pertuis utilisées pour ce scénario sont présentées au Tableau 6-5.

Tableau 6-5 : Ouverture des pertuis pour le scénario de rupture en temps sec

	Québec		Ontario	
Pertuis	**4 à 7**	**1 à 3, 8 à 10**	**6 à 11**	**1 à 5, 12 à 16**
Nombre de poutrelles	12	16	9	13

Tableau 6-6 : Résultats de l'analyse de rupture préliminaire du barrage Québec en temps sec

Scénario	Valeur (m³/s)
Débit avant rupture (barrage Québec)	95
Débit avant rupture (total)	205
Débit maximal après rupture (barrage Québec)	1 025
Débit maximal après rupture (total)	1 140

Les résultats de l'analyse préliminaire montrent que le débit de rupture maximal anticipé en temps sec est de l'ordre de 935 m³/s, ce qui représente une augmentation de plus de 560 % du débit total de la rivière des Outaouais. Bien que l'augmentation par rapport au débit avant rupture soit importante, le débit de rupture ne représente qu'une portion du débit de crue moyen de la rivière des Outaouais. Les impacts sur les infrastructures sont donc minimes. De plus, il est jugé que le barrage Otto Holden à l'aval du site à l'étude possède une capacité d'évacuation suffisante pour soutenir l'augmentation de débit en cas de rupture en temps sec. Cette hypothèse devra toutefois être validée lors d'une étude de rupture de barrage détaillée.

Toutefois, l'augmentation soudaine du débit présente un risque pour les embarcations et les personnes présentes aux abords de la rivière au moment de la rupture. En effet, des embarcations pourraient être renversées et des personnes emportées par l'onde de rupture. Pour ce scénario également, la rupture entraine l'effondrement du tablier de la route 101, ce qui augmente le niveau de conséquences préliminaire à **« important »**. Le tableau 6-7 présente un résumé des niveaux de conséquences associés aux différents critères établis par l'ACB.

Tableau 6-7 : Niveau de conséquences préliminaire pour une rupture en temps sec

	Population à risque	Pertes incrémentales		
		Perte de vie	Environnement / Social	Infrastructures / Économie
Niveau de conséquences	Faible	Significatif	Faible	**Important**

6.4.6 Crue de sécurité préliminaire

Selon l'ACB (2007), un ouvrage dont le niveau de conséquences est « important » doit pouvoir soutenir une crue équivalente au 1/3 entre la crue de récurrence 1000 ans et la crue maximale probable (CMP). La crue de récurrence 1 000 ans, telle que présentée à la section 4.2.2, représente un débit entrant de 3 311 m³/s. Dans leur rapport de 2001, SNC Lavalin a estimé le débit de la CMP à 9 034 m³/s. Ce débit correspond à la crue printanière maximale probable combinée à un événement de pluie maximale probable. Toujours selon la directive de l'ACB (2007), la crue de sécurité pour un barrage ayant un niveau de conséquence « important » se calcule comme suit :

$$Q_S = Q_{1000} + (Q_{CMP} - Q_{1000})/3$$

La crue de sécurité préliminaire pour le complexe Témiscamingue est donc de 5 219 m³/s. Cette crue servira donc à la conception de l'ouvrage de remplacement pour le barrage Québec.

7.0 RÉFÉRENCES

AGEOS SCIENCES. (1993). *Réservoir Témiscamingue: Faisabilité de la réduction du niveau d'exploitation maximale, étude hydrologique préliminaire.*

AGEOS SCIENCES. (1996). *Érosion des berges liée au mode de gestion des niveaux d'eau du réservoir Témiscamingue.*

CANADIAN DAM ASSOCIATION. (2007). Technical Bulletin: Inundation, Consequences, and Classification for Dam Safety.

CANADIAN DAM ASSOCIATION. (2007). Technical Bulletin: Hydrotechnical Considerations for Dam Safety.

