



# Manitoba Infrastructure

## Remote Road Operations

Project 6 - All Season Road Linking Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation

## Aquatic Environment Report: Existing Environment

📅 March 2017







# **MANITOBA INFRASTRUCTURE – REMOTE ROAD OPERATIONS**

## **PROJECT 6:**

### **ALL SEASON ROAD LINKING MANTO SIPI CREE NATION, BUNIBONIBEE CREE NATION AND GOD'S LAKE FIRST NATION**

#### **Aquatic Environment Report**

#### **Existing Environment**

March 2017

Prepared for

Manitoba Infrastructure – Remote Road Operations

by



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## EXECUTIVE SUMMARY

The East Side Road Authority (ESRA), whose projects were assumed by Manitoba Infrastructure – Remote Road Operations (MI-RRO) in November 2016, is designing and constructing an all season road connecting Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation. Based on the preliminary alignment, 53 watercourse crossings will be constructed including culverts at 51 unnamed watercourses, a clear-span bridge at God's River and a two-span bridge at Magill Creek.

Thirty-two species of fish are known to be present from the major waterbodies in the project area and include important commercial, recreational, and Aboriginal (CRA) fishery species such as Brook Trout, Lake Whitefish, Northern Pike and Walleye. Lake Sturgeon, designated by the Committee on the Status of Endangered Wildlife in Canada as special concern are found in the God's River.

Habitat at 28 of the 53 all season road stream crossing sites was assessed as not supporting fish. These unnamed streams are headwater wetland areas with no stream channel or channel connection to fish bearing waters. Habitat at 25 all season road stream crossing sites was assessed as supporting fish and this ranged from marginal habitat supporting forage fish only to sites with habitat supporting a greater diversity of fish species including large-bodied species. Marginal sites are located on small first or second order streams that are often poorly connected to downstream fish-bearing waters due to numerous ephemeral barriers or poor channel development. Many of these sites are considered unsuitable for large-bodied fish due to poor overwintering conditions and restricted access. Where access is less restrictive, large-bodied species such as Northern Pike are expected to make use of the crossings area for spawning, rearing and foraging. Seven stream crossing sites were assessed as important habitat including Magill Creek and God's River. Habitat at these sites was suitable for a range of life requisites for a diversity of fish species, including both forage fish and large-bodied species. Brook Trout, both adult and young of the year were captured at the God's River site.

### Risk Assessment

A detailed aquatic environmental study was undertaken in summer 2016 to assess the risk that crossing construction would result in "serious harm to fish", pursuant to Section 35(1) of the *Fisheries Act* and to assess the potential impacts of the Project on aquatic habitats.

Under the *Fisheries Act*, "serious harm to fish" applies to fish and fish habitat that are part of or support a CRA fishery. The risk of serious harm to fish from crossing construction and operation was assessed using a habitat-based approach. The approach considered the impact of the



crossing on the productivity of relevant fish and fish habitat. The assessment was conducted based on the preliminary crossing design, literature review and results of field investigations.

A risk assessment was conducted for the 25 stream crossing sites assessed as fish habitat. Installation of culverts at seven crossing sites was assessed as Low Risk to fish and fish habitat as they are not expected to contribute to a CRA fishery. At these sites the habitat was characterized as boreal wetland headwater areas of small streams with poor connectivity to downstream fish bearing waters and considered to be of poor quality for the life requisites of relevant CRA fishery species. The remaining 18 crossing sites were assessed as habitats that potentially support a CRA fishery. Sixteen culvert sites, one proposed clear span bridge and one two-span bridge were assessed as Low Risk to fish habitat.

The construction of a clear span bridge would be classified as Low Risk, provided that appropriate avoidance and mitigation measures are implemented. On the Minor Impact List, construction of a clear span bridge does not require DFO review. Although habitat at the culvert and two-span bridge crossing sites is suitable for large-bodied fish such as Northern Pike and other CRA species, this habitat type is not critical or limiting to the fishery and therefore classified as Low Risk.



## **ACKNOWLEDGEMENTS**

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## 1.0 INTRODUCTION

The East Side Road Authority (ESRA), whose projects were assumed by Manitoba Infrastructure – Remote Road Operations (MI-RRO) in November 2016, is undertaking the design, and in the future, the construction of an all-season road (ASR) connecting the communities of Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation (the Project). The Project is part of a larger initiative to provide improved, safe, and more reliable transportation service between all the communities on the east side of Lake Winnipeg.

The ASR Project is currently in the preliminary design phase and based on the preliminary alignment, the proposed ASR will intersect both small and medium-sized streams and one river. Detailed aquatic environmental studies were undertaken in June 2016 to identify and describe aquatic habitats potentially affected by the project and to assess the potential impacts of the Project on these habitats. This report includes:

- A description of the existing aquatic environment within the project study area;
- An assessment of risk of the project to fish and fish habitat at watercourse crossing sites relative to Section 35(1) of the federal *Fisheries Act*.

## 2.0

## PROJECT OVERVIEW

The proposed ASR will extend from Bunibonibee Cree Nation to God's Lake First Nation (P6a) and from Manto Sipi Cree Nation to the P6a junction (P6b; figures 1 and 2) and will consist of a 10 m wide road top centered within a 60 m cleared right-of-way (RoW). The Project is currently in the preliminary planning stage and the road alignment and crossing designs are yet to be finalized. Based on the preliminary route, the ASR project will require construction of 53 watercourse crossings. Although subject to change, the crossing designs are expected to include:

- a clear-span bridge at the God's River;
- a two-span bridge at Magill Creek; and
- culverts at 51 unnamed streams.



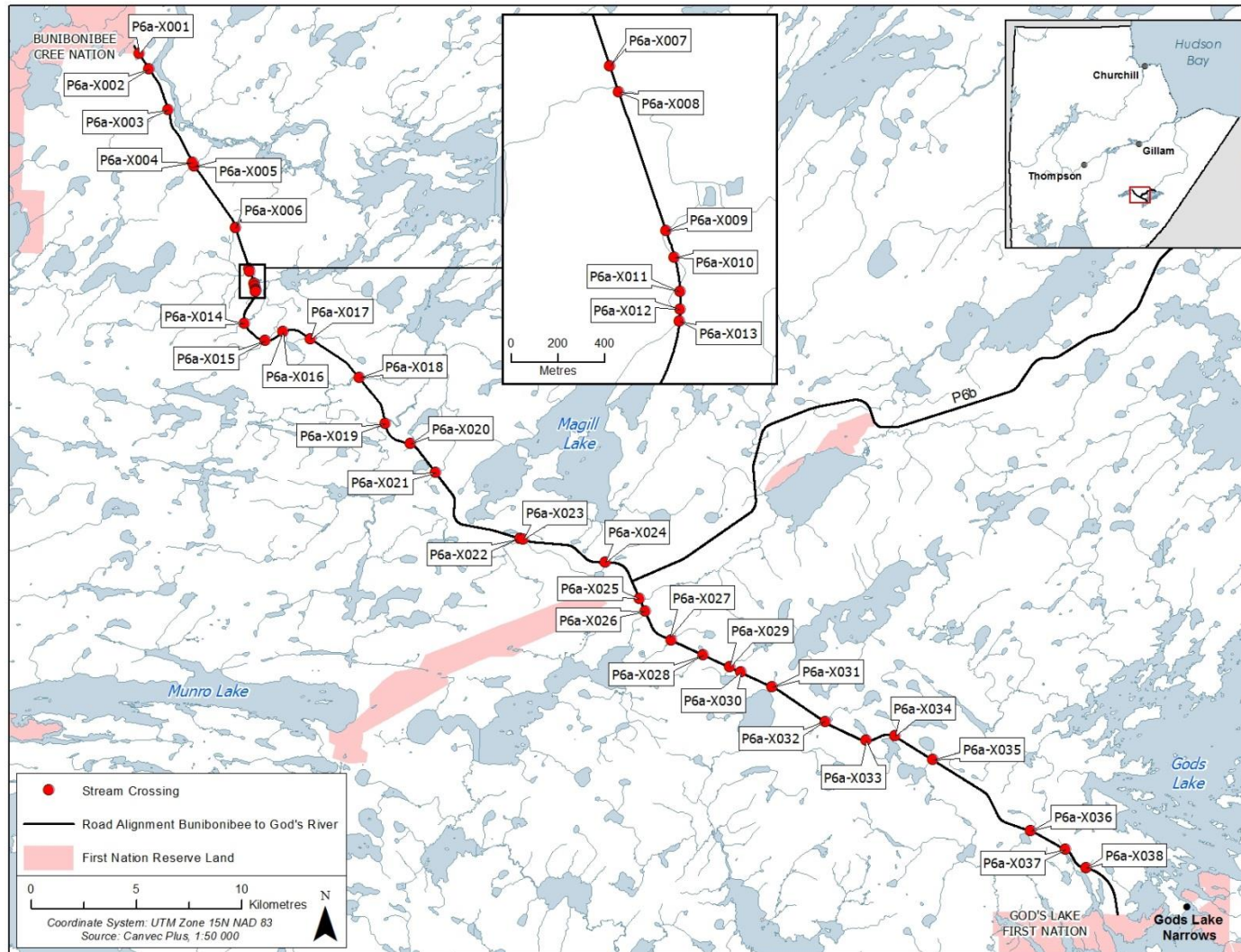


Figure 1. Project 6a – Bunibonibee Cree Nation to God's Lake First Nation All Season Road study area and watercourse crossing locations.

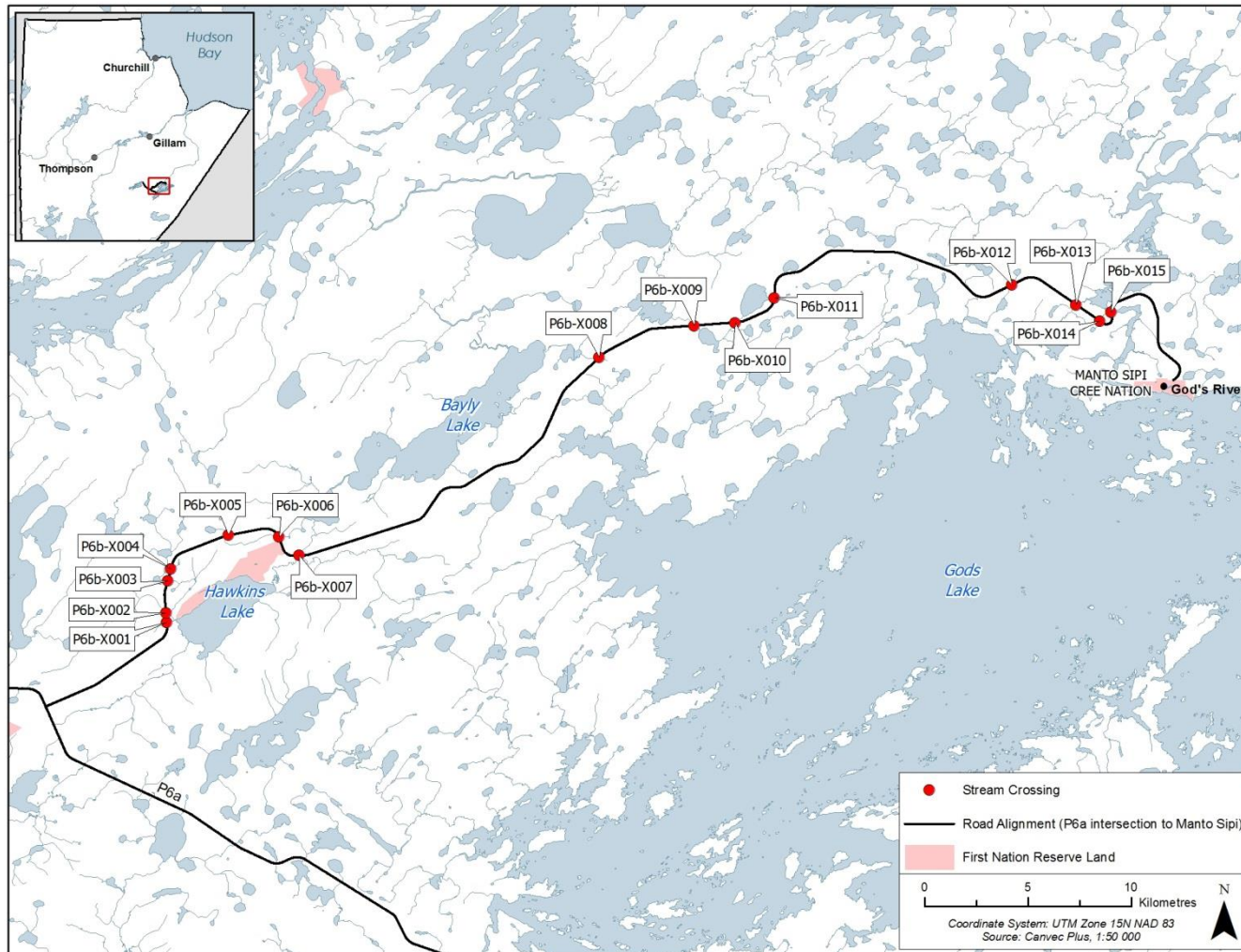


Figure 2. Project 6b – Manto Sipi Cree Nation to the P6a junction All Season Road study area and watercourse crossing locations.

### **3.0 EXISTING ENVIRONMENT**

The Project is located on the east side of Lake Winnipeg, between the communities of God's Lake First Nation, Bunibonibee Cree Nation, and Manto Sipi Cree Nation. The east side of Lake Winnipeg is located within the Boreal Shield ecozone and encompasses the Hayes River Upland ecoregion (Smith et al. 1998). Within the ecoregion, the Project traverses two ecodistricts; God's Lake and Silsby Lake. These two ecodistricts are characterized by short, cool summers, and long, very cold winters, with highest precipitation occurring during summer.

The northern-most portion of the alignment intersects the Silsby Lake ecodistrict. This ecodistrict is characterized by undulating to subdued hummocky loamy morainal plain covered by clayey, glaciolacustrine veneers and blankets with extensive peatlands (bogs and fens) (Smith et al. 1998). Drainage is considered poor due to the gentle topography and a landscape dominated by peatlands. Black spruce with ericaceous shrubs and mosses are common in bog peatlands and sedges, brown mosses, shrubs, and stunted tamarack are common in fens.

The Project lies largely within the God's Lake ecodistrict. This ecodistrict is also dominated by undulating to hummocky morainal plain with clayey glaciolacustrine veneers and blankets, often covered by peatlands (Smith et al. 1998). Forest vegetation is dominated by black spruce, particularly in upland and transitional bog peatlands. Fens support tamarack, while mixed forests of white spruce, balsam fir, trembling aspen and balsam poplar occur along lakes and rivers.

The proposed ASR alignment extends northwest from the God's Lake Narrows community to Oxford House and extends northeastward from the P6a junction to connect to the God's River community, (figures 1 and 2). The landscape is relatively undeveloped; in addition to the Oxford House, God's Lake, and God's River communities other infrastructure developments include a winter road connecting the communities and an electrical transmission line.

#### **3.1 AQUATIC HABITATS**

Drainage within the Project area is primarily to the northeast (Smith et al. 1998). Waterbodies within the area are primarily comprised of small streams but include medium and large sized rivers, as well as small to very large lakes (the largest being God's and Oxford lakes). The smaller streams are often part of boreal wetlands such as bogs and fens that drain local areas into larger creeks, rivers or lakes and are usually less than one metre in depth. Within the study area, these types of streams typically drain to major rivers, such as the God's and Hayes rivers. Discharges during spring flows may be a number of cubic metres per second, but become entirely dependent on precipitation during summer and can often reach zero during dry periods. Water temperatures in these streams may be near 0°C at break-up in April or May, but can rise rapidly to the mid-twenties by late May.



The smaller streams may be used as spawning and nursery areas by larger fish species (e.g., Northern Pike) in spring, while smaller forage species such as minnows and stickleback may utilize the streams through the summer if water volume is adequate. Due to shallow depths and low winter flows, small streams generally provide little or no over-wintering habitat. Medium sized streams may provide spawning habitat for larger fish such as suckers and Northern Pike. For the remainder of the year, these streams may be utilized as a nursery for young fish, as well as providing habitat for various species of minnows, darters, sticklebacks and sculpins. Over-wintering of smaller fish in these types of streams will often occur when deeper pools are available. The one large river within the Project area, God's River, provides year-round habitat for several fish species. Due to perennial flows it supports both spring and fall spawning species.

Small boreal wetlands areas also occur within the local area. These habitats generally do not have clear connection to fish bearing waters and typically become anoxic during winter. A few species of small-bodied fish that are tolerant of low oxygen levels may persist in some, but most of these wetlands are typically devoid of fish populations.

Based on existing information, including traditional knowledge studies, thirty-two fish species occur within the major watercourses in the Project area (Table 1).

### **3.1 WATER QUALITY**

No water quality data for waterbodies in the study area were found in Manitoba Sustainable Development databases.

Table 1. Documented fish species presence in major watercourses in the Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation study area<sup>1</sup>.

Common Name	Scientific Name	God's River	God's Lake	Knee Lake	Hayes River	Bayly Lake
Blacknose Dace	<i>Rhinichthys atratulus</i>		X			
Blacknose Shiner	<i>Notropis heterolepis</i>	X				
Blackside Darter	<i>Percina maculata</i>		X			
Brook Stickleback	<i>Culaea inconstans</i>	X	X		X	
Brook Trout	<i>Salvelinus fontinalis</i>	X	X		X	
Burbot	<i>Lota lota</i>	X	X		X	
Cisco	<i>Coregonus artedii</i>	X	X	X	X	
Deepwater Sculpin	<i>Myoxocephalus thompsonii</i>				X	
Emerald Shiner	<i>Notropis atherinoides</i>	X	X		X	
Fathead Minnow	<i>Pimephales promelas</i>	X	X		X	
Johnny Darter	<i>Etheostoma nigrum</i>	X	X		X	
Lake Chub	<i>Couesius plumbeus</i>	X	X		X	
Lake Sturgeon	<i>Acipenser fulvescens</i>	X	X		X	
Lake Trout	<i>Salvelinus namaycush</i>	X	X	X		
Lake Whitefish	<i>Coregonus clupeaformis</i>	X	X	X	X	X
Logperch	<i>Percina caprodes</i>				X	
Longnose Dace	<i>Rhinichthys cataractae</i>	X	X		X	
Longnose Sucker	<i>Catostomus catostomus</i>	X	X		X	
Mottled Sculpin	<i>Cottus bairdii</i>		X			
Ninespine Stickleback	<i>Pungitius pungitius</i>	X	X		X	
Northern Pike	<i>Esox lucius</i>	X	X	X	X	
Pearl Dace	<i>Margariscus margarita</i>		X		X	
River Darter	<i>Percina shumardi</i>				X	
Sauger	<i>Sander canadensis</i>	X	X	X		
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	X			X	
Silver Lamprey	<i>Ichthyomyzon unicuspis</i>				X	
Slimy Sculpin	<i>Cottus bairdii</i>	X	X		X	
Spottail Shiner	<i>Notropis hudsonius</i>	X	X		X	
Troutperch	<i>Percopsis omiscomaycus</i>	X	X		X	
Walleye	<i>Sander vitreus</i>	X	X	X	X	X
White Sucker	<i>Catostomus commersonii</i>	X	X		X	
Yellow Perch	<i>Perca flavescens</i>	X	X		X	

<sup>1</sup> – FIHCS (2016); HTFC Planning & Design (2016); Eaton (2012); COSEWIC (2006);, Stewart and Watkinson (2004).

## **4.0 FISH HABITAT AND RISK ASSESSMENT**

The methods and results of the fish habitat assessment and subsequent *Fisheries Act* risk assessment are presented in the following sections.

### **4.1 METHODS**

The aquatic environment data collection and analysis methods and habitat and risk assessment approach are described below.

#### **4.1.1 Aquatic Environment Data Collection and Analysis**

Aquatic environment field data were collected in June 2016 where the ASR alignment intersected watercourses. Data were collected through geographic information systems (GIS) and orthophoto analysis and during field surveys. The data were used to provide a physical description of fish habitat and assess potential fish use.

##### **4.1.1.1 Watercourse Identification**

Watercourse crossing sites were identified by MI-RRO and provided to North/South Consultants in shapefile format. The ASR alignment was also overlaid on the CanVec 1:50,000 hydrographic dataset (version 8; Natural Resources Canada 2007) using ArcGIS® 10.2 GIS software (Environmental Systems Research Institute [ESRI], Redlands, California) to identify any additional watercourse crossing sites.

##### **4.1.1.2 Drainage Analysis**

For each crossing site, the drainage area upstream of the proposed crossing and distance to the nearest downstream major waterbody were calculated. For drainage area, watershed boundaries were created using the Prairie Farm Rehabilitation Administration (PFRA) Incremental Gross Drainage Area dataset (PRFA 2008). Most watercourses crossed by the alignment are minor streams and their drainage area is located within the larger watersheds mapped in the PFRA dataset. The watershed boundaries for these smaller streams were delineated from the larger watershed using the Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) (USGS, n.d.). The upstream drainage area was then calculated using ArcGIS® 10.2.

The linear distance from each crossing to the nearest major fish bearing waterbody was determined using ArcGIS® 10.2. Distances were calculated based on the CanVec 1:50,000 hydrographic dataset.

### 4.1.1.3 Aerial Reconnaissance

Orthophoto analysis and aerial surveys were conducted to classify each watercourse by size and connection to other fish bearing waterbodies.

#### 4.1.1.3.1. Connectivity

The importance of fish habitat in smaller streams is often related to its connectivity to more extensive downstream habitats. For each stream crossing, downstream connectivity was assessed aerially in the field, and by orthophoto analysis. For each stream, the following features were noted:

- presence of a defined channel downstream of the crossing to the next major watercourse;
- permanent impediments to fish passage (e.g., waterfalls);
- ephemeral impediments to fish passage (e.g., beaver dams); and
- presence and extent of upstream habitat, including the three previous features.

Streams were assigned to one of four connectivity classes as presented in Table 2. The classifications were used to assess or support the known or expected migrations of large-bodied fish species. This was used in the risk assessment (Section 4.1.2) and in assessing the fish passage requirements for crossing design.

Table 2. Description of connectivity classes used to assess the connection of stream crossings to larger fish bearing waterbodies.

Connectivity Class	Class Description
Yes	Connection to downstream fish bearing waters apparent without impediments.
Yes – likely	Connection to downstream fish bearing waters apparent but permanent barrier visible but questionable if it presents a certain barrier; or ephemeral barriers present in low number and the crossing location is in close proximity to the downstream fish bearing water body.
Yes – unlikely	Connection to downstream fish bearing waters apparent, but due to the number of ephemeral barriers and the distance to the downstream water body, fish passage is considered unlikely in almost all years and, when possible, would not likely contribute to the productive capacity of the fishery.
No	Visible connection to downstream water body is not apparent, typically in the absence of a stream channel. Such streams typically diffuse into broad boreal wetlands.



#### **4.1.1.3.2. Watercourse Classification**

Based on aerial reconnaissance data, watercourses were classified as one of the following:

##### **Class 1: Medium to Large Streams and Rivers**

Class 1 streams are typically named watercourses that maintain perennial flow and contain important fish habitat.

##### **Class 2: Small Streams**

Class 2 streams are small watercourses where a distinct stream channel is visible upstream and downstream of the crossing. These include many unnamed creeks as well as smaller named streams with fish habitat ranging from Marginal to Important.

##### **Class 3: Drains**

Class 3 streams are drains that may or may not be identified as a watercourse in the CanVec hydrographic dataset. These systems do not have channel connectivity to larger fish bearing waters upstream or downstream. In some cases a small downstream channel may be present, but dissipates into a wetland before connecting to a larger watercourse. Where upstream habitat and habitat at the crossing is peatland, the site is classified as Class 3 even though a channel may be present further downstream. This reflects the lack of habitat at the site. Fish habitat is generally marginal or not present.

#### **4.1.1.4 Channel Sinuosity**

Channel sinuosity was calculated for Class 1 and larger Class 2 streams as follows:

$\text{Sinuosity} = \text{channel length} / \text{channel valley length}$

Channel and valley length were measured from digital orthophotos using ArcGIS® Explorer (ESRI, Redlands California). Channel length was measured along the centreline over a minimum valley length of 500 m.

#### **4.1.1.5 Physical Assessments**

Physical assessments were conducted at Class 1 and Class 2 streams. At each crossing location, two study areas were established; 400 m upstream and downstream of the proposed crossing location. The 800 m study reach was established in consideration of potential uncertainties in the location of the road alignment. In each study area a physical assessment of fish habitat was conducted.

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#### **4.1.1.5.1. General**

Transects were established within the upstream and downstream study areas. The number and location of transects were determined based on the watercourse classification and site-specific conditions, respectively.

##### **Class 1 Streams**

Three transects were established within the proposed cleared RoW (60 m on centreline) to record riparian and bank conditions. Transects were typically located at the crossing centreline and 25 m upstream and downstream of the centreline. Side scan sonar was used to capture channel profile and stream bed characteristics (Section 4.1.1.5.12) therefore transects to record this information were not required as per Class 2 stream assessments.

##### **Class 2 Streams**

A minimum of five transects were established: three within the RoW; one at the centreline of the crossing; and a minimum of one each within the upstream and downstream study areas.

#### **4.1.1.5.2. Water Quality**

Due to the potential for blasting near watercourses during the construction of the ASR, water quality was sampled at sites assessed as supporting a CRA fishery.

##### **Laboratory Samples**

To minimize disturbance of streambed materials and contamination of the samples, surface water samples were collected from the center of the channel at each site by attaching a clean 500 mL plastic collection jar to an extendable fiberglass pole. The collection jar was triple rinsed with site water prior to sample collection then the laboratory bottle was filled from the collection jar. Where necessary, samples were preserved according to instructions provided by the analytical laboratory. After collection, samples were kept cool and in the dark until submission (within 48 hours) to ALS Laboratories in Winnipeg, MB (a Canadian Association for Laboratory Accreditations, Inc. [CALA] accredited laboratory). The samples were analysed for the following parameters:

- Ammonia;
- Nitrate, nitrite, and nitrate/nitrite;
- Total Kjeldahl nitrogen (TKN);
- Dissolved phosphorus (DP);

- Total phosphorus (TP);
- Total organic carbon (TOC).
- Total suspended solids (TSS);
- Turbidity; and,
- Chlorophyll *a* and phaeophytin *a*.

### ***In situ Parameters***

Several water quality parameters were measured *in situ* at each site including: temperature; dissolved oxygen (DO); pH; turbidity; specific conductance; and conductivity. Turbidity was measured using an Analite NEP-160 (McVan Instruments Pty Ltd. Scoresby, Australia); other parameters were assessed using a YSI 556 MPS multi-meter (YSI Inc., Yellow Springs, Ohio). Sample collection sites were classified by habitat type (e.g., riffle, pool, run).

#### ***4.1.1.5.3. Discharge***

In Class 2 streams, discharge was measured at or near the proposed crossing at a relatively straight section of channel, free of vegetation, rocks and obstructions that may interfere with velocity measurements. Discharge was not measured in Class 1 streams as depths exceeded the range of equipment.

To measure discharge, the total wetted width was divided into parcels – typically ten parcels for small streams and a minimum of twenty for larger systems. Depending on channel width, fewer than ten parcels may have been used. The parcel width was divided by two to obtain the distance of the first measurement location from the bank (i.e., distance to the center of the first parcel). Subsequent measurement locations were determined by adding the original parcel width to the previous distance. Where the measured water depth was less than one meter, velocity was measured at 3/5 of the total depth using a Swoffer velocity meter. Where the water depth was greater than one meter, velocity was measured at 1/5 and 4/5 of the total depth.

Stream discharge was calculated as:

$$Q = \sum wdv$$

where, Q = discharge

w = parcel width

d = parcel depth

v = velocity

#### **4.1.1.5.4. General Morphology**

The general stream morphology, including pattern, stage, confinement, flow regime and profile of the surveyed reach of the watercourse was visually assessed and described as follows:

- *Pattern* – the channel pattern was classified as straight, sinuous, irregular wandering, irregular meandering, regular meanders and tortuous meanders or braided.
- *Stage* – describes the water level in relation to bankfull and was classified as: Low (0 – 30% bankfull); moderate (30 – 90%); or high (>90%).
- *Confinement* – describes the ability of the channel to migrate laterally on a valley flat between surrounding slopes. Channel confinement was classified as: entrenched; confined; frequently confined; occasionally confined; or unconfined.
- *Flow Regime* – describes the permanence of flow. Flow regime was classified as:
  - Perennial - Contains water at all times throughout the year, except during extreme drought;
  - Ephemeral - Stream bed is above the water table; stream flow is a direct response to a precipitation event (snowmelt or rainfall); or
  - Intermittent - Carries water a considerable portion of the time, but ceases to flow occasionally or seasonally because bed seepage and evapotranspiration exceed available water supply.
- *Channel Profile* – describes the cross sectional shape of the channel and was classified as: notched; U-shaped; V-shaped; or planar.

#### **4.1.1.5.5. Channel Profiles**

At Class 1 streams, the wetted width (water's edge) and the channel width (bank to bank) were estimated at each transect using a laser range finder ( $\pm 1$  m). The channel profile was determined using side scan sonar (Section 4.1.1.5.12).

At Class 2 streams, the wetted width (water's edge) and the channel width (bank to bank) were measured at each transect. Water depth at 25%, 50%, and 75% of the wetted width, starting at the left bank, and maximum depth were recorded. The left and right bank designations were determined while facing upstream.

#### **4.1.1.5.6. Riparian Area/Floodplain**

At each transect the floodplain and riparian vegetation (vegetation directly influenced by the watercourse) width was measured perpendicular from each bank. The dominant vegetation type

within the riparian zone and floodplain (if applicable) was classified as: none; grasses/sedge; shrubs; conifers; deciduous trees; or mixed forest. The riparian canopy cover over the stream was also estimated (%).

#### **4.1.1.5.7. Substrate**

At Class 1 streams, substrate composition was determined using side scan sonar (Section 4.1.1.5.12).

At Class 2 streams, substrate composition (%) was visually estimated at each transect. Substrate composition was based on the following size classifications:

<u>Class</u>	<u>Size</u>
fines	<2 mm
small gravel	2 – 16 mm
large gravel	17 – 64 mm
cobble	65 – 256 mm
boulder	>256 mm

#### **4.1.1.5.8. Banks**

At each transect, the following parameters regarding channel banks were collected:

- *Bank Materials* – Each bank was classified according to the dominant bank material. Materials were classified as: organic/mineral soils; mineral; mineral/rock; rock/boulder; and bedrock.
- *Bank Shape* – The shape of each bank was classified as follows:
  - Vertical steep sloping/vertical (45 – 90°);
  - Undercut protruding over the channel;
  - Overhanging; or
  - Sloping gradual or shallow slope (<45°).
- *Bank Stability* – Bank stability was visually assessed as follows:
  - Highly stable banks well vegetated or covered in large boulders;
  - Moderate stability >50% vegetated or rocked and some undercut banks;
  - Low stability <50% of the bank is vegetated or rocked; or
  - Unstable massive slumping, large silt deposition, exposed soil.



#### **4.1.1.5.9. Stream Gradient**

Stream gradient (%) was measured using a clinometer aimed at eye level at another crew member or at a survey rod.

#### **4.1.1.5.10. Habitat Inventory**

The percent composition of habitat types in each study area was visually assessed. Habitat types were classified as follows:

Falls	vertical drop
Cascade	high gradient and velocity, extremely turbulent, armoured substrate
Chute	area of channel constriction, typically bedrock
Rapids	high velocity, deeper than a riffle, coarse substrate
Riffle	high velocity/gradient (vs. run), surface broken, shallow (<0.5m)
Run (glide)	moderate to high velocity, surface mostly unbroken, deeper than a riffle
Flat	low velocity, near-uniform flow, differential from a pool by high channel uniformity
Pool	portion of the channel with increased depth and reduced velocity, formed by channel scour
Impoundment	pools formed behind dam (dam from debris, beaver or landslide)
Dam	creates the impoundment (debris, beaver or landslide)
Backwater	localized area of reversed flow direction
Boulder Garden	significant occurrence of large boulders, providing significant instream cover, in association with other habitat unit such as riffle or run.

#### **4.1.1.5.11. Cover**

The total available cover for fish (%) was estimated for each study reach. Within the available cover, the composition of cover types (%) was determined. Cover types included the following:

- Large woody debris (or coarse woody debris)
- Overhanging vegetation (< 1 m from the water surface)
- Instream vegetation

- Deep pool
- Boulder
- Undercut banks
- Surface turbulence
- Turbidity

#### ***4.1.1.5.12. Bathymetry and Substrate Mapping***

At Class 1 streams, boat-based habitat mapping was conducted using a Lowrance® HDS-5 with StructureScan® HD sonar imaging (Navico Inc.) and internal integrated global positioning system (GPS) receiver. Side imaging sonar captures detailed information on bottom topography and fish-attracting structure orientation. This device also was used to record water depths for bathymetric mapping.

#### **Data Collection**

The two transducers (skimmer and side scan) were mounted onto the transom of the boat and connected to the HDS-5 head. Care was taken to mount the transducer in an area that was relatively free of turbulent water and as far as possible from the propeller to minimize interference from water turbulence. Mounting depth was noted and later used as a correction factor for the depths recorded.

The boat was driven across the width of the river at 15-20 m intervals, down the centerline, and along each shoreline 400 m upstream and downstream of the crossing. Boat speed was maintained under 12 km/hr to minimize interference due to water turbulence.

Depth and geographic coordinate data (UTM) were collected along transects covering the study areas and logged to a flash memory card. Ponar grab samples were collected during each survey to verify substrate data collected by side scan sonar. For each ponar grab, substrate type and UTM location were recorded using a handheld GPS. Substrate type was based on the size classifications listed in Section 4.1.1.5.7. Ponar grab data are provided in Appendix 2.

#### **Data Analysis**

Shorelines of the Class 1 streams were digitized at a scale of 1:1500 from summer 2012 colour orthophotos (50 cm pixel), provided by MI-RRO, using ArcGIS® 10.2. Stream discharge and shoreline elevation were unknown at the time of orthophoto acquisition. The digitized shorelines were assumed to be representative of a normal flow condition for the studied streams.

The recorded data were exported from a Lowrance log file format (.sl2) to a Microsoft Excel format. Depths were corrected according to the transducer mounting depth. The corrected depth files were then imported into ArcGIS and projected to a UTM Zone 15 (NAD83) projection and saved to a GIS ready ESRI® shapefile format.

Prior to the creation of the bathymetric depth surfaces, shoreline zero depth points were created along the digitized shorelines at a 5 metre interval and merged with the corrected depth data set. The inclusion of these shoreline points allows the surface model to conform to the shoreline.

Bathymetric surfaces were interpolated from the corrected transducer depths using Surfer® 11 (Golden Software Inc.). A linear kriging variogram was used to create 5 m grid surfaces covering the extents of the survey. Final Surfer 11 format grid files were exported to an ESRI ascii format for import into ArcGIS® 10.2. Depth contouring and cartographic outputs were completed using ArcGIS® 10.2.

Substrate mapping techniques followed Kaeser and Litts (2010). Side scan images of the river bottom collected during field surveys were analysed using Dr. Depth®, where the positional and bearing information from the GPS data were used to georeference the side scan images of the riverbed and display them in a seamless mosaic. The side scan image mosaic was exported to an ESRI grid format and imported into ArcGIS® 10.2. Major substrate change boundaries were delineated and digitized from the imagery and validation data (ponar grabs) obtained during field studies were used to verify the visually delineated substrate classes. Final symbolization of substrate classes and cartographic output were generated in ArcGIS® 10.2.

#### **4.1.1.6 Biological Assessments**

Fish and mollusk sampling was conducted at each site to determine species presence and potential habitat use. Results from the fish sampling were intended to supplement existing fisheries information and fish presence inferred from the type of habitat present. It was recognized in the fish habitat assessment that the fish sampling only represented a single sampling event.

##### **Fish**

Fish sampling was conducted within the study reach to confirm fish presence and in Class 1 streams, to determine species use. Gear type was selected based on site-specific conditions and included backpack electrofishing and gillnetting. Backpack electrofishing surveys were conducted at small and medium-sized watercourses that could be waded. During each survey, the start and end of each pass were recorded with a handheld GPS. Sample duration, electrofisher settings, and number of passes also were recorded.

At larger waterbodies (typically Class 1), one standard index gillnet gang and one small-mesh gillnet gang were set for approximately 24 hours. The standard index gillnet gang was 137.2 m long and consisted of five 22.9 m long by 1.8 m deep panels of 1.5, 2.0, 3.0, 3.75, 4.25 and 5.0 inch twisted nylon mesh. Small-mesh gangs were 30 m long and consisted of three 10 m x 1.8 m deep panels of 8, 10 and 12.5 mm monofilament mesh. Gillnet set locations were recorded with a handheld GPS. Set and pull time and water depth were also recorded.

Captured fish were identified and enumerated according to species. Large-bodied fish species were measured for fork length ( $\pm 1$ mm). All fish were released into the area from which they were captured. Results of the fish sampling program presented in this report have been limited to presence, abundance and size of the species captured.

## **Mollusks**

Mollusk sampling was conducted in Class 1 streams with sampling targeted within the crossing area (30 m length of stream). Additional sampling was conducted outside of the crossing area, based on the presence and location of suitable habitat. Sampling methodology was selected based on site-specific conditions (i.e., depth) and included mussel raking, visual inspection using a bathyscope in wadeable areas and shoreline surveys for empty valves. Captured mussels were identified and enumerated by species and replaced at the area of capture.

### **4.1.1.7 Fish Habitat Assessment**

The potential fish use within the surveyed reach was assessed at each crossing site. The assessment was based on the field data, drainage analysis results and existing watercourse information and included:

- Assessment of fish overwintering, spawning, rearing and feeding potential (rated low [marginal], moderate or high); and
- Identification of areas that may be sensitive to disturbance, particularly downstream of the crossing site.

### **4.1.2 Fisheries Act Risk Assessment**

Section 35(1) of the federal *Fisheries Act* (the Act) prohibits “serious harm” to fish and fish habitat that are part of or support a CRA fishery. “Serious harm” is defined as the death of a fish or permanent alteration to or destruction of fish habitat. The purpose of this fisheries protection provision is to “provide for the sustainability and ongoing productivity” of CRA fisheries (DFO 2013a).

Small, localized infills that are typically associated with stream crossings (e.g., culverts, multi span bridges) can directly impact fish populations and fisheries yields through habitat loss (DFO 2013b). The potential effects to fisheries productivity from such small-scale projects would be difficult to measure due to the relatively small area of impact (Randall et al. 2013). Thus, an assessment method that considers the relative amount of habitat change is the best approach to determine impacts to CRA fisheries productivity (DFO 2013b; Randall et al. 2013) and risk of serious harm.

DFO is currently developing a risk management framework to provide guidance in assessing the risk of serious harm to fish from a project or project activity. In the absence of a framework, a habitat-based approach was developed to assess the likelihood that ASR crossing construction would result in a serious harm to fish. This approach was developed based on review of the Fisheries Protection Policy Statement (DFO 2013a) and relevant Canadian Science Advisory Secretariat Science Advisory Reports (DFO 2013b; Randall et al. 2013) and considered the following:

- the type of impact;
- the amount and quality of the affected habitat for each life history stage of fish species that are present; and
- the impact of the project on relevant fish and fish habitat.

The risk assessment is based on the Impacts to Fish and Fish Habitat criteria outlined by DFO (DFO 2013a). The risk assessment considered the residual effect at each crossing assuming that the mitigation measures would be applied as necessary. Each component of the risk assessment is described in the sections below.

A risk assessment was not conducted at crossings sites that did not support fish habitat or where an existing waterbody type was identified by DFO as not requiring authorization under the *Act* (e.g., agricultural and roadside ditches). In addition, DFO has developed a list of projects and project activities near waterbodies that are considered low risk of serious harm. These listed activities, which include clear span bridge construction, do not require authorization under the *Act* provided that measures to avoid harm are implemented. Consequently, an assessment of impacts to fish and fish habitat was not conducted where the preliminary design is a clear span bridge.

#### **4.1.3 Impacts to Fish and Fish Habitat**

Impacts to Fish and Fish Habitat were assessed through a rating system using the following six criteria outlined in the *Fisheries Protection Policy Statement* (DFO 2013a) as follows:



## **1. Residual Impact**

Following the pathway of effects, potential impacts to fish and fish habitat were identified and after the application of avoidance and mitigation measures the residual impacts remaining were identified and listed for each site.

## **2. Duration of Impact**

Description: The amount of time that a residual effect will persist.

Scale: Short term (days; low); medium term (weeks-months; medium); long term (years-permanent; high).

## **3. Extent of Impact**

Description: The direct footprint of the development as well as indirectly affected areas, such as downstream areas.

Scale: Site or segment (localized; low); channel reach or lake region (medium); entire watershed or lake (high).

## **4. Availability and Condition**

Description: The relative availability of the type and quality of habitat that is being impacted in the watercourse and/watershed.

Scale: Low - The habitat is common and widespread in the region and is relatively intact.

Medium - The habitat has a limited distribution within the region or river system, or is prevalent but degraded.

High - The habitat is rare or similar habitats are present within the area, but are threatened or have been significantly degraded.

## **5. Impact on Relevant Fish**

Description: The resulting effect to fish from the project in consideration of the first four criteria and results of fish and fish habitat studies.

Low - The habitat is used for a range of life requisites by the relevant fish and is not critical or limiting. Habitat impacts are unlikely to result in a measureable effect to local fish populations.

Medium - The habitat is important and is used for a specific life function by the relevant fish, but it is not critical or limiting habitat. Similar habitat is available within the area, but may have a limited distribution. Habitat impacts may result in a small effect on local fish populations.

High - The habitat is critical to the survival of the affected species or the affected species is sensitive or rare. Habitat impacts will likely result in decreased fish production.

## **6. Avoidance and Mitigation Measures**

The risk assessment assumes that all standard measures to avoid and mitigate harm will be implemented and the assessment is based upon the residual impacts that remain.

### **4.1.4 Categorization of Risk**

Risk was assigned to each stream crossing site by reviewing the ratings of the criteria outline above and providing a qualification of the determined risk.

### **4.1.5 Net Habitat Change**

Habitat change includes loss due to destruction and/or alteration of instream and riparian habitat. Habitat change was calculated for all crossing locations that support fish habitat. In calculating habitat loss, the best available information on crossing design was used. Where information was deficient, conservative assumptions were made.

#### **4.1.5.1 Destruction**

Habitat destruction will occur where crossing design requires the construction of permanent instream structures and placement of the road bed in riparian areas. Instream habitat destruction was calculated based on the dimensions (footprint) of permanent crossing structures located below the high water mark. For culvert crossings, the road bed width was assumed to represent the width of the instream destruction. Therefore the area of destruction would equal the road bed width by the stream channel width at the crossing location.

For bridge crossings, the maximum length of a bridge span is 80 feet or 24.3 meters (pers. comm. MI-RRO). Based on this criterion, clear span bridges would be constructed over watercourses less than 24.3 m wide and multi-span bridges over those greater than 24.3 m wide, unless otherwise indicated by MI-RRO. The number of spans required for each bridge site was determined based on the channel width, maximum span length and guided by known bridge designs from MI-RRO's PR 304 to Berens River ASR Project. These include two single pier multi span bridges at Pigeon and Bradbury Rivers (AECOM 2013a,b) and a two pier multi span

bridge at Long Body Creek (AECOM 2011). Where multi-span bridges are required, it was assumed that only the bridge piers would result in instream destruction and that all remaining bridge components (e.g., abutments) would be located above the high water mark. The pier dimensions used to calculate instream habitat loss was estimated based on the bridge design for Pigeon River, MI-RRO's PR 304 to Berens River ASR Project (AECOM 2013a).

#### **4.1.5.2 Alteration**

Riparian habitat within the RoW but outside of the road bed may be altered and maintained as low growth vegetation for line of sight. Alteration of instream fish habitat may occur where rip rap placement is required to reinforce bridge piers and protect channel banks. Rock placement along stream channels is expected to diversify habitats, provide cover for fish and increase productivity, as long as it does not have a harmful effect to flow patterns. Areas of habitat alteration will be determined following final design.

### **4.2 RESULTS**

A detailed summary of the physical and biological data at streams crossed by the proposed ASR alignment, are provided in appendices 4 and 5. These data were used to determine the potential risk to fish habitat and assess the likelihood of serious harm resulting from construction of crossing structures. The results of these assessments are discussed in the following sections.

#### **4.2.1 Water Quality**

##### **4.2.1.1 *In situ* Parameters**

*In situ* parameters measured at 24 stream crossings along the project route indicated that conditions were relatively similar throughout the region in June 2016. In particular, specific conductance was relatively low at every site, and pH was consistently slightly acidic to circumneutral (Table 3). The exception was that DO concentrations varied notably between sites, with particularly low concentrations measured in the headwaters of bogs or beaver flooded areas. Thirteen of the 24 streams had DO concentrations below the protection of aquatic life (PAL) objectives (6.0 or 6.5 mg/L for cool- and cold-water species, respectively; MWS 2011). In contrast, all stream crossings had pH within the Manitoba water quality guidelines for the protection of aquatic life (6.5-9.0 pH units; MWS 2011).

##### **4.2.1.2 Laboratory Analyses**

The laboratory samples collected in the study area in June 2016 indicate that the sites have relatively low nutrient concentrations as well as high clarity and low productivity (Table 4). Additionally, the sites have circumneutral pH conditions with relatively high alkalinity and low

acid sensitivity. Ammonia, nitrate, and nitrite concentrations were well within the MWQSOGs (site-specific guideline, 2.93 mg N/L, and 0.060 mg N/L, respectively; MWS 2011). The guideline for total phosphorus (TP) in streams and rivers (0.05 mg/L) was not exceeded at any site. However, because nutrient concentrations vary dramatically between seasons (e.g., during freshet), concentrations could exceed the guidelines at other times of the year or under different flow conditions.

Table 3. *In situ* water quality measured at streams crossed by the Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation All Season Road. Results in bold indicate values that do not fall within the Manitoba water quality guidelines for the protection of aquatic life.

Site ID	Watercourse	Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH (pH units)
<b>MWQSOG</b>			-	<b>6.0 -6.5<sup>1</sup></b>	-	-	<b>6.5-9.0<sup>2</sup></b>
P6a-X002	Unnamed tributary of Hayes River	17-Jun-16	18.9	<b>3.0</b>	31.8	92	6.6
P6a-X005	Unnamed tributary of Hayes River	17-Jun-16	18.8	<b>2.2</b>	23.8	156	6.8
P6a-X008	Unnamed tributary of Michikanes Lake	16-Jun-16	21.7	<b>4.0</b>	45.6	137	6.6
P6a-X018	Unnamed tributary of Knee Lake	16-Jun-16	19.8	<b>4.1</b>	44.8	138	6.5
P6a-X019	Magill Creek	21-Jun-16	17.1	7.2	75.1	131	7.4
P6a-X020	Unnamed tributary of Magill Creek	15-Jun-16	12.4	<b>3.1</b>	28.6	98	6.7
P6a-X022	Unnamed tributary of Laird Lake	15-Jun-16	17.6	<b>1.7</b>	18.3	148	6.7
P6a-X023	Unnamed tributary of Laird Lake	14-Jun-16	16.5	<b>2.7</b>	27.9	101	6.6
P6a-X027	Unnamed tributary of Wanless Lake	14-Jun-16	18.5	<b>2.2</b>	23.1	118	6.7
P6a-X028	Unnamed tributary of Wanless Lake	14-Jun-16	19.6	9.7	-	95.8	7.1
P6a-X029	Unnamed tributary of Hignell Lake	15-Jun-16	15.7	6.3	-	102.3	7.3
P6a-X031	Unnamed tributary of Hignell Lake	15-Jun-16	17.4	<b>4.9</b>	-	65.1	6.8
P6a-X032	Unnamed tributary of Hignell Lake	16-Jun-16	20.6	8.6	-	75.3	6.6
P6a-X033	Unnamed tributary of an unnamed lake	17-Jun-16	19.4	<b>3.5</b>	-	153.5	6.7
P6a-X034	Unnamed tributary of an unnamed lake	18-Jun-16	18.5	<b>2.9</b>	-	124.5	6.7
P6a-X037	Unnamed tributary of an unnamed lake	17-Jun-16	16.0	<b>3.8</b>	-	105.2	6.5
P6a-X038	Unnamed tributary of an unnamed lake	16-Jun-16	18.3	7.4	-	142.8	6.6
P6b-X002	Unnamed tributary of Hawkins Lake	18-Jun-16	18.3	7.9	84.2	105	6.6
P6b-X003	Unnamed tributary of Hawkins Lake	18-Jun-16	20.1	8.8	-	139.7	6.7
P6b-X006	Unnamed tributary of Opaskaykow Lake	18-Jun-16	18.2	7.6	80.1	145	6.9
P6b-X007	Unnamed tributary of Opaskaykow Lake	19-Jun-16	17.6	7.3	-	154.9	6.9
P6b-X009	Unnamed tributary of Tapper Lake	18-Jun-16	23.5	7.9	-	101.6	6.5



Site ID	Watercourse	Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Oxygen Saturation (%)	Specific Conductance (µS/cm)	pH (pH units)
<i>MWQSOG</i>			-	6.0 -6.5 <sup>1</sup>	-	-	6.5-9.0 <sup>2</sup>
P6b-X013	Unnamed tributary of God's River	20-Jun-16	14.2	5.7	57.3	92	6.8
P6b-X015	God's River	19-Jun-16	15.4	8.0	89.3	97	7.7

1 - Cool and cold water objectives, respectively.

2 - The lower and upper limits of the guideline for protection of aquatic life.

Table 4. Laboratory water quality results for streams crossed by the all season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation. Results in bold indicate values that do not fall within the Manitoba water quality guidelines for the protection of aquatic life.

Site ID	Watercourse	Sample Date	Nitrogen						Phosphorus			
			Ammonia	Nitrate/ Nitrite	Nitrate-N	Nitrite-N	Total Kjeldahl Nitrogen	Total N <sup>1</sup>	Total Dissolved Phosphorus	Total Particulate Phosphorus	Total Phosphorus	Total Organic Carbon
(mg N/L)	(mg N/L)	(mg N/L)	(mg N/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)			
Detection Limit			0.010	0.0051	0.0050	0.0010	0.2	-	0.001	0.0028	0.001	0.5
MWQSOG			1.76-39.2 <sup>a</sup>		2.93	2.93	0.060		0.05 <sup>2</sup>			
P6a-X002	Unnamed	17-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.69	0.69	0.0049	<0.0028	0.0049	16.6
P6a-X004	Unnamed	17-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.72	0.72	0.0080	<0.0028	0.0081	15.0
P6a-X006	Unnamed	17-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.66	0.66	0.0032	<0.0028	0.0040	17.0
P6a-X008	Unnamed	16-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.59	0.59	0.0033	<0.0028	0.0050	14.3
P6a-X009	Unnamed	17-Jun-16	0.017	<0.0051	<0.0050	<0.0010	0.89	0.89	0.0068	0.020	0.026	16.5
P6a-X018	Unnamed	16-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.64	0.64	0.0082	<0.0028	0.0078	13.2
P6a-X019	Magill Creek	21-Jun-16	0.010	<0.0051	<0.0050	<0.0010	0.69	0.69	0.0049	<0.0028	0.0065	10.0
P6a-X020	Unnamed	15-Jun-16	0.019	0.0085	0.0085	<0.0010	0.68	0.69	0.0069	<0.0028	0.0085	19.7
P6a-X023	Unnamed	14-Jun-16	0.015	<0.0051	<0.0050	<0.0010	0.72	0.72	0.0096	0.012	0.022	9.38
P6a-X028	Unnamed	14-Jun-16	<0.010	0.0058	0.0058	<0.0010	0.60	0.61	0.0041	<0.0028	0.0051	16.6
P6a-X032	Unnamed	16-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.64	0.64	0.0043	<0.0028	0.0049	15.9
P6a-X033	Unnamed	17-Jun-16	0.010	0.0054	0.0054	<0.0010	0.70	0.71	0.0051	<0.0028	0.0055	17.9
P6a-X034	Unnamed	18-Jun-16	0.016	0.0209	0.0209	<0.0010	0.72	0.74	0.0083	0.0132	0.0215	12.6
P6a-X037	Unnamed	17-Jun-16	<0.010	0.0099	0.0099	<0.0010	0.65	0.66	0.0027	<0.0028	0.0052	15.4
P6a-X038	Unnamed	16-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.71	0.71	0.0049	0.0118	0.0167	15.5
P6b-X002	Unnamed	18-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.58	0.56	0.0028	0.0053	0.0081	13.0
P6b-X003	Unnamed	18-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.68	0.68	0.0021	0.0035	0.0055	10.5
P6b-X006	Unnamed	18-Jun-16	<0.010	0.0083	0.0083	<0.0010	0.64	0.65	0.0030	0.0048	0.0078	13.0
P6b-X007	Unnamed	19-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.56	0.56	0.0032	0.0060	0.0092	9.16

Site ID	Watercourse	Sample Date	Nitrogen						Phosphorus			
			Ammonia	Nitrate/ Nitrite	Nitrate-N	Nitrite-N	Total Kjeldahl Nitrogen	Total N <sup>1</sup>	Total Dissolved Phosphorus	Total Particulate Phosphorus	Total Phosphorus	Total Organic Carbon
(mg N/L)	(mg N/L)	(mg N/L)	(mg N/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)			
Detection Limit			0.010	0.0051	0.0050	0.0010	0.2	-	0.001	0.0028	0.001	0.5
MWQSOG			1.76-39.2 <sup>a</sup>	2.93	2.93	0.060					0.05 <sup>2</sup>	
P6b-X009	Unnamed	18-Jun-16	0.070	0.0056	0.0056	<0.0010	0.84	0.85	0.0132	0.0099	0.0230	12.5
P6b-X013	Unnamed	20-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.71	0.71	0.0046	0.0068	0.0114	16.3
P6b-X015	God's River	19-Jun-16	<0.010	<0.0051	<0.0050	<0.0010	0.50	0.50	0.0038	0.0090	0.0128	6.6

a – the guideline is site-specific, dependent on temperature and pH at the site.

Table 4. Continued.

Site ID	Watercourse	Sample Date	Water Clarity			Alkalinity				Algal Pigments	
			Total Suspended Solids	Turbidity	pH	Total Alkalinity	Bicarbonate	Carbonate	Hydroxide	Chlorophyll <i>a</i>	Phaeophytin <i>a</i>
			(mg/L)	(NTU)	(pH units)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)
Detection Limit			2.0	0.10	0.10	1.0	1.2	0.60	0.34	0.10	0.10
MWQSOG						6.5-9.0 <sup>3</sup>					
P6a-X002	Unnamed	17-Jun-16	4.4	1.57	7.32	50.4	61.5	<0.60	<0.34	1.19	0.62
P6a-X004	Unnamed	17-Jun-16	2.0	0.63	7.37	97.4	119.0	<0.60	<0.34	3.91	2.37
P6a-X006	Unnamed	17-Jun-16	3.0	0.36	7.23	53.6	65.4	<0.60	<0.34	2.31	2.36
P6a-X008	Unnamed	16-Jun-16	<2.0	0.30	7.48	73.7	89.9	<0.60	<0.34	0.59	0.56
P6a-X009	Unnamed	17-Jun-16	29.2	4.23	7.38	102.0	124.0	<0.60	<0.34	23.8	10.7
P6a-X018	Unnamed	16-Jun-16	<2.0	1.11	7.64	79.5	97.0	<0.60	<0.34	1.12	1.24
P6a-X019	Magill Creek	21-Jun-16	3.2	2.68	7.84	74.7	91.1	<0.60	<0.34	1.95	1.77
P6a-X020	Unnamed	15-Jun-16	<2.0	1.13	7.56	78.7	96.0	<0.60	<0.34	0.61	0.41
P6a-X023	Unnamed	14-Jun-16	4.4	2.45	7.65	64.9	79.2	<0.60	<0.34	4.11	1.60
P6a-X028	Unnamed	14-Jun-16	<2.0	0.24	7.05	54.0	65.9	<0.60	<0.34	0.41	0.37
P6a-X032	Unnamed	16-Jun-16	<2.0	0.48	7.04	38.9	47.5	<0.60	<0.34	2.54	1.92
P6a-X033	Unnamed	17-Jun-16	<2.0	0.45	7.33	58.9	71.9	<0.60	<0.34	2.56	1.97
P6a-X034	Unnamed	18-Jun-16	<2.0	0.52	7.31	62.8	76.6	<0.60	<0.34	0.73	0.71
P6a-X037	Unnamed	17-Jun-16	<2.0	0.47	7.33	64.1	78.2	<0.60	<0.34	0.48	0.28
P6a-X038	Unnamed	16-Jun-16	<2.0	0.72	7.32	80.6	98.3	<0.60	<0.34	3.46	2.76
P6b-X002	Unnamed	18-Jun-16	<2.0	0.31	7.56	61.3	74.8	<0.60	<0.34	0.50	0.55
P6b-X003	Unnamed	18-Jun-16	<2.0	0.49	7.54	71.4	87.1	<0.60	<0.34	0.69	0.77
P6a-X006	Unnamed	18-Jun-16	5.8	0.50	7.64	93.1	114.0	<0.60	<0.34	0.84	0.53
P6b-X007	Unnamed	19-Jun-16	<2.0	0.63	7.66	89.2	109.0	<0.60	<0.34	0.82	0.8
P6b-X009	Unnamed	18-Jun-16	<2.0	1.21	6.90	52.2	63.7	<0.60	<0.34	1.35	1.43

Site ID	Watercourse	Sample Date	Water Clarity			Alkalinity				Algal Pigments	
			Total Suspended Solids	Turbidity	pH	Total Alkalinity	Bicarbonate	Carbonate	Hydroxide	Chlorophyll <i>a</i>	Phaeophytin <i>a</i>
(mg/L)	(NTU)	(pH units)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)			
Detection Limit			2.0	0.10	0.10	1.0	1.2	0.60	0.34	0.10	0.10
MWQSOG						6.5-9.0 <sup>3</sup>					
P6b-X013	Unnamed	20-Jun-16	<2.0	0.34	7.28	58.9	71.9	<0.60	<0.34	0.91	0.80
P6b-X015	God's River	19-Jun-16	<2.0	0.75	7.81	61.5	75.0	<0.60	<0.34	3.19	1.28

1 – Calculated as the sum of total Kjeldahl N and nitrate/nitrite-N.

