Lake Manitoba and Lake St. Martin Outlet Channels Project

Response to IAAC Technical Review Information Requests, Round 2

July 24, 2023

Stantec

Manitoba
Transportation and Infrastructure

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Abbreviations and Acronyms

%	percent
2D	two-dimensional
ac	acre
AEMP	Aquatic Effects Monitoring Plan
AIS	aquatic invasive species
AMP	Access Management Plan
ARU	autonomic recording units
ASAR	Aquatic Species at Risk
asl	above sea level
ATV	all-terrain vehicle
BC	British Columbia
BMP	best management practice
BOD_5	5-day biological oxygen demand
BON	Brokenhead Ojibway Nation
BRFN	Black River First Nation
Ca	calcium
ca.	circa
CAC	criteria air contaminant
CAMP	Coordinated Aquatic Monitoring Program
CCME	Canadian Council of Ministers of the Environment
CCOHS	Canadian Centre for Occupational Health and Safety

Abbreviations and Acronyms
July 24, 2023

CCSDH	Canadian Council on Social Determinants of Health
CEA Agency	Canadian Environmental Assessment Agency
CEA	cumulative effects assessment
CEAA	*Canadian Environmental Assessment Act, 2012*
CEMP	Construction Environmental Management Program
CEQG	Canadian Environmental Quality Guideline
cfs	cubic feet per second
CIE	Commission Internationale de L'Éclairage
cm	centimetre
CNWA	*Canadian Navigable Waters Act*
CO	carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife Species in Canada
CPUE	catch-per-unit-effort
CRP	Complaint Resolution Process
CSAM	Construction Safety Association of Manitoba
CWB	community well-being
CWQG-FAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life
dBA	A-weighted decibels
DCP	Dust Control Plan
DFO	Department of Fisheries and Oceans Canada
DO	dissolved oxygen
EA	environmental assessment
EAC	Environmental Advisory Committee

Abbreviations and Acronyms
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ECCC	Environment and Climate Change Canada
EDIT	Economic Development, Investment and Trade Department
EEPP	Evacuation and Emergency Preparedness Plan
EHMP	Eastern Whip-poor-will Habitat Mitigation Plan
EIS	Environmental Impact Statement
El.	Elevation
EMP	Environmental Management Program
EOC	Emergency Outlet Channel
EPP	Environmental Protection Plan
ESS	Environmentally Sensitive Site
FAOP	*Fisheries Act* Offsetting Plan
FDPI	First Peoples Development Inc.
FMU	Forest Management Unit
FN	First Nation
FPDI	First Peoples Development Inc.
FRCN	Fisher River Cree Nation
FRI	Forest Resource Inventory
FRWCS	Fairford River Water Control Structure
FSC	food, social and ceremonial
ft	feet
ft^3/s	cubic feet per second
$g/m^2/day$	grams per square metre per day
gal	gallon

Abbreviations and Acronyms
July 24, 2023

GCM	global climate model
GHA	Game Hunting Area
GUDI	Groundwater Under Direct Influence
GWMP	Groundwater Management Plan
ha	hectare
HADD	Harmful Alteration, Disruption, or Destruction
HIA	Health Impact Assessment
HMA	Habitat Management Area
HMMP	Hazardous Materials Management Plan
HQ	hazard quotient
hr	hour
HRB	Historic Resources Branch
HRIA	Heritage Resource Impact Assessment
HRPP	Heritage Resources Protection Plan
HVdc	High Voltage Direct Current
HWFN	Hollow Water First Nation
HWL	high water level
HWM	high water mark
IAAC	Impact Assessment Agency of Canada, the Agency
ICACS	Indigenous Consultation Approach and Current Status
ICSER	Indigenous Consultation and Stakeholder Engagement Report
IISD	International Institute for Sustainable Development
IMP	Ice Management Plan

Abbreviations and Acronyms
July 24, 2023

in	inches
IPI	Indigenous Procurement Initiative
IR	Indian Reserve
IR	Information Request
IRTC	Interlake Reserves Tribal Council
km	kilometre
km^2	square kilometre
kV	kilovolt
LAA	local assessment area
LCC	Land Cover Classification
LiDAR	light detection and ranging
LM&LSMRRC	Lake Manitoba and Lake St. Martin Regulation Review Committee
LMOC	Lake Manitoba Outlet Channel
LMRRAC	Lake Manitoba Regulation Review Advisory Committee
LSA	local study area
LSFN	Little Saskatchewan Fist Nation
LSM	Lake St. Martin
LSMFN	Lake St. Martin First Nation
LSMOC	Lake St. Martin Outlet Channel
LSNAC	Loon Straits Northern Affairs Community
LWL	low water level
LWR	Lake Winnipeg Regulation
m	metre

Abbreviations and Acronyms
July 24, 2023

m/d	metres per day
m/s	metres per second
m^3	cubic metre
m^3/day	cubic metres per day
m^3/s	cubic metres per second
MAAQC	Manitoba Ambient Air Quality Criteria
MAE	mean absolute error
MARD	Manitoba Agriculture and Resource Development
MB CDC	Manitoba Conservation Data Centre
MCC	Manitoba Conservation and Climate
MCPA	2-methyl-4-chlorophenoxyacetic acid
MEC	Manitoba Environment and Climate
MECP	Manitoba Environment, Climate and Parks
$MgCl_2$	Magnesium Chloride
mg/L	milligram per litre[1]
mi	mile
mi^2	square mile
mL	millilitre
mm	millimetre
MMF	Manitoba Métis Federation
MMTP	Manitoba-Minnesota Transmission Project

[1] Imperial conversion for mg/L has not been included in-text, however the oz/gal conversion factor is 1 mg/L = 0.00013 oz/gal

Abbreviations and Acronyms
July 24, 2023

MNRND	Manitoba Natural Resources and Northern Development
MSD	Manitoba Sustainable Development
MSOG-FAL	Manitoba Water Quality Standards, Objectives, and Guidelines for the Protection of Freshwater Aquatic Life
MSY	maximum sustainable yield
MWQSOG	Manitoba Water Quality Standards, Objectives, and Guidelines
MWS	former Manitoba Water Stewardship, now Manitoba Natural Resources and Northern Development
N	nitrogen
NAC	Northern Affairs Communities
NCM	Northern Community Manitoba
NDVI	normalized difference vegetation index
NEB	National Energy Board
ng/L	nanograms per litre
NH_3	Unionized Ammonia
NHCN	Norway House Cree Nation
NO_2	nitrogen dioxide
NPA	*Navigation Protection Act*
NPP	Navigation Protection Program
NSB	near surface bedrock
NSC	North/South Consultants Inc.
NTU	Nephelometric Turbidity Units
O_3	ozone
OEMP	Operation Environmental Management Program

Abbreviations and Acronyms
July 24, 2023

PA	physical activities
PAL	Protection of Freshwater Aquatic Life
PDA	Project development area
PDNAC	Pine Dock Northern Affairs Community
PER	Project Environmental Requirements
PFN	Pinaymootang First Nation
PM_{10}	particulate matter 10 micrometers or less in diameter
$PM_{2.5}$	particulate matter 2.5 micrometers or less in diameter
PMA	potentially most affected
ppm	parts per million
PR	provincial road
PRFN	Poplar River First Nation
Project	Lake St. Martin and Lake Manitoba Outlet Channels Project
PSC	Procurement and Supply Chain
PTH	Provincial Trunk Highway
QMP	Quarry Management Plan
RAA	regional assessment area
RHMP	Red-headed Woodpecker Habitat Mitigation Plan
RHO	Regional Historical Overview
RM	Rural Municipality
RMEF	Rocky Mountain Elk Foundation
ROW	right-of-way
RVMP	Revegetation Management Plan

Abbreviations and Acronyms
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SAFN	Sagkeeng Anicinabe First Nation
SAR	species at risk
SBOFN	Sandy Bay Ojibway First Nation
SFN	Sagkeeng First Nation
SMP	Sediment Management Plan
SO_2	sulfur dioxide
SOCC	species of conservation concern
SOD	sediment oxygen demand
Stantec	Stantec Consulting Ltd.
SWMP	Surface Water Management Plan
TAC	Transportation Association of Canada
TAG	Technical Advisory Group
TAN	total ammonia nitrogen
TCN	Tataskweyak Cree Nation
TIS	tanks-in-series
TK	Traditional Knowledge
TLRU	traditional land and resource use
ToR	terms of reference
TP	total phosphorus
TSS	total suspended solids
UV	ultraviolet
VC	Valued Component
VOC	volatile organic compound

Abbreviations and Acronyms
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VWs	Vibrating Wire piezometers
WCS	water control structure
WetMP	Wetland Monitoring Plan
WMA	Wildlife Management Area
WMP	Wildlife Monitoring Plan
WPP	Watchorn Provincial Park
WRF	Weather Research and Forecasting
WSC	Water Survey of Canada
WTA	wetland treatment area
µm	micrometre

QUESTION IAAC-R2-04

Referenced Round 1 IR(s): IAAC-14, IAAC-70, IAAC-88

Expert Dept. or group: IAAC
ECCC
York Factory First Nation
Hollow Water First Nation
Fisher River Cree Nation
Lake St. Martin First Nation

EIS Guideline Reference: 7.2.2 Changes to Groundwater, Surface Water, and Fluvial Morphology

7.3.1 Fish and Fish Habitat

7.3.2 Migratory Birds

Context and Rationale

The EIS guidelines requires the Proponent to assess the changes to groundwater, surface water and fluvial morphology as a result of the Project. Furthermore, the EIS Guidelines require the Proponent to describe potential changes to the habitat of migratory and non-migratory birds, including wetlands frequented by birds as well as potential adverse effects to fish and fish habitat.

The response to IAAC-14 references proposed provincial regulation for nutrient management under *The Water Protection Act* to establish target concentrations for phosphorus and nitrogen for the four major tributaries. Specific mitigation measures for algal blooms in Lake Manitoba, Lake St. Martin and Lake Winnipeg are required to understand Project-effects on surface water quality.

It is not clear how the requirements under the proposed legislation, or in the absence of the legislation, would mitigate algal blooms in Lake Manitoba, Lake St. Martin and Lake Winnipeg. The Agency needs to understand how the Proponent intends to ensure the Project does not contribute to the formation of algal blooms in Lake Manitoba, Lake St. Martin and Lake Winnipeg considering the potential for direct conveyance of anticipated runoff from cattle feedlot operations in the LMOC area.

The response to IAAC-14 section 14.2 (b) Effects to Environment and Biophysical Valued Components, indicates that nutrient levels may increase in the north basin of Lake St. Martin due to increased conveyance of water by the Project. The potentially higher nutrient loads in the north basin of Lake St. Martin could lead to increased algal blooms and decreased dissolved oxygen (DO) levels, which may affect plant species composition and the abundance and diversity of invertebrate food sources.

Question IAAC-R2-04
July 24, 2023

The response to IR IAAC-88 states: “Species potentially negatively affected by higher nutrient loads include dabbling ducks such as mallard (*Anas platyrhynchos*) and northern pintail (*Anas acuta*), and diving ducks such as common goldeneye (*Bucephala clangula*) and scaup spp.” The release of a harmful substance to waters frequented by migratory birds is prohibited under the *Migratory Birds Convention Act*.

The extent of the potential interactions between algal blooms, dissolved oxygen, plant species composition, diversity of invertebrate food sources and migratory birds and potential impact to fish and fish habitat remains unclear.

Information Requests

a. Provide any additional details (such as extent of impacts, frequency, duration, parameter concentration estimates) that are currently available regarding potential adverse effects in the north basin of Lake St. Martin. Include predicted changes to aquatic nutrient levels, dissolved oxygen, and changes to waterfowl habitat components (water quality, plant community composition, plant and wildlife species abundance, diversity of invertebrate food sources) and impacts to fish and fish habitat.

b. Describe the objectives for nutrient management in Lake Manitoba, Lake St. Martin and Lake Winnipeg. Confirm the specific mitigation measures that will be implemented to prevent increased algal blooms, decreased dissolved oxygen levels, and effects on invertebrates in the absence of the proposed provincial regulation in Lake Manitoba, Lake St. Martin and Lake Winnipeg.

c. Describe the thresholds that will be used to evaluate and confirm when Project-managed water would become harmful to migratory birds.

d. Provide an assessment of the potential effects to the health and socio-economic conditions of Indigenous peoples resulting from changes to surface water quality from nutrient loading and algal blooms.

Response IAAC-R2-04

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response addresses issues raised by Pinaymootang First Nation, Sagkeeng First Nation and Sandy Bay Ojibway First Nation October 24, 2022, submission that requests information on effects of changes in water levels in Lake St. Martin. It includes a reply to questions raised in September 30, October 17 and October 31, 2022, submissions from the Interlake Reserves Tribal Council Inc. requesting information on changes to water quality in Lake St. Martin, including the Portage Diversion, the south basin of Lake Manitoba and Lake Winnipeg. It includes a response to questions raised by Fisher River Cree Nation on February 27, 2023, regarding

potential changes to Lake Winnipeg. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

a. **Additional Details on Effects in the North Basin of Lake St. Martin**

As stated in the updated surface water quality analysis presented in the May 31, 2022, response to IR IAAC-14, the Project is moving water and suspended constituents through Lake St. Martin more efficiently, increasing both nutrient and sediment loads during flood years. However, this accelerated conveyance of water is not expected to affect nutrient concentrations in the lakes and rivers in the surface water local assessment area (LAA) beyond the range of existing natural variability. The assessment concluded that Project operation during future floods is not expected to result in measurable increases of nutrient loads in Lake St. Martin and Lake Winnipeg post-Project versus pre-Project.

Additional baseline data analysis for suspended sediment and nutrient concentrations has been completed since the May 31, 2022, response to IR IAAC-14, to support this conclusion (see Appendix IAAC-R2-04-1 for the methods and results). The analysis indicates that concentrations of total suspended solids (TSS), total phosphorus, and total nitrogen concentrations are similar between flood and non-flood conditions. This implies that other factors, such as wind and wave action, are more impactful on suspended sediment and total nutrient fraction concentrations compared to floods. While the Project operation would be relocating some of the flows to provide increasing capacity during floods, sediments and nutrients present in the system would be distributed by wind and wave action in the downstream receiving environments after Project operation. The Project is therefore not predicted to change nutrient and sediment concentrations in the downstream receiving environments beyond the range of existing natural variability.

The load sediment, total phosphorus, and total nitrogen concentrations may be higher during flood years as a result of Project operation. However, as the sediment and nutrients are present in the upstream-downstream continuum with or without the Project, the increased conveyance is not predicted to result in changes to nutrient concentrations in the north basin of Lake St. Martin beyond the range of existing variability. Similarly, as nutrient concentrations are not predicted to change, dissolved oxygen (DO) concentrations are not predicted to change in the receiving environments as a result of Project operation. As surface water quality is not predicted to change beyond the range of natural variability, this effect pathway is not expected to result in changes in waterfowl habitat and fish and fish habitat beyond existing variability as a result of Project operation.

b. **Objectives for Nutrient Management in Lake Manitoba, Lake St. Martin and Lake Winnipeg**

For regional nutrient management, Manitoba is proposing a new provincial regulation (*Nutrient Targets Regulation*) under *The Water Protection Act* that will be administered by Manitoba Environment, Climate, and Parks. It would establish concentration targets of 0.05 milligrams per litre (mg/L) for phosphorus and 0.75 mg/L for nitrogen for the four major tributaries (Red, Winnipeg, Saskatchewan, and Dauphin rivers) flowing into Lake Winnipeg (Manitoba 2020). It is recognized that half of the nutrients to Lake Winnipeg originate from outside of Manitoba and that measures to reduce nutrient loading need to have both a trans-boundary and local focus (Manitoba 2020). Within the Lake Winnipeg watershed in Manitoba, efforts to reduce nutrient loads include setting limits for industrial and municipal wastewater treatment facilities, regulating phosphorus in cleaning products (e.g., detergents) and cosmetic fertilizers, and initiatives aimed at reducing nutrient runoff from agricultural operations (e.g., beneficial management practices and environmental farm plans).

In the absence of specific regulation, Manitoba Transportation and Infrastructure, the Project proponent, is focusing on implementing the water quality monitoring and management plans referenced in Part c), to verify that Project effects relating to nutrients are not extending to downstream areas and measurably contributing to the existing issues regarding increased algal blooms, decreased DO levels, and effects on invertebrates. From a regional perspective, the reduction in overland flooding resulting from Project operations is expected to result in some reductions to nutrient levels in downstream areas. From a local perspective, there is the potential for the LMOC to increase current inputs from local cattle operations, however, mitigation measures are being developed to address potential effects. Mitigation measures for cattle operations runoff along the LMOC, the predicted efficacy of these mitigation measures, and cattle runoff monitoring are discussed in the response to IR IAAC-R2-01. As indicated, apart from the site-specific mitigation along the LMOC for cattle operations runoff, the primary mitigation measure is the overall design and purpose of the Project, which is the reduction in overland flooding and associated transport of soil-based nutrients.

c. **Management Thresholds for Migratory Birds**

Addressing potential effects to migratory birds from nutrients involves a pathways of effect approach. The primary tool will be monitoring water quality and managing any changes caused by the Project against appropriate federal and provincial water quality guidelines, which are outlined in the Surface Water Management Plan (SWMP), and Aquatic Effects Monitoring Plan (AEMP). These plans form part of the Project Environmental Management Program (EMP), and all plans were filed as part of the June 2022 supplemental information response to IAAC IRs. The guidelines are protective of aquatic organisms, which are more sensitive to changes in water quality compared to mammals and birds. A secondary tool will be monitoring wetlands and addressing losses in wetland function, in terms of habitat and water quality, as described in the Wetland Monitoring Plan (WetMP).

There will be coordination among the various monitoring and management plans to address issues such as nutrients. The SWMP has been developed to describe mitigation and monitoring measures for the construction and two-year post-commissioning phases of the Project to confirm the efficacy of mitigation measures. The AEMP has been developed to provide regional monitoring of surface water quality during long-term Project operation. The Groundwater Management Plan (GWMP), as filed as part of the June 22 supplemental information response to IAAC IRs, would be used to examine the influences of groundwater on wetland areas. Data collected during monitoring of the wells will be provided at regular intervals (i.e., following each monitoring and sampling event) to the wetlands monitoring team for incorporation into their assessment and decision-making. As indicated in the GWMP and discussed in the response to IR IAAC-R2-02, threshold exceedances will be cause for notification to the wetlands monitoring team for incorporation into their assessment and to inform recommendations made to Manitoba Transportation and Infrastructure for decision-making. In addition, the Sediment Management Plan (SMP) and Revegetation Management Plan (RVMP), as filed as part of the June 2022 supplemental information response to IAAC IRs, include monitoring to confirm that erosion control measures are effective, and as described in the response to IR IAAC-R2-18, the Wetland Monitoring Plan (WetMP) will monitor for changes in wetland function in terms of surface water flow/quality, groundwater interchange/hydraulics, wetland class (form), vegetative cover (function), presence of bird and amphibian species at risk, and use by Indigenous peoples. As described in the response to IR IAAC-R2-13, a Wetland Compensation Plan provides offsetting for select wetlands that are directly affected by the Project development area.

Based on the management thresholds and the results of the water monitoring program, follow-up responses will be implemented where conditions recorded appear to be outside of anticipated seasonal fluctuations, including for surface water quality. As indicated, follow-up responses are described in various plans that form the Project EMP, and plans such as the SWMP, SMP and RVMP involve measures such as addressing erosion issues and where feasible operating the water control structure gates to manage sediment loads (and any associated nutrients) to downstream areas when management thresholds are exceeded.

Given the monitoring and follow-up programs, and current water quality in upstream areas, it is not expected that the Project will cause increased nutrient levels that would cause negative effects such as increased algal blooms and decreased DO levels which may affect plant species composition and the abundance and diversity of invertebrate food sources, and therefore impact migratory birds.

d. **Effects to Health and Socio-economic Conditions of Indigenous Peoples**

As stated in the updated surface water quality analysis presented in the May 31, 2022, response to IR IAAC-14, overall, the residual effects of Project operation on surface water quality are not anticipated to pose a threat to the long-term persistence and viability of traditionally harvested fish or wildlife species in the regional assessment area and is not expected to result in or have any measurable adverse effects to vegetation communities in the LAA. Effects on surface water quality are therefore not predicted to have effects on current use of lands and resources for traditional purposes from changes in surface water quality. The Project is therefore not expected, from the

aforementioned effects, to affect the availability of traditional resources such as plants, animals and fish, access to areas of traditional use and traditional resources, or cultural and spiritual sites and areas. Additional information about concerns related to Indigenous health and socio-economic conditions as well as proposed mitigation and monitoring programs can be found in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

References

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Malone, Molly, Firelight Research Inc. (Firelight) with the Pinaymootang First Nation (PMFN). 2023. Draft Report. Pinaymootang First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Manitoba (Government of Manitoba). 2020. A Proposed Regulation under the *Water Protection Act*. Nutrient Concentration and Loading Targets for Lake Winnipeg and its Tributaries. Public Consultation Document. Winter 2020. Available at https://www.gov.mb.ca/water/pubs/water/lakes-beaches-rivers/nutrient_targets_regulation_plain_language_summary_fall_2020.pdf Accessed March 2023.

QUESTION IAAC-R2-06

Referenced Round 1 IR(s): IAAC-16, SMP

Expert Dept. or group: IAAC

EIS Guideline Reference: 3.1 Designated Project

3.2 Project Activities

7.1.7.Riparian, Wetland and Terrestrial Environments

7.2.2 Changes to Groundwater, Surface Water, and Fluvial Morphology

7.2.3 Changes to riparian, wetland and terrestrial environments

Context and Rationale

The EIS Guidelines requires the Proponent to include descriptions of Project activities including the location of each activity and predicted changes to the environment. Works for sediment control are considered an associated work and Project activity under Section 3.2 of the EIS Guidelines.

The Sedimentation Management Plan (SMP) describes surface water discharge into offsite receiving areas and describes discharge into dense vegetation or settling ponds that are adjacent to work areas. It is not clear if management of this discharge would be required for construction, operation, or both. The response to IAAC-16 states that if surface water discharge parameters exceed applicable Canadian Council of Ministers of the Environment (CCME) guidelines and Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) management thresholds for the protection of aquatic life and are attributed to the Project, that sedimentation ponds may be used to address both surface water and groundwater discharges.

Information is required on the surface water and groundwater discharge, including locations of pump discharge points and mitigation for conditions when management thresholds are exceeded, to assess effects due to changes in surface water and groundwater quality.

Information Requests

a. Provide plan view maps showing the potential locations and size of settling ponds and sedimentation ponds that will be used for surface water and groundwater discharge if management thresholds are exceeded. The potential locations and sizes could be included in the plan view map also requested in IAAC-R2-12.

b. Clarify whether the ponds would be required during construction, operation, or both.

c. Complete an assessment of potential effects from the construction and operation of the proposed ponds in part a. for:

   i. water quality, and for the potential off-site receiving environment(s) of surface water and groundwater discharge;

   ii. Indigenous peoples such as health and socio-economic conditions, the current use of lands and resources for traditional purposes, physical and cultural heritage, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; and

   iii. other areas of federal jurisdiction such as fish and fish habitat and Species at Risk.

d. Discuss mitigation measures for potential effects associated with construction and operation of sedimentation and settling ponds.

e. Provide monitoring and follow-up plans for the effects of surface water and groundwater discharge on receiving environment(s).

Response IAAC-R2-06

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) provided on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

a. Sediment and Erosion Control Measures During Project Construction

Overview

The use of settling ponds and sedimentation ponds are important tools in the overall management of sediment and erosion for the Project construction. Therefore, to provide context, this response includes information about the various measures that are proposed to manage sediment and erosion, and how the ponds are integrated in the broader program.

The management of sediment and erosion is discussed in Volume 2, Section 6.3.4.3 of the Project Environmental Impact Statement (EIS), and in the May 31, 2022, response to IR IAAC-30. During Project construction, surface water and groundwater originating within the construction work area need to be managed and discharged appropriately back into the local drainage areas. Various plans associated with the Environmental Management Program (EMP), as filed as part of the June 2022 supplemental information response to IAAC IRs, have been developed to describe mitigation and monitoring measures for the construction and two-year post-commissioning phases of the Project to confirm the efficacy of mitigation measures. These include the Surface Water Management Plan (SWMP), Sediment Management Plan (SMP), Project Environmental Requirements (PERs), Construction Environmental Management Program (CEMP), Environmental Protection Plans (EPPs), and Revegetation Management Plan (RVMP),

The SWMP and SMP include surface water management measures and sediment and erosion mitigation measures for the construction of the Lake Manitoba Outlet Channel (LMOC) and Lake St. Martin Outlet Channel (LSMOC). This response provides additional details on the ongoing work to refine the LMOC and LSMOC sediment and erosion control measures during the Project construction phase. The relevant sections of the management plans will be updated accordingly, prior to implementation. While monitoring and management of erosion and sedimentation will continue into the operations phase, it is not anticipated that these issues will require the same type of mitigation measures required during construction.

This section summarizes the water management considerations and associated surface water erosion and sediment control measures for the LMOC and LSMOC. There are similarities between LSMOC and LMOC methods and so details described for the LMOC are not replicated for the LSMOC.

LMOC Water Management Considerations

Existing surface water drainage in the region around the LMOC generally flows towards the lower lying area between Watchorn Bay on Lake Manitoba and Birch Bay on Lake St. Martin. This low-lying area includes Watchorn Creek, draining south to Lake Manitoba, with Reed Lake, Clear Lake, Water Lake, Goodison Lake and Birch Creek draining north to Lake St. Martin. The proposed LMOC will be located immediately to the west of this low-lying area and will intersect existing drainage paths originating from the west.

The primary method of managing surface water during construction of the LMOC will be via a permanent outside drain, which will be constructed in advance of the channel excavation. The outside drain will be located along the west side of the LMOC to intercept the watershed runoff originating from the west and prevent it from flowing into the construction zone. A drain is not required on the east side of the LMOC as surface water naturally flows away from the east side of the LMOC toward the existing wetlands and creeks. Snowmelt and rainfall within the active construction sites and excavations will need to be managed during construction by the construction contractor and removed

in order to not impede their progress. Since the entire length of the LMOC will be below existing grade, pumping will be required to manage surface water that collects within the excavation.

Following construction, the final site grading will be such that surface water from municipal drains and overland flow originating west of the LMOC will flow within existing ditches and over re-established vegetation or crushed rock products into the outside drain. Surface water from snow melt or rainfall that originates within the channel right-of-way (ROW) will flow over re-established vegetation into the outside drain, channel, or naturally east towards the existing wetlands and creeks located east of the channel. Further sediment or erosion control measures are not anticipated to be required post-construction once vegetation has been re-established in the area.

For groundwater, the main consideration in the construction methodology and sequencing for the LMOC is managing the risks associated with the potential for basal heave and/or slope instability due to the high bedrock piezometric pressures that exist over the entire channel alignment.

During construction, an active (i.e., pumped) depressurization system will be used to lower the piezometric level at various locations along the LMOC to limit the potential for excavation-related basal heave and slope instability. Active depressurization wells will be installed at select locations along the LMOC construction perimeter, with each well releasing groundwater from the confined aquifer to the surface, thereby reducing aquifer pressure. This pumped groundwater will need to be collected and removed from work areas, in order to not impede construction. Contract-specific plans for management of this pumped groundwater will be developed in accordance with the GWMP, SWMP and SMP.

Long-term groundwater depressurization will be required following construction of the LMOC. This will be accomplished by installing wells within the channel excavation during construction. These wells will extend to the bedrock and will naturally equilibrate to the prevailing water level in the channel. This is referred to as a passive groundwater depressurization system and will not require pumping. Groundwater that is released from these passive wells will flow into the channel and thus no permanent off-site groundwater discharge will occur. The passive wells will include a graded filter to prevent migration of contaminants to or from the aquifer. Additional information on groundwater can be found in IR responses IAAC-R2-02 and IAAC-R2-03.

Construction methods are described in Volume 1, Section 3.5 of the May 2023 Project Description Update. The following sections provide additional details on the LMOC construction methodology and the envisioned sediment and erosion control measures during construction. The following figures provide schematics of the planned measures:

- Figure IAAC-R2-06-1: LMOC Construction Sediment and Erosion Control Zones Schematic Plan.
- Figure IAAC-R2-06-2: LMOC Sediment and Erosion Control Measures for General Channel Excavation - Typical Plan.

- Figure IAAC-R2-06-3: LMOC Sediment and Erosion Control Measures for General Channel Excavation - Typical Section.
- Figure IAAC-R2-06-4: LMOC Sediment and Erosion Control Measures for Channel Outlet Excavation.

LMOC Surface Water Erosion and Sediment Control

LMOC construction has been broken down into different construction activity zones that are expected to utilize different erosion and sediment control measures in the management of surface water within these areas. The activity zones are shown schematically in Figure IAAC-R2-06-1.

The sediment and erosion control measures that are envisioned to be implemented by the construction contractor to manage surface water within each of these zones are discussed in the subsections below. Because the management of surface water within the construction work area will be the responsibility of the contractor, the sediment and erosion control measures used, and the locations where they are implemented, will be determined by them, based on their means and methods and the Manitoba Transportation and Infrastructure contract administrator's direction. As such, the descriptions provided in this document, and the associated sketches, only reflect potential locations and sample applications of sediment and erosion control measures. Regardless of methodology, the construction contractors will be required to meet applicable regulatory guidelines prior to discharging any water outside the channel ROW.

Construction of the outside drain will commence prior to starting the main channel excavation. The majority of the excavation work is expected to be performed during the winter months, to reduce the need to manage runoff that will naturally enter the construction area from the west. Re-vegetation of the outside drain would take place in the following spring/summer. Temporary erosion control products at appropriate locations (e.g., silt fences, erosion control blankets and straw wattle) and construction methods would be utilized within the outside drain to manage sediment until vegetation within it becomes established. The footprint of the outside drain itself is relatively small, so the amount of rainfall/snowmelt anticipated to directly enter the work area will be limited. Any surface water that does enter the work area would be pumped and discharged into vegetated areas that naturally drain away from the outside drain. Erosion and sediment control features anticipated to be implemented during outside drain construction include:

- A splash pad consisting of crushed stone (as shown on Figure IAAC-R2-06-3) or manufactured swamp mats placed at pump discharge points to minimize erosion.
- Silt fence placed away from the discharge point (approximately 30 m, or a distance determined to be necessary based on monitoring results), in three directions, to provide secondary sediment control prior to the water leaving the channel ROW.

