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Abbreviations and Acronyms

AEMP	Aquatic Effects Monitoring Plan
CAMP	Coordinated Aquatic Monitoring Program
CPUE	catch-per-unit-effort
EIS	environmental impact statement
EOC	emergency outlet channel
FRWCS	Fairford River Water Control Structure
GPS	global positioning system
km	kilometre
LAA	local assessment area
LMOC	Lake Manitoba outlet channel
LSMOC	Lake St. Martin outlet channel
m	metre
MI	Manitoba Infrastructure
mm	millimetre
NSC	North South Consultants
RAA	regional assessment area

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EIS Guideline Reference: 7.1.5 Characterization of fish populations

EIS Reference: 7.2.2.1 Methods; 7.2.10.1 Literature Cited; 7.2.7 Prediction Confidence

Context and Rationale

Section 7.1.5 of the EIS Guidelines requires the proponent to describe the fish surveys carried out and the source of data available (e.g., location of sampling stations, catch methods, date of catches, species, catch-per-unit effort) for characterization of fish populations.

Section 7.2.2.1 of the EIS includes a list of fish inventories, habitat use surveys, and fish habitat assessments that were used to develop the existing conditions for fish habitat in the RAA and LAA. The proponent has also indicated that "Descriptions of the methods used to conduct the fish habitat assessments, bathymetric and substrate surveys, benthic invertebrate surveys, and fish community inventories are provided in the technical reports identified above and listed in the reference section of this assessment."

Section 7.2.7 of the EIS states that "additional data will be required, prior to construction, to address potential changes to the Project coming out of detailed design and to ensure that the baseline is adequate for an effective aquatic effects monitoring program." With the information presented in the EIS, it is difficult to determine if baseline data collected used similar methods.

Further information provided on the baseline collection methods, including an analysis of similarities and differences between methods, is required in order to understand how data collected using various methods was integrated for the analysis of effects to fish and fish habitat.

Information Requests

a) Provide an analysis of baseline collection methods for the studies cited in the EIS. Similarities and differences should be provided. Provide a discussion on the validity of conclusions in the EIS if disparate methodologies were applied.

b) Describe proposed further baseline studies methodology and provide any available results or preliminary results. Consider and discuss the need for additional mitigation, including offsetting, to address uncertainties, given baseline data limitations.

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a) See response below.

The following provides a summary of the baseline data collection studies that were cited in the environmental impact statement (EIS). The information is delineated by Fish Habitat studies and Fish studies. Methods are described such that similarities and differences can be noted. Validity of the EIS conclusions are discussed in relation to disparate methodologies.

Fish Habitat

Existing Data

A considerable amount of fish habitat data has been collected in waterbodies in the Lake St Martin region. Data were collected as part of the Emergency Outlet Channel (EOC) monitoring program (2011-2015; NSC 2016), to support baseline information needs for the Project (Fall 2015 to Fall 2018), and to support Manitoba Infrastructure hydrologic flood forecasting for Lake St. Martin and the Dauphin River (2018). Existing data and data collection methods for these studies are provided in the following sections, as well as an assessment of confidence in baseline data with respect to data collection methods.

EOC Monitoring

Fish habitat data were collected during a series of field surveys conducted during EOC monitoring programs. These primarily documented the distribution of water depth and substrate classes in major waterbodies affected by EOC operation (i.e., the Buffalo Creek watershed, Dauphin River and Sturgeon Bay). The general location and timing of EOC habitat surveys are provided in Table IAAC-36-1. Habitat mapping products produced from information collected as part of the various EOC studies included:

- habitat classification maps of the Buffalo Creek watershed;
- bathymetric and substrate distribution maps of the lower Dauphin River from just upstream of Buffalo Creek to Sturgeon Bay; and
- bathymetric and substrate distribution maps of southern Sturgeon Bay.

Two basic approaches were utilized during the development of habitat descriptions and mapping products. For the Buffalo Creek watershed, habitat classifications were interpreted from geo-referenced orthographic imagery or satellite imagery (remote sensing methods) using field measurements of habitat characteristics as validation data. Hydroacoustic techniques were used to collect bathymetric and substrate classification data from the lower Dauphin River. Substrate samples were collected to validate interpretation of substrate classes from the hydroacoustic data.

Additional bathymetric data were collected throughout the lower Dauphin River to support engineering components (KGS 2016) but these data were not used in the fish habitat descriptions.