2 – Narrative guideline for streams.

3 – Lower and upper limits of the guideline for protection of aquatic life.

## **4.2.2 Species Presence**

Fish and mollusk species and aquatic species-at-risk presence in watercourses crossed by the ASR was assessed based on field sampling and literature review.

### **4.2.2.1 Fish**

Twenty-four fish species have been previously reported within streams and rivers crossed by the proposed alignment. These species records are limited to the God's River (Site P6b-X015) and include a variety of large-bodied fish, such as Brook Trout, Lake Sturgeon, Lake Whitefish, Northern Pike, suckers, and Walleye (FIHCS 2016, HTFC Planning & Design 2016, Eaton 2012, and Stewart and Watkinson 2004). During 2016 field surveys, Brook Trout (both adult and young-of-year), Longnose Sucker, Northern Pike, White Sucker, and sculpin spp. were captured near the crossing site (Appendix 2).

Information on species presence was not found in the literature for the remaining study streams. Field sampling identified three species in Magill Creek: Northern Pike, Shorthead Redhorse and Yellow Perch. At 19 streams, all unnamed tributaries consisting of small low gradient boreal streams, one or two species were identified, with Brook Stickleback found at 16 of the sites, Northern Pearl Dace at four sites, Northern Pike at three sites, Fathead Minnow at two sites and Burbot and Johnny Darter each at one site only (Appendix 2). Fish presence was not confirmed through field sampling at the remaining 33 streams crossed by the ASR.

### **4.2.2.2 Mussels**

The small tributary streams crossed by the ASR alignment are unsuitable for mussels. Mussels are typically found in medium to large river systems in areas predominately composed of silt/clay and sand and to a lesser extent gravel.

Fat Mucket (*Lampsilis siliquoidea*) and Giant Floater (*Pyganodon grandis*) mussels were captured using a mussel rake or through visual surveys in Magill Creek near the crossing site and Giant Floater was captured in the God's River near the crossing site.

### **4.2.2.3 Species-at-Risk**

The Manitoba *Endangered Species and Ecosystems Act* (MBESEA) was enacted to protect and enhance the survival of threatened and endangered species in Manitoba, to enable reintroduction of extirpated species into the province, and to designate species as threatened, endangered, extirpated, or extinct. At the federal level, the *Species at Risk Act* (SARA) is intended to protect wildlife species at risk in Canada. Within the *Act*, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was established as an independent body of experts responsible



for identifying and assessing wildlife species considered at risk. Wildlife species that have been designated by COSEWIC may then qualify for legal protection and recovery under SARA.

One at risk species, Lake Sturgeon has a distribution that overlaps the project area. The Southern Hudson Bay-James Bay population is designated as Special Concern by COSEWIC (COSEWIC 2006) and is currently under consideration for protection under SARA. Although they are not legally protected, the potential presence of sturgeon within the Project area was assessed in consideration of potential future listing under SARA.

### **Lake Sturgeon**

Lake Sturgeon inhabit larger lakes and rivers, are typically benthic and commonly found over sand and fine substrates. They spawn in fast moving water, such as rapids or at the base of falls. In the boreal shield, with deep lakes and impassable falls and rapids, populations are naturally fragmented into the small spatial populations. Critical habitat for the species has not been identified by COSEWIC.

There is generally a poor understanding of Lake Sturgeon populations as far upstream in the Hayes drainage as the Project 6, but overall Hayes River sturgeon populations are believed to be healthy (MCWS 2012, Manitoba Hydro 2014). Harvest is currently restricted to subsistence harvest by First Nations and is considered to be at a relatively low sustainable level (MCWS 2012).

Lake Sturgeon has been reported in the upper Hayes River drainage including the upper God's River. Biological studies have documented Lake Sturgeon populations in the God's River up to its confluence with the Red Sucker River, approximately 150 km downstream of the P6b project area (Koga 2014). Traditional Knowledge from Shamattawa First Nation extends the distribution further upstream to a set of rapids 4 km downstream of the P6b God's River crossing (Eaton 2012). In addition, God's Lake First Nation TK indicates the species is found within God's Lake (HTFC Planning & Design 2016). Surveys within the Hayes River have found Lake Sturgeon upstream of the confluence with the Fox River, but not as far upstream as Knee Lake (Pisiak and McLean 2007). Traditional Knowledge from Bunibonibee Cree Nation report sporadic records from Oxford Lake (HTFC Planning & Design 2016).

The God's River crossing site provides moderate velocity run habitat with sand and rocky substrates. The immediate crossing area provides foraging habitat for adults. Potential spawning habitat is found at a set of large rapids 4 km downstream of the crossing.

### **4.2.3 Fish and Fish Habitat Assessment**

Fish and fish habitat assessments were conducted at 53 stream crossings, 38 on P6a and 15 on P6b. A summary of the assessments is found in Table 5 and detailed assessments are available in appendices 4 and 5.

#### **4.2.3.1 No Fish Habitat**

Habitat at 28 of the 53 ASR stream crossing sites was assessed as not supporting fish and included 20 of 38 sites on P6a and eight of 15 on P6b (Table 5). These unnamed streams are headwater wetland areas with no stream channel or channel connection to fish bearing waters. Habitat at the sites was characterized as a wetland with either no visible water or stagnant pools unsuitable to support any fish. Descriptions of sites assessed as no fish habitat are available in Appendix 4.

#### **4.2.3.2 Fish Habitat**

Habitat at 25 ASR stream crossing sites was assessed as supporting fish and this ranged from marginal habitat supporting forage fish only to sites with habitat supporting a greater diversity of fish species (Table 5).

Of these 25 sites, 18 were assessed as marginal fish habitat (13 on P6a and 5 on P6b). These marginal sites are located on small first or second order streams that are often poorly connected to downstream fish-bearing waters due to numerous ephemeral barriers. These streams have small watersheds and limited flows which are often impounded by beaver dams. A defined stream channel is typically present with soft substrates, abundant instream vegetation and marshy floodplains. Site P6a-X002 was an exception, where coarse substrate (gravel/cobble) was abundant at the crossing; the coarse material presumably originating from the two existing winter road crossings. The flow conditions of these streams may result in degraded water quality due to low dissolved oxygen and therefore habitat at the majority of these sites is considered unsuitable for large-bodied fish due to poor overwintering conditions and restricted access. Forage fish adapted to small boreal streams were frequently captured at these sites and include Brook Stickleback, Fathead Minnow and Northern Pearl Dace. Where access is less restrictive, large-bodied species such as Northern Pike are expected to make use of the crossings area for spawning, rearing and foraging. This would include sites P6a-X031, P6b-X002, P6b-X003, and P6b-X009. The coarse substrate at P6a-X002 may be used by suckers and Walleye, but the small watershed and low water levels reduce the potential of the habitat.

Seven stream crossing sites were assessed as important habitat, four on P6a and three on P6b. These streams have larger upstream watersheds and connectivity to downstream and possibly

upstream fish bearing waters. Habitat at these sites was suitable for a range of life requisites for a diversity of fish species, including both forage fish and large-bodied species.

Habitat was similar at sites P6a-X008 (Unnamed Tributary of Michikanes Lake), P6a-X018 (Unnamed Tributary of Knee Lake) P6a-X023 (Unnamed Tributary of Laird Lake), and P6b-X013 (Unnamed Tributary of God's River) comprised of flat water, fine sediments and organic substrate and instream vegetation suitable for spawning, rearing and feeding of forage fish species and Northern Pike. Though small bodied fish tolerant of low oxygen conditions may overwinter within the reach, large-bodied species (e.g., Northern Pike) likely overwinter in downstream lakes.

Magill Creek is a long stream connecting a string of smaller lakes to the receiving waterbody, Knee Lake. The P6a-X019 crossing is located 7.4 km upstream of Knee Lake. Habitat within the reach consists largely of fine sediments with boulders and instream vegetation. Habitat is suitable for spawning, rearing, and feeding for Northern Pike and forage fish. There is some gravel/cobble habitat, suitable as spawning and rearing habitat for sucker and Walleye. Overwintering of large bodied species likely occurs in deeper holes in creek or in Knee Lake.

Habitat at crossing P6b-X007, an Unnamed Tributary of Opaskaykow Lake consists of run habitat with substrates dominated by fines but including some coarse material, and abundant instream vegetation. This habitat supports a range of life requisites for Northern Pike and forage fish, including spawning, rearing and feeding and may be used by other large-bodied species such as Burbot, Walleye and suckers. Though fish species may overwinter within the reach, the lakes are better suited for overwintering of large-bodied species

The God's River is a medium sized river flowing out of God's Lake. The crossing (P6b-X015) is located 6.5 km downstream from God's Lake. The crossing is located at the existing winter road bridge where the river narrows resulting in increased water velocities. Habitat was run and pool with areas of riffle upstream. The substrate was largely coarse material with larger cobble and boulder in the centre of the river and sand along the shore as well as downstream. The diversity of habitats, pool, run and riffle provide suitable habitat for a range of species, including Northern Pike, suckers, Walleye and Brook Trout. Both adult and young-the-year Brook Trout were captured at the site indicating the presence of foraging and rearing habitat in the area as well as the likelihood of spawning habitat in the area.

Table 5. Summary of aquatic environment characteristics of watercourse crossings on the proposed Project 6 ASR alignment.

Site	Stream Name	UTM 15		Stream Type	Flow Regime	Receiving Waterbody	Distance (km)	Upstream Drainage Area (km <sup>2</sup> )	Fish Habitat	Fish Species <sup>a</sup>
		Eastings	Northing							
P6a-X001	Unnamed Tributary of Hayes River	354680	6086782	Stream	Ephemeral	Hayes River	2.91	0.11	No	N/A
P6a-X002	Unnamed Tributary of Hayes River	355166	6086046	Stream	Perennial	Hayes River	0.25	0.14	Yes	FF, LB
P6a-X003	Unnamed Tributary of Hayes River	356066	6084096	Stream	Ephemeral	Hayes River	0.44	2.62	No	N/A
P6a-X004	Unnamed Tributary of Hayes River	357220	6081611	Wetland	Ephemeral	Hayes River	1.71	N/A	No	N/A
P6a-X005	Unnamed Tributary of Hayes River	357317	6081440	Stream	Perennial	Hayes River	1.49	3.31	Yes	FF
P6a-X006	Unnamed Tributary of Michikanes Lake	359259	6078497	Stream	Ephemeral	Michikanes Lake	5.26	1.36	No	N/A
P6a-X007	Unnamed Tributary of Michikanes Lake	359925	6076546	Wetland	Ephemeral	Michikanes Lake	2.17	0.00	Yes	FF
P6a-X008	Unnamed Tributary of Michikanes Lake	359963	6076436	Stream	Perennial	Michikanes Lake	2.01	39.24	Yes	FF, LB
P6a-X009	Unnamed Tributary of Michikanes Lake	360165	6075841	Wetland	Ephemeral	Michikanes Lake	1.61	0.95	No	N/A
P6a-X010	Unnamed Tributary of Michikanes Lake	360202	6075729	Wetland	Ephemeral	Michikanes Lake	1.74	0.89	No	N/A
P6a-X011	Unnamed Tributary of Michikanes Lake	360225	6075583	Wetland	Ephemeral	Michikanes Lake	1.91	0.83	No	N/A
P6a-X012	Unnamed Tributary of Michikanes Lake	360226	6075505	Wetland	Ephemeral	Michikanes Lake	2.03	0.77	No	N/A
P6a-X013	Unnamed Tributary of Michikanes Lake	360222	6075456	Wetland	Ephemeral	Michikanes Lake	2.09	0.74	No	N/A
P6a-X014	Unnamed Tributary of Michikanes Lake	359702	6073936	Wetland	Perennial	Michikanes Lake	3.20	1.24	No	N/A

Site	Stream Name	UTM 15		Stream Type	Flow Regime	Receiving Waterbody	Distance (km)	Upstream Drainage	Fish Habitat	Fish Species <sup>a</sup>
P6a-X015	Unnamed Tributary of Michikanes Lake	360702	6073154	Wetland	Ephemeral	Michikanes Lake	4.91	4.63	No	N/A
P6a-X016	Unnamed Tributary of Michikanes Lake	361536	6073552	Wetland	Ephemeral	Michikanes Lake	4.42	12.09	No	N/A
P6a-X017	Unnamed Tributary of Michikanes Lake	362851	6073221	Stream	Ephemeral	Michikanes Lake	6.39	4.30	No	N/A
P6a-X018	Unnamed Tributary of Knee Lake	365150	6071363	Stream	Perennial	Knee Lake	4.63	68.58	Yes	FF, LB
P6a-X019	Magill Creek	366392	6069210	Stream	Perennial	Knee Lake	7.40	186.54	Yes	FF, LB
P6a-X020	Unnamed Tributary of Magill Creek	367584	6068240	Stream	Intermittent	Knee Lake	7.81	0.36	Yes	FF
P6a-X021	Unnamed Tributary of Magill Creek	368803	6066857	Stream	Ephemeral	Knee Lake	9.20	0.99	No	N/A
P6a-X022	Unnamed Tributary of Laird Lake	372798	6063748	Wetland	Ephemeral	Laird Lake	14.00	1.06	Yes	FF
P6a-X023	Unnamed Tributary of Laird Lake	372935	6063705	Stream	Perennial	Laird Lake	13.95	42.00	Yes	FF, LB
P6a-X024	Unnamed Tributary of Laird Lake	376856	6062609	Stream	Ephemeral	Laird Lake	18.92	1.03	No	N/A
P6a-X025	Unnamed Tributary of Hawkins Lake	378492	6060867	Wetland	N/A	Hawkins Lake	8.89	1.01	No	N/A
P6a-X026	Unnamed Tributary of Wanless Lake	378756	6060265	Wetland	N/A	Wanless Lake	1.97	0.03	No	N/A
P6a-X027	Unnamed Tributary of Wanless Lake	379995	6058916	Stream	Perennial	Wanless Lake	3.34	2.26	Yes	FF
P6a-X028	Unnamed Tributary of Wanless Lake	381509	6058214	Fen	Perennial	Wanless Lake	5.51	0.41	Yes	FF
P6a-X029	Unnamed Tributary of Hignell Lake	382770	6057629	Stream	Perennial	Hignell Lake	2.33	4.40	Yes	FF

Site	Stream Name	UTM 15		Stream Type	Flow Regime	Receiving Waterbody	Distance (km)	Upstream Drainage	Fish Habitat	Fish Species <sup>a</sup>
P6a-X030	Unnamed Tributary of Hignell Lake	383321	6057373	Creek	Ephemeral	Hignell Lake	2.06	0.09	No	N/A
P6a-X031	Unnamed Tributary of Hignell Lake	384797	6056689	Stream	Perennial	Hignell Lake	0.30	0.48	Yes	FF, LB
P6a-X032	Unnamed Tributary of Hignell Lake	387333	6055019	Stream	Perennial	Hignell Lake	3.80	2.84	Yes	FF, LB
P6a-X033	Unnamed Tributary of an Unnamed Lake	389260	6054142	Stream	Perennial	God's Lake	16.66	1.47	Yes	FF, LB
P6a-X034	Unnamed Tributary of an Unnamed Lake	390626	6054355	Fen Stream	Perennial	God's Lake	15.19	7.51	Yes	FF, LB
P6a-X035	Unnamed Tributary of an Unnamed Lake	392437	6053228	Stream	Ephemeral	God's Lake	13.12	1.58	No	N/A
P6a-X036	Unnamed Tributary of an Unnamed Lake	397092	6049844	Stream	Ephemeral	God's Lake	5.91	1.64	No	N/A
P6a-X037	Unnamed Tributary of an Unnamed Lake	398766	6048950	Stream	Perennial	God's Lake	4.06	0.54	Yes	FF
P6a-X038	Unnamed Tributary of an Unnamed Lake	399735	6048087	Stream	Perennial	God's Lake	2.90	0.28	Yes	FF, LB
P6b-X001	Unnamed Tributary of Hawkins Lake	383989	6065801	Stream	Ephemeral	Hawkins Lake	0.42	0.39	No	N/A
P6b-X002	Unnamed Tributary of Hawkins Lake	383950	6066261	Stream	Perennial	Hawkins Lake	0.59	6.55	Yes	FF, LB
P6b-X003	Unnamed Tributary of Hawkins Lake	384030	6067799	Wetland	Perennial	Hawkins Lake	3.99	16.37	Yes	FF, LB
P6b-X004	Unnamed Tributary of Hawkins Lake	384190	6068376	Stream	Ephemeral	Hawkins Lake	5.53	0.30	No	N/A
P6b-X005	Unnamed Tributary of Opaskaykow Lake	386967	6070020	Wetland	Perennial	Opaskaykow Lake	5.47	1.17	No	N/A
P6b-X006	Unnamed Tributary of Opaskaykow Lake	389409	6069930	Stream	Perennial	Opaskaykow Lake	2.14	3.68	Yes	FF



Site	Stream Name	UTM 15		Stream Type	Flow Regime	Receiving Waterbody	Distance (km)	Upstream Drainage	Fish Habitat	Fish Species <sup>a</sup>
P6b-X007	Unnamed Tributary of Opaskaykow Lake	390380	6069047	Stream	Perennial	Opaskaykow Lake	2.43	134.31	Yes	FF, LB
P6b-X008	Unnamed Tributary of Bayley Lake	404927	6078620	Wetland	Ephemeral	Bayley Lake	3.37	0.41	No	N/A
P6b-X009	Unnamed Tributary of Tapper Lake	409513	6080144	Stream	Perennial	Tapper Lake	1.32	16.92	Yes	FF, LB
P6b-X010	Unnamed Tributary of Tapper Lake	411494	6080295	Wetland	Ephemeral	Tapper Lake	4.06	9.00	No	N/A
P6b-X011	Unnamed Tributary of Tapper Lake	413389	6081483	Wetland	Ephemeral	Tapper Lake	6.74	1.04	No	N/A
P6b-X012	Unnamed Tributary of God's Lake	424907	6082134	Wetland	Ephemeral	God's Lake	3.86	1.91	No	N/A
P6b-X013	Unnamed Tributary of God's River	428031	6081141	Stream	Perennial	God's River	0.76	9.87	Yes	FF, LB
P6b-X014	Unnamed Tributary of God's River	429148	6080372	Stream	Ephemeral	God's River	0.59	0.31	No	N/A
P6b-X015	God's River	429706	6080809	River	Perennial	Hayes River	287	12,861	Yes	FF, LB

a – FF = Forage Fish (e.g., minnows, etc.), LB = Large Bodied (e.g., Northern Pike, Walleye, sucker spp., etc.).

#### **4.2.4 Fisheries Act Risk Assessment**

The results of the risk assessment are discussed in the following sections and presented in Table 6. The assessment is based on the existing habitat as described in section 4.2.2 and the Availability and Condition and Impact on Relevant Fish Ratings for each site assessed as having fish habitat at the crossing.

#### **4.2.5 No Fish Habitat**

Twenty eight of the 53 proposed culvert sites were assessed as No Fish Habitat based on the absence of a channel at the crossing and/or connectivity to downstream fish bearing waterbodies. A summary of these watercourses are provided in Appendix 4. These sites are not discussed further in the risk assessment.

#### **4.2.6 Fish Habitat**

Habitat at 25 ASR stream crossing sites was assessed as directly supporting fish. These crossings include culverts at small and medium-sized streams, a clear-span bridge at the God's River and a multi-span bridge at Magill Creek. The Residual Impact, Extent and Duration of Impact assessment for each type of crossing structure is discussed below. A risk assessment for each crossing site is available in Appendix 5

##### **4.2.6.1 Culvert Crossing**

In the absence of preliminary design information, culverts were assumed to be 30 m long (pers. comm. MI-RRO). Habitat loss within the footprint of the crossing will be permanent and therefore duration is rated as high, the extent of the affected habitat is small and rated as low. The overall assessment considers that some productivity will be maintained within the culvert following construction as culverts will be embedded and designed for fish passage. Crossing design was undetermined for P6a-X018, Unnamed Tributary of Knee Lake at the time of assessment, but based on previous East Side Road Authority crossing designs the crossing is assumed to be a culvert.

##### ***4.2.6.1.1. Sites Not Supporting a Commercial, Recreational or Aboriginal Fishery***

Culvert crossings are proposed for twenty three sites, of which seven were assessed as not contributing to a CRA fishery (P6a-X005, P6a-X007, P6a-X020, P6a-X022, P6a-X027, P6a-X028 and P6a-X029). These seven sites were all characterized as boreal bog/fen headwater areas of small streams with poor connectivity to downstream fish bearing waters (see Section 4.2.2.2). The crossing sites support forage fish only and are considered unsuitable for large-bodied fish due to poor overwintering conditions and restricted access. At all seven sites the

habitat availability and condition was considered widespread and common in the region and the impacts to fish from the project were expected to have no measurable effect on the downstream CRA fishery productivity. Overall, the construction and operation of the culvert crossing at each of these seven sites was assessed as low risk of causing serious harm to the fishery because of the small area of impact, the low quality of habitat and abundance of similar habitat within the system.

#### ***4.2.6.1.2. Sites Supporting a Commercial, Recreational or Aboriginal Fishery***

##### ***Bog/Fen Streams***

Of the remaining 16 culvert crossing sites assessed as contributing to a CRA fishery, 10 of the sites, six on P6a (P6a-X031, P6a-X032, P6a-X033, P6a-X034, P6a-X037, P6a-X038) and four on P6b (P6b-X002, P6b-X003, P6b-X006, P6b-X009) support marginal fish habitat with limited use by large-bodied species such as Northern Pike due to restricted access and suitable overwintering habitat. Habitat for species such as pike was frequently available in close proximity downstream of the crossing site.

The Availability and Condition and Impacts on Relevant Fish were rated as Low. The habitat provided by these streams is common within the area and is not critical or limiting to Northern Pike or other CRA species. Northern Pike and their habitats are abundant within Project area and there are no known threats to the habitat or the species.

Based on the habitat assessment and duration and extent ratings the proposed culvert crossings are classified as Low Risk. Although each stream may support Northern Pike, suitable habitat for the species is located downstream of the crossing and outside of the anticipated cleared ROW.

##### ***P6a-X002***

The crossing of the Unnamed Tributary of the Hayes River is located on an existing winter road crossing of a typical boreal bog/fen stream. However, the crossing site and areas downstream contain gravel, cobble and boulder substrates, presumably from the winter road bed which are relatively uncommon in such streams. The permanent culvert would cover some of the coarse substrate at the site but the placement of rip rap at the culvert inlet/outlet would replace the effected substrates. Because such substrates and habitat are not rare in the region and rip rap will replace affected substrates, the Availability and Condition and Impacts on Relevant Fish were rated as Low. Based on the small area of impact and replacement of affected substrates the proposed culvert is classified as Low Risk

##### ***Medium Sized Creeks***

Crossing sites P6a-X008, P6a-X018, P6a-X023, P6b-X007 and P6b-X013 are located on medium sized flat streams within open canopied grass, sedge and shrub dominated floodplains. The habitat in these watercourses is generally uniform, consisting of fine substrates with moderate to abundant instream vegetation for cover. Habitat at these sites is suitable for spawning, rearing and feeding by forage fish and Northern Pike. In addition to fine sediments, crossing P6b-X007 (Unnamed Tributary of Opaskaykow Lake) areas of gravel, cobble and boulder were present both upstream and downstream of the crossing. All sites are expected to contribute to downstream CRA fisheries with unimpeded access to downstream waterbodies.

The Availability and Condition and Impacts on Relevant Fish were rated as Low. The habitat provided by these streams is common within the area and is not critical or limiting to Northern Pike or other CRA species. Northern Pike and their habitats are abundant within Project area and there are no known threats to the habitat or the species.

Based on the habitat assessment and duration and extent ratings the proposed culvert crossings are classified as Low Risk. Although each stream may support Northern Pike, suitable habitat for the species is located downstream and in most cases, upstream, of the crossing and outside of the anticipated cleared ROW.

#### **4.2.6.2 Clear Span Bridge Crossings**

A clear span bridge crossing is proposed for the God's River, located at the site of the existing winter road clear span bridge. The crossing is located at an area with run habitat over coarse substrate including cobble and boulder in the centre of the river and sand along the shore. Pool areas were found downstream of the crossings. The diversity of habitats provide suitable habitat for a range of species, including Northern Pike, suckers, Walleye and Brook Trout.

Clear span bridge construction and operation poses minimal risk to cause serious harm to fish and their habitat provided that measures to avoid harm are implemented. DFO review is not required for this type of activity and is therefore considered Low Risk.

#### **4.2.6.3 Multi-Span Bridge Crossings**

At the time of assessments, the preliminary crossing design was unconfirmed for P6a-X019, Magill Creek but included a two-span bridge, arch culvert or multiple culverts (pers. comm. MI-RRO). A two-span bridge design is assumed based on the channel width as per chosen bridge designs for the PR 304 to Berens River All Season Road Alignment Project. The habitat at the crossing site provides suitable habitat for CRA fishery species (i.e. Walleye, sucker, Northern Pike), but this type of habitat is not considered to be critical or limiting as similar habitat is

plentiful in the region. Negative impacts to fish populations from rip rap armouring around the pier are unlikely as it provides a similar substrate to current conditions.

Habitat loss within the footprint of the crossing at Magill Creek will be permanent and therefore duration is rated as high, the extent of the affected habitat is small and rated as low. Habitat impacts are expected to result in no measureable effect to local fish populations and therefore a two-span design would be classified as Low Risk to fish and fish habitat.

Table 6. Summary of Relevance to a Fishery, Scale of Negative Effects, and Risk Assessment related to construction and operation of the proposed Project 6 ASR alignment.

Site	Stream Name	Crossing Structure	Supports a CRA Fishery <sup>a</sup>	Extent	Duration	Availability and Condition	Impacts on Fish	Risk of Serious Harm
P6a-X002	Unnamed Tributary of Hayes River	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X005	Unnamed Tributary of Hayes River	Culvert	No	Low	High	Low	Low	LOW
P6a-X007	Unnamed Tributary of Michikanes Lake	Culvert	No	Low	High	Low	Low	LOW
P6a-X008	Unnamed Tributary of Michikanes Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X018	Unnamed Tributary of Knee Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X019	Magill Creek	Two-span Bridge <sup>c</sup>	Yes	Low	High	Low	Low	LOW
P6a-X020	Unnamed Tributary of Magill Creek	Culvert	No	Low	High	Low	Low	LOW
P6a-X022	Unnamed Tributary of Laird Lake	Culvert	No	Low	High	Low	Low	LOW
P6a-X023	Unnamed Tributary of Laird Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X027	Unnamed Tributary of Wanless Lake	Culvert	No	Low	High	Low	Low	LOW
P6a-X028	Unnamed Tributary of Wanless Lake	Culvert	No	Low	High	Low	Low	LOW
P6a-X029	Unnamed Tributary of Hignell Lake	Culvert	No	Low	High	Low	Low	LOW
P6a-X031	Unnamed Tributary of Hignell Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X032	Unnamed Tributary of Hignell Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X033	Unnamed Tributary of an Unnamed Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X034	Unnamed Tributary of an Unnamed Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X037	Unnamed Tributary of an Unnamed Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6a-X038	Unnamed Tributary of an Unnamed Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6b-X002	Unnamed Tributary of Hawkins Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6b-X003	Unnamed Tributary of Hawkins Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6b-X006	Unnamed Tributary of Opaskaykow Lake	Culvert	Yes	Low	High	Low	Low	LOW



Site	Stream Name	Crossing Structure	Supports a CRA Fishery <sup>a</sup>	Extent	Duration	Availability and Condition	Impacts on Fish	Risk of Serious Harm
P6b-X007	Unnamed Tributary of Opaskaykow Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6b-X009	Unnamed Tributary of Tapper Lake	Culvert	Yes	Low	High	Low	Low	LOW
P6b-X013	Unnamed Tributary of God's River	Culvert	Yes	Low	High	Low	Low	LOW
P6b-X015	God's River	Clear-span Bridge	Yes	N/A <sup>b</sup>	N/A	N/A	N/A	LOW

a – commercial, recreational or Aboriginal fishery.

b – "N/A" indicates where the crossing design does not require a review by DFO and therefor a risk assessment was not conducted

c – risk assessment was based on a crossing design of a two-span bridge that requires one instream pier.

Table 7. Net Habitat Change resulting from the Project 6 All Season Road.

Site	Watercourse	Instream Destruction (m <sup>2</sup> )	Instream Alteration (m <sup>2</sup> ) <sup>1</sup>	Riparian Destruction (m) <sup>2</sup>	Riparian Alteration (m) <sup>3</sup>
P6a-X002	Unnamed Tributary of Hayes River	48.6	0	36	0 <sup>4</sup>
P6a-X005	Unnamed Tributary of Hayes River	930.0	0	36	0 <sup>4</sup>
P6a-X007	Unnamed Tributary of Michikanes Lake	162.0	0	36	0 <sup>4</sup>
P6a-X008	Unnamed Tributary of Michikanes Lake	300.0	0	36	0 <sup>4</sup>
P6a-X018	Unnamed Tributary of Knee Lake	270.0	0	36	0 <sup>4</sup>
P6a-X019	Magill Creek	5.8	161.5	36	84
P6a-X020	Unnamed Tributary of Magill Creek	21.0	0	36	84
P6a-X022	Unnamed Tributary of Laird Lake	3.0	0	36	0 <sup>4</sup>
P6a-X023	Unnamed Tributary of Laird Lake	300.0	0	36	0 <sup>4</sup>
P6a-X027	Unnamed Tributary of Wanless Lake	60.0	0	36	0 <sup>4</sup>
P6a-X028	Unnamed Tributary of Wanless Lake	234.0	0	36	84
P6a-X029	Unnamed Tributary of Hignell Lake	120.0	0	36	84
P6a-X031	Unnamed Tributary of Hignell Lake	66.0	0	36	84
P6a-X032	Unnamed Tributary of Hignell Lake	75.0	0	36	0 <sup>4</sup>
P6a-X033	Unnamed Tributary of an Unnamed Lake	30.0	0	36	84
P6a-X034	Unnamed Tributary of an Unnamed Lake	90.0	0	36	84
P6a-X037	Unnamed Tributary of an Unnamed Lake	-	0	36	84
P6a-X038	Unnamed Tributary of an Unnamed Lake	174.0	0	36	84
P6b-X002	Unnamed Tributary of Hawkins Lake	55.8	0	36	84
P6b-X003	Unnamed Tributary of Hawkins Lake	300.0	0	36	0 <sup>4</sup>
P6b-X006	Unnamed Tributary of Opaskaykow Lake	18.6	0	36	0 <sup>4</sup>
P6b-X007	Unnamed Tributary of	162.0	0	36	84

Site	Watercourse	Instream Destruction (m <sup>2</sup> )	Instream Alteration (m <sup>2</sup> ) <sup>1</sup>	Riparian Destruction (m) <sup>2</sup>	Riparian Alteration (m) <sup>3</sup>
	Opaskaykow Lake				
P6b-X009	Unnamed Tributary of Tapper Lake	36.0	0	36	84
P6b-X013	Unnamed Tributary of Gods River	210.0	0	36	0 <sup>4</sup>
P6b-X015	Gods River	0	0	0 <sup>5</sup>	0 <sup>5</sup>

1 – instream alteration consist of the addition of rip rap below the high water mark. Rip rap is expected to increase the diversity and productivity of the stream and is therefore not considered an adverse effect.

2 – calculated as the width of the road bed on each bank.

3 – calculated based on a 60 m cleared right-of-way on each bank. Does not include the length of riparian destruction.

4 – Existing riparian consists of low growing vegetation. Alteration due to clearing for line of sight safety requirements is not expected.

5 – Existing road and bridge at the God's River crossing has previously impacted riparian vegetation.

## 5.0 REFERENCES

- AECOM 2011. East Side Road Authority Plans: PR 304 to Berens River All Season Road Project, Tender No. B4 Longbody Creek Bridge, General Arrangement. Consultant Drawing No. CS-B4-01. Issued for Review January 2011.
- AECOM 2013a. East Side Road Authority Plans: PR 304 to Berens River All Season Road Project, Tender No. B5 Pigeon River Bridge, General Arrangement. Consultant Drawing No. CS-B5-0101. Issued for Review October 2013.
- AECOM 2013b. East Side Road Authority Plans: PR 304 to Berens River All Season Road Project, Tender No. B7 Bradbury River Bridge. Situation Plan. Consultant Drawing No. CS-B7-0003. Issued for Review December 2013.
- BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, LANDS, AND PARKS (BCMELP). 1998. Guidelines for interpreting water quality data. Version 1, May 1998. Prepared for the Land Use Task Force Resource Inventory Committee.
- COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA (COSEWIC). 2006. COSEWIC assessment and update status report on the Lake Sturgeon *Acipenser fulvescens* in Canada. Ottawa, ON. Xi + 107 pp.
- EATON, G.J. 2012. Report on the collection of traditional ecological knowledge from Shamattawa First Nation – 2011. A report prepared for Shamattawa First Nation and Manitoba Hydro by North/South Consultants Inc. 28 pp.
- FISHERIES AND OCEANS CANADA. (DFO). 2013a. Fisheries Protection Policy Statement. October 2013. 26 pp.
- FISHERIES AND OCEANS CANADA. (DFO). 2013b. Science Advice to Support Development of a Fisheries Protection Policy for Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/063.
- FISHERIES INVENTORY AND HABITAT CLASSIFICATION SYSTEM (FIHCS). 2016. Manitoba Sustainable Development. Data request September 22, 2016.
- HTFC PLANNING & DESIGN. 2016. Traditional Knowledge Study for East Side Road Authority Project 6: All-Season Road linking Manto Sipi, Bunibonibee Cree Nation & God's Lake Narrows First Nation. Preliminary data, shared May 20, 2016.
- KAESER, A.J., AND T.L. LITTS. 2010. A novel technique for mapping habitat in navigable streams using low-cost side scan sonar. Fisheries 35: 163-174.
- KOGA, E. 2014. Results of the 2013 Lake Sturgeon population studies on the Gods and Echoing rivers. A report prepared for Manitoba Hydro by North/South Consultants Inc., Winnipeg, Manitoba as part of the Conawapa Environmental Studies Program. #5691.13-04.
- MANITOBA HYDRO. 2014. Lake Sturgeon in Manitoba: A summary of current knowledge. 48 pp.

- MANITOBA WATER STEWARDSHIP (MWS). 2011. Manitoba water quality standards, objectives, and guidelines. Water Science and Management Branch, MWS Report 2011-01, November 28, 2011; 67 pp.
- MANITOBA CONSERVATION AND WATER STEWARDSHIP (MCWS). 2012. Manitoba Lake Sturgeon Management Strategy – 2012. Manitoba Conservation and Water Stewardship, Fisheries Branch.
- NATURAL RESOURCES CANADA. 2007. CanVec – Hydrography data for Canada, Version 8. Available: <http://geogratis.gc.ca/geogratis/search?lang=en> [accessed July 2011]
- PISIAK, D.J. and B. MACLEAN. 2007. Population Studies of Lake Sturgeon (*Acipenser fulvescens*) in the Fox River, Manitoba, Summer 2004. A report prepared for Manitoba Hydro by North/South Consultants Inc., Winnipeg, Manitoba. 42 pp. #5374.04-14
- PRAIRIE FARM REHABILITATION ADMINISTRATION (PFRA). 2009. Incremental Gross Drainage Areas of the PFRA Watershed Project. Regina, Saskatchewan. Prairie Farm Rehabilitation Administration (PFRA), Agriculture and Agri-Food Canada. Available: <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1228408887219&lang=eng>. [accessed December 2009].
- RANDALL, R.G., M.J. BRADFORD, K.D. CLARKE AND J.C. RICE. 2013. A science-based interpretation of ongoing productivity of commercial, recreational or Aboriginal fisheries. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/112 iv + 26 p.
- SMITH, R.E., H. VELDHUIS, G.F. MILLS, R.G. EILERS, W.R. FRASER, AND G.W. LELYK. 1998. Terrestrial Ecozones, Ecoregions, and Ecodistricts of Manitoba, An Ecological Stratification of Manitoba's Landscapes. Technical Bulletin 98-9E. Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada, Winnipeg, Manitoba.
- STEWART, K.W. and D.A. WATKINSON. 2004. The Freshwater Fishes of Manitoba. University of Manitoba Press. Winnipeg, Manitoba.

## APPENDIX 1. SUBSTRATE VERIFICATION DATA COLLECTED BY PONAR GRAPS DURING SIDE SCAN SONAR SURVEYS AT MAJOR WATERCOURSES CROSSED BY THE ASR ALIGNMENT

Table A1-1. Site P6b-X015 – God's River substrate verification data.

UTM (Zone 15 U)			Substrate Type											Comment
Ponar	Easting	Northing	Clay	Silt	Clay/ Silt	Sand	Gravel	Cobble	Cobble/ Boulder	Boulder/ Boulder	Bedrock	Bedrock	Organic	
1	429795	6080881	-	-	-	40	60	-	-	-	-	-	-	
2	429978	6080875	-	-	-	-	-	-	-	100	-	-	-	
3	429903	6080825	-	-	-	-	-	-	-	-	100	-	-	
4	429454	6080884	-	-	-	-	-	-	-	-	-	100	-	
5	429514	6080802	-	-	-	80	20	-	-	-	-	-	-	

Table A1-2. Site P6b-X013 – Unnamed Tributary of God's River substrate verification data.

UTM (Zone 15 U)			Substrate Type											Comment
Transect	Easting	Northing	Clay	Silt	Clay/ Silt	Sand	Gravel	Cobble	Cobble/ Boulder	Boulder/ Boulder	Bedrock	Bedrock	Organic	
1	428369	6081316	-	-	100	-	-	-	-	-	-	-	-	Field assessment was used to determine substrate was 100% fines at each transect
2	428075	6081182	-	-	100	-	-	-	-	-	-	-	-	
3	428025	6081138	-	-	100	-	-	-	-	-	-	-	-	
4	427980	6081104	-	-	100	-	-	-	-	-	-	-	-	
5	427802	6080861	-	-	100	-	-	-	-	-	-	-	-	



Table A1-3. Site P6a-X019 – Magill Creek substrate verification data.

Ponar	UTM (Zone 15 U)		Substrate Type											Comment
	Easting	Northing	Clay	Silt	Clay/ Silt	Sand	Gravel	Cobble	Cobble/ Boulder	Boulder	Boulder/ Bedrock	Bedrock	Organic	
1	366085	6069095	-	-	-	20	10	-	-	70	-	-	-	
2	366097	6069076	-	20	-	70	10	-	-	-	-	-	-	
3	366478	6069278	-	30	-	30	-	-	-	-	-	-	40	
4	366628	6069375	-	50	-	-	-	-	-	-	-	-	50	
5	366273	6069204	-	20	-	80	-	-	-	-	-	-	-	
6	366361	6069192	-	-	-	-	-	-	-	-	-	100	-	

**APPENDIX 2. SIZE AND ABUNDANCE DATA FOR FISH CAPTURED DURING THE STREAM CROSSING ASSESSMENT SURVEYS, JUNE 2016.**

Site	Watercourse	Sample Date	Gear Type <sup>1</sup>	Species	n <sup>2</sup>	Fork Length (mm)
P6a-X002	Unnamed Tributary of the Hayes River	17-Jun-16	EF	Brook Stickleback	1	-
P6a-X002	Unnamed Tributary of the Hayes River	17-Jun-16	EF	Johnny Darter	1	-
P6a-X005	Unnamed Tributary of the Hayes River	17-Jun-16	DN	Brook Stickleback	1	-
P6a-X008	Unnamed Tributary of the Michikanes River	16-Jun-16	V	Brook Stickleback	1	-
P6a-X008	Unnamed Tributary of the Michikanes River	16-Jun-16	V	Northern Pike	1	>200
P6a-X008	Unnamed Tributary of the Michikanes River	16-Jun-16	V	Northern Pike	1	-
P6a-X018	Unnamed Tributary of the Knee Lake	16-Jun-16	V	Brook Stickleback	-	-
P6a-X019	Magill Creek	21-Jun-16	GN	Northern Pike	1	445
P6a-X019	Magill Creek	21-Jun-16	GN	Northern Pike	1	403
P6a-X019	Magill Creek	21-Jun-16	GN	Shorthead Redhorse	1	435
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	69
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	75
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	73
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	69
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	62
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	70
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	65
P6a-X019	Magill Creek	21-Jun-16	GN	Yellow Perch	1	77
P6a-X020	Unnamed Tributary of the Magill Creek	15-Jun-16	EF	Fathead Minnow	2	-
P6a-X020	Unnamed Tributary of the Magill Creek	15-Jun-16	EF	Brook Stickleback	1	-
P6a-X023	Unnamed Tributary of the Laird Lake	14-Jun-16	EF	Brook Stickleback	1	-
P6a-X023	Unnamed Tributary of the Laird Lake	14-Jun-16	V	Northern Pike	6	4-10 inch
P6a-X027	Unnamed Tributary of the Wanless Lake	14-Jun-16	V	Brook Stickleback	1	-

1 – EF = backpack electrofisher; GN = gillnet; DN = dipnet; V = visual observation; A = rod and reel angling

2 = n = # of fish captured.

Appendix 2. Continued.

Site	Watercourse	Sample Date	Gear Type <sup>1</sup>	Species	n <sup>2</sup>	Fork Length (mm)
P6a-X027	Unnamed Tributary of the Wanless Lake	14-Jun-16	EF	Brook Stickleback	1	-
P6a-X029	Unnamed Tributary of the Hignell Lake	15-Jun-16	EF	Brook Stickleback	1	-
P6a-X031	Unnamed Tributary of the Hignell Lake	15-Jun-16	EF	Brook Stickleback	1	-
P6a-X032	Unnamed Tributary of the Hignell Lake	16-Jun-16	EF	Brook Stickleback	4	-
P6a-X033	Unnamed Tributary of the unnamed lake	17-Jun-16	EF	Northern Pearl Dace	20	-
P6a-X033	Unnamed Tributary of the unnamed lake	17-Jun-16	EF	Brook Stickleback	3	-
P6a-X034	Unnamed Tributary of the unnamed lake	18-Jun-16	EF	Brook Stickleback	3	-
P6a-X034	Unnamed Tributary of the unnamed lake	18-Jun-16	V	Northern Pearl Dace	-	-
P6a-X037	Unnamed Tributary of the unnamed lake	17-Jun-16	EF	Brook Stickleback	5	-
P6a-X037	Unnamed Tributary of the unnamed lake	17-Jun-16	EF	Northern Pearl Dace	7	-
P6a-X038	Unnamed Tributary of the unnamed lake	16-Jun-16	EF	Northern Pearl Dace	11	-
P6b-X002	Unnamed Tributary of the Hawkins Lake	18-Jun-16	V	Brook Stickleback	1	-
P6b-X003	Unnamed Tributary of the Hawkins Lake	18-Jun-16	V	Northern Pike	2	-
P6b-X006	Unnamed Tributary of the Opaskaykow Lake	18-Jun-16	DN	Brook Stickleback	9	-
P6b-X007	Unnamed Tributary of the Opaskaykow Lake	19-Jun-16	EF	Burbot	1	180
P6b-X009	Unnamed Tributary of the Tapper Lake	18-Jun-16	EF	Fathead Minnow	49	-
P6b-X009	Unnamed Tributary of the Tapper Lake	18-Jun-16	EF	Brook Stickleback	1	-
P6b-X015	God's River	19-Jun-16	A	Northern Pike	1	498
P6b-X015	God's River	19-Jun-16	A	Northern Pike	1	-
P6b-X015	God's River	19-Jun-16	A	Northern Pike	1	590
P6b-X015	God's River	19-Jun-16	A	Brook Trout	1	340
P6b-X015	God's River	19-Jun-16	GN	Longnose Sucker	1	469
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	450

1 – EF = backpack electrofisher; GN = gillnet; DN = dipnet; V = visual observation; A = rod and reel angling

2 = n = # of fish captured.

Appendix 2. Continued.

Site	Watercourse	Sample Date	Gear Type <sup>1</sup>	Species	n <sup>2</sup>	Fork Length (mm)
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	473
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	468
P6b-X015	God's River	19-Jun-16	GN	Northern Pike	1	788
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	448
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	-
P6b-X015	God's River	19-Jun-16	V	Sculpin spp.	2	-
P6b-X015	God's River	19-Jun-16	GN	Northern Pike	1	-
P6b-X015	God's River	19-Jun-16	DN	Brook Trout	1	Young of year
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	492
P6b-X015	God's River	19-Jun-16	GN	White Sucker	1	412

1 – EF = backpack electrofisher; GN = gillnet; DN = dipnet; V = visual observation; A = rod and reel angling

2 = n = # of fish captured.

**APPENDIX 3. MUSSEL SPECIES CAPTURED DURING STREAM CROSSING  
ASSESSMENT SURVEYS, JUNE 2016.**

Site	Watercourse	Sample Date	Gear Type <sup>1</sup>	Species	n <sup>2</sup>	State
P6a-X019	Magill Creek	21-Jun-16	MR, V	Giant Floater	-	-
P6a-X019	Magill Creek	21-Jun-16	MR, V	Fat Mucket	-	-
P6b-X015	God's River	19-Jun-16	MR, V	Giant Floater	20	-

1 – MR = mussel rake; V = visual observation

2 = n = # of mussels captured.

#### **APPENDIX 4. STREAM CROSSING ASSESSMENT SUMMARIES ASSESSED AS NO FISH HABITAT**

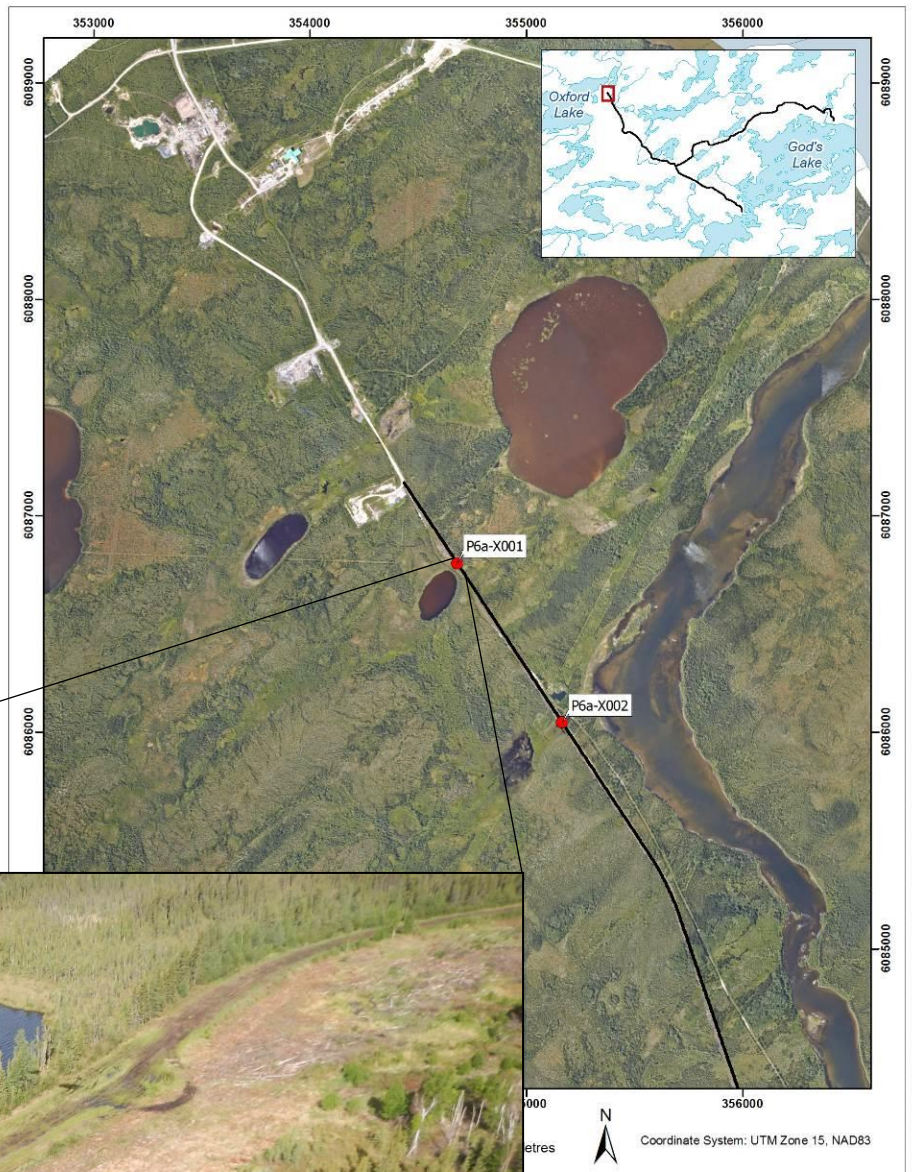


## Location

Datum: NAD 83  
UTM: 15U 354680 6086782

## General Morphology

Type: Stream  
Canvec Mapped: Yes  
Pattern: -  
Confinement: -  
Flow Regime: Ephemeral  
Upstream Drainage Area (km<sup>2</sup>): 0.11  
Distance to Major DS Waterbody (km): 2.91 (Hayes River)  
Connectivity: No





## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located in a low lying area near the headwaters of a small tributary, in close proximity to the community of Oxford House within the traditional territory of the Bunibonibee Cree Nation. This ephemeral stream connects a small unnamed lake to a second, larger, downstream unnamed lake which eventually drains into the Hayes River. No channel or connectivity was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	TBD
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

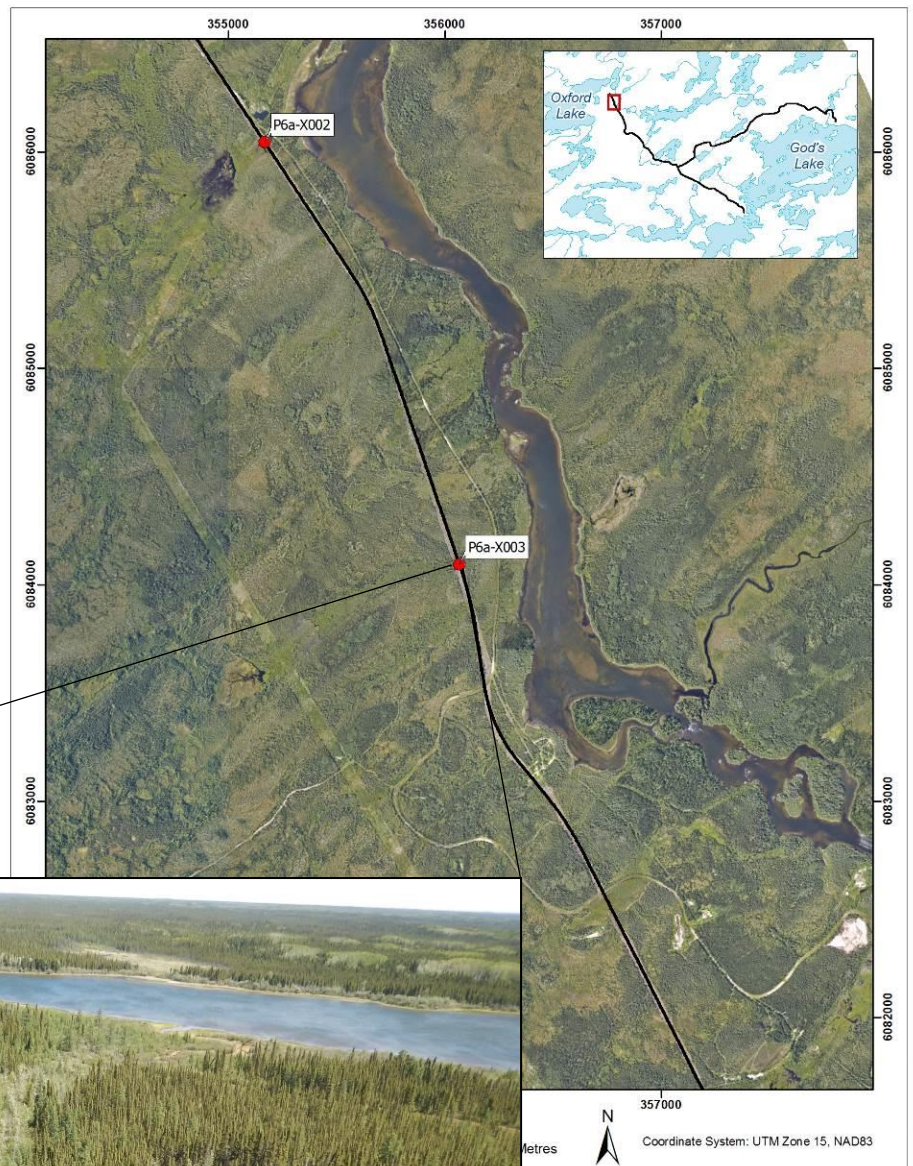
a – pers. comm. ESRA.

## Location

**Datum:** NAD 83  
**UTM:** 15U 356066 6084096

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 2.62  
**Distance to Major DS Waterbody (km):** 0.44 (Hayes River)  
**Connectivity:** No



## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located in a low lying area near the headwaters of a small tributary to the Hayes River. This ephemeral stream drains upland areas into the Hayes River, contributing to a perennial channel approximately 200 m downstream of the crossing site. The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA.

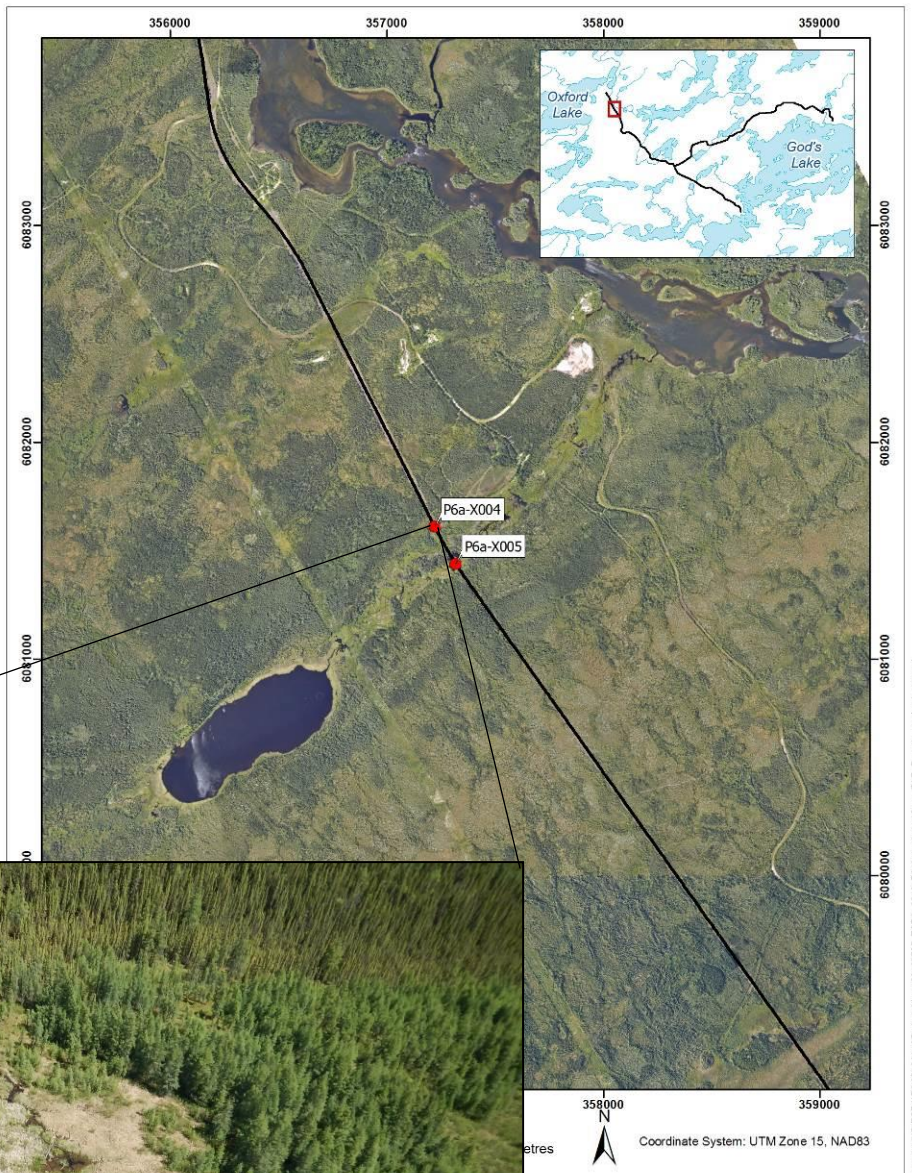


## Location

**Datum:** NAD 83  
**UTM:** 15U 357220 6081611

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** N/A  
**Distance to Major DS Waterbody (km):** 1.71 (Hayes River)  
**Connectivity:** No



## **Fish Habitat Classification**

### **+ Fish Habitat**

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The crossing is located in a low lying area of a secondary tributary of a small tributary to the Hayes River. This wetland area drains upland areas into the Hayes River with no visible channel.

The site is classified as No Fish Habitat based on the absence of a channel or clear connection to fish-bearing waters.

## **Crossing Information**

### **+ Proposed Crossing**

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

a – pers. comm. ESRA.