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Figure IAAC-R2-06-1 LMOC Sediment and Erosion Control Zones Schematic Plan

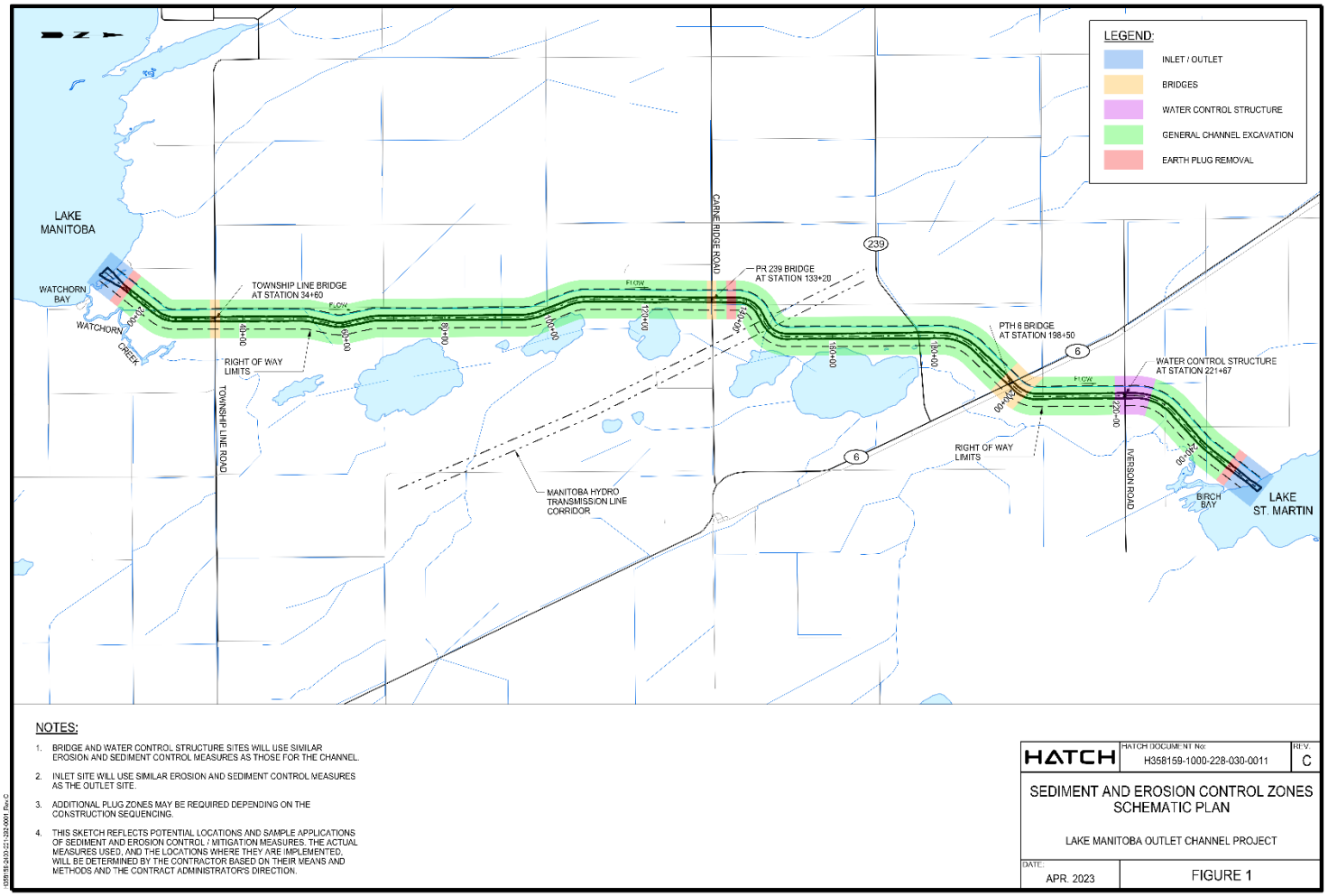

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Figure IAAC-R2-06-2 LMOC Sediment and Erosion Control Measures for General Channel Excavation – Typical Plan

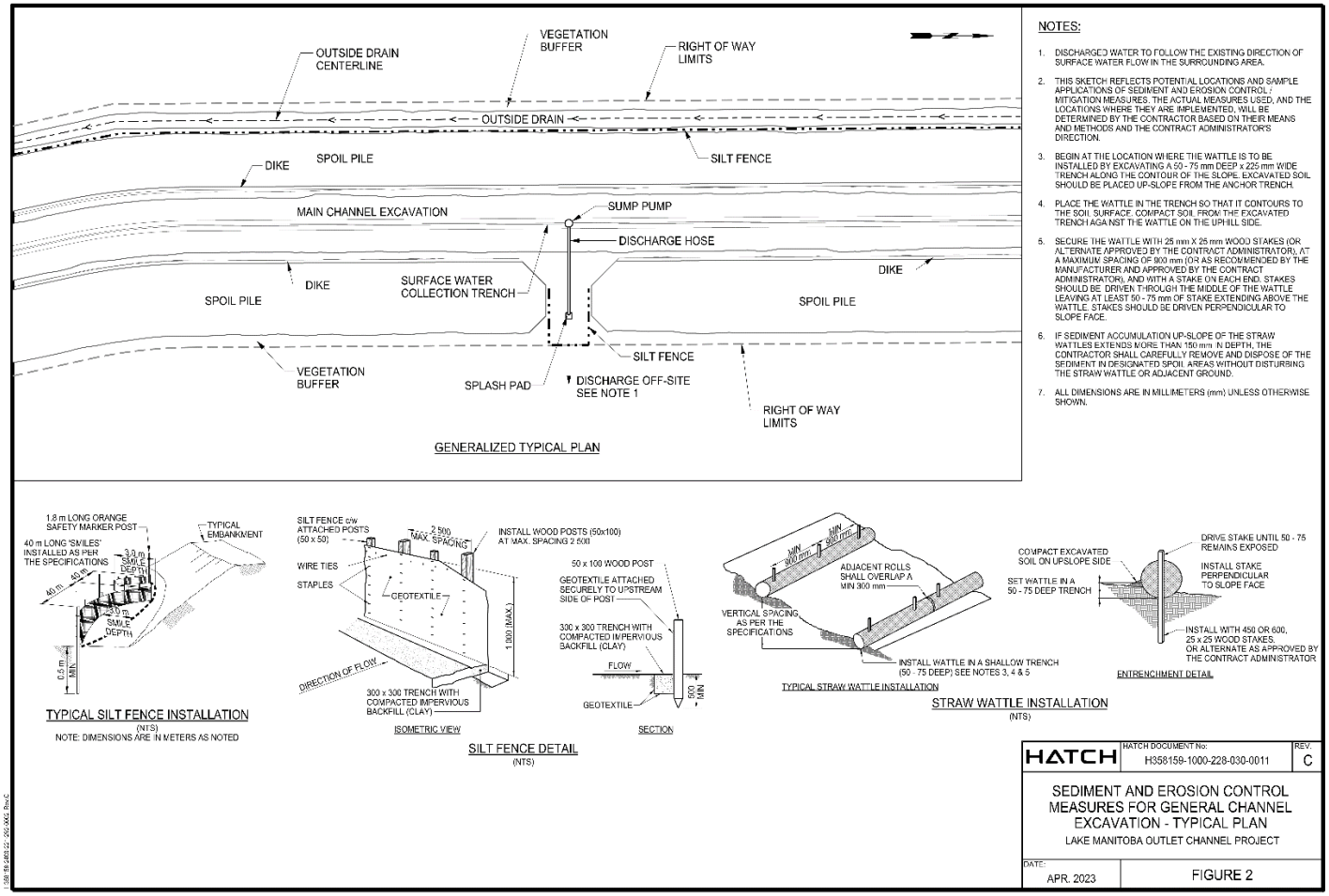

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Figure IAAC-R2-06-3 LMOC Sediment and Erosion Control Measures for General Channel Excavation – Typical Section

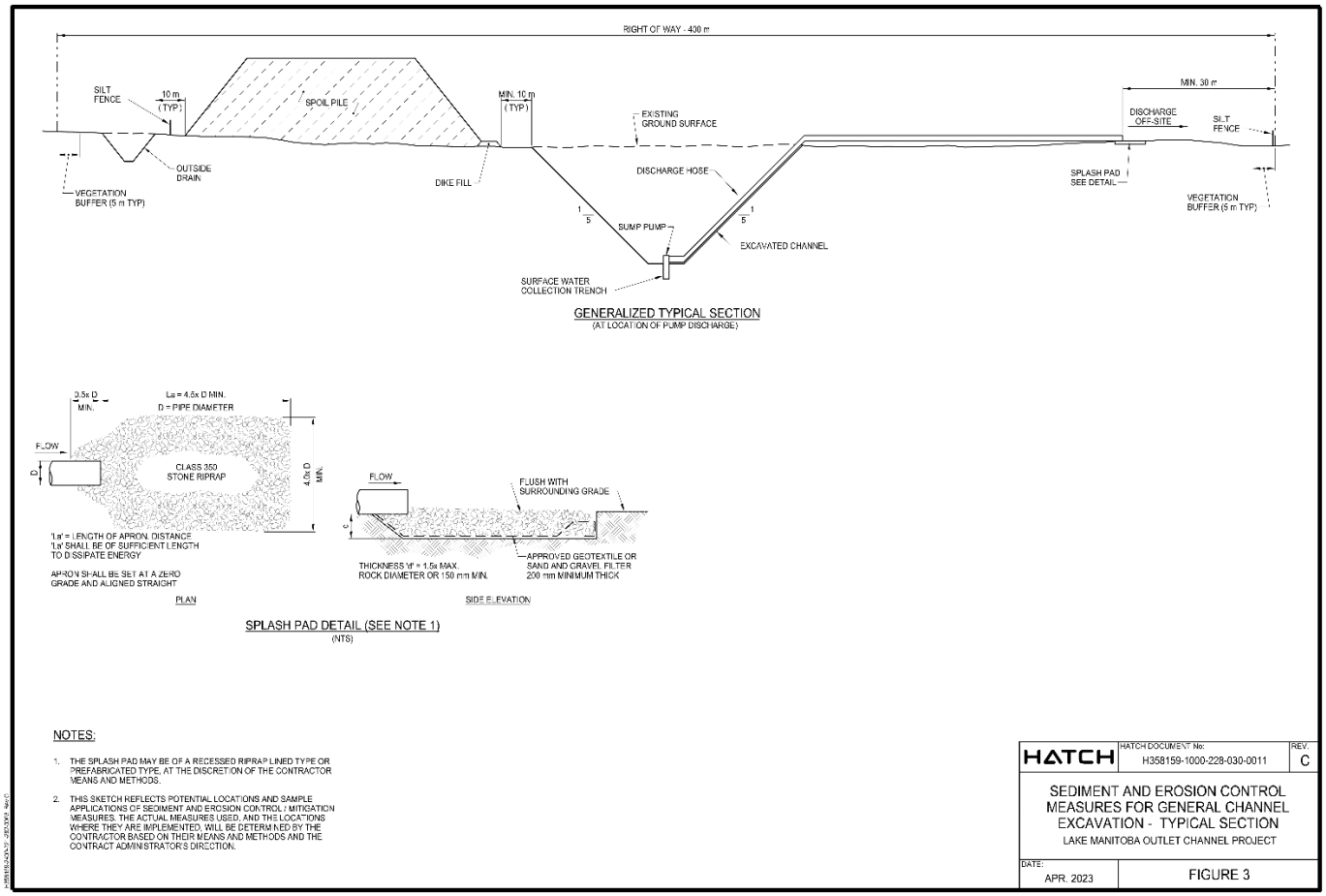

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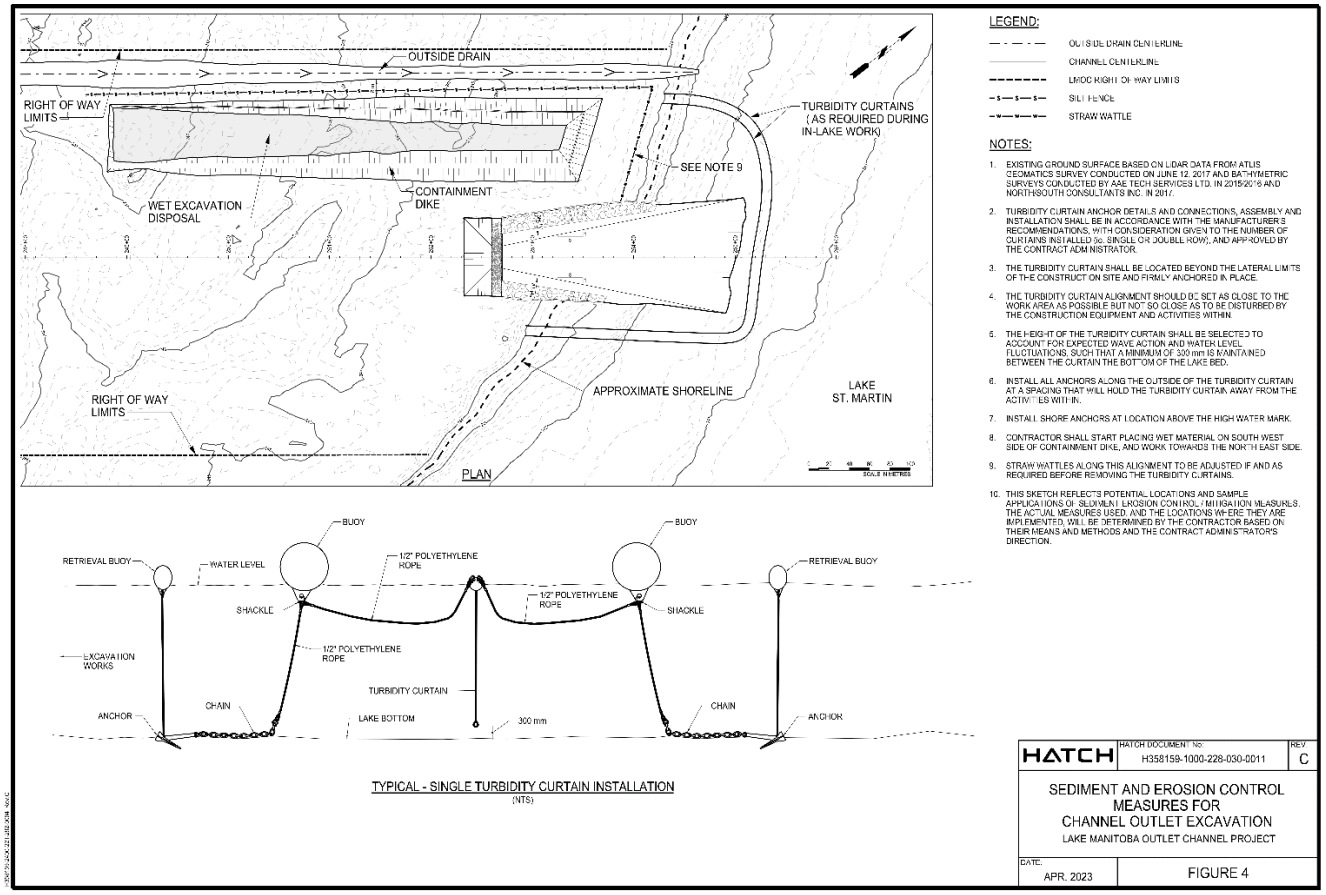
Figure IAAC-R2-06-4 LMOC Sediment and Control Measures for Channel Outlet Excavation



As the entire length of the LMOC will be below existing grade, surface water will not be able to leave the work area via gravity. Pumping will therefore be required to manage surface water within the excavation during construction. Surface water management within the channel excavation is envisioned to involve several features, which are illustrated on Figure IAAC-R2-06-2 and Figure IAAC-R2-06-3 and summarized below.

The design of the LMOC includes a trench that will be sub-cut into the base of the channel (below final grade) over the majority of its length to provide a controlled path for groundwater seepage. This trench may also provide a location to collect surface water within the excavation for transport to a sedimentation pond that provides a place for suspended sediment in the surface water to settle out, prior to being pumped off-site. Dimensions of the trench are 2 m (7 ft) wide by 1 m (3 ft) deep as per detailed design. The trench will be backfilled with a granular filter to mitigate the risk of contaminated surface water from entering the bedrock aquifer. Note that even during active depressurization of the bedrock aquifer during construction, the groundwater will remain artesian, further reducing the risk of surface water contaminating groundwater.

Sump pumps would be placed at various locations within the trench, as determined by the contractor, to facilitate removal of the water from the work area. The pumped water would be discharged at a location within the channel ROW upstream of where it would leave the construction site via surface drainage (approximately 30 m [98 ft], or a distance determined to be necessary based on monitoring results). The pump discharge point could be on either side, or both sides, of the channel excavation, depending on the contractor's means and methods (Figure IAAC-R2-06-2 illustrates the pump discharge point located on the east side).

A splash pad consisting of crushed stone or manufactured swamp mats would be placed at the end of the discharge hose, to minimize erosion at the pump discharge point. Silt fence would be placed downstream of the discharge point (within the channel ROW), in three directions, to provide secondary sediment control prior to the water leaving the channel ROW.

Turbidity will be monitored where water leaves the channel ROW, so that discharged water meets Canadian Environmental Quality Guideline (CEQG) for the protection of aquatic life and Manitoba Water Quality Guideline (MWQG) Tier III Guideline for freshwater aquatic life. The water quality guideline is that concentrations should not exceed a 25 mg/L increase in total suspended solid (TSS) concentrations from background concentrations (converted from field-measured turbidity concentrations using a predefined site-specific TSS-turbidity curve) prior to discharge to fish-bearing waters. The response to Part e) provides details on monitoring.

In the event that a substantial amount of time is required to achieve sufficient settling of suspended sediment in order to meet applicable water quality guidelines, then the contractor may consider constructing temporary low-height berms within the base of the channel to isolate the active construction area from the completed area. The completed area would then function as a settling pond, and surface water within the active construction area could be pumped into it, allowing it to settle out, prior to the water then being pumped off-site. The temporary berm could then be removed and a new berm established closer to the active construction front as it advances.

The LMOC inlet and outlet areas will require both on-land and in-lake excavation. The on-land portion of the excavation would be performed “in-the-dry” and is expected to employ similar erosion and sediment control measures as those described for the main channel excavation above. It is presently expected that the in-lake portion of the inlet and outlet excavation will take place “in-the-wet” with the construction area enclosed by a double turbidity curtain to prevent or minimize the migration of disturbed sediments into the lake during construction. The following sediment and erosion control measures are anticipated to be implemented to facilitate this in-water excavation, and are illustrated for the outlet construction on Figure IAAC-R2-06-4:

- Turbidity curtains would be installed in the lake prior to any excavation or other in-water work commencing.
- The material excavated in the wet would be placed behind earthfill containment dikes constructed to contain the sediment; with the lake side face made of a gravel material that will facilitate flow of water out of the diked area while filtering suspended sediment. Water exiting the containment area will be monitored to confirm compliance with the 25 mg/l concentration limit before entering a fish-bearing waterbody.
- Straw wattle would be placed between the containment dikes and the lakes as a secondary sediment control measure for the water that leaves the diked area via the gravel filter zone.
- Removal of turbidity curtains would occur once monitored water quality parameters on both sides of the curtain are similar and meet the CEQG and MWQG TSS guideline (25 mg/L increase from background concentrations) as converted from field-measured turbidity. The response to Part e) provides details on monitoring.

The sediment and erosion control measures that are envisioned to be implemented to manage surface water within the bridge and water control structure construction work areas are expected to be similar to those for main channel excavation described above.

Completed channel contract areas will be “flooded” with lake water to allow active groundwater depressurization pumping to cease. In order to do this, the earth plug that is keeping the lake water from entering the excavation will need to be removed “in-the-wet”. Anticipated locations of these earth plug removal areas are shown in Figure IAAC-R2-06-1, although the number and location of these may change based on the construction sequence and the contractor’s means and methods. Regardless of the final location and number, the same methodology is envisioned to be utilized by the contractor to remove them. The anticipated steps for plug removal “in-the-wet” are as follows, but may vary based on the contractor’s means and methods:

- A turbidity curtain will be installed to prevent migration of sediment into the lake during plug removal activities.
- A fish salvage would be undertaken, if required, within the area enclosed by the turbidity curtain should fish be present.

- The earth plug would then be removed in phases, and in such a manner that as much of it is removed “in-the-dry” as possible. This would involve removal of material from the crest of plug, likely to within 0.3 m (1 ft) of the prevailing lake level, followed by removal of material from the dry side of the plug. The objective of this being to reduce its width as much as safely possible.
- Flooding of the downstream “dry” portion of the channel excavation would then be achieved by removing material from a portion of the plug crest, to below the prevailing lake level. This will reduce the water level differential across the plug and thus limit the associated erosive forces when the remainder of the plug removal is undertaken. Erosion of some of the plug material will occur during this period, which will be transported downstream into the newly excavated channel segment. Since the dry segment of the channel will not be open to a waterway, this material will remain confined within the channel excavation. It is expected that this material will ultimately be mobilized from the channel during the commissioning phase, which is described further in the SMP.
- Once the water level has equilibrated on both side of the earth plug, the remainder of the plug would be removed the “in-the-wet”.
- When the plug removal is complete, the turbidity curtain would then be removed once suspended sediment has settled out and TSS levels within the curtained area are within required limits.

Sediment and erosion control features envisioned to manage the groundwater pumped from the active depressurization wells are expected to be similar to those described above for pump discharge points related to general channel and outside drain excavation. Specifically, splash pads consisting of crushed stone (as shown on Figure IAAC-R2-06-3) or manufactured swamp mats would be placed at the location where groundwater is discharged from the active groundwater depressurization pumps. This will serve to both control erosion, as well as increase aeration of the groundwater as it is discharged. The discharge location of the pumped groundwater will depend on when the groundwater discharge is being generated, as indicated below:

- Prior to the outside drain being constructed and vegetated, it is envisioned that the groundwater collected from the active wells would be discharged into vegetated areas that naturally drain away from the outside drain.
- Once vegetation has established within the outside drain and the main channel excavation has begun, the groundwater collected from the active depressurization wells on the west side of the channel is envisioned to be discharged into the outside drain, while that collected from the wells on the east side of the channel would be discharged into vegetated areas that naturally drain eastward towards the existing wetlands and creeks.
- If deemed necessary, silt fence could be placed downstream of the pump discharge points, in three directions, to provide secondary sediment control prior to the water leaving the site.
- For details on monitoring, refer to part e).

LSMOC Water Management Considerations

Along the LSMOC, most of the surface water flows naturally towards Buffalo Creek. The sub-basins crossed by the LSMOC drain to Buffalo Creek, with the exception of one sub-basin, which discharges directly to Lake Winnipeg. Two distinct groundwater systems are known to be present within the region of the LSMOC: the upper saturated peat and the lower confined carbonate bedrock aquifer. The upper, saturated peat unit is perched above the clays (where present) and underlying till units. The peat is recharged directly from surface rainfall and snowmelt, as well as flowing artesian discharge from the underlying bedrock aquifer through natural springs. Small-scale flow systems develop from raised bog/peat mound areas, flowing radially outward toward relatively lower-lying depressions and other associated open water areas. Construction of the LSMOC will result in temporarily localized discharge from this system into excavated areas until channel dikes are constructed. Localized discharge will also occur into the outside drain and will vary seasonally depending on the water table and surface conditions.

The lower, confined bedrock aquifer is comprised of a Paleozoic rock sequence commonly referred to in Manitoba as the “Carbonate Aquifer System”. This aquifer system is isolated from the peat unit by the upper clay zone and underlying tills. In areas where the pressures are high relative to the confining till units, there is a risk of upward pressure fracturing the till and producing some uncontrolled groundwater discharge, which is anticipated to be limited by the low permeable nature of the tightly fractured bedrock. Because these conditions cannot be avoided in the region, it was estimated for the Project that there will be a degree of groundwater discharge. In general, consideration of groundwater piezometric pressures and any associated aquifer depressurization requirements will apply to the channel excavation, the channel inlet/outlet excavations, and channel WCS foundations, including long-term WCS uplift pressure mitigation.

LSMOC construction activities are planned to be subdivided into multiple contracts. Surface water management within the cleared and excavated area of each individual contract will be the responsibility of the contractor. The contractor will be required to develop a contract specific SWMP and SMP that must conform to the EMP plans developed for the Project, as well as other federal and provincial environmental and regulatory requirements. This is anticipated to involve a combination of temporary pumping in low lying areas and gravity drainage away from the construction site, where possible.

CEQGs and MWQGs for the protection of aquatic life will be met where water is discharged from the Project construction area to waterbodies, including wetlands with open water. An environmental monitor on-site will implement a monitoring program for turbidity/TSS, and other potentially relevant parameters such as dissolved oxygen, pH, conductivity, and temperature at discharge points at an appropriate frequency to confirm compliance. The response to Part e) provides details on monitoring.

The following sections provide additional details on the LSMOC construction methodology and the envisioned sediment and erosion control measures during construction. The following figures provide schematics of the planned measures:

- Figure IAAC-R2-06-5 – LSMOC General Layout Plan.
- Figure IAAC-R2-06-6 – LSMOC Plan and Sections of Typical Sediment Pond.
- Figure IAAC-R2-06-7 – LSMOC Typical Details of Sediment Pond and Erosion and Sediment Control Measures.

LSMOC Surface Water Erosion and Sediment Control

Measures to be used to mitigate or avoid impacts to local surface water during construction and operation of the LSMOC are described in the SWMP. These include methods to manage local runoff both inside and outside of construction areas, and the associated potential transport and deposition of sediments beyond construction areas and into off-site receiving water bodies.

Temporary measures will be required during construction to manage surface water to improve constructability, control the potential for erosion and manage sediments. The specific measures will depend on construction staging and sequencing until the permanent works are completed. Construction methods for temporary drainage works will consider the erosion and sediment control measures described in the SMP. Typical details of key sediment management measures, such as turbidity curtains, straw wattles, and ditch checks, are shown on Figure IAAC-R2-06-7. Project requirements for fish exclusion, salvage, and monitoring will be implemented for all in-water work in accordance with applicable EMP plans, and as described for the LMOC.

Within the main LSMOC channel footprint, a pilot ditch will be constructed along the centreline of the channel alignment as part of the initial clearing contracts to promote downstream drainage of the excavation area. Temporary check dams and rock-lined gradient control structures will be used within the pilot ditch to mitigate potential for erosion and sediment transport. Typical details are shown on Figure IAAC-R2-06-7.

In addition to the pilot ditch, a permanent outside drain will be constructed along the east side of the LSMOC channel to intercept surface water runoff upstream of the construction areas and minimize inflow of surface water into the construction zone. Water from the drain will be discharged directly into Lake Winnipeg during construction with temporary erosion protection (riprap) provided by at the outlet. The outside drain is designed to discharge directly into the channel after construction is complete and includes permanent erosion and sediment control measures such as riprap and a trash rack to collect debris before it enters the channel. Gradient control structures and temporary rock check dams will be installed in the drain to mitigate potential for erosion and sediment transport during both construction and operation.

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Figure IAAC-R2-06-5 LSMOC General Layout Plan

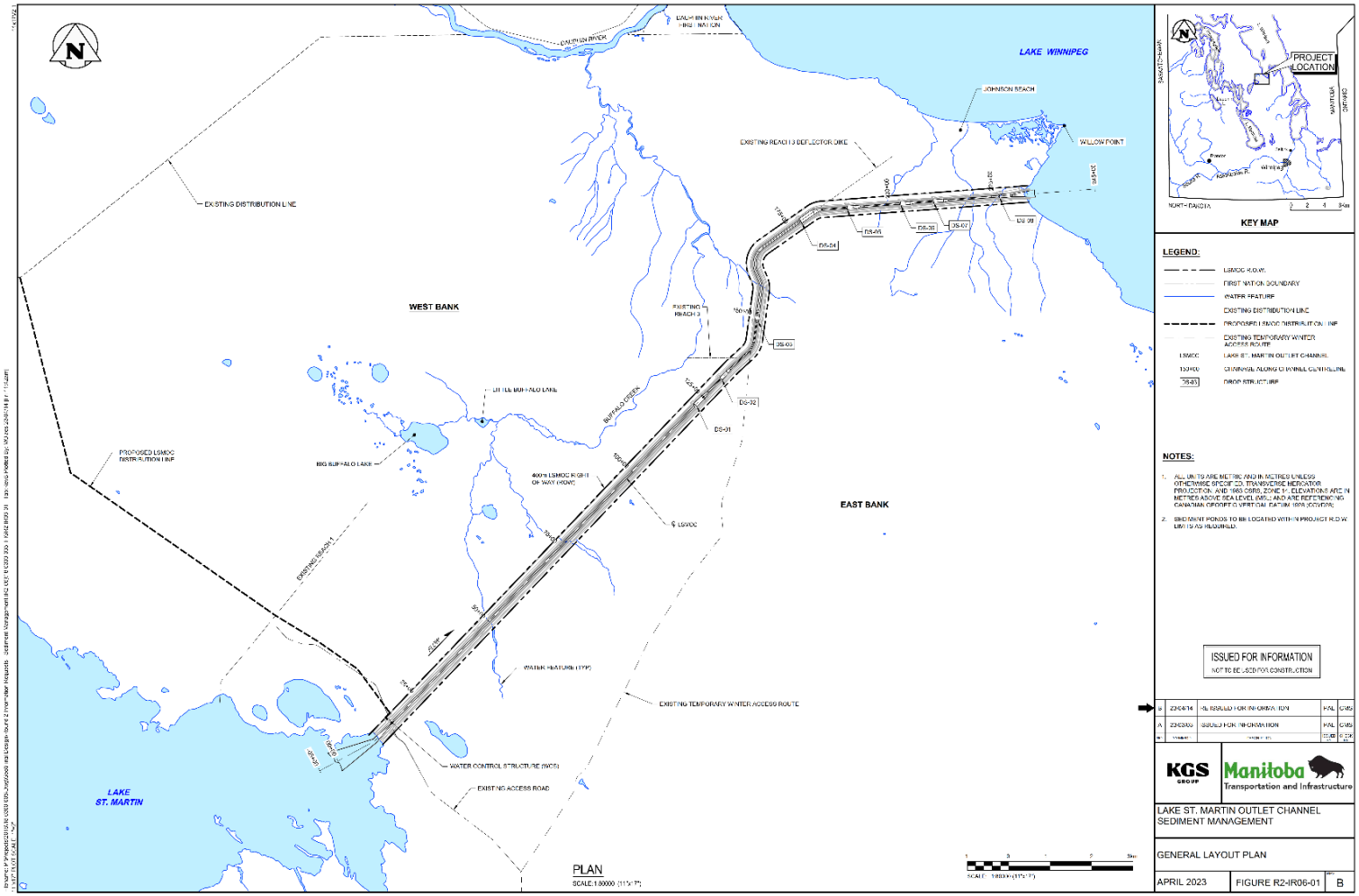

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Figure IAAC-R2-06-6 LSMOC Plan and Sections of Typical Sediment Pond

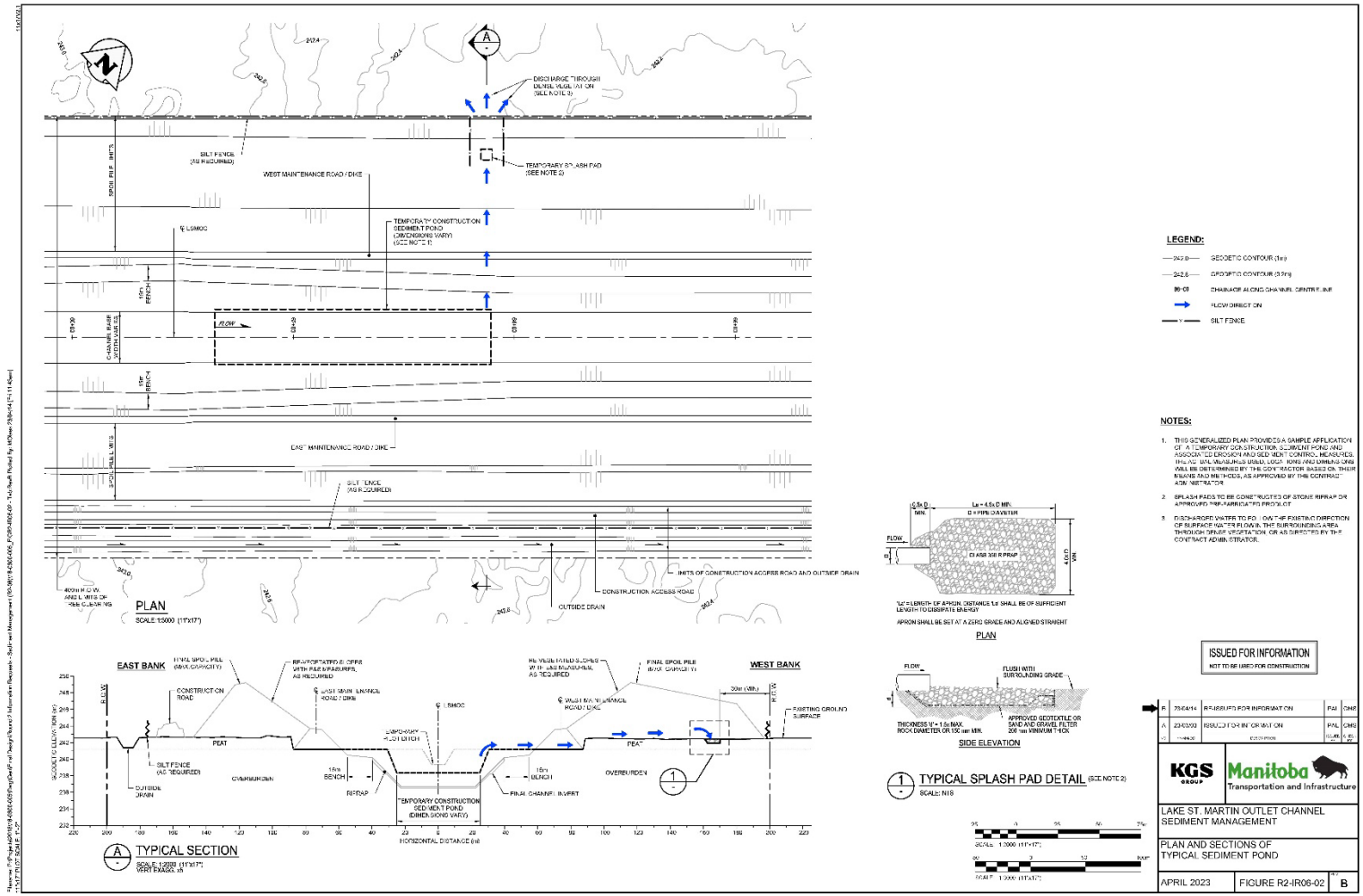

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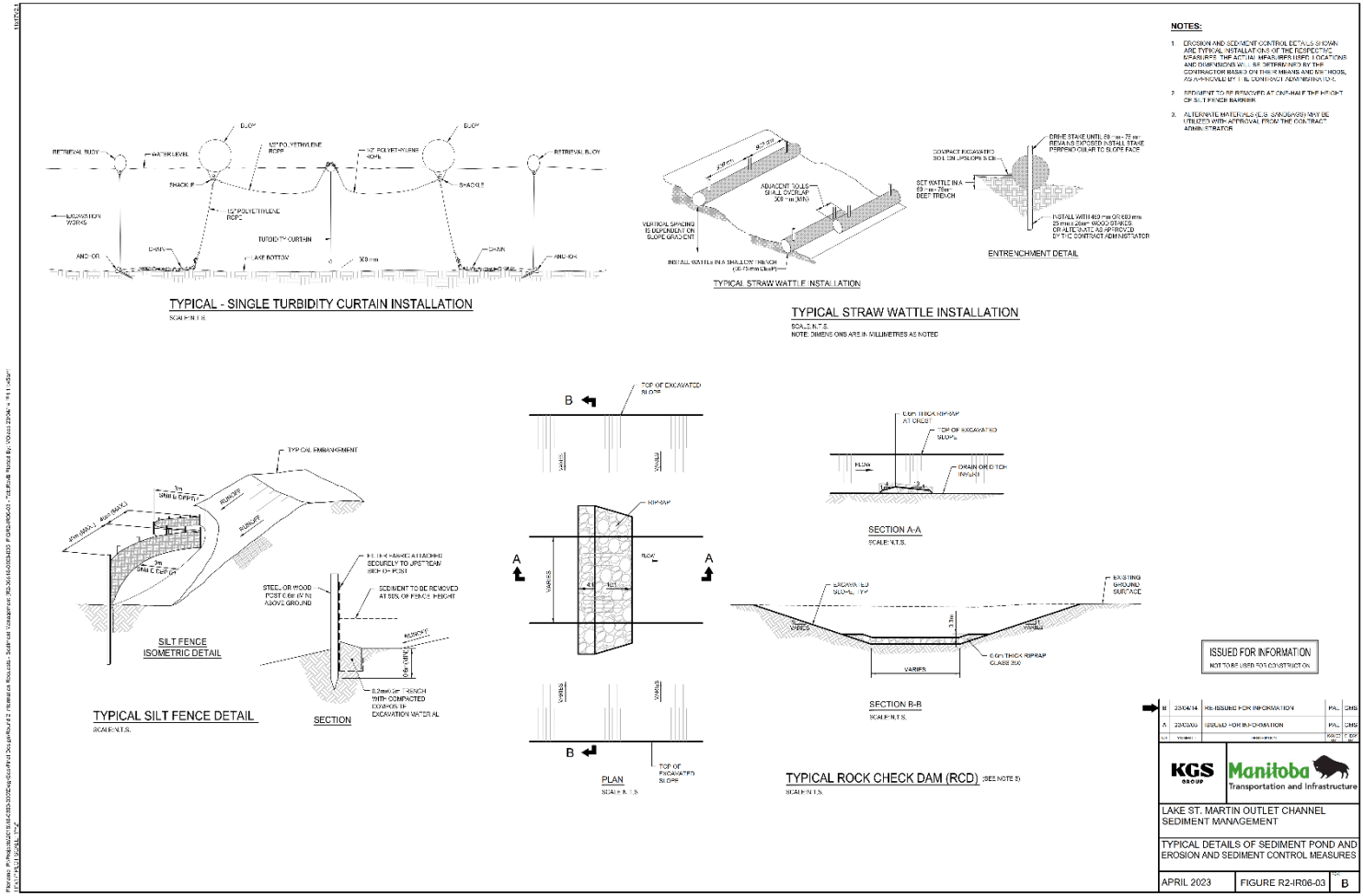
Figure IAAC-R2-06-7 LSMOC Typical Details of Sediment Pond and Erosion and Sediment Control Measures



A typical section of the LSMOC channel showing the location of the pilot ditch and outside drain is provided on Figure IAAC-R2-06-6. General flow patterns and temporary outlets for the pilot ditch and the outside drain are shown on Figure 7 of the SWMP.