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Project Baseline Collections

The timing and locations of field surveys conducted as part of Project baseline data collections are provided in Table IAAC-36-1. Habitat mapping products produced from baseline data collections included:

- Detailed bathymetric, substrate distribution and aquatic vegetation distribution maps of the Lake Manitoba Outlet Channel (LMOC) inlet on Lake Manitoba and the LMOC outlet on Lake St. Martin (AAE Technical Services 2016a). Field survey work included the use of hydroacoustic techniques to collect water depth and substrate classification data. Substrate samples were collected to validate interpretation of substrate classes from the hydroacoustic data;

- Additional survey work to expand bathymetric and substrate distribution maps in the vicinity of the Lake St. Martin Outlet Channel (LSMOC) inlet at Lake St. Martin (NSC for Manitoba Infrastructure 2018). Field survey work included the use of hydroacoustic techniques to collect water depth and substrate classification data. Substrate samples were collected to validate interpretation of substrate classes from the hydroacoustic data; and

- Additional survey work to expand bathymetric and substrate distribution maps in southern Sturgeon Bay to include all Mantagao Bay in the vicinity of the LSMOC outlet (NSC for Manitoba Infrastructure 2018). Field survey work included the use of hydroacoustic techniques to collect water depth and substrate classification data. Substrate samples were collected to validate interpretation of substrate classes from the hydroacoustic data.

Manitoba Infrastructure Hydrologic Support

The timing and locations of field surveys conducted to support hydrologic forecasting are provided in Table IAAC-36-1. Habitat data products developed from data collected to address hydrologic forecasting needs also contributed information towards development of the Project EIS and includes the following:

- Bathymetry and substrate distribution maps of the Fairford River and Pineimuta Lake (NSC for Manitoba Infrastructure 2018). Field survey work included the use of hydroacoustic techniques to collect water depth and substrate classification data. Substrate samples were collected to validate interpretation of substrate classes from the hydroacoustic data; and

- A bathymetric and substrate distribution map of Lake St. Martin (NSC for Manitoba Infrastructure 2018). Field survey work included the use of hydroacoustic techniques to collect water depth and substrate classification data. Substrate samples were collected to validate interpretation of substrate classes from the hydroacoustic data.

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Comparison of Methods, Data Confidence and Validity of Conclusions

Except for habitat mapping completed for the Buffalo Creek watershed, field surveys to collect water depth and substrate classification data were generally consistent among the various surveys. All surveys were conducted by collecting hydroacoustic data in grid or transect patterns across the waterbody being surveyed. Hydroacoustic data were collected using the same sonar equipment (a Biosonics® Habitat MX echosounder linked to a global positioning system (GPS) to obtain sub-meter accuracy for horizontal positions) and all studies used substrate samples to validate interpretation of substrate classification during data processing to generate map products.

Local Assessment Area waterbodies were surveyed at different times and as part of different programs (e.g., EOC monitoring vs. Project baseline investigations) and various map products were produced for each study. Although data processing to generate map products from the field survey data was generally consistent among the various programs, the majority of data sets were merged, and integrated map products were generated to support the Project EIS. Only data collected in Lake St. Martin during fall 2015 and spring 2016 (AAE Technical Services 2016) were not included in the merged mapping products. Instead, areas of Lake St. Martin covered by those surveys were re-surveyed during summer 2018 and those data were merged with other data to create the bathymetry, substrate, and habitat maps.

Habitat survey coverage included all major waterbodies within the Local Assessment Area (LAA) and data collection and analytical methods for fish habitat mapping and baseline descriptions were consistent throughout the LAA. Consequently, there is a high level of confidence in the completeness and consistency in fish habitat data used to support the Project EIS. While it is recognized that there are uncertainties as to how these baseline habitats may be affected and how fish may respond to those changes, the validity of conclusions based on these baseline data would be expected to be high.