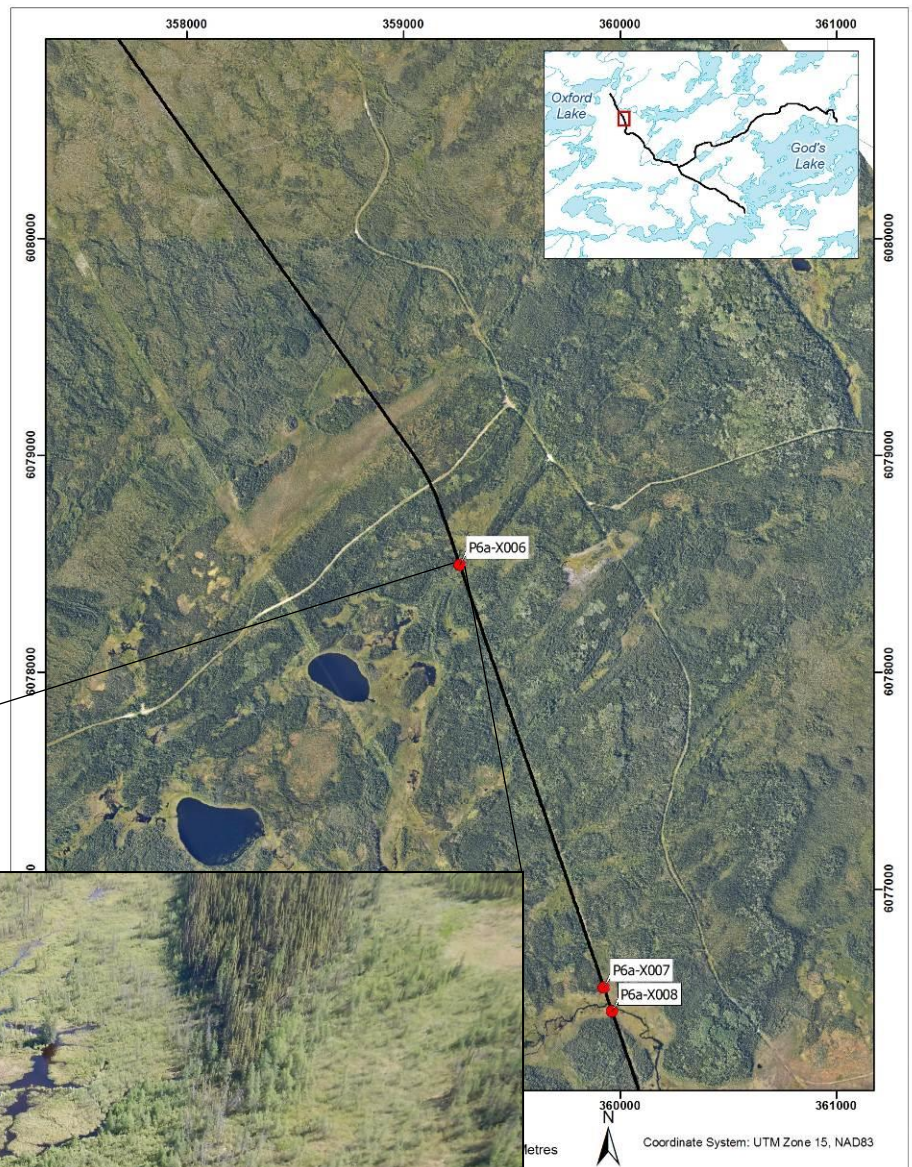


## Location

**Datum:** NAD 83  
**UTM:** 15U 359259 6078497

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 1.36  
**Distance to Major DS Waterbody (km):** 5.26 (Michikanes Lake)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located at the headwaters of an unnamed tributary feeding into Michikanes Lake, over 5 km downstream of the crossing. Habitat in the immediate vicinity of the crossing site does not support fish as it is situated on an elevated portion of land which may have surface water during high water events (i.e., spring melt) draining the upstream fen. Poor connectivity to the downstream fish bearing waterbody is seasonal and reliant on high water.

At the time of survey, the area at and downstream of the crossing was dry, with no visible channel.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a - pers. comm. ESRA

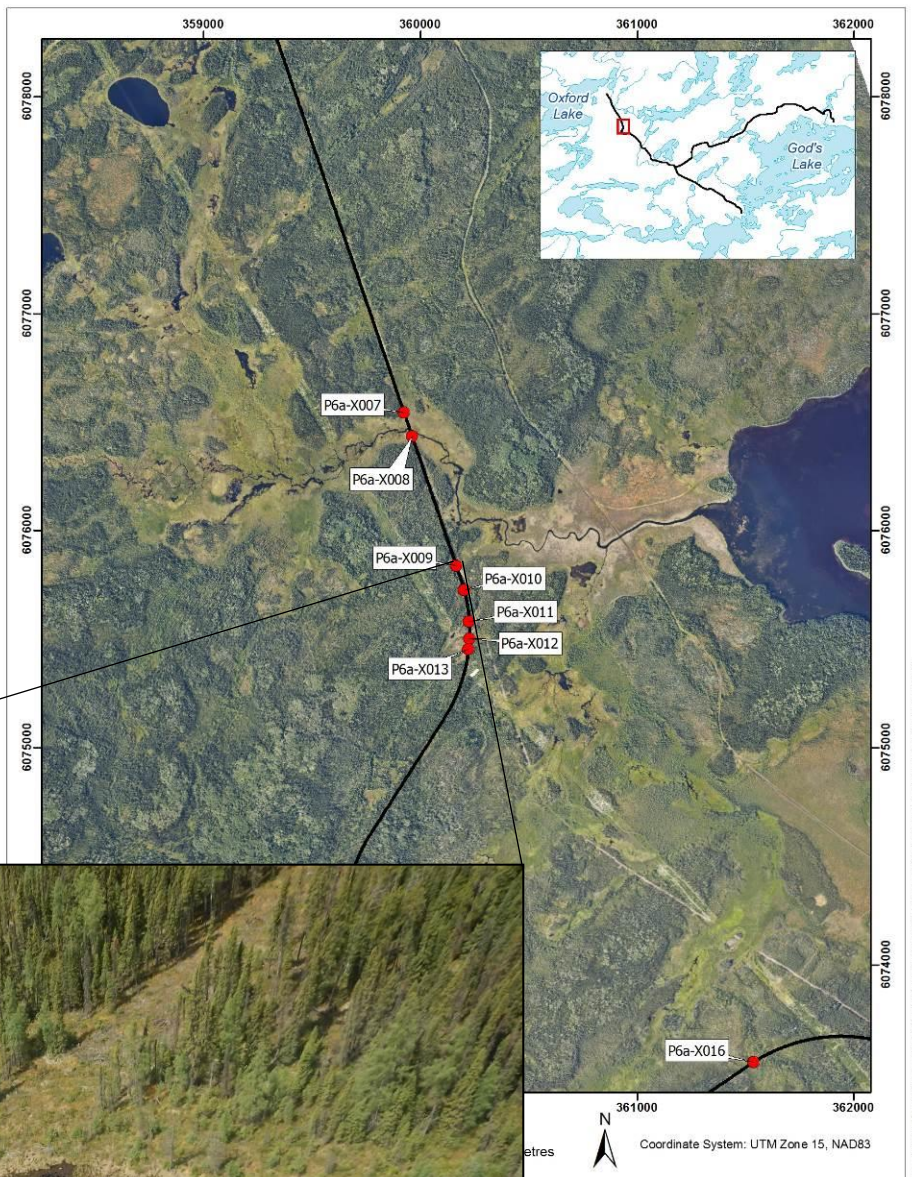


## Location

**Datum:** NAD 83  
**UTM:** 15U 360165 6075841

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 0.95  
**Distance to Major DS Waterbody (km):** 1.61 (Michikanes Lake)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on boreal wetland that drains into an unnamed tributary to Michikanes Lake. There is no flow in this region and a series of beaver dams in the area limits connectivity of this upland area to the main tributary feeding into Michikanes Lake. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

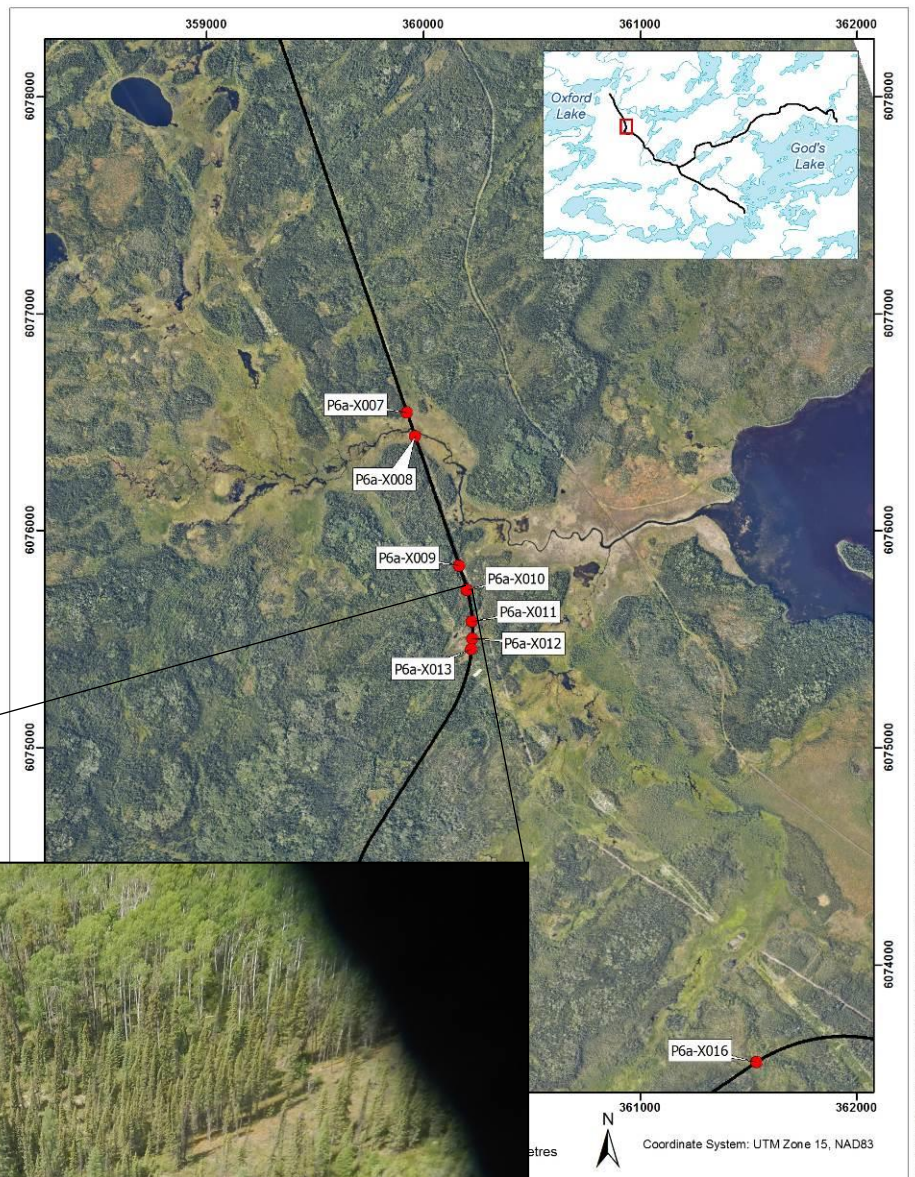


## Location

**Datum:** NAD 83  
**UTM:** 15U 360202 6075729

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 0.89  
**Distance to Major DS Waterbody (km):** 1.74 (Michikanes Lake)  
**Connectivity:** No



## **Fish Habitat Classification**

### **+ Fish Habitat**

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The crossing is located on boreal wetland that drains into an unnamed tributary to Michikanes Lake. There is no flow in this region and a series of beaver dams in the area limits connectivity of this upland area to the main tributary feeding into Michikanes Lake. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## **Crossing Information**

### **+ Proposed Crossing**

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

a – pers. comm. ESRA

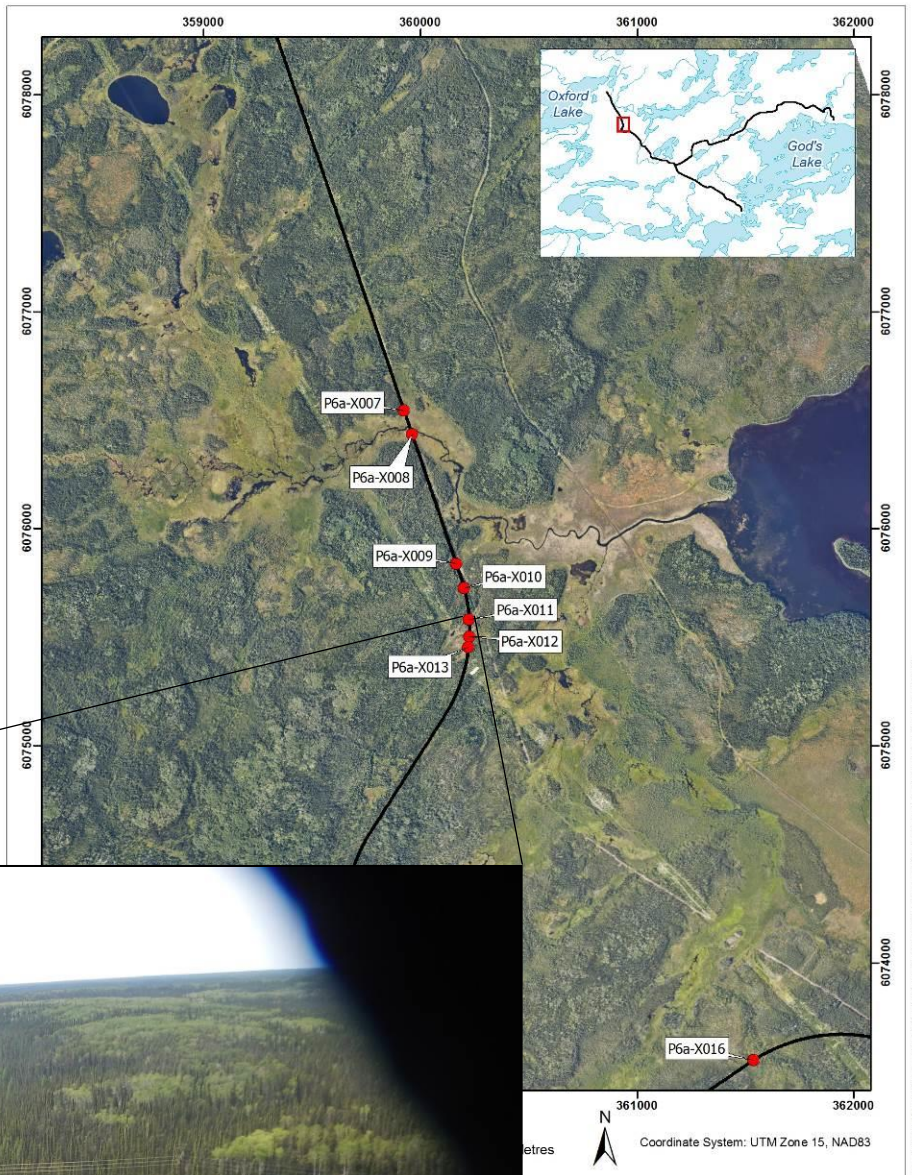


## Location

**Datum:** NAD 83  
**UTM:** 15U 360225 6075583

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 0.83  
**Distance to Major DS Waterbody (km):** 1.91 (Michikanes Lake)  
**Connectivity:** No



## **Fish Habitat Classification**

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The crossing is located on boreal wetland that drains into an unnamed tributary to Michikanes Lake. There is no flow in this region and a series of beaver dams in the area limits connectivity of this upland area to the main tributary feeding into Michikanes Lake. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## **Crossing Information**

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

a – pers. comm. ESRA

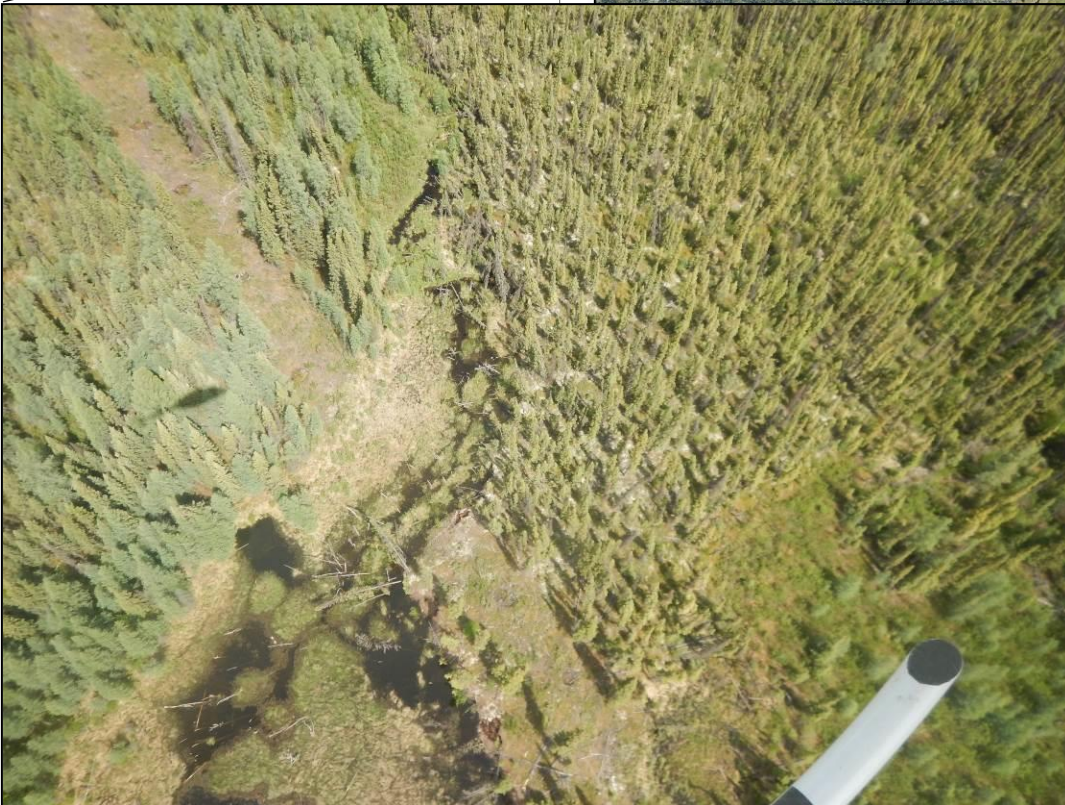
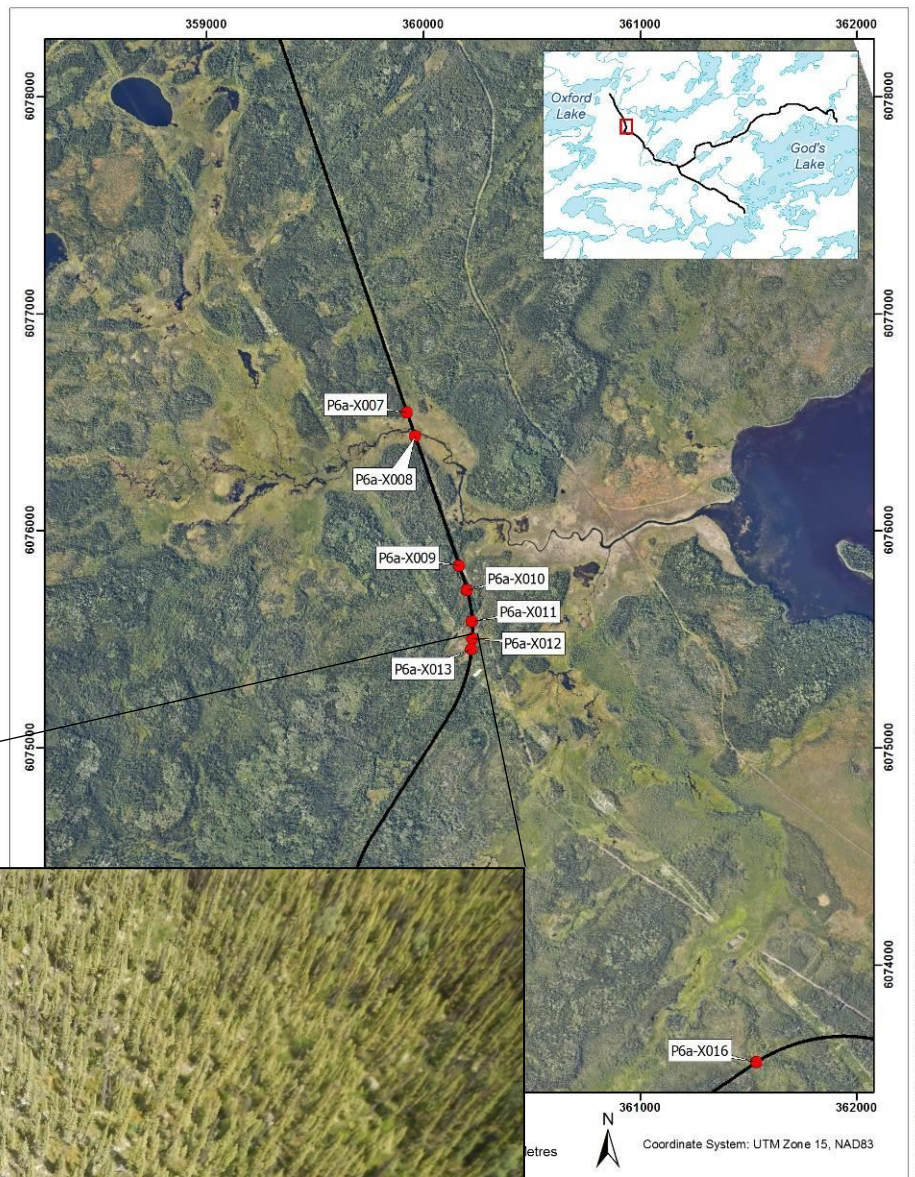


## Location

**Datum:** NAD 83  
**UTM:** 15U 360226 6075505

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 0.77  
**Distance to Major DS Waterbody (km):** 2.03 (Michikanes Lake)  
**Connectivity:** No





## 📄 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on boreal wetland that drains into an unnamed tributary to Michikanes Lake. There is no flow in this region and a series of beaver dams in the area limits connectivity of this upland area to the main tributary feeding into Michikanes Lake. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## 📄 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

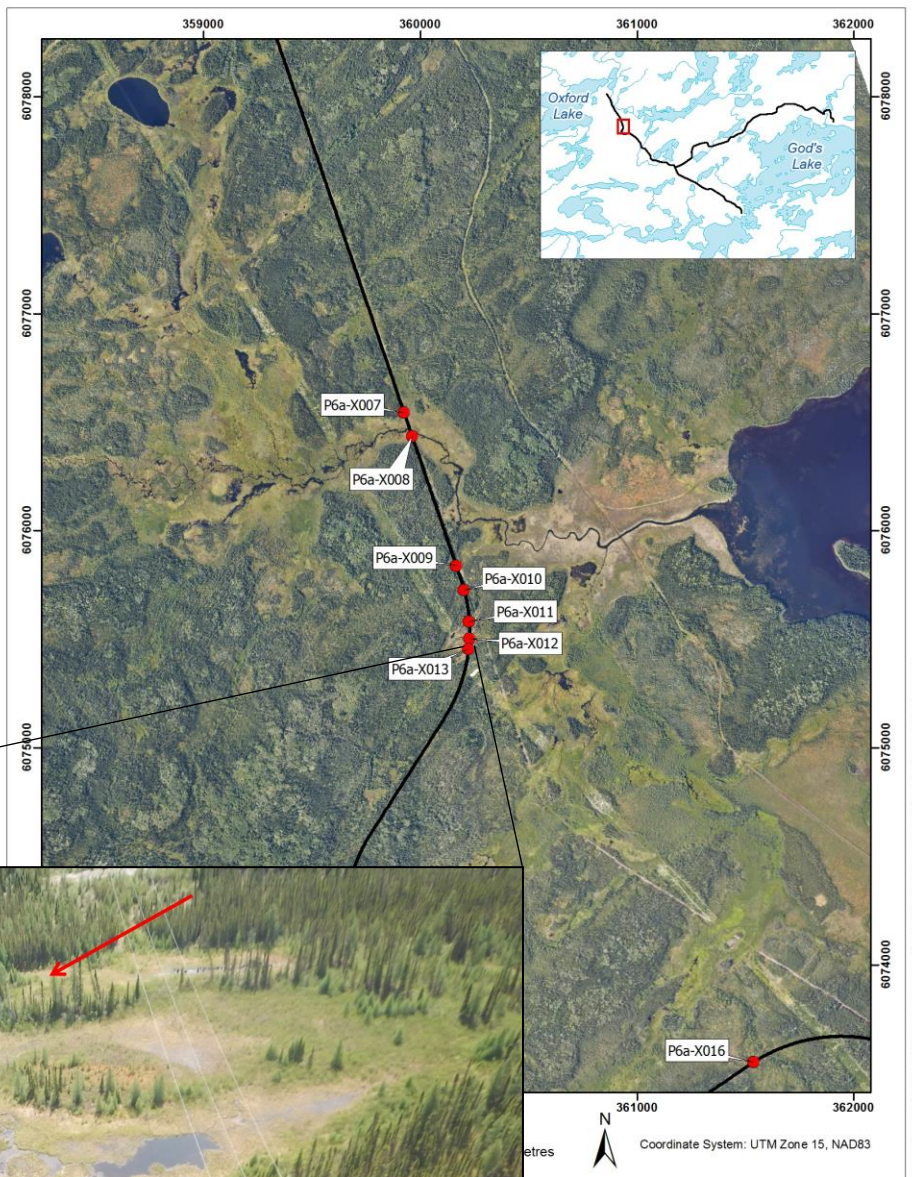
a – pers. comm. ESRA

## Location

**Datum:** NAD 83  
**UTM:** 15U 360222 6075456

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 0.74  
**Distance to Major DS Waterbody (km):** 2.09 (Michikanes Lake)  
**Connectivity:** No



## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located at the upstream end of a wetland feeding into Michikanes Lake. Although deeper pools are present here, the water appears stagnant with no flow, and habitat within this forested reach is marginal for fish species due to access and connectivity. Beaver activity is abundant within this reach. Large bodied fish, relevant to a CRA fishery, are unlikely to use this reach as fish must pass through a forested region with heavily vegetated bog/fen to reach the main tributary. Although high water events (i.e. spring run-off) may allow for occasional connectivity, connectivity to Michikanes Lake was not present at the time of the site visit.

The site is classified as No Fish Habitat based on the current absence of a channel or connection to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

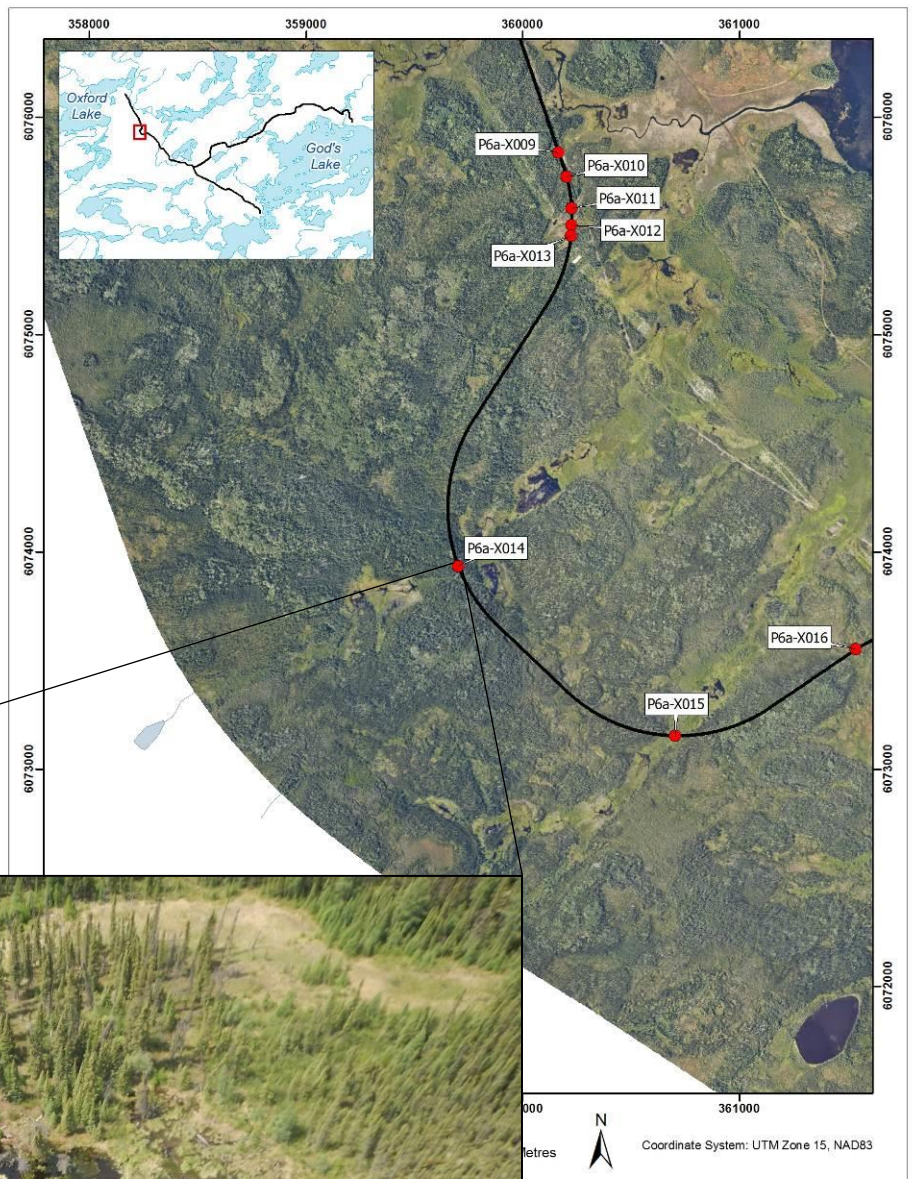


## Location

**Datum:** NAD 83  
**UTM:** 15U 359702 6073936

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Perennial  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 1.24  
**Distance to Major DS Waterbody (km):** 3.20 (Michikanes Lake)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on a secondary tributary connecting two large wetlands, ultimately draining into Michikanes Lake 3.2 km downstream. There is no flow in this region and a series of beaver dams in the area limits connectivity of this upland area to the main tributary feeding into Michikanes Lake. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

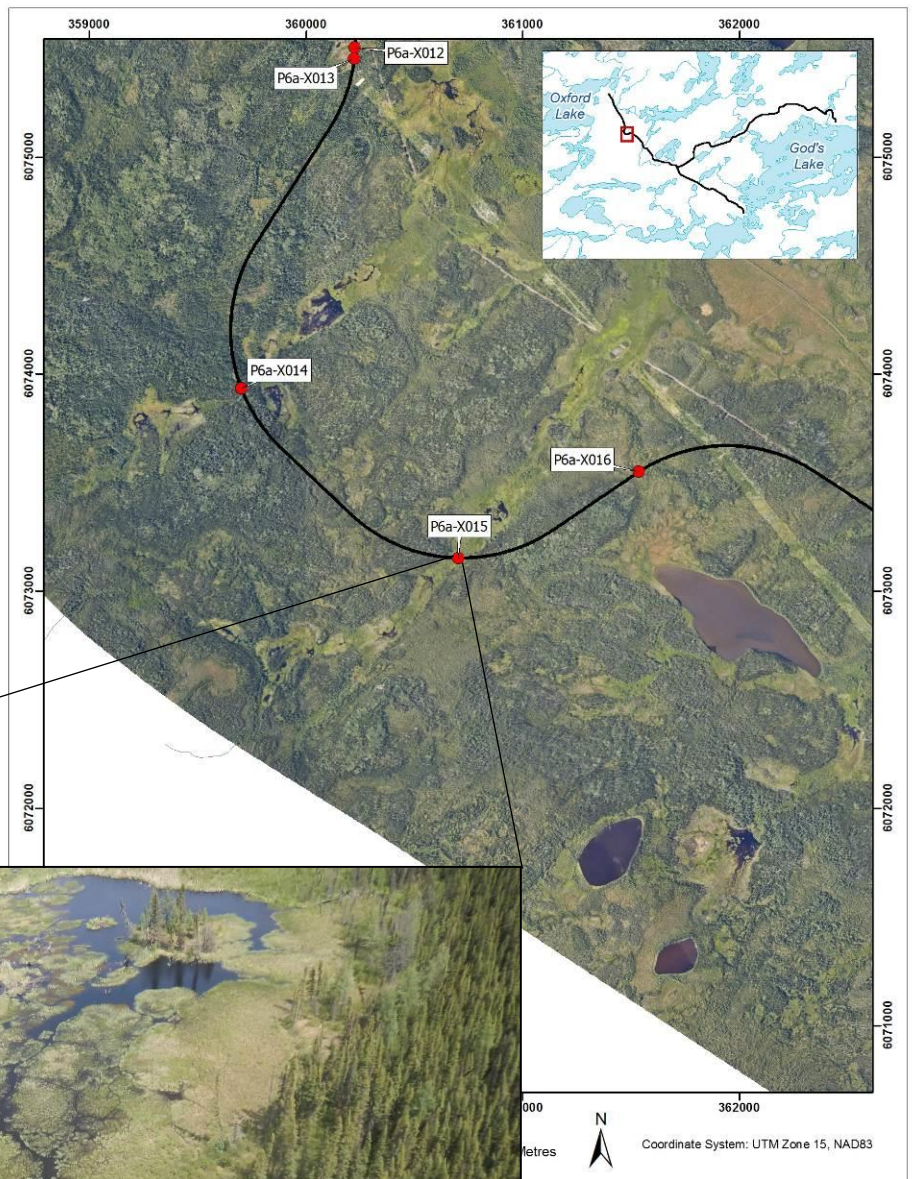


## Location

**Datum:** NAD 83  
**UTM:** 15U 360702 6073154

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 4.63  
**Distance to Major DS Waterbody (km):** 4.91 (Michikanes Lake)  
**Connectivity:** No



## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on a small tributary ultimately draining into Michikanes Lake nearly 5 km downstream. No channel was present at the time of the site visit. Although there are portions of the tributary that contain small perennial pools and channels there is no clear connection to the main fish bearing waterbody, therefore contributions to the CRA fishery in Michikanes Lake are unlikely.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

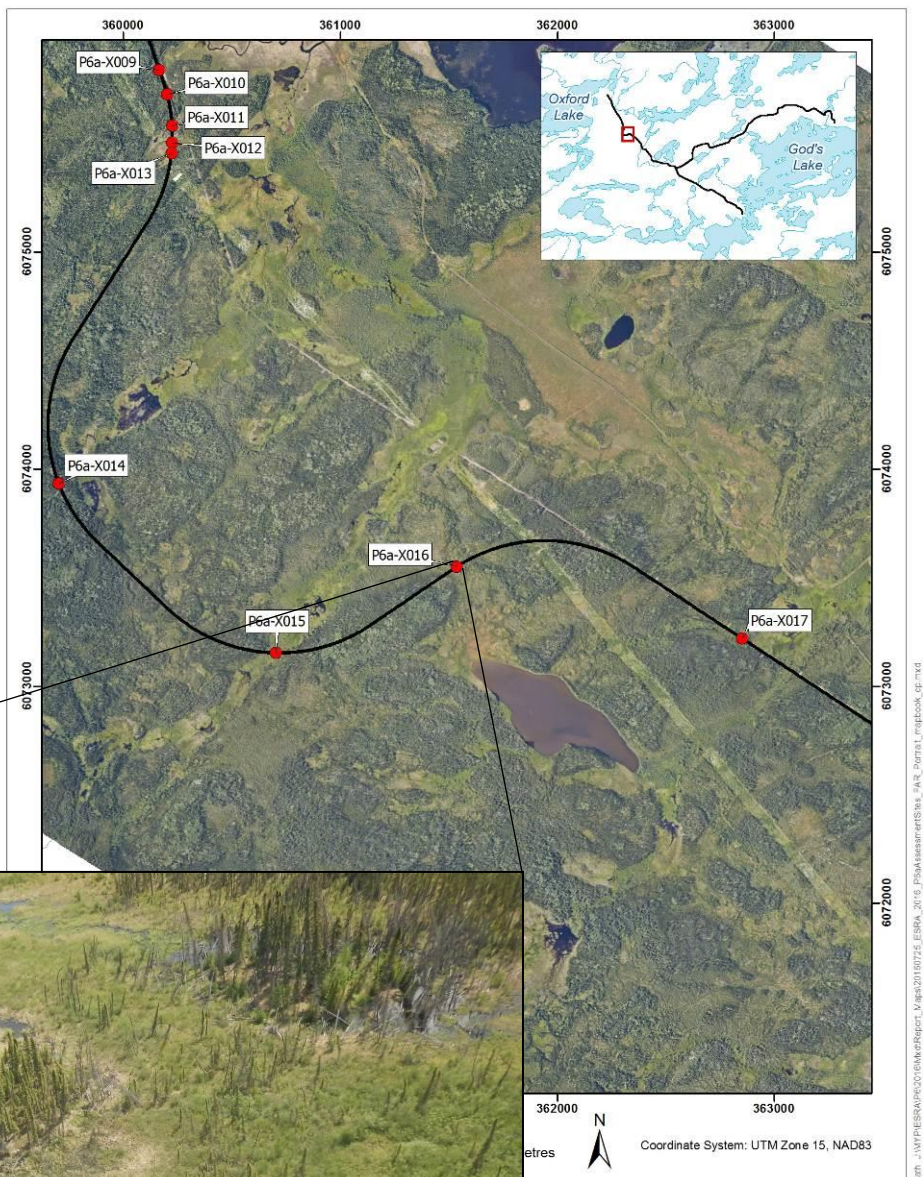


## Location

**Datum:** NAD 83  
**UTM:** 15U 361536 6073552

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 12.09  
**Distance to Major DS Waterbody (km):** 4.42 (Michikanes Lake)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located in a wetland region ultimately draining into Michikanes Lake nearly 5 km downstream. No channel was present at the time of the site visit. There is no clear connection to the main fish bearing waterbody; as such, contributions to the CRA fishery in Michikanes Lake are unlikely.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

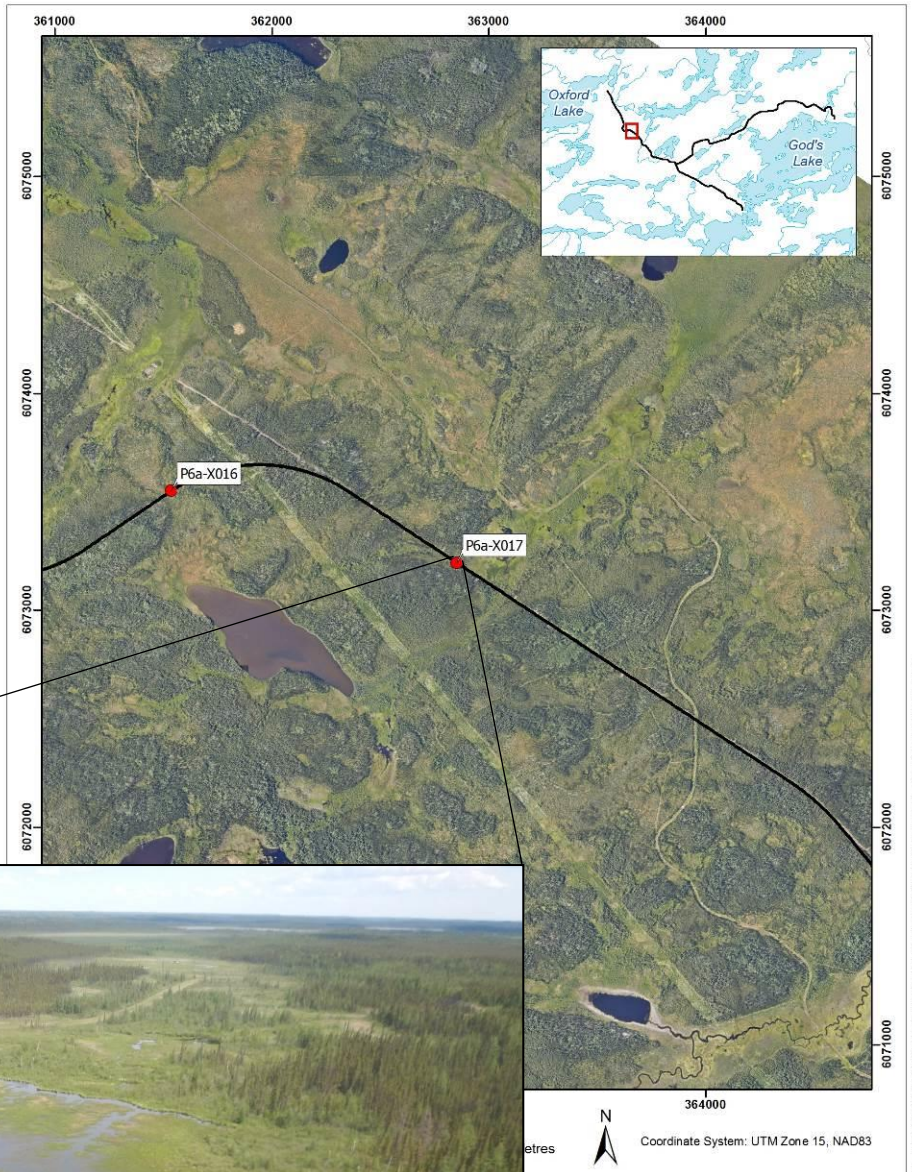


## Location

**Datum:** NAD 83  
**UTM:** 15U 362851 6073221

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 4.30  
**Distance to Major DS Waterbody (km):** 6.39 (Michikanes Lake)  
**Connectivity:** No



## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on a tributary connecting two small unnamed wetland lakes, eventually feeding into Michikanes Lake 6.4 km downstream of the crossing. A large beaver pond with a small inlet channel was present at the time of the site visit but there is no connection to the main fish bearing waterbody due to a series of beaver dams and heavily vegetated wetlands.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

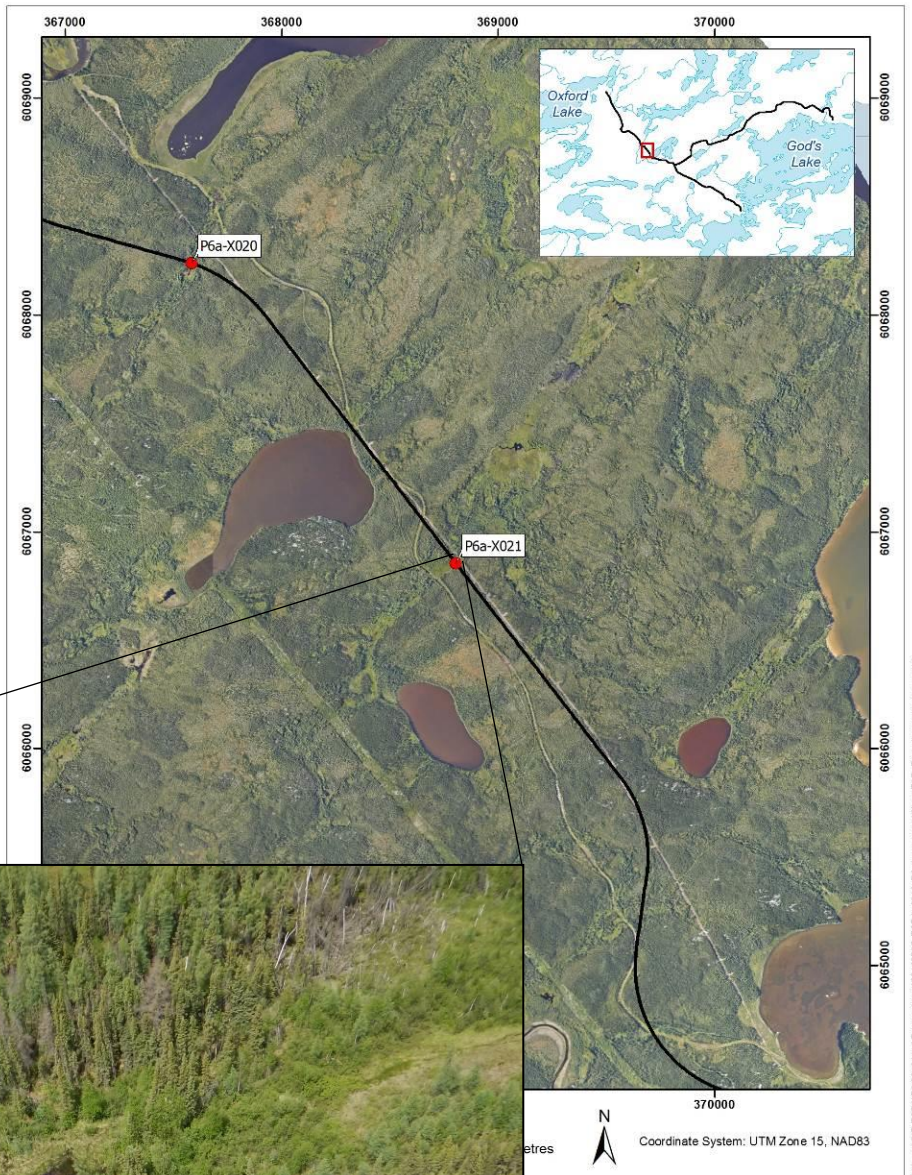


## Location

**Datum:** NAD 83  
**UTM:** 15U 368803 6066857

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 0.99  
**Distance to Major DS Waterbody (km):** 9.20 (Knee Lake)  
**Connectivity:** No



## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on an ephemeral tributary of Magill Creek, which in turn enters Knee Lake 9 km downstream. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA.

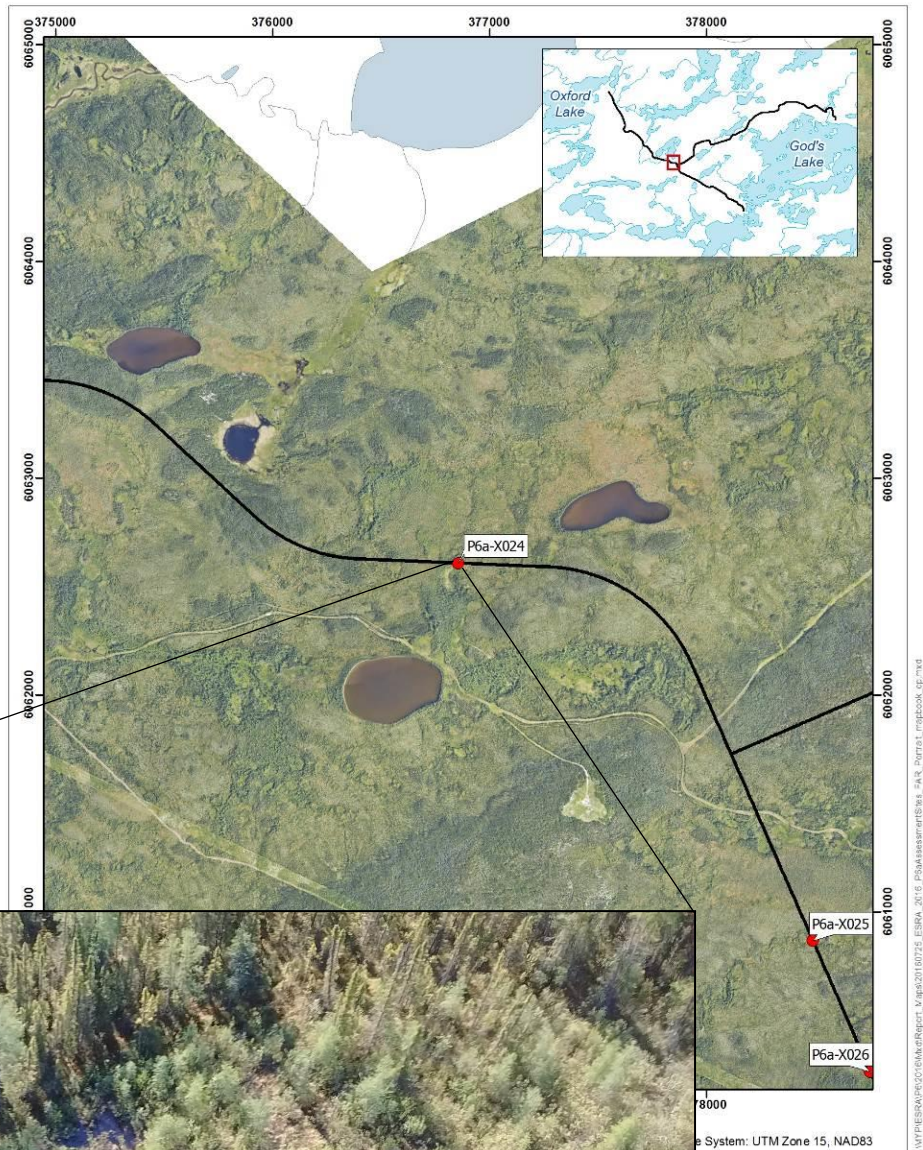


## Location

Datum: NAD 83  
UTM: 15U 376856 6062609

## General Morphology

Type: Stream  
Canvec Mapped: Yes  
Pattern: -  
Confinement: -  
Flow Regime: Ephemeral  
Upstream Drainage  
Area (km<sup>2</sup>): 1.03  
Distance to Major DS  
Waterbody (km): 18.92 (Laird Lake)  
Connectivity: No





## 📄 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on an ephemeral tributary which drains two small ponds at the upstream-most end, and draining through a low lying area (fen) before connecting to the main tributary, and ultimately to Laird Lake, 18.92 km downstream of the crossing. No connecting channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## 📄 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

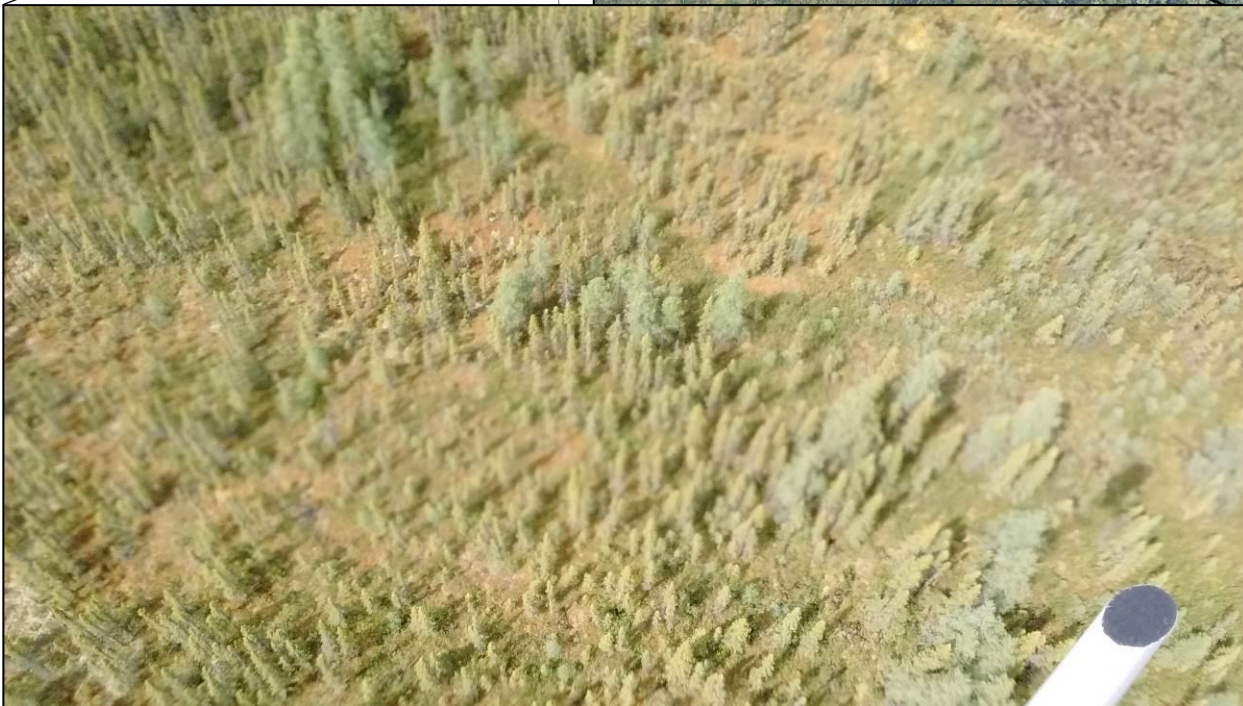
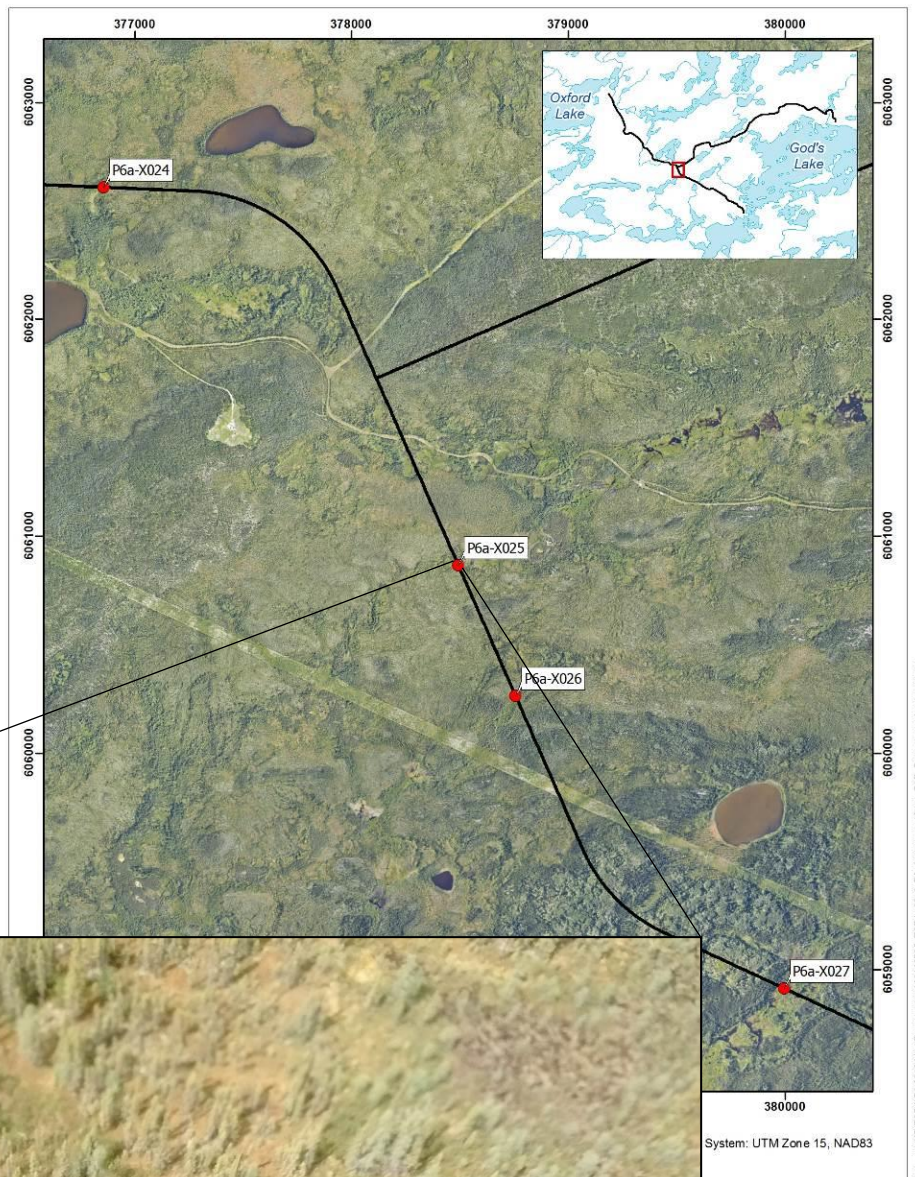
a – pers. comm. ESRA.

## Location

Datum: NAD 83  
UTM: 15U 378492 6060867

## General Morphology

Type: Wetland  
Canvec Mapped: Yes  
Pattern: -  
Confinement: -  
Flow Regime: -  
Upstream Drainage  
Area (km<sup>2</sup>): 1.01  
Distance to Major DS  
Waterbody (km): 8.89 (Hawkins Lake)  
Connectivity: No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on an ephemeral tributary which drains a low lying area (wetland) into Hawkins Lake, 8.89 km downstream. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA.