Water from within the work area will be collected, monitored, and treated, as required, to comply with the water quality criteria outlined in the SWMP, prior to discharge into the outside drain, or towards Lake St. Martin, Lake Winnipeg, or Buffalo Creek, and as approved by Manitoba Transportation and Infrastructure during construction. Water from the work area will be released within the LSMOC ROW to sediment ponds, filtering systems or towards dense terrestrial vegetation of sufficient distance from waterbodies or streams to reduce the potential impacts of sediment release downstream of the construction areas.

Sediment ponds will be located within the LSMOC ROW and are most likely to be constructed by the contractor within the proposed channel excavation area by directing surface runoff to low areas of the excavation. A general plan showing the LSMOC ROW is provided on Figure IAAC-R2-06-5.

As construction progresses, sediment ponds will be considered to allow sediment to settle prior to being pumped to offsite receiving areas or released downstream by gravity. The size and location of sediment ponds will vary and depend on the contractor means and methods, runoff volumes, and the extent of sediment erosion during construction. An example sediment pond application is shown on Figure IAAC-R2-06-6. Pump discharge points will be lined with clean rock or other acceptable flow dissipating applications, as required, to prevent erosion at the release point. Water will be discharged according to the defined water quality criteria in the SWMP and will follow the existing direction of surface water flow in the surrounding area through existing dense vegetation.

b. **Clarification on the Use of Sedimentation Ponds**

Sedimentation or settling ponds may be used by the construction contractors during Project construction as described in the response, to manage surface water and groundwater that originate from the construction work areas. These ponds will be temporary and will not be used during Project commissioning or operation during flood conditions.

During the LMOC construction, the design includes a pilot ditch that will be sub-cut into the base of the channel over the majority of its length to provide a controlled path for groundwater seepage. This pilot ditch will also provide a location to collect surface water within the excavation. The contractor may utilize it as a sedimentation pond that provides a place for suspended sediment in the surface water to settle out, prior to being pumped off-site.

During the LSMOC construction, sediment ponds will be located within the LSMOC ROW and are most likely to be constructed by the contractor within the proposed channel excavation area by directing surface runoff to low areas of the excavation.

c. **Effects of Water Discharges During Project Construction**

i. ***Surface and Groundwater Quality***

Applicable water quality guidelines for the protection of aquatic life will be met where water is discharged directly from the Project construction area to fish-bearing waters. On-site monitoring will take place, as identified in the SWMP, to verify the effectiveness of implemented mitigations and minimize the effects of water discharge from the Project construction areas on surface water quality.

The assessment conclusions of the updated surface water quality analysis presented in the May 31, 2022, response to IR IAAC-14, remain unchanged. With the implementation of mitigation measures, the effects of the Project construction on sediment concentrations in surface water are considered to be of adverse direction, short-term in duration, negligible to low magnitude, reversible in the short-term, and of infrequent or sporadic in frequency.

As discussed in the response to IR IAAC-R2-05, it is not anticipated that groundwater quality will be affected by water discharges during Project construction. A monitoring program for groundwater quality will be conducted in the region of the LMOC and LSMOC to confirm the lack of pathways from surface water to groundwater.

ii. ***Indigenous Groups, Heritage Resources, Health and Socio-Economic Conditions***

Volume 4, Section 10.3 of the Project EIS examines the Project effects on Indigenous health and socio-economic conditions. Given the above assessment conclusions for changes in surface water quality, no potential adverse effects are predicted on the health of Indigenous groups, and a requirement for a human health risk assessment is not anticipated, as sediment and other constituent concentrations in construction water discharges are not expected to exceed water quality guidelines for the protection of aquatic life. As a result, no adverse effects are anticipated on the health of Indigenous groups.

Volume 4, Section 10.2.4 of the Project EIS documents provide an assessment of the change in availability of traditional resources for current use and change to cultural and spiritual sites and areas. As stated above, the impact from sediment management on fish, the risk of invasive weed species, and the potential for erosion or sedimentation of the water will be limited by construction timing and practices to lower the potential impacts on important species during construction. Furthermore, it is anticipated that there will be low erosion and sediment rates, as well as the re-establishment of natural vegetation post-construction. As indicated in the Project EIS, there are no anticipated adverse effects to traditionally harvested resources or commercially harvested fish, including their abundance and health, due to changes in water quality, water flow, erosion rate, or sedimentation. As well, the anticipated locations and water flow changes due to the proposed ponds are also anticipated to have limited potential adverse effects on heritage resources. Sensitive locations to be avoided are identified in the EPP mapbooks, filed as part of the June

2022 supplemental information response to IAAC IRs. The EMP plans will be adhered to during construction and operations phases of the Project and will aid in mitigating any potential impacts.

In addition, given the above assessment conclusions, drinking water quality is not anticipated to change in the local assessment area as a result of water discharges from construction work areas during Project construction. Additional information on the Lake St. Martin First Nation surface water intake at the Lake St. Martin Narrows is provided in the response to IR IAAC-R2-09 d).

Additional information about water quality impacts on the availability of the traditional resource for current use, as well as proposed mitigation and monitoring programs can be found in Attachment 4 - Table IAAC-122-1 in the May 31, 2022, response to IR IAAC-122. Additional information about the effects of water quality on the health and socio-economic conditions of Indigenous groups can be found in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

iii. ***Other Areas of Federal Jurisdiction***

Effects to fish and fish habitat are discussed in Volume 3 of the Project EIS, including aquatic species at risk (Section 7.2.2), fish habitat (Section 7.2.4.2), and fish health and mortality (Section 7.2.4.4). Given the above assessment conclusions for surface water quality, including avoidance of any sensitive time periods, there is no change from the predictions provided in Volume 3, Section 7.2.5.1 of the Project EIS regarding significance to fish and fish habitat or aquatic species at risk resulting from water discharges from construction work areas during Project construction. The information described above provides additional details and is consistent with proposed mitigation measures described in the Project EIS.

d. **Mitigation Measures**

Mitigation measures for potential effects associated with construction and operation of sedimentation and settling ponds are provided in the response to Part a).

e. **Monitoring and Follow-up**

The SWMP and SMP, as filed as part of the June 2022 supplemental response to IAAC IRs, have been developed to describe mitigation and monitoring measures for the construction and two-year post-commissioning phases of the Project to confirm the efficacy of mitigation measures. The SWMP includes a plan to monitor discharges from the Project construction (Section 6.2.2 of the SWMP). This monitoring will be undertaken to identify any changes in surface water quality that may result from construction activities and to assess the effectiveness of proposed erosion and sedimentation control measures.

Water quality management controls during Project construction will be designed by the contractor, in accordance with contract requirements and with approval from Manitoba Transportation and Infrastructure or the contract administrator, to allow discharge into waterbodies using various methods of containment, treatment and discharge. The actions will be guided by a combination of the

results of visual inspections and testing, where appropriate as determined by the inspector on-site, and meeting appropriate CEQGs and MWQGs for the protection of aquatic life. In combination with observable changes in surface water (e.g., oil sheens, sediment plumes), these guidelines form the basis of the adaptive management and follow-up measures described in Sections 7.0 and 11.0 of the SWMP.

CEQGs and MWQGs for the protection of aquatic life will be used to manage water discharged from the Project construction area to waterbodies, including wetlands with open water. On-site monitoring for turbidity/TSS, and other potentially relevant parameters such as dissolved oxygen, pH, conductivity, and temperature at discharge points will be implemented at an appropriate frequency to confirm compliance.

In addition to monitoring surface water quality where water is discharged from the construction areas, the SWMP describes monitoring of surface water quality during in-lake excavation, and local waterbodies along the LMOC and LSMOC.

Although the methods and recommendations outlined in the SWMP were developed based on site-specific expectations and conditions, it is accepted that these conditions are subject to change. For example, weather conditions and climate change will inevitably drive some of the design decisions during Project construction and long-term operation. Results from ongoing data collection and monitoring programs will inform and facilitate any necessary adjustments to this plan, to the extent feasible. By employing adaptive management strategies, assumptions used in the initial design will be evaluated and management practices modified in response to the outcomes during the Project construction period and subsequent operation phase based on baseline investigations, follow-up monitoring and reporting.

Adaptive management uses the Project designs while learning from field performance to manage risk and allow the incorporation of new knowledge into subsequent steps. The foundation of this process relies on data input and implementation of sound monitoring programs. Based on the monitoring results and feedback during construction, temporary mitigation measures described in this SWMP, as well as those included in the SMP, will be revisited and updated, as required. Adaptive management will play an important role in acknowledging and working through management challenges in the presence of uncertainty.

Question IAAC-R2-06
July 24, 2023

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QUESTION IAAC-R2-07

Referenced Round 1 IR(s): IAAC-14

Expert Dept. or group: Peguis First Nation

EIS Guideline Reference: 7.1.4 Ground Water and Surface Water

Context and Rationale

The EIS guidelines requires the Proponent to assess the changes to groundwater, surface water, and fluvial morphology as a result of the Project. The EIS Guidelines require an assessment of potential effects to the health and socio-economic conditions of Indigenous peoples.

The Proponent has developed a hydrodynamic model (KGS 2021) re-designing the intake of the north channel. Due to this re-design of the intake of the north channel, updated and accurate modeling of head loss at the Lake St Martin Narrows is crucial in assessing future hydrodynamic conditions in Lake St Martin during channel operation.

Peguis First Nation developed a model to predict head loss at the Lake St Martin Narrows. For predictions of the head loss between the south and north basins of Lake St Martin during the 2011 flood, the model developed by Peguis First Nation predicts a 57 cm headloss, while the Proponent's initial model predicts an 11 cm headloss. For predictions during the 2011 flood with the channels operating, the model developed by Peguis First Nation predicts a 76 cm headloss, while the Proponent's model predicts a 29 cm headloss. Clarity on the prediction and accuracy of the Proponent's headloss model is required to assess potential effects resulting from the changes to surface water flows.

A sensitivity analysis focused on variation in head loss at the Lake St Martin Narrows would provide an understanding of the expected variation in predicted hydraulic parameters, and is required to validate the accuracy of the Proponent's predictions of water levels, discharges and flow velocities.

Information Requests

a. Given the differences in head losses predicted by the Peguis First Nation and the Proponent's models, describe the following:

   i. potential effects to water levels, discharges and flow velocities in the Lake St Martin Narrows under flood conditions during channel operation;

   ii. potential effects on erosion, transport and deposition of sediment in Lake St Martin under flood conditions;

   iii. potential effects to the use of rip rap and armouring of the channels; and

iv. potential effects to wetlands, fish and fish habitat, and the current use of lands and resources for Indigenous peoples.

b. Provide a sensitivity analysis based on varying the head loss at the channels to understand potential effects on water levels, discharges and flow velocities. Consider the following:

i. assess the head loss at increments of 20 cm between 30 cm and 90 cm for the 2011 flood with the channels operating; and

ii. based on the results of the sensitivity analysis, describe potential effects on sediment erosion, sediment transport and deposition, fish and fish habitat, and resulting potential effects to the current use of lands and resources for Indigenous peoples, and health and socio-economic conditions of Indigenous peoples.

Response IAAC-R2-07

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) issued on August 25, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided to Indigenous groups. This response integrates a reply to questions raised in October 24, 2022, correspondence from Pinaymootang First Nation, Sagkeeng First Nation and Sandy Bay Ojibway First Nation regarding revising assessments using a spectrum of hydraulic parameters and examining effects to lake whitefish spawning areas in the vicinity of the Lake St. Martin Narrows and fish habitat in the north basin. It also integrates a reply to questions raised in September 30, October 17 and October 31, 2022, submissions from the Interlake Reserves Tribal Council Inc. requesting information on a variety of topics, such as effects lake whitefish spawning areas in the vicinity of the Narrows, impacts to surface water flow in Lake St Martin, the Lake St. Martin head loss, and effects to lakes and rivers within the hydraulic system. This response also integrates the outputs of discussions with Peguis First Nation and their consultant during several technical meetings on the head loss issue at the Lake St Martin Narrows, in which representatives on Impact Assessment Agency of Canada (IAAC) were also in attendance. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

Question IAAC-R2-07
July 24, 2023

a. **Lake St. Martin Head Loss Effects**

i. ***Water levels, Discharges and Flow Velocities in the Narrows Under Flood Conditions***

The MIKE 21 model of Lake St. Martin was calibrated using surveyed water levels in the south and north basins of Lake St. Martin from the 1995 and 2011 flood events. Details on the model setup and calibration are provided in the KGS Lake St. Martin Head Loss Analysis Report, which was included in Attachment 2 of Manitoba Transportation and Infrastructure's response to the Round 1 Information Requests on May 31, 2022. The calibrated model was used to simulate water levels in the north and south basins that closely matched measured water levels for the 1995 and 2011 flood events, as shown in Figure IAAC-R2-07-1 and Figure IAAC-R2-07-2 below. As shown in Figure IAAC-R2-07-2, water levels in the north basin of Lake St. Martin were only measured during the rising limb of the 2011 flood.

Figure IAAC-R2-07-1 Comparison of Simulated and Observed Water Levels in Lake St. Martin – 1995 Flood

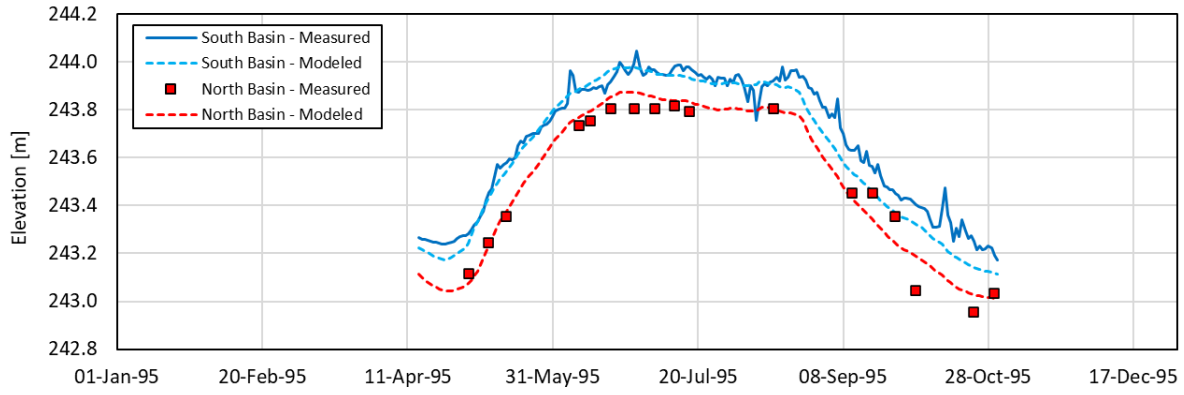
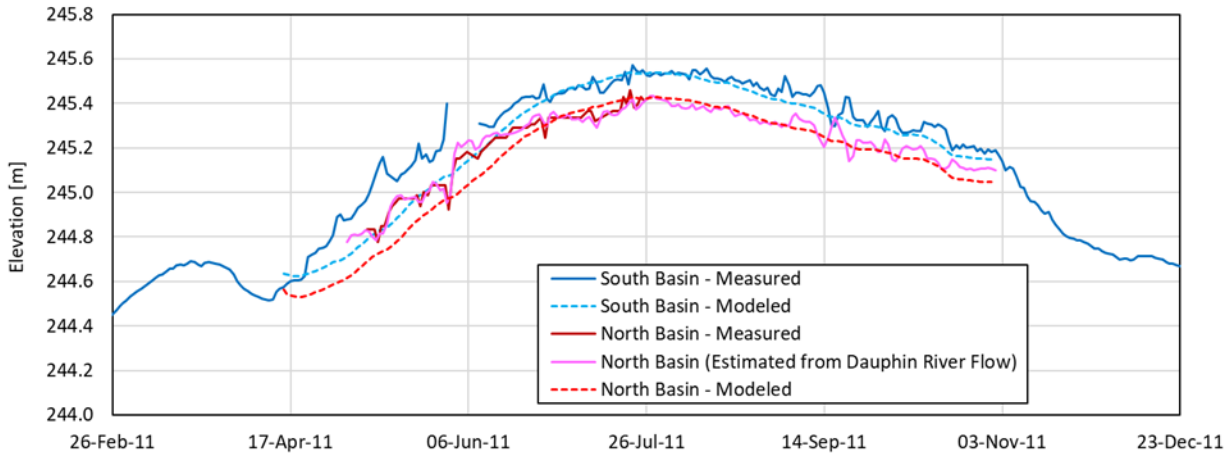
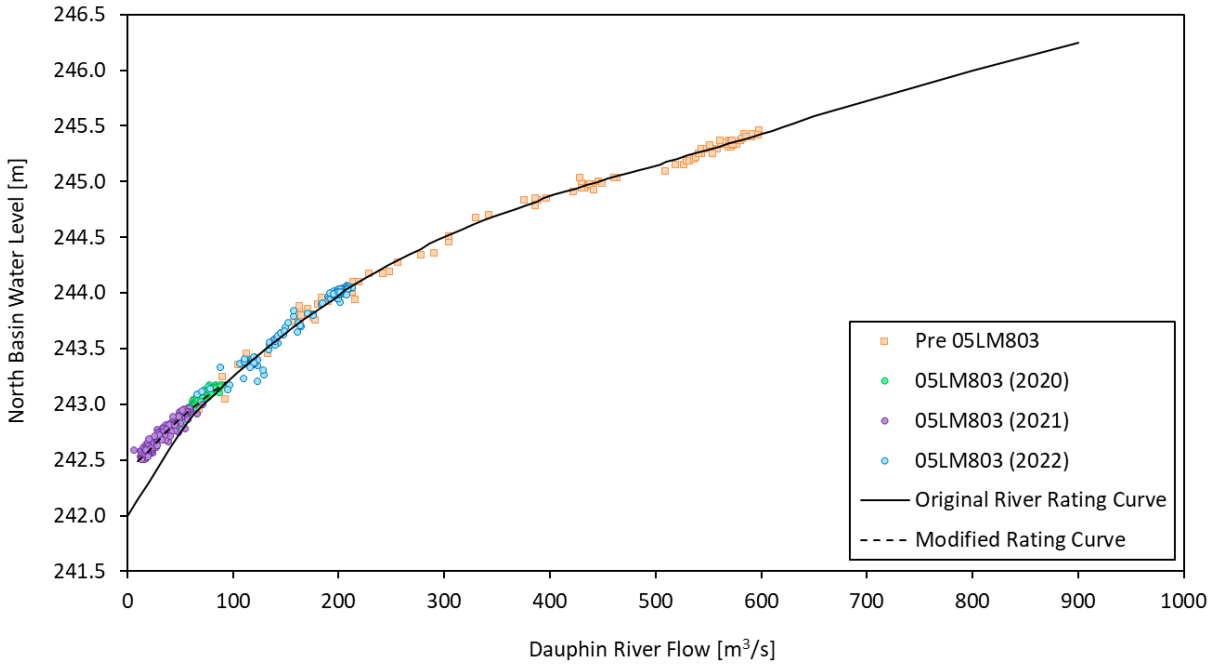


Figure IAAC-R2-07-2 Comparison of Simulated and Observed Water Levels in Lake St. Martin – 2011 Flood



As documented in the Lake St. Martin Head Loss – Model Verification and Sensitivity Analysis Appendix IAAC-R2-07-1, additional analysis has been carried out since the development of the KGS Lake St. Martin Head Loss Analysis Report, which was included in Attachment 2 of Manitoba Transportation and Infrastructure's response to the Round 1 Information Requests on May 31, 2022. This includes accessing additional historical water level measurements, and new data from a water level gauge in the north basin of the lake (Station 05LM803) that was obtained after the report was developed by Manitoba Transportation and Infrastructure. This additional water level data has allowed further verification of the Dauphin River rating curve, which is used as the downstream outflow boundary condition in the MIKE 21 model. The measured data is overlain on the Dauphin River rating curve in Figure IAAC-R2-07-3. In general, the rating curve matches very well to the measured data. A small adjustment was made to the low end of the rating curve based on low water levels recorded in 2021. The adjustment only affects the predicted outflows when the north basin water level is below El. 243.1 m (797.6 feet [ft]); therefore, the flood simulations completed as part of the Lake St. Martin Head Loss Analysis Report, which was included in Attachment 2 of Manitoba Transportation and Infrastructure's response to the Round 1 Information Requests on May 31, 2022, would be unaffected by this change.

Figure IAAC-R2-07-3 Dauphin River Outflow Rating Curve (Open Water)



The Dauphin River rating curve was used to generate a time series of estimated north basin water levels during the 2011 flood event (shown in Figure IAAC-R2-07-2). As shown, the north basin water levels estimated from the Dauphin River flow record match well with the surveyed north basin water level for the rising limb of the hydrograph. Extension of the estimated north basin water levels to the falling limb of the hydrograph indicates that the MIKE 21 model is able to accurately simulate the recession in the lake levels after the flood peak.

The additional north basin water level data made available since the KGS Lake St. Martin Head Loss Analysis Report, which was included in Attachment 2 of Manitoba Transportation and Infrastructure's response to the Round 1 Information Requests on May 31, 2022, allowed simulation of other flood events to further verify the MIKE 21 model. Two flood events were identified as suitable candidates for verification: 2017 and 2022. The peak lake water levels during these floods fall between the peaks of the 1995 and 2011 events that were used for model calibration.

Modeled water levels in the south and north basins of Lake St. Martin for the 2017 and 2022 events are shown in Figure IAAC-R2-07-4 and Figure IAAC-R2-07-5, respectively. The start times of the simulations were selected to approximately correspond to the start of the rising limb of the flood hydrograph. Aside from a few days at the start of the simulation when conditions are equilibrating, the model results are not sensitive to the initial condition (particularly at the peak of the floods).

Figure IAAC-R2-07-4 Model Verification – 2017 Flood Event

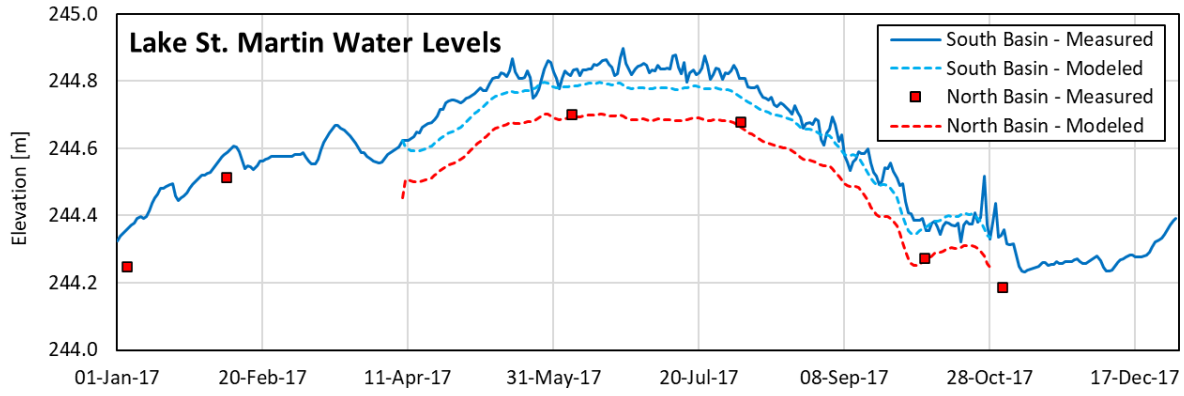
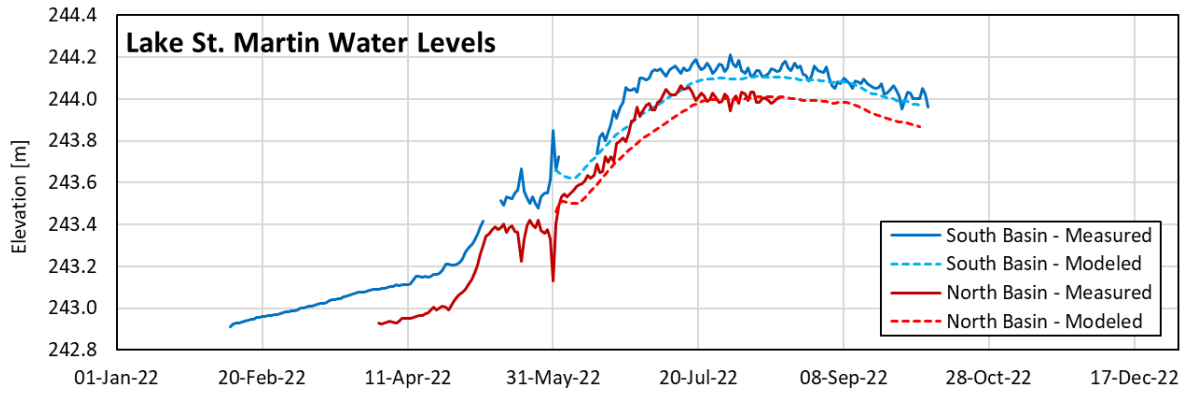


Figure IAAC-R2-07-5 Model Verification – 2022 Flood Event



For both the 2017 and 2022 simulations, the north basin water levels at the peak of the flood are well matched to observed measurements. The simulated water levels in the south basin at the peak of the floods match reasonably well to the measurements as well. Considering a seven-week period (to average out the “noise” from wind effects in the measured data) during the peak of the 2017 flood event, the simulated south basin water levels are approximately 0.06 m (0.20 ft) lower than the measured levels, on average. Considering a seven-week period during the peak of the 2022 flood event, the simulated south basin water levels are approximately 0.04 m (0.13 ft) lower than the measured levels, on average. These results are shown in Table IAAC-R2-07-1.

Table IAAC-R2-07-1 Simulated and Measured Lake Levels During 2017 and 2022 Flood Peaks

Event	South Basin Water Level [m]			North Basin Water Level [m]		
	Measure	Sim.	Diff.	Meas.	Sim.	Diff.
2017	244.84	244.78	-0.06	244.70	244.69	-0.01
2022	244.14	244.10	-0.04	244.00	244.00	0.00

Notes:
2017 south basin peaks consider period from May 31 to July 20.
2017 north basin peak refers to point water level measurement on June 6.
2022 north and south basin peaks consider period from July 20 to September 8.

In summary, the MIKE 21 model achieves a good fit to measured north basin and south basin water levels for the 1995 and 2011 flood events (i.e., calibration runs). Results of the model verification simulations (2017 and 2022 flood events) indicate that the simulated north basin water levels match well with measured data. The simulated south basin water levels show reasonable agreement with measured data but are slightly underpredicted at the flood peaks by approximately 0.04-0.06 m (0.13-0.20 ft). Bathymetric surveys and substrate typing of the LSM Narrows will be conducted in summer 2023 to provide detailed baseline conditions. Monitoring and subsequent follow-up surveys during construction and operation of the channels will assess if any changes to the substrates occur from future operations during flood events.

As indicated in the Impact Assessment Agency of Canada's Context and Rationale for this IR (included in the opening section above), the model developed by Peguis First Nation predicts a head loss of 0.57 m (1.87 ft) during the peak of the 2011 flood. This substantially exceeds the measured head loss, which is in the order of 0.12 m (0.39 ft) and is well represented by the MIKE 21 model described above (see Figure IAAC-R2-07-2). Potential effects to water levels, discharges, and flow velocities in the Lake St. Martin Narrows, as well as potential effects on erosion, transport, and deposition of sediment in Lake St. Martin included in the May 2022 responses to Information Requests (e.g., IAAC-68) were based on results of the calibrated MIKE 21 model. Therefore, the May 2022 responses related to head loss through the Narrows remain valid. Part b of this response includes a sensitivity analysis and assessment of potential effects if the actual head loss varies from what was originally predicted.

ii. ***Erosion, Transport and Deposition of Sediment***

As indicated in Part i, the May 2022 response to Information Request IAAC-68 discusses potential effects of changes to water levels and flow velocities in the Lake St. Martin Narrows to erosion, transport, and deposition of sediment in Lake St. Martin. Based on the analysis and comparisons summarized in Part i, there are no changes to predictions regarding the erosion, transport, and deposition of sediment.

iii. ***Channel Armouring***

The design of riprap and armouring for the LSMOC are based on hydraulic conditions in the channel (i.e., water velocities and shear stresses during passage of the Design Flow). As shown in Part b of this response, the head loss through the Narrows affects water levels in the south basin of Lake St. Martin but has a small to negligible effect on water levels in the north basin and flows through the Dauphin River and LSMOC. Because of this (i.e., small to negligible effect to LSMOC flows), the design of riprap and armouring in the LSMOC would not be affected by changes to head loss in the Narrows. As described in the May 2023 Project Description Update, there are no proposed changes to the hydraulic design of the LSMOC.

iv. ***Effects Assessment***

Overview

As described above, and in the May 2022 response to Information Request IAAC-68, there will be some small differences in water elevation between the north and south basins of Lake St. Martin during operation of the channels. This difference in water level elevation affects the velocity of water passing through the Narrows and thus the potential for sediment mobilization with resulting effects to substrate type; both water velocity and substrate type are important characteristics of fish habitat. Given that lake whitefish spawn within and in the vicinity of the Narrows, and fish are an important resource for Indigenous groups, potential changes at the Narrows are of particular concern. Effects of head loss at the Narrows were previously assessed in the May 2022 responses to Information Requests IAAC-68 and as noted above, additional examination of the hydraulic model has not indicated any need for change to the assessment.

Fish and Fish Habitat

Effects to fish and fish habitat due to increased water velocity and mobilization of sands and gravels resulting from Lake St. Martin head loss conditions were previously described in the May 2022 response to Information Requests IAAC-68. As noted in the response to IAAC-68, velocities will be greatest at constrictions in the Lake St. Martin narrows (the Narrows). Based on the modeling carried out, during the fall period (September to November), when lake whitefish would be migrating through the area, velocities in the Narrows are not predicted to exceed velocities that currently occur in the Dauphin River at corresponding flows (see May 2022 response to Information Request IAAC-43) and are not expected to impede upstream movement of fish. Fish will also be able to use localized areas of lower velocity (e.g., boulders and other natural/existing barriers) suitable for upstream movement in nearshore areas.

As described in the May 2022 response to Information Request IAAC-36, habitat surveys conducted in 2021 found that suitable substrate for spawning is widespread in the vicinity of the Narrows, including along the shore and islands upstream of the western constriction, between the two constrictions, and at and immediately downstream of the eastern constriction, including at the abundant shoals and islands in this area. Although ample suitable spawning substrate occurs in the area, water depth may currently be insufficient under moderate and low flow conditions (approximately once in every ten years) to support overwinter survival of eggs. During Project operation, the increased velocities are expected to transport some sands and gravels from the center of the Narrows channel at the western and eastern constrictions further downstream into the reach between the two constrictions or just downstream of the eastern constriction in the north basin of Lake St. Martin, respectively (as shown in the May 2022 response to IR IAAC-68, Figure IAAC-68-6). However, this shift in substrates is not expected to affect the overall areas of spawning habitat, as suitable substrates are widespread along the margins of the constrictions, and along the many shoals and islands within this section of the lake. The response to IR IAAC-R2-31, Appendix IAAC-R2-31-1 provides aerial imagery indicating the location of shoals as observed under low water conditions (Figure 7) and maps showing the estimated potential Walleye (Figures 21 and 22) and Lake Whitefish (Figures 25 and 26) spawning habitat.

Surveys for spawning adult and larval fish and mapping of habitat has indicated that suitable spawning habitat for lake whitefish is widespread in Lake St. Martin, as well as in adjoining waters including the Fairford and Dauphin rivers. The May 2022 response to Information Request IAAC-36 summarizes results of the field studies on fish populations and habitat. Lake whitefish are believed to spawn immediately upstream and downstream and within the Narrows based on habitat characteristics, historic information (Stone 1965; Cook and MacKenzie 1979), observations of local resource harvesters (Lake St. Martin First Nation, personal communication, fall 2021), and the observed presence of large concentrations of adult lake whitefish prior to the spawning period. Results from larval fish surveys indicate that lake whitefish also spawn in the Fairford River and several locations in the south basin of Lake St. Martin, in particular Birch Bay. Anecdotal reports suggest that whitefish spawning also occurs in the southern part of Lake St. Martin near Hilbre Beach (W. Galbraith, Indigenous Services Canada, pers comm; 18 November 2022). Suitable spawning substrate is widespread in the Dauphin River, but water levels may be insufficient under some flow conditions to support overwinter egg survival. Spawning has been documented near the confluence with Buffalo Creek under high flow conditions (NSC 2016). While suitable substrates are widespread in the north basin of Lake St. Martin, analysis of water depths indicates that conditions are likely only suitable under high water levels because the basin is generally too shallow to support the overwinter survival of eggs. Additional information can be found in the response to IR IAAC-R2-31.

Current Use of Lands and Resources

The assessment of potential effects to the availability of traditional resources for current use, including traditionally harvested fish and fishing by Indigenous groups, is discussed in Volume 4, Section 10.2.4.4 of the Project EIS. Additional information about traditionally harvested fish and fishing by Indigenous groups obtained by Manitoba Transportation and Infrastructure is available in the May 2022 response to information request IAAC-122. Given the conclusions with respect to fish and fish habitat above, the conclusion in Volume 4, Section 10.2.4.4 of the Project EIS that the Project is not anticipated to pose a threat to the long-term sustainability and production of fish populations that are important to commercial, recreational, or Aboriginal fisheries in Lake Manitoba, Lake St. Martin, and Lake Winnipeg remain unchanged.

b. **Head Loss Sensitivity Analysis**

i. ***2011 Flood Scenarios***

A sensitivity analysis was conducted to understand the potential range of model-predicted head losses and the corresponding range of Project effects when the outlet channels are in operation. The requested approach of explicitly defining and varying the head loss at the Narrows is not exactly possible, as the head loss is an *output* from the MIKE 21 model. Instead, model input parameters were varied to obtain different head losses through the Narrows, which allowed for an assessment of different head loss increments. This approach was presented at a meeting on November 1, 2022, including representatives from Peguis First Nation, Lake St. Martin First Nation, Hollow Water First Nation, and Fisher River Cree Nation, as well as regulators (Impact Assessment Agency and Environment and Climate Change Canada). It was agreed that the proposed approach met the intent of the request. Model input parameters were varied to determine the sensitivity of the model predictions to each parameter. Parameters and inputs tested included bed roughness, eddy viscosity, mesh resolution, and the representation of bathymetric features in the model geometry. Of the parameters tested, the bed roughness (Manning n value) was found to have the greatest influence on the head loss in the Narrows.