CANADIAN HYDRAULICS CENTRE. (2004). *Hydraulic model study of scour and erosion protection at the east Témiscaming dam.* National Research Council Canada.

ENVIRONNEMENT CANADA. (2016). *Rapport de données météorologiques quotidiennes pour juillet 2004 à la station Barrage Témiscamingue 7080468.*

FENTON, J. D. (2015). *Calculating flow over rectangular sharp-edged weirs.* Alternative Hydraulics Paper 6.

GÉNIVAR. (2011). *Timiskaming Dam rehabilitation; As built plans of the Timiskaming Dam East (Quebec).* R.027164.002.

HATCH. (2013). *Hydraulic study and analysis report for Timiskaming Ontario dam replacement.* Gatineau.

HATCH. (2014). *Extended stoplog plan, detail & sections. Timikaming Ontario dam replacement.* S011.

J.W. KAMPHUIS ASSOCIATES LIMITED. (1997). *The effects of reservoir operation on shore erosion along lake Timiskaming.*

MARCHE, Claude (2004). *Barrages: crues de rupture et protection civile,* Presses inter Polytechnique, 388 pages

MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC. (1987). *Rivière des Outaouais, augmentation de la débitance du barrage Témiscamingue en période de bas niveaux du réservoir Témiscamingue.* Québec, Direction générale des ressources hydriques.

MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC. (1988). *A study of the increase in storage and flood reserves at Baskatong, Temiscamingue, Des Quinzes and Kipawa.* Direction générale des ressources hydriques.

OGDEN BEEMAN & ASSOCIATES. (1997). *Operations of the water control structure at lake Timiskaming.*

OUELLET, Y. (1997). *Érosion des berges du lac Témiscamingue, rapport d'expertise.* Université Laval, Département de génie civil.

OUELLET, Y., & LLAMAS, J. (1994). Évaluation du rapport intitulé : *« Réservoir du barrage Témiscamingue : Faisabilité de la réduction du niveau d'exploitation maximum, étude hydrologique préliminaire »* préparée par la firme AGEOS Sciences. Université Laval, Département de génie civil.

PUBLIC SERVICES AND PROCUREMENT CANADA (2016). *Timiskaming dam complex operating plan, draft version.* Major Crown Projects & Marine and Transportation Engineering.

SNC LAVALIN (2001). *Étude de risque hydrologique pour la rivière des Outaouais, Barrage des Quinze, Kipawa et Lac-Témiscamingue, Étude de laminage des crues*. Division Énergie.

WAY, S. (1999). *Investigation of Timiskaming dams discharge at low reservoir levels.* Architectural and Enginnering Services.

Annexe A Carte topographique et bathymétrique

5 174 000

5 174 000

Légende

Courbe maîtresse (5 m)

Courbe secondaire (1 m)

Image aérienne: © Bing 2016

TETRA TECH

CLIENT

Services publics et Approvisionnement Canada

PROJET

REMPLACEMENT DU BARRAGE TÉMISCAMINGUE

TITRE

Annexe

Carte topographique et bathymétrique

DESSIN	VÉRIFICATION
Dominic Delorme	Simon Armstrong
APPROBATION	**DATE**
Jean Gauthier	2017-01-20
PROJET NO.	**FICHIER NO.**
32760TT	32760TT_Contour.mxd

ÉCHELLE

0 15 30 60 90 120 m

1:2 000

Projection: NAD 1983 UTM Zone 17N

Équidistance des coubes topographiques: 1m

APPENDIX O – HDRO-QUÉBEC PUBLICATION ON MERCURY

COMPRENDRE L'HYDROÉLECTRICITÉ QUÉBÉCOISE

MERCURE ET RÉSERVOIRS : UN PHÉNOMÈNE TEMPORAIRE, CONNU ET BIEN GÉRÉ

Toutes les filières de production d'électricité ont un impact environnemental. Dans le cas de l'hydroélectricité, un des impacts est l'augmentation temporaire des teneurs en mercure dans la chair des poissons des réservoirs. Pour produire de l'hydroélectricité, il faut ennoyer des terres, ce qui cause la décomposition de la végétation qui s'y trouve. Une partie du mercure inorganique qu'elle contient se transforme alors en mercure organique (ou méthylmercure), une substance neurotoxique qui s'accumule dans les organismes qui l'ingèrent.