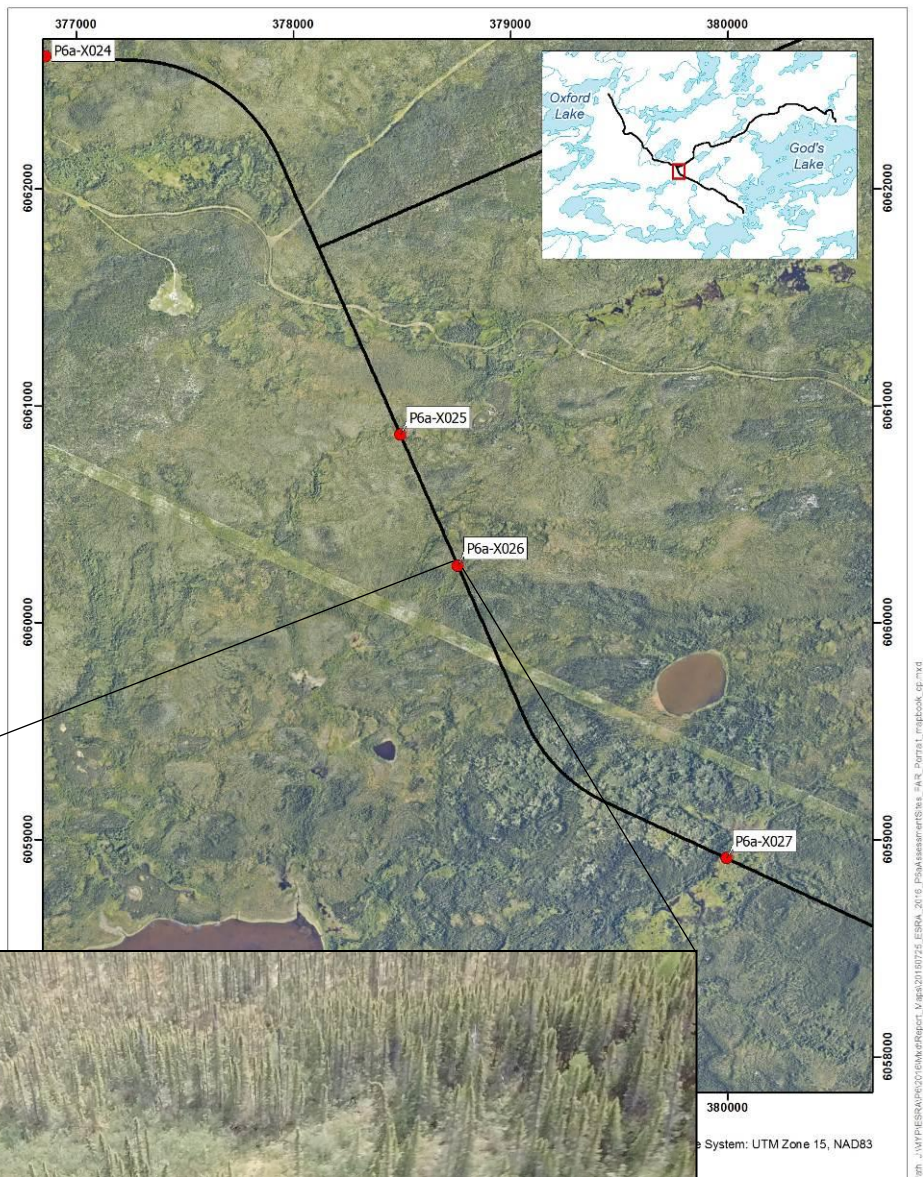


## Location

Datum: NAD 83  
UTM: 15U 378756 6060265

## General Morphology

Type: Wetland  
Canvec Mapped: Yes  
Pattern: -  
Confinement: -  
Flow Regime: -  
Upstream Drainage  
Area (km<sup>2</sup>): 0.03  
Distance to Major DS  
Waterbody (km): 1.97 (Wanless Lake)  
Connectivity: No





## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on an ephemeral tributary which drains a low lying area (wetland) into Wanless Lake, 1.97 km downstream. No channel was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

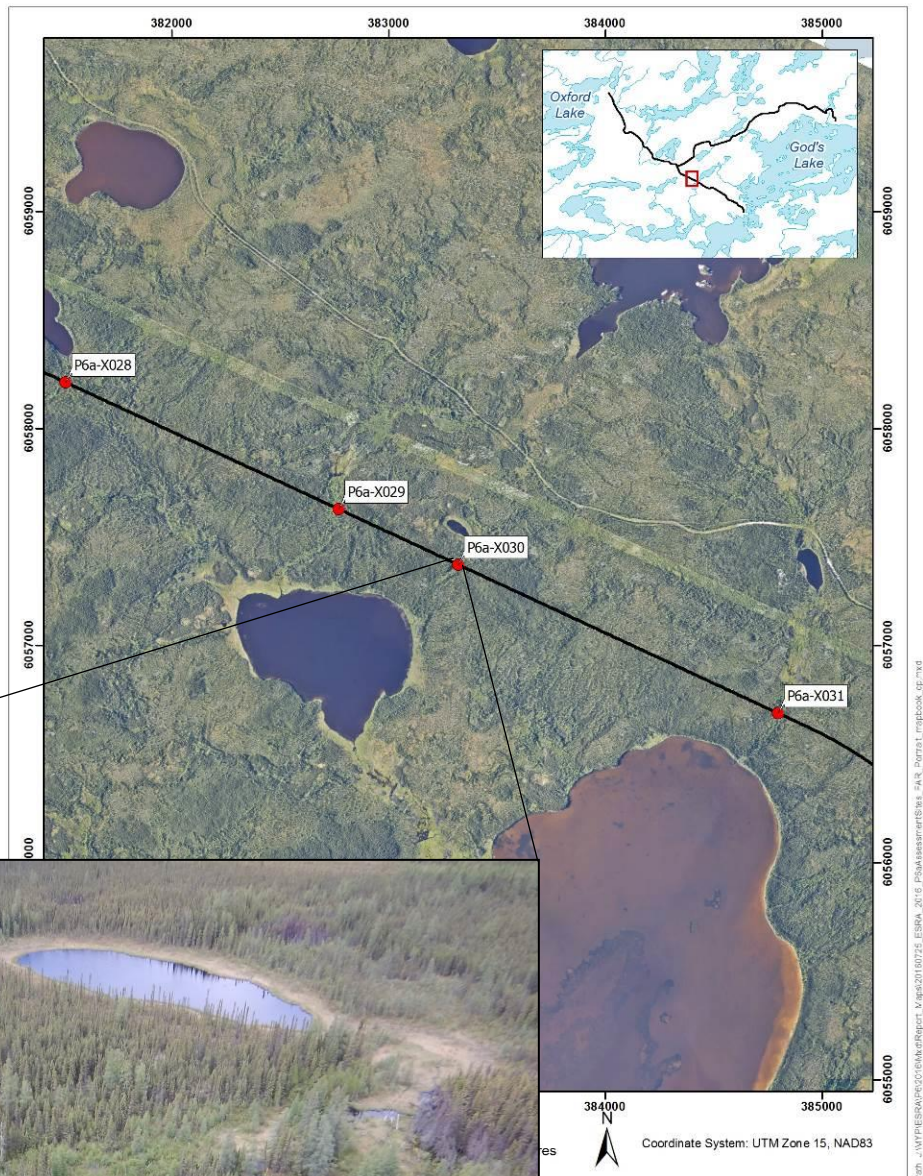
a – pers. comm. ESRA.

## Location

**Datum:** NAD 83  
**UTM:** 15U 383321 6057373

## General Morphology

**Type:** Creek  
**Canvec Mapped:** Yes  
**Pattern:** Braided  
**Confinement:** Unconfined  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 0.09  
**Distance to Major DS Waterbody (km):** 2.06 (Hignell Lake)  
**Connectivity:** No



## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located on an ephemeral braided tributary between a small pond and a larger unnamed lake which drains to Hignell Lake about 2 km downstream of the crossing. Braiding of the tributary was visible at the mouth of the small pond and as it entered the unnamed lake; no continual channel was present between the two waterbodies.

The site is classified as No Fish Habitat based on the absence of a distinct channel and standing water in the braided sections of the tributary, resulting to limited connectivity to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA.

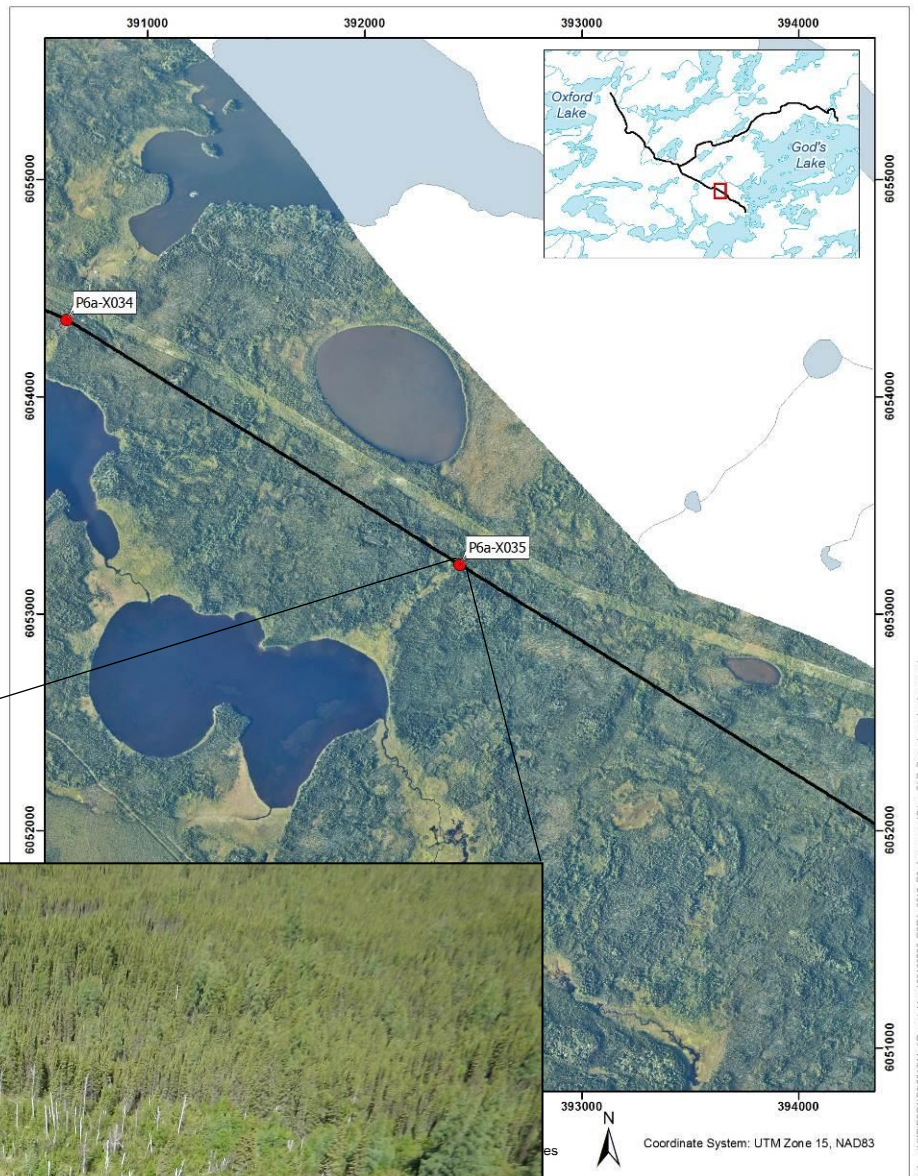


## Location

**Datum:** NAD 83  
**UTM:** 15U 392437 6053228

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** Sinuous  
**Confinement:** Occasionally Confined  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 1.58  
**Distance to Major DS Waterbody (km):** 13.12 (Gods Lake)  
**Connectivity:** No





## 📌 Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located near the headwaters of a small unnamed creek. The creek lies within a broad wetland floodplain and is heavily impacted by beaver dams. During the time of the site visit, no direct connectivity was present between the crossing site and the lake. The habitat mostly consisted of saturated fen habitat with intermittent isolated pools of standing water.

The site is classified as No Fish Habitat based on the absence of a distinct channel, resulting in limited connectivity to fish-bearing waters.

## 📌 Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

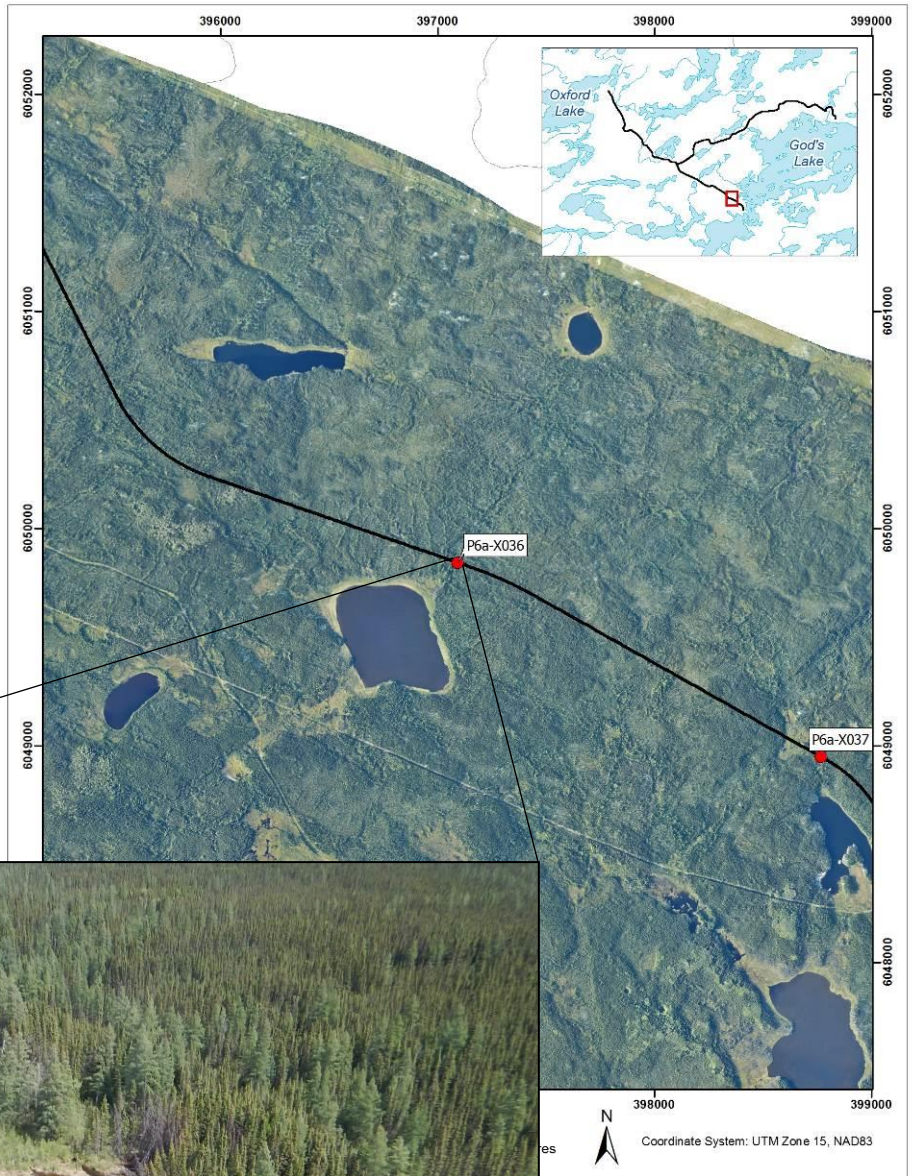
# P6a-X036 Unnamed Tributary of an Unnamed Lake

## Location

**Datum:** NAD 83  
**UTM:** 15U 397092 6049844

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 1.64  
**Distance to Major DS Waterbody (km):** 5.91 (God's Lake)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located in a low-lying wetland stream connecting two small unnamed lakes near the headwaters of a tributary to Gods Lake, 5.91 km downstream of the crossing. During the time of visit, no direct connectivity was present between the crossing site and the lakes. A meandering channel was visible only at the mouth of the downstream unnamed lake, and dissipated after approximately 150 m. Braiding was frequent in both the open canopy and forested areas. The habitat consisted mostly of wetland habitat further upstream of the crossing.

The site is classified as No Fish Habitat based on the absence of a distinct channel, resulting to limited connectivity to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

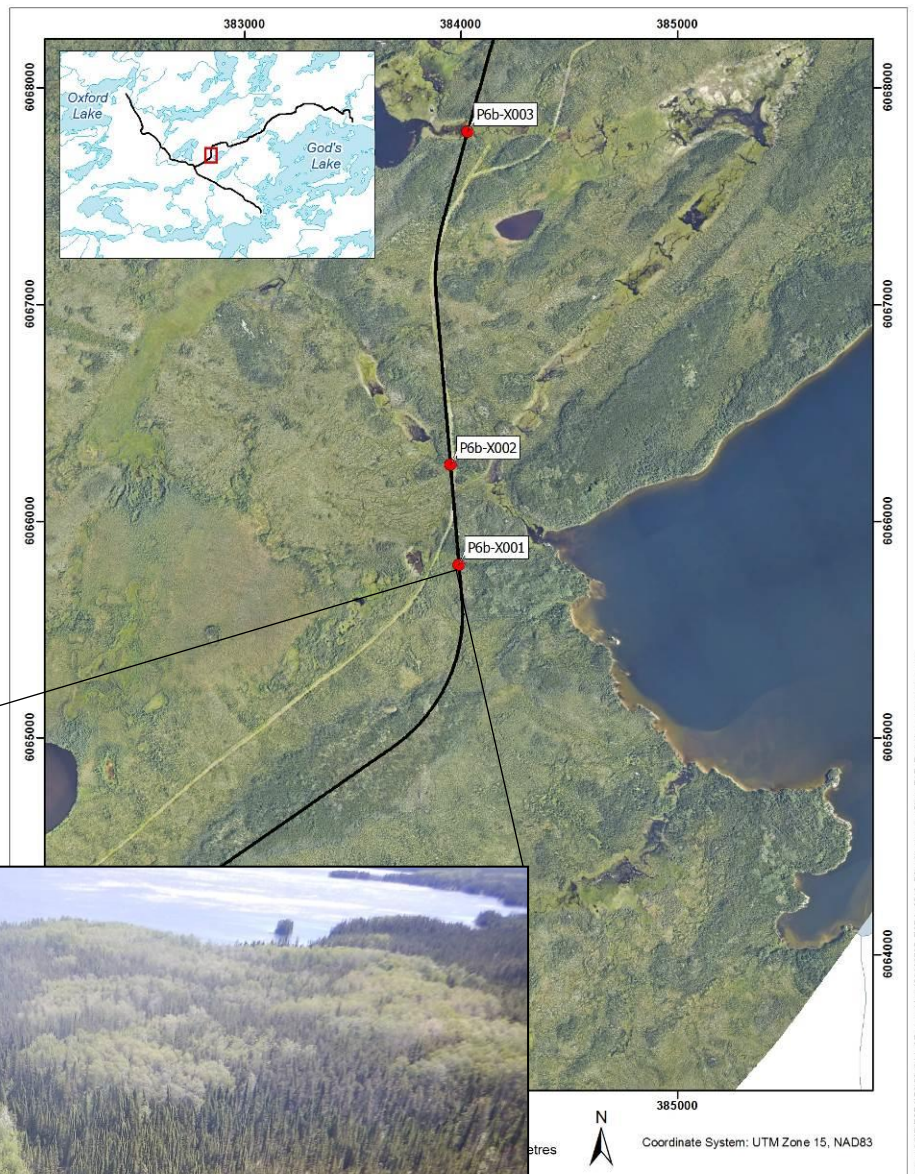


## Location

**Datum:** NAD 83  
**UTM:** 15U 383989 6065801

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 0.39  
**Distance to Major DS Waterbody (km):** 0.42 (Hawkins Lake)  
**Connectivity:** No





## **Fish Habitat Classification**

### **+ Fish Habitat**

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The crossing is located approximately 100 m downstream of a clearing and consists of flooded forest habitat with no defined channel. Further downstream, the channel is braided with no distinction of a main channel. No connectivity was present at the time of the site visit.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## **Crossing Information**

### **+ Proposed Crossing**

<b>Type</b>	Culvert
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

a – pers. comm. ESRA

## Location

Datum: NAD 83

UTM: 15U 384190 6068376

## General Morphology

Type: Stream

Canvec Mapped: Yes

Pattern: -

Confinement: -

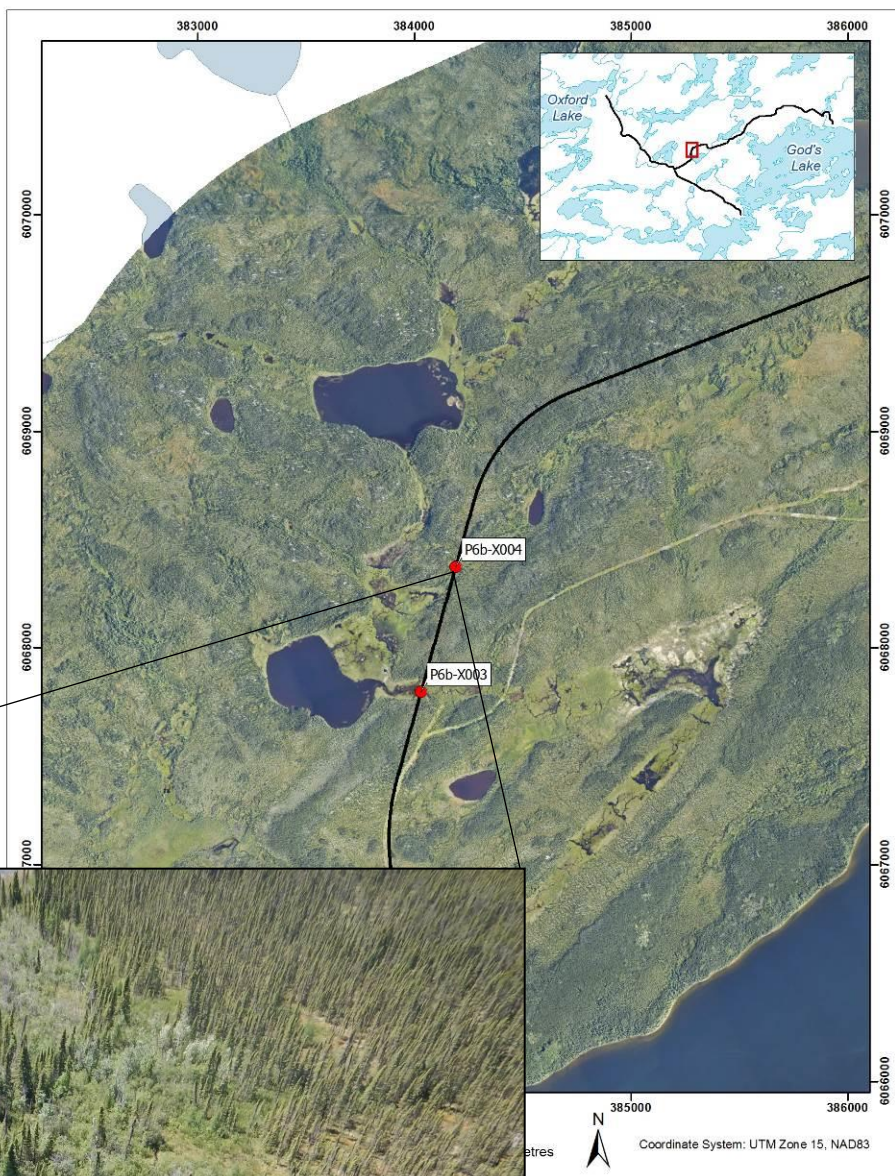
Flow Regime: Ephemeral

Upstream Drainage

Area (km<sup>2</sup>): 0.30

Distance to Major DS  
Waterbody (km): 5.53 (Hawkins Lake)

Connectivity: No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The watercourse connects two wetland areas with no stream channel.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA.



# P6b-X005

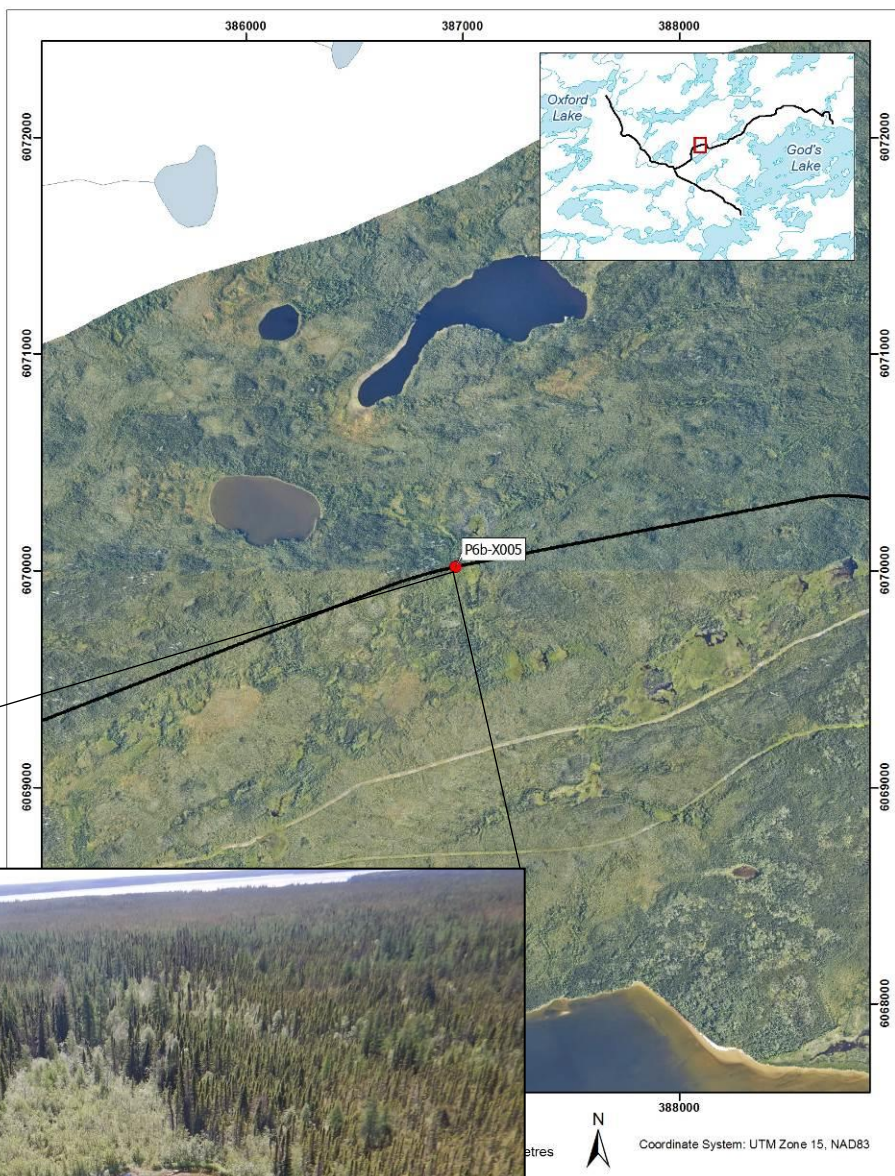
## Unnamed Tributary of Opaskaykow Lake

### Location

**Datum:** NAD 83  
**UTM:** 15U 386967 6070020

### General Morphology

<b>Type:</b>	Wetland
<b>Canvec Mapped:</b>	Yes
<b>Pattern:</b>	-
<b>Confinement:</b>	-
<b>Flow Regime:</b>	Perennial
<b>Upstream Drainage</b>	
<b>Area (km<sup>2</sup>):</b>	1.17
<b>Distance to Major DS Waterbody (km):</b>	5.47 (Opaskaykow Lake)
<b>Connectivity:</b>	No





## ↓ Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The area surrounding the crossing site is saturated. A defined channel was not observed among the many beaver ponds. There is not connectivity to any major waterbody.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## ↓ Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

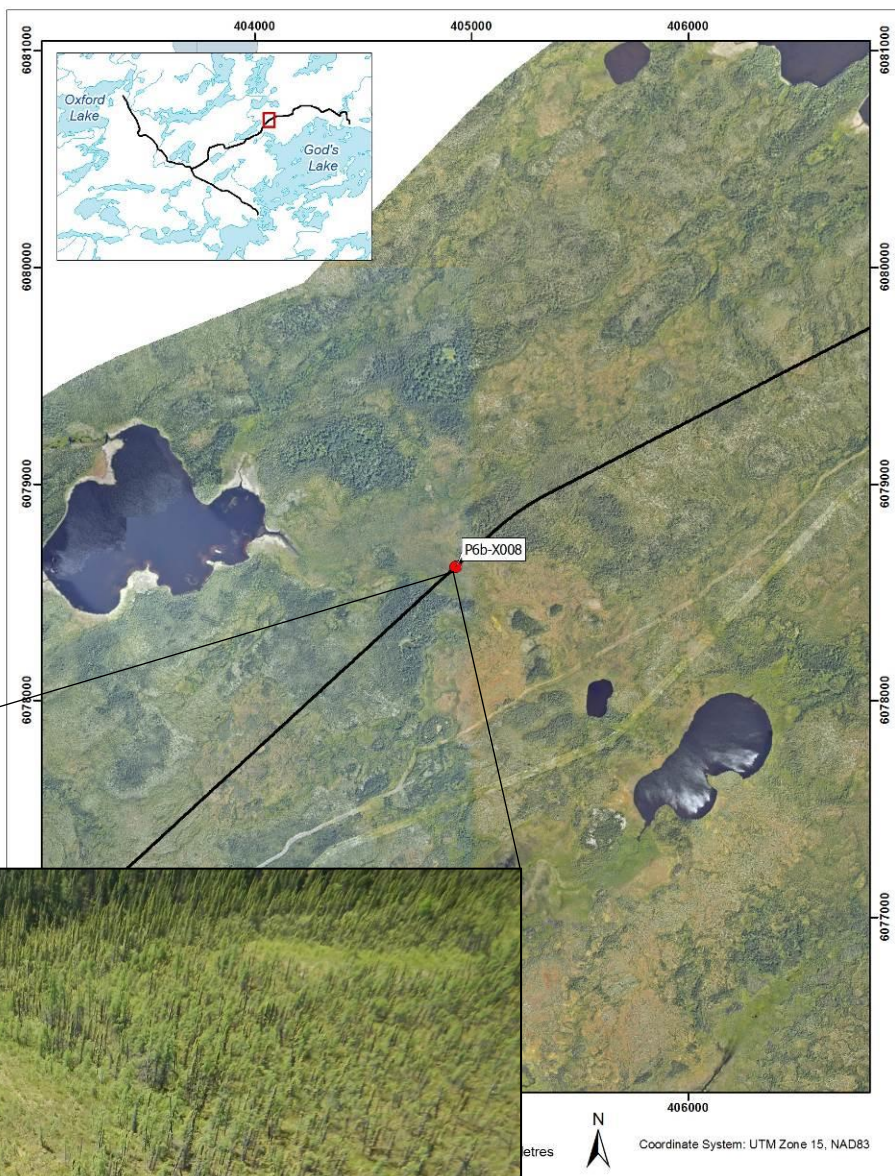
a – pers. comm. ESRA.

## Location

**Datum:** NAD 83  
**UTM:** 15U 404927 6078620

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 0.41  
**Distance to Major DS**  
**Waterbody (km):** 3.37 (Bayly Lake)  
**Connectivity:** No



## **Fish Habitat Classification**

### **+ Fish Habitat**

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The area consists of fen habitat. There was no discernable channel observed.

The site is classified as No Fish Habitat based on the absence of a channel or connection to fish-bearing waters.

## **Crossing Information**

### **+ Proposed Crossing**

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

a – pers. comm. ESRA.

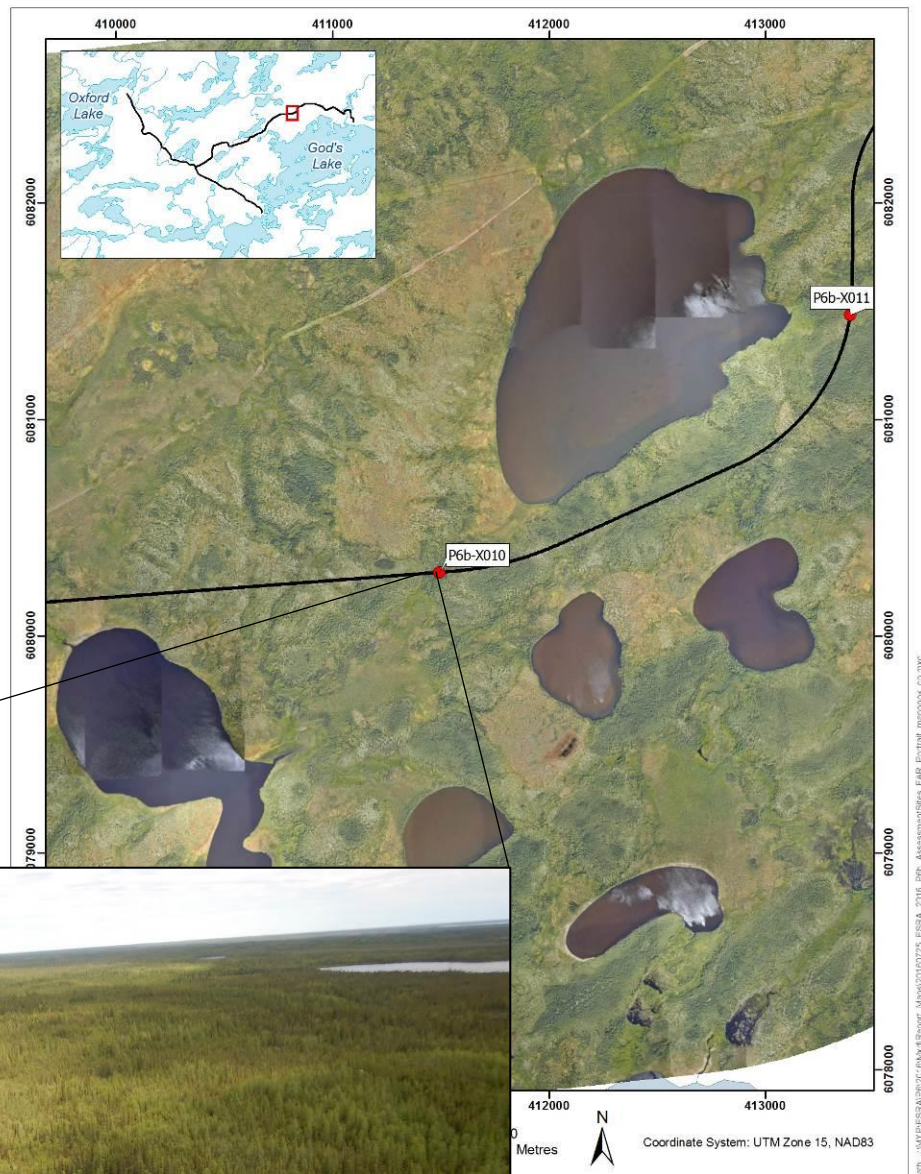


## Location

**Datum:** NAD 83  
**UTM:** 15U 411494 6080295

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 9.00  
**Distance to Major DS Waterbody (km):** 4.06 (Tapper Lake)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located in an ephemeral tributary connecting two small unnamed lakes upstream of Tapper Lake. A defined channel was not observed at the crossing site at time of the visit.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

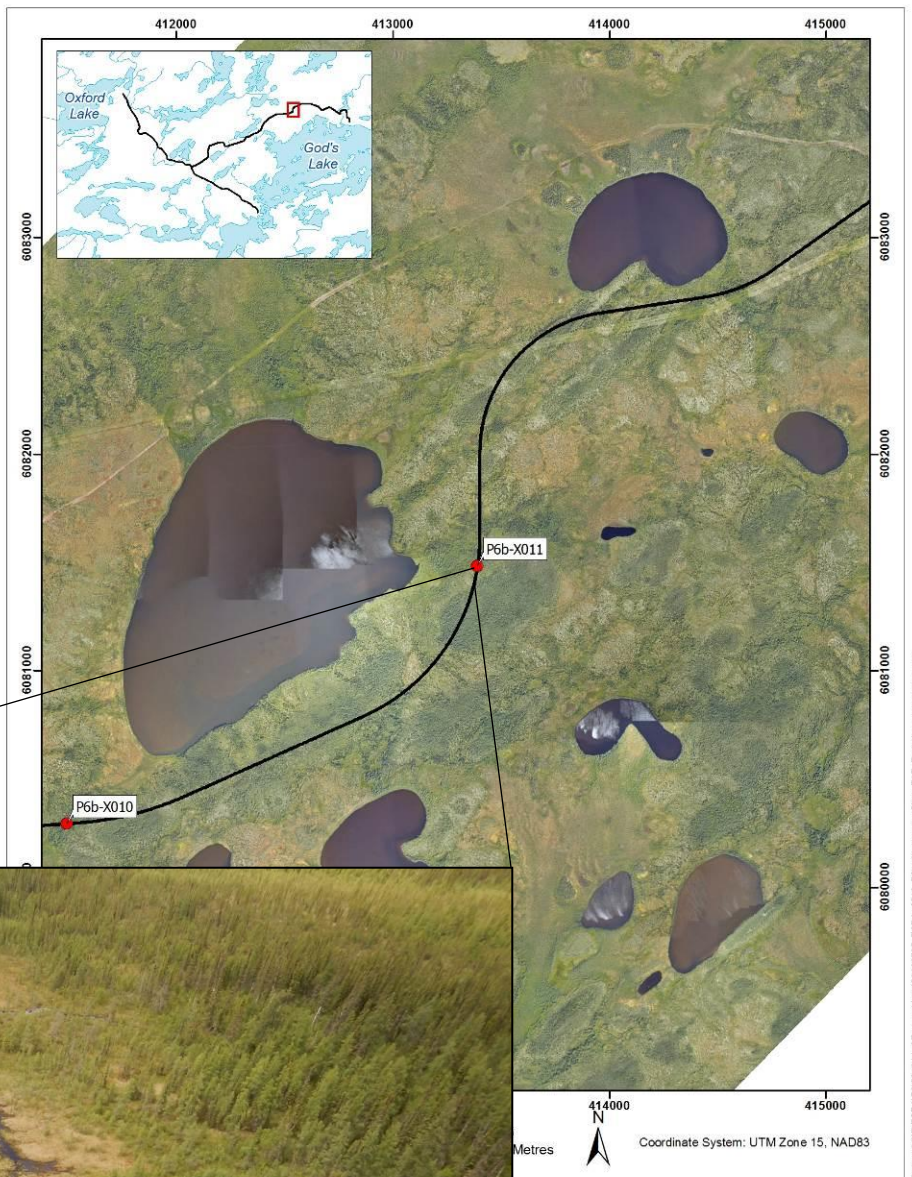


## Location

**Datum:** NAD 83  
**UTM:** 15U 413389 6081483

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 1.04  
**Distance to Major DS**  
**Waterbody (km):** 6.74 (Tapper Lake)  
**Connectivity:** No





## **Fish Habitat Classification**

### **+ Fish Habitat**

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The crossing is located in an ephemeral tributary draining into a small unnamed lake upstream of Tapper Lake. A defined channel was not observed at the crossing site at time of the visit.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## **Crossing Information**

### **+ Proposed Crossing**

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

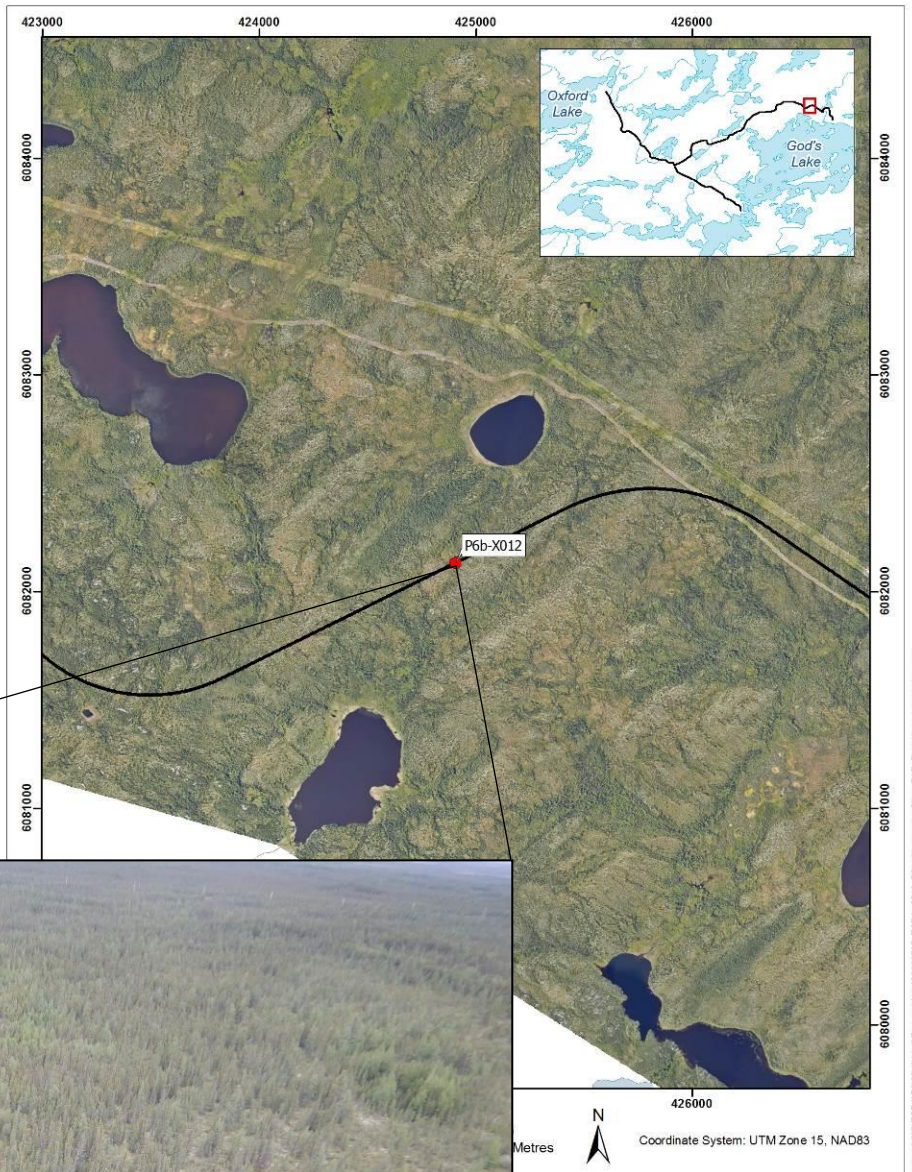
a – pers. comm. ESRA

## Location

**Datum:** NAD 83  
**UTM:** 15U 424907 6082134

## General Morphology

**Type:** Wetland  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage**  
**Area (km<sup>2</sup>):** 1.91  
**Distance to Major DS Waterbody (km):** 3.86 (Gods Lake)  
**Connectivity:** No



## **Fish Habitat Classification**

### **+ Fish Habitat**

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### **Comments**

The crossing is located in an ephemeral tributary draining into a small unnamed lake upstream of Tapper Lake. A defined channel was not observed at the crossing site at time of the visit.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## **Crossing Information**

### **+ Proposed Crossing**

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### **Information Sources:**

a – pers. comm. ESRA

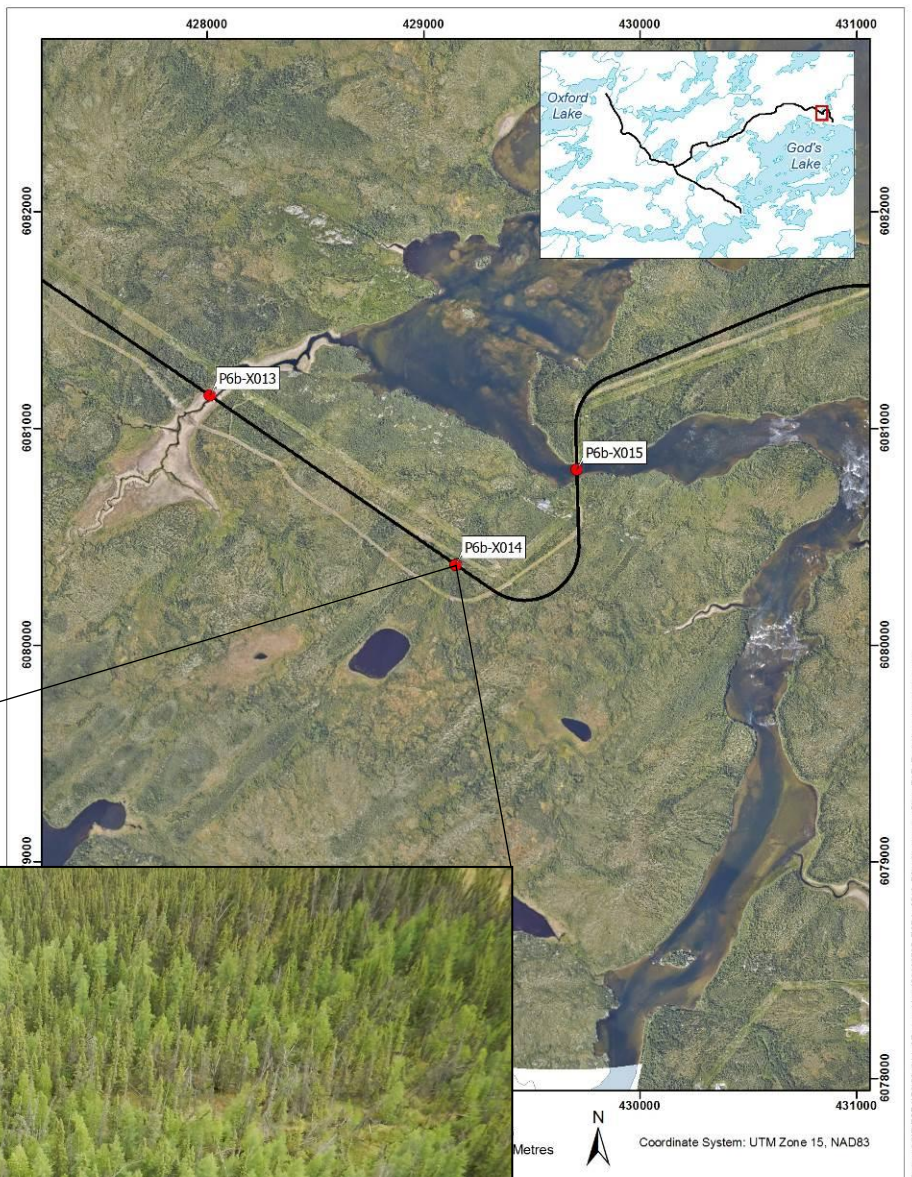


## Location

**Datum:** NAD 83  
**UTM:** 15U 429148 6080372

## General Morphology

**Type:** Stream  
**Canvec Mapped:** Yes  
**Pattern:** -  
**Confinement:** -  
**Flow Regime:** Ephemeral  
**Upstream Drainage Area (km<sup>2</sup>):** 0.31  
**Distance to Major DS Waterbody (km):** 0.59 (Gods River)  
**Connectivity:** No



## Fish Habitat Classification

### + Fish Habitat

<b>Fish Habitat Present</b>	No
<b>Habitat Supports a CRA Fishery</b>	No
<b>Fish Habitat Classification</b>	No Fish Habitat

#### Comments

The crossing is located in a small ephemeral tributary which passes through a forested region and connects a small unnamed lake to God's River. No channel was present within the study area.

The site is classified as No Fish Habitat based on the absence of a channel, standing water, or connection to fish-bearing waters.

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision for Fish Passage</b>	No

#### Information Sources:

a – pers. comm. ESRA

## **APPENDIX 5. STREAM CROSSING ASSESSMENT SUMMARIES ASSESSED AS FISH HABITAT**

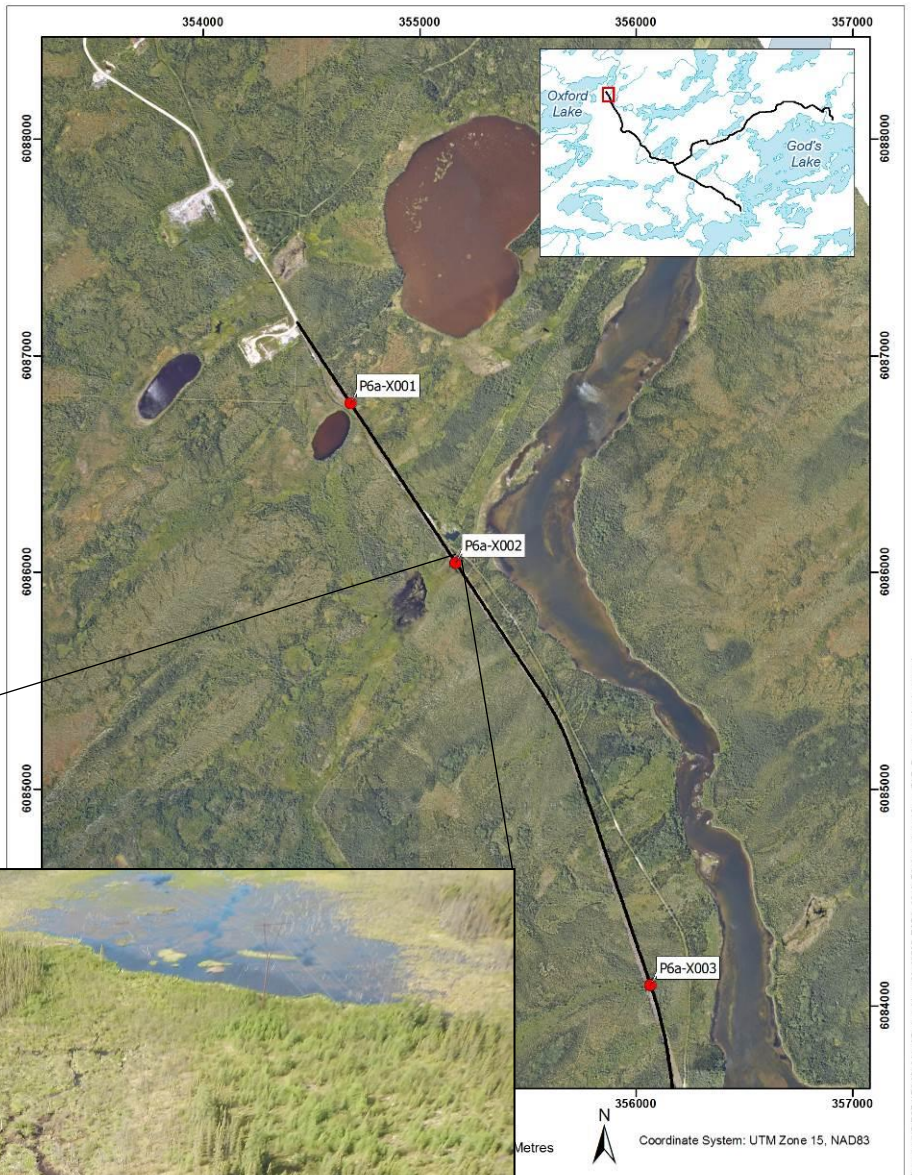


## Location

**Datum:** NAD 83  
**UTM:** 15U 355166 6086046

## General Morphology

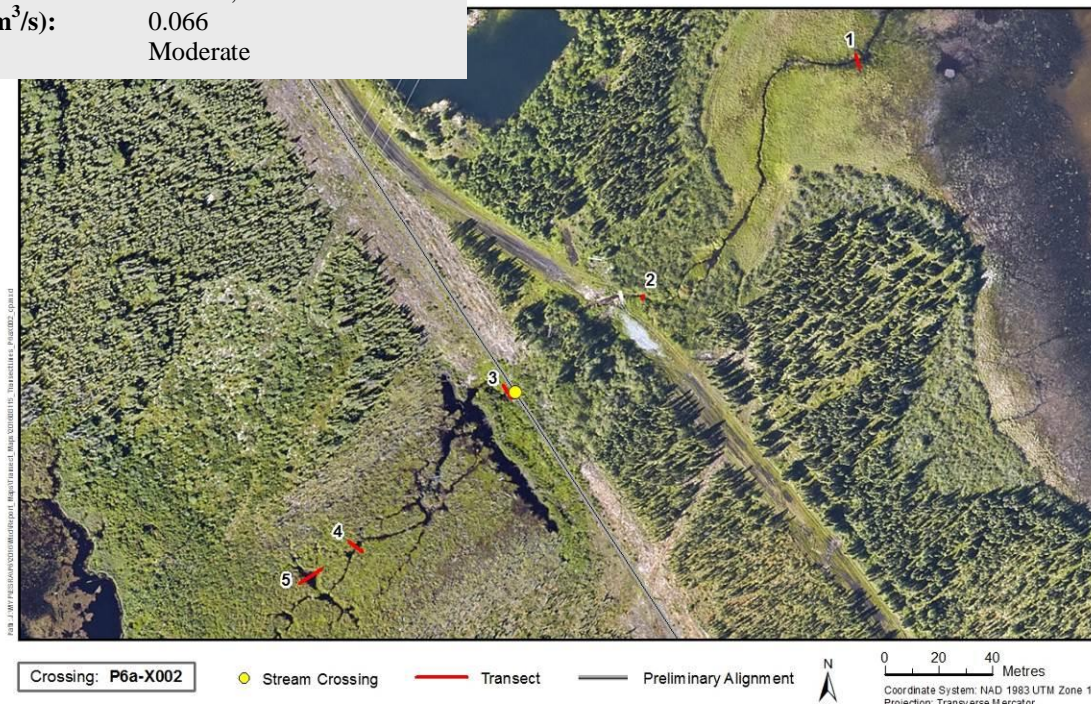
**Type:** Stream  
**Pattern:** Irregular Braided  
**Channel Profile:** Notched  
**Sinuosity:** -  
**Confinement:** Frequently Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 17, 2016  
**Discharge (m<sup>3</sup>/s):** 0.066  
**Stage:** Moderate



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	180 DS	60 DS	0	60 US	100 DS
<b>Channel and Flow</b>					
Channel (m)	1.0	1.10	1.62	1.1	30
Wetted Width (m)	1.0	1.10	1.60	1.1	30
Depth at 25% (m)	0.38	0.22	0.22	0.25	0.3
Depth at 50% (m)	0.64	0.18	0.3	0.4	0.3
Depth at 75% (m)	0.54	0.16	0.2	0.16	0.3
Maximum Depth (m)	0.64	0.22	0.3	0.4	0.3
<b>Gradient (%)</b>	1	1	1	0	0
<b>Banks</b>					
Left Bank Height (m)	0.10	0.3	0.6	0.15	0.3
Right Bank Height (m)	0.1	0.4	0.55	0.15	0.3
Left Bank Shape	Vertical	Vertical	Vertical	Sloping	Sloping
Right Bank Shape	Vertical	Vertical	Vertical	Sloping	Sloping
Left Bank Materials	Fines	Fines/Veg	Fines	Fines/Veg	Fines
Right Bank Materials	Fines/Veg	Fines/Veg	Fines	Fines/Veg	Fines
Left Bank Stability	Moderate	High	Moderate	Moderate	Moderate
Right Bank Stability	Moderate	High	Moderate	Moderate	Moderate
<b>Substrate Type and Distribution (%)</b>					
Fines	100	30	40	100	100
Small Gravel	0	0	25	0	0
Large Gravel	0	0	2.5	0	0
Cobble	0	0	2.5	0	0
Boulder	0	70	30	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	68	10	10	53	53
Right Bank	47	10	10	48	48
<b>Riparian Distance (m)</b>					
Left Bank	68	2	4	53	48
Right Bank	47	2	4	53	48
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA	SHR/ GRA	SHR/ GRA	SHR/ GRA	SHR/ GRA
<b>Canopy Cover (%)</b>	0	20	0	0	5

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type (%)

Transect	1	2	3	4	5
Pool	0	20	20	30	40
Riffle	0	0	0	0	0
Run	100	20	45	40	35
Chute	0	5	0	0	0
Dam	0	0	0	0	25
Boulder	0	55	35	30	0

### + Water Quality Data

<b>Habitat:</b>	Run
<b>Temperature (°C):</b>	18.93
<b>pH:</b>	6.56
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	92
<b>DO (mg/L):</b>	2.96



Upstream view at Transect 3 (0 m).



Downstream view at Transect 3 (0 m).



Bedrock riffle/chute (between Transect 2 and 3).



Downstream view from Transect 1 (180 m D/S).



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	50	80
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	20	6
Overhanging Vegetation	20	20
Instream Vegetation	30	0
Pool	5	25
Boulder	5	25
Undercut Bank	20	12
Surface Turbulence	0	6
Turbidity	0	6

## Fish Presence

### + Fish Habitat Potential

<b>Forage Fish</b>	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	Low	Moderate
Migration	Moderate	High
<b>Large Bodied Fish</b>		
Spawning	Low	High
Rearing	Low	High
Overwinter	Low	Low
Migration	Low	High

#### Comments

The crossing is located at an existing winter road temporary crossing where the stream cuts through two separate and parallel roads and drains a small beaver impacted wetland into the Hayes River 250 m downstream of the crossing. The stream consists mostly of run habitat, with pools, some boulder gardens and a bedrock riffle/chute just downstream of the crossing. The stream is comprised mostly consists of organic substrate, with instream vegetation suitable for various life cycle stages of forage fish and for spawning and rearing of Northern Pike. Gravel/cobble substrate and riffle may provide suitable spawning substrate for sucker species and Walleye as well as some forage species. Overwintering by forage fish is expected in downstream areas due to low water levels and hypoxic conditions upstream.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Johnny Darter, Brook Stickleback

**Existing Information:** none

## ↘ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ↘ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.14

**Distance to Major DS Waterbody (km):** 0.25 (Hayes River)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of run habitat, with a mix of fine substrate and gravel/cobble and boulder likely from the road two road crossings. The presence of coarse substrate in boreal wetland streams such as this one is relatively uncommon.