The four flood events used for calibration and verification (1995, 2011, 2017, and 2022) were simulated with Manning n values ranging from 0.02 to 0.04 (at increments of 0.005) in the Narrows (the original calibrated Manning n value was 0.025). Simulated and observed water levels are shown in Figure IAAC-R2-07-6 to Figure IAAC-R2-07-9.

Figure IAAC-R2-07-6 Sensitivity to Bed Roughness – 1995 Flood Event

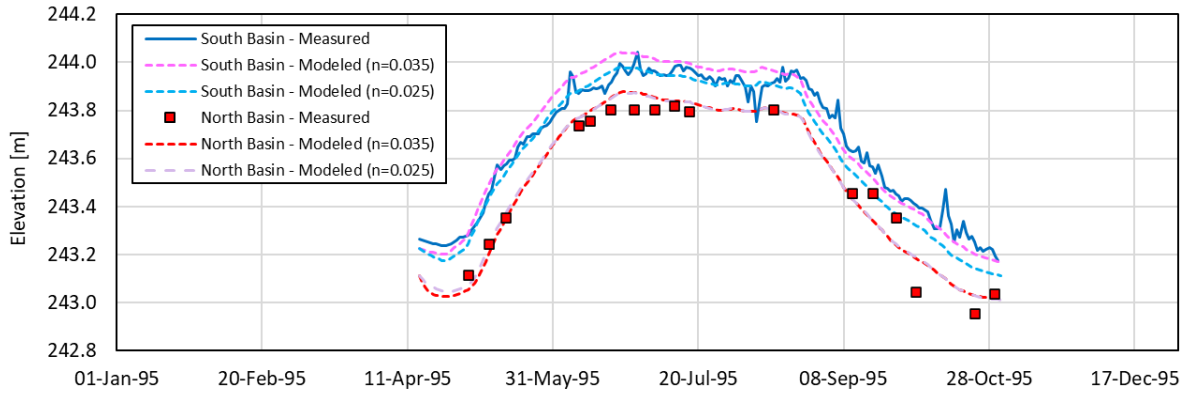


Figure IAAC-R2-07-7 Sensitivity to Bed Roughness – 2011 Flood Event

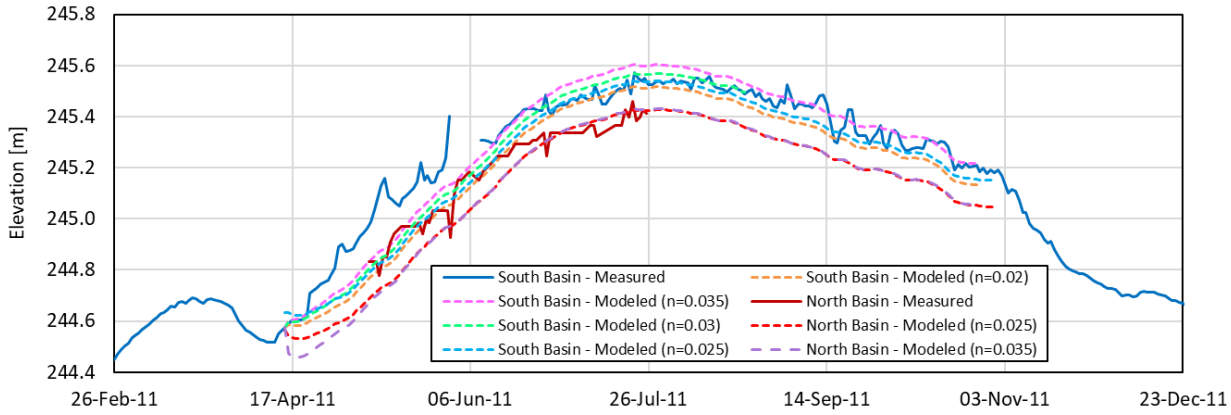


Figure IAAC-R2-07-8 Sensitivity to Bed Roughness – 2017 Flood Event

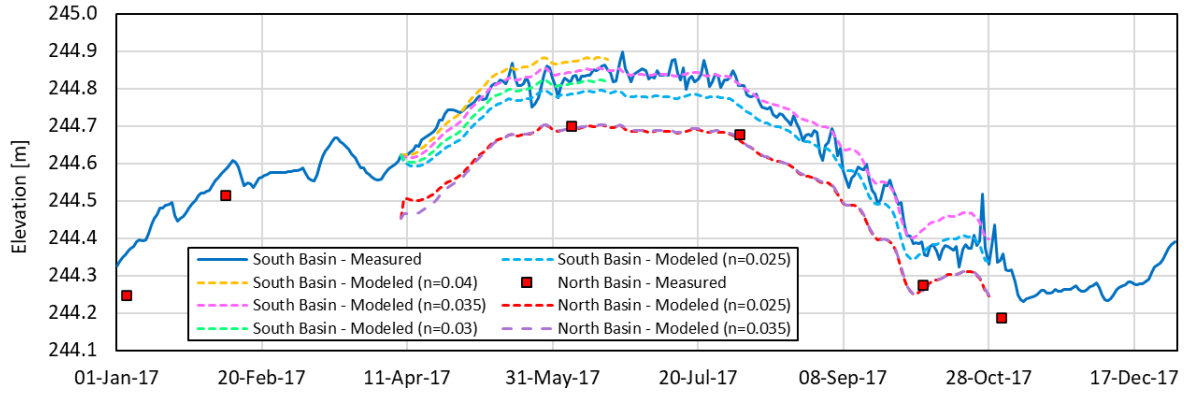
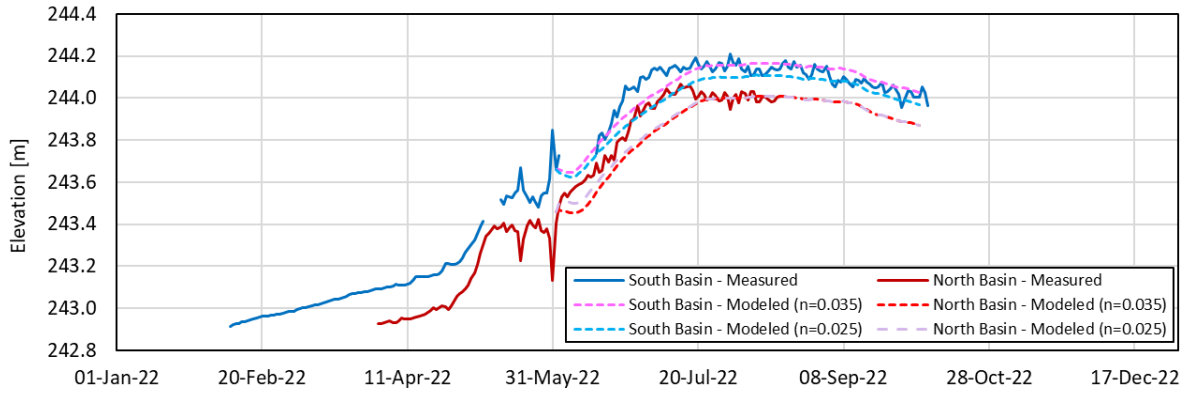


Figure IAAC-R2-07-9 Sensitivity to Bed Roughness – 2022 Flood Event



Visual assessment of the graphs suggests that the model with a Manning n of 0.025 in the Narrows provides a good match to the observed head loss at the peak of the 2011 event (after the rising limb) but tends to underpredict the head loss by varying amounts for the other flood events.

A summary of measured and simulated peak water levels in the south basin of Lake St. Martin is presented in Table IAAC-R2-07-2. The peak values represent the averages recorded over a multiple week period during the peak of the flood (this was done to eliminate noise in the data from wind). Note that four Manning n values were used for the 2011 and 2017 simulations. Those results showed that Manning n values of 0.025 and 0.035 bracketed the measured water levels; as such, only two Manning n values of 0.025 and 0.035 were used for the 1995 and 2022 simulations. Values of 0.02 and 0.04 were deemed to be outside the bounds of the optimal range, which was confirmed by the results for the 1995 and 2022 simulations using Manning n values of 0.025 and 0.035.

Table IAAC-R2-07-2 Summary of Simulated vs. Measured Peak South Basin Water Levels for Varying Bed Roughness

	Average South Basin Water Level at Peak (m)					
		Simulated *(Difference)*				
Flood Event	**Measured**	**n = 0.02**	**n = 0.025**	**n = 0.03**	**n = 0.035**	**n = 0.04**
1995	243.96		243.95 *(-0.01)*		244.01 *(+0.06)*	
2011	245.53	245.50 *(-0.03)*	245.52 *(-0.01)*	245.55 *(+0.02)*	245.58 *(+0.05)*	
2017	244.84		244.78 *(-0.06)*	244.82 *(-0.02)*	244.84 *(-)*	244.88 *(+0.04)*
2022	244.14		244.10 *(-0.04)*		244.16 *(+0.02)*	

The mean absolute error (MAE) of modeled south basin water levels for the four flood events are shown in Table IAAC-R2-07-3. The timeframe considered for calculation of MAE spanned from approximately the end of the rising limb to the end of the receding limb. This was done to reduce the effect of the delayed rise in the rising limb (due to absence of local inflow in the numerical model) as well as any residual effects of initial conditions.

Table IAAC-R2-07-3 Mean Absolute Error of Modeled South Basin Water Levels

Flood Event	Date Range	MAE (m)	
		n = 0.025	n = 0.035
1995	Apr 15 – Oct 31	0.056	0.051
2011	Jun 12 – Oct 20	0.036	0.043
2017	May 20 – Oct 28	0.043	0.031
2022	Jul 20 – Oct 4	0.037	0.029

There is no single Manning n value that results in the best fit between simulated and observed water levels for all flood events. This is likely due to the complex flow conditions through the Narrows, which differ depending on the magnitude of the flood. The water levels and head losses observed for all flood events are bracketed by model results with a Manning n in the range of 0.025-0.035. Project effects were originally evaluated based on the MIKE 21 model with a Manning n of 0.025 in the Narrows. It is acknowledged that there is some uncertainty in the “true” bed roughness that would be realized over a broad range of flow conditions, and that an upper limit Manning n value of 0.035 is plausible. Therefore, to fully assess the potential range in Project effects, an analysis of Project-affected flows and water levels was completed using the greater Manning n of 0.035.

ii. *Effects Assessment*

Overview

The effect of a greater head loss than predicted in the hydraulic model was assessed through a sensitivity analysis. As described above, increasing the roughness coefficient in the Narrows was found to be the most effective means of increasing the difference in head between the two basins of Lake St. Martin. The effect of the increased head difference is considered below on effects to velocity and sediment dynamics and resulting effects to fish and fish habitat.

Sediment Erosion, Transport and Deposition

Manitoba Transportation and Infrastructure previously developed a water balance model to route flows through the hydraulic system from Lake Manitoba to Lake Winnipeg. The water balance model has previously been used to simulate how floods would move through the system in the pre- and post-Project environments, and to assess the effect of outlet channel operation on lake levels and river flows.

The previous model results were based on a family of head loss curves generated by the MIKE 21 model using a Manning n of 0.025 in the Narrows. An alternate family of rating curves was developed from the MIKE 21 model using a Manning n of 0.035 in the Narrows.

Manitoba Transportation and Infrastructure re-ran the water balance model for the historical period from 1915-2017 using the alternate family of head loss curves (Manning n of 0.035). Statistical parameters were calculated by Manitoba Transportation and Infrastructure to quantify the ability of the model to simulate south basin water levels. Statistics were calculated on daily water levels in the south basin starting in 1976. The statistics were compared to the previous model (which used head loss rating curves based on a Manning n of 0.025 in the Narrows). Key statistical parameters are summarized in Table IAAC-R2-07-4Table IAAC-R2-07-4. As shown, the statistics indicate the model with a Manning n of 0.025 is better able to simulate water levels in the south basin compared to the model with a Manning n of 0.035.

Table IAAC-R2-07-4 Statistics of Model Fit to Measured (Pre-Project) South Basin Water Levels

Parameter	n=0.025	n=0.035
Percent Bias	-0.01%	0.01%
Mean Absolute Percentage Error (MAPE)	0.03%	0.07%
Root Mean Squared Error (RMSE)	0.09 m	0.21 m
Nash Sutcliff Efficiency (NSE)	0.98	0.88

Duration curves of water levels in the south and north basins of Lake St. Martin are provided in Figure IAAC-R2-07-10. As shown, there are only very minor changes to the north basin levels, likely caused by minor variations in timing and durations of channel operations. The changes to south basin water levels are more discernible. As expected, the scenario with the greater bed roughness (n=0.035) shows higher water levels. Increasing the Manning n from 0.025 to 0.035 has a greater effect on post-Project water levels than pre-Project levels.

A key observation is that the difference in pre- and post-Project water levels for the scenario with a Manning n of 0.035 is less than the difference for the scenario with a Manning n of 0.025. In other words, the effect of the Project on south basin water levels would be reduced if the bed roughness in the Narrows is greater than previously assumed.

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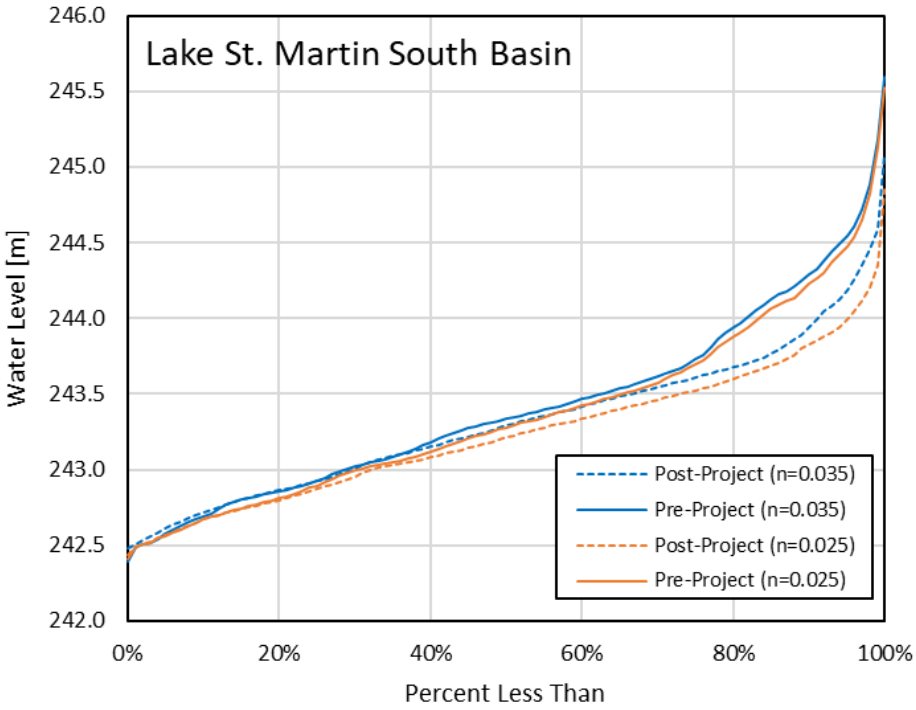
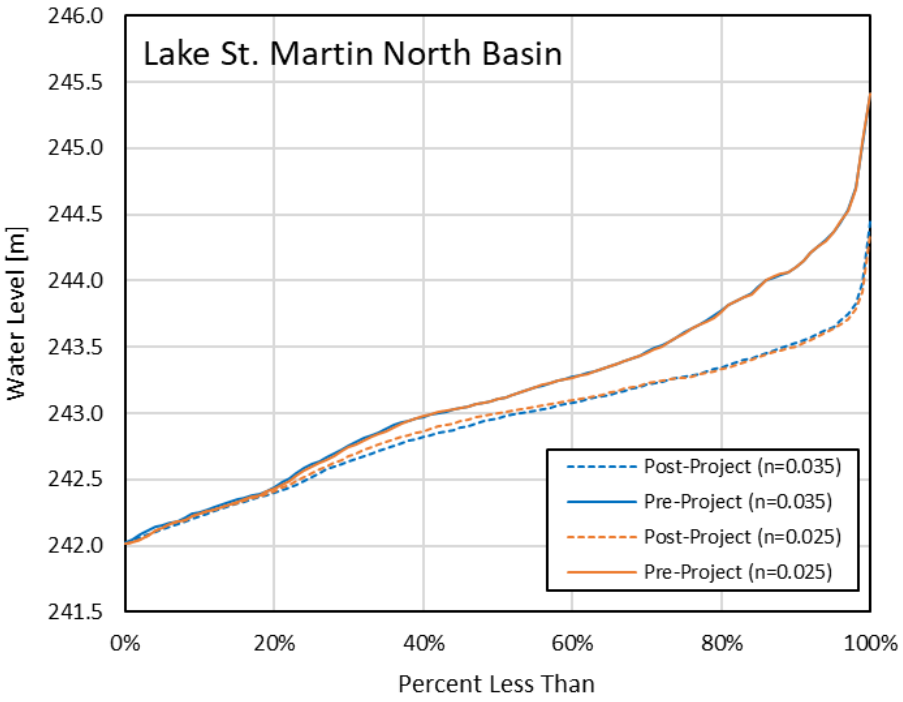
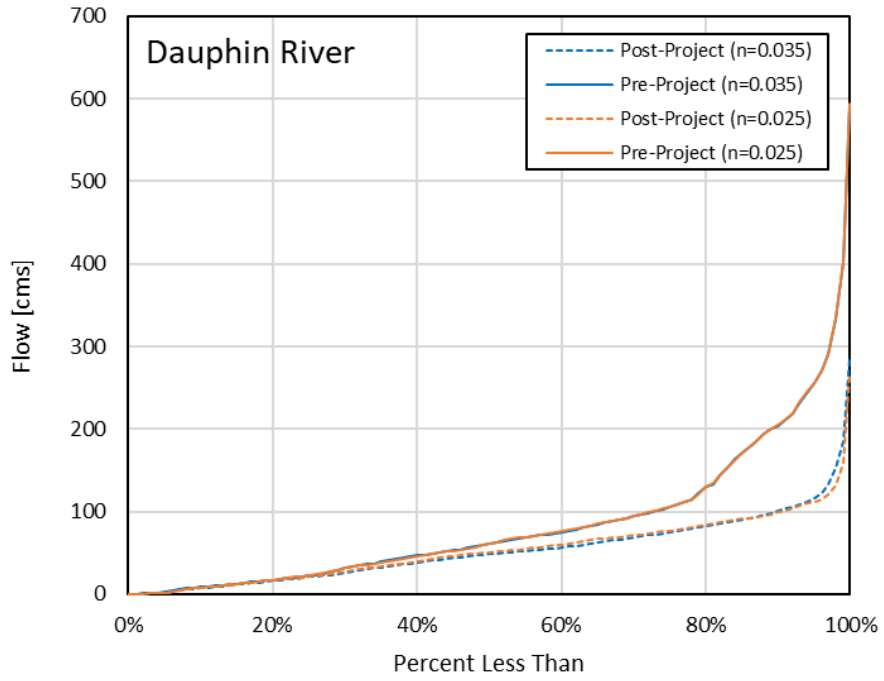
Figure IAAC-R2-07-10 Duration Curves of Lake St. Martin Water Levels





Duration curves of flows in the Dauphin River are shown in Figure IAAC-R2-07-11. As shown, the bed roughness in the Narrows has a negligible effect on flows in the Dauphin River. Therefore, the previously reported Project effects to flows and sediment transport potential in the Dauphin River remain valid.

Figure IAAC-R2-07-11 Duration Curves of Dauphin River Flows



The 2011 flood event was simulated with the MIKE 21 model for the scenario with the outlet channels in place, with Manning n values of 0.025, 0.030, and 0.035 applied to the Narrows. The inflow hydrographs were based on results of Manitoba Transportation and Infrastructure's water balance model and consider contributions from the Fairford River and LMOC. Outflow from the north basin is conveyed by the Dauphin River and LSMOC. Simulated water levels in the south and north basins are shown in Figure IAAC-R2-07-12 and the peaks are tabulated in Table IAAC-R2-07-5. The recorded water levels in the south basin (pre-Project) are also shown in Figure IAAC-R2-07-12.

Figure IAAC-R2-07-12 Simulated Lake St. Martin Water Levels – Post-Project 2011 Flood

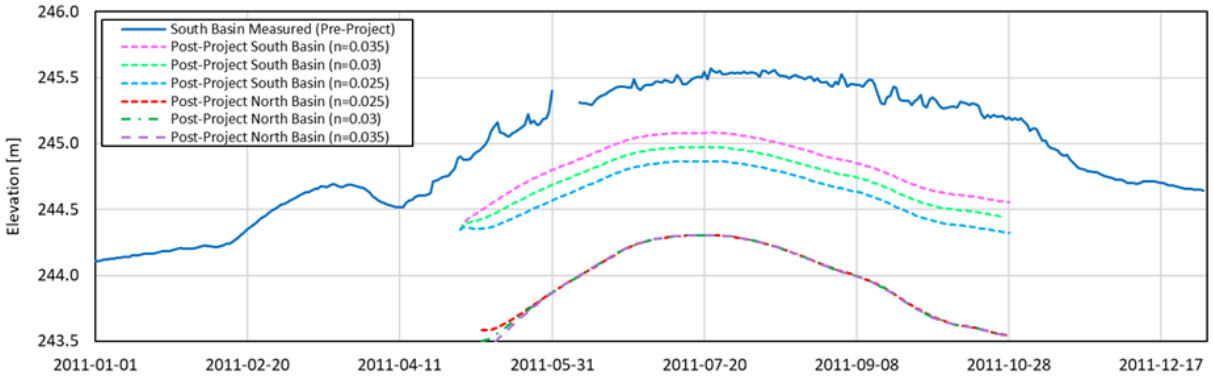


Table IAAC-R2-07-5 Simulated Peak Lake St. Martin Water Levels – Post-Project 2011 Flood

Scenario	South Basin (m)	North Basin (m)	Head Loss (m)
n = 0.025	244.87	244.30	0.57
n = 0.030	244.97	244.30	0.67
n = 0.035	245.08	244.30	0.78

Increasing the bed roughness through the Narrows from an n-value of 0.025 to 0.035 causes an increase of 0.21 m (0.69 ft) to the peak water level in the south basin. As shown in Figure IAAC-R2-07-12, the peak south basin water level remains below the pre-Project peak. The variation in Manning n in the Narrows has a comparatively negligible effect on the water levels in the north basin. This is because the water levels in the north basin are affected primarily by the outflow rating curves (Dauphin River and LSMOC) which remain identical between simulations.

Simulated water surface profiles and velocities through the Narrows at the peak of the 2011 flood event, both without (pre-Project) and with (post-Project) the outlet channels in operation, are shown in Figure IAAC-R2-07-13 and Figure IAAC-R2-07-14. Depth-averaged velocity contours are shown in Figure IAAC-R2-07-15. The figures show results of the models with Manning n values of 0.025 and 0.035 in the Narrows for comparison.

As shown in Figure IAAC-R2-07-13, the effect of increasing the bed roughness through the Narrows is an increase in flow depth. Also evident in Figure IAAC-R2-07-13 is the greater effect of the increase in bed roughness on the post-Project water levels compared to the pre-Project water levels.

The increase in flow depth results in a concomitant reduction in water velocity, as indicated in Figure IAAC-R2-07-14. The reduction in velocity is greater for the post-Project scenario than the pre-Project scenario. Also overlaid in Figure IAAC-R2-07-14 are the velocities at which various substrate types would be expected to deposit or erode, based on the Hjulstrom curve. This provides an indication of the change in erosion and deposition potential through the Narrows.

As shown in Figure IAAC-R2-07-14 and Figure IAAC-R2-07-15, the difference in water velocities from pre- to post-Project is greater for the scenario with a Manning n of 0.025 than for the scenario with a Manning n of 0.035. In other words, there is less effect of the Project on erosion and deposition potential for the scenario with a Manning n of 0.025.

Figure IAAC-R2-07-13 Simulated Water Surface Profiles through Narrows at Peak of 2011 Flood Event

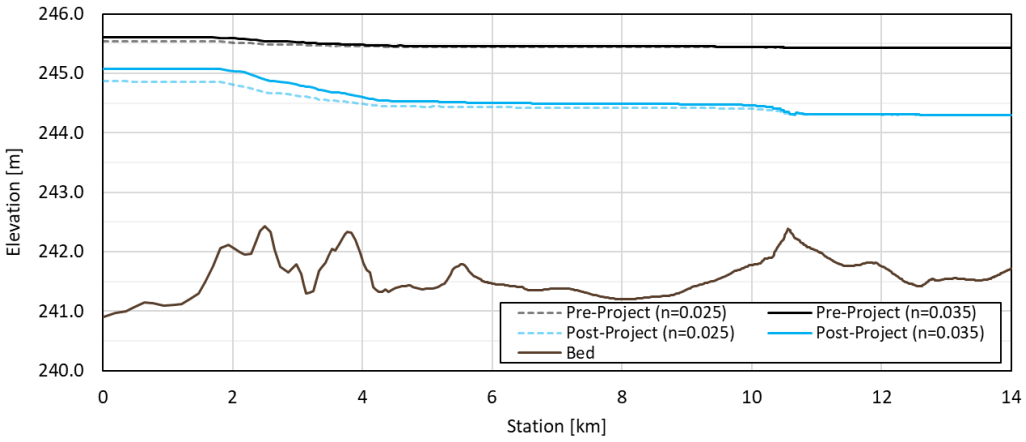


Figure IAAC-R2-07-14 Simulated Centreline Water Velocity through Narrows at Peak of 2011 Flood Event

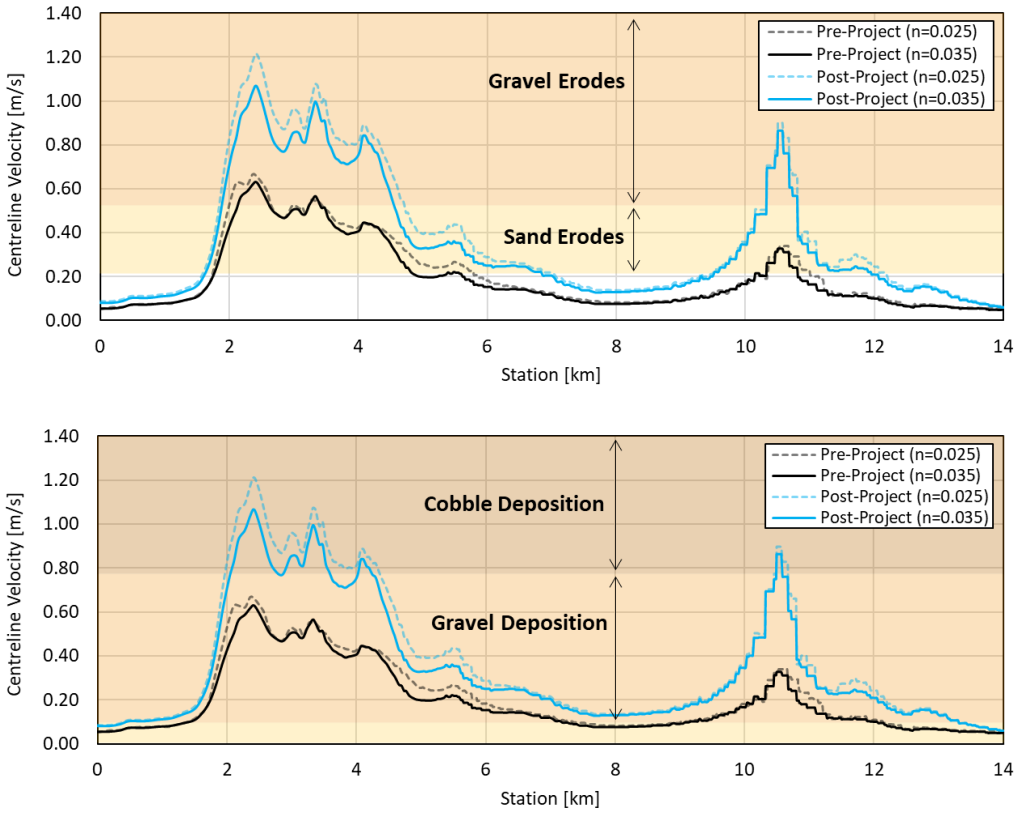
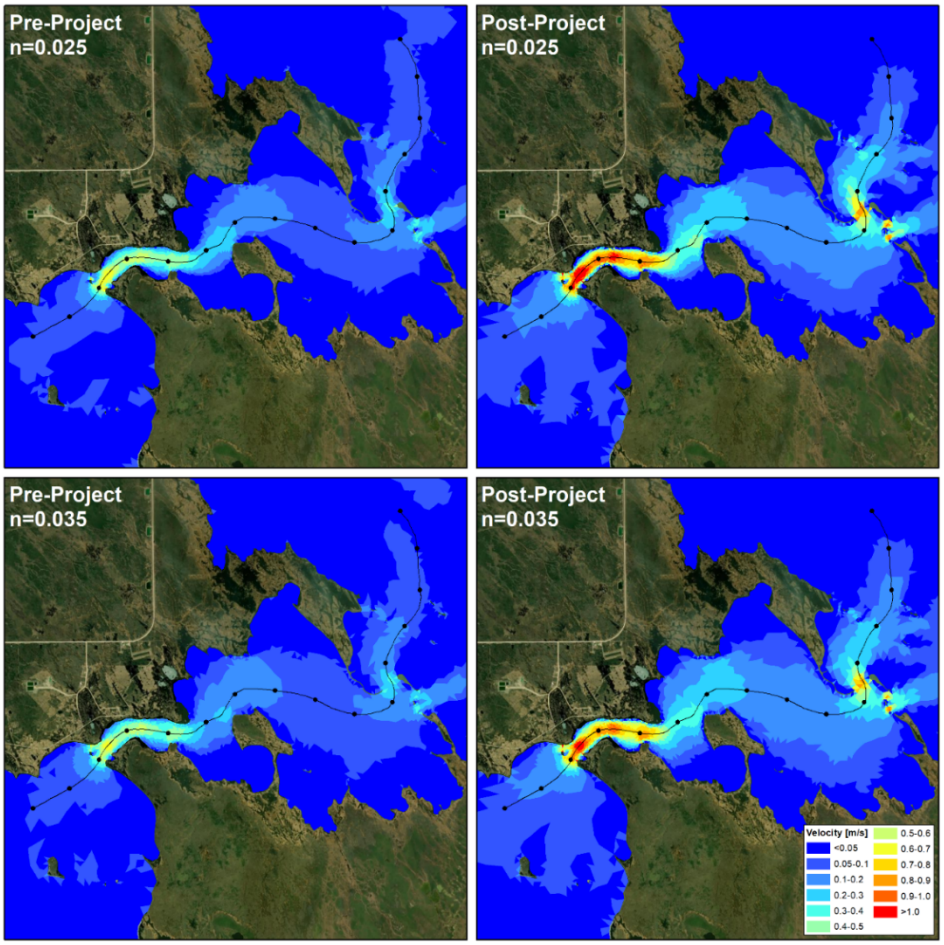


Figure IAAC-R2-07-15 Simulated Depth-Averaged Velocity Contours Through Narrows at Peak of 2011 Flood



Fish and Fish Habitat

As noted above, increasing the roughness coefficient in the Narrows increases water depth and therefore decreases water velocity and the potential for the transport of sediments. Therefore, potential effects to fish and fish habitat are less than described in Part a of this response, where head loss is estimated using a lower roughness coefficient.

Current Use of Lands and Resources

Given the effects described above for sediment erosion, transport and deposition, the conclusion in Volume 4, Section 10.2.4.4 of the Project EIS that the Project is not anticipated to pose a threat to the long-term sustainability and production of fish populations that are important to commercial, recreational, or Aboriginal fisheries in Lake Manitoba, Lake St. Martin, and Lake Winnipeg remains unchanged.

Health and Socio-economic Conditions of Indigenous Peoples

The assessment of potential effects to Indigenous health and socio-economic conditions is discussed in Volume 4, Section 10.3.3 of the Project EIS. Additional information obtained by Manitoba Transportation and Infrastructure since the Project EIS was filed is described in the response to the IR IAAC-R2-29. Given the effects described above for sediment erosion, transport and deposition, the conclusion stated in Volume 4, Section 10.3.3.1 of the Project EIS that the Project is not anticipated to adversely affect Indigenous health conditions from consumption of country foods, ingestion of drinking water or contact with surface or ground water remains unchanged. Similarly, the conclusion stated in Volume 4, Section 10.3.3.1 of the Project EIS that Project operation and maintenance are predicted to have no measurable potential interactions with Indigenous commercial fishing remains unchanged.

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QUESTION IAAC-R2-09

Referenced Round 1 IR(s): IAAC-14, IAAC-17, SMP

Expert Dept. or group: ECCC
IAAC
Lake St. Martin First Nation
Hollow Water First Nation

EIS Guideline Reference: 7.2.2 Changes to Groundwater, Surface Water, and Fluvial Morphology

Context and Rationale

The EIS Guidelines require the Proponent to consider the predicted changes to surface water quality as a result of erosion and sedimentation.

In the response to IAAC-14, the updated summary of residual effects on surface water quality suggests that the initial operation of the Project during commissioning will result in mobilization of sediment from the channels, leading to additional sediment sources. During commissioning, the associated one-time increase in TSS concentrations downstream of the LMOC and LSMOC is predicted to have a moderate magnitude effect on surface water quality within the LAA.

The Proponent's draft response to IAAC-14 (provided Fall 2021) indicated that commissioning is predicted to result in an exceedance of the water quality guideline for TSS and potentially for other sediment-associated water quality constituents in the LAA. The draft response stated that other sediment-associated water quality constituents, such as sediment-bound metals, may increase in concentration and may temporarily exceed relevant water quality guidelines near the LMOC and LSMOC outlets during the initial Project operation. However, the draft response provided limited information regarding the potential exceedance of sediment-associated water quality parameters.