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Table IAAC-36-1 Timing of the Field Surveys that Provided the Majority of the Aquatic Habitat Data for the Project Baseline

Waterbody	Field Survey	EOC Monitoring					Project Baseline	Manitoba Infrastructure (Hydrology)
		Pre-operation (flood)	2011/2012 Operation	2011/2012 Closure	2014/2015 Operation	2014/2015 Closure		
Lake Manitoba	Sonar surveys - bathymetry and substrate Substrate validation	-	-	-	-	-	Fall 2015 Spring 2016	-
Fairford River	Sonar surveys - bathymetry and substrate Substrate validation	-	-	-	-	-	-	Summer 2018
Lake St. Martin	GAIM [1] data collection	Summer 2011	-	-	-	Fall 2015	-	-
	Atlis Geomatics data collection [2]	Summer 2011	-	-	-	-	-	-
	Sonar surveys - bathymetry and substrate Substrate validation						Summer 2018	Summer 2018
Big Buffalo Lake and Buffalo Creek	GAIM [1] data collection	Summer 2011	Winter 2011/2012	Summer 2013 Spring 2014	-	Summer 2015	-	-
	Atlis Geomatics data collection [2]	Summer 2011	-	-	-	-	-	-
	Fish habitat surveys	Summer 2011	-	Winter 2012/2013 2013 Spring 2014	-	-	-	-

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Table IAAC-36-1 Timing of the Field Surveys that Provided the Majority of the Aquatic Habitat Data for the Project Baseline

Waterbody	Field Survey	EOC Monitoring					Project Baseline	Manitoba Infrastructure (Hydrology)
		Pre-operation (flood)	2011/2012 Operation	2011/2012 Closure	2014/2015 Operation	2014/2015 Closure		
lower Dauphin River	GAIM [1] data collection	Fall 2011	Winter 2011/2012	Summer 2013 Spring 2014	-	Summer 2015	-	-
	Atlis Geomatics data collection [2]	Summer 2011	-	-	-	-	-	-
	Sonar surveys - bathymetry and substrate Substrate validation	Summer 2011	Summer 2012	Summer 2013 Spring 2014	-	-	-	-
Sturgeon Bay	GAIM [1] data collection	-	-	Summer 2013 Spring 2014	-	-	-	-
	Atlis Geomatics data collection [2]	Summer 2011	-	-	-	-	-	-
	Sonar surveys – bathymetry and substrate Substrate validation	Fall 2011	-	Fall 2013 Spring 2014	-	Summer 2015	Fall 2018	-
	Particle size analysis of sediment samples	Fall 2011	-	Fall 2013 Spring 2014	-	Summer 2015	-	-

1 - GAIM™ = Geo-referenced Aerial Imagery and Mapping
2 - Digital orthometric imagery

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Fish

Existing Data

A considerable amount of fish community composition, abundance, distribution and habitat utilization data were available to support the EIS for the Project, including data collected for Manitoba Infrastructure (MI) during the Lake St. Martin EOC monitoring program (2011-2015), baseline data collected for MI as part of the Project (fall 2015 – fall 2018), and data collected by the Province of Manitoba and Manitoba Hydro as part of the Coordinated Aquatic Monitoring Program (CAMP; 2008-ongoing). An overview of these studies is provided below.

EOC Monitoring

Field activities conducted as part of the EOC monitoring programs focused on documenting the occurrence and timing of fish spawning activity, the occurrence, distribution and abundance of fish eggs and larvae, and the occurrence, distribution and abundance of adult fish and their status with respect to spawning activity. Studies occurred in the north basin of Lake St. Martin, the Dauphin River, and Sturgeon Bay. Timing and location of the various studies are provided in Table IAAC-36-2. Detailed methods and results from each year of sampling are provided in NSC (2016c).

In Lake St. Martin, investigations were focused on the north basin of the lake and included:

- Documentation of water temperature throughout the open-water season;
- Installation of drift traps at the entrance to the Dauphin River and, during operation, at the inlet to the EOC to document the movement of larvae and smaller fish out of Lake St. Martin during spring;
- Larval fish sampling during spring to determine the presence and abundance of larval lake whitefish and other species in Lake St. Martin (i.e., to help determine the success of the previous fall's lake whitefish spawn). Larval fish were collected using a neuston sampler;
- Sampling with standard experimental gill nets in Lake St. Martin to determine the status of spring-spawning fish (pre-spawn, ready to spawn, post-spawn) and to attempt to locate spawning aggregations of walleye and other species; and,
- A fall gillnetting survey in 2014 using standardized experimental gill net gangs to determine if lake whitefish tagged in either the EOC or the Dauphin River had moved into Lake St. Martin.
- In Big Buffalo Lake and Buffalo Creek, field investigations included:
- Documentation of water temperature throughout the open-water season;
- Installation of drift traps in the EOC and at the upstream and downstream ends of Buffalo Creek (with an emphasis on the area near the Dauphin River confluence) during periods of operation and closure to document successful spawning and/or identify movements of larvae and smaller fish in the watershed;

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- Sampling with experimental gill nets in Big Buffalo Lake to determine fish community composition and fish abundance during operation and following closure of EOC; and,
- Sampling with a backpack or boat electrofisher in the EOC, Big Buffalo Lake, and Buffalo Creek to determine fish community composition and fish abundance during operation and following closure of EOC.