### + Fishery

**Fishery Area:** Hayes River

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

The crossing is located on a small tributary to the Hayes River near the community of Oxford House, within the traditional territory of the Bunibonibee Cree Nation. The stream provides suitable spawning, rearing and feeding habitat for forage fish species, Northern Pike, and possibly suckers and Walleye.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

Type	Culvert <sup>a</sup>
Diameter (mm)	TBD
Length (m)	TBD
Number of Barrels	TBD
Provision of Fish Passage	Yes

#### Information Sources:

a –pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat potentially suitable for spawning, rearing and feeding of forage fish species which support CRA fishery species and may also provide habitat for Northern Pike, suckers and Walleye
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

Type	Culvert construction and operation
Minor Impact List	No
Residual Impact	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	Although not abundant in this stream, the coarse substrate at the crossing is not unique in the region.
Impact on Relevant Fish	Low	The habitat at the crossing site is suitable for spawning, rearing and feeding of by large-bodied and small bodied species of fish. The area at and downstream of the winter road crossings may be the only location within the creek that contains coarse substrate and if removed would no longer be available to fish species that currently make use of it. The permanent culvert would cover some of the coarse substrate at the site and the placement of rip rap at the culvert inlet/outlet would replace effected substrate so that there is no measureable effect to downstream fisheries.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and replacement of effected substrates, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	48.6 m <sup>2</sup>	0 m <sup>2</sup>	- 48.6 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

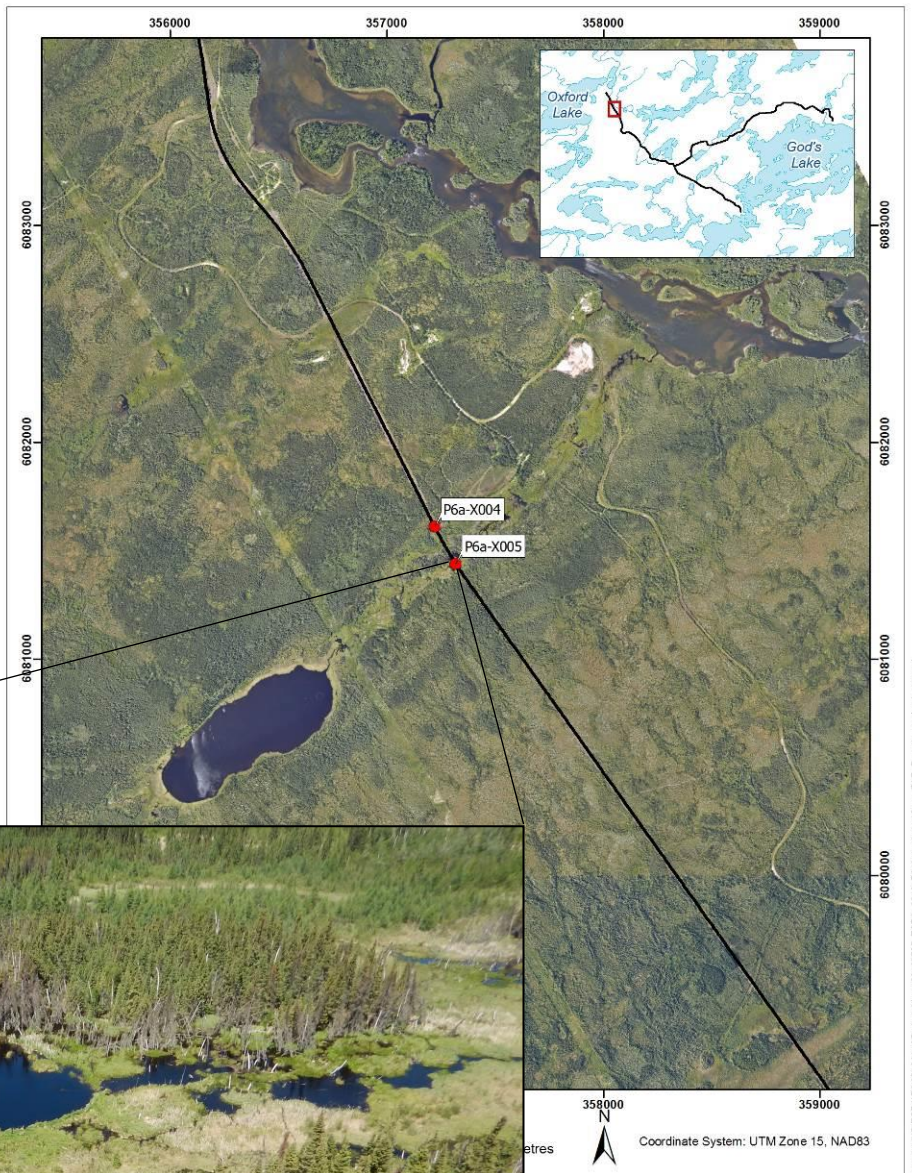
2 – Culvert design unavailable at the time of assessment. Area estimated based on the length of culvert crossings constructed as part of the Provincial Road 304 to Berens River All Season Road Project (30 m) and the channel width at the crossing (1.62 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 357317 6081440

## General Morphology

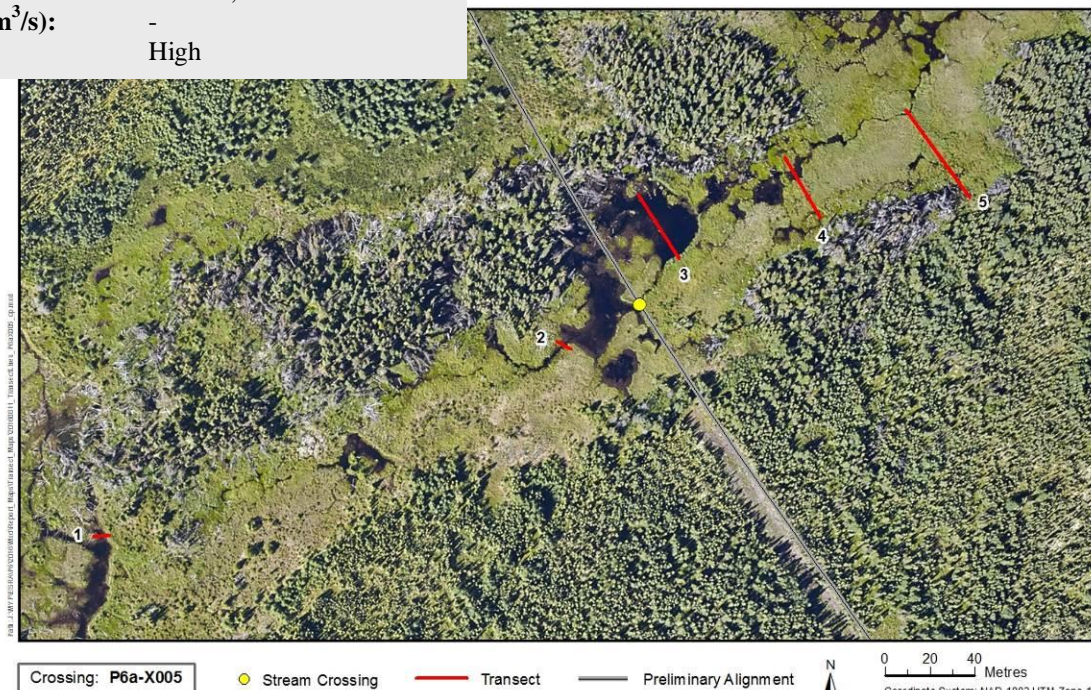
**Type:** Stream  
**Pattern:** Straight  
**Channel Profile:** Notched  
**Sinuosity:** -  
**Confinement:** Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 17, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** High



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	283 US	62 US	0	60 DS	120 DS
<b>Channel and Flow</b>					
Channel (m)	140	2	31	32	117
Wetted Width (m)	-	2	31	32	117
Depth at 25% (m)	>1	>1	>1	>1	-
Depth at 50% (m)	>1	>1	>1	-	-
Depth at 75% (m)	>1	>1	>1	-	-
Maximum Depth (m)	>1	>1	>1	-	-
<b>Gradient (%)</b>	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	-	0	0	0	0
Right Bank Height (m)	-	0	0	0	0
Left Bank Shape	Sloping	Vertical	Vertical	Vertical	Vertical
Right Bank Shape	Sloping	Vertical	Vertical	Vertical	Vertical
Left Bank Materials	Peat	Peat/Bog	Peat	Peat	Peat
Right Bank Materials	Peat	Bog	Peat	Peat	Peat
Left Bank Stability	High	High	Moderate	Moderate	Moderate
Right Bank Stability	High	High	Moderate	Moderate	Moderate
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	70	48	46	117	117
Right Bank	70	24	31	117	117
<b>Riparian Distance (m)</b>					
Left Bank	70	48	46	117	117
Right Bank	70	24	2	117	117
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR
<b>Canopy Cover (%)</b>	20	0	10	0	-

a – GRA = grass; SHR = Shrub

### + Habitat Type (%)

Transect	1	2	3	4	5
Flat	0	0	0	0	0
Pool	70	100	90	100	100
Rapid	0	0	0	0	0
Riffle	0	0	0	0	0
Run	20	0	0	0	0
Dam	10	0	10	0	0

### + Water Quality Data

<b>Habitat: <sup>a</sup></b>	Pool
<b>Temperature (°C):</b>	18.82
<b>pH:</b>	6.81
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	156
<b>DO (mg/L):</b>	2.22

a – BW=backwater



Downstream view at crossing site (Transect 3).



Upstream view at Transect 4, located 60 m downstream from crossing.



Upstream view from Transect 5, located 120 m downstream from crossing.



Downstream view from Transect 1, located 283 m upstream from crossing.

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	35	35
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	15	15
Overhanging Vegetation	5	5
Instream Vegetation	65	65
Pool	15	15
Boulder	0	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Moderate	High
Rearing	Moderate	High
Overwinter	Moderate	Moderate
Migration	Low	Moderate
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located 1.49 km upstream of the Hayes River. The reach has similar habitat both upstream and downstream of the crossing, consisting of a boreal wetland: flat water/pool habitat, organic substrates and instream vegetation. The stream connects a small unnamed lake to the Hayes River and is heavily impacted by beavers. Use by large bodied fish is unlikely as the connection to both waterbodies is hindered by beaver dams and debris. It is, however, suitable for spawning and rearing of forage fish species which may support CRA fisheries species in the Hayes River, provided there is access. Only fish species tolerant of low oxygen conditions are likely to overwinter within the reach.

### + Fish Sampling Data

**Methods:** Dip net

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## ↘ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ↘ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 3.31

**Distance to Major DS Waterbody (km):** 1.49 (Hayes River)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site consists mainly of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Hayes River, Knee Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

The crossing is located on an unnamed tributary which feeds into the Hayes River and is within the traditional territories of Bunibonibee Cree Nation. The stream provides suitable spawning, rearing, feeding and overwintering habitat for forage fish species tolerant of low oxygen conditions. Due to the barriers between the crossing and the Hayes River, contributions to the CRA fishery are expected to be minimal.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a – pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The crossing contains habitat suitable for spawning, rearing and feeding of forage fish species tolerant of low oxygen conditions. Contributions to a CRA fishery would be minimal because of poor connectivity to the Hayes River.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	Construction of the crossing is expected to have no measurable effect on the CRA fishery productivity. The habitat in the immediate crossing area supports a range of life requisites primarily for forage fishes, including spawning, rearing and feeding, however, connectivity to the nearest relevant fish bearing waterbody is restricted because of the heavy beaver activity.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	930 m <sup>2</sup>	0 m <sup>2</sup>	- 930 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

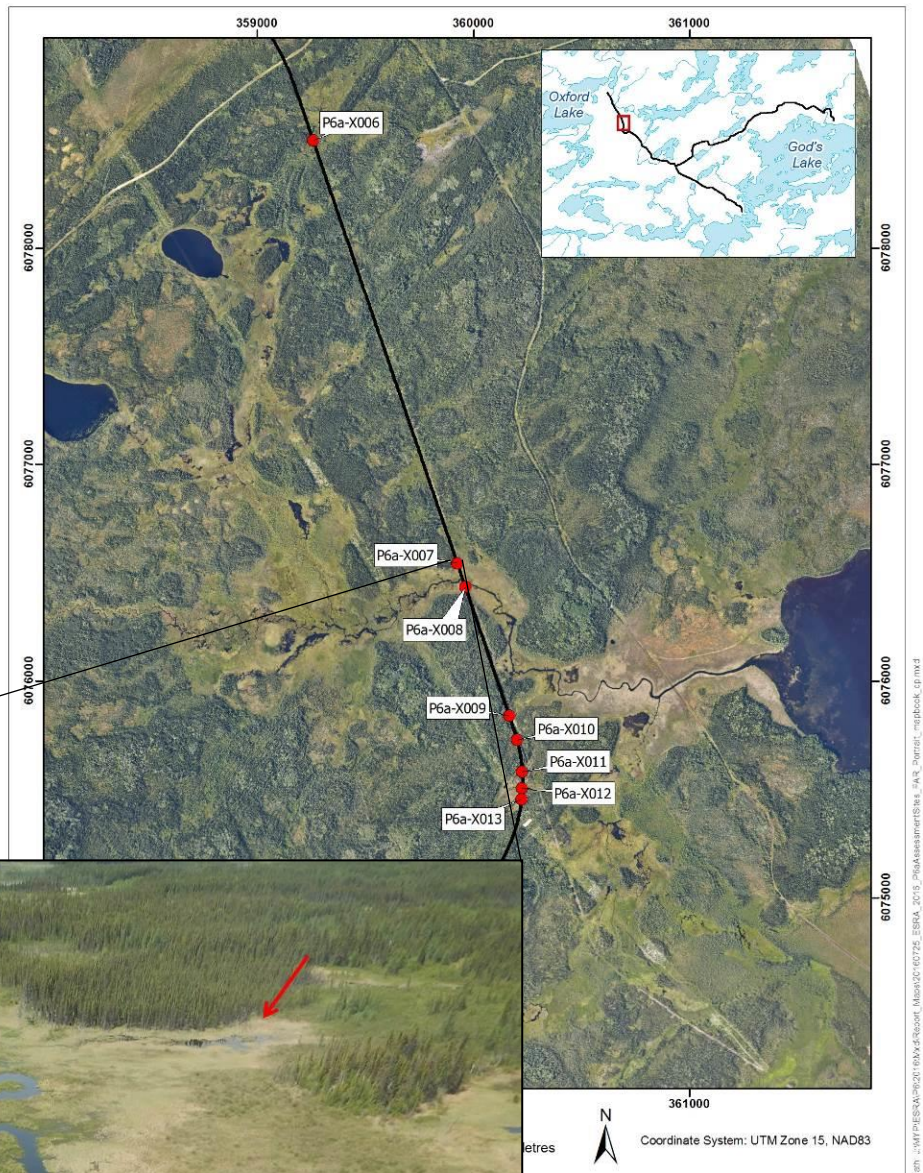
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (31 m).

## Location

Datum: NAD 83  
UTM: 15U 359925 6076546

## General Morphology

Type: Wetland  
Pattern: -  
Channel Profile: -  
Sinuosity: -  
Confinement: Unconfined  
Flow Regime: Ephemeral





## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.00  
**Distance to Major DS Waterbody (km):** 2.17 (Michikanes Lake)  
**Connectivity:** Yes - unlikely

#### Comments

The crossing site is located in a wetland region that drains into a tributary of Michikanes Lake. Habitat consists of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Michikanes Lake

#### Fishery Users:

Commercial <sup>a</sup>	No
Recreational	Yes
Aboriginal	Yes – Bunibonibee Cree Nation

#### Comments

The crossing is located near an unnamed tributary that feeds into Michikanes Lake. It is within the traditional territories of Bunibonibee Cree Nation. The area may provide suitable spawning, rearing and feeding habitat for forage fish species tolerant of low oxygen conditions. The unnamed tributary immediately downstream of the crossing provides suitable spawning, rearing and feeding habitat for Northern Pike and small bodied fish supporting CRA fishery species.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

Type	Culvert <sup>a</sup>
Diameter (mm)	TBD
Length (m)	30 m
Number of Barrels	TBD
Provision for Fish Passage	Yes

#### Information Sources:

a – pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The crossing contains habitat suitable for spawning, rearing and feeding of forage fish species tolerant of low oxygen conditions. Contributions to a CRA fishery would be minimal because of poor connectivity to Michikanes Lake.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

Type	Culvert construction and operation
Minor Impact List	No
Residual Impact	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	Construction of the crossing is expected to have no measurable effect on the CRA fishery productivity. The habitat in the immediate crossing area supports a range of life requisites primarily for forage fishes, including spawning, rearing and feeding, however, channel development and connectivity to the nearest relevant fish bearing waterbody is limiting.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

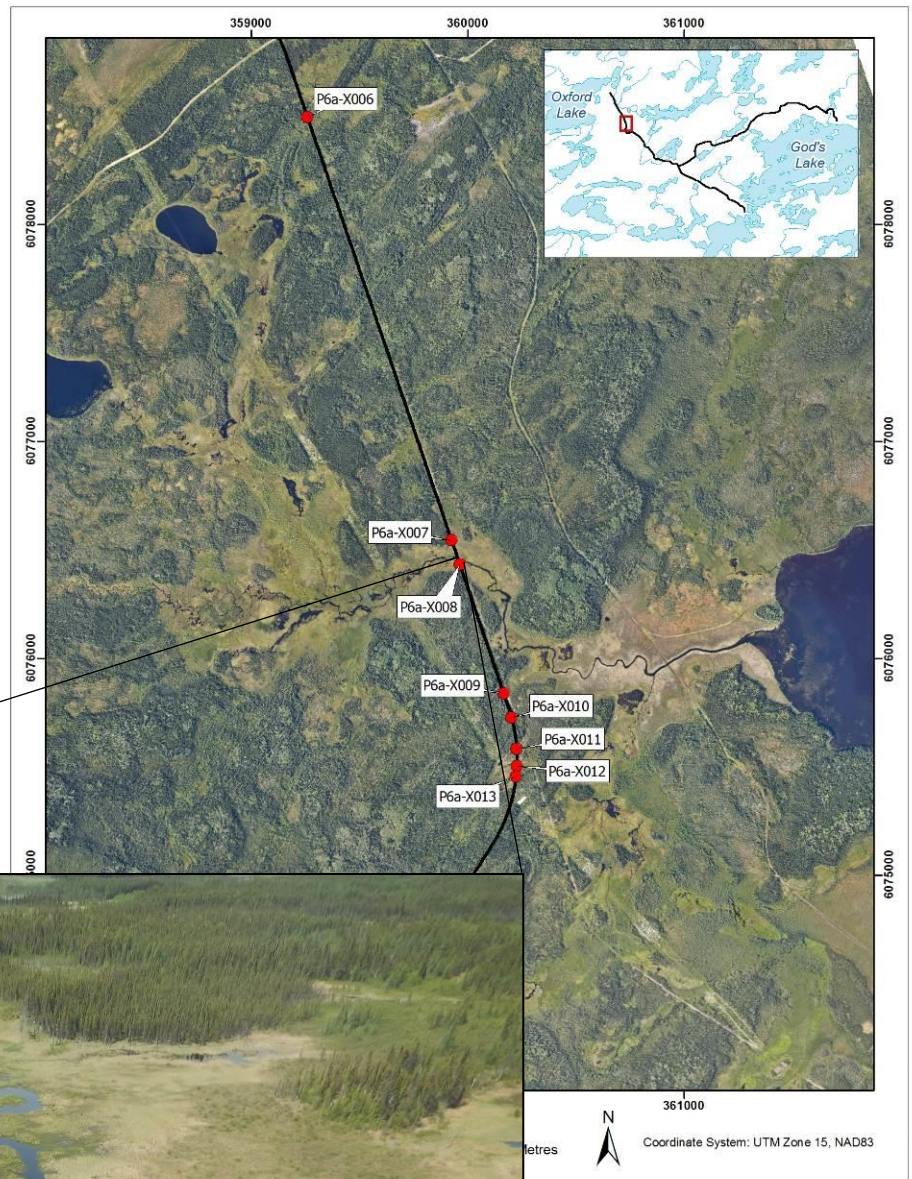
**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Location

**Datum:** NAD 83  
**UTM:** 15U 359963 6076436

## General Morphology

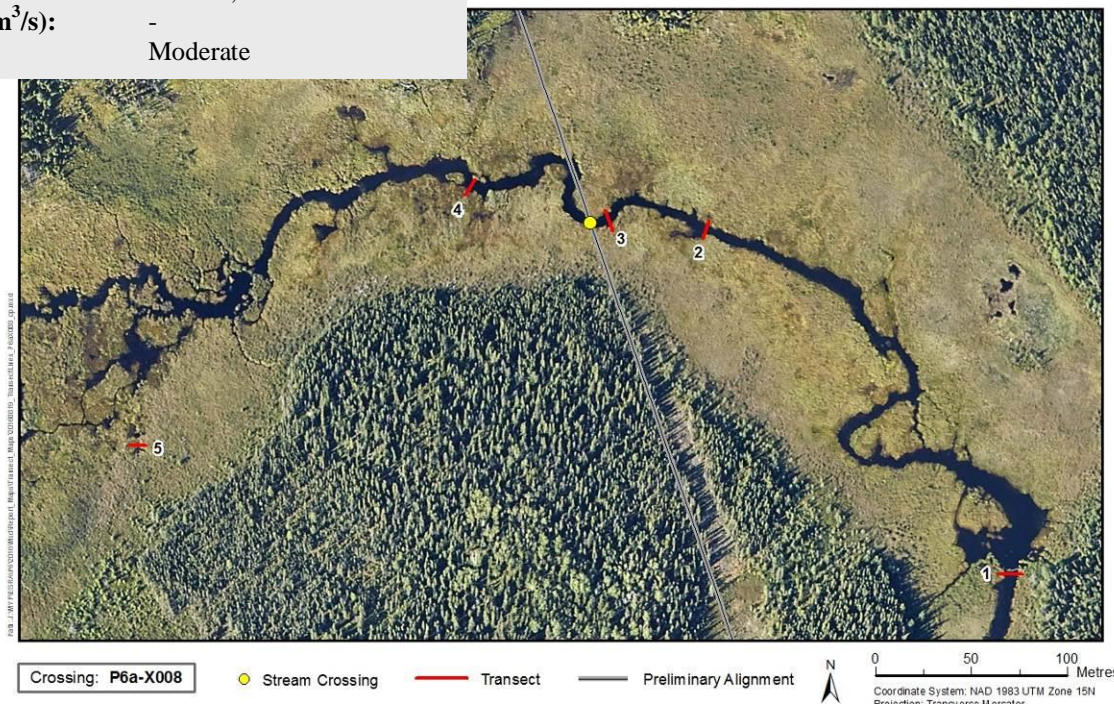
**Type:** Fen Stream  
**Pattern:** Meandering  
**Channel Profile:** U-shaped  
**Sinuosity:** -  
**Confinement:** Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 16, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### + Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	400 DS	60DS	0	60 US	400 US
<b>Channel and Flow</b>					
Channel (m)	8	8	10	8	-
Wetted Width (m)	8	8	10	8	-
Depth at 25% (m)	1	1.98	3	0.83	-
Depth at 50% (m)	>1	-	>3	>2	-
Depth at 75% (m)	0.9	1.8	0.84	-	-
Maximum Depth (m)	>1	-	>3	>2	-
<b>Gradient (%)</b>	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0	0	0	0	0
Right Bank Height (m)	0	0	0	0	0
Left Bank Shape	Vertical	Vertical	Sloping	Vertical	Vertical
Right Bank Shape	Vertical	Vertical	Sloping	Vertical	Vertical
Left Bank Materials	Peat/fines	Peat	Peat	Peat	Peat
Right Bank Materials	Peat/fines	Peat	Peat	Peat	Peat
Left Bank Stability	High	High	High	High	High
Right Bank Stability	High	High	High	High	High
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.

## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	58	67	62	53	20
Right Bank	6	134	108	131	144
<b>Riparian Distance (m)</b>					
Left Bank	15	20	26	43	10
Right Bank	2	18	63	75	10
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR
<b>Canopy Cover (%)</b>	0	0	0	0	0

a – GRA = grass; SHR = Shrub

### + Habitat Type (%)

Transect	1	2	3	4	5
Flat	0	70	70	-	30
Pool	50	30	30	-	70
Rapid	0	0	0	-	0
Riffle	0	0	0	-	0
Run	50	0	0	-	0
Cascade	0	0	0	-	0

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	21.69
<b>pH:</b>	6.56
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	137
<b>DO (mg/L):</b>	4.02



Downstream view at crossing site (Transect 3).



Upstream view at Transect 1, located 400 m downstream from crossing.



Downstream view at Transect 1, located 400 m downstream from crossing.



Upstream view at Transect 5 (400 m upstream of crossing), showing upstream extent of flooded beaver pond.

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	-	45
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	-	10
Overhanging Vegetation	-	0
Instream Vegetation	-	90
Pool	-	0
Boulder	-	0
Undercut Bank	-	0
Surface Turbulence	-	0
Turbidity	-	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	High	High
<b>Large Bodied Fish</b>		
Spawning	High	High
Rearing	High	High
Overwinter	Moderate	Moderate
Migration	Moderate	High

#### Comments

The crossing is located approximately 2 km from the stream's confluence with Michikanes Lake. The upstream extent of the area (i.e. Transect 5) consists of a flooded beaver pond. Habitat within the survey reach consists of flat water, organic substrate and instream vegetation suitable for spawning, rearing and feeding of forage fish species and Northern Pike. Floating bog is abundant. Though small bodied fish tolerant of low oxygen conditions may overwinter within the reach, large bodied species (e.g. Northern Pike) likely overwinter in Michikanes Lake. There appears to be no barriers preventing access to the crossing site from the lake.

### + Fish Sampling Data

**Methods:** Electrofishing, Visual Survey

**Fish Species Captured:** Northern Pike, Brook Stickleback

**Existing Information:** none



## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 39.24

**Distance to Major DS Waterbody (km):** 2.01 (Michikanes Lake)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Michikanes Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

The unnamed stream feeds into Michikanes Lake, within the traditional territories of Bunibonibee Cree Nation. The stream provides suitable spawning, rearing and feeding habitat for Northern Pike and small bodied fish supporting CRA fishery species.

#### Information Sources:

a – Manitoba Conservation 2014

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –ESRA pers. comm.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike. The crossing is approximately 1.5 km from Michikanes Lake with potential to support overwintering large bodied fish.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream and upstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	300 m <sup>2</sup>	0 m <sup>2</sup>	- 300 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (10 m).

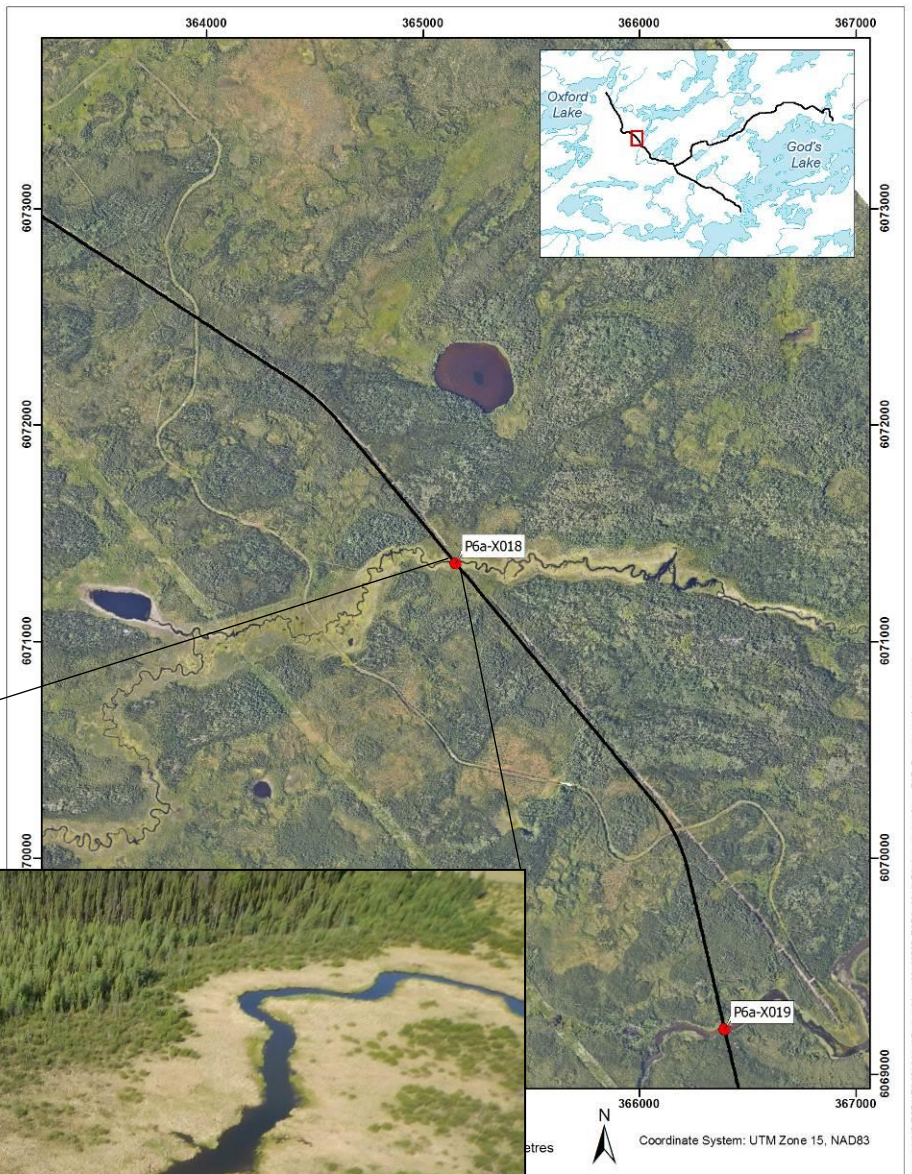


## Location

**Datum:** NAD 83  
**UTM:** 15U 365150 6071363

## General Morphology

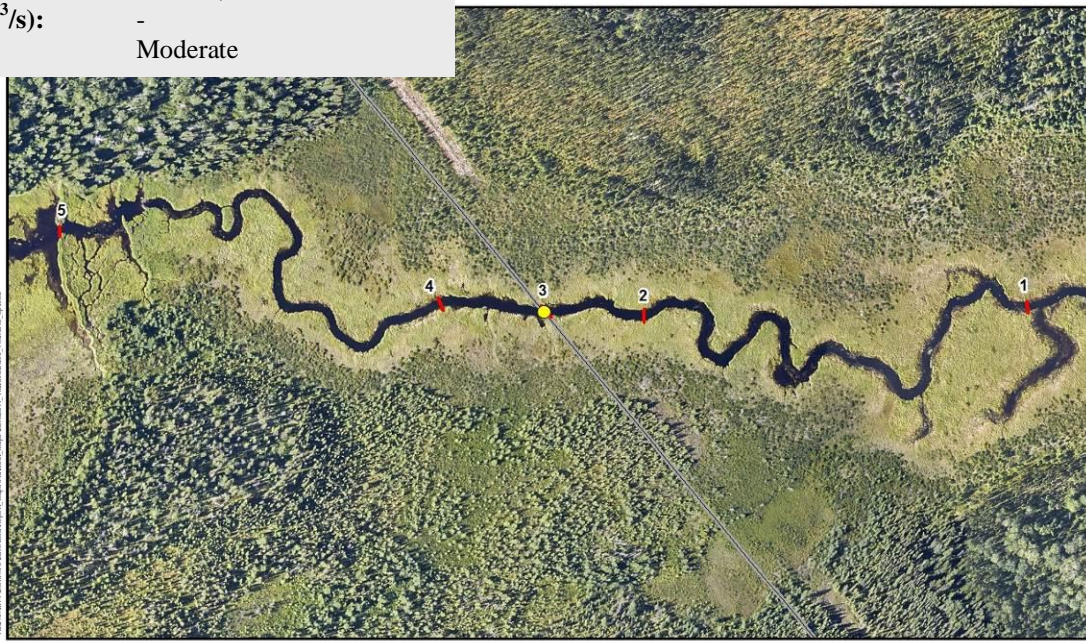
**Type:** Stream  
**Pattern:** Meandering  
**Channel Profile:** U-Shape  
**Sinuosity:** -  
**Confinement:** Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 16, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



Crossing: P6a-X018

 Stream Crossing

 Transect

 Preliminary Alignment



0 50 100 Metres  
 Coordinate System: NAD 1983 UTM Zone 15N  
 Projection: Transverse Mercator  
 Units: Meter For illustration only.

### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	300 DS	60 DS	0	60 US	300 US
<b>Channel and Flow</b>					
Channel (m)	8	8	9	10	6
Wetted Width (m)	8	8	9	10	6
Depth at 25% (m)	0.94	0.68	1.54	0.2	0.56
Depth at 50% (m)	>1	>1	>1	>1	>1
Depth at 75% (m)	0.67	0.9	0.16	0.6	0.6
Maximum Depth (m)	>1	>1	>1	>1	>1
Gradient (%)	1	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.1	0.2	0.1	0.2	0.55
Right Bank Height (m)	0.1	0.2	0.1	0.2	0.2
Left Bank Shape	Vertical	Vertical	Vertical	Vertical	Vertical
Right Bank Shape	Vertical	Vertical	Vertical	Vertical	Vertical
Left Bank Materials	Silt/Organics	Silt/Organics	Silt/Organics	Silt/Organics	Silt/Organics
Right Bank Materials	Silt/Organics	Silt/Organics	Silt/Organics	Silt/Organics	Silt/Organics
Left Bank Stability	High	High	High	High	High
Right Bank Stability	High	High	High	High	High
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.

## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	87	50	31	56	90
Right Bank	93	48	73	128	22
<b>Riparian Distance (m)</b>					
Left Bank	57	20	21	30	90
Right Bank	23	24	9	16	22
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR
<b>Canopy Cover (%)</b>	0	0	0	0	0

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type (%)

Transect	1	2	3	4	5
Flat	90	100	85	95	-
Pool	10	0	15	5	-
Rapid	0	0	0	0	-
Riffle	0	0	0	0	-
Run	0	0	0	0	-
Boulder	0	0	0	0	-

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	19.81
<b>pH:</b>	6.51
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	138
<b>DO (mg/L):</b>	4.10



Upstream view at crossing site (Transect 3).



Downstream view at crossing site (Transect 3).



Downstream view at Transect 2 (60 m downstream from crossing).



Upstream view from beaver dam, located immediately downstream from Transect 5.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	12	10
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	10	10
Overhanging Vegetation	0	0
Instream Vegetation	70	80
Pool	0	0
Boulder	20	0
Undercut Bank	0	10
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

<b>Forage Fish</b>	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	Moderate	High
<b>Large Bodied Fish</b>		
Spawning	High	High
Rearing	High	High
Overwinter	Moderate	High
Migration	Moderate	High

#### Comments

This perennial stream is approximately 14 km long, connecting McLaughlin Lake to Knee Lake. There is a beaver dam located upstream transect (i.e., T5). The crossing is located approximately 4.6 km upstream from the stream's confluence with Knee Lake. Habitat within the reach consists of a broad channel within a grass floodplain, soft substrates and abundant instream vegetation along each shoreline, suitable for spawning, rearing and feeding by Northern Pike and forage fish. Although small bodied fish may overwinter within the reach, large bodied fish (i.e., Northern Pike) likely overwinter in either McLaughlin or Knee Lake.

### + Fish Sampling Data

**Methods:** Electrofishing, Visual Survey

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 68.58

**Distance to Major DS Waterbody (km):** 4.63 (Knee Lake)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Knee Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes – Fishing Lodge (North Star Resort)

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

This unnamed tributary connects McLaughlin Lake to Knee Lake, within the traditional territories of Bunibonibee Cree Nation. The stream provides suitable spawning, rearing and feeding habitat for Northern Pike.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike. Overwintering habitat is present in the headwater lake as well as the receiving lake.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream and upstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	270 m <sup>2</sup>	0 m <sup>2</sup>	- 270 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

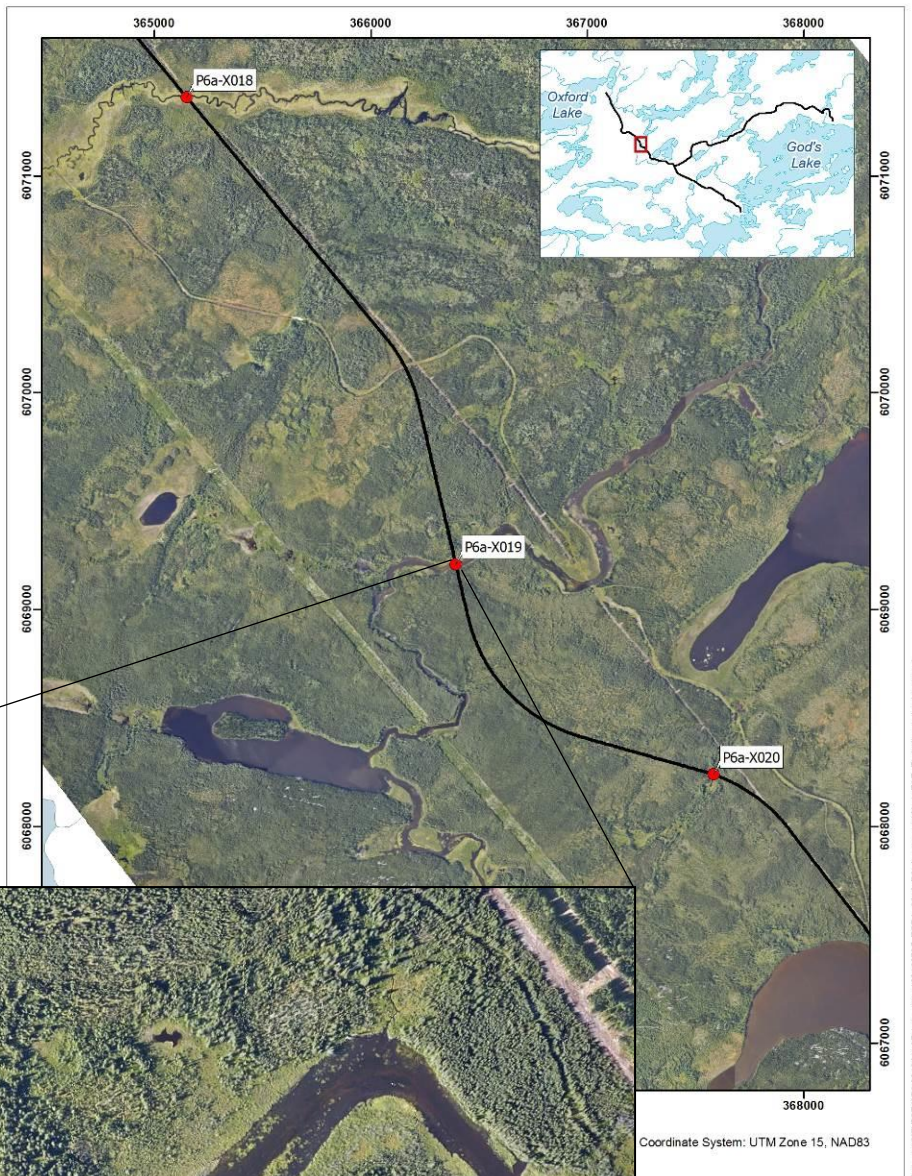
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (9 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 366392 6069210

## General Morphology

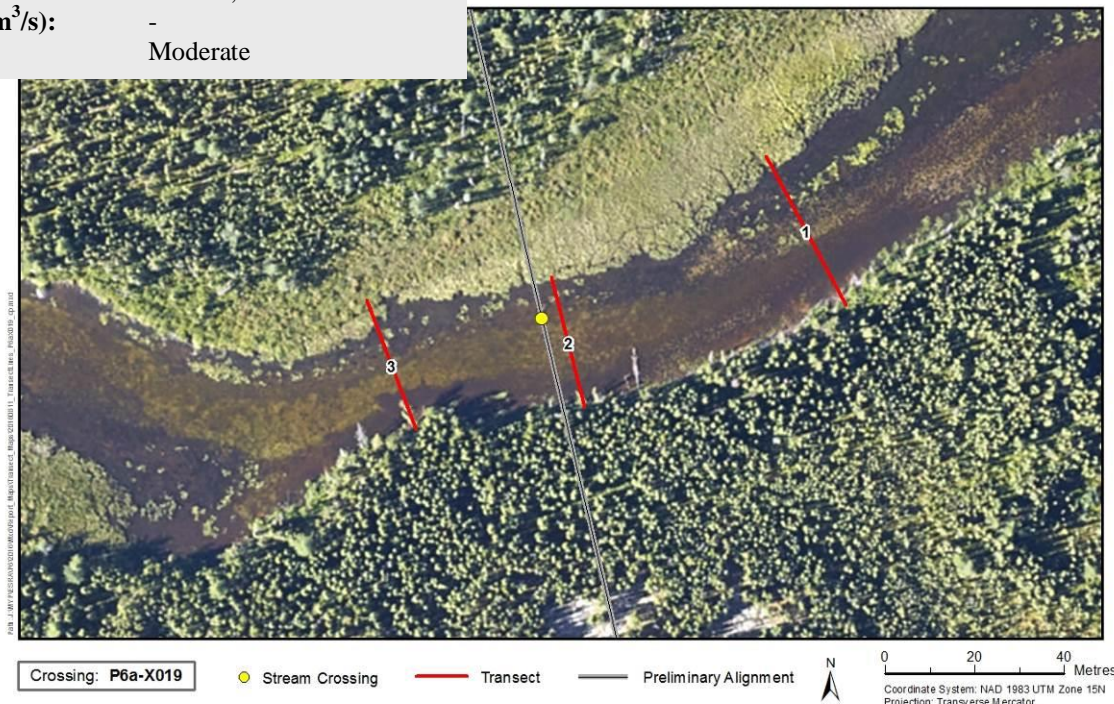
**Type:** Stream  
**Pattern:** Sinuous  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Frequently Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 21, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	60 DS	0	60 US	-	-
<b>Channel and Flow</b>					
Channel (m)	31.7	29.5	29	-	-
Wetted Width (m)	41.7	29.5	29	-	-
Depth at 25% (m)	0.25	0.55	0.96	-	-
Depth at 50% (m)	0.93	0.8	0.85	-	-
Depth at 75% (m)	0.63	0.7	0.48	-	-
Maximum Depth (m)	1.06	0.8	0.96	-	-
<b>Gradient (%)</b>	1	1	1	-	-
<b>Banks</b>					
Left Bank Height (m)	0.6	0.6	0.9	-	-
Right Bank Height (m)	0	0	0.1	-	-
Left Bank Shape	Vertical	Undercut	Undercut	-	-
Right Bank Shape	Vertical	Vertical	Vertical	-	-
Left Bank Materials	Fines/Organics	Fines/Organics	Bedrock/Fines	-	-
Right Bank Materials	Fines/Organics	Fines/Organics	Fines/Organics	-	-
Left Bank Stability	Moderate	Moderate	Moderate	-	-
Right Bank Stability	Moderate	High	High	-	-
<b>Substrate Type and Distribution (%)</b>					
Fines	90	90	60	-	-
Small Gravel	0	0	2	-	-
Large Gravel	0	0	2	-	-
Cobble	0	0	6	-	-
Boulder	10	10	10	-	-
Bedrock	0	0	20	-	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	2	2	2	-	-
Right Bank	31	32	27	-	-
<b>Riparian Distance (m)</b>					
Left Bank	2	2	2	-	-
Right Bank	19	13	15	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/	GRA/	GRA/	-	-
	SHR/	SHR/	SHR/	-	-
	-	CON	CON	-	-
<b>Canopy Cover (%)</b>					
	50	50	50	-	-

a – GRA = grass; SHR = Shrub; CON = coniferous

### + Habitat Type

Transect	1	2	3	4	5
Flat	0	0	0	-	-
Pool	20	20	20	-	-
Rapid	0	0	0	-	-
Riffle	0	0	0	-	-
Run	70	70	70	-	-
Boulder Garden	10	10	10	-	-

### + Water Quality Data

<b>Habitat:</b>	Run
<b>Temperature (°C):</b>	17.12
<b>pH:</b>	7.35
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	131
<b>DO (mg/L):</b>	7.22



Upstream view at crossing site (Transect 2).



Right bank view at crossing site (Transect 2).



Upstream view from Transect 1 (60 m downstream).

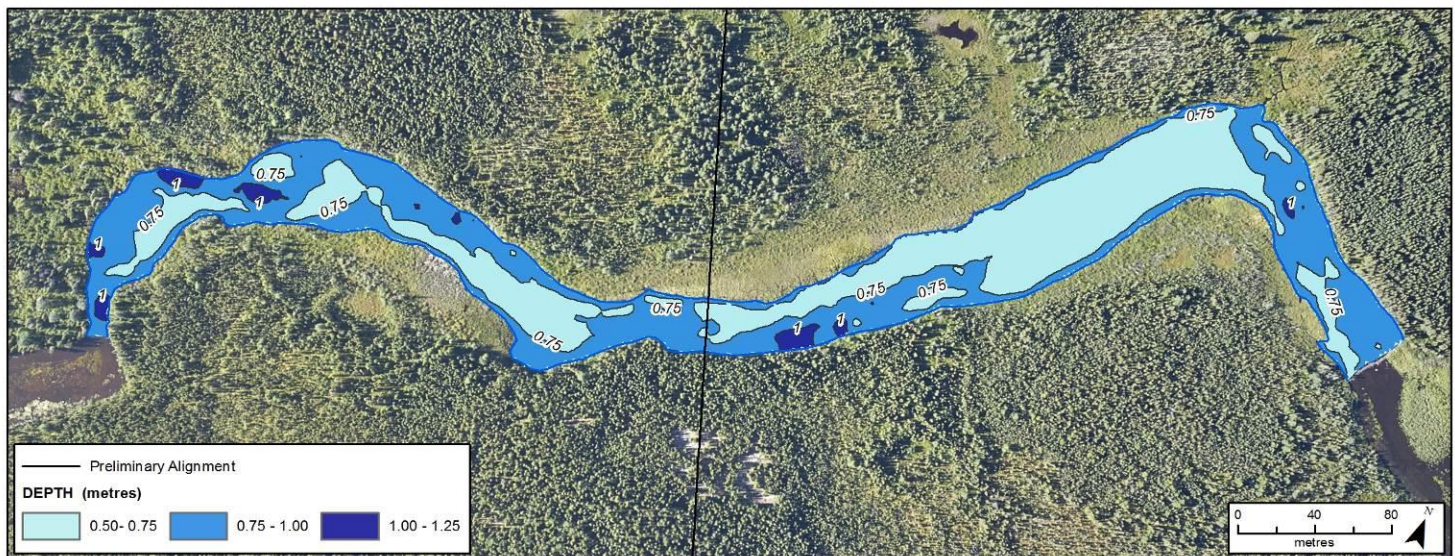


Potential beaver dam located 400 m downstream from crossing.



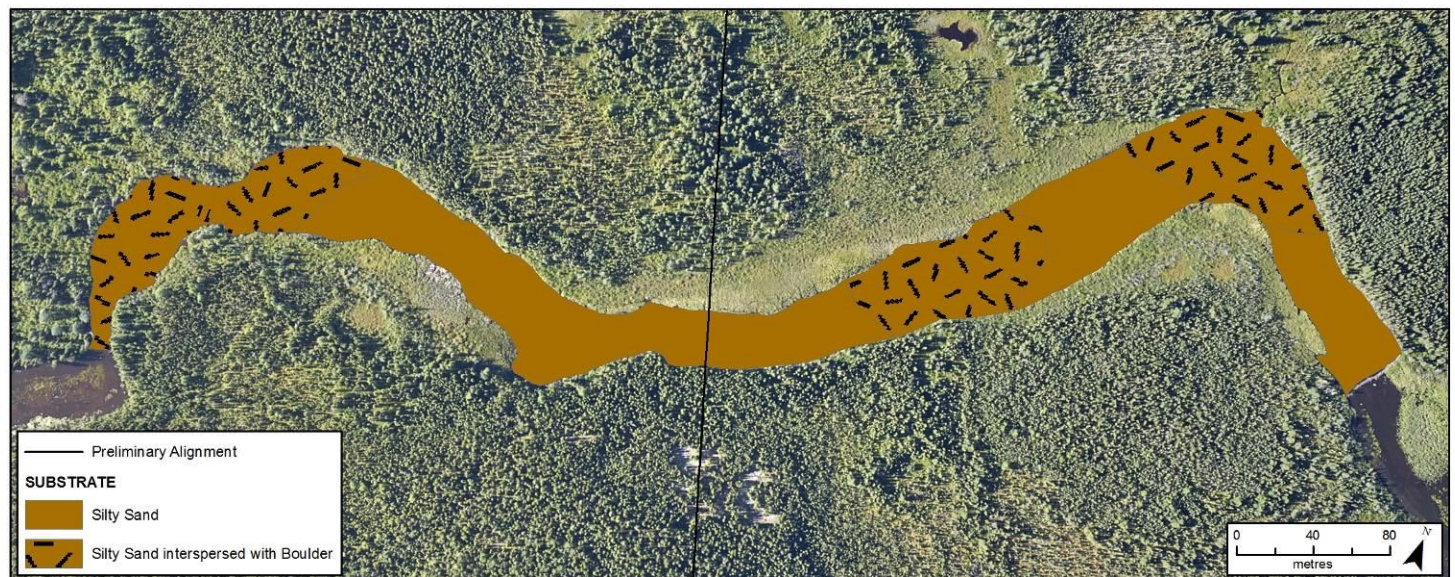
## ↘ Site Conditions Continued

### + Bathymetric Map



Note: This is a generalized substrate map, intended for fish habitat assessment. It should not be used for navigation or design purposes.

### + Substrate Map



Note: This is a generalized substrate map, intended for fish habitat assessment. It should not be used for navigation or design purposes.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	55	70
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	20	13
Overhanging Vegetation	35	30
Instream Vegetation	20	13
Pool	0	13
Boulder	25	30
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	High	High
<b>Large Bodied Fish</b>		
Spawning	High	High
Rearing	High	High
Overwinter	Low	Low
Migration	High	High

#### Comments

Magill Creek is a long stream connecting a string of smaller lakes to the receiving waterbody, Knee Lake. The crossing is located 7.4 km upstream of Knee Lake. Habitat within the reach consists largely of fine sediments with boulders and instream vegetation. There is some gravel/cobble habitat, suitable as spawning and rearing habitat may sucker and Walleye. Habitat is suitable for spawning, rearing, and feeding Northern Pike and forage fish. Overwintering of large bodied species likely occurs in the deeper waters of Knee Lake.

### + Fish Sampling Data

**Methods:** Gillnetting

**Fish Species Captured:** Northern Pike, Shorthead Redhorse, Yellow Perch

**Existing Information:** none



## Mussel Presence

### + Mussel Sampling Data

**Methods:** Mussel Rake

**Mussel Species Captured:** Fatmucket, Giant Floater

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 186.54

**Distance to Major DS Waterbody (km):** 7.40 (Knee Lake)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of flat-water habitat, with a mix of fine and coarse substrates, with instream vegetation and boulders for cover. This type of habitat is not considered rare or unique within the stream or project area.

### + Fishery

**Fishery Area:** Knee Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes – Fishing Lodge (North Star Resort)

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

Magill Creek is a major tributary connecting a string of upstream lakes to the receiving Knee Lake. The crossing is located within the traditional territory of the Bunibonibee Cree Nation. The creek provides suitable spawning, rearing and feeding habitat for Northern Pike, Yellow Perch, suckers and Walleye.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

Type	TBD <sup>a</sup>
Diameter (mm)	TBD
Length (m)	TBD
Number of Barrels	TBD
Provision of Fish Passage	Yes

#### Information Sources:

a –Crossing design may be either a bridge, arch culvert or multiple culverts - pers. comm. ESRA. For the purpose of the risk assessment, a two-span bridge was assumed as the crossing design.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike, Yellow Perch, suckers and spawning Walleye. The crossing is 5 km from Knee Lake which would support overwintering of large bodied fish.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

Type	Two-span bridge construction and operation	
Minor Impact List	No	
Residual Impact	Channel infilling from a single instream pier Habitat alteration from rip rap placement at base of the pier	
Attribute	Rating	Comment
Extent of Impact	Low	Infilling and rip rap placement will be limited to the footprint and immediate base of the pier.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat at the crossing site provides suitable habitat for CRA fishery species (i.e. Walleye, sucker, Northern Pike). This type of habitat is not considered to be critical or limiting as similar habitat is plentiful in the region, as are the affected species. Fish are expected to fulfill their life requisites using the habitats located outside of the footprint of the pier more suited to spawning and rearing. Negative impacts to fish populations from rip rap placement are unlikely as it provides a similar substrate to current conditions. Habitat impacts are expected to result in no measureable effect to local fish populations.

### + Risk of Serious Harm to Fish

<b>Risk Rating:</b>	LOW
<b>Qualification:</b>	Based on the small area of impact, abundance of similar habitat within the system, and absence of critical or limiting habitat, bridge construction is expected to have minimal impact on the productivity of local fish populations.

## Net Habitat Change

### Habitat Change

#### Type of Structure: Three-span Bridge

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	161.5 m <sup>2</sup>	0 m <sup>2</sup>	161.5 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	5.84 m <sup>2</sup>	0 m <sup>2</sup>	-5.84 m <sup>2</sup>

Net Habitat Change was calculated for a two-span bridge crossing that requires one instream pier. Should a different crossing design be selected, recalculation of the net habitat change is required

- 1 – Bridge design was unavailable at the time of assessment. Area calculated as the area rip rap armouring around the one pier and was estimated based on AECOM design drawings provided in Plans PR 304 to Berens River All Season Road Alignment Tender No. B5 Pigeon River Bridge, issued October 3, 2013.
- 2 – Bridge design was unavailable at the time of assessment. Habitat loss is estimated using the area of one pier from the Pigeon River bridge design (based on AECOM design drawings provided in Plans PR 304 to Berens River All Season Road Alignment Tender No. B5 Pigeon River Bridge, issued October 03, 2013)

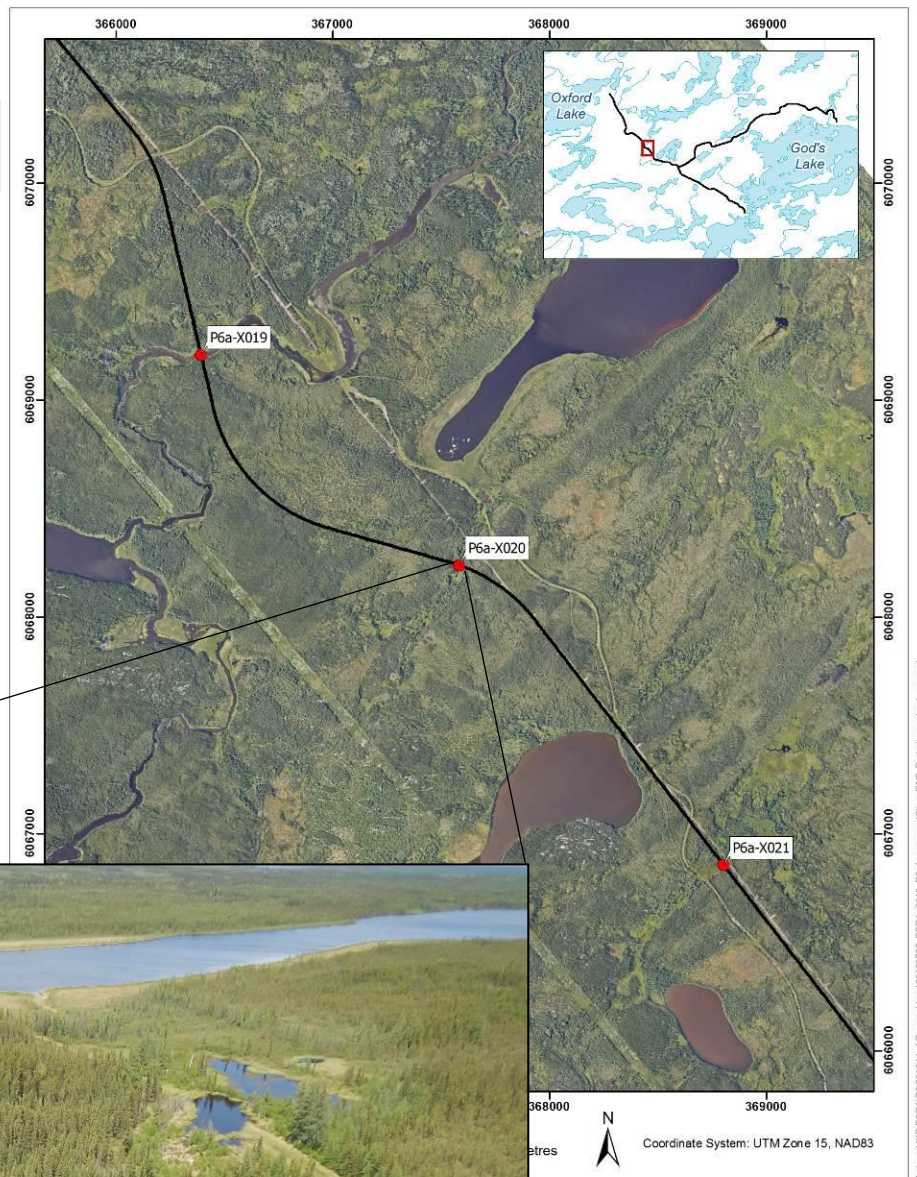


## Location

**Datum:** NAD 83  
**UTM:** 15U 367584 6068240

## General Morphology

**Type:** Stream  
**Pattern:** Irregular Meandering  
**Channel Profile:** Notched  
**Sinuosity:** -  
**Confinement:** Confined  
**Flow Regime:** Intermittent





## Site Conditions


**Survey Date:** June 15, 2016  
**Discharge (m<sup>3</sup>/s):** 0.116  
**Stage:** Moderate



Crossing: P6a-X020

 Stream Crossing

 Transect

 Preliminary Alignment



0 50 100 Metres  
 Coordinate System: NAD 1983 UTM Zone 15N  
 Projection: Transverse Mercator  
 Units: Meter For illustration only.

### Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	300 DS	60 DS	0	60 US	250 US
<b>Channel and Flow</b>					
Channel (m)	0.80	1.3	0.70	0.9	0.9
Wetted Width (m)	0.80	1.1	0.6	0.9	0.9
Depth at 25% (m)	0.24	0.05	0.1	0.05	0.2
Depth at 50% (m)	0.32	0.21	0.23	0.22	0.30
Depth at 75% (m)	0.34	0.18	0.1	0.05	0.30
Maximum Depth (m)	0.34	0.21	0.23	0.22	0.3
Gradient (%)	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.5	0.2	0.4	0	0.2
Right Bank Height (m)	0.1	0.04	0.4	0	0.2
Left Bank Shape	Sloping	Sloping	Vertical	Undercut	Undercut
Right Bank Shape	Vertical	Sloping	Vertical	Undercut	Vertical
Left Bank Materials	Silt	Silt	Silt/Peat	Silt/Grass	Silt
Right Bank Materials	Silt/Peat	Silt/Peat	Silt/Peat	Silt/Grass	Silt
Left Bank Stability	High	High	High	High	High
Right Bank Stability	High	High	High	High	High
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	10	2	5	27	20
Right Bank	10	5	5	22	20
<b>Riparian Distance (m)</b>					
Left Bank	-	5	25	32	20
Right Bank	20	10	15	27	20
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR/ MIX	MIX	SHR/ GRA	GRA/ SHR	MIX
<b>Canopy Cover (%)</b>					
	>80	100	40	0	100

a – GRA = grass; SHR = Shrub; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	80	20	0	10	70
Pool	20	0	0	25	30
Rapid	0	0	0	0	0
Riffle	0	80	100	45	0
Run	0	0	0	20	0
Cascade	0	0	0	0	0

### + Water Quality Data

<b>Habitat:</b>	Flat/Riffle
<b>Temperature (°C):</b>	12.36
<b>pH:</b>	6.65
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	98
<b>DO (mg/L):</b>	3.06



Downstream view at crossing site (Transect 3).



Upstream view at Transect 1 (>300 m DS of crossing).



Downstream view at Transect 2 (60 m downstream of crossing)



View of pool created by dam located between the crossing site and Transect 4 (60 m upstream of crossing).