The Proponent's final response to IAAC-14 does not indicate whether sediment-associated parameters could potentially exceed guidelines at channel outlets during commissioning. It is unclear whether concentrations of sediment-associated water quality constituents, including nutrients and metals, could exceed Canadian Council of Ministers of the Environment (CCME) Guidelines near LMOC and LSMOC during Project commissioning. It is not clear how sediment associated parameters compare to water quality guidelines for drinking water.

It is unclear whether the potential mobilization and transport of any residual nitrogen-based explosives from armouring materials has been considered. Given that the full length of both channels will be armoured with crushed rock, potential contributions from residual explosives should be discussed.

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Information Requests

a. Clarify whether concentrations of sediment-associated water quality constituents (such as nutrients and metals) could potentially exceed guidelines near the LMOC and LSMOC outlets during commissioning, and the potential source(s) of such exceedances.

b. Provide details on potential sediment-associated water quality constituents (such as nutrients and metals), including extent of impacts, frequency, duration, and parameter concentration estimates.

c. Discuss any potential contributions from residual nitrogen-based explosives on armour materials.

d. Provide an assessment of the potential effects to the health and socio-economic conditions of Indigenous peoples resulting from changes to surface water quality from sediments. As part of the assessment, compare anticipated sediment concentrations to relevant drinking water guideline thresholds. Include an assessment on potential effects to the use of water in relation to the Lake St. Martin First Nation surface water intake.

Response IAAC-R2-09

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IRs) provided on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response integrates a reply to questions raised in October 24, 2022, correspondence from Pinaymootang First Nation, Sagkeeng First Nation and Sandy Bay Ojibway First Nation regarding sediment transport modeling, rock armouring, TSS loads entering the channels, and effects to fish in terms of TSS exposure. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

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a. **Potential Exceedances of Sediment-associated Water Quality Constituents**

To manage flood waters during operations, the Lake Manitoba Outlet Channel (LMOC) and Lake St. Martin Outlet Channel (LSMOC) were initially designed with having armoured sections only in targeted areas with greater risk of erosion, with the majority of channel area primarily consisting of consolidated till. During ongoing design and investigations, a potential risk of softening or degradation of till that would be under water for prolonged periods of time was identified. The resulting reduction in shear strength increases the risk of erosion and introduction of sediments from the channel during future operations. Based on this risk, and concerns expressed during engagement feedback, a decision was made to armour the full length of both channels as a precautionary measure to prevent erosion and mitigate sediment mobilization.

Subsequent to the change in channel design, the sources and amounts of sediments left in the channels after construction have been estimated; these sediments are anticipated to mobilize during commissioning. Sediment modeling has been ongoing and the response to IR IAAC-R2-08 provides updated results for commissioning, including the sources and types of sediment and estimates of total suspended solids (TSS) concentrations and deposition in downstream areas. Updated sediment sources for LMOC and LSMOC during commissioning are provided in Table IAAC-R2-09-1. The main sources of sediment during commissioning are the fine dust on armouring rock and till/lake sediments disturbed during inlet and outlet excavation. For comparison, the May 31, 2022, response to IR IAAC-14, described annual sediment loads from the Fairford and Dauphin rivers based on flows from 2005 to 2017 as 74,447 and 43,318 tonnes, respectively, with the 2011 high of 160,069 tonnes in the Fairford River associated with the flood.

Table IAAC-R2-09-1 Sediment Sources in LMOC and LSMOC During Commissioning

Sediment Source	LMOC (tonnes)	LSMOC (tonnes)
Armour stone	7,360	4,496
Cofferdam removal	-	4,710
In-lake inlet excavation	2,700	1,350
In-lake outlet excavation	1,900	110
Riprap for hydraulic structures	125	1,561
Plug Removal	4,040	-
Revegetation zone (5 mm erodible layer)	*negligible*	*negligible*
Total	16,125	12,227

Rock material for armouring will be sourced from quarries. A Quarry Management Plan (QMP), as filed as part of the June 2022 supplemental information response to IAAC IRs, outlines criteria for site selection and development of quarries with the objective to avoid (to the extent possible) and mitigate potential adverse environmental effects associated with quarry development and aggregate production activities. The QMP provides the overall guidance for addressing this Project activity. Each specific quarry will require its own development plan and decommissioning plan. Prior to development of a quarry site, it shall be assessed for the potential of acid rock generation. Sites found to contain acid generating rock shall not be developed.

The armouring is crushed and screened limestone rock, which will be overlain on geotextile that will isolate the channel from the underlying till substrates. In addition to limestone rock, a small amount of granite rock will be used for riprap immediately downstream of the water control structures and at the bridges, drop structures, inlets and outlets. Granite will be used only for very large size riprap and such rock is required in much smaller quantities than limestone rock. Based on calculations, larger rocks result in lower percentages of dust relative to the weight of the rock because the overall surface area of larger riprap is much less than smaller riprap (or armouring) when taking the entire range of sizes of rock in the gradation into consideration. Granite is also a much harder rock than limestone and will not produce as much dust as limestone during crushing operations. As the majority of armouring and riprap rock and rock dust will be limestone, the discussion on water quality effects provided below focuses on limestone rock.

It is anticipated that limestone rock material used to line the channels and provide permanent erosion protection will be relatively clean (i.e., free of soil/sediment) but will have small amounts of rock dust on the surface. This rock dust would be mobilized when water is introduced into the channel during initial commissioning, but it is important to note that this would only be a one-time release. Laboratory testing was conducted on representative samples of the proposed armouring rock to quantify the amount of sediment that might be mobilized during commissioning. The testing revealed that the quantity of fines in the processed limestone armouring rock range from 0.18% to 0.68% by weight of the rock. The potentially available sediment from armouring rock during commissioning are based on the most conservative condition (i.e., the 0.68% value). The quantity of rock dust on the larger riprap sizes will be less than the armouring rock due to the relatively smaller total surface area. Taking into account the reduced surface area of the riprap, a value of 0.18% has been used to estimate the potentially available sediment from the riprap during commissioning.

Limestone is a sedimentary rock comprised primarily of calcium carbonate with other minor constituents like clay, iron, feldspar, pyrite and quartz, all of which are essentially inert. Higher magnesium quantities have also been found in limestone in the Project local assessment area (LAA) (referred to as dolomite). Concentrations of constituents in groundwater are generally a good indicator of the potential constituents in the rock dust on the armouring rock. Considering that limestone dust is relatively inert, it is not anticipated that sediment from armouring rock or riprap will measurably affect water quality (including pH), with the exception of temporarily increased TSS concentrations, which are discussed in the response to IR IAAC-R2-08.

b. **Sediment-associated Water Quality Impacts**

Sediments originating from the lakes during construction will reflect the baseline sediment chemistry at the inlets and outlets. Baseline sediment chemistry data collected in 2020 and 2021 was presented in the May 31, 2022, response to IR IAAC-12. Analyzed sediment parameters with Manitoba and CCME sediment quality guidelines were below protection of aquatic life guidelines at all sites sampled, including arsenic, cadmium, chromium, copper, lead, mercury, and zinc. As the sediments present in the lakes reflect baseline conditions, sediment mobilized from lake sources during commissioning will not be expected to measurably affect water or sediment chemistry in downstream of the channels, with the exception of temporarily increased TSS concentrations, which are discussed in the response to IR IAAC-R2-08. Information on potential sediment-associated water quality constituents was provided in the response to Part a). Sediment mobilized during commissioning is not anticipated to affect water or sediment chemistry measurably downstream of the channels, with the exception of temporarily increased TSS concentrations. Details on the TSS concentrations during commissioning can be found in the response to IR IAAC-R2-08.

The initial response to IR IAAC-14 included an assessment conclusion that the Project commissioning could result in sediment-associated water quality constituents that could exceed water quality guidelines in downstream of the channels in Birch Bay and Sturgeon Bay. This conclusion was made based on the assumed till layer that would mobilize during commissioning. However, this conclusion of potential exceedances of water quality guidelines was revised after the decision to armour the channels was made and the sediment sources were updated, reflecting relatively inert armour stone dust and existing lake sediments.

c. **Potential Contributions from Residual Nitrogen-based Explosives on Armour Materials**

As discussed in the response to IR IAAC-R2-33, armouring rock will be sourced from quarries in Manitoba, which are regulated under the *Mines and Minerals Act* Quarry Minerals Regulation. This regulation specifies wastewater drainage restrictions and groundwater protection requirements.

The use of explosives is the main source of nitrogen emissions in the mining sector (Revey 1996). Based on literature review, nitrogen blast residues in quarries have not been the focus for many published studies. Nitrogen in drainage from a natural granitic stone quarry was found to be relatively low in a case study by Karlsson and Kauppila (2016). The majority of nitrogen originated from pit dewatering water in the case study, and this indicates that nitrogen residues of armouring rock remain largely in the source quarry. Armouring of streambanks in natural freshwater systems is generally considered to have a positive effect on water quality by reducing suspended sediment concentrations (e.g., Kaushal et al. 2008 and Sargeant et al. 2004). Based on this information sourced from literature, it is not anticipated that the armouring or rip-rap rock will be a substantial source of nitrogen species.

d. **Assessment of Potential Effects to Health and Socio-economic Conditions of Indigenous Peoples**

The sediment concentrations anticipated during Project commissioning downstream of the LMOC and LSMOC are discussed in the response to IR IAAC-R2-08. In addition, as described in the response to IR IAAC-R2-08 and in the response to IR IAAC-14, as filed on May 31, 2022, measures are in place to manage TSS concentrations during commissioning.

Lake St. Martin First Nation has a surface water intake at Lake St. Martin Narrows, approximately 30 kilometres (km) from the LMOC outlet. The intake was installed in 2014. Based on as-built drawings, the intake will stay under water during the range of Project operation and is also underwater when lake levels are low. The intake has an ultrafiltration membrane, which filters out suspended sediments, and a nanofiltration membrane, which filters out organics such as nutrients and pathogens. There is also a secondary treatment with chlorine before distribution. The system is appropriate for treating drinking water from a lake environment. This system is capable of treating increased sediment concentrations, but it is not anticipated that the Project commissioning or future operation will affect the Lake St. Martin First Nation surface water intake.

As noted above in Parts a to c, it is not anticipated that sediment from armouring rock or riprap will measurably affect water quality, with the exception of temporarily increased TSS concentrations in local downstream areas during commissioning, nor is it anticipated that the armouring or rip-rap rock will be a source of nitrogen species. Furthermore, as stated in the updated surface water quality analysis presented in the May 31, 2022, response to IR IAAC-14, overall, the residual effects of Project operation on surface water quality are not anticipated to pose a threat to the long-term persistence and viability of traditionally harvested fish or wildlife species in the regional assessment area and is not expected to result in or have any measurable adverse effects to vegetation communities in the LAA. Therefore, effects resulting from changes to surface water quality from sediments to the health and socio-economic conditions of Indigenous peoples are not expected. As stated in the Project EIS (Chapter 6), after mitigation there are no adverse effects predicted to overall surface water quality in the region and the composition and volume of water being transported from Lake Manitoba to Sturgeon Bay is not expected to be substantially altered by the Project construction or operation and the results presented in this IR response do not change those conclusions. Manitoba Transportation and Infrastructure acknowledges that Indigenous peoples may choose not to use water in Lake St. Martin or Sturgeon Bay for recreational or cultural purposes for a variety of aesthetic, personal, cultural, or spiritual reasons. Additional information about concerns related to Indigenous health and socio-economic conditions related to surface water quality, as well as proposed mitigation and monitoring programs can be found in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

Question IAAC-R2-09
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QUESTION IAAC-R2-13

EIS Guideline Reference: IAAC-133 Wetland Compensation Plan & Wetland Monitoring Plan

EIS Reference: 7.2.3 Changes to Riparian, Wetland and Terrestrial Environments

7.3.5 Species at Risk

7.4 Mitigation Measures

Context and Rationale:

The EIS Guidelines require that the EA consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project. Under CEAA 2012, mitigation measures include “measures to eliminate, reduce or control the adverse environmental effects of a designated Project, as well as restitution for damage to the environment through replacement, restoration, compensation or other means”.

Under Manitoba’s The Water Rights Act, Class III, Class IV, and Class V wetlands require compensation to offset and mitigate wetland effects. In the Wetland Monitoring Plan and the Wetland Compensation Plan, a summary of wetland classes and estimated area affected in the PDA are presented for both LMOC and LSMOC. The total area of wetlands requiring compensation intersected by LMOC is 237.1 ha, by PR 239 is 1.8 ha and by LSMOC is 0.1 ha. Based on the summary it appears that the Project will require a total of 239 ha of wetland compensation.

The Wetland Compensation Plan discusses potential locations for anticipated compensation of the 239 ha of wetland potentially affected by the Project. In the response to IAAC-133, it is stated, “Manitoba Transportation and Infrastructure has begun to identify potential wetland enhancement, restoration, and protection Projects, including areas of local and regional crown lands. Manitoba Transportation and Infrastructure anticipates funds will be provided to a provincially approved wetland service provider, such as Manitoba Habitat Heritage Corporation, for some or all Project required wetland compensation. Information on the spatial, temporal or plan participation is currently unknown; however, information will be shared when available.”

Due to the lack of clarity regarding the spatial and temporal plans for wetland compensation, there is uncertainty with respect to the effectiveness of wetland compensation to mitigate Project effects due to the loss of wetlands. Furthermore, it is not clear how wetland compensation for the purposes of mitigating Project effects will be managed to meet the spatial and temporal requirements and the inclusion of affected Indigenous groups if compensation is managed by a third-party service provider such as the Manitoba Habitat Heritage Corporation. Given the range of effects due to the direct loss of wetland habitat, an understanding of the general locations of compensation of wetland habitat is needed. It is unclear how compensation areas potentially identified on the provincial level (i.e., in other areas of the province that communities in the LAA may not access) may mitigate project effects in the LAA.

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Additional details surrounding wetland compensation is required to understand how the effects of the loss or alteration of wetlands.

Information Requests:

a. Describe the process that will determine wetland compensation locations. Describe how the process will take into consideration project-specific effects and the criteria or methodology for determining locations suitable for mitigating the loss of wetlands and related effects (e.g., to the current use of lands and resources for traditional purposes; migratory birds; Species at Risk).

b. Describe mitigation measures, follow-up program components and monitoring that would be required for Project effects due to direct loss and alteration of wetlands. For potential effects to the current use of lands and resources for traditional purposes, include a discussion on preference and experience with respect to the locations.

c. Provide additional details on how Indigenous groups and traditional knowledge will be included in wetland compensation planning (including the selection of locations as described in part a.), development, and monitoring.

Response IAAC-R2-13:

Glossary of Terms:

This glossary section is provided to facilitate a better understanding of pertinent terms used in the current information response that describes the Wetland Offsetting Program. The definitions are also the terms used elsewhere in the environmental assessment documentation for the Project (e.g., the Wetland Compensation Plan and Wetland Monitoring Plan). The terms also align with legislations and guidance documentation, such as The Water Rights Act (WRA), and the associated Stewart and Kantrud Wetland Classification System.

Groundwater: Water that occurs beneath the land surface and fills the pore spaces of soil or rock below saturated zone.

Peatland: Refers to:

(a) a bog, fen, or swamp, and

(b) has waterlogged conditions that prevent plant material from fully decomposing, resulting in the production of organic matter exceeding its decomposition resulting in a net accumulation of peat.

Stewart and Kantrud Wetland Classification System: A wetland classification system that identifies 7 classes of prairie wetlands (Manitoba Sustainable Development, 2020). The class is determined by the length of time that the wetland holds surface water in a year of average moisture conditions and the associated vegetation and soils.

- **Class I**: short-lived wetlands (retains water for one week or less), mainly existing in spring after winter snow melts or large rain events, typically supporting vegetation such as Kentucky bluegrass, goldenrod, forbs.
- **Class II**: short-lived wetlands (retains water for one week to one month), mainly existing in spring after winter snow melts or large rain events, typically supporting vegetation such as fine stemmed grasses, sedges, and forbs.
- **Class III**: seasonal wetlands (retains water for one month to three months), often dry by mid-June, but may hold water for the entire year, often lasting fewer than five months; typically supporting shallow marsh vegetation such as emergent wetland grasses, sedges, and rushes on gleysolic soils.
- **Class IV**: semi-permanent wetlands (retains water for more than three months), holds some water year-round under wetter conditions, but goes dry in below average years, often lasting more than five months; typically supporting marsh vegetation and submerged aquatic vegetation such as cattails, bulrushes, and pond weeds in the central area of the wetland as on gleysolic soils.
- **Class V**: permanent wetlands (retains water year-round) in average years with permanent open water in the central areas but may go dry in years with well below average moisture conditions; typically having a central area that is open water free of vegetation surrounded be a zone of submerged aquatic vegetation such as cattails, bulrushes, and pond weeds on gleysolic soils.
- **Class VI**: alkali (deep water is semi-permanent), retaining a pH of 7 and high saline content. Dominant vegetation cover includes red swampfire and spiral ditchgrass due to the species saline tolerance. Inhabits shore birds.
- **Class VII**: fen (dominant vegetation within the deepest area of the wetland), dominant vegetation cover on the perimeter, that includes wet meadow and low prairie species. Soils retain saline content due to alkaline groundwater seepage. Inhabits floating mats of emergent vegetation, such as sedges and grasses.

Surface water: Water that is on the Earth's surface, such as in a stream, river, lake, or reservoir.

*Watershed***:** Inland area where runoff from precipitation is guided into creeks, streams, and rivers; in the end, outflowing into reservoirs, bays, and lakes (National Oceanic and Atmospheric Administration). For the purpose of the project, the watershed discussed in the response refers to the Lake Manitoba Watershed.

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Wetland: Refers to:

(a) a marsh, bog, fen, swamp, or ponded shallow water, and

(b) low areas of wet or water-logged soils that are periodically inundated by standing water and that may support aquatic vegetation and biological activities adapted to the wet environment in normal conditions.

Wetland Enhancement: Undertaking actions to increase a particular wetland function and/or value or multiple wetland functions and/or values (Cox & Grose, 1997). This typically involves improvements to existing wetlands, but for this Project may also include creation of a new wetland where one did not previously exist.

Wetland Offset Lead: An organization responsible for performing wetland restoration or enhancement projects under The Water Rights Act.

Wetland Preservation: The protection of wetlands by removing a threat to or preventing the decline of wetland functions through the implementation of legal and/or physical mechanisms.

Wetland Specialist: An individual or group who assesses the health of wetlands and determines, through field investigations, how anthropogenic and natural activities may influence the function of a wetland.

Wetland Restoration: The practice of restoring water levels and/or the function of a wetland that has been altered, degraded, impaired, or lost.

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Request (IR) regarding IAAC-R2-13, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups.

This response integrates a reply to questions raised in October 24, 2022 correspondence from Pinaymootang First Nation, Sagkeeng First Nation and Sandy Bay Ojibway First Nation regarding a qualitative and quantitative description of the functionality of the wetlands that will be lost, including implications for wetland dependent SAR and for Indigenous rights holders, consideration of Indigenous values and use for rights-based activities in the identification and selection of appropriate wetlands deserving compensation and in the determination of compensation calculations and rationale why vegetation wetland characterization or evaluation activities are not proposed to occur as part of the monitoring and follow up program.

This response also integrates a reply to questions raised in September 30, October 17 and October 31, 2022, submissions from the Interlake Reserves Tribal Council Inc. (IRTC). The IRTC asks a variety of questions, such as the effects of water level changes in Lake St. Martin to wetlands, the need to quantify effects even if wetland types do not qualify for compensation, consideration of Indigenous values and use

for rights-based activities in the identification and selection of appropriate wetlands deserving compensation, and in the determination of compensation calculations. They also ask for wetland monitoring details and implications for wetland dependent SAR and for Indigenous rights holders.

This response integrates a reply to questions raised by Fisher River Cree Nation in a February 27, 2023, submission regarding the wetland area calculations, benefits to impacted communities and their involvement in wetland enhancement and replacement projects.

Overview/Supporting Information

This response summarizes the Wetland Offsetting Program for wetlands that are affected by the Lake Manitoba and Lake St. Martin Outlet Channels Project (the Project, see Figure IAAC-R2-13-1). The Project is exempt under The Water Rights Act from offsetting (enhancement, restoration or preservation; also known as wetland compensation) for the loss or alteration of any wetlands. Regardless, for this Project, Manitoba Transportation and Infrastructure is voluntarily providing offsetting in alignment with the intent of the Act by offsetting for the loss or alteration of directly affected Class III wetlands (the only class listed under the Act; see Wetland Compensation Plan, or WCP). Additionally, the WCP goes beyond prescribed wetlands by incorporating compensation for Classes IV and V in addition to Class III wetlands. The WCP identifies 239 ha of Class III, IV, and V wetland habitat that will receive offsetting in a manner consistent with The Water Rights Act.

The Water Rights Act characterizes Class I and II wetlands according to the Stewart and Kantrud Wetland Classification System described in the Glossary of Terms. The Stewart and Kantrud Classification System defines Class I wetlands as short-lived wetlands (retains water for one week or less), mainly existing in spring after winter snow melts or large rain events, typically supporting vegetation such as Kentucky bluegrass, goldenrod, forbs. In addition, the classification system defines Class II wetlands as short-lived wetlands (retains water for one week to one month), mainly existing in spring after winter snow melts or large rain events, typically supporting vegetation such as fine stemmed grasses, sedges, and forbs (Stewart & Kantrud, 1971).

The potential options for mitigation measures or offsetting for Class I and II wetlands are neither feasible nor expected to be effective, largely due the short-term surface water retention times for these wetland classes, i.e., approximately 1 week and 1 month, respectively. As these classes of wetlands primarily exist during the spring season due to snow melt and large rain events, it is unlikely that they would provide suitable breeding habitat for wetland dependant migratory birds and/or Species at Risk. According to the Species at Risk Registry, wetland dependant Species at Risk, including, but not limited to Yellow Rail, migrate to Manitoba in late June. Class I and II wetlands are typically dried up by late May to mid-June within southwestern Manitoba (Stewart & Kantrud, 1971). Thus, Class I and II wetlands are not preferred breeding habitat and are unlikely to be used by wetland dependant migratory birds and Species at Risk in the Project region, where considerable preferred habitat exists (WSP, 2023b). As such, mitigation or offsetting of potential effects to these ephemeral Class I and II wetland habitats are not being provided.

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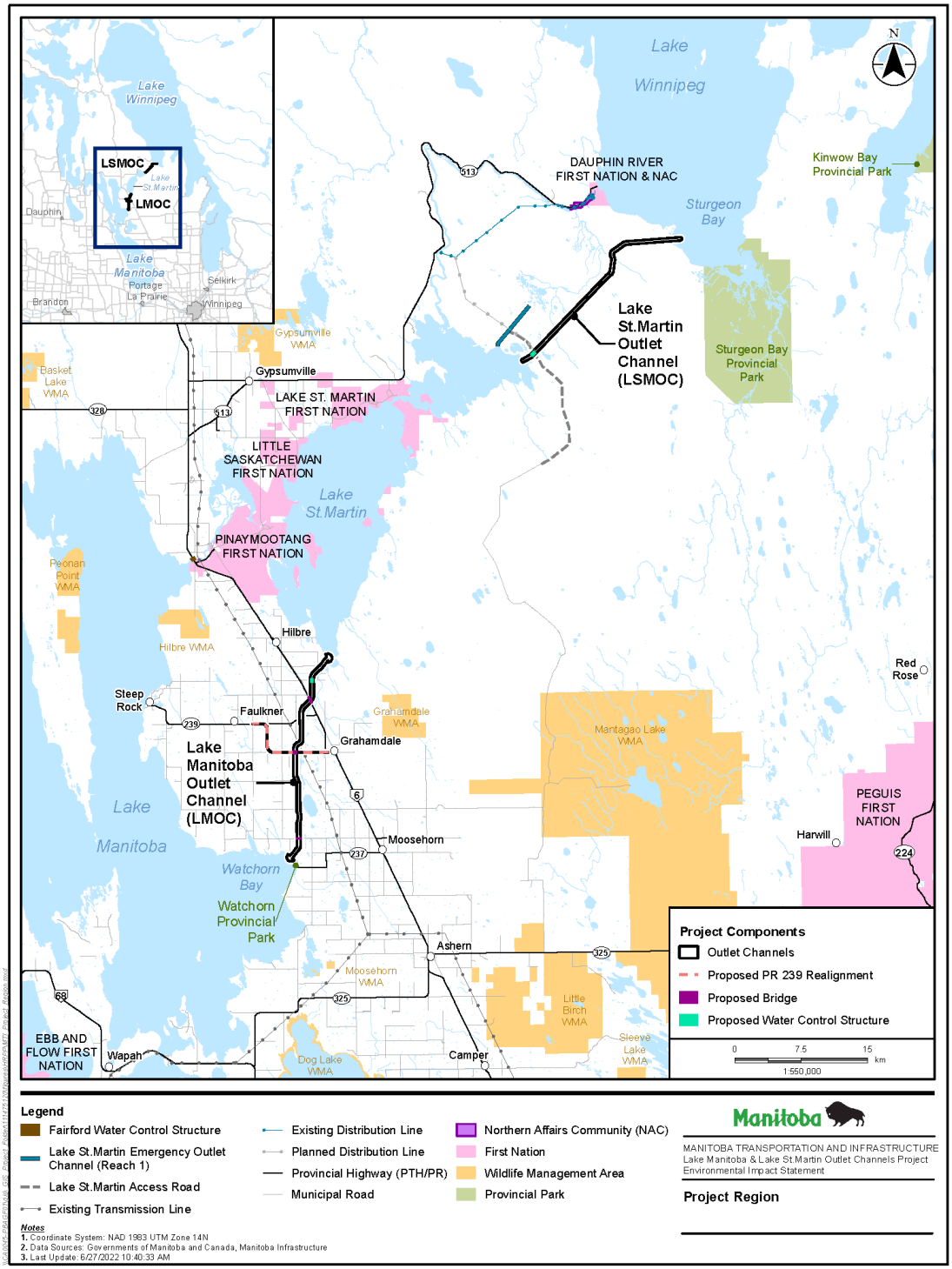
Figure IAAC-R2-13-1 Lake Manitoba and Lake St. Martin Outlet Channels Project Development Area



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Peatlands are a predominant wetland type (bogs, fens and swamps) in the Project region that are not regulated under The Water Rights Act. The Peatland Stewardship Act does regulate peatlands for resource users such as peat harvesters. While neither Act require Manitoba Transportation and Infrastructure to provide any form of offsetting for wetlands, Manitoba Transportation and Infrastructure has recently decided to provide peatland offsetting for wetlands that would be affected by the Project. Manitoba Transportation and Infrastructure recognizes the ecological and environmental significance of peatlands and is providing this additional offsetting in recognition of concerns expressed by Indigenous groups and the request of the Federal government to provide sufficient functional offsetting for wetlands that will not receive an effective level of mitigation otherwise. Considerable discussions and planning with Manitoba Natural Resources and Northern Development and others has led to the determination that any offsetting for peatlands would most appropriately be done in a manner consistent with the Boreal Wetlands Conservation Codes of Practice (BWCCP). This is the most appropriate guidance as Manitoba Transportation and Infrastructure is exempt from providing peatland offsetting and it is not a resource developer for this flood mitigation project. Manitoba Transportation and Infrastructure has calculated that 769 ha of peatland habitat is directly affected by the Project Development Areas (PDA).

The Wetland Offsetting Program therefore comprises most wetland sites that are directly affected by the Project in a way that cannot be fully mitigated (i.e., 1,008 ha (239 ha for Class III, IV, V plus 769 ha for peatlands). Results arising from the Wetland Monitoring Plan will be evaluating functional changes to adjacent waterbodies and to determine if there are appropriate mitigation options to address Project-related effects such as drawdown and whether additional offsetting may be required.

This information response outlines the process for delivering wetland offsetting (also referred to in the question as compensation; see Part A). Part B describes mitigation measures and monitoring that will be used to address Project-related effects on wetlands. Part C describes how Indigenous groups and associated Traditional Knowledge will be included in planning, development and monitoring of the Wetland Offsetting Program.

a. **Process for Selection of Wetland Offsetting Sites**

Background

The Wetland Offsetting Program includes measures taken to enhance, restore or preserve those wetlands that cannot be effectively mitigated otherwise and are either: a) defined under The Water Rights Act as Class III; b) defined under the WCP as Class IV and V, or; c) peatlands that are affected by the Project.

Manitoba Transportation and Infrastructure continues to follow pertinent legislation implemented federally and provincially over the last few decades for the management of wetlands in Manitoba. In 2017, the Province of Manitoba implemented the Made-in-Manitoba Climate and Green Plan. The plan identifies wetlands and watersheds as a keystone ecosystem, emphasizing the importance of protecting wetlands and watersheds to preserve habitat, wildlife, natural drainage features, and

traditional land use (Manitoba Sustainable Development, 2017). Protection of wetland areas is critical, as climate change-related natural disasters are continually escalating.

The Province of Manitoba released their Water Management Strategy in November 2022. The strategy recognizes the importance of wetlands while considering their losses throughout Manitoba due to anthropogenic development (Manitoba Environment, Climate and Parks, 2022). One strategy to help deal with water management is to incorporate wetland restoration into the planning of new water related infrastructure, as Manitoba Transportation and Infrastructure is doing with this Project.

Manitoba Transportation and Infrastructure recognizes that wetlands are integral components of watersheds, providing numerous benefits including, but not limited to localized water retention, increasing local biodiversity, as well as improving surface and groundwater quality.

In the early 1990s, Manitoba Transportation and Infrastructure adopted an informal policy of no-net-loss of critical prairie wetland habitat function. In 1998, Manitoba Transportation and Infrastructure received approval to develop an expanded program of natural habitat mitigation to offset construction related effects to prairie wetland areas, as well as to assist in achieving the no-net-loss goal of wetland benefits for prescribed wetland classes (Class III), as indicated under The Water Rights Act. The Act establishes a requirement for a provincial licence to control water or construct and operate water control works. The Act and regulations also establish a licensing requirement for compensation or offsetting to mitigate loss and/or alteration of Class III wetlands. Since 2021, Manitoba Transportation and Infrastructure's program of wetland offsetting has extended well beyond the original prairie habitats in southwestern Manitoba, e.g., the Interlake and Whiteshell regions of Manitoba.

Manitoba Transportation and Infrastructure is exempt from licensing under The Water Rights Act for the Project*;* however, this is the first provincial major infrastructure project where wetland offsetting included Class IV and V, and other wetlands (peatlands comprised of bogs, fens and swamps). The Project will directly affect 239 ha of Class III, IV, and V wetlands (see Wetland Compensation Plan), in addition to approximately 769 ha of peatlands. Peatlands (a type of wetland) are regulated in Manitoba as a harvestable natural resource under The Peatland Stewardship Act, which includes a requirement for a proponent to reclaim peatlands after harvest. Peatlands are not prescribed for compensation or offsetting, nor are they regulated under The Water Rights Act. Offsetting of affected peatlands is being advanced as an accommodation measure to minimize the chance that loss or alteration of peatlands will impact the exercise of Aboriginal and Treaty Rights. Offsetting for peatlands is a recent addition to the Project's Environmental Management Program to address the recommendations put forth by Fisher River Cree Nation and the Interlake Reserves Tribal Council. The operational details of peatland offsets, including site and delivery agent, are still in development and will be filed once complete. The remainder of this Information Request deals with mineral wetlands (Class III, IV and V) as outlined in the Wetland Compensation Plan.

While being exempt from any requirement for offsetting, Manitoba Transportation and Infrastructure is providing wetland offsetting in a manner that adheres to intent of The Water Rights Act for Class III,

the Wetland Compensation Plan for classes IV and V wetlands, as well and for peatlands in a manner consistent with the Boreal Wetlands Conservation Codes of Practice. Wetland offsetting for the Project also considers the Environmental Impact Statement (EIS) and recommendations proposed by Indigenous groups and Federal regulators.

The Wetland Offsetting Program will facilitate the enhancement, restoration or preservation of wetlands with consideration of wetlands affected by the Project. The program will include the following key characteristics:

- Achieve a no-net-loss of wetland benefits for prescribed wetland classes (Class III), as indicated under The Water Rights Act. Manitoba Transportation and Infrastructure is upholding the intent of The Water Rights Act, even though the department is not required to seek approval for works related to water rights, diverting water or diversion under this project. In line with The Water Rights Act, Manitoba Transportation and Infrastructure is providing offsetting for Class IV and V wetlands as defined under the WCP.
- Achieve no-net-loss of other wetland types (peatlands) that are affected by the Project, in line with the Boreal Wetlands Conservation Codes of Practice.
- Provide consistency, as well as clarity in relation to Manitoba Transportation and Infrastructure's Environmental Management Program, specifically for the Wetland Compensation and Wetland Monitoring Plans.
- Address the Project-related concerns and recommendations regarding the loss or alternation of wetlands.
- Wetland-related feedback provided by Indigenous groups, other stakeholders, and the Federal government.
- Utilize the Project's plans towards effectively avoiding or managing wetland-related effects where possible; otherwise, implement the Wetland Offsetting Program, and thereby further mitigate against anticipated loss and alteration of wetlands within and potentially near the PDA.
- Mitigation measures will be applied wherever practicable during the design, construction, and operation of the Project. The overall guiding wetland-related mitigation measures that will be followed during Project development are as follows:
    - Proposed avoidance/minimizing measures such as:
        - The movement of non-native invasive species.
        - The removal of riparian vegetation to help maintain the stability of waterbody banks in wetland areas peripheral to waterbodies (Class V).
    - Proposed monitoring measures such as:
        - Monitor wetland form and function, including specific environmental parameters associated with surface and groundwater, vegetation, wildlife habitat, wetland dependant Species at Risk (SAR) and resources with Indigenous cultural significance.