Temporaire

Tous les poissons – qu'ils vivent dans les lacs, les rivières ou les océans – contiennent du mercure. Dans les années qui suivent la mise en eau d'un réservoir, la quantité de mercure organique dans la chair des poissons augmente. Elle atteint un maximum au bout de quatre à quatorze ans suivant la mise en eau (selon l'espèce), puis prend de 10 à 35 ans pour revenir graduellement au **niveau naturel**[1].

Connu

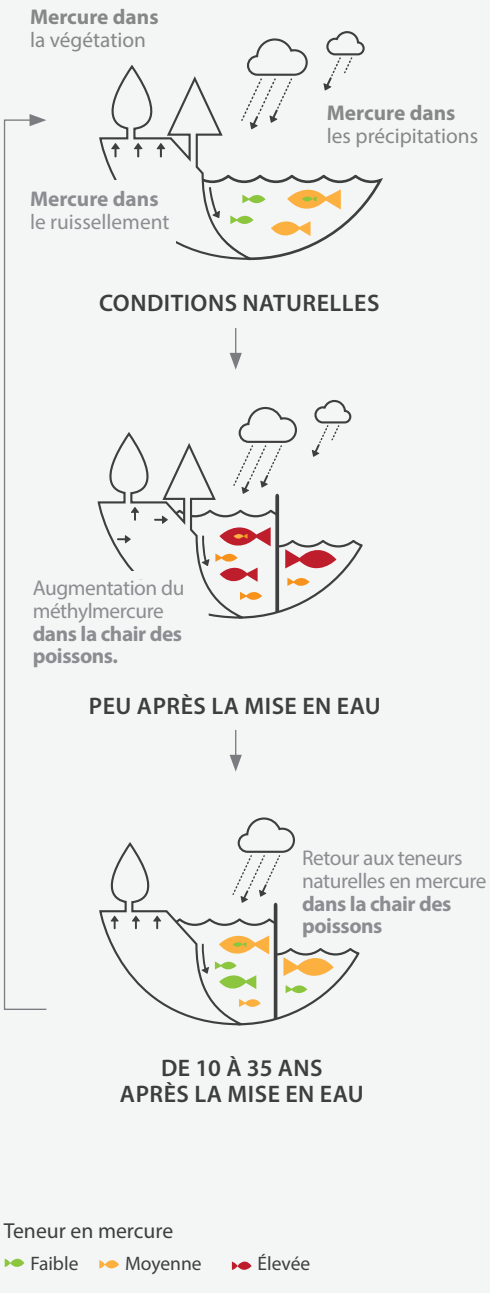
Depuis 40 ans, grâce à un **programme de recherche unique en son genre** mené en collaboration avec des gouvernements, des organismes de santé, des collectivités, des universités et des entreprises, Hydro-Québec a acquis une vaste expertise sur le mercure dans les réservoirs hydroélectriques. Pour tous les projets hydroélectriques, la question du mercure est étudiée rigoureusement dans le cadre de l'évaluation des impacts sur l'environnement, et les obligations relatives aux mesures de surveillance et d'atténuation font partie intégrante des autorisations de projet. Des études montrent que l'augmentation du niveau de mercure ne menace ni les populations de poissons[2] , ni les oiseaux ou les mammifères qui s'en nourrissent[3].