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	35	95
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	20	15
Overhanging Vegetation	40	60
Instream Vegetation	5	5
Pool	25	10
Boulder	0	0
Undercut Bank	10	10
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Low	Moderate
Migration	Low	Moderate
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	None	Low
Migration	Low	Low

#### Comments

The crossing is located midway through a forested section of the tributary which passes through a small unnamed lake before draining into Magill Creek, and eventually Knee Lake. Habitat consisted of organic substrates with riparian cover and good flow. Limited connectivity created by beaver activity creates pools suitable for fish but is expected to prevent access by CRA fishery species to the crossing site.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Fathead Minnow, Brook Stickleback

**Existing Information:** none

## ↘ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ↘ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.36

**Distance to Major DS Waterbody (km):** 7.81 (Knee Lake)

**Connectivity:** Yes - unlikely

#### Comments

The habitat at the crossing site consists mainly of a shallow forested stream with organic substrate. Cover consists mostly of large woody debris and overhanging vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Knee Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes – Fishing Lodge (North Star Resort)

Aboriginal Yes – Bunibonibee FN

#### Comments

This unnamed creek feeds into Knee Lake, within the traditional territories of the Bunibonibee Cree Nation. The creek provides habitat for forage fish species tolerant of low oxygen waters and is unlikely to provide direct habitat for CRA fishery species.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The habitat at the crossing may support small bodied fish, however it is far from the main fish bearing waterbody and is unlikely to contribute to the CRA fishery in Knee Lake.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute minimally to the downstream CRA fishery as it is suitable for forage fish only, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) as it is situated well downstream of the crossing site. Direct access to the crossing by large bodied species is unlikely.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## **Net Habitat Change**

### **Type of Structure: Culvert**

#### **Type of Structure: Culvert**

<b>Effect</b>	<b>Pathway of Effect</b>	<b>Proposed Area Affected</b>	<b>Existing Area Affected</b>	<b>Loss/Gain</b>
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	21 m <sup>2</sup>	0 m <sup>2</sup>	- 21 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

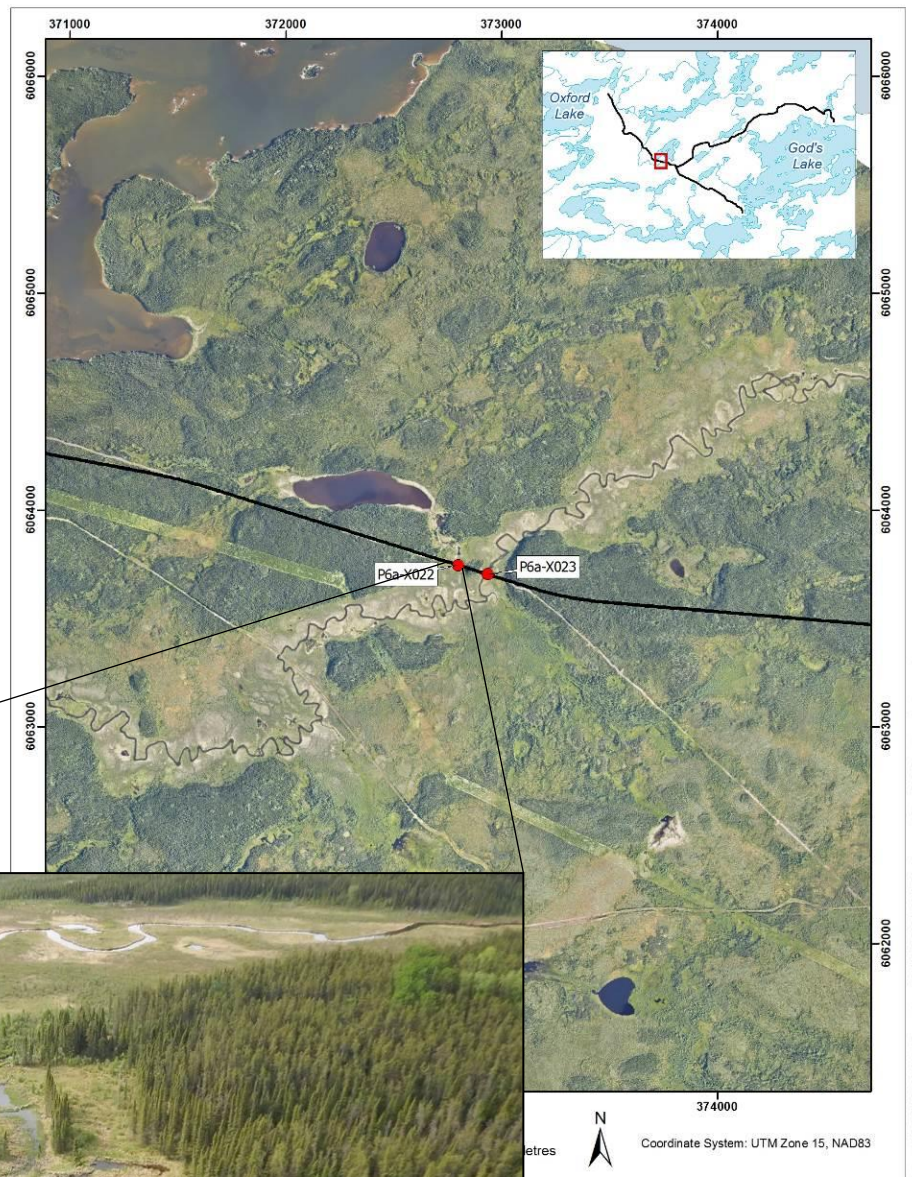
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (0.70 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 3727981 6063748

## General Morphology

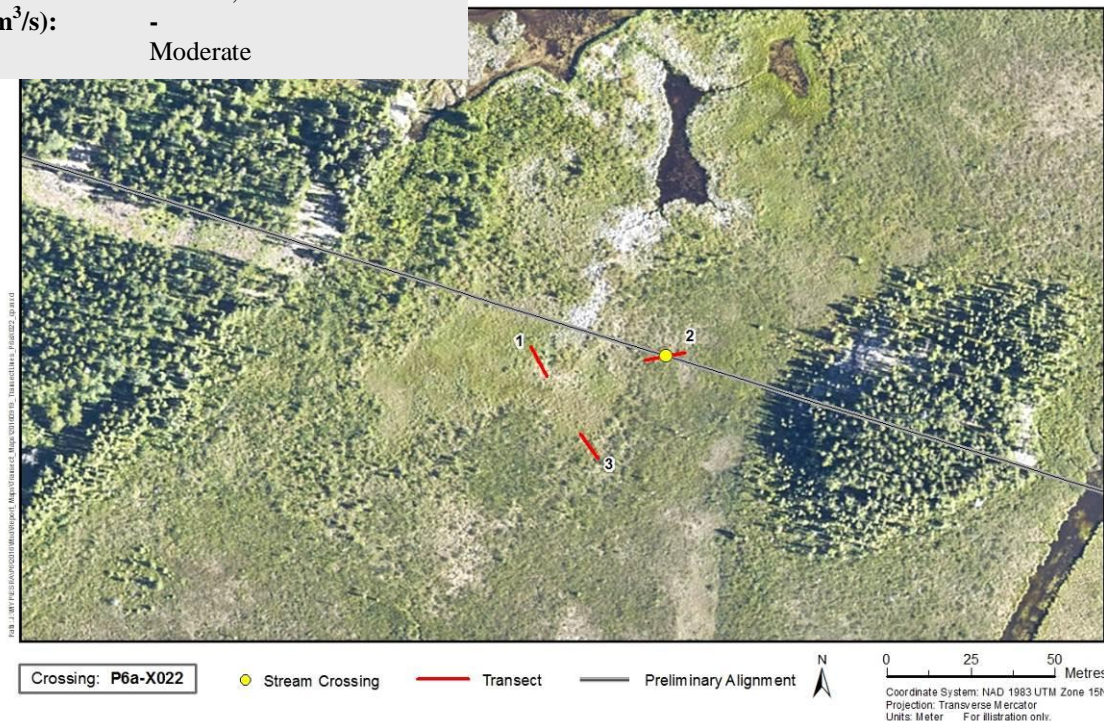
**Type:** Wetland  
**Pattern:** Irregular Wandering  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Ephemeral





## Site Conditions

**Survey Date:** June 15, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### + Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	60	0	60	-	-
<b>Channel and Flow</b>					
Channel (m)	N/A	0.10	N/A	-	-
Wetted Width (m)	N/A	0.10	N/A	-	-
Depth at 25% (m)	-	<0.05	-	-	-
Depth at 50% (m)	-	<0.05	-	-	-
Depth at 75% (m)	-	<0.05	-	-	-
Maximum Depth (m)	-	-	-	-	-
<b>Gradient (%)</b>	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	N/A	0	N/A	-	-
Right Bank Height (m)	N/A	0	N/A	-	-
Left Bank Shape	N/A	N/A	N/A	-	-
Right Bank Shape	N/A	N/A	N/A	-	-
Left Bank Materials	N/A	N/A	N/A	-	-
Right Bank Materials	N/A	N/A	N/A	-	-
Left Bank Stability	N/A	High	N/A	-	-
Right Bank Stability	N/A	High	N/A	-	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	-	-
Small Gravel	0	0	0	-	-
Large Gravel	0	0	0	-	-
Cobble	0	0	0	-	-
Boulder	0	0	0	-	-
Bedrock	0	0	0	-	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	10	10	10	-	-
Right Bank	10	10	10	-	-
<b>Riparian Distance (m)</b>					
Left Bank	20	20	20	-	-
Right Bank	20	20	20	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR	GRA/ SHR	GRA/ SHR	-	-
<b>Canopy Cover (%)</b>					
	-	-	-	-	-

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	N/A	100	N/A	-	-
Pool	N/A	0	N/A	-	-
Rapid	N/A	0	N/A	-	-
Riffle	N/A	0	N/A	-	-
Run	N/A	0	N/A	-	-
Cascade	N/A	0	N/A	-	-

### + Water Quality Data

<b>Habitat:</b>	Flat//N/A
<b>Temperature (°C):</b>	17.56
<b>pH:</b>	6.7
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	148
<b>DO (mg/L):</b>	1.72



Downstream view at crossing site (Transect 2).



Bog/wetland at Transect 1 (60 m from crossing).



Bog at Transect 3 (60 m from crossing).



At a small pond northwest of crossing site.

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	100	100
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	0	0
Overhanging Vegetation	50	50
Instream Vegetation	50	50
Pool	0	0
Boulder	0	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

<b>Forage Fish</b>	<b>US</b>	<b>DS</b>
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located in an ephemeral tributary/bog area which drains a small unnamed lake into an unnamed tributary of Lair Lake which lies 14 km downstream. Habitat consists of bog with very little water present and no defined channel visible. Habitat at the crossing site has overall low fish habitat potential.

### + Fish Sampling Data

**Methods:** Not sampled

**Fish Species Captured:** N/A

**Existing Information:** none

## ↘ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ↘ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 1.06

**Distance to Major DS Waterbody (km):** 14.00 (Laird Lake)

**Connectivity:** Yes- unlikely

#### Comments

The crossing site consists mainly of low water bog habitat, dominated by soft organic substrates, and instream and wetland vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Laird Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

This unnamed boggy area connects an unnamed lake, upstream to Laird Lake and is located within the traditional territories of the Bunibonibee Cree Nation. The nearby ponds provide marginal fish habitat potential for forage fish species but are limited by access.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The absence of a defined channel, marginal quality of habitat at the site and the distance from overwintering areas greatly limit the potential for the site to support CRA species.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation	
<b>Minor Impact List</b>	No	
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet	
Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute minimally to the downstream CRA fishery as it is marginally suitable for forage fish only. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) as it is situated well downstream of the crossing site. Direct access to the crossing by large bodied species is unlikely.

### + Risk of Serious Harm to Fish

<b>Risk Rating:</b>	LOW
<b>Qualification:</b>	Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	3 m <sup>2</sup>	0 m <sup>2</sup>	- 3 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

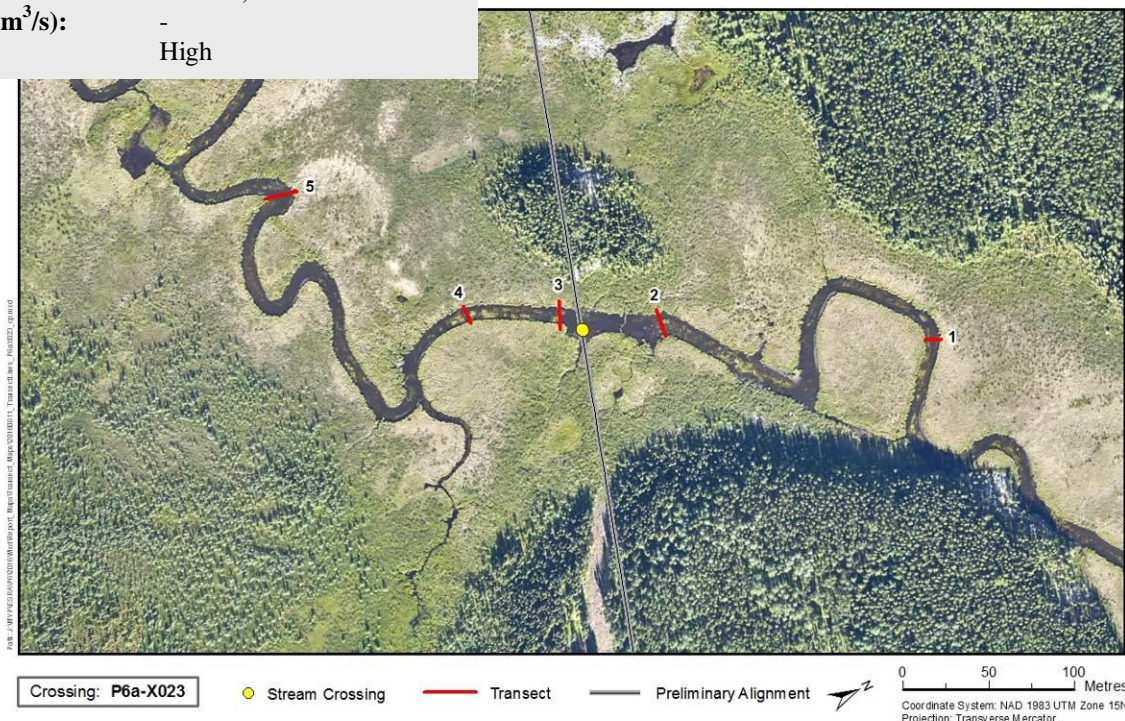
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (0.10 m).





## Site Conditions

**Survey Date:** June 14, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** High



### + Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	400 US	60 US	0	60 DS	400 DS
<b>Channel and Flow</b>					
Channel (m)	9	18	10	10	16
Wetted Width (m)	9	18	10	10	16
Depth at 25% (m)	0.60	0.15	0.5	0.5	0.2
Depth at 50% (m)	-	-	-	-	-
Depth at 75% (m)	-	-	-	-	-
Maximum Depth (m)	-	-	-	-	-
<b>Gradient (%)</b>	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.1	0.3	0.3	0.2	0.1
Right Bank Height (m)	0.1	0.3	0.3	0.2	0.1
Left Bank Shape	Vertical	Vertical	Vertical	Vertical	Vertical
Right Bank Shape	Vertical	Vertical	Vertical	Vertical	Vertical
Left Bank Materials	Organics	Organics/Silt	Organics/Silt	Organics/Silt	Organics/Silt
Right Bank Materials	Organics	Organics/Silt	Organics/Silt	Organics/Silt	Organics/Silt
Left Bank Stability	Moderate	Moderate	Moderate	Moderate	Moderate
Right Bank Stability	Moderate	Moderate	Moderate	Moderate	Moderate
<b>Substrate Type and Distribution (%)</b>					
Fines	100	70	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	30	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.

## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	10	10	10	10	20
Right Bank	10	10	15	10	20
<b>Riparian Distance (m)</b>					
Left Bank	15	30	15	65	115
Right Bank	100	40	75	120	200
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR	GRA/ SHR
<b>Canopy Cover (%)</b>	0	1	10	1	0

a – GRA = grass; SHR = Shrub

### + Habitat Type

Transect	1	2	3	4	5
Flat	100	100	100	100	100
Pool	0	0	0	0	0
Rapid	0	0	0	0	0
Riffle	0	0	0	0	0
Run	0	0	0	0	0
Cascade	0	0	0	0	0

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	16.5
<b>pH:</b>	6.57
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	101
<b>DO (mg/L):</b>	2.7



Upstream view at crossing site (Transect 3).



Downstream view at Transect 1 (400 m upstream of crossing).



Looking upstream at small tributary between upstream transects 1 and 2.



Upstream view at Transect 5 (400 m downstream of crossing).

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	35	31
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	4	3
Overhanging Vegetation	0	0
Instream Vegetation	30	33
Pool	30	33
Boulder	6	0
Undercut Bank	30	33
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

<b>Forage Fish</b>	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	Moderate	Moderate
Migration	High	High
<b>Large Bodied Fish</b>		
Spawning	High	High
Rearing	High	High
Overwinter	Low	Low
Migration	High	High

#### Comments

The crossing is located on a perennial stream connecting Magill and Laird lakes, approximately 4 km downstream from its headwaters at Magill Lake. The reach has similar habitat both upstream and downstream of the crossing, consisting of slow flowing flat water, organic substrate and instream vegetation suitable for spawning, rearing and feeding by Northern Pike and forage fish. While pike likely overwinter in the lakes, forage fish may overwinter within the stream itself. White sucker may also use the creek to feed on benthic invertebrates.

### + Fish Sampling Data

**Methods:** Electrofishing, Visual Survey

**Fish Species Captured:** Brook Stickleback, Northern Pike

**Existing Information:** none



## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 42.00

**Distance to Major DS Waterbody (km):** 13.95 (Laird Lake)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of slow flowing, flat-water habitat, dominated by soft organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Laird Lake, MaGill Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

This unnamed stream connects Magill Lake, upstream, to Laird Lake and is located within the traditional territories of the Bunibonibee Cree Nation. The creek provides suitable spawning, rearing and feeding habitat for Northern Pike.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream and upstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	300 m <sup>2</sup>	0 m <sup>2</sup>	- 300 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (10 m).

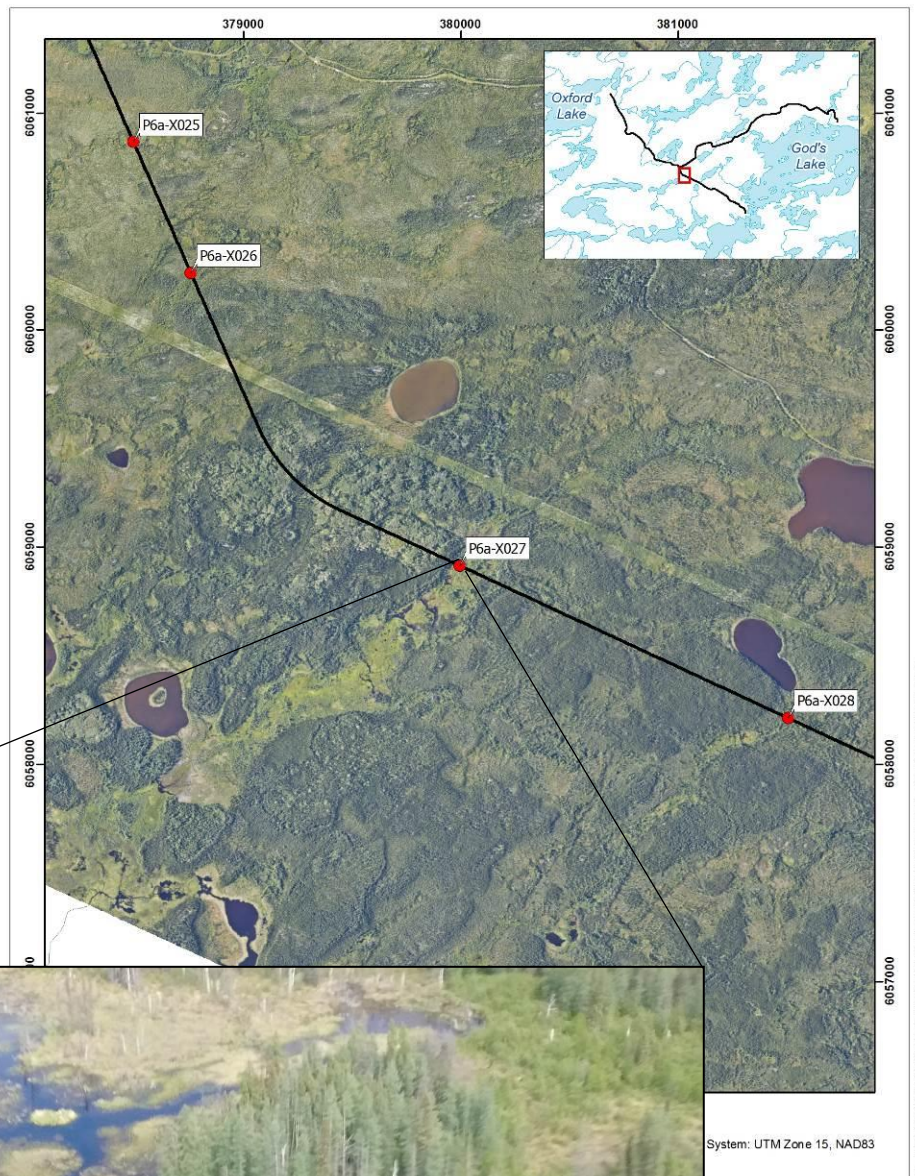


## Location

**Datum:** NAD 83  
**UTM:** 15U 379995 6058916

## General Morphology

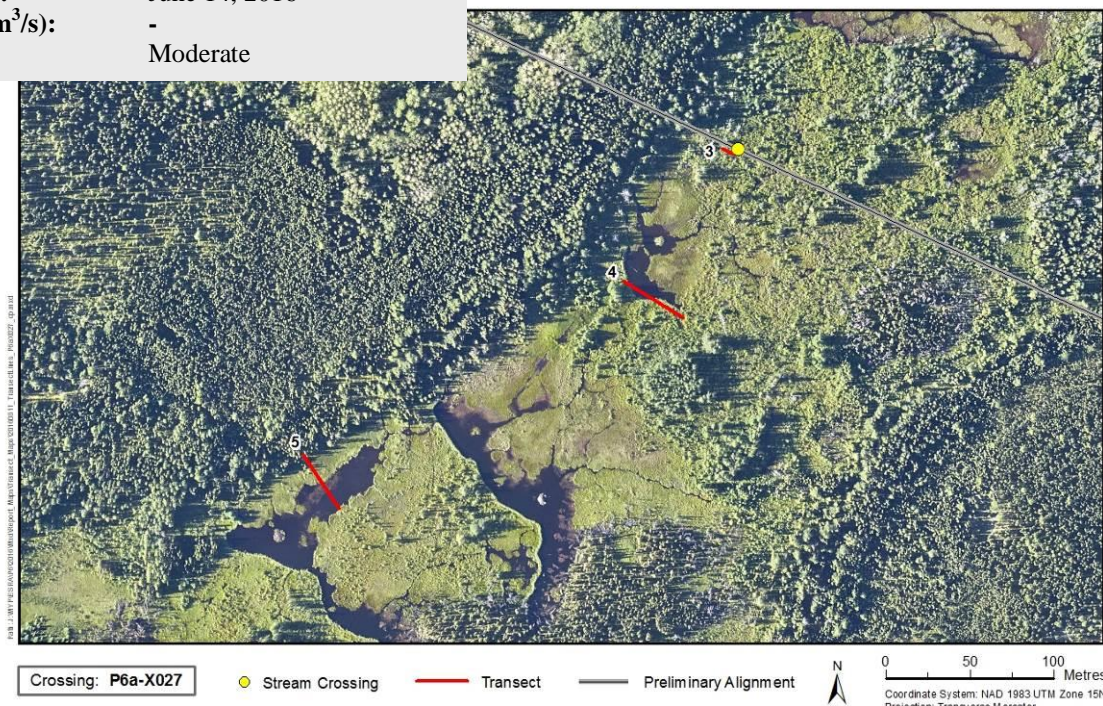
**Type:** Stream  
**Pattern:** Straight  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 14, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### + Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	-	-	0	100 US	400 US
<b>Channel and Flow</b>					
Channel (m)	-	-	2	45	25
Wetted Width (m)	-	-	2	45	25
Depth at 25% (m)	-	-	0.1	0.3	>1
Depth at 50% (m)	-	-	0.12	>1.0	>1
Depth at 75% (m)	-	-	0.08	>1	>1
Maximum Depth (m)	-	-	0.15	>1	>1
<b>Gradient (%)</b>	-	-	<b>0</b>	-	-
<b>Banks</b>					
Left Bank Height (m)	-	-	0.1	0	0
Right Bank Height (m)	-	-	0.1	0	0
Left Bank Shape	-	-	Vertical	Vertical	Vertical
Right Bank Shape	-	-	Vertical	Vertical	Vertical
Left Bank Materials	-	-	Fines/Organics	Fines/Organics	Sedge/Peat
Right Bank Materials	-	-	Fines/Organics	Fines/Organics	Sedge/Peat
Left Bank Stability	-	-	High	High	High
Right Bank Stability	-	-	High	High	High
<b>Substrate Type and Distribution (%)</b>					
Fines	0	0	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.

## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	-	-	10	20	20
Right Bank	-	-	20	20	20
<b>Riparian Distance (m)</b>					
Left Bank	-	-	100	20	100
Right Bank	-	-	20	20	20
<b>Riparian Vegetation Type<sup>a</sup></b>	-	-	SHR/ CON/ GRA	SHR/ CON/ GRA	SHR/ CON/ GRA
<b>Canopy Cover (%)</b>	-	-	5	5	5

a – GRA = grass; SHR = Shrub; CON = coniferous

### + Habitat Type

Transect	1	2	3	4	5
Flat	-	-	100	50	50
Pool	-	-	0	50	50
Rapid	-	-	0	0	0
Riffle	-	-	0	0	0
Run	-	-	0	0	0
Cascade	-	-	0	0	0

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	18.54
<b>pH:</b>	6.67
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	118
<b>DO (mg/L):</b>	2.19



Upstream view at crossing site (Transect 3).



Downstream view at Transect 5 (400 m upstream from crossing).



Looking south from downstream beaver dam between Transects 4 and 5.



Looking east from downstream beaver dam between Transects 4 and 5.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	50	100
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	5	20
Overhanging Vegetation	5	70
Instream Vegetation	50	10
Pool	40	0
Boulder	0	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

<b>Forage Fish</b>	US	DS
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Moderate	Moderate
Migration	High	High
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located on a tributary which feeds Wanless Lake, 3.34 km downstream. The tributary is heavily impacted by beavers and access to the crossing site by fish species which would overwinter in the lake (e.g., Northern Pike) is not expected in most years. The habitat at the crossing is suitable for small bodied fish. The crossing is situated at a narrow channel connecting pools within 100 m up- and downstream of the crossing. The habitat consists of slow flowing water over soft substrates and plentiful instream vegetation providing cover for spawning, rearing, feeding and overwintering of fish species tolerant of low oxygen conditions.

### + Fish Sampling Data

**Methods:** Electrofishing, Visual Survey

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 2.26

**Distance to Major DS Waterbody (km):** 3.34 (Wanless Lake)

**Connectivity:** Yes-unlikely

#### Comments

The crossing site consists mainly of pools within a wetland environment; substrates are soft and dominated by organics. Cover consists of instream vegetation, large woody debris and overhanging vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Wanless Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

This unnamed tributary feeds into Wanless Lake, within the traditional territories of Gods Lake First Nation. The crossing is not expected to support a CRA Fishery as the connection to the downstream fish bearing waterbody is obstructed by multiple beaver dams.

#### Information Sources:

a – Manitoba Conservation and Waterstewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a – pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The crossing is isolated from the fish bearing water body by multiple beaver dams.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is not expected to contribute to the downstream CRA fishery as it supports a range of life requisites for local populations of forage fish. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as the crossing site is unlikely to be accessed by relevant species (e.g., Northern Pike).

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact, abundance of similar habitat within the system, and lack of direct access, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	60 m <sup>2</sup>	0 m <sup>2</sup>	- 60 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

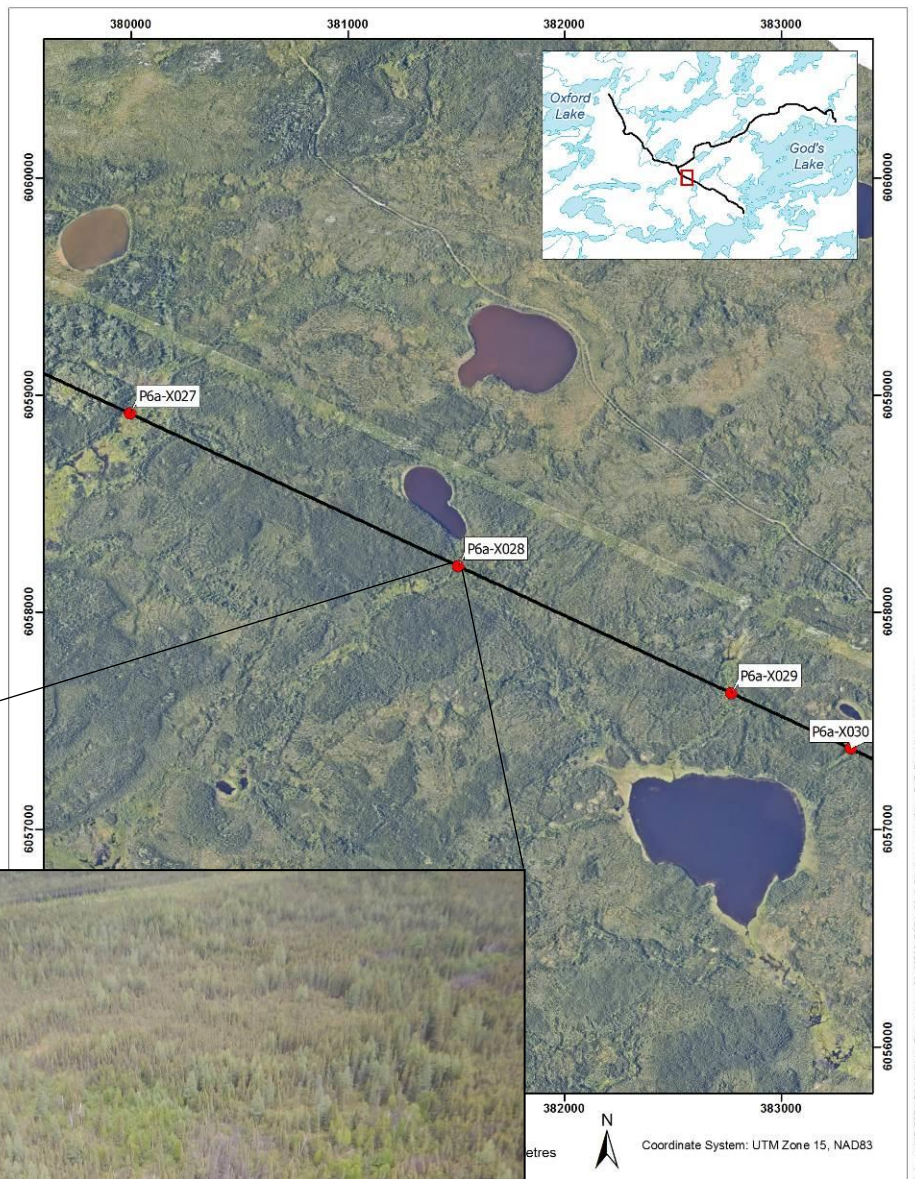
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (2 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 381509 6058214

## General Morphology

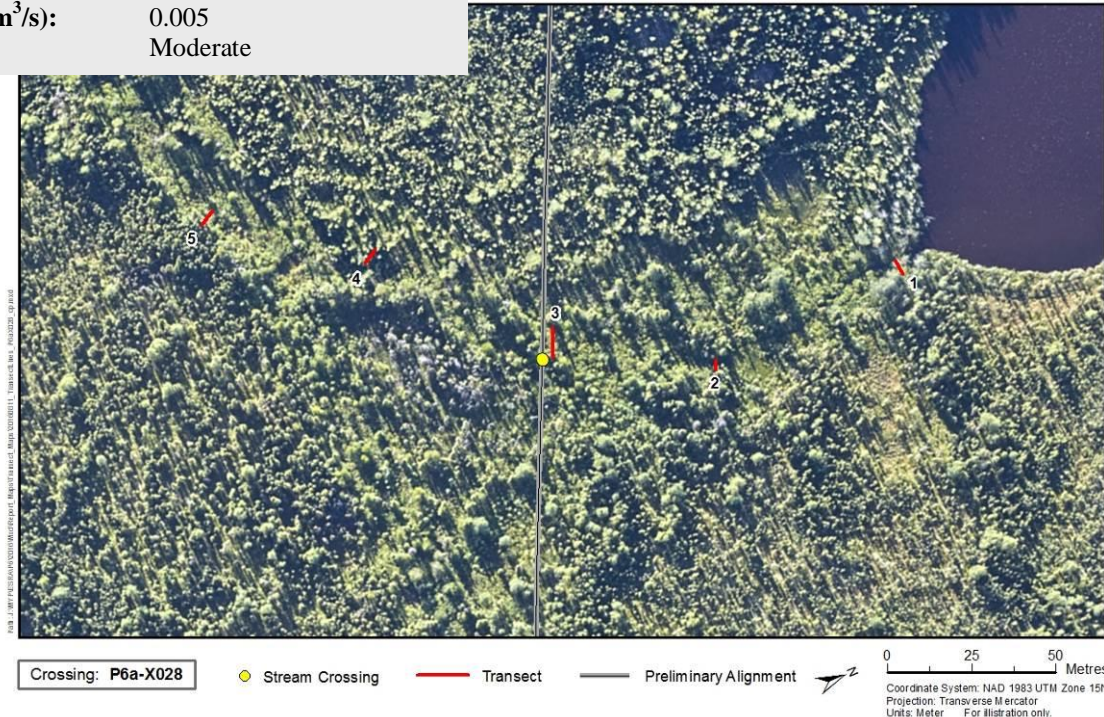
**Type:** Fen  
**Pattern:** Braided  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 14, 2016  
**Discharge (m<sup>3</sup>/s):** 0.005  
**Stage:** Moderate



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	110 US	60 US	0	60 DS	110 DS
<b>Channel and Flow</b>					
Channel (m)	3.3	1.6	7.8	4.4	3.3
Wetted Width (m)	3.2	0.9	0.5	2.4	2.1
Depth at 25% (m)	0.30	0.17	0.29	0.30	0.48
Depth at 50% (m)	0.47	0.20	0.32	0.33	0.53
Depth at 75% (m)	0.39	0.16	0.35	0.20	0.39
Maximum Depth (m)	0.47	0.20	0.35	0.35	0.54
<b>Gradient (%)</b>	0.5	0.5	0.5	0.5	0.5
<b>Banks</b>					
Left Bank Height (m)	0.12	0.20	0.10	0.30	0.15
Right Bank Height (m)	0.20	0.12	0.25	0.35	0.05
Left Bank Shape	Sloping	Sloping	Sloping	Vertical	Sloping
Right Bank Shape	Sloping	Sloping	Sloping	Vertical	Sloping
Left Bank Materials	Organics	Organics	Organics	Organics	Organics
Right Bank Materials	Organics	Organics	Organics	Organics	Organics
Left Bank Stability	Low	Low	Low	Low	Low
Right Bank Stability	Low	Low	Low	Low	Low
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	1.8	2.3	0.9	0.8	3.5
Right Bank	1.4	0.8	1.2	3.0	3.8
<b>Riparian Distance (m)</b>					
Left Bank	2.2	2.5	1.5	1.4	3.5
Right Bank	2.6	2.0	1.0	3.7	3.8
<b>Riparian Vegetation Type<sup>a</sup></b>					
	SHR/ GRA/ CON	DEC/ GRA	DEC/ GRA	DEC/ SHR/ GRA	DEC/ SHR/ GRA
<b>Canopy Cover (%)</b>	10	90	95	85	90

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	100	30	30	90	100
Pool	0	70	70	10	0
Rapid	0	0	0	0	0
Riffle	0	0	0	0	0
Run	0	0	0	0	0
Cascade	0	0	0	0	0

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	19.6
<b>pH:</b>	7.09
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	95.8
<b>DO (mg/L):</b>	9.71



Upstream view at Transect 1 (110 m upstream from crossing) at the small lake at upstream end of tributary.



Bottleneck area of main channel at Transect 2 (60 m upstream from crossing).



Open canopy section at Transect 2 (60 m upstream from crossing).



Narrow channel flowing through a thick canopy at Transect 4 (60 m downstream from crossing).

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	90	90
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	0	0
Overhanging Vegetation	70	90
Instream Vegetation	30	10
Pool	0	0
Boulder	0	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	Moderate	Moderate
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located on a tributary feeding a small unnamed lake into and eventually into Wanless Lake, 5.51 km downstream of the site. The channel is often constricted and narrow, with thick canopy cover. Multiple beaver dams further downstream of the area may limit access to the crossing. The tributary consists mainly of slow flowing water over soft substrates and instream vegetation, suitable for providing cover for forage fish tolerant of low oxygen conditions. Multiple beaver dams further downstream of the area may, however, limit access to the crossing; forage fish may be present in the small upstream lake, but were not found in the tributary.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** none

**Existing Information:** none

## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.41

**Distance to Major DS Waterbody (km):** 5.51 (Wanless Lake)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site consists of a narrow forested channel consisting of soft substrates and both instream and overhanging vegetation for cover. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Wanless Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

This unnamed tributary feeds into Wanless Lake, within the traditional territories of Gods Lake First Nation. The stream is not expected to support the CRA fishery in Wanless Lake as access to the site by relevant fish species is hindered by multiple beaver dams.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The crossing site is inaccessible to relevant CRA fishery species.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is not expected to contribute to the downstream and upstream CRA fishery. Multiple beaver dams downstream of the crossing site prevent access to the reach.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact, abundance of similar habitat within the system, and lack of direct habitat for relevant fish species, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	234 m <sup>2</sup>	0 m <sup>2</sup>	- 234 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

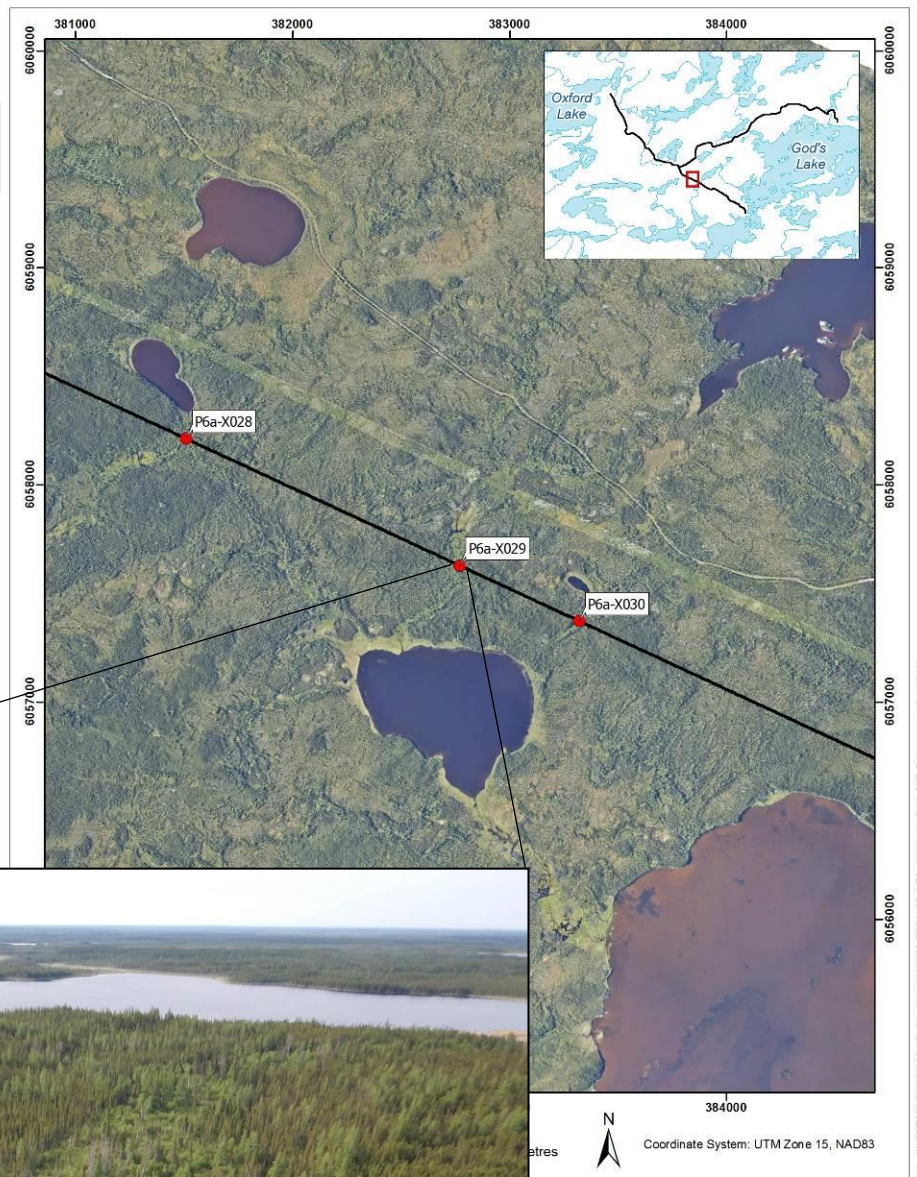
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (7.8 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 382770 6057629

## General Morphology

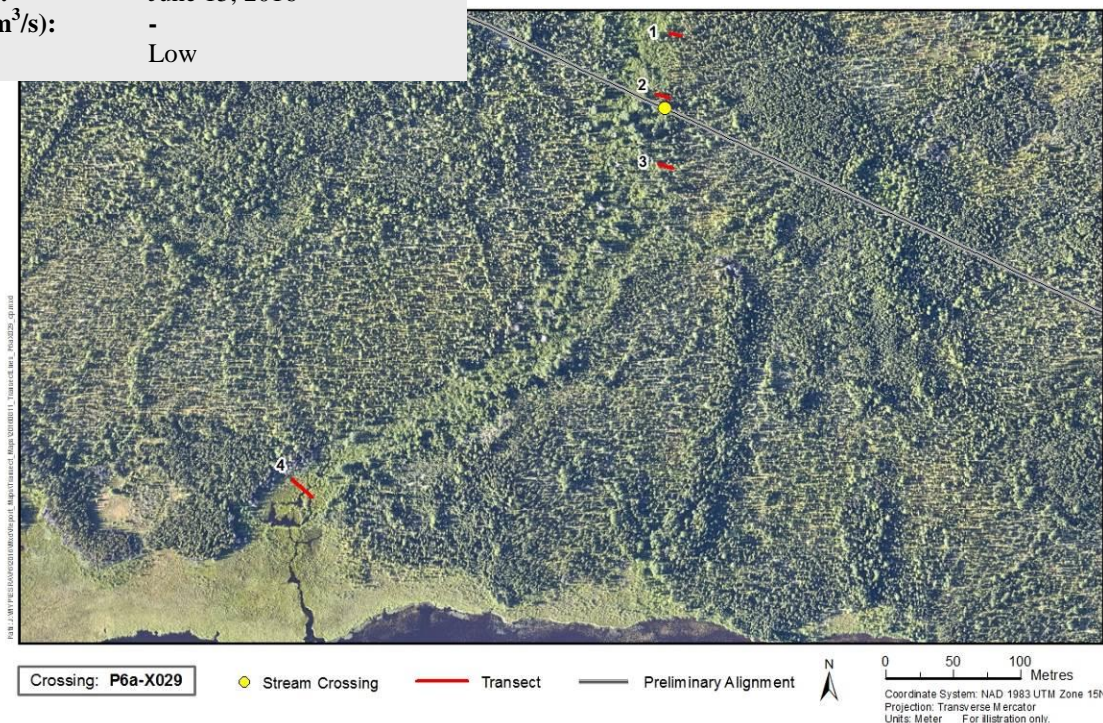
**Type:** Stream  
**Pattern:** Braided  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 15, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Low



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	60 US	0	60 DS	390 DS	-
<b>Channel and Flow</b>					
Channel (m)	4.1	4.0	-	-	-
Wetted Width (m)	3.4	4.0	-	-	-
Depth at 25% (m)	0.17	0.05	-	-	-
Depth at 50% (m)	0.14	0.14	-	-	-
Depth at 75% (m)	0.20	0.19	-	-	-
Maximum Depth (m)	0.26	0.20	-	-	-
<b>Gradient (%)</b>	0.5	0.5	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.3	0.2	-	-	-
Right Bank Height (m)	0.3	0.3	-	-	-
Left Bank Shape	Vertical	Sloping	-	-	-
Right Bank Shape	Sloping	Sloping	-	-	-
Left Bank Materials	Organics	Organics	Organics	Organics	-
Right Bank Materials	Organics	Organics	Organics	Organics	-
Left Bank Stability	Low	Low	Low	Low	-
Right Bank Stability	Low	Low	Low	Low	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	-
Small Gravel	0	0	0	0	-
Large Gravel	0	0	0	0	-
Cobble	0	0	0	0	-
Boulder	0	0	0	0	-
Bedrock	0	0	0	0	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	1.2	0.5	-	19	-
Right Bank	2.4	0.5	-	30	-
<b>Riparian Distance (m)</b>					
Left Bank	4.0	1.0	-	22	-
Right Bank	5.0	1.0	-	36	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	DEC/ CON	DEC/ CON	DEC/ CON	CON/ DEC	-
<b>Canopy Cover (%)</b>					
	60	100	-	0	-

a –DEC = deciduous; CON = coniferous

### + Habitat Type

Transect	1	2	3	4	5
Flat	60	0	0	0	-
Pool	40	100	100	100	-
Rapid	0	0	0	0	-
Riffle	0	0	0	0	-
Run	0	0	0	0	-
Cascade	0	0	0	0	-

### + Water Quality Data

<b>Habitat:</b>	Flat/Pool
<b>Temperature (°C):</b>	15.7
<b>pH:</b>	7.27
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	102.3
<b>DO (mg/L):</b>	6.25



Upstream view at Transect 1 (60 m upstream from crossing site).



Looking at farthest braided channel and riparian vegetation of crossing site (Transect 2).



Braided tributary at Transect 3 (60 m downstream from crossing).



Mouth of tributary as it enters a small lake downstream of Transect 4 near a beaver dam (390 m DS from crossing).

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	90	90
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	0	0
Overhanging Vegetation	60	25
Instream Vegetation	20	10
Pool	20	65
Boulder	0	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located on a tributary connecting two unnamed lakes, ultimately feeding into Hignell Lake, over 2 km downstream of the crossing. There are beaver dams both upstream and downstream of the study reach. The reach is braided and very shallow, with similar habitat both upstream and downstream of the crossing, consisting of negligible flow, organic substrate, and both instream and overhanging vegetation. The braided channel provides limited connectivity throughout the tributary. Additionally, an abundance of beaver activity may limit access to the crossing and neighboring lakes.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none



## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 4.40

**Distance to Major DS Waterbody (km):** 2.33 (Hignell Lake)

**Connectivity:** Yes- unlikely

#### Comments

The crossing site consists mainly of a braided, flat-water/pool habitat (with negligible flow), dominated by organic substrates, and both instream and overhanging vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Hignell Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

This unnamed tributary feeds into Hignell Lake, within the traditional territories of Gods Lake First Nation. The creek is not expected to contribute to the CRA fishery as habitat within the crossing is unsuitable for relevant fish species, and access to the site is hindered by beaver activity and limited connectivity.

#### Information Sources:

a – Manitoba Conservation and Waterstewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

Type	Culvert <sup>a</sup>
Diameter (mm)	TBD
Length (m)	30 m
Number of Barrels	TBD
Provision of Fish Passage	Yes

#### Information Sources:

a – pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	No	The habitat within at the crossing site is suitable for local populations of small bodied fish and is not accessible to relevant fish species.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

Type	Culvert construction and operation
Minor Impact List	No
Residual Impact	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is not expected to contribute to the downstream CRA fishery as it supports a range of life requisites for local populations of forage fish including spawning rearing and feeding, but is inaccessible or unsuitable to relevant species. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	120 m <sup>2</sup>	0 m <sup>2</sup>	- 120 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (4 m).

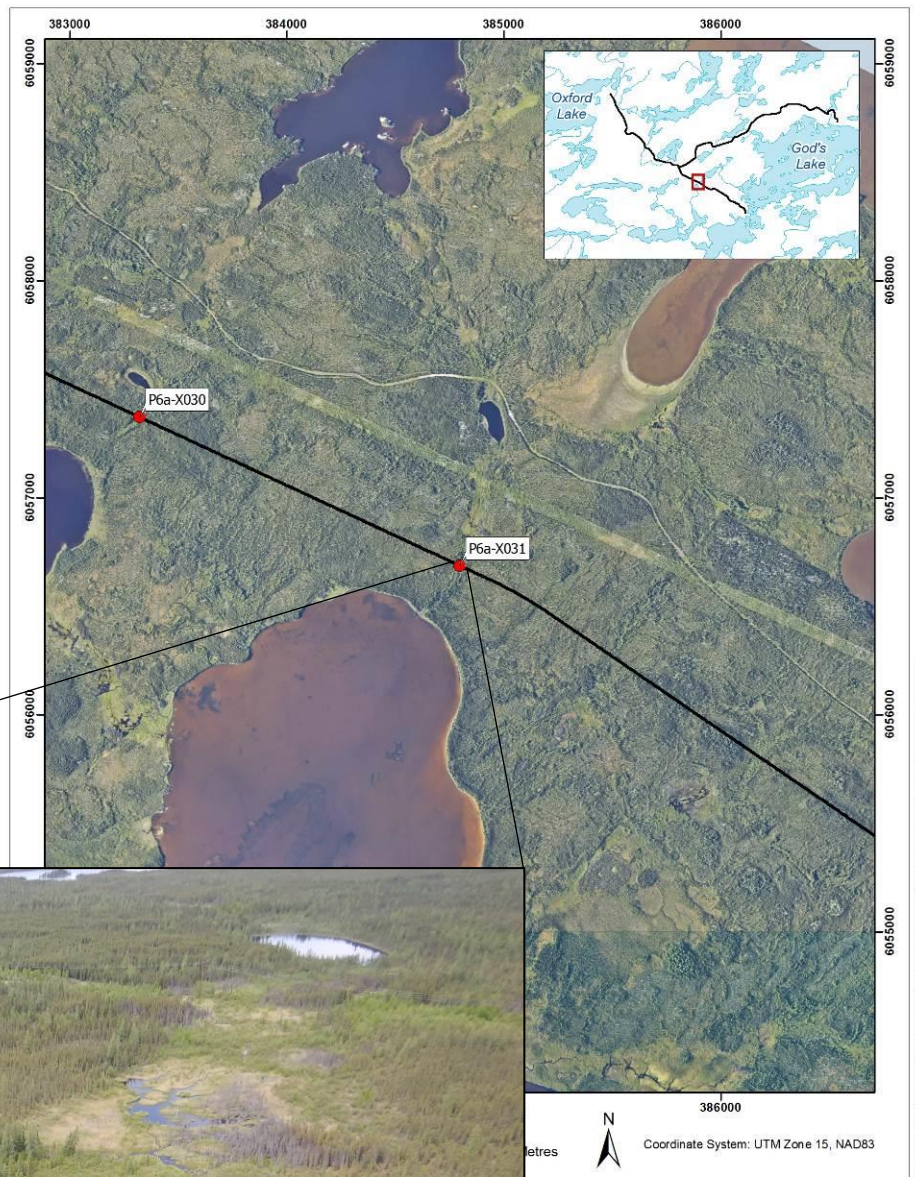


## Location

**Datum:** NAD 83  
**UTM:** 15U 384797 6056689

## General Morphology

**Type:** Stream  
**Pattern:** Sinuous  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 15, 2016  
**Discharge (m<sup>3</sup>/s):** 0.040  
**Stage:** Moderate



### + Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	110 US	40 US	0	65 DS	265 DS
<b>Channel and Flow</b>					
Channel (m)	-	2.8	2.2	2.9	3.6
Wetted Width (m)	-	2.5	1.6	2.5	2.2
Depth at 25% (m)	-	0.31	0.19	0.22	0.23
Depth at 50% (m)	-	0.43	0.23	0.31	0.30
Depth at 75% (m)	-	0.13	0.20	0.31	0.36
Maximum Depth (m)	-	0.43	0.23	0.32	0.39
<b>Gradient (%)</b>	-	0.5	0.5	0.5	0.5
<b>Banks</b>					
Left Bank Height (m)	-	0.20	0.15	0.20	0.10
Right Bank Height (m)	-	0.20	0.20	0.20	0.15
Left Bank Shape	-	Sloping	Vertical	Vertical	Sloping
Right Bank Shape	-	Sloping	Vertical	Sloping	Sloping
Left Bank Materials	-	Organics	Organics	Organics	Organics
Right Bank Materials	-	Organics	Organics	Organics	Organics
Left Bank Stability	-	Low	Low	Low	Low
Right Bank Stability	-	Low	Low	Low	Low
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	-	1.5	1.5	-	2.6
Right Bank	-	2.2	1.5	-	1.4
<b>Riparian Distance (m)</b>					
Left Bank	-	2.7	-	-	7.9
Right Bank	-	2.6	-	-	10.4
<b>Riparian Vegetation Type<sup>a</sup></b>					
-	CON/ DEC	DEC/ CON	CON/ DEC	DEC/ SHR	
<b>Canopy Cover (%)</b>					
-	90	90	70	25	

a -SHR = Shrub; DEC = deciduous; CON = coniferous

### + Habitat Type

Transect	1	2	3	4	5
Flat	100	100	0	0	0
Pool	0	0	0	0	0
Rapid	0	0	0	0	0
Riffle	0	0	35	50	10
Run	0	0	50	50	90
Chute	0	0	15	0	0

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	17.4
<b>pH:</b>	6.82
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	65.1
<b>DO (mg/L):</b>	4.87



View of edge of open-canopy habitat at Transect 1 (110 m upstream of crossing).



Upstream view at Transect 2 (40 m upstream of crossing), as tributary exits dense brush into RoW clearing.



Downstream view at crossing (Transect 3).



Downstream view at mouth of tributary at Hignell Lake (Transect 5, 265 m downstream of crossing).



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	80	90
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	0	0
Overhanging Vegetation	70	50
Instream Vegetation	10	10
Pool	20	40
Boulder	0	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Low	Moderate
Rearing	Low	Moderate
Overwinter	Low	Low
Migration	Low	High
<b>Large Bodied Fish</b>		
Spawning	Low	Moderate
Rearing	Low	Moderate
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located on a tributary draining a small pond into Hignell Lake 300 m downstream of the crossing. The upstream portion of the reach consists of mostly uniform flat water habitat while the downstream section contains more riffle and run habitat. Both sections pass through dense riparian habitat, and contain organic substrate, and instream and overhanging vegetation. The tributary is generally braided, with only the last downstream 100 m having a defined channel, suitable for spawning, rearing and feeding by forage fish and possibly Northern Pike. The lake approximately 300 m downstream of the crossing likely supports overwintering large bodied fish.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.48

**Distance to Major DS Waterbody (km):** 0.30 (Hignell Lake)

**Connectivity:** Yes - likely

#### Comments

The crossing site is located in a riparian habitat, and consists of both flat-water and riffle/run habitat, dominated by organic substrates, and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Hignell Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

The crossing site is located on a tributary between a small unnamed pond and Hignell Lake, within the traditional territories of Gods Lake First Nation. The upstream portion of the tributary provides suitable spawning, rearing and feeding habitat for forage fish. The lake approximately 300 m downstream of the crossing likely supports overwintering large bodied fish.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike. The crossing is 320 m from the mouth of a lake with potential to support overwintering large bodied fish.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream and upstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	66 m <sup>2</sup>	0 m <sup>2</sup>	- 66 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (2.2 m).

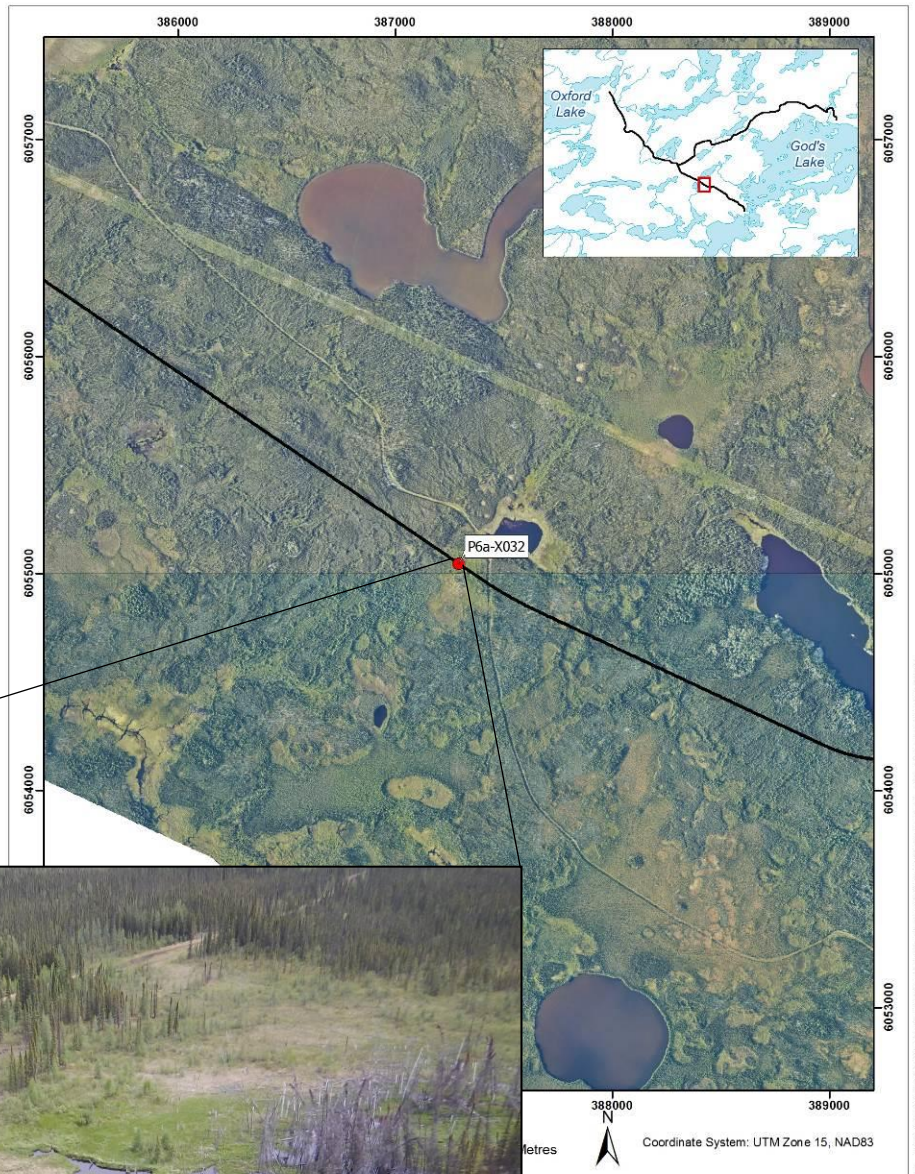


## Location

**Datum:** NAD 83  
**UTM:** 15U 387333 6055019

## General Morphology

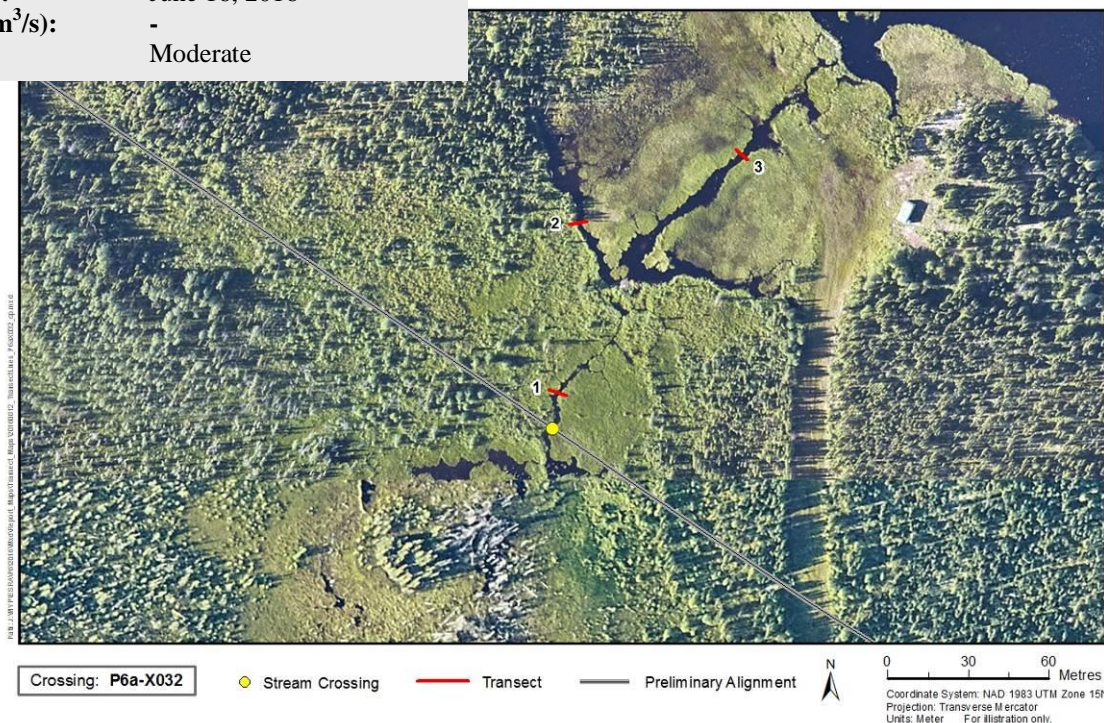
**Type:** Stream  
**Pattern:** Braided  
**Channel Profile:** Notched  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 16, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	0	70 US	110 US	-	-
<b>Channel and Flow</b>					
Channel (m)	-	-	-	-	-
Wetted Width (m)	2.5	-	1.5	-	-
Depth at 25% (m)	0.32	-	0.15	-	-
Depth at 50% (m)	0.28	-	0.33	-	-
Depth at 75% (m)	0.18	-	0.19	-	-
Maximum Depth (m)	0.34	-	0.34	-	-
<b>Gradient (%)</b>	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	-	-	-	-	-
Right Bank Height (m)	-	-	-	-	-
Left Bank Shape	-	-	-	-	-
Right Bank Shape	-	-	-	-	-
Left Bank Materials	-	-	-	-	-
Right Bank Materials	-	-	-	-	-
Left Bank Stability	-	-	-	-	-
Right Bank Stability	-	-	-	-	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	-	-
Small Gravel	0	0	0	-	-
Large Gravel	0	0	0	-	-
Cobble	0	0	0	-	-
Boulder	0	0	0	-	-
Bedrock	0	0	0	-	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	-	-	-	-	-
Right Bank	-	-	-	-	-
<b>Riparian Distance (m)</b>					
Left Bank	-	-	-	-	-
Right Bank	-	-	-	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	-	-	-	-	-
<b>Canopy Cover (%)</b>					
	-	-	-	-	-

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	100	-	-	-	-
Pool	0	-	-	-	-
Rapid	0	-	-	-	-
Riffle	0	-	-	-	-
Run	0	-	-	-	-
Cascade	0	-	-	-	-

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	20.6
<b>pH:</b>	6.61
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	75.3
<b>DO (mg/L):</b>	8.58



Downstream view at crossing site (Transect 1).