Key Guidelines to the Wetland Offsetting Program

To achieve the goal of no-net-loss, there are several key guidelines for the Project's Wetland Offsetting Program that will be followed, such as:

- Offsetting will include measures of restoration, enhancement or preservation of wetlands defined under The Water Rights Act, of which are directly affected by the Project.
    - The objective is that offsetting will be prioritized based on wetland function/functional area, type of wetland, geographic context, and time frame.
    - The preferred method of offsetting for wetland functions is restoration or enhancement of other degraded wetland habitats rather than financial offsetting.
- The order of priority for mitigation measures is: 1) on-site; 2) as close to the site as possible; 3) within the same watershed, and; 4) in upstream watersheds. Site selection will consider input from the Environmental Advisory Committee (EAC). Per IAAC-R2-30, it is anticipated that the primary output from the EAC will be written advice and/or recommendations to Manitoba Transportation and Infrastructure with respect to the EMP and environmental aspects of the Project more generally, including prioritization of sites for wetland offsetting.
- Functional losses will be restored to the same prior wetland type; if this is not practicable, adequate reasoning will be provided for a different replacement wetland type (e.g., similar functions, similar water retention, etc.).
- An iterative approach, informed by wetland ecological evaluation, will be taken to help guide understanding of what is required to improve the reliability and performance of offsetting measures (e.g., ecological function objectives).
    - Adaptive approaches will be designed to respond to unanticipated monitoring results and to therefore minimize uncertainty with respect to offsetting outcomes.
    - Restored ecological function decisions will be informed by Traditional Knowledge information and studies in the Project area, as well as the best science literature available.
- The Wetland Offsetting Program will be transparent and made accessible to the public as additional details become available. Indigenous groups will be involved in the Wetland Offsetting Program through avenues such as the Environment Advisory Committee and the ongoing consultation and engagement process.
- Manitoba Transportation and Infrastructure will demonstrate the efficiency and effectiveness of offsetting measures in terms of restoring wetland functions, via reports that will be directly shared with the Potentially Most Affected Indigenous groups and the public on Manitoba Transportation and Infrastructure's Project website.
- Offsetting requires monitoring that will be transparent and accessible to the public.

For wetlands that are receiving offsetting in a manner consistent with The Water Rights Act, the ratio of offsetting will depend on whether the Class III, IV, or V wetland directly affected by the Project is being restored, enlarged, enhanced or receiving permanent protection (see WCP Table 3):

- Restore or enlarge an existing wetland – offset at a ratio of 2:1.
- Enhance or permanent legal protection – 3:1.

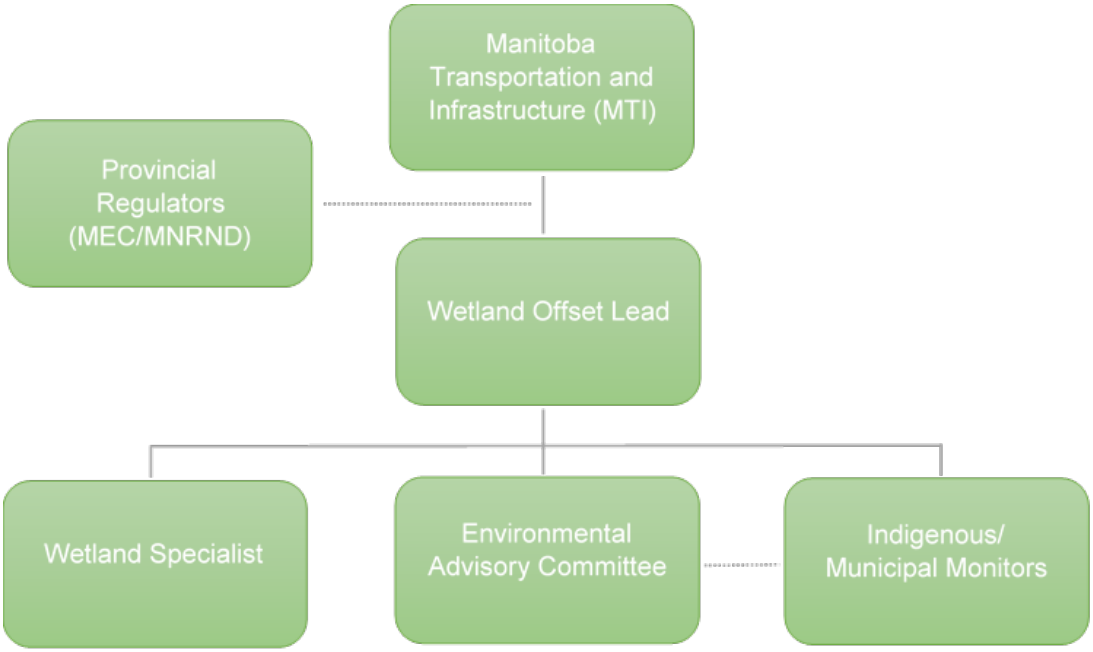
Peatland offsetting will be applied at a 3:1 ratio in a manner defined by Manitoba Natural Resources and Northern Development (MNRND).

Wetland Offsetting Program Organizational Structure and Description of Key Roles

For the Wetland Offsetting Program to operate as intended, an organizational structure defining the key roles and responsibilities will be followed.

Manitoba Transportation and Infrastructure is the Project proponent that is responsible for defining and implementing the Wetland Offsetting Program and wetland-related guidance documentation to help achieve a no-net-loss of wetland functions and values for prescribed wetland classes (Class III) as indicated under the Act, as well as providing offsetting measures for Class IV and V, and other wetlands (peatlands). The overall Wetland Offsetting Program organizational structure outlines the communication between Manitoba Transportation and Infrastructure, Provincial Regulators, Wetland Offset Lead, Wetland Specialist, Environmental Advisory Committee and the Indigenous/Municipal Environmental Monitor(s) and is illustrated in Figure IAAC-R2-13-2.

Figure IAAC-R2-13-2 Organizational Structure of the Wetland Offsetting Program



The Wetland Offsetting Program requires the following roles and respective responsibilities to achieve the desired outcome of the program and its implementation:

- **Wetland Offset Lead (WOL):** An organization designated under The Water Rights Act, with an extensive history of conducting wetland offsetting, who will ultimately:
  - Use funds and other support from Manitoba Transportation and Infrastructure to conduct wetland offsetting through means of restoration, enhancement and/or preservation of wetlands.
  - Manage the allocated budget for wetland offsetting.
  - Lead the tasks associated with the groups outlined in Figure IAAC-R2-13-2, including overseeing meetings and/or workshops that take place during the Wetland Offsetting Program.
  - Create a wetland offsetting work plan and manage its implementation.
  - Establish and conduct monitoring protocols for the newly offset wetlands.
- **Provincial Regulators**: Manitoba Environment and Climate (MEC) are responsible for regulating The Water Rights Act and the ongoing management of wetlands that received offsetting in the province. MNRND are responsible for regulating The Peatland Stewardship Act and the implementation of peat-related restoration associated with developments by resource users such as peat harvesters. These regulators will be provided an opportunity for involvement in this process.

- **Wetland Specialist:** Individual(s) or organization(s) with extensive knowledge in conducting wetland functional assessments, analyzing wetland effects and providing recommendations for mitigation and restoration, who will ultimately:
  - Assess sites for wetland offsetting suitability.
  - Assist in selecting candidate sites for wetland offsetting.
  - Participate in all wetland offsetting workshops.
- **Environmental Advisory Committee (EAC):** A committee with representatives from Indigenous groups, the Rural Municipality of Grahamdale, and Manitoba Transportation and Infrastructure. The primary output from the EAC is anticipated to be written advice and/or recommendations to Manitoba Transportation and Infrastructure with respect to wetland-related aspects of the Wetland Offsetting Program (e.g., wetland sites evaluated for their potential development of an offset). The Terms of Reference (ToR) contemplate a process by which the EAC would provide written advice to Manitoba Transportation and Infrastructure directly on a range of topics. These EAC-related advisory key topics are expected to include wetland offsetting, mitigation and monitoring plans. For example, the EAC may help identify sites for wetland offsetting or have specific recommendations pertaining to the wetland offsetting planning and implementation. The involvement of provincial regulators in this process would further provide an avenue for the EAC to share advice or findings directly with the relevant regulatory authority (see Figure IAAC-R2-13-2). For more information, refer to IAAC-R2-30 for the outlined EAC process, timeline, and Indigenous involvement.
- **Indigenous and Municipal Environmental Monitor(s):** Members and/or representatives of Indigenous groups and the Rural Municipality of Grahamdale who will be managed by the EAC and be tasked by the WOL with monitoring activities for adherence with the Project Environmental Impact Statement, including wetland offsetting. Specific tasks may include:
  - Monitoring whether the functional target of each wetland that has been offset is met.
  - Monitor adaptive management strategies to verify their effectiveness and report any signs of ineffectiveness.
  - Suggest mitigation and adaptive management strategies that the Wetland Offset Lead may integrate into the overall Wetland Offsetting Program.

Wetland Offsetting Program

The Wetland Offsetting Program may be described in the steps that are outlined below:

1. Identify an organization to lead the Wetland Offsetting Program.
   a. At present, the organization listed as the approved Wetland Offset Lead under The Water Rights Act would lead the Wetland Offsetting Program, however:
      i. The WOL selection will be a decision that will occur once the regulatory, Indigenous, and public engagement process is finalized, and following feedback received through the

EAC and/or other forms of engagement processes for the Project. As such, the WOL may be the organization listed under The WRA or another acceptable organization.

b. The WOL will coordinate all aspects of the offsetting program, such as facilitating in developing and working with various associated groups.

   i. MNRND is expected to play a key role in overseeing implementation of the peatland portion of the Wetland Offsetting Program. MNRND may, for example, explore options to preserve peatland sites from future resource harvesting.

2. The WOL will designate a Wetland Specialist/Organization experienced in selecting wetland offsetting sites. The wetland specialist will have a good understanding of monitoring methods and experience conducting sampling, as well as mitigation measures pertaining to wetlands and wetland function.
3. Hold meetings and workshops where the process may be discussed at community meetings in a manner advised by the EAC, e.g., these meetings may include elders, traditional knowledge holders, and other wetland related resource user.
4. Provide a work plan with candidate sites and respective mitigation and monitoring plans.
5. Collaborate with Indigenous and Municipal Environmental Monitor(s), who may partake in the process, through monitoring the Wetland Offsetting Program and make suggestions for mitigation and adaptive management strategies.
6. Implement the plan, which may require out-sourcing some of the work if offsetting involves wetland enhancement and restoration actions (including developing a new wetland).

A timeline discussing the Wetland Offsetting Program, is laid out step-by-step in Figure IAAC-R2-13-3 followed by a detailed description of the process.

Detailed Wetland Offsetting Program Steps

Step 1. Selection of a Wetland Offset Lead:

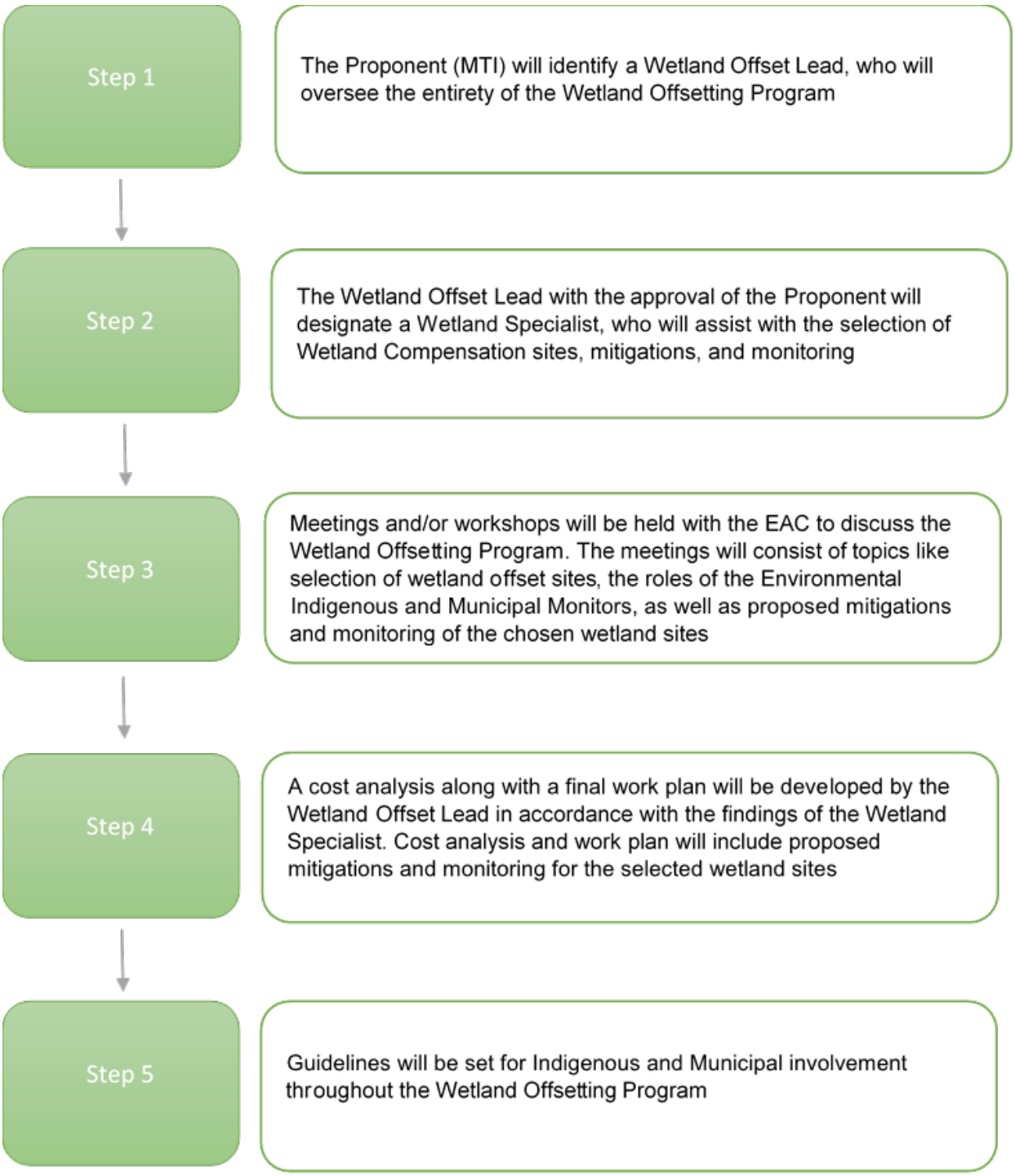
The first step in the Wetland Offsetting Program is for Manitoba Transportation and Infrastructure to identify a Wetland Offset Lead, who will oversee the process. To do this, Manitoba Transportation and Infrastructure will meet with the organization(s) that have history of experience restoring, enhancing, and preserving wetlands in Manitoba. The Wetland Offset Lead will be responsible to restore, enhance, and preserve wetlands and will otherwise require sufficient justification if not designated to perform wetland offsetting practices under The Water Rights Act. Currently, The Manitoba Habitat and Heritage Corporation (MHHC) is the only service provider designated under The Water Rights Act for wetland offsetting. Manitoba Transportation and Infrastructure will be assisted by the EAC during the selection process of the Wetland Offset Lead, who will provide input to help determine the most suitable candidate wetland offsetting sites for this Project.

It is intended that the Wetland Offset Lead will be responsible for delivering several tasks related to the Wetland Offsetting Program for the Project. As the Wetland Offset Lead will be overseeing the

process and the implementation, they will oversee several key responsibilities including, but not limited to the following:

- Managing administrational duties while staying within the allocated budget of the Project (e.g., allocated Project funds).
- Ensuring the overall Wetland Offsetting Program is being followed in a consistent and effective manner as outlined in the Wetland Compensation Plan, under The Water Rights Act, and the Boreal Wetlands Conservation Codes of Practice.
- Coordinating engagement workshops under Manitoba Transportation and Infrastructure's direction with the WOL, Manitoba Transportation and Infrastructure, the Wetland Specialist, affected/interested Indigenous groups, as well as the RM of Grahamdale.

Figure IAAC-R2-13-3 Step-by-Step Plan of the Wetland Offsetting Program



Once the candidates have been thoroughly reviewed regarding their competency and ability to take on the required role, a Wetland Offset Lead will be selected.

Step 2. Designation of a Wetland Specialist:

The second step of the Wetland Offsetting Program is for the Wetland Offset Lead to designate a Wetland Specialist to assist with the program and implementation. The Wetland Specialist will have several key responsibilities that will help with the selection of wetlands that are suitable for offsetting. The Wetland Specialist will first need to conduct studies of wetlands that have been previously identified as Class III, under The Water Rights Act, and Class IV and V identified under the WCP, as well as other wetlands (e.g., peatlands) to confirm whether any additional site-specific information is required prior to the selection of potential candidate sites. Once completed, the Wetland Specialist will attend meetings and workshops for the selection of wetland offsetting sites (further details are outlined below).

With the selection of all candidate sites for offsetting, the Wetland Specialist will then assist in the determination of offsetting wetlands based on criteria developed in workshops 1 and 2 outlined in Step 3 between Manitoba Transportation and Infrastructure, EAC, the WOL and Wetland Specialist. One criterion that the Wetland Specialist will consider the functional purpose or target for a particular wetland site (e.g., traditional land use, biodiversity, and/or Species at Risk) – with consideration of the Project-related loss or alteration of wetlands. The Wetland Specialist will evaluate ecologically sound options for wetland enhancement, restoration or preservation through the candidate site selection process. For instance, whether the site was originally part of a wetland system, and its proximity to other projects that may affect its viability (Alberta, 2007). As well as its proximity to another protected wetland site and whether the eco-site conditions (soil, surface water, and groundwater/surface water interchange) are conducive to wetland preservation, enhancement or restoration. To ensure project-specific effects are assessed, they will also examine candidate sites that are comparable to Class III, IV, V, and select sites for other wetland types (peatlands) that are directly affected by the Project.

Once the study has been completed by the Wetland Specialist, in terms of wetlands that have been affected by the Project and the most suitable wetland offsetting sites, the Wetland Specialist will go over the chosen sites with the key personnel involved including, but not limited to Indigenous groups, EAC and stakeholders.

Step 3. Coordination of Workshops and Meetings:

The third step of the Wetland Offsetting Program requires the Wetland Offset Lead to coordinate workshops and meetings between Manitoba Transportation and Infrastructure, the elected EAC members (consisting of Indigenous groups and the RM of Grahamdale) and Wetland Specialist. There will be ongoing liaison and meetings involving groups illustrated in IAAC-R2-13-2 throughout the planning and implementation phases of the Wetland Offsetting Program to ensure transparency of information regarding this process. As discussed, the workshops will facilitate the selection of sites for

wetland offsetting and sites will be chosen with the assistance of the Wetland Specialist, Manitoba Transportation and Infrastructure and the EAC.

It is anticipated there will be a minimum of 5 workshops that will occur throughout the course of the Wetland Offsetting Program. The workshops are intended to involve discussion of the Wetland Offsetting Program, wetland offsetting site selection, roles of the Indigenous and Municipal Environmental Monitor(s), and the monitoring and mitigation measures proposed for the chosen wetland offsetting sites. Workshops 1, 2 and 3 will include Manitoba Transportation and Infrastructure, the WOL, the EAC and the Wetland Specialist, whereas workshops 4 and 5 will consist of all groups except for the Wetland Specialist, as follows:

- **Workshop 1** - will be used to discuss each party's involvement in the overall Wetland Offsetting Program, where roles will be defined, as well as partnerships, and responsibilities of each group listed in Figure IAAC-R2-13-2.
- **Workshop 2** - will be used to develop a list of potential wetland offsetting sites, and reasoning for desired offsetting per site (i.e., traditional land use, SAR, etc.). These sites may include, but are not limited to areas of concern, previously identified through the consultation and engagement process and sites evaluated by Manitoba Transportation and Infrastructure and Environmental Service Providers (WSP and Stantec).
- **Workshop 3** - will be used to discuss what candidate sites have been chosen for wetland offsetting based on the Wetland Specialists evaluations using preliminary studies (mentioned in Step 2), the key guiding principles for offsetting (Key Guidelines to the Wetland Offsetting Program) and suggestions from the EAC during Workshop 2.
- **Workshop 4** - will involve engagement with Indigenous groups and the RM of Grahamdale to determine how they may act as an Environmental Indigenous and Municipal Monitor(s) associated with the Wetland Offsetting Program during monitoring activities.
- **Workshop 5** - will be used to discuss the proposed mitigation and monitoring plan per selected candidate sites.

Throughout the process, additional workshops may be required or desired. This will be further discussed between Manitoba Transportation and Infrastructure, WOL, Wetland Specialist, and the EAC.

Step 4. Wetland Offsetting Work Plan for Offsetting Sites:

The fourth step of the Wetland Offsetting Program follows Workshop 2, where the WOL will develop a finalized list of candidate sites and offsetting efforts that concur with the Projects overall budget, and the cost estimate defined under The Water Rights Act and the BWCCP. To develop a finalized list, the WOL will verify what restoration, enhancement, or preservation is required per wetland site, which may include collecting survey data (topographic, hydraulic, and geotechnical data), soils data, watershed data, landowner needs (Indigenous groups and the RM of Grahamdale), access to materials and existing infrastructure (e.g., roads and distribution power lines). Once the Wetland

Specialist has identified sites for offsetting, the WOL and Wetland Specialist will develop a work plan that includes monitoring and mitigations for the selected sites. As stated in Step 3, the EAC will be able to provide their input for chosen monitoring and mitigations that will be implemented, during Workshop 5.

Step 5. Setting Indigenous Involvement Guidelines:

The fifth and final step of the Wetland Offsetting Program is to provide the WOL with guidelines for Indigenous and Municipal involvement in the implementation process. These guidelines will state that Indigenous and Municipal involvement will be a minimum of 10% within the monitoring processes. These guidelines will be issued to all interested Indigenous groups and stakeholders.

b. **Mitigation and Monitoring of Wetlands**

The following section outlines the potential effects to wetlands defined within the Glossary of Terms that are directly lost or altered by the Project. Mitigation, follow-up and monitoring associated with project planning are described in proceeding sections.

Planning and Project Design Components

This section outlines the steps that were taken to define the Project in a manner that reduces overall effects on wetlands in the region.

Project Effects to Wetlands

Potential effects on wetlands were described in the EIS and can be found throughout Section 6.4 (Ground Water and Surface Water). Manitoba Transportation and Infrastructure has also developed an Environmental Management Program that is comprised of 23 draft Environmental Management and/or Monitoring Plans (EMPs) for the Lake Manitoba and Lake St. Martin Outlet Channels Project as part of the provincial and federal environmental assessment process. These draft plans were developed to assist with mitigation and monitoring aspects of various Project related effects that may be found within the EIS (see sections regarding mitigations and monitoring). Potential effects and concerns were outlined in the EIS and expanded through the consultation and engagement process; this includes information provided by Indigenous groups and stakeholders.

The anticipated project-related effects with potential indirect impacts on wetlands may include, but are not limited to:

- Alteration or loss of habitat for fish and fish foraging.
- Loss or alteration of 306.3 ha of native upland vegetation within the Local Assessment Area.
- Loss of plant Species of Conservation Concern within the Project Development Area.
- Reduction in area for carbon sequestration and nutrient filtration.

- Effects to groundwater levels and flows within wetlands, Buffalo Creek, and domestic wells.
- Loss or alteration of vegetation due to change in surface/groundwater drainage flow; resulting in altered soil moisture.
- Change in local drainage areas and patterns.
- Change in regional flows and water levels.
- Reduction of traditional hunting and gathering sites, used to forage, trap, fish, and hunt.
    - The most prominent concerns received from Indigenous groups during the consultation and engagement process are as follows:
        - Loss in groundwater quality and quantity.
        - Loss of nesting habitat for migratory birds.
        - Loss of wildlife habitat.
        - Loss of traditional land use, hunting, trapping, and gathering culturally important species such as moose, beaver, and muskrat.
- Loss or alteration of wildlife habitat (such as Species at Risk and/or migratory birds)
    - Species at Risk who inhabit wetlands are protected under:
        - Federal Species at Risk Act.
        - Federal Migratory Birds Convention Act.
        - Manitoba Endangered Species and Ecosystems Act.
        - Manitoba Wildlife Act.
    - Species at Risk that inhabits wetlands and are protected under the Species at Risk Act or Migratory Birds Convention Act are listed in Table IAAC R2-13-1.
        - The following wetland dependant SAR are anticipated to encounter project-related effects due to loss and/or alteration of wetlands:
            - Horned Grebe
            - Least Bittern
            - Northern Leopard Frog
            - Yellow Rail

As discussed in the Overview/Supporting Information Section, Class I and II wetlands are typically dried up by late May and mid-June, respectively. Yellow Rail migrate to Manitoba in late June (SARA Registry, 2013). According to the data collected in WSP's 2022 Wetland Monitoring Report, suitable breeding habitat for Yellow Rail preferably contain surface water with a depth of 50 cm, and nesting habitat containing a depth of approximately 15 cm. Horned Grebe prefer suitable breeding habitat consisting of semi-permanent and permanent ponds and marshes; these require open water throughout the breeding season (SARA, 2009). Least Bittern prefer breeding habitat that is within

marshes and areas surrounded by open water; they favour areas with stable water levels during the breeding period (SARA, 2009). Habitat preferences and Project-related survey results indicate that these ephemeral and temporary wetlands (Class I and II wetlands) would likely not provide suitable breeding habitat for Yellow Rail, as well as the other wetland dependant species listed in Table IAAC-R2-13-1.

Table IAAC R2-13-1 Regulatory Status of Wetland Dependant Species Potentially Affected by Project-related Loss and/or Alteration of Wetlands

Common Name	Scientific Name	Habitat	Species at Risk Act	Endangered Species and Ecosystems Act	Migratory Birds Convention Act	Wildlife Act
Horned Grebe	*Podiceps auritus*	Lakes & Ponds; floating nesters	Special Concern	No	Yes	Yes (Division 6)
Least Bittern	*Ixobrychus exilis*	Marsh birds; ground nesters	Threatened	Endangered	Yes	Yes (Division 6)
Northern Leopard Frog	*Lithobates pipiens*	Marshes and wetlands	Special Concern	No	No	Yes (Division 5)
Yellow Rail	*Coturnicops noveboracensis*	Marsh birds; ground nesters	Special Concern	No	Yes	Yes (Division 3)

The larger, more seasonal (Class III), semi-permanent (Class IV) and permanent (Class V) wetlands provide preferred and suitable habitat for breeding by Yellow Rail and for other wetland dependant migratory birds and Species at Risk. These wetland types are prominent in the LMOC LAA (WSP 2020). This is supported by local data as documented in the findings of WSP's 2023 Wetland Monitoring Program (WSP, 2023a), ARU Analysis Surveys, where Yellow Rail detection occurred within Class IV wetland within the Lake Manitoba Outlet Channel PDA. There were no detections of Yellow Rail within any Class II Wetland sampled (WSP, 2023a).

One of the roles of the Wetland Specialist regarding the Wetland Offsetting Program will be to review existing information on wetlands and to select suitable sites for wetland offsetting. As outlined in Part A, site selection will involve evaluating the amount and types of Species at Risk habitat that is being directly altered or lost.

Potential loss and alteration of wetlands are being addressed through mitigation measures outlined in the following section. Additionally, many of the potential effects on wetlands were avoided through careful siting of the Project (see Appendix IAAC-R2-13).

Mitigation

This section outlines the proposed key mitigation measures for wetlands that will be directly altered or lost due to the project. Construction of the Outlet Channels Project will remove 239 ha of combined Class III, IV, and V wetlands. An additional 769 ha of other wetlands (peatlands) will be directly affected by the Project and will receive offsetting; depending on the outcome of the Wetland Monitoring Plan, additional offsetting may be provided for wetlands that are demonstrated to be affected by the Project (where effective mitigation cannot be applied). As per IAAC-R2-14, the response summarizes the progress of the development and assessment of options to rewater Birch Creek and the Buffalo Creek wetland complex (i.e., Buffalo Creek and adjacent wetlands). Due primarily to technical and regulatory constraints, the updated assessment concludes that rewatering is not feasible for either location. Wetland monitoring will facilitate delineating the extent of Project-related effects. Mitigation options will then be considered; if at that time mitigation remains an ineffective option, no-net-loss wetland offsetting will be applied. This is currently expected to occur for demonstrated loss or alteration of wetlands west of the LSMOC. Other wetlands adjacent to the PDA will be evaluated to determine if there are Project-related effects and whether there are opportunities to apply effective mitigation measures no-net-loss offsetting will be applied where there are no mitigation options. To mitigate against potential project effects, Manitoba Transportation and Infrastructure has developed 23 draft Environmental Management and Monitoring Plans (EMPs). These management and monitoring plans propose environmental protection measures and monitoring activities that will be undertaken during construction and operation of the proposed Project. The Plans that directly relate to mitigation and monitoring for wetland effects are listed below.

The Surface Water Management Plan describes the measures that will be used to mitigate or avoid effects to local surface water during construction and operation of the LMOC and LSMOC. This plan identifies preliminary monitoring requirements to confirm mitigations are effective and the process for identifying and implementing adaptive measures if measures are not effective.

The Groundwater Management Plan describes the measures that will be used to mitigate or avoid effects to groundwater or from groundwater during the construction and operation of the LMOC and LSMOC. Groundwater monitoring will occur to help with understanding the groundwater pressure variations during construction and provide information on groundwater piezometric head. This information will aid in the further refinement of adaptive management and may thereby influence the interpretation of the results of the wetland monitoring plan.

The Revegetation Management Plan describes the measures that will be used to establish vegetation in areas affected by the Project. The Project will result in clearing and grubbing for the excavation of the Outlet Channels, local drainage construction, and road construction/realignment. Revegetation will be conducted in disturbed areas of the Project as a key component of the Sediment Management Plan. In addition, monitoring will be undertaken to determine the success of revegetation efforts as well as potential Project effects to adjacent vegetation and plant communities.

The Project Environmental Requirements describe the measures that will be used to mitigate or avoid effects that may be otherwise caused by construction and/or operation activities. The Project Environmental Requirements state mitigations that are specific to the protection of wetlands that will

be followed by the Contractor during Project works. Some of these mitigations include following setback distances for designated areas and refueling, properly installing erosion and sediment control before starting Project work, etc.

Manitoba Transportation and Infrastructure will follow strict mitigation procedures set out by the Project Environmental Requirements (PERs), as these commitments are fundamental to the regulatory compliance requirements, including Project approvals, permits, licences, and authorizations. These requirements and commitments are specific to the work and activities being conducted under the authority of licences, permits authorizations or approvals obtained for the Project.

The PERs are based upon long-standing strategies that have been used provincially on other projects and have been proven effective in mitigating potential environmental effects from construction practices. Below are some of the mitigation measures that will be followed during construction and operation of the Project related to wetlands:

- Designated areas will be located a minimum of 100 metres (m) from any waterbody or wetland or as approved by the Contract Administrator (See Section 2.2 of the Construction Environmental Management Plan for details regarding the responsibilities of the Contract Administrator).
- Clearing will not occur between April 1st and August 31st of any year unless otherwise authorized by the Contract Administrator to avoid disturbance to nesting birds and other wildlife.
    - If clearing within the nesting period (April 1 to August 31) is required, a nest survey may be undertaken by a qualified environmental professional if warranted and approved by the Contract Administrator.
- Clearing within 30 metres (m) of a waterbody will be done by hand.
- Removal of riparian vegetation will be kept to a minimum to help maintain the stability of waterbody banks. Vegetative root masses found within the waterbody banks will remain undisturbed unless specified.
- Cleared trees and vegetation will not obstruct waterways during any season and will be kept above the ordinary high-water mark. Stockpiles or windrows of any material are to be kept a minimum of 100 m from any waterbody's ordinary high-water mark.
- Effective erosion and sediment control measures will be properly installed before starting any work to prevent undesirable soil movement or the entry of sediment into any waterbody or wetland.
- Disturbance to the waterbody bed and banks will be minimized. Existing trails, roads or cut lines to access the site where possible to avoid disturbance to riparian vegetation.
- Immediately after disturbance or upon completion of the work in or around waterbodies, waterbody banks, and riparian vegetation areas, the disturbed areas will be restored to the original contour and gradient and cover treatment applied.

- If an area cannot be restored to its original contour and gradient due to instability or other reasons, a stable gradient will be constructed, and cover treatment applied.

The above-mentioned mitigation measures would be integrated into the development of new wetland sites that are selected for offsetting. The Project design has been evaluated and finalized with consideration of ways to further mitigate effects on wetlands. Additional wetland-related design mitigations have been evaluated specifically for Birch Creek and the Buffalo Creek systems; for these locations it was determined that re-watering is not a feasible option due to Federal concerns regarding aquatic invasive species – as lake water would need to be treated before being used to re-water either creek wetland complexes (see IAAC-R2-14). Mitigation measures, including re-watering, could still be applied to wetlands, depending on the results of wetland monitoring and best available mitigation options; no-net-loss offsetting would be applied where mitigation of Project-related wetland effect is not applied.

Manitoba Transportation and Infrastructure will determine wetland sites that are directly and indirectly affected by the Project, by use of the Wetland Monitoring Plan. If mitigation is determined to not be feasible for specific wetland sites demonstrated to be affected by the Project, Manitoba Transportation and Infrastructure will provide no-net-loss offsetting for those specific wetland sites.

The next section describes the follow-up program regarding monitoring, adaptive management and evaluation for offsetting of prescribed wetlands for the Project.

Follow-up and Monitoring Program

Indigenous groups will be involved throughout the follow-up and monitoring process as outlined in Part A. This includes, but is not limited to their involvement as monitors, which is currently planned to be coordinated by the EAC. The Indigenous Environmental Monitor(s) will be given opportunities throughout this process to provide feedback on the findings of wetland benefits restoration/enhancement efforts and monitoring, as well as to provide recommendations. With respect to wetland offsetting, the EAC will at minimum review, discuss and provide recommendations on planned or implemented monitoring and mitigation measures, or other actions associated with sites selected to be offset under the Wetland Offsetting Program. The EAC will also provide pertinent feedback received from Indigenous groups.

Wetland Offsetting Program

This section outlines the follow-up and monitoring associated with wetlands that are altered or lost due to the Project (i.e., wetlands sites that are associated with wetland offsetting). In addition to the approaches to avoid, minimize or mitigate potential Project effects to wetlands, offsetting projects (meaning those wetlands selected to offset for Project-related loss through enhancement, restoration or preservation) that are selected a part of the Wetland Offsetting Program will be subject to monitoring. This monitoring will be performed to ensure offsetting projects are self-sustaining and provide desired or targeted ecological benefits.