In the Dauphin River, field investigations included the following:

- Documentation of water temperature throughout the open water season;
- Installation of drift traps in the lower Dauphin River in the vicinity of the Buffalo Creek confluence during spring to document spawning success in the Dauphin River and Buffalo Creek and to document larval fish movements in the area;
- Installation of egg mats in multiple locations in the lower Dauphin River during spring and fall to collect fish eggs and document fish spawning activity in that area; and,
- Boat electrofishing in the lower reaches of the Dauphin River during spring and fall to document fish use of the area and to locate spawning aggregations of fish.

In Sturgeon Bay, field investigations included the following:

- Documentation of water temperature throughout the open water season;
- Installation of egg mats during spring and fall to capture fish eggs and identify spawning locations for spring and fall spawning fish;
- Sampling with neuston tows to determine the presence and abundance of larval lake whitefish, walleye, and other species in nearshore areas (i.e., to help determine the success of the fall lake whitefish spawn and spring walleye spawn); and,
- Sampling with experimental gill nets to determine status of spring and fall spawning fish (pre-spawn, ready to spawn, post-spawn) and to attempt to locate aggregations of spawning fish and spawning areas for walleye, lake whitefish and cisco.

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Table IAAC-36-2 Summary of Fish Data Collections Conducted as Part of the EOC Monitoring Programs

Waterbody	Sampling Method	Pre-2011/2012 Operation	2011/2012 Operation	2011/2012 Closure	2014/2015 Operation	2015 Closure
Lake St. Martin	Larval drift traps	-	Spring 2012	Spring 2013 Spring 2014	Summer 2014	-
	Neuston tows	-	Spring 2012	Spring 2013 Spring 2014	-	-
	Standard index gillnetting	-	Spring 2012	Spring 2013 Spring 2014	Summer 2014	-
Big Buffalo Lake	Standard index gillnetting	Summer 2011	Fall 2012	Summer 2013 Spring 2014	Fall 2014	-
	Small mesh gillnetting	Summer 2011	Fall 2012	Spring 2013 Summer 2013 Spring 2014	-	-
	Boat electrofishing	-	-	-	Fall 2014	-
Buffalo Creek	Egg mats	-	Fall 2011	Spring 2013 Spring 2014	-	-
	Larval drift traps	-	Spring 2012	Spring 2013 Spring 2014	-	-
	Backpack electrofishing	Summer 2011	-	Summer 2013 Spring 2014	-	-
	Boat electrofishing	-	Fall 2012	Summer 2013 Spring 2014	Fall 2014	-
lower Dauphin River	Egg mats	-	Fall 2011 Spring 2012	Fall 2012 Spring 2013 Fall 2013 Spring 2014	Fall 2014	-
	Larval drift traps	-	Spring 2012	Spring 2013 Spring 2014	-	-
	Boat electrofishing	Fall 2011	Fall 2011 Spring 2012 Fall 2012	Fall 2012 Spring 2013 Fall 2013 Spring 2014	Summer 2014 Fall 2014	-

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Table IAAC-36-2 Summary of Fish Data Collections Conducted as Part of the EOC Monitoring Programs

Waterbody	Sampling Method	Pre-2011/2012 Operation	2011/2012 Operation	2011/2012 Closure	2014/2015 Operation	2015 Closure
Sturgeon Bay	Egg mats	-	Spring 2012	Fall 2012 Spring 2013 Fall 2013 Spring 2014	Fall 2014	-
	Neuston tows	-	Spring 2012	Spring 2013 Spring 2014	-	-
	Standard index gillnetting	Fall 2011	Spring 2012 Fall 2012	Fall 2012 Spring 2013 Fall 2013 Spring 2014	Fall 2014	-

Project Baseline Data Collections

Baseline data collections were conducted at four lake sites and four tributaries during fall 2015 and spring 2016 to assess fish utilization at alternate route options for the LMOC. Detailed methods and results are provided in AAE Technical Services (2016). Sampling locations included:

- Lake Manitoba at Fairford
- Lake Manitoba at Watchorn Bay
- Lake St. Martin at Harrison Bay
- Lake St. Martin at Birch Bay
- Watchorn Creek
- Harrison Creek
- Mercer Creek
- Birch Creek

Field investigations at these sites included:

- Backpack (creek sites) or boat electrofishing (lake sites) during spring and fall to determine fish species presence and abundance;
- Standardized experimental gillnetting during spring and fall at lake sites to determine fish species presence and abundance;

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- Hoopnetting at creek sites during spring to determine fish species presence and abundance;
- Zooplankton tows at lake sites during spring to determine larval fish occurrence;
- Deploying egg mats at lake sites during fall and spring to collect fish eggs; and
- Kick net sampling at lake sites during spring to collect fish eggs.

Additional baseline studies were conducted during 2018 to support the assessment of the LSMOC channel. Detailed methods and results are presented in NSC (2019a; 2019c; 2019d). Studies included:

- Collection of fish abundance and community composition information from both basins of Lake St. Martin during summer. Fish collections were conducted using standardized experimental gill nets (NSC 2019d);
- Spring and fall surveys to describe fish community composition and biological activity (emphasis on spawning) at the proposed LSMOC inlet in the north basin of Lake St. Martin and the LSMOC outlet in Sturgeon Bay (NSC 2019c); and
- A field program to document fish distribution in Lake Manitoba and Lake St. Martin tributaries likely to be affected by construction of the LMOC (i.e., Mercer, Watchorn, and Birch creeks; NSC 2019a).

Manitoba/Manitoba Hydro Coordinated Aquatic Monitoring Program (CAMP)

CAMP is an aquatic monitoring program conducted jointly by the Province of Manitoba and Manitoba Hydro. Data from CAMP was used for the baseline and will likely become part of the Aquatic Effects Monitoring Plan (AEMP). Ongoing data collections conducted as part of CAMP include the collection of fish community and abundance data in southern Sturgeon Bay during late summer. The program was initiated in 2008 and has been conducted annually between 2008 and 2010 and from 2012 to present. Standardized experimental gill nets and standardized small mesh index nets are used to collect fish. Detailed methods and results for 2008-2013 are provided in CAMP (2017).

Comparison of Methods

The following sections provide an overview and comparison of sampling methods between the studies identified above. The methods are delineated based on the fish life history stage targeted by the sampling methods (i.e., fish eggs, fish larvae, juvenile or adult fish).

Fish Egg Sampling

Fish eggs were collected to assist in identifying spawning areas for fish as part of EOC monitoring and Project baseline studies. In most cases, eggs were collected by deploying egg mats in suspected or known spawning areas, allowing fish to spawn and subsequently retrieving the mats and any eggs deposited on the mats. Kick sampling was also used to collect fish eggs as part of Project baseline studies (Table IAAC-36-3).

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Table IAAC-36-3 Summary of Studies and Sampling Methods Used to Collect Fish Eggs During EOC Monitoring and Project Baseline Studies

Waterbody/Study		Source	Method	Season	Set Duration	Sets per Season
Lake Manitoba	Project Baseline Studies	AAE Technical Services (2016)	Egg mats	Fall 2015 Spring 2016	22-29 days 39 days	70 70
	Project Baseline Studies	AAE Technical Services (2016)	Kick	Fall 2015 Spring 2016	15-25 m^2	-
Lake St. Martin	Project Baseline Studies	AAE Technical Services (2016)		Fall 2015 Spring 2016	30 days 36-38 days	70 70 -
	Project Baseline Studies	NSC (2019c)	Egg mats	Spring 2018	15 days	20
Buffalo Creek	EOC Studies	NSC (2016c)	Egg mats	Fall 2011 Spring 2013 Spring 2014	6 days 17 days 7 days	4 4 2
Dauphin River	EOC Studies	NSC (2016c)	Egg mats	Fall 2011 Spring 2012 Fall 2012 Spring 2013 Fall 2013 Srping 2014 Fall 2014	18 Days 47 days 14-26 days 16-19 days 22-26 days 22 days 14 days	8 10 15 17 21 18 20
Sturgeon Bay	EOC Studies	NSC (2016c)	Egg mats	Spring 2012 Fall 2012 Fall 2013 Spring 2014 Fall 2014	13-35 days 8 days 20-21 days 23 days 15 days	15 10 10 10 10
	Project Baseline Studies	NSC (2019c)	Egg mats	Spring 2018	13 days	19

Egg mats used in all studies were constructed of 40 x 20 cm cinder blocks wrapped with air filter material (i.e., latex-coated horsehair or fiberglass) to capture fish eggs deposited over the egg mat (AAE Technical Services 2016; NSC 2016c). Kick sampling was conducted as part of the Project baseline studies to supplement egg mat sampling (AAE Technical Services 2016). Kick sampling included disturbing the substrate in a 1 m^2 area and then filtering the water over the disturbed area with a 250 µm dip net to collect re-suspended fish eggs.