Upstream view at beaver pond habitat just upstream of Transect 2 (70 m upstream of crossing).



Upstream view of bog at Transect 2 (70 m upstream of crossing).



Downstream view at Transect 3 (110 m upstream of crossing).

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	50	75
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	5	0
Overhanging Vegetation	5	5
Instream Vegetation	10	5
Pool	55	50
Boulder	0	0
Undercut Bank	25	40
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Low	Low
Migration	Moderate	Moderate
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located in the upper reaches of an unnamed tributary of Hignell Lake, 3.8 km downstream of the crossing and drains three upstream unnamed lakes into Hignell Lake. A narrow channel is present in the immediate crossing area. Habitat is flat slow moving or still water with soft substrates and instream vegetation within a soft marshy floodplain. A few small ponds are present immediately downstream, suitable for forage fish, however, the stream becomes ephemeral and enters an elevated forested reach 270 m downstream of the crossing. There is a beaver dam between the crossing and the small upstream lake. The habitat within the reach is suitable for spawning, rearing and feeding of forage fish and Northern Pike. However, pike are not likely to be present as the upstream lake may not be sufficiently deep for overwintering of large bodied species and access to the site from Hignell Lake is unlikely.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 2.84

**Distance to Major DS Waterbody (km):** 3.80 (Hignell Lake)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site consists mainly of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Hignell Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

This unnamed tributary connects several small unnamed lakes to Hignell Lake 3.8 km downstream of the crossing, within the traditional territories of Gods Lake First Nation. The stream provides suitable spawning, rearing and feeding habitat for forage fish and Northern Pike that may overwinter in the small lake upstream of the crossing.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing site is connected to a small body of water 200 upstream. Multiple barriers downstream, including dams and ephemeral reaches precludes access by large bodied fish overwintering in Hignell Lake. Fish from the upstream lake may make use of the crossing area.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is accessible only to populations of fish in the small lake upstream; connectivity to the CRA fishery downstream is not likely except during extremely high water events.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	75 m <sup>2</sup>	0 m <sup>2</sup>	- 75 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

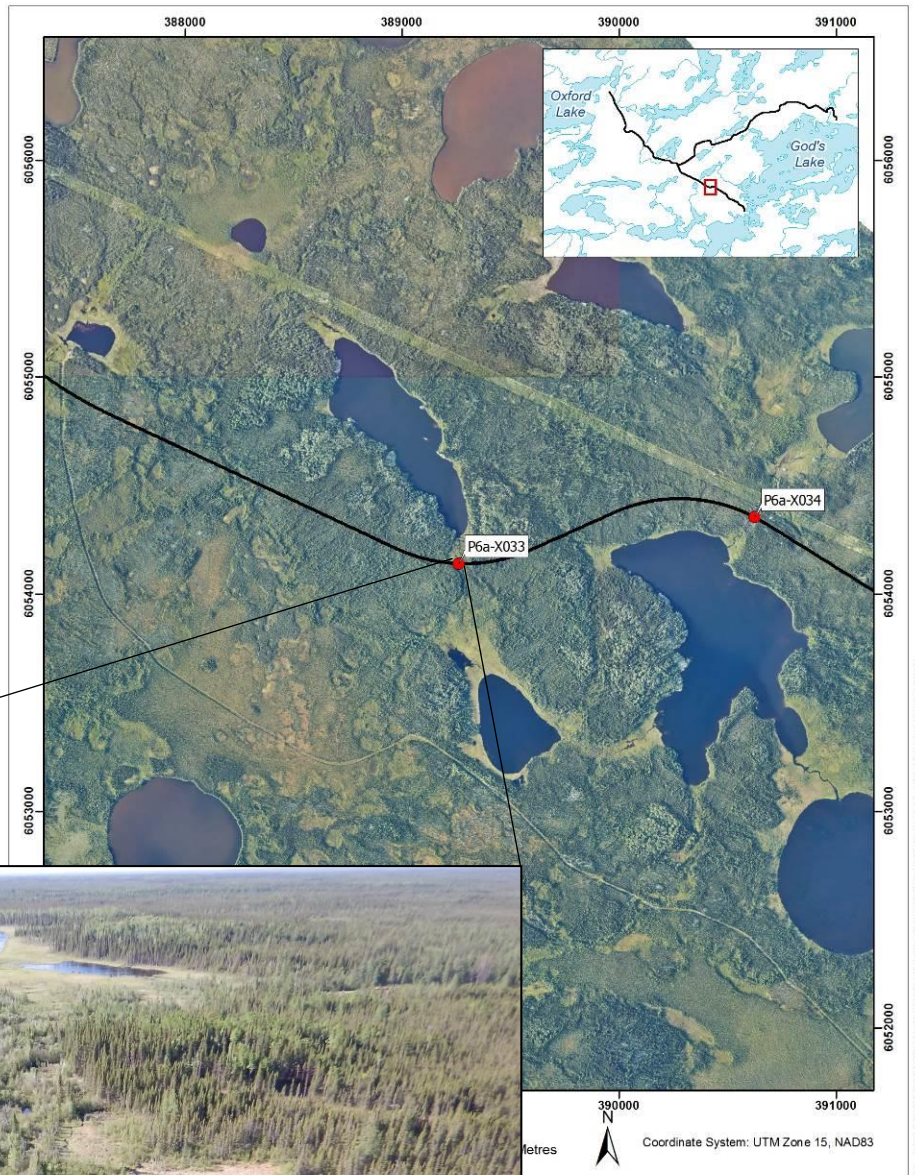
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (2.5 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 389260 6054142

## General Morphology

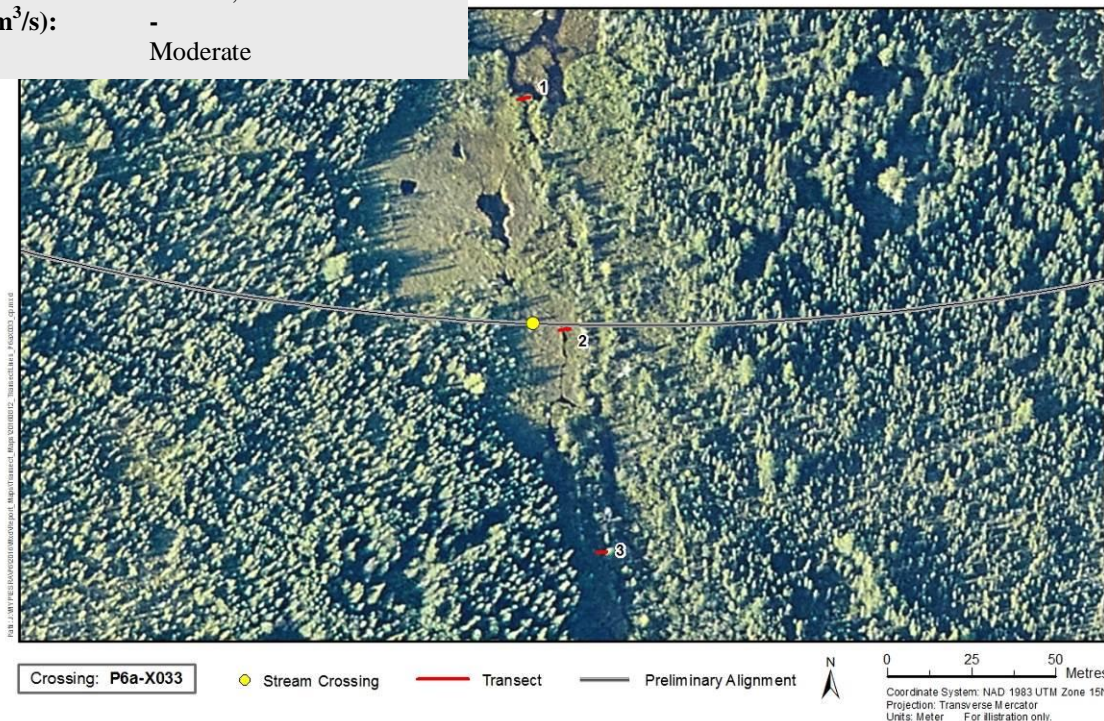
**Type:** Stream  
**Pattern:** Braided  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 17, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	70 US	0	70 DS	-	-
<b>Channel and Flow</b>					
Channel (m)	1.9	1.0	0.9	-	-
Wetted Width (m)	1.5	0.7	0.7	-	-
Depth at 25% (m)	0.41	0.37	0.07	-	-
Depth at 50% (m)	0.46	0.56	0.09	-	-
Depth at 75% (m)	0.23	0.50	0.09	-	-
Maximum Depth (m)	0.46	0.56	0.09	-	-
Gradient (%)	0.5	0.5	0.5	-	-
<b>Banks</b>					
Left Bank Height (m)	0.3	0.1	0.3	-	-
Right Bank Height (m)	0.3	0.1	0.3	-	-
Left Bank Shape	Vertical	Sloping	Vertical	-	-
Right Bank Shape	Vertical	Sloping	Vertical	-	-
Left Bank Materials	Organics	Organics	Organics	-	-
Right Bank Materials	Organics	Organics	Organics	-	-
Left Bank Stability	Low	Low	Low	-	-
Right Bank Stability	Low	Low	Low	-	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	80	-	-
Small Gravel	0	0	0	-	-
Large Gravel	0	0	0	-	-
Cobble	0	0	0	-	-
Boulder	0	0	20	-	-
Bedrock	0	0	0	-	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	0.8	5.0	0.5	-	-
Right Bank	1.0	2.9	1.0	-	-
<b>Riparian Distance (m)</b>					
Left Bank	2.8	6.1	1.5	-	-
Right Bank	1.5	6.0	2.0	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	DEC/ GRA	DEC/ SHR/ GRA	DEC/ SHR/ GRA	-	-
<b>Canopy Cover (%)</b>					
	10	10	10	-	-

a – GRA = grass; SHR = Shrub; DEC = deciduous

### + Habitat Type

Transect	1	2	3	4	5
Flat	70	80	90	-	-
Pool	30	20	10	-	-
Rapid	0	0	0	-	-
Riffle	0	0	0	-	-
Run	0	0	0	-	-
Cascade	0	0	0	-	-

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	19.4
<b>pH:</b>	6.73
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	153.5
<b>DO (mg/L):</b>	3.47



Upstream view at Transect 1 (70 m upstream of crossing).



Downstream view at crossing site (Transect 2).



Downstream view at Transect 3 (75 m downstream of crossing).



View from outlet of small lake upstream of transects, looking downstream at beaver pond habitat

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	90	90
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	0	10
Overhanging Vegetation	5	5
Instream Vegetation	80	5
Pool	15	55
Boulder	0	0
Undercut Bank	0	20
Surface Turbulence	0	5
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Moderate	Moderate
Migration	Low	Moderate
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located near the headwaters of a low-lying forested wetland habitat prone to flooding, approximately 500 m long, connecting two small unnamed lakes. The reach consists of shallow, often braided, slow moving water over soft substrates mixed with some boulders, large woody debris and pool habitat in the downstream reach, and a more uniform flooded habitat with instream vegetation in the upstream reach. Habitat here is suitable for spawning, feeding and rearing of small bodied fish. Overwintering of both small and large bodied fishes likely occurs in the lakes. Fish passage may be hindered by beaver dams along the creek.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Brook Stickleback, Northern Pearl Dace

**Existing Information:** Walleye and Northern Pike in connected lakes (HTFC Planning & Design. 2016).



## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 1.47

**Distance to Major DS Waterbody (km):** 16.66 (God's Lake)

**Connectivity:** Yes - likely

#### Comments

The crossing site consists mainly of forested. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Unnamed Lakes

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

The crossing lies within the traditional territories of Gods Lake First Nation. This unnamed stream connects two small lakes near the head waters of a tributary consisting of a string of small lakes feeding into God's Lake over 16 kms downstream of the crossing. The creek provides suitable spawning, rearing and feeding habitat for Northern Pike in its lower reaches closest to the downstream lake. The affected reach supports small bodied fish suited to forested stream habitats.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

A – pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing itself does not contain direct habitat suitable for relevant species, however, habitat suitable for spawning, rearing and feeding of Northern Pike is present downstream.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream and upstream CRA fishery as it supports a range of life requisites for both forage fish, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	30 m <sup>2</sup>	0 m <sup>2</sup>	- 30 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (1 m).

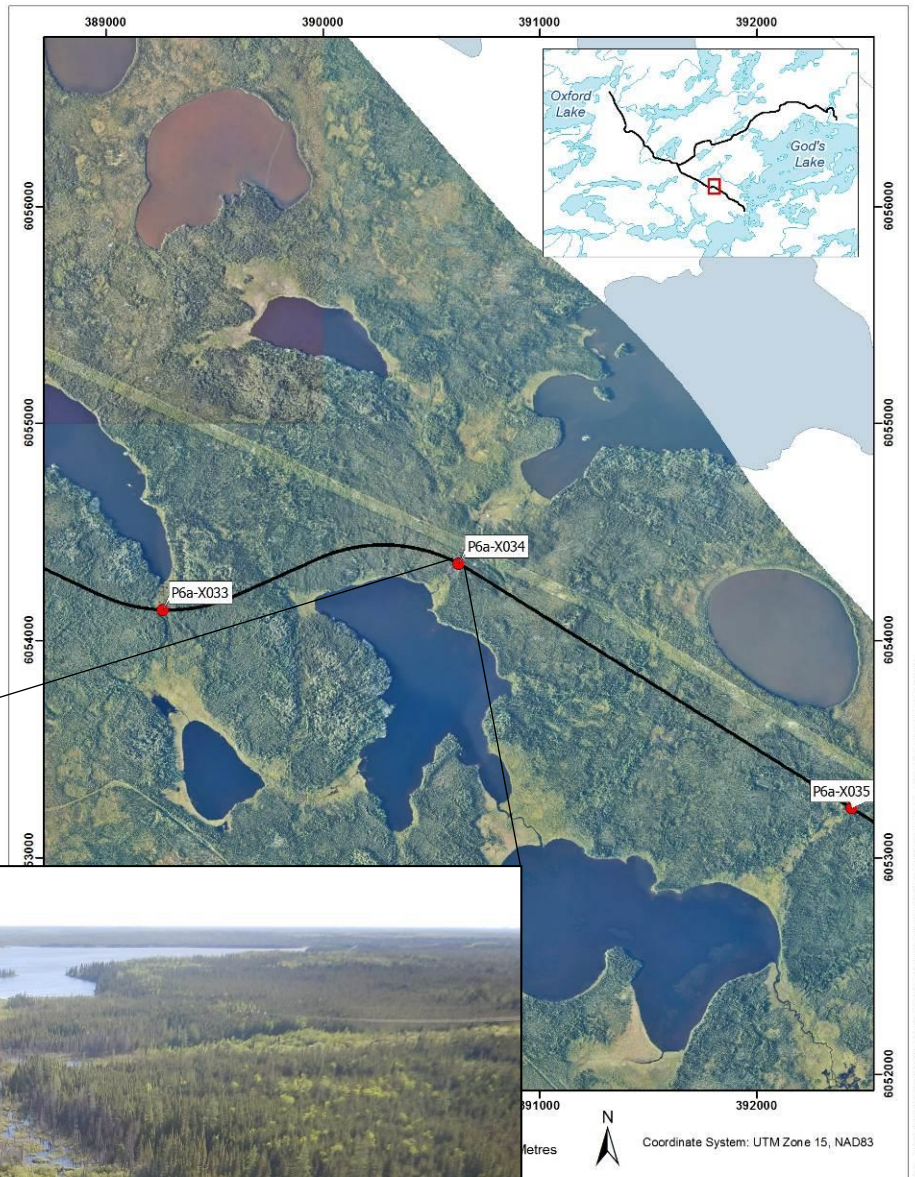


## Location

**Datum:** NAD 83  
**UTM:** 15U 390626 6054355

## General Morphology

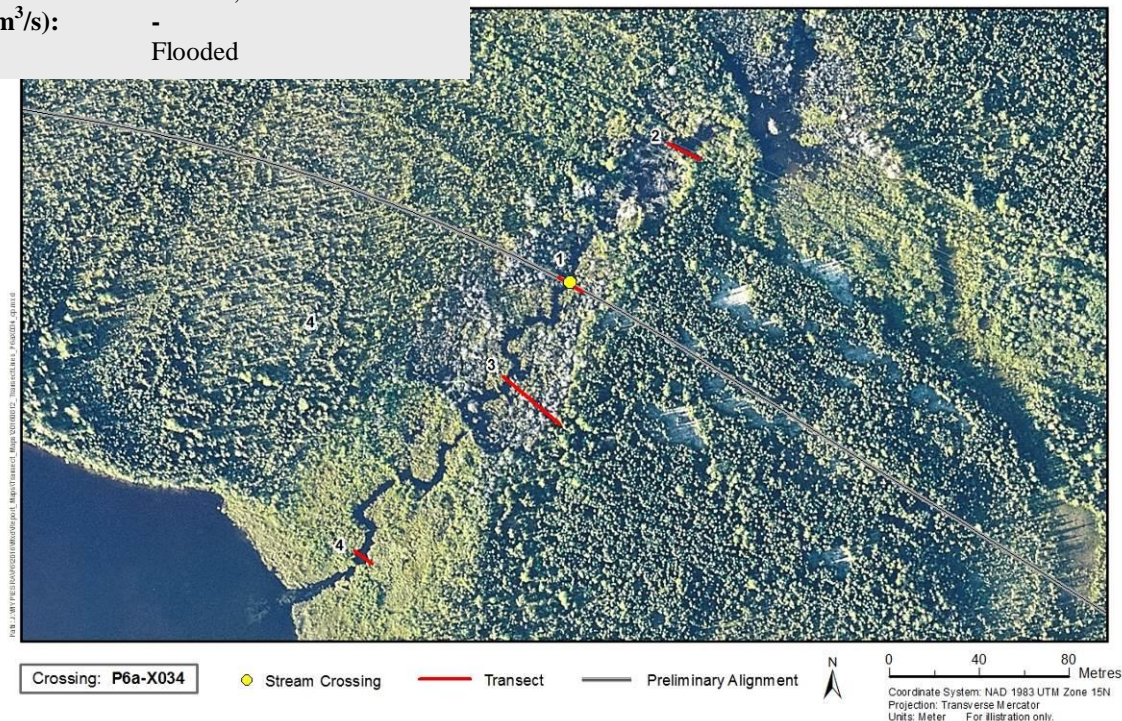
**Type:** Fen Stream  
**Pattern:** Sinuous  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 18, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Flooded



### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	0	80 US	60 DS	157 DS	-
<b>Channel and Flow</b>					
Channel (m)	~3	-	-	6.4	-
Wetted Width (m)	-	-	-	6.4	-
Depth at 25% (m)	-	-	-	0.95	-
Depth at 50% (m)	-	-	-	0.80	-
Depth at 75% (m)	-	-	-	0.77	-
Maximum Depth (m)	-	-	-	1.0-	-
Gradient (%)	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	-	-	-	0.2	-
Right Bank Height (m)	-	-	-	0.2	-
Left Bank Shape	-	-	-	Sloping	-
Right Bank Shape	-	-	-	Sloping	-
Left Bank Materials	-	-	-	Organics	-
Right Bank Materials	-	-	-	Organics	-
Left Bank Stability	-	-	-	Low	-
Right Bank Stability	-	-	-	Low	-
<b>Substrate Type and Distribution (%)</b>					
Fines	-	-	-	100	-
Small Gravel	-	-	-	0	-
Large Gravel	-	-	-	0	-
Cobble	-	-	-	0	-
Boulder	-	-	-	0	-
Bedrock	-	-	-	0	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	0.8	5.0	0.5	-	-
Right Bank	1.0	2.9	1.0	-	-
<b>Riparian Distance (m)</b>					
Left Bank	2.8	6.1	1.5	-	-
Right Bank	1.5	6.0	2.0	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	DEC/ GRA	DEC/ SHR/ GRA	DEC/ SHR/ GRA	-	-
<b>Canopy Cover (%)</b>					
	10	10	10	-	-

a – GRA = grass; SHR = Shrub; DEC = deciduous

### + Habitat Type

Transect	1	2	3	4	5
Flat	0	0	0	0	0
Pool	0	0	0	0	0
Rapid	0	0	0	0	0
Riffle	0	0	0	0	0
Run	0	0	0	0	0
Impoundment	100	100	100	100	100

### + Water Quality Data

<b>Habitat:</b>	Flat
<b>Temperature (°C):</b>	18.5
<b>pH:</b>	6.67
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	124.5
<b>DO (mg/L):</b>	2.88



Upstream view at flooded habitat at crossing (Transect 1).



Upstream look at beaver pond habitat located upstream of beaver dam at Transect 2 (80 m upstream of crossing).



Upstream view at flooded habitat at Transect 3 (60 m downstream of crossing).



Downstream view atop beaver lodge at Transect 4 (157 m downstream of crossing)



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	-	-
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	10	10
Overhanging Vegetation	10	5
Instream Vegetation	20	5
Pool	55	80
Boulder	5	0
Undercut Bank	0	0
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

<b>Forage Fish</b>	US	DS
Spawning	Moderate	High
Rearing	Moderate	High
Overwinter	Moderate	High
Migration	Low	High
<b>Large Bodied Fish</b>		
Spawning	Low	Moderate
Rearing	Low	Moderate
Overwinter	Low	Moderate
Migration	Low	Moderate

#### Comments

The crossing is located in a low-lying forested fen habitat prone to flooding, approximately 600 m long, connecting Hobson Lake to a series of small unnamed lakes, ultimately draining into Gods Lake over 15 km downstream of the crossing. At the time of the visit, the reach was flooded, and contains soft substrates with some boulders, large woody debris, instream and overhanging vegetation. Habitat here is suitable for spawning, feeding and rearing of select small bodied forage fish tolerant of low oxygen conditions; the impounded habitat is not suitable for most fish species. Suitable habitat for Northern Pike is available downstream of the crossing in closer proximity to the unnamed lake.

### + Fish Sampling Data

**Methods:** Electrofishing, Visual Survey

**Fish Species Captured:** Brook Stickleback, Northern Pearl Dace

**Existing Information:** Surrounding lakes are known to contain Walleye and Northern Pike (HTFC Planning & Design 2016).

## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 7.51

**Distance to Major DS Waterbody (km):** 15.19 (God's Lake)

**Connectivity:** Yes - likely

#### Comments

The crossing site consists mainly of flooded forested fen habitat. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Unnamed Lakes

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

The crossing lies within the traditional territories of Gods Lake First Nation. This unnamed stream connects two small lakes near the head waters of a tributary consisting of a string of small lakes feeding into God's Lake over 15 km downstream of the crossing. The affected reach supports some small bodied fish species tolerant of low dissolved oxygen conditions. The surrounding lakes are fished by God's Lake First Nation (HTFC Planning & Design 2016).

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a – pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing itself does not contain direct habitat suitable for relevant species, however, habitat suitable for spawning, rearing and feeding of Northern Pike is present downstream.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream and upstream CRA fishery as it supports a range of life requisites for both forage fish, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	90 m <sup>2</sup>	0 m <sup>2</sup>	- 90 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (3 m)

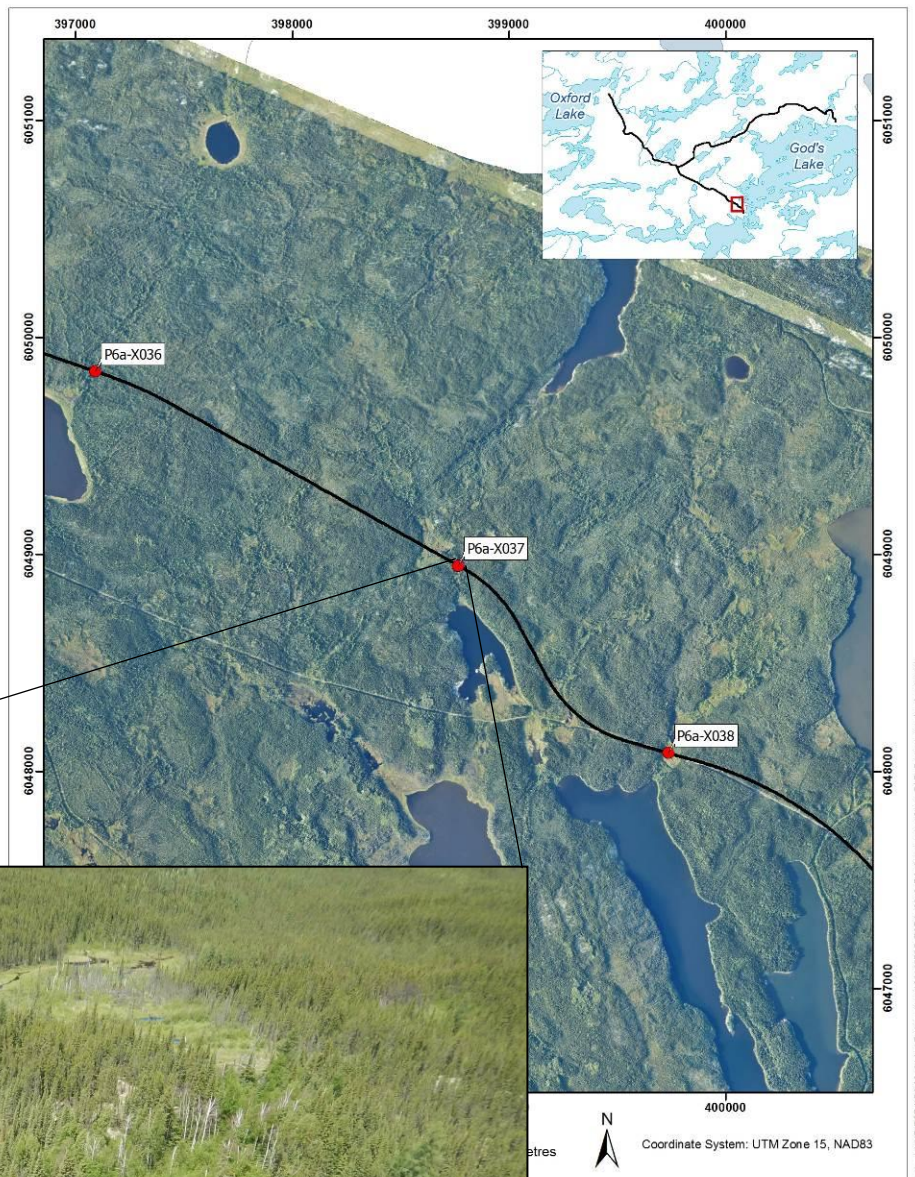
# P6a-X037 Unnamed Tributary of Unnamed Lake

## Location

**Datum:** NAD 83  
**UTM:** 15U 398766 6048950

## General Morphology

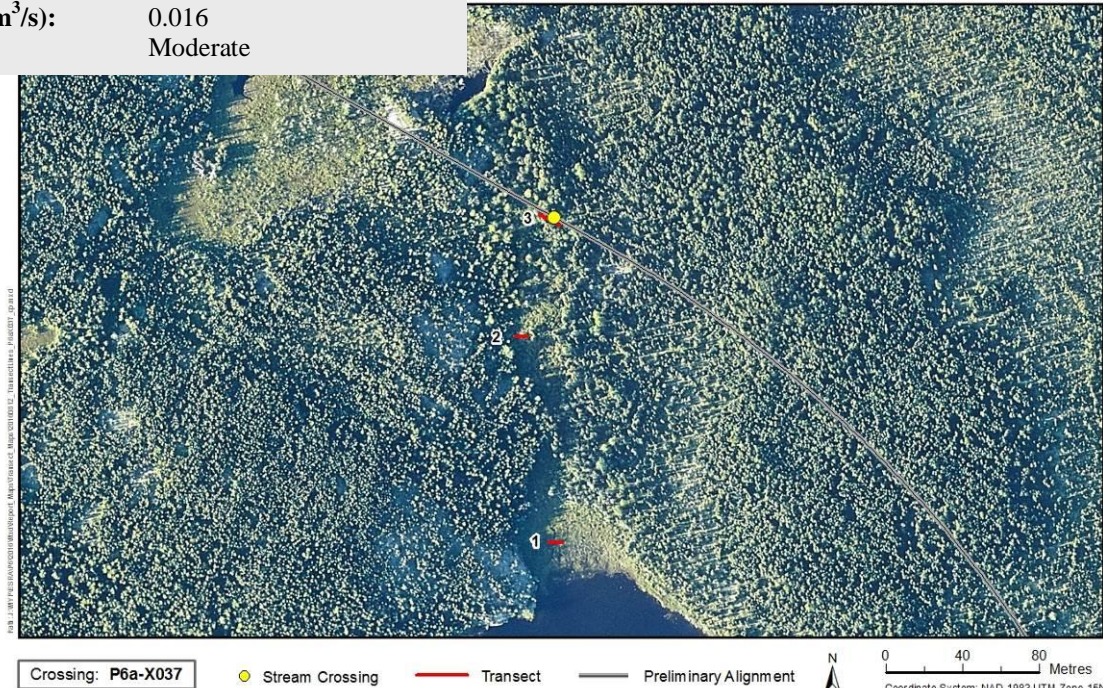
**Type:** Stream  
**Pattern:** Sinuous  
**Channel Profile:** U-Shape  
**Sinuosity:** -  
**Confinement:** Occasionally Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 17, 2016  
**Discharge (m<sup>3</sup>/s):** 0.016  
**Stage:** Moderate



### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	175 DS	70 DS	0	-	-
<b>Channel and Flow</b>					
Channel (m)	1.3	1.3	-	-	-
Wetted Width (m)	1.0	1.2	-	-	-
Depth at 25% (m)	0.16	0.10	-	-	-
Depth at 50% (m)	0.22	0.20	-	-	-
Depth at 75% (m)	0.23	0.22	-	-	-
Maximum Depth (m)	0.23	0.25	-	-	-
Gradient (%)	0.5	0.5	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.3	0.2	-	-	-
Right Bank Height (m)	0.3	0.3	-	-	-
Left Bank Shape	Vertical	Vertical	-	-	-
Right Bank Shape	Vertical	Vertical	-	-	-
Left Bank Materials	Organics	Organics	-	-	-
Right Bank Materials	Organics	Organics	-	-	-
Left Bank Stability	Low	Low	-	-	-
Right Bank Stability	Low	Low	-	-	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	95	-	-	-
Small Gravel	0	0	-	-	-
Large Gravel	0	0	-	-	-
Cobble	0	0	-	-	-
Boulder	0	5	-	-	-
Bedrock	0	0	-	-	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	55	0.4	-	-	-
Right Bank	12	0.1	-	-	-
<b>Riparian Distance (m)</b>					
Left Bank	57	3.5	-	-	-
Right Bank	13	2.5	-	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
DEC/ CON	DEC/ SHR	-	-	-	-
<b>Canopy Cover (%)</b>					
	0	35	-	-	-

a – SHR = Shrub; DEC = deciduous; CON = coniferous

### + Habitat Type

Transect	1	2	3	4	5
Flat	0	0	0	-	-
Pool	30	30	100	-	-
Rapid	0	0	0	-	-
Riffle	0	0	0	-	-
Run	70	70	0	-	-
Cascade	0	0	0	-	-

### + Water Quality Data

<b>Habitat:</b>	Run/Pool
<b>Temperature (°C):</b>	16.0
<b>pH:</b>	6.48
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	105.2
<b>DO (mg/L):</b>	3.86



Downstream view at Transect 1 (175 m downstream of crossing).



Downstream view at Transect 2 (70 m downstream of crossing).



Downstream view at crossing (Transect 3).



Upstream view at crossing (Transect 3).

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	50	95
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	10	5
Overhanging Vegetation	20	5
Instream Vegetation	5	10
Pool	60	60
Boulder	5	5
Undercut Bank	0	15
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Low	Moderate
Rearing	Low	Moderate
Overwinter	Low	Low
Migration	Low	Moderate
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located across a series of small braided indistinct channels within a small forested stream. The tributary drains a small area of wetlands within a riparian region, into an unnamed lake and ultimately draining into God's Lake approximately 4 km downstream of the crossing. The area immediately downstream of the crossing consists mainly of slow-moving waters and pools, and soft substrates with large woody debris, some boulders, and instream and overhanging vegetation. Habitat is suitable for spawning, feeding and rearing of select small bodied forage fish but may be limited in connectivity due to several small beaver dams between the tributary and the crossing site. The crossing itself is disconnected, consisting of a braided channel not suitable as fish habitat, with water often flowing underground.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Brook Stickleback, Northern Pearl Dace (downstream of crossing).

**Existing Information:** none

## ↘ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ↘ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.54

**Distance to Major DS Waterbody (km):** 4.06 (Gods Lake)

**Connectivity:** Yes - likely

#### Comments

The crossing site consists mainly of slow moving and pool habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Gods Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – God's Lake First Nation

#### Comments

This tributary drains a wetland into a small unnamed lake before feeding into Gods Lake, within the traditional territories of God's Lake First Nation. The creek provides suitable spawning, rearing and feeding habitat for forage fish but is limited in connectivity due to beaver activity and braiding of the channel.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	Habitat at the crossing is suitable for forage fish and contributes to downstream areas that are suitable for Northern Pike. The crossing is 320 m from the mouth of a lake with potential to support overwintering large bodied fish.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat at the crossing is expected to contribute to the downstream CRA fishery as it supports a range of life requisites for forage fish and is connected to downstream habitats. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	m <sup>2</sup>	0 m <sup>2</sup>	- m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

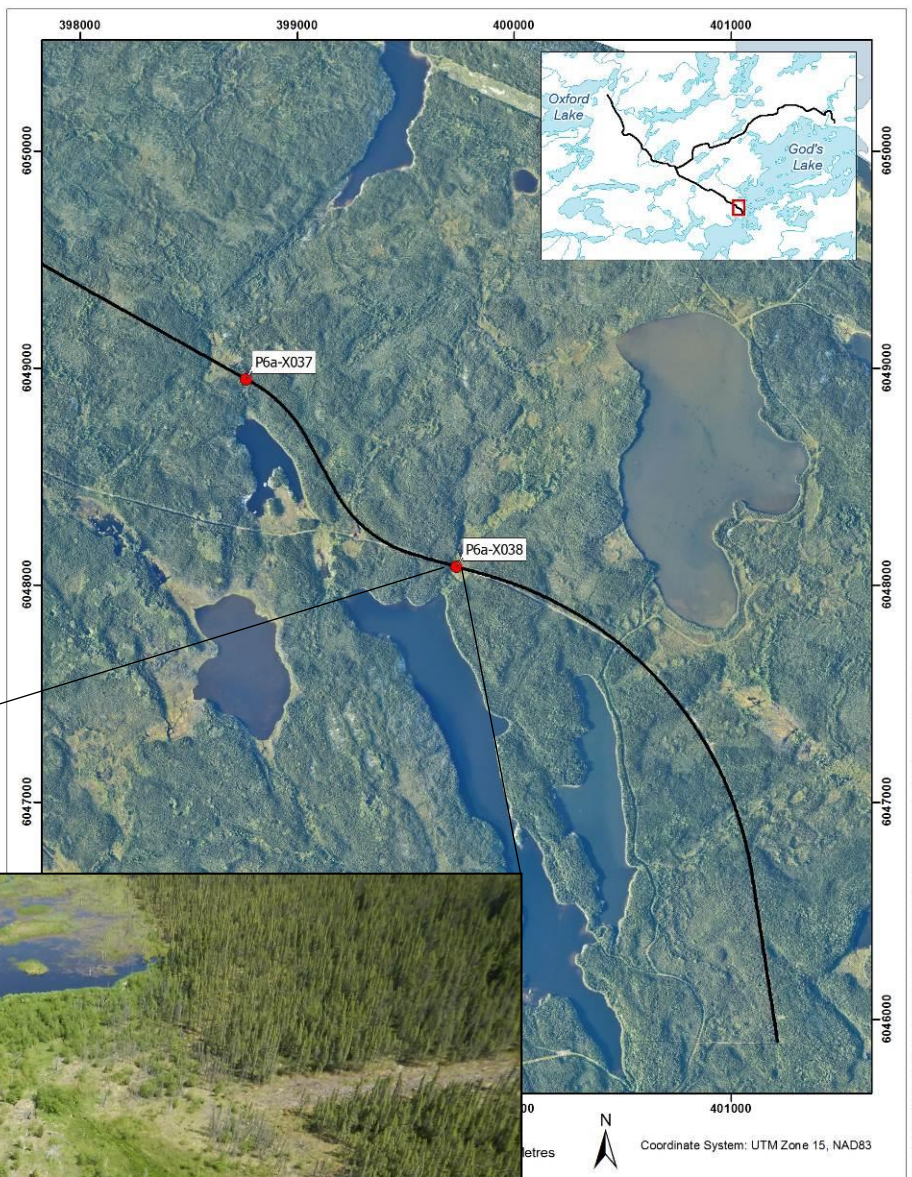
2 – Area affected has not been calculated because a discernable channel was not present.

## Location

**Datum:** NAD 83  
**UTM:** 15U 399735 6048087

## General Morphology

**Type:** Stream  
**Pattern:** Braided  
**Channel Profile:** U-Shape  
**Sinuosity:** -  
**Confinement:** Occasionally Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 16, 2016  
**Discharge (m<sup>3</sup>/s):** 0.010  
**Stage:** Low



### + Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	0	45 DS	105 DS	-	-
<b>Channel and Flow</b>					
Channel (m)	5.8	-	1.1	-	-
Wetted Width (m)	1.8	-	1.0	-	-
Depth at 25% (m)	0.25	-	0.14	-	-
Depth at 50% (m)	0.37	-	0.18	-	-
Depth at 75% (m)	0.21	-	0.18	-	-
Maximum Depth (m)	0.44	-	0.18	-	-
<b>Gradient (%)</b>	0.5	-	0.5	-	-
<b>Banks</b>					
Left Bank Height (m)	0.3	-	0.4	-	-
Right Bank Height (m)	0.2	-	0.4	-	-
Left Bank Shape	Sloping	-	Vertical	-	-
Right Bank Shape	Sloping	-	Vertical	-	-
Left Bank Materials	Organics	-	Organics	-	-
Right Bank Materials	Organics	-	Organics	-	-
Left Bank Stability	Low	-	Moderate	-	-
Right Bank Stability	Low	-	Moderate	-	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	-	95	-	-
Small Gravel	0	-	0	-	-
Large Gravel	0	-	0	-	-
Cobble	0	-	0	-	-
Boulder	0	-	5	-	-
Bedrock	0	-	0	-	-

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	3.0	-	0.3	-	-
Right Bank	2.5	-	0.3	-	-
<b>Riparian Distance (m)</b>					
Left Bank	106	-	1.0	-	-
Right Bank	25	-	1.2	-	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
CON	-		DEC/ CON	-	-
<b>Canopy Cover (%)</b>					
	30	-	30	-	-

a – DEC = deciduous; CON = coniferous

### + Habitat Type

Transect	1	2	3	4	5
Flat	100	-	-	-	-
Pool	-	-	-	-	-
Rapid	-	-	-	-	-
Riffle	-	-	-	-	-
Run	-	-	100	-	-
Cascade	-	-	-	-	-

### + Water Quality Data

<b>Habitat:</b>	Flat/Run
<b>Temperature (°C):</b>	18.3
<b>pH:</b>	6.61
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	142.8
<b>DO (mg/L):</b>	7.36



Old beaver dam upstream of crossing (Transect 1).



Pooled water habitat at beaver dam at Transect 2 (45 m downstream of crossing).



Downstream view of meandering tributary at Transect 3 (105 m downstream of crossing).



Downstream view of channel entering lake downstream of Transect 3.

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	15	80
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	5	0
Overhanging Vegetation	25	10
Instream Vegetation	70	10
Pool	0	50
Boulder	0	0
Undercut Bank	0	30
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Low	Moderate
Rearing	Low	Moderate
Overwinter	Low	Low
Migration	Low	Low
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing site is located on the downstream side of an old passable beaver dam, draining a fen wetland area into an unnamed lake and ultimately draining into God's Lake nearly 3 km downstream of the crossing. Forage fish and large-bodied fish habitat is present downstream, towards the mouth of the tributary. Although the crossing site and upstream habitat contains soft substrate and instream vegetation, braiding and heavy vegetation of the channel results in poor connectivity, resulting in poor quality fish habitat.

### + Fish Sampling Data

**Methods:** Electrofishing

**Fish Species Captured:** Northern Pearl Dace

**Existing Information:** none



## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 0.28

**Distance to Major DS Waterbody (km):** 2.90 (Gods Lake)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site consists mainly of slow moving and pool habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** God's Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Gods Lake First Nation

#### Comments

This tributary is located in the traditional territories of the God's Lake First Nation and in close proximity to the community of God's Lake Narrows. The crossing drains a heavily vegetated fen which is poorly connected to an arm of God's Lake preventing access to upstream reaches by CRA fishery species.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	Habitat at the crossing is suitable for forage fish and contributes to downstream areas that are suitable for Northern Pike. The crossing is 130 m from the mouth of a lake with potential to support overwintering large bodied fish.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat at the crossing is expected to contribute to the downstream CRA fishery as it supports a range of life requisites for forage fish and is connected to downstream habitats. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish is plentiful outside of the project footprint within the stream and in the region

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	174 m <sup>2</sup>	0 m <sup>2</sup>	- 174 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (5.8 m).

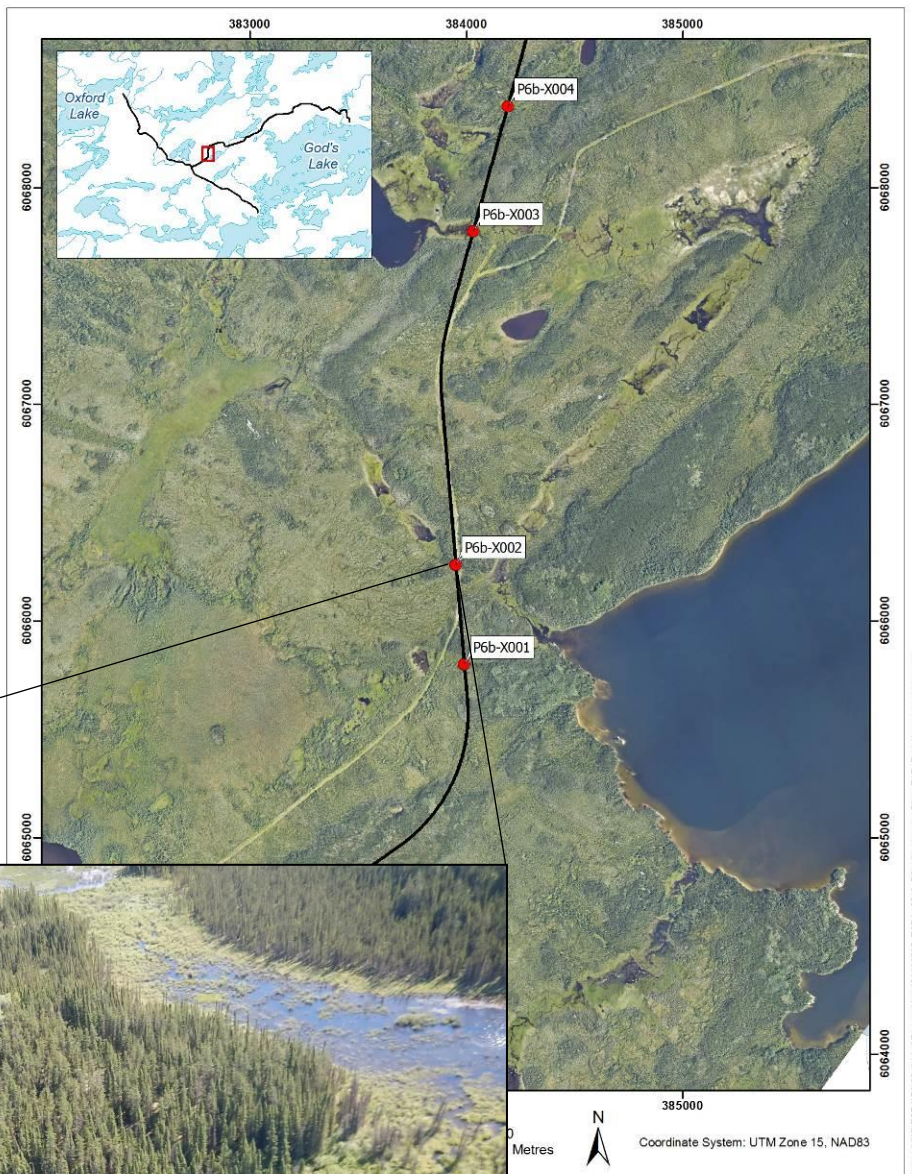


## Location

**Datum:** NAD 83  
**UTM:** 15U 383950 6066261

## General Morphology

**Type:** Stream  
**Pattern:** Irregular Wandering  
**Channel Profile:** Notched  
**Sinuosity:** -  
**Confinement:** Occasionally Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 18, 2016  
**Discharge (m<sup>3</sup>/s):** 0.091  
**Stage:** Moderate



### Physical Channel Data

<b>Transect</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Distance from Crossing <sup>a</sup> (m)	160 DS	60 DS	0	60 US	127 US
<b>Channel and Flow</b>					
Channel (m)	1.55	2.60	1.86	6.00	2.40
Wetted Width (m)	1.50	2.45	1.86	5.70	2.40
Depth at 25% (m)	0.35	0.30	0.40	0.10	0.30
Depth at 50% (m)	0.66	0.50	0.51	0.25	0.50
Depth at 75% (m)	0.65	0.35	0.45	0.30	0.35
Maximum Depth (m)	0.70	0.50	0.51	0.30	0.50
<b>Gradient (%)</b>	-	-	1	-	-
<b>Banks</b>					
Left Bank Height (m)	0.25	0.50	0.08	0.40	0.20
Right Bank Height (m)	0.20	-	0.08	0.50	0.40
Left Bank Shape	Undercut	Vertical	Undercut	Sloping	Vertical
Right Bank Shape	Undercut	Vertical	Undercut	Vertical	Vertical
Left Bank Materials	Fines/Clay	Fines/Veg	Fines/Veg	Fines	Fines
Right Bank Materials	Fines	-	Fines/Veg	Fines	Fines
Left Bank Stability	Moderate	Moderate	Moderate	High	Moderate
Right Bank Stability	Moderate	Moderate	Moderate	High	Moderate
<b>Substrate Type and Distribution (%)</b>					
Fines	60	75	75	98	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	15	0	0	0	0
Boulder	25	25	25	2	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	20	10	16	10	42
Right Bank	26	10	18	8	36
<b>Riparian Distance (m)</b>					
Left Bank	5	1	16	1	-
Right Bank	5	1	18	1	3
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA/ SHR	CON/ SHR	GRA	CON/ SHR/ GRA	SHR/ GRA
<b>Canopy Cover (%)</b>	2	80	0	90	5

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Pool	0	0	0	40	25
Riffle	0	50	0	40	0
Run	35	35	80	15	25
Chute	5	5	10	0	10
Boulder Garden	10	10	10	0	0
Backwater	50	0	0	5	40

### + Water Quality Data

<b>Habitat:</b>	-
<b>Temperature (°C):</b>	18.3
<b>pH:</b>	6.63
<b>Turbidity (NTU):</b>	105
<b>Specific Conductance (µS/cm):</b>	120
<b>DO (mg/L):</b>	7.90



Upstream view at crossing site (Transect 3).



Downstream view at crossing site (Transect 3).



Beaver dam upstream of transect 5.



Downstream view at beaver dam near transect 1.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	-	-
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	10	5
Overhanging Vegetation	70	40
Instream Vegetation	10	10
Pool	0	35
Boulder	5	5
Undercut Bank	5	5
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

	US	DS
<b>Forage Fish</b>		
Spawning	Moderate	High
Rearing	Moderate	High
Overwinter	Moderate	High
Migration	Moderate	High
<b>Large Bodied Fish</b>		
Spawning	Low	Moderate
Rearing	Low	Moderate
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is situated 550 m upstream of Hawkins Lake and centered within a forested reach (150 m long) of the tributary. Cover is primarily riparian vegetation in this reach, with flowing water and sand/gravel/rock substrates suitable for small bodied fish. The stream becomes a fen stream within a broad inundated grass/shrub floodplain 75 m downstream of the crossing. Habitat within this reach is characterized by slow flowing water, pools, soft substrates and abundant instream vegetation suitable for the spawning, rearing and feeding by both small bodied fish and Northern Pike. The lake provides overwintering habitat for pike and other large bodied fish species. As series of beaver dams may hinder migration to the site.

### + Fish Sampling Data

**Methods:** electrofishing

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 6.55

**Distance to Major DS Waterbody (km):** 0.59 (Hawkins Lake)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site is situated in a forested reach of the tributary. Habitat is characterized by coarse substrate, shallow fast flowing water with boulders and riparian vegetation provided the majority of the cover. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Hawkins Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Gods Lake First Nation

#### Comments

This unnamed tributary feeds into Hawkins Lake, within the traditional territories of Gods Lake First Nation. The stream downstream of the crossing provides suitable spawning, rearing and feeding habitat for Northern Pike.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers. comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing itself does not contain direct habitat suitable for relevant species, however, habitat suitable for spawning, rearing and feeding of Northern Pike is present downstream.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation	
<b>Minor Impact List</b>	No	
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet	

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable spawning, rearing and feeding habitat for relevant fish (e.g., Northern Pike) is situated outside of the project footprint within the stream and in the region. The habitat in the immediate crossing area is expected to support a range of life requisites for small bodied fish.

### + Risk of Serious Harm to Fish

<b>Risk Rating:</b>	LOW
<b>Qualification:</b>	Based on the small area of impact, lack of direct habitat for relevant species, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	55.8 m <sup>2</sup>	0 m <sup>2</sup>	- 55.8 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

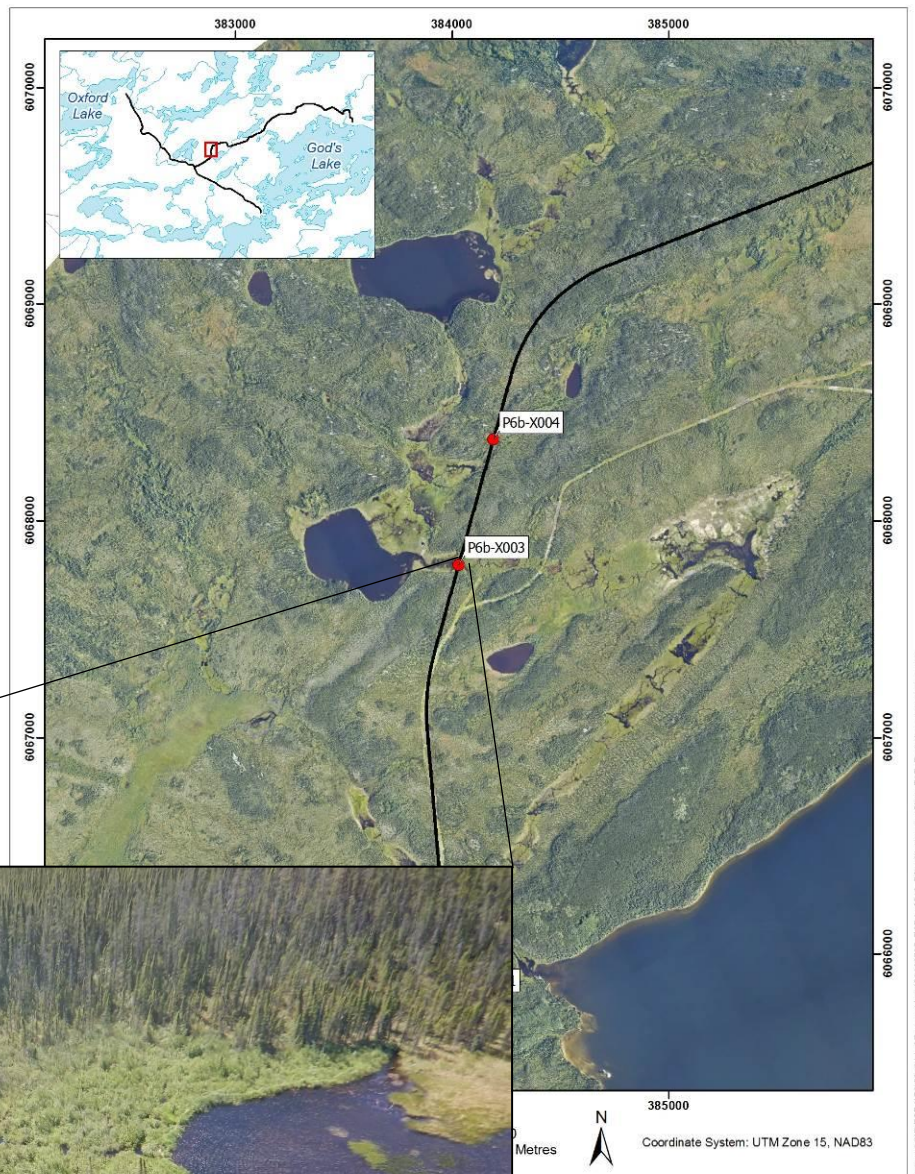
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (1.86 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 384030 6067799

## General Morphology

**Type:** Wetland  
**Pattern:** Braided  
**Channel Profile:** Planar  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 18, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate

### Water Quality Data

**Habitat:** Flat  
**Temperature (°C):** 20.1  
**pH:** 6.65  
**Turbidity (NTU):** -  
**Specific Conductance (µS/cm):** 140  
**DO (mg/L):** 8.75

### Cover

	US	DS
<b>Total Cover Available (%)</b>	70	90
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	5	5
Overhanging Vegetation	10	10
Instream Vegetation	5	5
Pool	60	65
Boulder	0	0
Undercut Bank	20	15
Surface Turbulence	0	0
Turbidity	0	0



Upstream view of large beaver pond habitat at crossing site.



Pond habitat where two Northern Pike were observed.



Downstream view of braided channel covered in shrub at crossing site.



View of left-hand bank from middle of beaver dam at crossing site.



## Fish Presence

### + Fish Habitat Potential

#### Forage Fish

Spawning  
Rearing  
Overwinter  
Migration

#### US

Moderate  
Moderate  
Moderate  
Moderate

#### DS

Moderate  
Moderate  
Low  
Low

#### Large Bodied Fish

Spawning  
Rearing  
Overwinter  
Migration

Moderate  
Moderate  
Low  
Low

Low  
Low  
Low  
Low

#### Comments

The alignment crosses a series of narrow channels within an inundated grass/shrub floodplain. Habitat is primarily a combination of pools and narrow low flow channels. Substrates are soft and cover consists of aquatic vegetation, suitable for supporting a range of life requisites, including spawning, rearing and feeding of forage fishes, and to a lesser degree Northern Pike. Overwintering may occur in the small upstream lake provided it is accessible. Access to the site from a small upstream lake is limited by the presence of a large beaver dam 50 m from the crossing site. Downstream, the habitat is the same, and a series of at least 13 beaver dams over a distance of nearly 4 km likely deters upstream migrations of fish from Hawkins Lake. Habitat consists of saturated grass/shrub floodplain with isolated pools of standing water. No connectivity observed between watercourse and downstream lake.