To best ensure effective monitoring, monitoring planning will be tailored to individual offsetting projects by the Wetland Specialist – with input from Manitoba Transportation and Infrastructure, EAC, as well as provincial and federal regulators. Key principles that will be identified as part of monitoring plans for wetland offsetting projects include an understanding of required wetland functions and values that will be provided by the offsetting project (e.g., Species at Risk habitat, water retention, Traditional Land Use). Manitoba Transportation and Infrastructure will also review information on successes and challenges encountered by wetland offsetting projects in other areas or jurisdictions if available to account for long term complications and the need for potential adaptive measures. Representative sites would be identified based on similarities in climate, hydrology, topography and other appropriate features. This should ensure greater success rates for offsetting projects and promote more effective use of funds and resources.

The planning of monitoring measures will include information pertaining to each wetland offsetting project, such as, but not limited to, the location of the wetland site, the desired or targeted ecological function and an estimated monitoring timeline within which offsetting project success and self-sustenance can be confirmed per wetland.

Methods

Monitoring of proposed and developed wetland sites may involve a combination of site inspections, satellite imagery, and/or aerial photography to assess long-term wetland conditions. Should further wetland alterations occur, and require mitigation, additional monitoring may be required.

To verify that the wetlands that are offset are functioning properly, standard monitoring parameters will be used. If any changes are made to set standard parameters, it will be reported and dealt with accordingly, by use of mitigations by recommendation of the Wetland Specialist. The standard parameters will be used to evaluate the following, at minimum:

- Surface water flow/quality.
- Groundwater parameters.
- Wetland class.
- Vegetative cover, including wildlife habitat (biodiversity and Species of Conservation Concern/SAR).
- Traditional use by Indigenous groups.

Following both the mitigation and monitoring process, the wetland site will be assessed to determine whether the wetland functional target has been achieved. The Wetland Specialist will at minimum conduct an evaluation of wetland characteristics. This may involve an evaluation of satellite imagery and/or aerial photography, to determine whether the process allowed for the wetland-specific desirable outcome. The evaluation will also verify that the new and restored wetland meets the standards of classification for the specific wetland type created (I.e., Class III, IV, or V wetland) using the Stewart and Kantrud Wetland Classification System.

Timeline

The monitoring timeline will consider the type of offsetting required that is specific to the site, as well as the specific mitigations that will be implemented, and the monitoring which will be required to verify that the specific functional benefits for each wetland are met.

Below is a list of the potential effects that will be monitored, accompanied by a suggested timeline for monitoring, where appropriate for individual offsetting sites (Enbridge Energy, 2020):

- **Erosion and Sediment Control:** Evaluation of stream bank stability will be focused on year 1 post-construction but will continue to be monitored for the rest of the 5-year monitoring timeline.
- **Physical Landscape Changes:** Baseline conditions will be established 6 months prior to the start of construction.
    - Evaluation: Hydrology and topography will be focused on year 1.
    - Monitoring: During years 3 & 5 will focus on landscape level, where hydrology will be continually monitored during the 5-year period, to verify they both meet baseline conditions established during pre-construction assessments. During years 1 & 3, monitoring will be implemented for areas of crowning or subsidence.
- **Vegetation:** Re-vegetation monitoring will occur during year 1-3 for all disturbed areas requiring restoration or enhancement (if required). This will include but is not limited to comparing plant cover to previous years through satellite imagery and/or aerial photography. This will aid in determining wetland community type, along with baseline studies conducted by WSP.
- **Weed Control:** Weed monitoring will occur during the first growing season and will be continually monitored with the native re-vegetation for a minimum of 3 years. Undesired species control will be maintained as outlined in the Revegetation Monitoring Plan.
- **Wildlife:** Wildlife monitoring will begin after preservation, enhancement and/or restoration of the wetland, and will continue periodically throughout the 5-year period. Monitoring of affected Species at Risk and identified species of traditional importance will be monitored as outlined in the Wildlife Monitoring Plan.
- **Overall Monitoring Timeline:** During each stage and year of the Project, at site evaluation, if surveys suggest, a more intensive study may be required. Additional detailed site investigations of a wetland will occur, as well as the requirement and nature of adaptive management measures.

During the development of the Project areas, monitoring will be conducted through compliance, as well as the Wetland Monitoring Plan.

***Adaptive* Management**

Built into the monitoring programs for wetland offsetting projects will be adaptive management measures to ensure unanticipated monitoring results are addressed (as needed) and so that offsetting objectives are met. Adaptive management measures will be based on knowledge and expertise from the Wetland Specialist, literature and associated findings for other similar wetland projects as well as input from the EAC. It is anticipated that the EAC will review, discuss and provide recommendations for solutions, which could be employed, where measures are found to be ineffective and/or if unanticipated effects occur. Adaptive management strategies that may be utilised for offsetting projects are listed in Table IAAC R2-13-2.

Table IAAC R2-13-2 Proposed Adaptive Management Strategies to Promote Restoration, Enhancement or Protection of Wetland Offsetting Sites

Area of Concern	Potential Issue	Examples of Proposed Adaptive Measures
Site Stability & Erosion	Erosion of Wetland and/or Stream Banks	Short-term (Mitigation) Measures: • Silt fence installation • Straw wattle placement • Mulch cover and/or common oat placement Long-term Measures: • Construction of slope breakers • Re-contouring an area to correct a drainage flow pattern • Additional tree/shrub planting in select areas • Implementing beaver/muskrat deterrents
Physical Landscape Changes	Undesired Ponding and Drainage, Changes and/or Disruptions in Flow Patterns, causing a Change in Wetland Hydrology	Long-term Measures: • Re-contouring • Regrading
Vegetation Disturbance	Revegetation is Unsuccessful	Short-term Measures: • Installation of fences to prevent livestock grazers and wildlife foraging (if required) Long-term Mitigations: • Re-seed areas that are not revegetated accordingly • Regrading to correct topography issues • Fertilizing low nutrient soils (in compliance with Manitoba's Nutrient Management Regulation) • De-compacting areas with compact soils, that may prevent root growth • Supplementing or revisiting seed mixes to promote vegetation establishment for specific conditions and to ensure vegetation can withstand drought and/or flooding events

Area of Concern	Potential Issue	Examples of Proposed Adaptive Measures
Weeds	Establishment, Introduction or Persistence of Noxious Weed Species in Re-Vegetated Sites	Short-term Measures: • Control tier 2 noxious weeds if the contiguous area colonized by the weeds is five acres or more; • Control tier 3 noxious weeds and other various invasive species. Long-term Measures: • Destroy tier 1 noxious weeds; • Destroy tier 2 noxious weeds if the contiguous area colonized by the weeds is less than five acres; • Prevent the spread of noxious weeds (tier 1, tier 2 and tier 3) or other various invasive species. Mitigation measures and monitoring are described further in the Revegetation Management Plan.
Wildlife	Absence of key indicator species, SAR or species of cultural importance.	Long-term Mitigations: • Maintaining desired wetland function • Investigate monitoring results for site hydrology, topography, vegetation and other physical features • Further minimize site disturbance and access (if possible) • Add nesting structures (e.g., snags, nest boxes) to wetland area.
Aquatic	Disturbance to Fish, Fish Habitat, and Spawning	Follow the PER, and measures outlined in other applicable EMP plans such as the AEMP, Surface Water Management and Sediment Management plans.
* Source: (Enbridge Energy, 2020; Revegetation Plan, 2020; Wildlife Management Plan, 2020)		

Selected sites for wetland offsetting will be protected, enhanced, or restored. The actions taken would depend on the reasoning for offsetting, evaluation results from the Wetland Specialist and others, and whether there are any issues requiring mitigation.

Additional adaptive management strategies may be required if construction and post-construction monitoring reveals that wetlands near the Project Development Areas are being affected in a manner inconsistent from what was predicted (e.g., selectively refreshing wetlands with additional surface water flow).

Other Wetland Monitoring

This section outlines additional monitoring, which is separate from what will be done from the Wetland Offsetting Program monitoring described above.

The Wetland Monitoring Plan describes the methods for assessing potential indirect Project effects on wetlands including changes to class/size of wetlands, surface and groundwater quality and quantity, vegetation cover, and wildlife habitat from changes to groundwater and surface water regimes for those wetlands outside the PDA that do not receive offsetting.

Additionally, wetland related monitoring is associated with several of the EMPs, such as:

- Surface Water Management Plan – describes the measures that will be used to mitigate or avoid effects to local surface water during construction and operation, including wetland areas.
- Groundwater Management Plan – describes the measures that will be used to mitigate or avoid effects to groundwater or from groundwater during the construction and operation, including effects to wetland areas.
- Revegetation Management Plan – describes the measures that will be used to establish vegetation in all areas affected by the Project, including wetland areas.

Monitoring will also be undertaken to determine the success of revegetation efforts as well as potential Project effects to adjacent vegetation and plant communities.

The Wildlife Monitoring Plan describes the monitoring activities that will be undertaken to address follow-up requirements identified in Volume 5, Section 12 of the Project EIS. Follow-up requirements are actions implemented to verify key environmental assessment predictions, to reduce potential adverse effects on wildlife and their habitat(s), and to confirm compliance with regulatory requirements. For the wildlife and wildlife habitat valued component, monitoring of wetlands and other habitats will be carried out during the construction and operation phases of the Project and includes consideration of species that have been listed as culturally important by Indigenous groups.

Indigenous Involvement

Potential effects to the current use of lands and resources for traditional purposes is mentioned earlier in Part B, as well as the involvement of Indigenous Monitors. Discussion will take place with Indigenous leadership and groups regarding preference and experience with respect to the wetland offset sites as discussed in Part A. However, Indigenous involvement will include more than the selection process and monitoring and is further outlined in the section below.

c. **Indigenous Involvement**

As part of the Environmental Management Program review process, Manitoba Transportation and Infrastructure offered specific meetings to 39 Indigenous leadership and groups that are engaged on the Project to discuss the Environmental Management Plans (EMPs). As a result of input received from Indigenous leadership and groups, meetings were held to discuss proposed mitigation, monitoring and offsetting measures. Further meetings to discuss the EMPs are included in all high-level work plans developed for Indigenous leadership and groups with funding agreements. Additionally, 18 Indigenous groups were offered additional funding for their EMPs review based on their known interest in the EMP and high likelihood of experiencing potential effects from the Project. These Indigenous leadership and groups include: Dauphin River Northern Affairs Community, Dauphin River First Nation, Lake St. Martin First Nation, Little Saskatchewan First Nation, Pinaymootang First Nation, Peguis First Nation, Fisher River Cree Nation, Fox Lake Cree Nation, Misipawistik Cree Nation, Manitoba Metis Federation, Hollow Water First Nation, Norway House Cree

Nation, Sagkeeng First Nation, Sandy Bay Ojibway First Nation, Tataskweyak First Nation, Lake Manitoba First Nation, Kinonjeoshtegon First Nation, and Pimicikamak Okimawin. EMP feedback received to-date, as well as input received during the continued environmental assessment process, has and will inform continued improvement to the EMP (see updated plans in Attachment 1 – Updated Environmental Management Plans submitted to IAAC on June 30, 2022).

Manitoba Transportation and Infrastructure is committed to ongoing consultation and engagement throughout the development of the Environmental Management Program, consisting of 23 EMPs which included both the Wetland Monitoring Plan and Wetland Compensation Plan. The Wetland Monitoring Plan outlines methods that have been proposed to verify and test key predictions made in the EIS with respect to indirect effects on wetlands near the PDA. The results will also facilitate in determining the requirement and effectiveness of mitigation measures, and nature of associated follow-up where required. The Wetland Compensation Plan is one component to the Wetland Offsetting Program and implementation. As outlined in Part A of this response, the WCP illustrates a basis for a framework of Wetland Offsetting, by describing the wetlands that will be directly affected by the Project and which of those qualify for mitigation, monitoring and/or offsetting. The draft Wetland Compensation Plan was provided to the Agency on June 30, 2022, which was subsequently shared with Indigenous leadership and groups and the public. The plan incorporated and addressed pertinent comments from Indigenous groups. Additionally, Manitoba Transportation and Infrastructure is going to provide offsetting for peatlands affected by the Project.

In response to Indigenous leadership and groups and stakeholder concerns regarding environmental mitigation and monitoring, and as committed to throughout the response to this Information Request, Manitoba Transportation and Infrastructure has proposed that a Project Environmental Advisory Committee (EAC) be established for the Project. The EAC is intended to serve as a communication and advisory forum to provide an avenue for the flow of information between and among Indigenous groups, the RM of Grahamdale and Manitoba Transportation and Infrastructure. The intent is to focus on providing opportunities for Indigenous groups and the RM of Grahamdale to have meaningful input into Project planning, plan implementation, and follow-up processes associated with the Project, including wetland offsetting. The EAC is further described in the response to IAAC-R2-30.

Manitoba Transportation and Infrastructure is also coordinating with Manitoba Economic Development and Training, Indigenous Services Canada, and First Peoples Development Inc. (FPDI) to identify Project labour force requirements, procurement requirements and anticipated schedules which could assist in the development of training opportunities for Indigenous peoples to support potential employment as part of construction and environmental monitoring activities.

Regarding wetland offsetting specifically, the EAC will be requested to participate in aspects of the Wetland Offsetting Program and its implementation. The EAC will be asked to share their knowledge on different aspects on this process including, wetland offsetting sites, objectives monitoring and adaptive management. The EAC will provide opportunities for members to advise Manitoba Transportation and Infrastructure on wetland offsetting projects, and implementation of environmental management and monitoring plan details.

Manitoba Transportation and Infrastructure has been and continues to be committed to ongoing consultation and engagement throughout this Project. To date, input provided by Indigenous groups as part of engagement and consultation discussions and Traditional Land and Resource Use reports, responding to environmental management plan questionnaires and providing additional feedback on draft plans have provided important information regarding wildlife, vegetation and culturally important land uses. Similarly, through participation in community meetings to discuss environmental concerns and other Project-related topics, information regarding preferred wetland offsetting candidate sites have also taken place. Areas identified as preferred offsetting project areas include: the entire area extending from Lake St. Martin Outlet Channel north to Saskatchewan and McBeth Points, east to Fisher Bay and further east to include the entire Washow-Fisher Peninsula, south to PR 325, the Lake Manitoba Outlet Channel area, large areas of Manitoba, riparian wetland areas along Lake Winnipeg and downstream on the Nelson River, as well within as the upper Assiniboine River and Lake Manitoba watersheds. Discussions regarding the establishment of terms of reference for the EAC have also continued. This forum has also provided an opportunity for Indigenous leadership and groups and the RM of Grahamdale to express environmental concerns, such as those pertaining to wetland effects.

Lastly, as described in the response to Part A above, Manitoba Transportation and Infrastructure encourages Indigenous groups and the RM of Grahamdale to continue providing feedback and participate in a series of wetland offsetting planning workshops to further finalize Wetland Offsetting Program as we collaboratively move forward to operationalize this program.

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QUESTION IAAC-R2-14

Referenced Round 1 IR(s): IAAC-14, IAAC-53, IAAC-77, IAAC-132

Expert Dept. or group: IAAC
INFC
ECCC
DFO
Hollow Water First Nation
Lake St. Martin First Nation
RM of Grahamdale

EIS Guideline Reference: 7.2.2 Changes to Groundwater, Surface Water, and Fluvial Morphology

7.2.3 Changes to riparian, wetland and terrestrial environments

Context and Rationale

The EIS Guidelines require the Proponent to assess the changes to groundwater, surface water and fluvial morphology as a result of the Project. Furthermore, the EIS Guidelines require the Proponent to describe potential adverse environmental effects of the Project associated with the introduction and/or spread of aquatic invasive species.

The response to IAAC-14 states that to mitigate the reduction in Birch Creek basin drainage along the LMOC, a small, gated control structure (known as the Birch Creek Augmentation Structure) will be constructed to restore lost flow. The response to IAAC-122 indicates that the Birch Creek Augmentation Structure could provide a pathway for zebra mussels to enter Birch Creek but notes that conditions are not optimal for zebra mussels to survive in Birch Creek. It is also stated, “the effects that zebra mussels could have on Buffalo Creek are not fully known; however, the effects would primarily occur to species that reside in the creek. Those species are primarily forage species and are not used by local resource users.” Effects to fish and fish habitat include forage species and can lead to impacts to fish and fisheries depended upon by Indigenous peoples.

The response to IAAC-77 states that aquatic invasive species, including zebra mussel, could colonize streams in the Buffalo Creek watershed while colonization in Birch Creek may be limited by winter conditions. The response to IAAC-77 indicates that an Aquatic Invasive Species (AIS) permit will be issued if a net benefit of improving fish habitat by supplementing flow is favored. However, specific mitigation to ensure listed AIS are removed from the water that will enter Buffalo and Birch Creeks is not clear.

An assessment of the effectiveness and feasibility of the mitigation for re-watering Birch Creek is required to assess Project effects on water quality parameters, AIS, wetland function, SAR, and fish and fish habitat.

Question IAAC-R2-14
July 24, 2023

Information Requests

a. Provide construction and operational details for the selected mitigation for re-watering Birch and Buffalo Creeks.

b. Describe the anticipated effectiveness of mitigations and/or adaptive management responses to unanticipated effects of re-watering Birch and Buffalo Creeks.

c. Complete effects analyses for the pathways of effects due to re-watering of Birch and Buffalo Creeks, including potential effects to SAR, fish and fish habitat, the health and socio-economic condition of Indigenous peoples, and the current use of lands and resources for traditional purposes due to changes in water quality, introduction of AIS, and changes in wetland function.

Response IAAC-R2-14

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) provided on August 25, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response integrates a reply to questions raised in an October 31, 2022, letter from the Interlake Reserves Tribal Council Inc. requesting information specific to the proposed re-watering plans and effects on the creeks and wetlands. Information requested regarding the impacts of drought conditions on the creeks and wetlands, and the transfer of nutrients through the system are addressed in the responses to IR IAAC-R2-02, IAAC-R2-03 and IAAC-R2-09. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

This response summarizes the progress of the development and assessment of options to re-water Birch Creek and the Buffalo Creek wetland complex (i.e., Buffalo Creek and adjacent wetlands), including treatment for aquatic invasive species (AIS); specifically, zebra mussels (*Dreissena polymorpha*). Due primarily to technical and regulatory constraints regarding AIS, the updated assessment concludes that re-watering is not feasible for either location. As a result, offsetting will be provided for Project-related harmful alterations to fish and fish habitat in Birch and Buffalo creeks as required under the federal Fisheries Act as described in IAAC-R2-10. Monitoring will facilitate in determining the area that will be provided no-net-loss wetland offsetting for Project-related loss of wetlands west of the Lake St. Martin

Outlet Channel (LSMOC); the wetland offsetting process is described in IAAC-R2-13.~~and offsetting for loss of wetlands west of the Lake St. Martin Outlet Channel (LSMOC) as described in IAAC-R2-13.~~

As no re-watering is currently planned for the Birch and Buffalo creek systems, the response has been re-organized. Part A describes the analysis of the re-watering options for Birch Creek and Buffalo Creek. Part B refers to the response to IR IAAC-R2-13 and IAAC-R2-10 for details on the adjustments to wetland and fish habitat offsetting, respectively; and Part C describes the predicted effects to Birch Creek and Buffalo Creek, in terms of (as applicable) fish and fish habitat, wetland function, species at risk (SAR), the health and socio-economic condition of Indigenous groups, and the current use of lands and resources for traditional purposes. The definition of wetland types described in this response is provided in the response to IR IAAC-R2-13.

a. **Creek Re-watering Construction and Operation**

Overview

As part of the May 31, 2022, responses to IR IAAC-38 and IAAC-53, Manitoba Transportation and Infrastructure presented an analysis of options to re-water the downgradient areas of the Lake Manitoba Outlet Channel (LMOC) and LSMOC. This is because the channels will intercept surface water flowing from upgradient areas and reduce flows to Birch Creek (downgradient of the LMOC) and the Buffalo Creek wetland complex (downgradient of the LSMOC). Further development and assessment of the proposed conceptual re-watering options has been completed to determine the feasibility and effectiveness of mitigating the reduction of flow to Birch Creek and the Buffalo Creek wetland complex caused by the Project. Hydrologic conditions in the local assessment area (LAA) and the Project impacts on flows remain unchanged and are described in the May 31, 2022, responses to IR IAAC-53, with details pertinent to the updated assessment provided in the individual sections below.

Further to information provided in the May 31, 2022 response to IR IAAC-77, as zebra mussels have been found in Lake Manitoba, Manitoba Natural Resources and Northern Development and the Department of Fisheries and Oceans Canada (DFO) have advised Manitoba Transportation and Infrastructure that introduction of zebra mussels into Birch Creek and the Buffalo Creek wetland complex cannot be permitted and treatment would be required before lake water can be used to re-water Birch Creek (downgradient of the LMOC) and the Buffalo Creek wetland complex (downgradient of the LSMOC). Under the Fisheries Act AIS Regulations, “it is prohibited for any person to introduce an aquatic species into a particular region or body of water frequented by fish where it is not indigenous unless authorized to do so under federal or provincial law.” Under the Manitoba Fishery Regulations, the Minister may issue a permit to allow the activity if the issuance will not adversely affect the conservation and protection of the fish to which the Permit applies.

As described in the response to IR IAAC-R2-27, zebra mussels are designated as an AIS in Manitoba and are currently present in Lake Winnipeg and Lake Manitoba, but have not been observed in Lake St. Martin or Birch Creek. Lake St. Martin is naturally connected to Lake Manitoba via the Fairford River, and it is likely that zebra mussels will be found in Lake St. Martin in the near future. Once present in a waterbody, zebra mussels reproduce quickly and can negatively impact fish populations by consuming large quantities of algae, which is the base of the aquatic food chain, as well as smothering fish habitat through development of large colonies. Larval zebra mussels or "veligers" are microscopic and range in size from 70 to 200 micrometres (µm), which is similar to grains of silt or very fine sand. The veligers float and are passively carried in flowing water. While efforts can be made to slow down the spread, it is not feasible to prevent the eventual spread of zebra mussels to new areas such as Lake St. Martin.

As indicated in the May 31, 2022, responses to IRs IAAC-77 and IAAC-132, while zebra mussels would not be expected to enter the reaches of Birch Creek and Buffalo Creek upstream of the backwater influence of the Lake St. Martin and the Dauphin River, respectively, they could be introduced through the proposed re-watering concepts. Therefore, the updated assessment focuses primarily on re-watering and treatment options that prevent the introduction of zebra mussels to Birch Creek and the Buffalo Creek wetland complex from the Project.

It should be noted that habitat conditions are not optimal for zebra mussels in Birch Creek and effects to fish resources in the creek are not expected. Any effects to fish resources that use Birch Creek will occur in Lake St. Martin and will occur regardless of the Project. None of the Indigenous groups engaged on the Project have identified fishing sites or locations in Buffalo Creek; however, Hollow Water First Nation and Lake St. Martin First Nation have expressed concerns that impacts to Buffalo Creek may affect the fishery and that fish may not be able to populate the portion of Buffalo Creek cut off by the LSMOC. Historically fish movement in the creek is limited by beaver activity and the lake was known to periodically winterkill. As indicated, the effects that zebra mussels could have on Buffalo Creek are not fully known; however, the effects would primarily occur to species that reside in the creek. Those species are primarily forage species and are not used by local resource users.

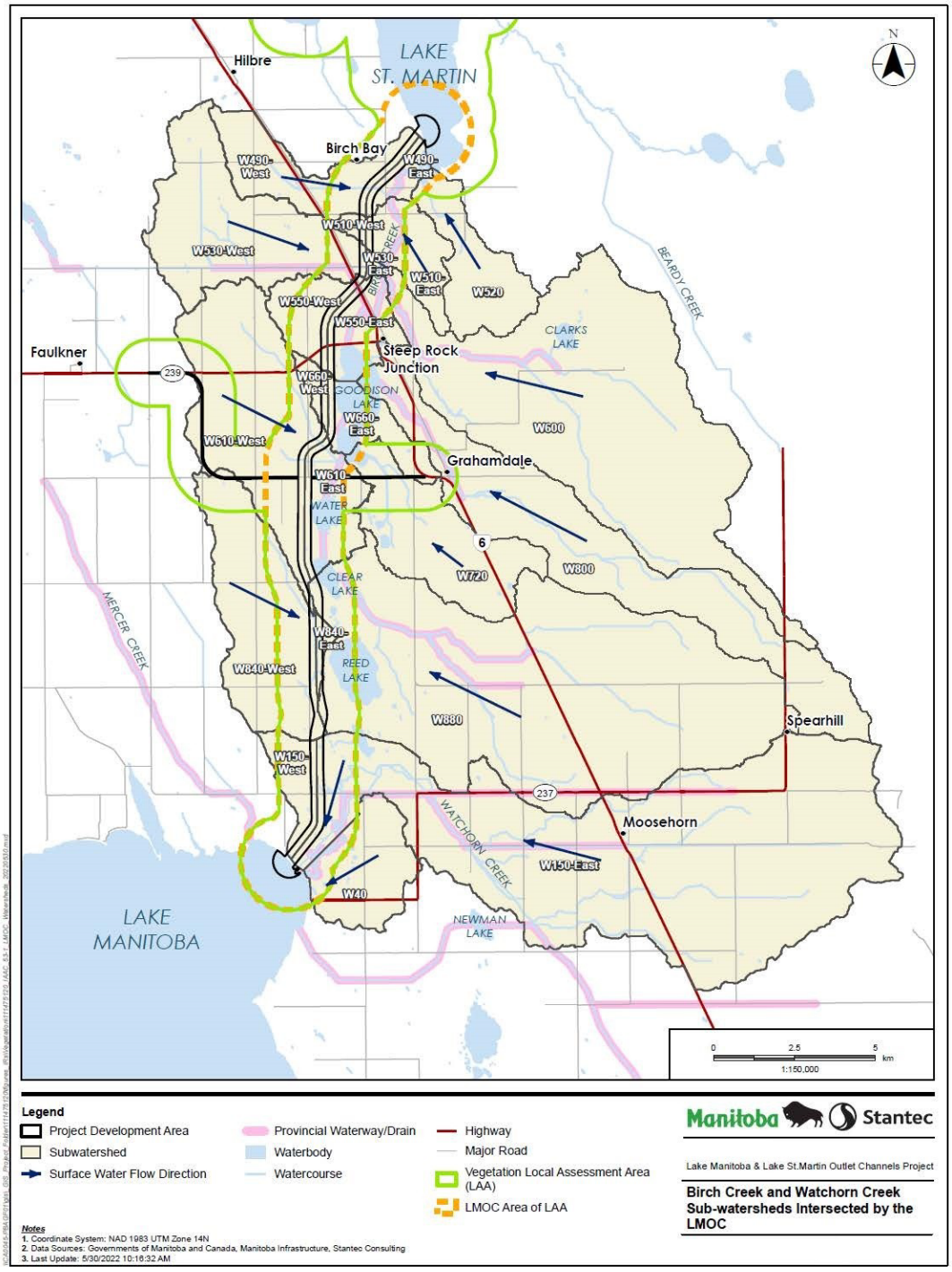
Issues for the Buffalo Creek area relate to the wetlands present, as described below.

Birch Creek

Hydrology

Hydrologic flow to Birch Creek from the municipal drainage network and overland flow originating west of the LMOC right-of-way (ROW) will be intercepted by the outside drain and discharged directly to Lake Manitoba (south of new Provincial Road [PR] 239) and Lake St. Martin (north of new PR 239). Figure IAAC-R2-14-1 illustrates the watershed area and general overland flow directions.

Figure IAAC-R2-14-1 Birch Creek and Watchorn Creek Sub-Watersheds Intersected by the LMOC



Tables IAAC-R2-14-1 and IAAC-R2-14-2 summarize the monthly mean flow estimates (in cubic metres per second [m^3/s]) for Birch Creek at Lake St. Martin (just upstream) and Goodison Lake (just downstream), respectively, based on drainage areas in the Pre- and Post-Project environment.

Table IAAC-R2-14-1 Birch Creek Monthly Mean Flow Estimates at Lake St. Martin (m^3/s)

	March	April	May	June	July	August	September	October
Pre-Construction	0.07	1.30	0.78	0.30	0.07	0.11	0.08	0.04
Post-Construction	0.05	0.95	0.57	0.22	0.05	0.08	0.06	0.03
Flow Reduction	-0.02	-0.35	-0.21	-0.08	-0.02	-0.03	-0.02	-0.01

Table IAAC-R2-14-2 Birch Creek Monthly Mean Flow Estimates at Goodison Lake (m^3/s)

	March	April	May	June	July	August	September	October
Pre-Construction	0.04	0.80	0.48	0.18	0.05	0.07	0.05	0.03
Post-Construction	0.03	0.61	0.37	0.14	0.03	0.05	0.04	0.02
Flow Reduction	-0.01	-0.19	-0.11	-0.04	-0.02	-0.02	-0.01	-0.01

Based on the hydrologic assessment there is a small, but identifiable flow reduction caused by the Project, primarily in the months of April and May when snow melt and spring rainfall events occur in the watershed area. Further, the data indicates that approximately 50% of the flow reduction occurs within Birch Creek between Goodison Lake and Lake St. Martin (see Figure IAAC-R2-14-1). Birch Creek downstream of Goodison Lake currently provides spawning habitat for white sucker (*Catostomus commersonii*) and to a lesser extent northern pike (*Esox lucius*) and walleye (*Sander vitreus*) in years when there is flow in the creek from snow melt and precipitation. The reduction in flow in the creek due to construction of the LMOC is expected to reduce its use by these species, although smaller streams also support spawning runs by sucker.

Re-watering Options

Options to mitigate the flow reduction include gravity drainage and pumping options that source water from the LMOC. Gravity drainage options are limited to locations at or north of Rafkillsen Road due to the natural topography of the area and the anticipated range of lake levels in Lake Manitoba and Lake St. Martin, which directly influence water levels in the LMOC during non-operational periods. Pumping options may be located at any point along the LMOC, but there appears to be minimal benefit to fish and fish habitat if water is introduced into the lakes upstream of the point where Birch Creek originates just downstream of Goodison Lake.

Treatment Options

Options investigated to treat the source waters from the LMOC for zebra mussels include granular filtration, membrane filtration and ultraviolet (UV) treatment.

Granular filtration systems have been successfully used to treat zebra mussels in waters from the Great Lakes. The granular filtration system described in the referenced literature (Keillor, n.d.) required a 4.88 metre (m) (18.0 feet [ft]thick granular filter (2.44 m [8.0 ft] lakebed sand, 0.61 m [2.0 ft] coarse graded sand, and 1.83 m [6.0 ft] gravel) to treat the water prior to collection and discharge from an underlying pipe system similar to weeping tiles. The system required an approximate 0.4 hectares (ha) (1 acre) area to treat 30,000 m^3/day (8 mgd) of water, which equates to a constant flow of 0.35 m^3/s (12.4 cubic feet per second [ft^3/s] (note that 0.35 m^3/s [12.4 ft^3/s] is also the estimated mean flow reduction in Birch Creek for the month of April). A granular filtration system could generally work with both the gravity drainage and pumping options, but it is considered impractical as a treatment option due to its size and depth, and associated cost.

Membrane filtration systems have also been successfully used on a project to treat zebra mussels in waters from Lake Michigan (Amiad Water Systems, n.d.). The membrane filtration system used for that project was a proprietary disc filter system capable of filtration to a 70 µm size with a flow rate of 0.1 m^3/s (3.5 ft^3/s]. However, in the case of Birch Creek re-watering, the size of the system would need to be increased by 3.5 fold to mitigate the estimated mean flow reduction and a pump station would be required to collect and treat the water from the LMOC, and then discharge it to Birch Creek. Although this treatment option is considered possible from a treatment perspective, the capital and long-term operational costs of the pump station and membrane filtration system are considered impractical.

UV treatment systems have been successfully used to treat zebra mussels in medium- to small-scale water systems with flow rates greater than the 0.35 m^3/s (12.4 ft^3/s) flow required to mitigate the estimated flow reduction in Birch Creek (Delrose, 2012). Similar to the membrane filtration system, a pump station would be required, and the capital and long-term operational costs are considered impractical.

~~The costs of the options for rewatering Birch Creek described above are estimated to range from $2.5M to $3M, with approximately $10,000 required for annual maintenance and operation of the pump station.~~ Based on the assessment of treatment options described above, Manitoba Transportation and Infrastructure has concluded that the benefit to support primarily a spawning run of white sucker does not warrant the high cost of re-watering of Birch Creek to mitigate the identified flow reductions, and that investments in habitat offsetting are likely more appropriate to address effects, as discussed in the response to IR IAAC-R2-10. White sucker, as well as other species that use the creek (i.e., northern pike and a few walleye) have spawning habitat available in the Dauphin and Fairford rivers and Lake St. Martin, as found in the response to IR IAAC-R2 -31. Post-Project, Birch Creek is still expected to support spawning runs by white sucker, as evidenced by the fact that smaller streams in the area support spawning. Manitoba Transportation and Infrastructure will work

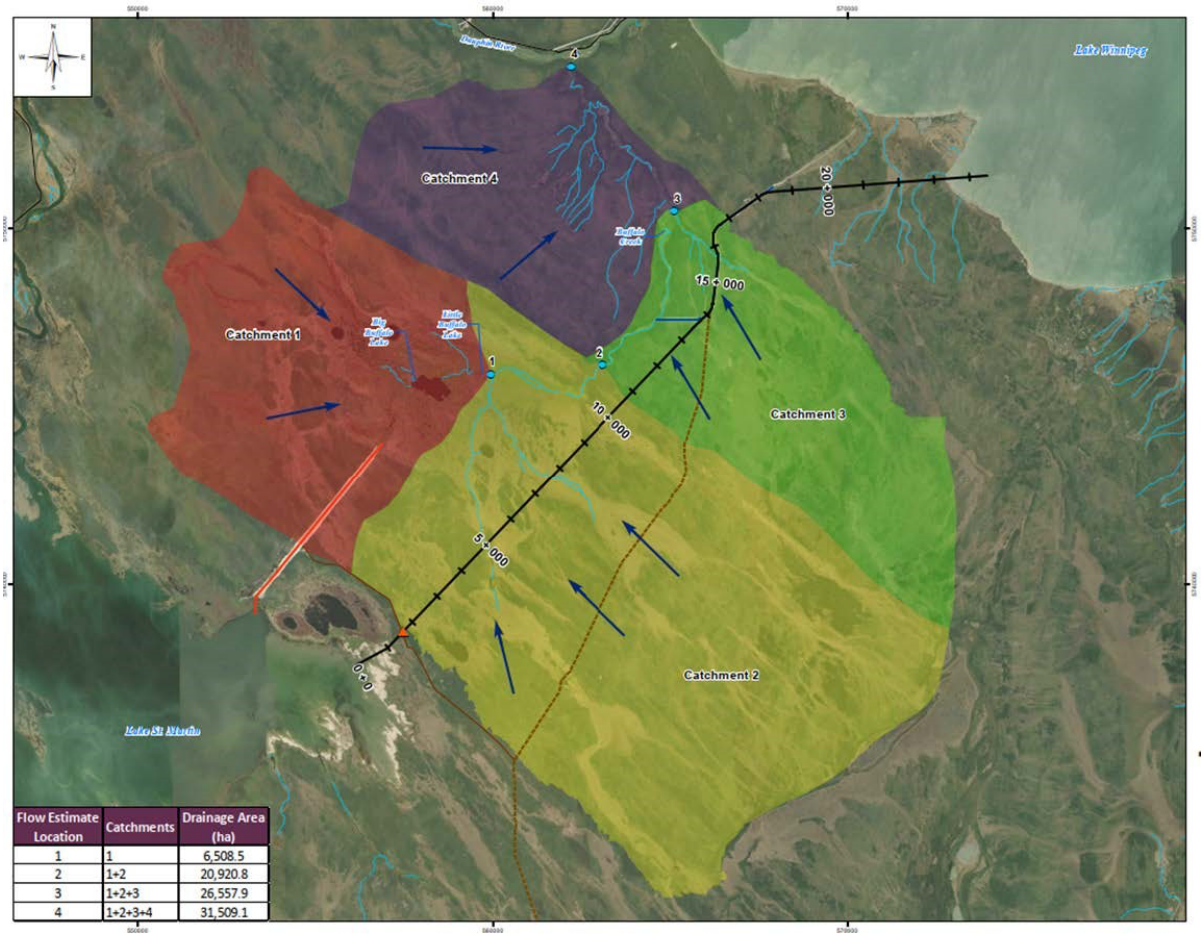
with DFO to identify habitat offsets that provide higher benefit to fish and fish habitat as part of the Authorization process under the federal Fisheries Act.