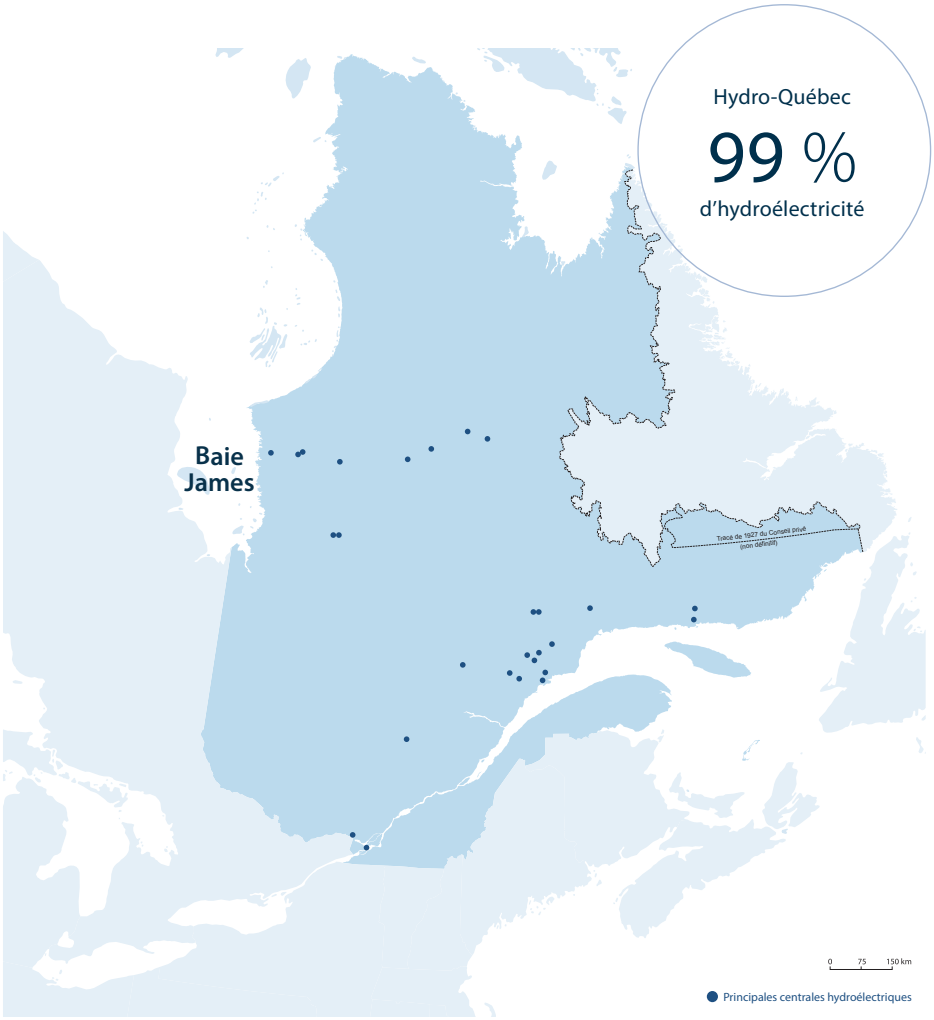


Bien géré

Bien qu'il soit impossible d'empêcher ce phénomène de se produire, on peut réduire ses impacts sur la santé des populations. En effet, en collaboration avec les organismes de santé publique et nos partenaires des Premières Nations, nous publions des **guides sur la consommation de poisson**. Conscients du rôle de la pêche traditionnelle dans la vie et la culture des Premières Nations ainsi que des avantages nutritionnels du poisson, nous encourageons les populations à continuer de consommer du poisson. Dans certaines situations, nous avons même aménagé de nouveaux sites de pêche.