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Larval Fish Sampling

Larval fish were collected during EOC monitoring and Project baseline studies to assist in identifying spawning locations, to assess spawning success and to document larval fish movement (EOC studies; Table IAAC-36-4).

Table IAAC-36-4 Summary of Studies and Sampling Methods Used to Collect Larval Fish During EOC Monitoring and Project Baseline Studies

Waterbody/Study	Source	Method	Set Duration (Volume)
Lake Manitoba			
Project Baseline Studies	AAE Technical Services (2016)	Wisconsin tow	4 minutes (482-578 L)
Lake St. Martin			
EOC Studies	NSC (2016c)	Drift traps	24 hours
EOC Studies	NSC (2016c)	Neuston tows	9-33 minutes (75-391 m^3)
Big Buffalo Lake			
EOC Studies	NSC (2016c)	Neuston tows	10-15 minutes (46-179 m^3)
LSMEOC and Buffalo Creek			
EOC Studies	NSC (2016c)	Drift traps	24 hours
Dauphin River			
EOC Studies	NSC (2016c)	Drift traps	24 hours
Sturgeon Bay			
EOC Studies	NSC (2016c)	Neuston tows	7-31 minutes (73-454 m^3)
Project Baseline Studies	NSC (2019c)	Neuston tows	12-30 minutes (193-238 m^3)

Field sampling methods varied between riverine and lacustrine habitats. In general, larval fish were captured in creeks and rivers using stationary drift traps that filtered flowing water continuously and samples were collected every 24 hours. Two types of drift traps were used during EOC investigations. The first were used in 2012 and 2013 and had a mouth opening of 43 x 85 cm and included a 300 cm long screen bag constructed of 950 µm Nitex®, which tapered to a 9 cm diameter removable ABS pipe cod-end. The second type of drift trap, used from 2012-2014, was of similar design but was much smaller. These had a mouth opening of 15 x 15 cm, and a 1 m long cod-end constructed of 500 µm Nitex®. Drift traps were not used as part of Project baseline studies (Table IAAC-36-4).

In lacustrine habitat, larval fish were collected by conducting horizontal tows with filtering nets to skim surface waters. Neuston samplers were used during all EOC monitoring studies and some Project baseline studies (NSC 2019c). The sampler consisted of an aluminum box with a mouth opening 45 x 45 cm, a wing on either side of the box and a depressor control box elevation within the water column. A

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500 µm mesh Nitex® screen bag tapered into a removable 500 µm Nitex® cod-end was attached to the aluminum box. A General Oceanics (GO) flow meter was mounted in the mouth opening of the aluminum box to estimate the volume of water filtered (NSC 2016c; NSC 2019c).

During Project baseline studies, a Wisconsin zooplankton net was used. The net was 1 m in diameter, 1.5 m in length and constructed of 500 µm mesh. A GO Environmental propeller flow meter attached to the cod end to record water flow through the net to standardize catch-per-unit-effort (CPUE). Three four-minute surface tows were conducted travelling 7-10 km/hr (AAE Technical Services 2016).

Adult and Juvenile Fish Sampling

The community composition, distribution and abundance of adult fish were documented in baseline studies using a combination of fish collection methods. Primary methods included the use of standardized experimental gill nets, small mesh gill nets, and boat-based electrofishing in lakes and major rivers; hoop nets were used to a limited extent in several small tributaries. The following sections provide a comparison of pertinent field methods between studies for each of the primary fish collection techniques.

Standardized Experimental Gill Nets

Standardized gill nets were used in every study area to capture adult and juvenile fish. Characteristics of the index nets and set target duration for each study are provided in the Table IAAC-36-5.