### + Fish Sampling Data

**Methods:** electrofishing, visual inspection

**Fish Species Captured:** Northern Pike

**Existing Information:** none

## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 16.37

**Distance to Major DS Waterbody (km):** 3.99 (Hawkins Lake)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site consists mainly of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Hawkins Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Bunibonibee Cree Nation

#### Comments

While the crossing site is located within the traditional territory of the Bunibonibee Cree Nation the tributary feeds into Hawkins Lake, in the traditional territories of Gods Lake First Nation. The creek provides marginal spawning, rearing and feeding habitat for Northern Pike. Multiple ephemeral barriers downstream prohibit access to the site from the CRA fishery in Hawkins Lake.

#### Information Sources:

a – Manitoba Conservation and Water Stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	Habitat at the crossing site provides marginal habitat for life requisites of relevant species. Multiple ephemeral barriers (i.e., beaver dams) hinder access from Hawkins Lake; however access to the upstream lake is less impeded by beaver dams.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute minimally to the downstream and upstream CRA fishery. While it may support a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding access from larger waterbodies is restricted. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact, abundance of similar habitat within the system and lack of direct access by relevant species, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	300 m <sup>2</sup>	0 m <sup>2</sup>	- 300 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

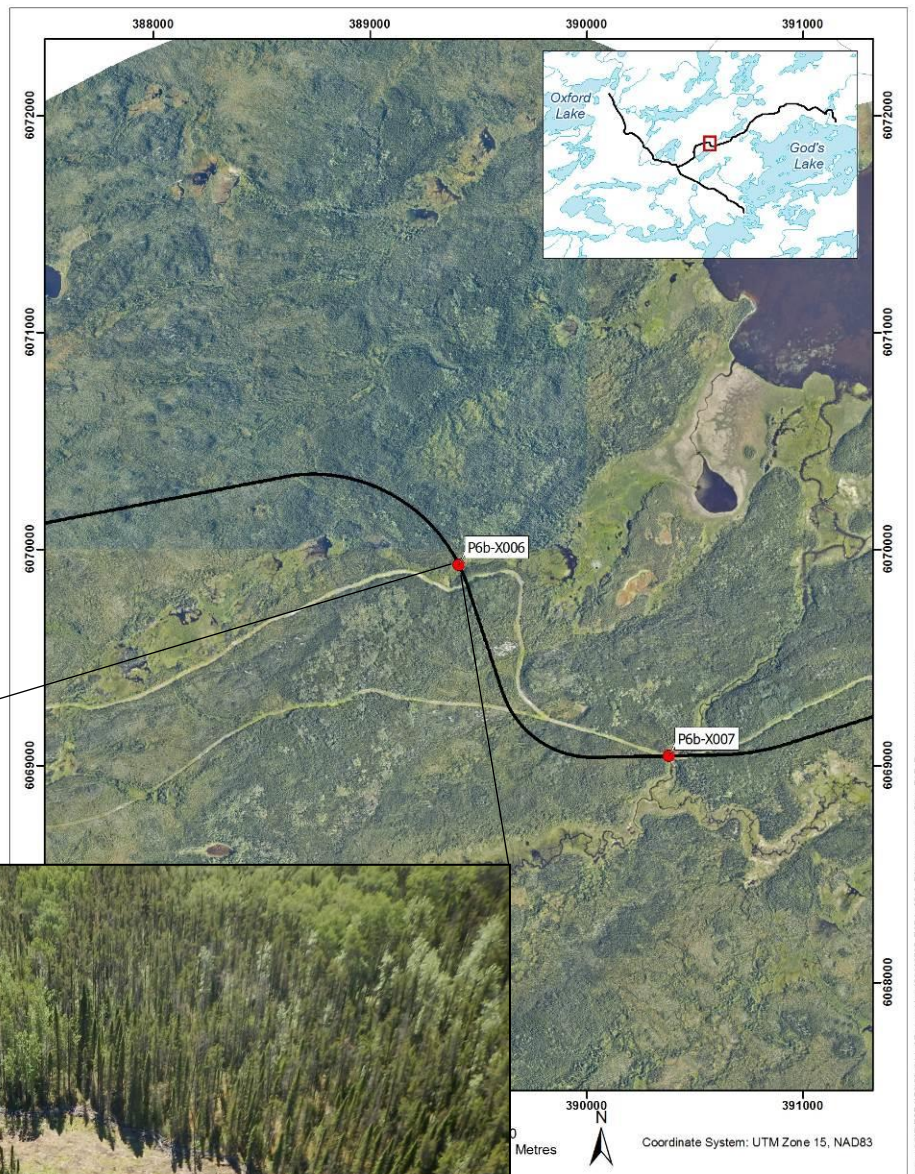
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (10 m). The stream consists of a broad floodplain with numerous braided channels. The affected instream area is highly dependent of the precise location of the crossing and the area provided is an estimate subject to refinement based on the precise crossing location.

## Location

**Datum:** NAD 83  
**UTM:** 15U 389409 6069930

## General Morphology

**Type:** Stream  
**Pattern:** Irregular Wandering  
**Channel Profile:** Notched  
**Sinuosity:** -  
**Confinement:** Frequently Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 18, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



Crossing: P6b-X006

 Stream Crossing

 Transect

 Preliminary Alignment



0 50 100 Metres  
 Coordinate System: NAD 1983 UTM Zone 15N  
 Projection: Transverse Mercator  
 Units: Meter For illustration only.

### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	350 DS	60 DS	23	60 US	280 US
<b>Channel and Flow</b>					
Channel (m)	2.50	1.55	0.62	0.75	6.90
Wetted Width (m)	2.38	1.57	0.6	0.75	6.90
Depth at 25% (m)	0.05	0.17	0.80	0.16	0.20
Depth at 50% (m)	0.20	0.22	0.40	0.19	0.36
Depth at 75% (m)	0.06	0.28	0.35	0.14	0.15
Maximum Depth (m)	0.20	0.30	0.40	0.19	0.36
Gradient (%)	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.05	0.45	0.50	0.45	0.05
Right Bank Height (m)	0.02	0.26	0.40	0.30	0.05
Left Bank Shape	Sloping	Undercut	Undercut	Vertical	Sloping
Right Bank Shape	Sloping	Undercut	Undercut	Vertical	Sloping
Left Bank Materials	Fines	Fines/Grv	Fines/Veg	Fines/Veg	Fines
Right Bank Materials	Fines	Fines/Grv	Fines/Veg	Fines/Veg	Fines
Left Bank Stability	Moderate	Moderate	High	Moderate	Moderate
Right Bank Stability	Moderate	Moderate	High	Moderate	Moderate
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	70	57	25	64	36
Right Bank	30	32	52	24	10
<b>Riparian Distance (m)</b>					
Left Bank	5	10	25	2	1
Right Bank	5	50	52	18	1
<b>Riparian Vegetation Type<sup>a</sup></b>					
	SHR/ GRA	GRA/ SHR	GRA SHR	GRA/ SHR/	CON
<b>Canopy Cover (%)</b>					
	60	0	50	50	100

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Pool	0	0	0	45	10
Riffle	0	0	0	10	10
Run	100	100	100	45	45
Dam	0	0	0	0	5
Boulder Garden	0	0	0	0	0
Backwater	0	0	0	0	30

### + Water Quality Data

<b>Habitat:</b>	Run
<b>Temperature (°C):</b>	18.2
<b>pH:</b>	6.86
<b>Turbidity (NTU):</b>	145
<b>Specific Conductance (µS/cm):</b>	166
<b>DO (mg/L):</b>	7.55



Upstream view at crossing site (Transect 3).



Downstream view at crossing site (Transect 3).



Upstream view at Transect 4 (60 m upstream of crossing site).



Downstream view at Transect 5 (280 m upstream from crossing site).

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	80	75
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	4	3
Overhanging Vegetation	40	46
Instream Vegetation	16	11
Pool	0	13
Boulder	0	0
Undercut Bank	40	27
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Moderate	Moderate
Migration	Low	Low
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The unnamed creek is a small tributary of Opaskaykow Lake. The creek is heavily impacted by beaver dams with several dams downstream from the crossing that may restrict fish passage from Opaskaykow Lake -to the crossing site. The stream crossing site is narrow (<1 m) and shallow within a broad marshy floodplain with dense alder. Based on poor connectivity (numerous downstream dams) and relatively small channel in areas downstream from the crossing, the crossing site is considered marginal fish habitat. The habitat is suitable for spawning, rearing and feeding by forage fish species. Large bodied fish use is not expected.

### + Fish Sampling Data

**Methods:** Electrofishing, dipnetting

**Fish Species Captured:** Brook Stickleback

**Existing Information:** none

## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 3.68

**Distance to Major DS Waterbody (km):** 2.14 (Opaskaykow Lake)

**Connectivity:** Yes - unlikely

#### Comments

The crossing site consists mainly of pool habitat, dominated by fine substrate within a narrow channel. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Opaskaykow Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Gods Lake First Nation

#### Comments

The crossing is located on an unnamed perennial stream 2.14 km upstream of Opaskaykow Lake, within the traditional territories of Gods Lake First Nation. The creek provides habitat for forage fish, but large-bodied species such as Northern Pike are not expected to access the crossing area.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing itself does not contain direct habitat suitable for relevant species, however, habitat suitable for spawning, rearing and feeding of Northern Pike is present downstream.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable spawning, rearing and feeding habitat for relevant fish (e.g., Northern Pike) is situated outside of the project footprint within the stream and in the region. The habitat in the immediate crossing area is expected to support a range of life requisites for small bodied fish.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact, lack of direct habitat for relevant species, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	18.6 m <sup>2</sup>	0 m <sup>2</sup>	- 18.6 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

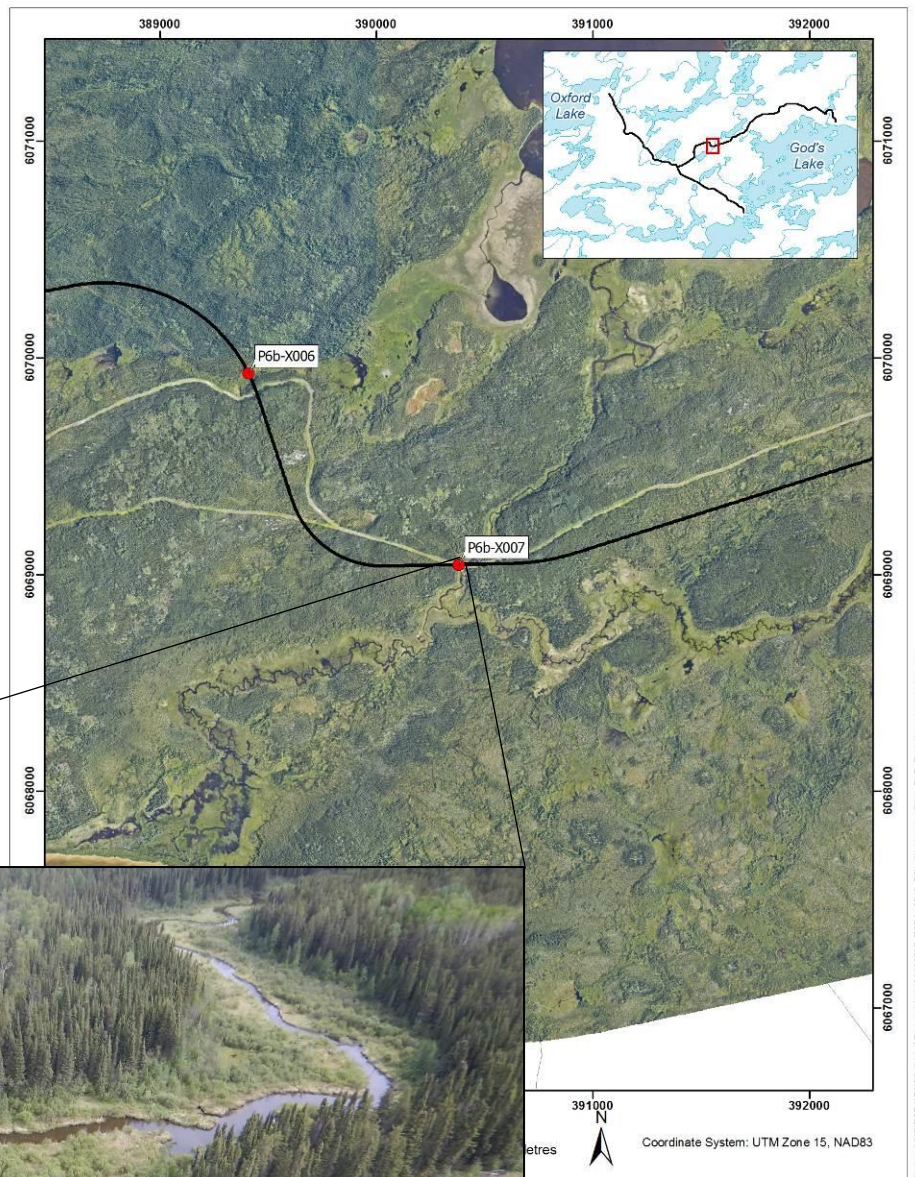
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (0.62 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 390380 6069047

## General Morphology

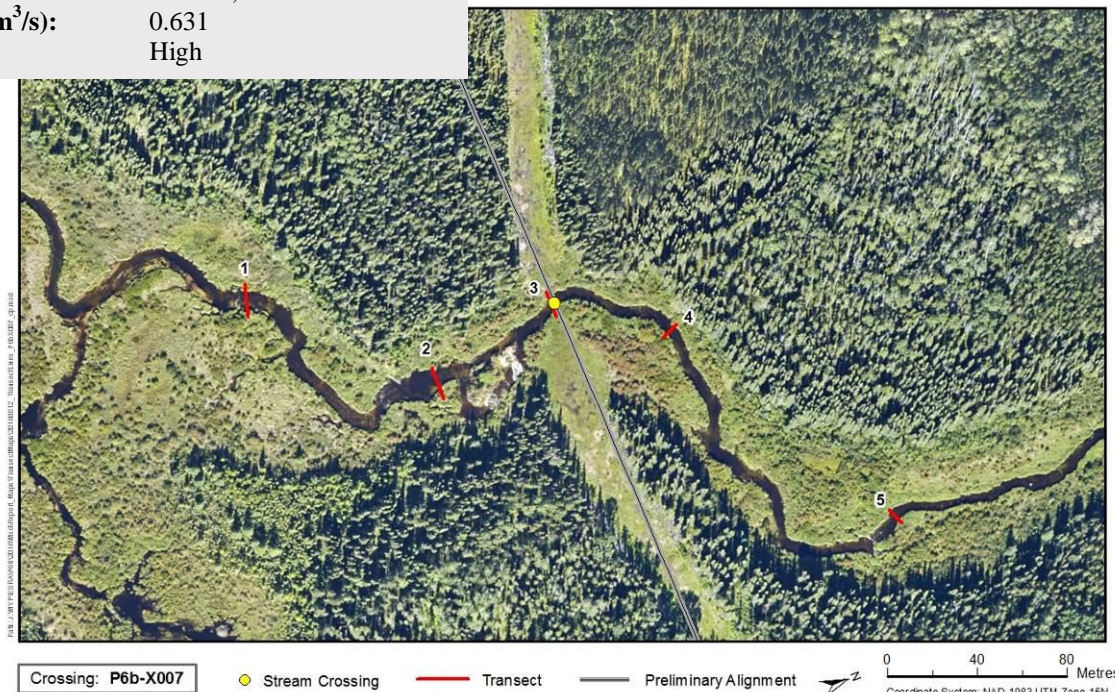
**Type:** Stream  
**Pattern:** Irregular Wandering  
**Channel Profile:** U-shaped  
**Sinuosity:** -  
**Confinement:** Occasionally Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 19, 2016  
**Discharge (m<sup>3</sup>/s):** 0.631  
**Stage:** High



### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	160 US	60 US	0	60 DS	200 DS
<b>Channel and Flow</b>					
Channel (m)	11.6	10.1	5.4	4.6	5.1
Wetted Width (m)	9.5	9.8	5.1	4.2	4.7
Depth at 25% (m)	0.75	-	-	-	-
Depth at 50% (m)	0.70	-	-	-	-
Depth at 75% (m)	0.88	-	-	-	-
Maximum Depth (m)	0.92	-	-	-	-
Gradient (%)	0.5	1	0.5	0.5	1
<b>Banks</b>					
Left Bank Height (m)	0.4	0.6	0.7	0.5	0.3
Right Bank Height (m)	0.6	0.7	0.6	0.8	0.3
Left Bank Shape	Vertical	Vertical	Vertical	Vertical	Sloping
Right Bank Shape	Vertical	Vertical	Vertical	Vertical	Sloping
Left Bank Materials	Organics	Organics	Organics	Organics	Organics
Right Bank Materials	Organics	Organics	Organics	Organics	Organics
Left Bank Stability	Moderate	Moderate	Moderate	Moderate	Low
Right Bank Stability	Moderate	Moderate	Moderate	Moderate	Low
<b>Substrate Type and Distribution (%)</b>					
Fines	60	60	-	-	35
Small Gravel	15	20	-	-	10
Large Gravel	5	10	-	-	10
Cobble	5	0	-	-	20
Boulder	15	0	-	-	25
Bedrock	0	10	-	-	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	2.2	5.5	-	1.1	3.5
Right Bank	3.5	6.2	-	0.5	3.0
<b>Riparian Distance (m)</b>					
Left Bank	6.5	7.5	-	7.0	8.4
Right Bank	40.0	8.0	-	2.5	2.6
<b>Riparian Vegetation Type<sup>a</sup></b>					
	SHR/ DEC/ GRA	MIX	-	SHR/ CON	SHR/ DEC
<b>Canopy Cover (%)</b>					
	0	5	0	5	0

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	0	0	0	0	0
Pool	0	25	0	0	0
Rapid	0	0	0	0	0
Riffle	0	15	0	0	10
Run	100	60	100	100	90
Cascade	0	0	0	0	0

### + Water Quality Data

<b>Habitat:</b>	Run
<b>Temperature (°C):</b>	17.6
<b>pH:</b>	6.94
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	155
<b>DO (mg/L):</b>	7.32



Downstream view at crossing site (Transect 3).



Gillnet panel set across channel near Transect 2.



Upstream view at crossing site (Transect 3).



Riffles flowing over old beaver dam upstream of Transect 5.

## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	100	100
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	15	4
Overhanging Vegetation	1	1
Instream Vegetation	15	10
Pool	50	70
Boulder	5	0
Undercut Bank	14	10
Surface Turbulence	0	5
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	High	High
<b>Large Bodied Fish</b>		
Spawning	High	High
Rearing	High	High
Overwinter	Moderate	High
Migration	High	High

#### Comments

The crossing is located on a 4 km perennial stream connecting Hawkins Lake to Opaskaykow Lake and receives water from a stream upstream of the crossing. Habitat within the crossing area and the entire study reach consists largely of run habitat with substrated dominated by fines but including some coarse material, and abundant instream vegetation. This habitat supports a range of life requisites for Northern Pike and forage fish, including spawning, rearing and feeding and may be used by other large-bodied species such as Walleye and suckers. Though fish species may overwinter within the reach, the lakes are better suited for overwintering of large bodied species.

### + Fish Sampling Data

**Methods:** electrofishing, gillnetting

**Fish Species Captured:** Burbot

**Existing Information:** none



## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled.

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 134.31

**Distance to Major DS Waterbody (km):** 2.43 (Opaskaykow Lake)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of runr habitat, dominated by fine substrates, instream vegetation and some coarse bed material. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** Opaskaykow Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Gods Lake First Nation

#### Comments

The crossing is located on an unnamed perennial stream 2.43 km upstream of Opaskaykow Lake, within the traditional territories of Gods Lake First Nation. The creek provides suitable spawning, rearing and feeding habitat for Northern Pike and possibly supports other large-bodies species.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike and other large-bodied species of fish.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (i.e., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	162 m <sup>2</sup>	0 m <sup>2</sup>	- 162 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (5.4 m).

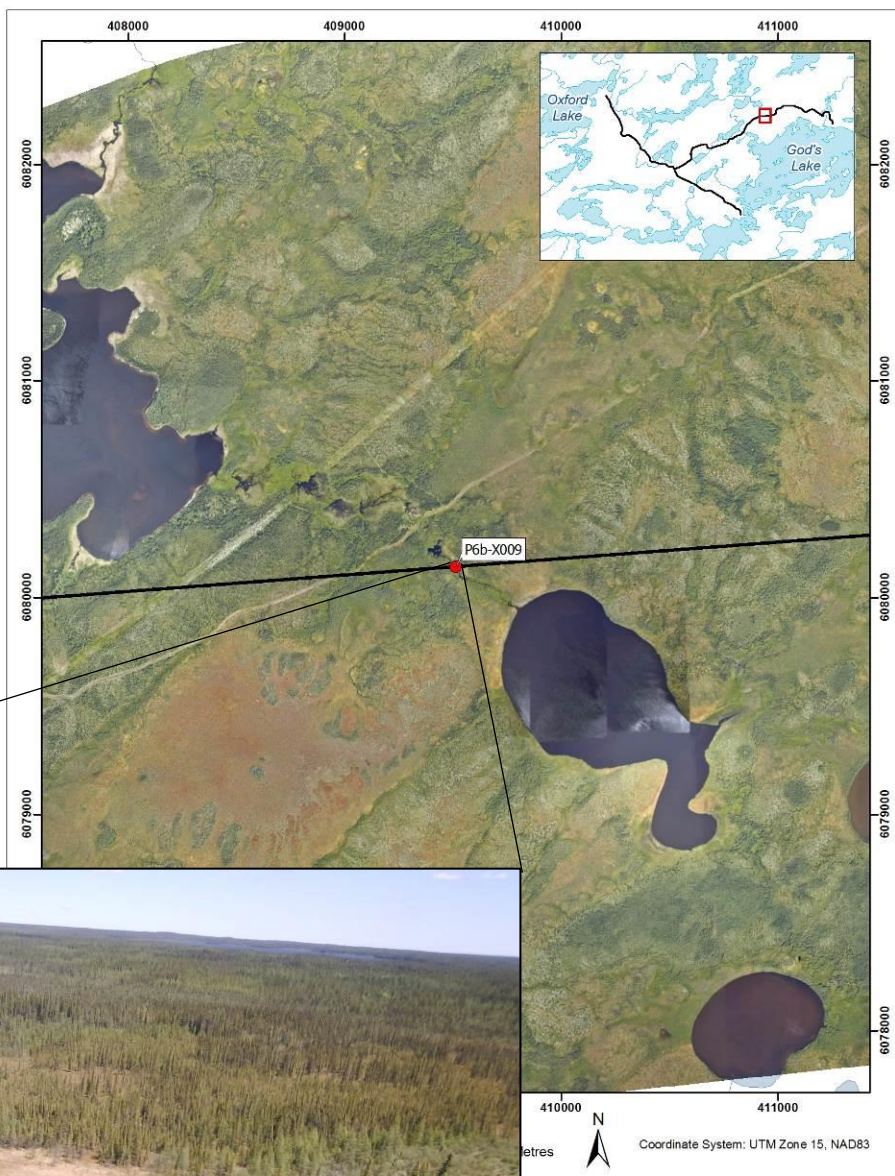


## Location

**Datum:** NAD 83  
**UTM:** 15U 409513 6080144

## General Morphology

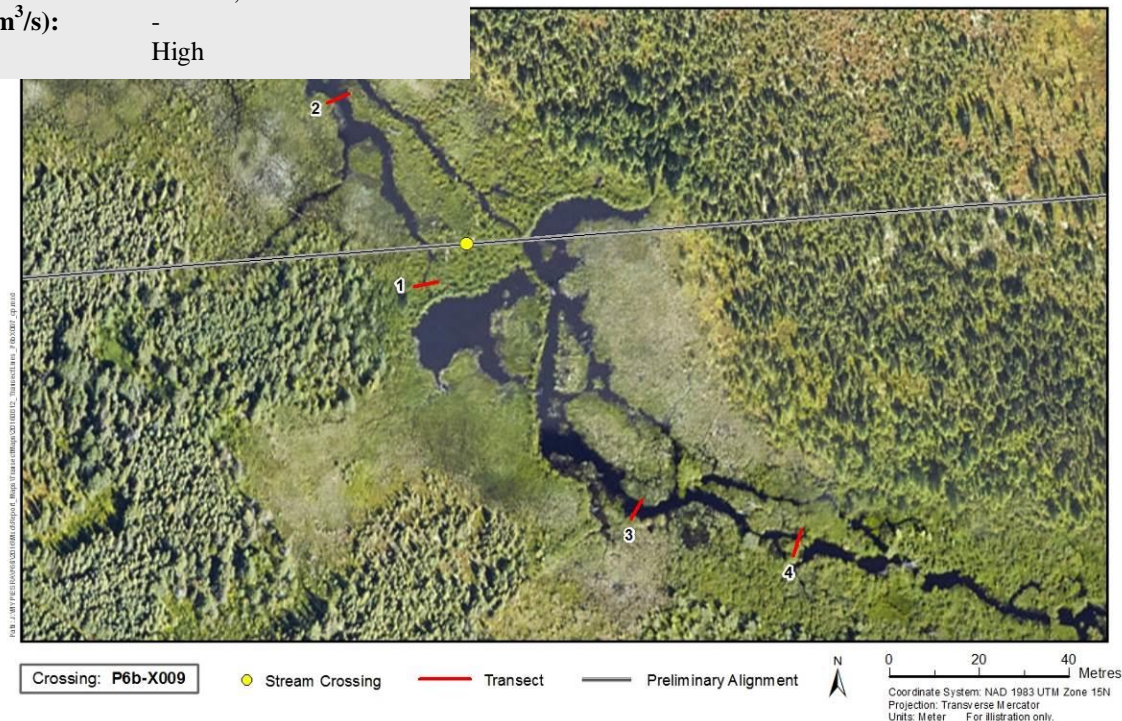
**Type:** Stream  
**Pattern:** Sinuous  
**Channel Profile:** U-shape  
**Sinuosity:** -  
**Confinement:** Unconfined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 18, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** High



### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	0	40DS	75US	100US	-
<b>Channel and Flow</b>					
Channel (m)	1.2	4.2	3.2	3.1	-
Wetted Width (m)	1.0	3.7	2.8	2.4	-
Depth at 25% (m)	0.72	0.40	0.38	0.27	-
Depth at 50% (m)	0.79	1.10	0.54	0.51	-
Depth at 75% (m)	0.85	0.81	0.49	0.18	-
Maximum Depth (m)	0.86	1.15	0.59	0.58	-
Gradient (%)	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	-	-	-	-	-
Right Bank Height (m)	-	-	-	-	-
Left Bank Shape	Sloping	Sloping	Sloping	Sloping	-
Right Bank Shape	Sloping	Sloping	Sloping	Sloping	-
Left Bank Materials	Organics	Organics	Organics	Organics	-
Right Bank Materials	Organics	Organics	Organics	Organics	-
Left Bank Stability	Low	Low	Low	Low	-
Right Bank Stability	Low	Low	Low	Low	-
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	-
Small Gravel	0	0	0	0	-
Large Gravel	0	0	0	0	-
Cobble	0	0	0	0	-
Boulder	0	0	0	0	-
Bedrock	0	0	0	0	-

a – US = upstream from crossing; DS = downstream from crossing.

## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	2.0	60.0	8.0	1.8	-
Right Bank	12.0	7.0	8.1	2.4	-
<b>Riparian Distance (m)</b>					
Left Bank	6.0	85.0	25.0	18.0	-
Right Bank	30.0	31.0	9.0	7.0	-
<b>Riparian Vegetation Type<sup>a</sup></b>					
	CON/ GRA	CON/ GRA	SHR/ GRA/ CON	SHR/ GRA	-
<b>Canopy Cover (%)</b>					
	10	5	5	5	-

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Impoundment	100	100	100	100	-
Pool	0	0	0	0	-
Rapid	0	0	0	0	-
Riffle	0	0	0	0	-
Run	0	0	0	0	-
Cascade	0	0	0	0	-

### + Water Quality Data

<b>Habitat:</b>	Impoundment
<b>Temperature (°C):</b>	23.5
<b>pH:</b>	6.47
<b>Turbidity (NTU):</b>	-
<b>Specific Conductance (µS/cm):</b>	102
<b>DO (mg/L):</b>	7.86



Upstream view at crossing site (Transect 1) from base of beaver dam.



Downstream view of channel separation at Transect 2.



Downstream view at crossing site (Transect 1).



Downstream view of primary tributary channel at Transect 3.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	90	100
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	1	0
Overhanging Vegetation	4	5
Instream Vegetation	5	15
Pool	75	60
Boulder	0	0
Undercut Bank	15	20
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Moderate	Moderate
Migration	Low	Low
<b>Large Bodied Fish</b>		
Spawning	Low	Low
Rearing	Low	Low
Overwinter	Low	Low
Migration	Low	Low

#### Comments

The crossing is located on a stream connecting a small unnamed lake, upstream, to Tapper Lake. The reach has similar habitat both upstream and downstream of the crossing, consisting of flat water, organic substrates and instream vegetation, suitable for a range of life requisites for forage fish and Northern Pike, including spawning, rearing and feeding. The stream is heavily impacted by beavers; four dams downstream (120 m, 340 m, 680 m and 1.2 km) and one upstream (25 m) precludes migrations of Northern Pike to the crossing site, except perhaps during high water events. Overwintering of small bodied fish tolerant of low oxygen conditions may occur in the study reach, but Northern Pike would overwinter in the source and receiving lakes.

### + Fish Sampling Data

**Methods:** Electrofisher

**Fish Species Captured:** Fathead Minnow, Brook Stickleback

**Existing Information:** none

## ▼ Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled; unsuitable habitat

**Mussel Species Captured:** -

**Existing Information:** -

## ▼ Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 16.92

**Distance to Major DS Waterbody (km):** 1.32 (Tapper Lake)

**Connectivity:** Yes - Unlikely

#### Comments

The crossing site consists mainly of flat-water habitat, dominated by organic substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area. Connectivity to Tapper Lake is limited as there are at least four intact beaver dams downstream of the crossing site.

### + Fishery

**Fishery Area:** Tapper Lake

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational No

Aboriginal Yes – Gods Lake First Nation

#### Comments

The crossing is located on an unnamed tributary, within the traditional territories of Gods Lake First Nation. Contributions to a CRA fishery is limited to the upstream unnamed lake, as the creek provides suitable spawning, rearing and feeding habitat for Northern Pike within the reach upstream of the crossing site. Downstream connectivity is limited by the presence of four intact beaver dams over a distance of 1.36 km. Migrations of Northern Pike from Trapper Lake are not expected.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The study reach upstream of the crossing contains accessible habitat suitable for spawning, rearing and feeding of Northern Pike.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the crossing reach is expected to contribute to the upstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.



## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	36 m <sup>2</sup>	0 m <sup>2</sup>	- 36 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

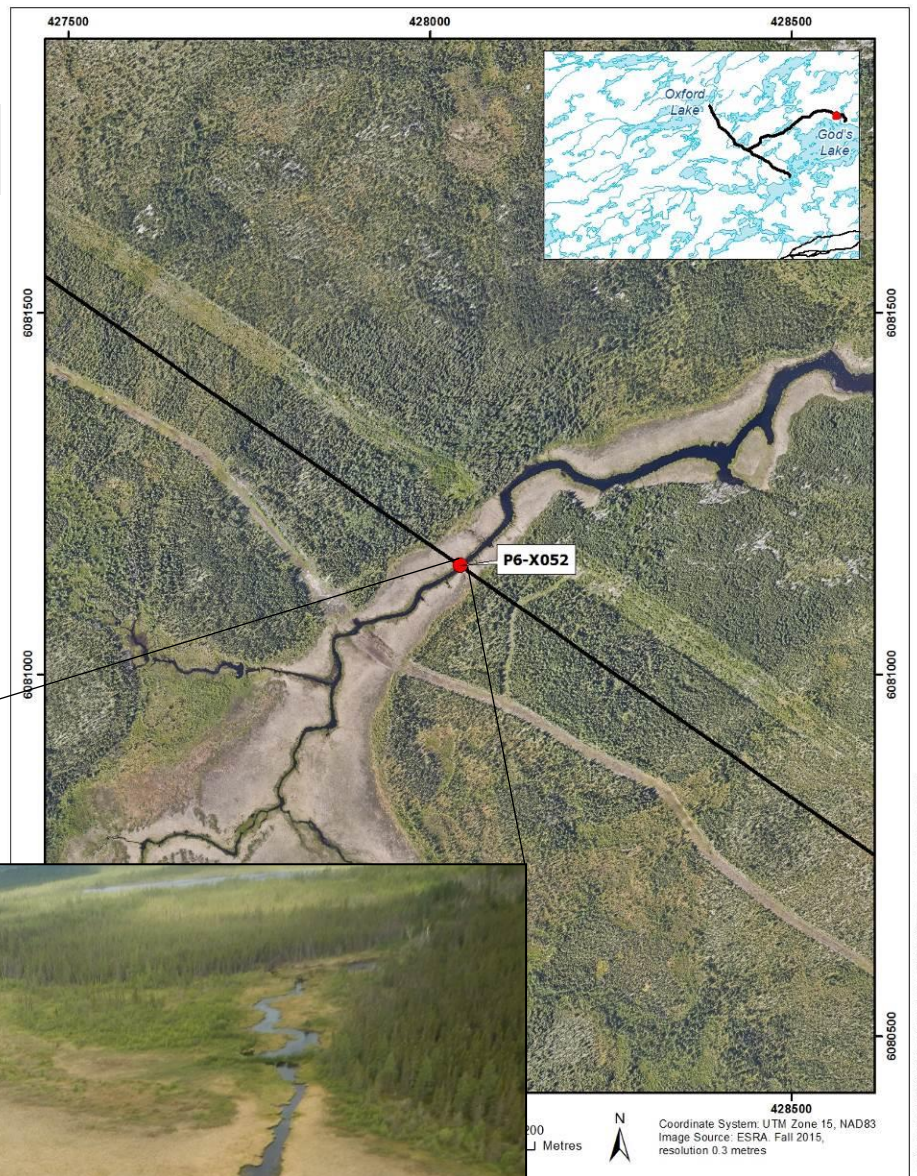
2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (1.2 m).

## Location

**Datum:** NAD 83  
**UTM:** 15U 428031 6081141

## General Morphology

**Type:** Stream  
**Pattern:** Regular Meanders  
**Channel Profile:** U-shape  
**Sinuosity:** -  
**Confinement:** Frequently Confined  
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 20, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



Crossing: P6b-X013

 Stream Crossing

 Transect

 Preliminary Alignment



0 50 100 Metres

Coordinate System: NAD 1983 UTM Zone 15N  
 Projection: Transverse Mercator  
 Units: Meter For illustration only.

### Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	~400 DS	66 DS	0	60 US	356 US
<b>Channel and Flow</b>					
Channel (m)	18	9	7	9	3
Wetted Width (m)	18	9	7	9	3
Depth at 25% (m)	0.50	0.32	0.30	0.11	0.10
Depth at 50% (m)	0.90	1.20	1.00	1.52	1.80
Depth at 75% (m)	0.74	0.10	0.21	0.16	0.10
Maximum Depth (m)	0.90	1.20	1.00	-	1.80
Gradient (%)	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	0.05	0.05	0.00	0.05	0.05
Right Bank Height (m)	0.05	0.05	0.00	0.05	0.05
Left Bank Shape	Vertical	Sloping	Vertical	Vertical	Vertical
Right Bank Shape	Vertical	Sloping	Sloping	Vertical	Vertical
Left Bank Materials	Fines/Organics	Fines/Organics	Fines/Organics	Fines/Organics	Fines/Organics
Right Bank Materials	Fines/Organics	Fines/Organics	Fines/Organics	Fines/Organics	Fines/Organics
Left Bank Stability	Moderate	Moderate	Moderate	Moderate	Moderate
Right Bank Stability	Moderate	Moderate	Moderate	Moderate	Moderate
<b>Substrate Type and Distribution (%)</b>					
Fines	100	100	100	100	100
Small Gravel	0	0	0	0	0
Large Gravel	0	0	0	0	0
Cobble	0	0	0	0	0
Boulder	0	0	0	0	0
Bedrock	0	0	0	0	0

a – US = upstream from crossing; DS = downstream from crossing.



## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	25	30	40	150	35
Right Bank	40	55	54	100	50
<b>Riparian Distance (m)</b>					
Left Bank	25	25	30	150	30
Right Bank	35	50	44	100	45
<b>Riparian Vegetation Type<sup>a</sup></b>					
	GRA	GRA	GRA/SHR	GRA/SHR	GRA/SHR
<b>Canopy Cover (%)</b>					
	0	0	0	0	0

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	0	0	0	0	0
Pool	20	20	0	0	0
Rapid	0	0	0	0	0
Riffle	0	0	0	0	0
Run	80	80	100	100	100
Cascade	0	0	0	0	0

### + Water Quality Data

<b>Habitat:</b>	Run
<b>Temperature (°C):</b>	14.23
<b>pH:</b>	6.84
<b>Turbidity (NTU):</b>	92
<b>Specific Conductance (µS/cm):</b>	115
<b>DO (mg/L):</b>	5.72



Upstream view at crossing site (Transect 3).



Looking upstream from Transect 1 – a bedrock outcrop is visible in the background.



Downstream view at crossing site (Transect 3).



Looking downstream from Transect 4.



## Site Conditions Continued

### + Bathymetric Map



Note: This map is intended for fish habitat assessments. It should not be used for navigation or design purposes.

### + Substrate Map



Note: This map is intended for fish habitat assessments. It should not be used for navigation or design purposes.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	5	5
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	5	2
Overhanging Vegetation	5	3
Instream Vegetation	80	80
Pool	5	10
Boulder	0	0
Undercut Bank	5	5
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	Moderate	Moderate
Migration	Moderate	Moderate
<b>Large Bodied Fish</b>		
Spawning	Moderate	Moderate
Rearing	Moderate	Moderate
Overwinter	Moderate	Moderate
Migration	Moderate	Moderate

#### Comments

The crossing is located 520 m upstream of the stream's confluence with the God's River. Habitat within the study reach and at the crossing site is suitable for fulfilling the life requisites of forage fish and Northern Pike, including spawning, rearing and feeding. The channel flows through a broad grassy floodplain draining a small unnamed lake upstream. The habitat is characterized by slow flowing water over silt substrate and instream vegetation for cover.

### + Fish Sampling Data

**Methods:** Gillnetting

**Fish Species Captured:** none

**Existing Information:** none



## Mussel Presence

### + Mussel Sampling Data

**Methods:** Not sampled

**Mussel Species Captured:** -

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 9.87

**Distance to Major DS Waterbody (km):** 0.76 (Gods River)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of run habitat, dominated by fine substrates and instream vegetation. This type of habitat is not considered rare or unique within the project area.

### + Fishery

**Fishery Area:** God's River

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes – Fishing Lodge (God's River Lodge)

Aboriginal Yes – Manto Sipi Cree Nation

#### Comments

This unnamed tributary feeds into the Gods River, within the traditional territories of Manto Sipi Cree Nation. The creek provides suitable spawning, rearing and feeding habitat for Northern Pike.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016

## Crossing Information

### + Proposed Crossing

<b>Type</b>	Culvert <sup>a</sup>
<b>Diameter (mm)</b>	TBD
<b>Length (m)</b>	30 m
<b>Number of Barrels</b>	TBD
<b>Provision of Fish Passage</b>	Yes

#### Information Sources:

a –pers. comm. ESRA.

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning, rearing and feeding of Northern Pike.
Species at Risk Present	No	No known species at risk.

### + Impacts to Fish and Fish Habitat

<b>Type</b>	Culvert construction and operation
<b>Minor Impact List</b>	No
<b>Residual Impact</b>	Channel infilling within the footprint of the culvert Habitat alteration from rip rap placement at culvert inlet and outlet

Attribute	Rating	Comment
Extent of Impact	Low	The infill of the stream bed and rip rap placement is restricted to the culvert site.
Duration of Impact	High	The infill and rip rap will be in place for approximately 50 years.
Availability & Condition	Low	The affected habitat is common and widespread within the system and the region.
Impact on Relevant Fish	Low	The habitat in the immediate crossing area is expected to contribute to the downstream CRA fishery as it supports a range of life requisites for both forage fish and Northern Pike, including spawning, rearing and feeding. Habitat impacts are expected to have no measurable effect on the CRA fishery productivity as suitable habitat for relevant fish (e.g., Northern Pike) is plentiful outside of the project footprint within the stream and in the region.

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## Net Habitat Change

### Type of Structure: Culvert

#### Type of Structure: Culvert

Effect	Pathway of Effect	Proposed Area Affected	Existing Area Affected	Loss/Gain
Instream Alteration	None <sup>1</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>
Instream Destruction	Footprint <sup>2</sup>	210 m <sup>2</sup>	0 m <sup>2</sup>	- 210 m <sup>2</sup>

1 – Any habitat alterations due to rip rap included in footprint (i.e., destruction)

2 – Area calculated using length of crossing (30 m proposed) and the channel width at the crossing (7 m).



## Location

**Datum:** NAD 83

**UTM:** 15U 429706 6080809

## General Morphology

**Type:** River

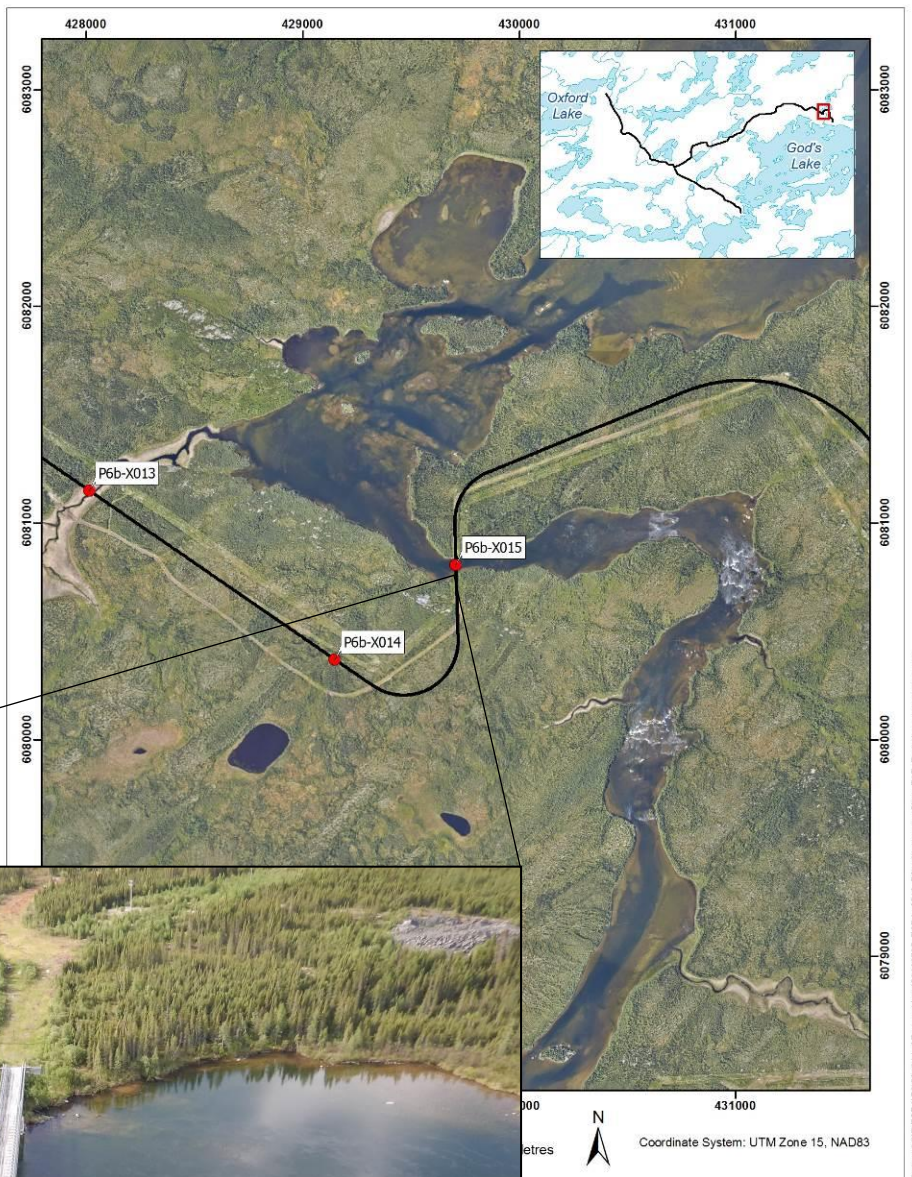
**Pattern:** Sinuous

**Channel Profile:** U-shape

**Sinuosity:** -

**Confinement:** Confined

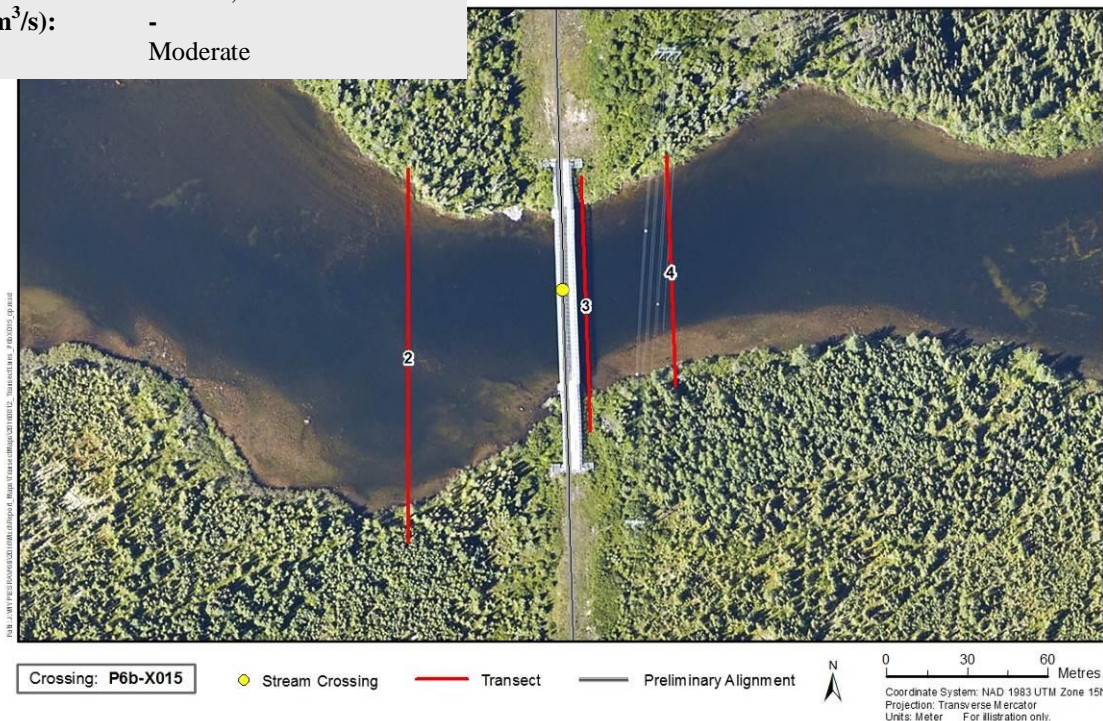
**Flow Regime:** Perennial





## Site Conditions

**Survey Date:** June 19, 2016  
**Discharge (m<sup>3</sup>/s):** -  
**Stage:** Moderate



### + Physical Channel Data

Transect	1	2	3	4	5
Distance from Crossing <sup>a</sup> (m)	-	60 DS	0	60 US	-
<b>Channel and Flow</b>					
Channel (m)	-	98	97	103	-
Wetted Width (m)	-	98	97	103	-
Depth at 25% (m)	-	-	-	-	-
Depth at 50% (m)	-	-	-	-	-
Depth at 75% (m)	-	-	-	-	-
Maximum Depth (m)	-	-	-	-	-
<b>Gradient (%)</b>	-	-	-	-	-
<b>Banks</b>					
Left Bank Height (m)	-	0.8	1.2	0.7	-
Right Bank Height (m)	-	0.8	1.2	0.6	-
Left Bank Shape	-	Undercut	Sloping	Vertical	-
Right Bank Shape	-	Vertical	Sloping	Vertical	-
Left Bank Materials	-	Organics, Fines	Cobble	Gravel, Fines	-
Right Bank Materials	-	Organics, Fines	Fines	Bedrock	-
Left Bank Stability	-	Moderate	Moderate	Moderate	-
Right Bank Stability	-	Moderate	Moderate	Moderate	-
<b>Substrate Type and Distribution (%)</b>					
Fines	-	15	10	25	-
Small Gravel	-	10	5	15	-
Large Gravel	-	5	5	15	-
Cobble	-	50	45	30	-
Boulder	-	10	20	10	-
Bedrock	-	10	15	5	-

a – US = upstream from crossing; DS = downstream from crossing.

## Site Conditions Continued

### + Riparian Area/Floodplain

Transect	1	2	3	4	5
<b>Floodplain Distance (m)</b>					
Left Bank	-	2	2	5	-
Right Bank	-	2	2	5	-
<b>Riparian Distance (m)</b>					
Left Bank	-	2	2	5	-
Right Bank	-	2	2	5	-
<b>Riparian Vegetation Type<sup>a</sup></b>	-	GRA/ SHR/ CON	SHR/ GRA	CON/ SHR/ GRA	-
<b>Canopy Cover (%)</b>	-	-	-	0	-

a – GRA = grass; SHR = Shrub; DEC = deciduous; CON = coniferous; MIX = mixed

### + Habitat Type

Transect	1	2	3	4	5
Flat	-	0	0	0	-
Pool	-	30	50	35	-
Rapid	-	0	0	0	-
Riffle	-	30	0	30	-
Run	-	40	50	35	-
Cascade	-	0	0	0	-

### + Water Quality Data

<b>Habitat:</b>	Run
<b>Temperature (°C):</b>	15.40
<b>pH:</b>	7.68
<b>Turbidity (NTU):</b>	97
<b>Specific Conductance (µS/cm):</b>	118
<b>DO (mg/L):</b>	8.86



Upstream view at crossing site (Transect 3).



Example of gravel shoreline at crossing site.



Downstream view at crossing site (Transect 3).

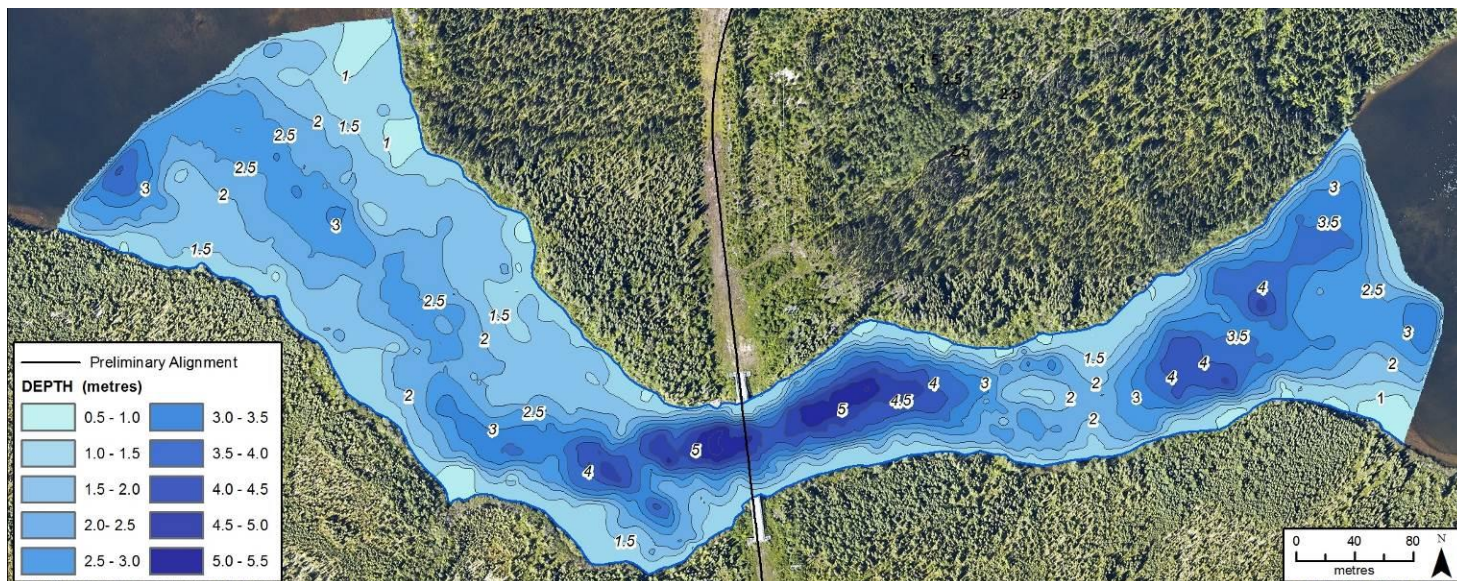


Looking downstream from 60 m downstream of the right bank.



## Site Conditions Continued

### + Bathymetric Map



Note: This map is intended for fish habitat assessments. It should not be used for navigation or design purposes.

### + Substrate Map



Note: This is a generalized substrate map, intended for fish habitat assessment. It should not be used for navigation or design purposes.



## Site Conditions Continued

### + Cover

	US	DS
<b>Total Cover Available (%)</b>	65	60
<b>Cover Composition (% of Total)</b>		
Large Woody Debris	5	15
Overhanging Vegetation	10	10
Instream Vegetation	5	10
Pool	30	20
Boulder	35	30
Undercut Bank	15	15
Surface Turbulence	0	0
Turbidity	0	0

## Fish Presence

### + Fish Habitat Potential

Forage Fish	US	DS
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	High	High
<b>Large Bodied Fish</b>		
Spawning	High	High
Rearing	High	High
Overwinter	High	High
Migration	High	High

#### Comments

The God's River is a major perennial watercourse that provides important fish habitat for a diverse fish community. The study reach provides a variety of habitat types including: run and riffle habitat with gravel, cobble, boulder/bedrock; and shallow shoreline areas with fine substrates and submergent macrophytes. Macrophyte beds in the shallow, off-current areas may be suitable for spawning and rearing by Northern Pike and forage fish species; whereas main channel areas with higher water velocities and coarse substrate area suitable foraging habitat for species such as suckers, Brook Trout and Walleye. Spawning by Walleye and suckers may occur over coarse substrate in riffle habitats in the study reach, but more suitable spawning habitat exists at rapids both upstream (1.5 km) and downstream (4 km) of the crossing. These rapids may be used for spawning by Lake Sturgeon.

### + Fish Sampling Data

**Methods:** Angling, Gillnetting, Dipnetting, Visual Observation

**Fish Species Captured:** Brook Trout, Longnose Sucker, Northern Pike, White Sucker, Sculpin spp.

**Existing Information:** Blacknose Shiner, Brook Stickleback, Brook Trout, Burbot, Cisco, Emerald Shiner, Fathead Minnow, Johnny Darter, Lake Chub, Lake Sturgeon, Lake Trout, Lake Whitefish, Longnose Dace, Longnose Sucker, Ninespine Stickleback, Northern Pike, Sauger, Shorthead Redhorse, Slimy Sculpin, Spottail Shiner, Troutperch, Walleye, White Sucker, Yellow Perch.

#### Information Sources:

FIHCS (2016); HTFC Planning & Design (2016); Eaton (2012); COSEWIC (2006); Stewart and Watkinson (2004).

## Mussel Presence

### + Mussel Sampling Data

**Methods:** mussel rake, visual survey

**Mussel Species Captured:** Giant Floater

**Existing Information:** -

## Regional Context

### + Habitat

**Upstream Drainage Area (km<sup>2</sup>):** 12, 861

**Distance to Major DS Waterbody (km):** 287 (Hayes River)

**Connectivity:** Yes

#### Comments

The crossing site consists mainly of run habitat, dominated by cobble/boulder/bedrock substrates. This type of habitat is not considered rare or unique within the river.

### + Fishery

**Fishery Area:** God's River

#### Fishery Users:

Commercial<sup>a</sup> No

Recreational Yes – Fishing Lodge (God's River Lodge)

Aboriginal Yes –Manto Sipi Cree Nation

#### Comments

The crossing site is located on the God's River 5 km downstream of Gods Lake, within the traditional territories of Manto Sipi Cree Nation. The river provides suitable spawning, rearing and feeding habitat for numerous CRA species including Brook Trout, Cisco, Lake Sturgeon, Lake Whitefish, Northern Pike, Walleye and suckers.

#### Information Sources:

a – Manitoba Conservation and Water stewardship Fisheries Branch - NE Region pers comm. Don MacDonald March 31, 2016



## Crossing Information

### + Proposed Crossing

Type	Clear-span Bridge <sup>a</sup>
Diameter (mm)	TBD
Length (m)	TBD
Number of Barrels	TBD
Provision of Fish Passage	N/A

#### Information Sources:

a –pers. comm. ESRA

## Risk Assessment

### + Preliminary Considerations

Attribute	Rating	Comments
Supports a CRA Fishery	Yes	The crossing contains habitat suitable for spawning of Walleye, sucker and Northern Pike. Habitat within the reach would also support a community of forage fish which would support a wide range of piscivorous species.
Species at Risk Present	Yes	Lake Sturgeon have been reported in this reach of the river.

### + Impacts to Fish and Fish Habitat

Type	Clear-span Bridge
Minor Impact List	Yes
Residual Impact	No residual impact to fish or fish habitat is expected with the implementation of avoidance and mitigation measures.

Attribute	Rating	Comment
Extent of Impact	N/A	
Duration of Impact	N/A	
Availability & Condition	N/A	
Impact on Relevant Fish	N/A	

### + Risk of Serious Harm to Fish

**Risk Rating:** LOW

**Qualification:** Based on the small area of impact and abundance of similar habitat within the system, culvert construction and operation is expected to have no measureable impact on the productivity of local fish populations.

## **Net Habitat Change**

### **Type of Structure:** Clearspan Bridge

The crossing is a clearspan bridge design; no net habitat change is expected.