1 Schetagne et Therrien (2013); 2 Bilodeau et coll. (2016); 3 Lucotte et coll. (1999)



LES CENTRALES HYDROÉLECTRIQUES NE REJETTENT PAS DE MERCURE

Les roches et le sol contiennent naturellement du mercure. Dans cette région, le mercure provient principalement de sources naturelles ou d'activité humaine :

- Volcans et feux de forêt
- Centrales au charbon et activité industrielle

50 000

mesures de la teneur en mercure dans les poissons de la Baie James

40 ans

de recherches sur le phénomène à Hydro-Québec

0

cas d'intoxication au mercure causé par la consommation de poisson au Québec (selon les données dont nous disposons)

BIBLIOGRAPHIE

BILODEAU, F., SCHETAGNE, R., THERRIEN, J., VERDON, R. 2016. « Absence of noticeable mercury effects on fish populations in boreal reservoirs despite threefold to sevenfold increases in mercury concentrations ». *Journal canadien des sciences halieutiques et aquatiques*. Vol. 73, no 7, p. 1104-1125. Montréal.

LORANGER, S., SCHETAGNE, R., PLANTE, M., CARRIER, G., SAUVÉ, S., ÉMARD, B., PICHÉ, L., BABO, S. 2002. « Evaluation of a questionnaire-based method for the estimation of methylmercury exposure of recreational anglers in the James Bay Territory (Québec, Canada) ». *Human and Ecological Risk Assessment*. Vol. 8, no 3, p. 559-571.

LUCOTTE, M., R. SCHETAGNE, N. THÉRIEN, C. LANGLOIS AND A. TREMBLAY (réd.). 1999. *Mercury in the Biochemical Cycle: Natural Environments and Hydroelectric Reservoirs of Northern Québec (Canada)*. Berlin, Heidelberg, New York, Environmental Science Series, Springer-Verlag. 334 p.

SCHETAGNE, R., DOYON, J-F., FOURNIER, J-J. « Export of Mercury Downstream from reservoirs ». 2000. *The Science of the Total Environment*. Vol. 260, p. 135-145.

SCHETAGNE, R., PLANTE, M., CASTONGUAY, D. 2010. *Impact of the Sainte-Marguerite 3 hydroelectric reservoir on the mercury exposure of local fish consumers*. In Barganska Z., Beyer A., Klimazewska K., Namiesnik J., Tobiszewski M., Rutkiewicz I. (réd.), Proceedings of 15th International Conference on Heavy metals in the Environment. [En ligne]. Université technologique de Gdansk. Téléchargeable en format PDF. http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/41/131/41131147.pdf. p. 380-383

SCHETAGNE, R., PLANTE, M., VAILLANCOURT, G., DUMONT, D. 2009. *Health risk assessment related to mercury exposure from the consumption of fish from a proposed hydroelectric complex*. Exposé et affiche, International Conference on Mercury as a Global Pollutant. Guiyang, Chine.

SCHETAGNE, R., THERRIEN, J. 2013. *Suivi environnemental du complexe La Grande. Évolution des teneurs en mercure dans les poissons. Rapport synthèse 1978-2012*. GENIVAR inc. et Hydro-Québec Production. 174 p.

SURETTE, C., LUCOTTE, M., TREMBLAY, A. 2006. « Influence of intensive fish on the partitioning of mercury and methylmercury in three lakes of Northern Québec ». *The Science of the Total Environment*. Vol. 368, no 1, p. 248-261.

TREMBLAY, A., CLOUTIER, L., LUCOTTE, M. 1998. « Total mercury and methylmercury fluxes via emerging insects in recently flooded hydroelectric reservoirs and a natural lake ». *The Science of the Total Environment*. Vol. 219, p. 209-221.

TREMBLAY, A., LUCOTTE, M., SCHETAGNE, R. 1998. « Total mercury and methylmercury accumulation in zooplankton of hydroelectric reservoirs in Northern Québec (Canada) ». *The Science of the Total Environment*, Vol. 213, p. 307-315.

Pour en savoir davantage sur la production hydroélectrique, le mercure et les mesures appliquées pour réduire les risques pour la santé, consultez notre site Web :

http://www.hydroquebec.com/developpement-durable/centre-documentation/mercure.html.

Hydro Québec

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