Table IAAC-36-5 Comparison of Standard Experimental Gillnet Gang Configuration and Set Duration Between Studies Used in Development of the Project Baseline

Waterbody/Study	Source	Net Type [1]	Set Duration
Lake Manitoba			
Project Baseline Studies	AAE Technical Services (2016)	Standard 1	~1 hr
Lake St. Martin			
EOC Studies	NSC (2016c)	Standard 1	< 2 hrs
Project Baseline Studies	AAE Technical Services (2016)	Standard 1	~1 hr
Project Baseline Studies	NSC (2019d)	Standard 1	overnight set (target 18 hrs)
Project Baseline Studies	NSC (2019c)	Standard 1	< 2 hrs
Big Buffalo Lake			
EOC Studies	NSC (2016c)	Standard 1	< 2 hrs
Sturgeon Bay			
EOC Studies	NSC (2016c)	Standard 1	< 2 hrs
Project Baseline Studies	NSC (2019c)	Standard 1	< 2 hrs
CAMP	CAMP (2017)	Standard 2	overnight set (target 24 hrs)

[1] Standard 1: 137.2 m long and consisted of 22.9 m long by 1.8 m deep panels of 1.5, 2.0, and 3.0 inch stretched twisted nylon mesh and 3.75, 4.25, and 5.0 inch stretched twisted monofilament mesh
Standard 2: 114 m long and consisted of 22.9 m long by 1.8 m deep panels of 2.0, 3.0, 3.75, 4.25, and 5.0 inch stretched mesh

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The mesh and panel sizes of standardized experimental gillnet gangs were consistent among most studies and included 22.9 m long by 1.8 m deep panels of 38 mm (1.5”), 51 mm (2.0”), 76 mm (3.0”), 95 mm (3.75”), 108 mm (4.25”) and 127 mm (5”) stretched mesh. The only deviation from this was during the CAMP studies, where panels and mesh sizes were the same as other studies, except that the 38 mm panel was not included.

Set duration varied between studies. Gillnet gangs set during all EOC monitoring studies and most of the Project baseline studies were left in the water for 2 hours or less to minimize fish mortality. In contrast gillnet gangs set for CAMP and in Lake St. Martin during 2018 were left to fish overnight and durations varied between 16 and 24 hours (CAMP 2017; NSC 2019d).

Small Mesh Index Nets

Small mesh index gillnet gangs were used in several locations to capture adult and juvenile fish. Characteristics of the small mesh index nets and set target duration for each study are provided in Table IAAC-36-6.

Table IAAC-36-6 Comparison of Small Mesh Index Net Configuration and Set Duration Between Studies Used in Development of the Project Baseline

Waterbody/Study	Source	Net Type [1]	Set Duration
Lake Manitoba			
Project Baseline Studies	AAE Technical Services (2016)	not used	
Lake St. Martin			
EOC Studies	NSC (2016c)	Standard	< 2 hrs
Project Baseline Studies	AAE Technical Services (2016)		
Project Baseline Studies	NSC (2019d)	Standard	overnight set (target 18 hrs)
Project Baseline Studies	NSC (2019c)	not used	
Big Buffalo Lake			
EOC Studies	NSC (2016c)	Standard	< 2 hrs
Sturgeon Bay			
EOC Studies	NSC (2016c)	Standard	< 2 hrs
Project Baseline Studies	NSC (2019c)	Standard	< 2 hrs
CAMP	CAMP (2017)	Standard	overnight set (target 24 hrs)

[1] Standard: 30 m long and consisted of 10.0 m long by 1.8 m deep panels of 16 mm (0.6 in), 20 mm (0.8 in), and 25 mm (1.0 in) stretched mesh

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The mesh and panel sizes of small mesh index gangs were consistent among all studies and consisted of 10.0 m long by 1.8 m deep panels of 16 mm (0.6 in), 20 mm (0.8 in), and 25 mm (1.0 in) stretched mesh. Set duration varied between studies. Small mesh index gangs set during the EOC monitoring studies and most of the Project baseline studies were left in the water for 2 hours or less to minimize fish mortality. In contrast, small mesh index gangs set for CAMP and in Lake St. Martin during 2018 were left to fish overnight and durations varied between 20 and 24 hours (CAMP 2017; NSC 2019d).

Boat Electrofishing

During the EOC monitoring programs, boat electrofishing was used exclusively to sample juvenile and adult fish in the lower Dauphin River during spring and fall of each year (2011-2015) and in the Buffalo Creek watershed during periods when the EOC was in operation (Table IAAC-36-1; NSC 2016c). Boat electrofishing was conducted from a 5.5 m boat equipped with a Smith-Root® GPP 5.0 electrofisher with dual boom Smith-Root® UAA-6 Umbrella anodes (0.91 m diameter), mounted two meters apart. Numerous electrofishing runs were conducted during each sampling period, particularly in the lower Dauphin River. Boat electrofishing catches were tabulated by species, sampling session, phase and/or run/pass. The CPUE for electrofishing runs was calculated as the number of fish captured per 60 seconds of electrofishing.

During the Project baseline studies, boat electrofishing was conducted during fall 2015 at one location in Lake Manitoba and four lake locations (two in Lake Manitoba and two in Lake St. Martin) during spring 2016. Electrofishing was conducted using a Smith-Root® 2.5 GPP electrofisher system with two boom umbrella arrays mounted to the bow of a 4.8 m dual hull aluminum boat. Boat electrofishing catches were tabulated by species and CPUE was calculated as the number of fish captured per 60 seconds of electrofishing.

Data Confidence and Validity of Conclusions

A considerable amount of fish community composition, abundance, distribution, and habitat utilization data were available to support the EIS for the Project. Methods used to collect information regarding fish (fish eggs, larval fish, and juvenile and adult fish) were comparable between studies. Small differences in sampling gear configurations (e.g., exclusion of 1.5 in mesh in CAMP standard experimental gillnets) or gear deployment strategies (< 2 hr versus 24 hr gill net set duration) occurred, but these differences were taken into consideration when interpreting the data. Methods used in the majority of studies were fisheries assessment tools that are accepted as standard techniques to assess fish communities, populations, and utilization. Consequently, there is a high level of confidence in the completeness and consistency of information used to support the assessment of fish-related effects presented in the Project EIS. The validity of conclusions based on these baseline data would be expected to be high. It is recognized that there are uncertainties as to how habitats may be affected and how fish may respond to those changes.

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b) See response below

Additional Baseline Studies

This section summarizes additional baseline studies that are proposed for 2020. Mitigation and offsetting are discussed in relation to the baseline data limitations.

Additional baseline studies are proposed for 2020 to:

- support further assessment of Project effects and support the Application for *Fisheries Act* Authorization;
- provide pre-Project information to support a future AEMP; and/or
- provide additional information to assess or monitor unforeseen effects that may arise once detailed Project design and the approach to construction have been finalized.

While the Fish and Fish Habitat baseline information is considered to be sufficient to assess most effects of the Project based on using a precautionary approach, more detailed information regarding the spawning movements of lake whitefish in the Project area will strengthen the understanding of lake whitefish movements and preferred habitat in the region. The Dauphin River and Lake St. Martin are known to provide important spawning habitat for lake whitefish that reside in Lake St. Martin and Lake Winnipeg. Lake whitefish in Lake Winnipeg begin to move into the Dauphin River and Lake St. Martin in mid-September and are believed to spawn in both the river and lake in late October and/or early November. Information on the following aspects of the lake whitefish migration are required:

- number of lake whitefish entering the Dauphin River in the fall;
- number of lake whitefish that migrate to Lake St. Martin;
- specific lake whitefish spawning destinations in the Dauphin River and Lake St. Martin;
- movements of lake whitefish past the Fairford River Water Control Structure (FRWCS); and
- timing of lake whitefish downstream post-spawning migrations to Lake Winnipeg.

The Project has the potential to affect lake whitefish spawning migrations by altering flow patterns and by attracting fish into the constructed channels. The following studies will be conducted concurrently in the fall of 2020 to address these questions:

- a split-beam hydroacoustics study to enumerate lake whitefish migrating into the Dauphin River during fall; and
- a lake whitefish acoustic telemetry study to determine the specific destinations of spawning lake whitefish within the Lake St. Martin/Dauphin River system.

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Additional Mitigation and Offsetting

The requirement for additional mitigation and offsetting has not been identified at this time. An AEMP is currently being developed. The AEMP will provide a comprehensive program for monitoring Project effects on fish and fish habitat and will prescribe mitigation or adaptive management actions should adverse effects occur. Additional baseline studies may be identified within the AEMP where pre-Project data are considered insufficient. The AEMP will form a key component of the Application for *Fisheries Act* Authorization which will detail offsetting measures for any remaining unavoidable adverse effects to fish and fish habitat.

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