Buffalo Creek Wetland Complex

Hydrology

Hydrologic flow to the Buffalo Creek wetland complex from overland flow originating east of the LSMOC ROW will be intercepted by the outside drain and discharged directly to Lake Winnipeg. Figure IAAC-R2-14-2 illustrates the watershed area and general overland flow directions, and Table IAAC-R2-14-3 summarizes the monthly mean flow estimates (in m^3/s) for Buffalo Creek just downstream of the wetlands complex based on drainage areas in the Pre and Post-Project environment.

Figure IAAC-R2-14-2 Buffalo Creek Watershed Catchments and Flow Directions



Flow Estimate Location	Catchments	Drainage Area (ha)
1	1	6,508.5
2	1+2	20,920.8
3	1+2+3	26,557.9
4	1+2+3+4	31,509.1

Table IAAC-R2-14-3 Buffalo Creek Monthly Mean Flow Estimates Downstream of Wetland Complex (m^3/s)

	March	April	May	June	July	August	September	October
Pre-Construction	0.05	0.89	0.59	0.19	0.02	0.03	0.01	0.00
Post-Construction	0.02	0.40	0.27	0.09	0.01	0.01	0.00	0.00
Flow Reduction	-0.03	-0.49	-0.32	-0.10	-0.01	-0.02	-0.01	0.00

Treatment Options

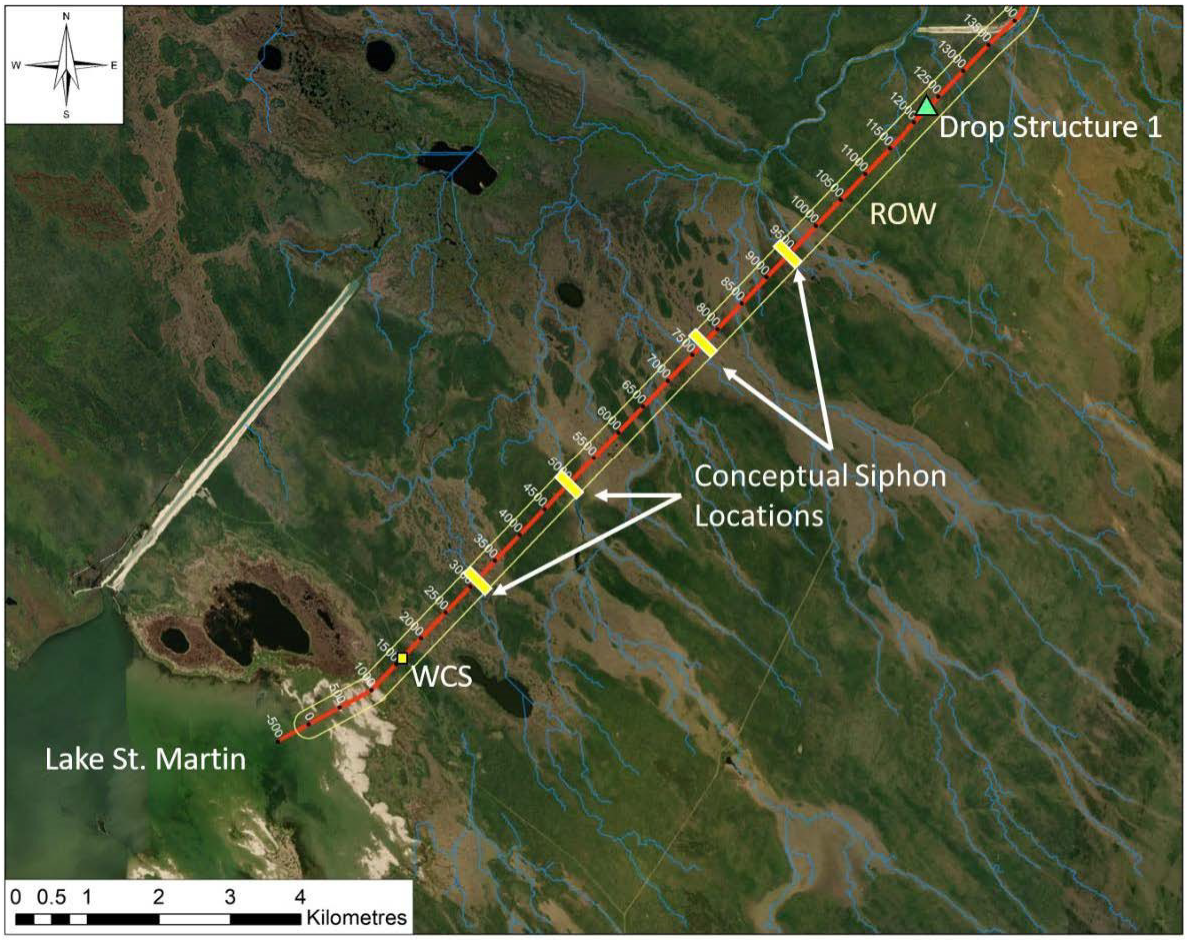
Based on the hydrologic assessment there is a measurable flow reduction caused by the Project, primarily in the months of April and May when snow melt and spring rainfall events occur in the watershed area. Options to mitigate the flow reduction include pumping options that source water from the LSMOC and siphons that collect water from the wetlands east of the LSMOC, transfer the water under the ROW through pipes, and discharge into the wetlands to the west. Gravity drainage from Lake St. Martin or the LSMOC is not possible due to the natural topography of the surrounding wetlands.

Pumping options with treatment for zebra mussels are the same as options considered for Birch Creek, with slightly higher flow requirements to mitigate the anticipated flow reduction of 0.50 m^3/s. Based on the assessment, Manitoba Transportation and Infrastructure has concluded that pumping and treatment options to mitigate the identified flow reductions in the Buffalo Creek wetland complex are not feasible.

Siphons provide an option to maintain the east-west flow of water in the wetlands and eliminate the need for treatment of zebra mussels as the source of water is generated directly by upgradient areas east of the LSMOC and is not connected to flow from the lakes. This option involves constructing multiple siphons to convey surface water runoff and/or subsurface flow in the wetlands from the east side of the LSMOC to the wetlands on the west side. A siphon is an enclosed flow structure commonly used to carry flow across a depression or beneath a linear feature such as a highway or channel. It typically consists of an intake structure, conduit, and outlet structure. All portions of the siphon could be installed during channel construction by open cut excavation below the base of the channel or by directional drilling methods at some point in the future. The siphons would primarily operate during April and May when mean flows are higher, as well as periods when higher intensity rainfall events occur throughout the summer and fall. Based on the topography of the wetlands, four siphons each with a discharge capacity of approximately 0.125 m^3/s (4.4 ft^3/s) would be required at the locations shown in Figure IAAC-R2-14-3 to mitigate the estimated flow reduction. The proposed outside drain would still be required to convey flows exceeding the capacity of the siphons.

The primary advantages of the siphon are that the option best maintains the natural hydrologic conditions and water quality of the area and conveys the water to multiple points in the Buffalo Creek wetland complex to best replicate flow distribution. Though the option allows conveyance of the water to multiple points west of the LSMOC, it would still be challenging to fully distribute the water to provide coverage over the entire wetlands complex. As with other options, the cost of constructing and maintaining the siphons is high and the need to install the conduit below the base of the LSMOC also introduces risk to the performance of the siphon and the permanent outlet channel from the high groundwater pressures in the bedrock aquifer. The siphon option appears technically viable, but is unproven and costly as a re-watering option for the Buffalo Creek wetland complex.

Figure IAAC-R2-14-3 Conceptual Siphon Locations along LSMOC



The estimated costs of the options for re-watering the Buffalo Creek wetland complex described are high and uncertainties related to effective implementation and outcomes exist. For these reasons, Manitoba Transportation and Infrastructure is assessing other means to mitigate for potential loss or change in functionality of the wetlands in the Buffalo Creek wetland complex due to the flow reduction. Conceptual mitigation options described earlier concluded that effective wetland mitigation could not be delivered through an engineering design solution. Post-construction monitoring outlined in the Wetland Monitoring Plan as well as other EMP plans (e.g., Surface Water and Groundwater management plans) will help to determine the extent of Project-related effects on Buffalo Creek. Where mitigation is not a viable option, no-net-loss offsetting associated with the proposed Wetland Offsetting Program would be applied for potentially affected wetlands, as described in IAAC-R2-13.

b. **Anticipated Effectiveness of Mitigations and/or Adaptive Management Responses**

As indicated in the Preamble, re-watering is no longer being considered for either Birch Creek or Buffalo Creek and therefore this question is not applicable. Part C describes the current predicted effects to these creeks (i.e., without re-watering), with additional details on effects provided in the response to IR IAAC-R2-10 for fish, and in the response to IR IAAC-R2-13 for wetlands.

c. **Re-watering Effects**

As indicated in the Preamble, as re-watering is not currently being considered for either Birch Creek or Buffalo Creek, Part C describes the current predicted effects to these creeks, in terms of fish and fish habitat, wetland function, SAR, the health and socio-economic condition of Indigenous groups, including leadership, and the current use of lands and resources for traditional purposes.

Birch Creek

Wetland Function

The intent for re-watering of Birch Creek was to supplement flows to mitigate effects to fish; as such, no benefits were envisioned for wetlands. As discussed in the May 31, 2022, response to IR IAAC-53, 713.2 ha of wetlands within the LMOC portion of the LAA (i.e., 1 kilometre buffer either side of the PDA) from the Lake Manitoba inlet to Lake St. Martin outlet will remain downgradient of the LMOC in the intersected sub-watersheds and, as such, some of these wetlands may become drier following Project construction. The majority of water inputs for these wetlands is likely received from areas close to the individual wetlands. Reduced inputs could reduce wetland flood duration, with the wetlands drying out earlier in the growing season and lengthen time between periods of open water and natural drawdown; however, the wetlands are marshes which are naturally highly dynamic. Wetland loss may occur because of altered water inputs. Changes in wetland conditions will be evaluated with respect to the results of monitoring outlined in the Wetland Monitoring Plan, as filed as part of the June 2022 supplemental information response to IAAC IRs. Project-related wetland loss identified through monitoring will be evaluated to determine if it is additional to or within the wetland

areas that will receive offsetting. Additional offsetting is being provided for other wetland types affected by the Project (see IAAC-R2-13).

Fish and Fish Habitat

As described in the July 24, 2023, response to IR IAAC-R2-10, the loss of fish habitat in Birch Creek will be addressed through offsetting as required under the federal Fisheries Act. Birch Creek is channelized with an average width of 9.7 m (31.8 ft) and average depth of 0.5 to 1 m (1.6 to 3.3 ft) in spring. The width of the creek will decrease by 0.21 m (0.69 ft) as a result of the flow reduction. The creek is used in the spring for spawning by white suckers, and to a small extent by northern pike and even fewer numbers of walleye. It may also provide summer foraging habitat for small-bodied fish when water is present. The presence of spawning runs in smaller drainages suggests that Birch Creek will continue to provide spawning habitat in spring months even with lower flows. Spawning habitat for these species is present in the Dauphin and Fairford rivers and Lake St. Martin and the changes are not expected to affect fish populations.

Species at Risk

Re-watering of Birch Creek to supplement flows and mitigate effects to fish would have minimal benefits for SAR. The creek does not provide breeding habitat for wetland SAR, nor is it deep enough to provide suitable northern leopard frog (*Lithobates pipiens*) overwintering habitat. Barn swallow (*Hirundo rustica*) may experience a reduction in insect prey abundance at this creek due to reduced flow; however, changes are likely negligible due to the small changes in creek width. Overall, reduction in flows at Birch Creek are anticipated to have a low magnitude, localized effect on SAR or SAR habitat.

Health and Socio-economic Condition of Indigenous Groups

Effects on the health and socio-economic conditions are primarily related to the current and future availability of country foods. Changes to fish and fish habitat summarized above are unlikely to result in measurable changes to the long-term sustainability and production of focal fish populations that are important to commercial, recreational, and Aboriginal fisheries. The changes in wetland function discussed above may result in drier conditions, which may change the abundance of plants of interest to Indigenous groups, with upland plants such as berries, sage or birch becoming more prevalent (see also response to IAAC-R2-15). However, the area traversed by Birch Creek is classified mostly as tame pasture and haylands with some natural wetlands. Therefore, the overall effect on the current and future availability of country foods is considered negligible and the assessment of effects to the Indigenous health and socio-economic conditions remains unchanged from Volume 4, Section 10.3.3 of the Project Environmental Impact Statement (EIS). Additional information about the potential Indigenous health and socio-economic effects, as well as proposed mitigation measures, is available in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

Current Use of Lands and Resources for Traditional Purposes

Effects on the current use of lands and resources for traditional purposes are primarily related to change in the availability of resources for current use. Through the Indigenous consultation and engagement program for the Project, including Project-specific traditional land and resource use (TLRU) studies, Birch Creek was generally not identified as a harvesting location by Indigenous groups. Pinaymootang First Nation mapped fishing values demarcated by polygons that included Birch Creek (Tam 2022). Manitoba Transportation and Infrastructure acknowledges that lack of information about current use in a particular area should not be taken to indicate a lack of interest or use by Indigenous groups. Manitoba Transportation and Infrastructure has conservatively assumed that there is the potential for current use to occur at Birch Creek.

As discussed above, decreased flow in Birch Creek is unlikely to result in changes to the long-term sustainability and production of focal fish populations that are important to commercial, recreational, and Aboriginal fisheries. Change in wetland function discussed above may result in drier conditions, which may change the abundance of plants of interest to Indigenous groups, with upland plants such as berries, sage or birch becoming more prevalent (see also response to IAAC-R2-15). However, the area traversed by Birch Creek is classified mostly as tame pasture and haylands with some natural wetlands. Therefore, the assessment of effects to the availability of traditional resources for current use remains unchanged from Volume 4, Section 10.2.4.4 of the Project EIS.

Buffalo Creek Wetland complex

Wetland Function

As described in the May 31, 2022, response to IR IAAC-07, the Buffalo Creek wetland complex is fed by both surface water overland flow and groundwater upwelling within the catchment areas. In addition, Big Buffalo Lake may be supported by limited upward groundwater seepage from the underlying bedrock aquifer, thereby supplying Buffalo Creek with additional water that is difficult to measure and quantify.

As wetlands in the intersected sub-watersheds of the LSMOC may receive a mix of surface and sub-surface water, partial wetland loss and water flow blockage is expected to alter hydrology and associated vegetation conditions of remaining wetland areas, primarily downgradient of the LSMOC channel (see May 31, 2022, response to IR IAAC-53 for more information). The outside drain upgradient of the LSMOC will reduce upgradient effects from water blockage; however, flow and size limitations of the outside drain mean some upgradient flooding may still occur, particularly during periods of higher precipitation and surface run-off.

Based on the evaluation of effects from the Emergency Outlet Channel and scientific studies evaluating how peatland conditions change with distance from roads (Saraswati et al. 2020; Willier et al. 2022), effects from water blockage downgradient of the LSMOC will likely be greatest within 100 m of the channel, but could extend to 600 m, and possibly further. Effects will likely occur with or without

re-watering downgradient of the LSMOC but are expected to extend over a greater distance and have a greater magnitude without re-watering.

Changes in wetland conditions will be evaluated within 100-200 m of the Project development area (PDA) using a Before-After-Control design (Underwood 1992) with control sites located near the edge of the Vegetation and Wildlife LAA. This will allow evaluation of changes in wetland classes and functions, including early detection and longer-term changes. The Project Wetland Monitoring Plan, as filed as part of the June 2022 supplemental information response to IAAC IRs, will facilitate an assessment of changes to wetland size and class, and surface water flow/quality, groundwater interchange/hydraulics, vegetative cover, wildlife habitat for species biodiversity and SAR, and availability for use by Indigenous groups. The assessment will be expanded to monitor locations further from the PDA if changes in wetland condition and function are observed. Monitoring results will inform mitigation, including adjustment of selected measures and the need for potential additional measures.

As described in the July 24, 2023, response to IR IAAC-R2-13, the predominant wetland types in the LSMOC portion of the Project area are primarily peatlands (i.e., bogs, fens or swamps), with approximately 768.6 ha of these wetland types identified as being directly affected by the Project.

Peatlands are neither prescribed for offsetting nor are they regulated under The Water Rights Act or The Peatland Stewardship Act. Despite being exempt from providing any form of wetland offsetting, Manitoba Transportation and Infrastructure recognizes the ecological and environmental significance of other wetland types and is providing a Wetland Offsetting Program for the Project (see IAAC-R2-13) that addresses concerns received from local Indigenous groups (through the Indigenous consultation and engagement process), the RM of Grahamdale and Federal regulators. Indigenous groups have expressed that they would like to see offsetting for all wetland types affected by the Project – this includes peatlands in addition to other wetland types identified in the Wetland Compensation Plan (WCP) filed with IAAC in June 2022. Where mitigation is not available to address peatlands indirectly affected by the Project, Manitoba Transportation and Infrastructure will consider no-net-loss offsetting, thereby minimize the chance that loss or alteration of indirectly wetland types will have a measurable environmental impact on environmental parameters or the exercise of Aboriginal and Treaty rights.

Fish and Fish Habitat

As described in the July 24, 2023 response to IR IAAC-R2-10, the loss of fish habitat in Buffalo Creek will be addressed through offsetting as required under the federal Fisheries Act. Due to the nature of the wetland drainage, the original concept of re-watering of Buffalo Creek Wetland Complex was never considered as a potential mitigation for flow reduction in Buffalo Creek, as the extent to which flows added through re-watering efforts would have reached Buffalo Creek was not known. The reduction in flows in Buffalo Creek and associated reduction in wetted area is expected to affect habitat use by resident fish and spring spawning species such as sucker in years of high snow melt and spring precipitation. As noted for Birch Creek, spring spawning species have habitat available in

the Dauphin and Fairford Rivers and Lake St. Martin and measurable effects to fish populations are not expected.

Species at Risk

The reduction in flows in Buffalo Creek and associated reduction in wetted area may decrease habitat availability for SAR (e.g., olive-sided flycatcher [*Contopus cooperi*]) and reduce food (i.e., insect) availability for insectivorous SAR including little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), common nighthawk (*Chordeiles minor*), and olive-sided flycatcher (*Contopus cooperi*). An increase in tree and shrub establishment adjacent to the PDA may shift the distribution of SAR over time. Marsh wetlands that provide breeding habitat for SAR such as trumpeter swan (*Cygnus buccinator*), horned grebe (*Podiceps auratus*), rusty blackbird (*Euphagus carolinus*), and northern leopard frog (*Rana pipiens*) is not prevalent and unlikely to be affected by the LSMOC. Reduced flow may benefit some species requiring drier habitats such as short-eared owl (*Asio flammeus*) and yellow rail (*Coturnicops noveboracensis*). Overall, a decrease in wetted area downgradient of LSMOC may reduce habitat suitability for some SAR while increasing it for others. Effects are anticipated to be moderate in magnitude and long-term. The Project Wetland Monitoring Plan, as filed as part of the June 2022 supplemental information response to IAAC IRs, will facilitate an assessment of changes to wetlands and SAR in the LSMOC area. The assessment will be expanded to include monitoring locations further from the PDA if changes in wetland condition and function are observed. Monitoring results will inform mitigation, including adjustment of selected measures and the need for potential additional measures.

Health and Socio-economic Condition of Indigenous Groups

Effects on the health and socio-economic conditions are primarily related to the current and future availability of country foods. As noted above, while changes in wetted area may change fish habitat and spring spawning in some years for species such as sucker, these changes are unlikely to result in changes to the long-term sustainability and production of focal fish populations in the region that are important to commercial, recreational, and Aboriginal fisheries. Similar to effects on SAR described above, a decrease in wetted area downgradient of LSMOC may reduce habitat suitability for some traditionally harvested species (e.g., ducks, geese), while increasing it for others (e.g., sharp-tailed grouse [*Tympanuchus phasianellus*]).

The changes in wetland function discussed above may result in drier conditions, which may affect surface water flow, vegetation cover and wildlife habitat. Manitoba Transportation and Infrastructure has developed a Wetland Offsetting Program that includes both those wetlands outlined in the WCP as well as other wetlands as described in IAAC-R2-13. This will be used to address most of the potential effects that the Project has on wetlands of various types (including peatland) that cannot be fully mitigated. The result should be to address functional changes in wetlands in a manner that also facilitates the ongoing exercise of Aboriginal and Treaty rights by Indigenous groups. While the potential effects to the Buffalo Creek wetland complex may adversely affect the availability of country foods, the intent of wetland offsetting (where applied) is to enhance, restore or preserve wetlands with

consideration of the select functional environmental target(s); in this case to have plants and wildlife that would have been harvested before and, ideally, in close proximity to the area where they were harvested. Therefore, the overall effect on the current and future availability of country foods is considered low and the assessment of effects to the Indigenous health and socio-economic conditions remains unchanged from Volume 4, Section 10.3.3 of the Project EIS.

Current Use of lands and Resources for Traditional Purposes

Effects on the current use of lands and resources for traditional purposes are primarily related to change in the availability of resources for current use. Through the Indigenous consultation and engagement process for the Project, including Project-specific TLRU studies, Buffalo Creek was identified as an area where harvesting occurs. Dauphin River First Nation, Fisher River Cree Nation, and Peguis First Nation reported hunting and trapping areas along Buffalo Creek, with good wildlife habitat including for moose and deer. Hollow Water First Nation and Lake St. Martin First Nation expressed concerns that effects to Buffalo Lake, Buffalo Creek and adjacent wetlands will affect the fishery. Dauphin River First Nation, Hollow Water First Nation, Manitoba Metis Federation, Norway House Cree Nation and Pimicikamak Okimawin have shared concerns that the Project will affect Buffalo Creek ecosystem and impact wildlife habitat. Dauphin River First Nation, Kinonjeoshtegon First Nation and Lake Manitoba First Nation have stated that changing the water drainage in the Buffalo Creek watershed may have adverse impacts on Indigenous land use. Lake St. Martin First Nation is concerned that modification of the terrestrial and wetland habitat adjacent to the LSMOC impacts Lake St. Martin First Nation traditional land usage, hunting and harvesting, and cultural practices. Manitoba Transportation and Infrastructure acknowledges that lack of information about current use in a particular area should not be taken to indicate a lack of interest or use by Indigenous groups. Manitoba Transportation and Infrastructure has conservatively assumed that there is the potential for current use to occur at Buffalo Creek.

As noted above, while changes in wetted area may change fish habitat and spring spawning in some years for species such as sucker, these changes are unlikely to result in changes to the long-term sustainability and production of focal fish populations that are important to commercial, recreational, and Aboriginal fisheries. Similar to effects on SAR described above, a decrease in wetted area downgradient of LSMOC may reduce habitat suitability for some traditionally harvested species (e.g., ducks, geese), while increasing it for others (e.g., sharp-tailed grouse). Changes in wetland function discussed above may result in drier conditions at some sites, which may subsequently affect surface water flow, vegetation cover and wildlife habitat. Monitoring will help determine if and where the effects to the Buffalo Creek wetland complex are adversely affecting the availability of resources for Indigenous use. Manitoba Transportation and Infrastructure is proposing no-net-loss wetland offsetting to address potential effects where mitigation cannot be effectively applied (see response to IAAC-R2-13 for more details). Therefore, the assessment of effects to the availability of traditional resources for current use remains unchanged from Volume 4, Section 10.2.4.4 of the Project EIS.

Question IAAC-R2-14
July 24, 2023

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QUESTION IAAC-R2-22

Referenced Round 1 IR(s): IAAC-38, IAAC-65, IAAC-66, IAAC-69, IAAC-127

Expert Dept. or group: IAAC
Norway House Cree Nation
York Factory First Nation

EIS Guideline Reference: 7.1.10 Indigenous peoples

7.3.3 Indigenous peoples

Context and Rationale

The EIS Guidelines require the Proponent to describe any residual environmental effects of the Project on VCs. For those VCs related to effects of changes to the environment on Indigenous peoples, the Proponent is required to discuss the residual effects with Indigenous groups and consider the view of Indigenous peoples in the determination of significance criteria.

The response to IAAC-66 states that the modeling used to predict water level conditions in Lake Winnipeg estimates that with the Project, peak water levels could reach a maximum of 218.58 m, with daily water levels expected to be in the range of 0-7 cm during channel operation (data collected between 1976 and 2018). Norway House Cree Nation indicated that in 2022, Manitoba Hydro reported a wind eliminated water level of 218.69 m in Lake Winnipeg, an 11 cm increase over the predicted peak with the Project.

In the response to IAAC-65 (notes for Table IAAC-65-1), it is described that water moves more efficiently from Lake Manitoba to Lake Winnipeg (shown as reduced overland flooding and duration in IAAC-38) and therefore it is not clear how the Project would remain analogous with the 7 cm increase in water levels for the 2011 flood in July. The response to IAAC-127 states, “Aside from the flood peaks, water levels in Lake Winnipeg and downstream may differ slightly at other times of the year. However, the dominant factor influencing operation of the Lake Winnipeg Regulation (LWR) is the overall amount of water inflow to the system, which varies widely from year to year. The differences in water levels in Lake Winnipeg and water bodies downstream of Lake Winnipeg associated with the Lake Manitoba Lake St Martin Channels Project are not expected to be discernible in the context of existing water level variations (Manitoba Hydro 2019, included as Volume 2, Appendix 6I of the Project EIS).” Appendix 6I of the EIS also concludes, “Under some flood conditions, the duration of maximum Lake Winnipeg outflow operations are extended in the case with the Lake Manitoba Lake St. Martin Channels Project, resulting in longer periods of higher water levels along the Nelson River.” The effects of increased duration of high-water levels experienced on the Nelson River from the operation of the Project have not been assessed. Appendix 6I does not consider recent modeling completed by the Proponent and it is unclear if Appendix 6I is still relevant considering additional modeling completed since the submission of the EIS.

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July 24, 2023

The 2019 report entitled “Impacts of Lake Manitoba and Lake St. Martin Outlet Channels Project on Downstream Water Levels” prepared by Manitoba Hydro states that “Manitoba Hydro may alter its operation to anticipate and mitigate the effect of higher intensity Lake Winnipeg inflows due to the LMB/LSM Channels Project.” Given that LWR operations regulate flow out of Lake Winnipeg and peak flood levels on Lake Winnipeg to reduce the number and severity of Lake Winnipeg shoreline flooding incidents, understanding the peak water levels on Lake Winnipeg due to operation of the Project is necessary to determine if there could be additional downstream effects (including the Nelson River) to Indigenous communities. The interaction between the operation of the LWR and the operation of the Project requires further consideration in order to assess potential adverse effects.

An updated evaluation of water levels on Lake Winnipeg is required to understand the relative contribution of the outlet channels on potential effects of downstream peak flood levels. Periods of high-water levels have the potential to adversely affect land and resource use by Indigenous peoples for traditional and recreational purposes and their health and socio-economic conditions.

Information Requests

a. Provide an updated assessment of changes to water levels in Lake Winnipeg and downstream from the operation of the Project and include in the assessment:

   i. limitations in outflow capacity for Lake Winnipeg;

   ii. the duration of increased water levels; and

   iii. anticipated effects of climate change on predicted water levels of Lake Winnipeg and downstream waterbodies.

b. Assess the potential downstream effects to the health and socio-economic condition of Indigenous peoples, and the current use of lands and resources for traditional and recreational purposes based on the revised assessment in a. and describe any required mitigation measures and monitoring and follow-up programs.

c. Provide information on how Indigenous groups will be engaged and their views considered to determine mitigation measures and monitoring and follow-up programs.

d. Provide information on the Lake Winnipeg Regulation (LWR) operations in relation to the operation of the Project. Describe magnitude and duration of downstream peak high-water levels and maximum discharge periods from Lake Winnipeg associated with LWR operation in conjunction with operation of the Project.

e. Complete a cumulative effects assessment on the Project and the LWR including mitigation measures for potential adverse cumulative effects to the health and socio-economic condition of Indigenous peoples, and the current use of lands and resources for traditional and recreational purposes.

Question IAAC-R2-22
July 24, 2023

Response IAAC-R2-22

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

Regarding the Context and Rationale in the first sentence of the second paragraph, Manitoba Transportation and Infrastructure offers a correction for the reference to IAAC-66 as the source of the stated information. The correct source is Project EIS Volume 2 Appendix 6I.

a. **Updated Assessment of Changes to Water Levels in Lake Winnipeg and Downstream Waterbodies**

A detailed updated assessment of changes to water levels in Lake Winnipeg and downstream waterbodies is provided in IAAC-R2-22 Appendix IAAC-R2-22-1. This includes a cover letter and two technical appendices: Water Simulation and Climate Change. This information, prepared by Manitoba Hydro in response to request by Manitoba Transportation and Infrastructure, is an update to the original information provided in 2019, filed as Project Environmental Impact Statement (EIS) Volume 6 Appendix 6I. That original information however did not include consideration of climate change. As before, the immediate downstream waterbody is the Nelson River, along which information is provided for two Indigenous groups: Pimicikamak Cree Nation (located at Cross Lake) and Tataskweyak Cree Nation (located at Split Lake). The discussion below references the lakes given the needed geographic context.

This updated assessment reflects refinements in Project engineering design (provided to Manitoba Hydro by Manitoba Transportation and Infrastructure) since the Project EIS and includes information in the May 2023 Project Description Update filed prior to filing of the Round 2 IRs with IAAC. Of particular relevance to IAAC-R2-22 is the update to the water balance model to incorporate the head loss that occurs as water flows through the Lake St. Martin Narrows. The updated model indicated that the head loss reduced the flood reduction benefit on Lake Manitoba and Lake St Martin, since the Narrows creates a restriction in the flow through Lake St. Martin between its south and north

basins. In response to the updated modeling results, the LSMOC was modified to improve the Project's ability to manage flows through Lake St. Martin and to restore the original flood reduction benefit.

The updated results (Appendix IAAC-R2-22-1,Table 1) are similar to those provided in the Project EIS (Volume 6 Appendix 6I Table 1) and, as such, represent a negligible change that, also as before, represents a negligible incremental effect by the Project to Lake Winnipeg and downstream waterbodies. While there are some differences in presentation of the tabular information, the key result of lake elevations are directly comparable, as summarized below in Table IR2-22-1. Those tabular results rely on a hydrologic model in which recorded (historical) inflows into Lake Winnipeg are used to simulate that lake's elevation, hence the meaning of Manitoba Hydro's term "simulated recorded".

Table IAAC-R2-22-1 Lake Elevation Comparison Between Original and Updated Results

Location	Elevation Change by Project (m)			
	Original	Updated	Direction	Difference
Lake Winnipeg	0.07	0.05	Decrease	0.02
Cross Lake	0.06	0.04	Decrease	0.02
Split Lake (2005)	0.01	0.01	Same	0.00
Split Lake (2017)	0.00	0.00	Same	0.00

Regarding Lake Winnipeg, the updated maximum increase in elevation is 5 cm (2 in), which is slightly less than the original 7 cm (3 in). The maximum elevation at Cross Lake has likewise slightly decreased to 4 cm (1.5 in), while the results at Split Lake remain the same, with a maximum increase in elevation of 1 cm (0.4 in). The trend of diminishing change from Lake Winnipeg to Split Lake reflects the distances downstream of the communities from Lake Winnipeg.

To further assist interpretation of these results, Figure IAAC-R2-22-1 (based on the response to IR IAAC-65, as filed on May 31, 2022, with IAAC) illustrates the locations of, and distances between, the various geographic points of interest in this response (i.e., along the Nelson River, distances by air versus the longer distance along the river).

Interpretation of the magnitude of Project-caused elevation increase, leading to the above conclusion of negligible relative change, is based on a comparison of the simulated post-Project water levels to the simulated pre-Project water levels on Lake Winnipeg. Those historical levels are subject to natural variation and to various degrees of management along the Nelson River. In the case of Lake Winnipeg, the updated Duration Curve (Appendix IAAC-R2-22-1, Figure 1; the % of time that water levels are at a specific elevation) for that lake shows a change in water level (from minimum to maximum) of 1.65 m (5 ft) over that 40-year history (1977-2017). As such, the maximum Project-caused increase of 0.05 m (2 in) is only 3% of that variation of lake level.

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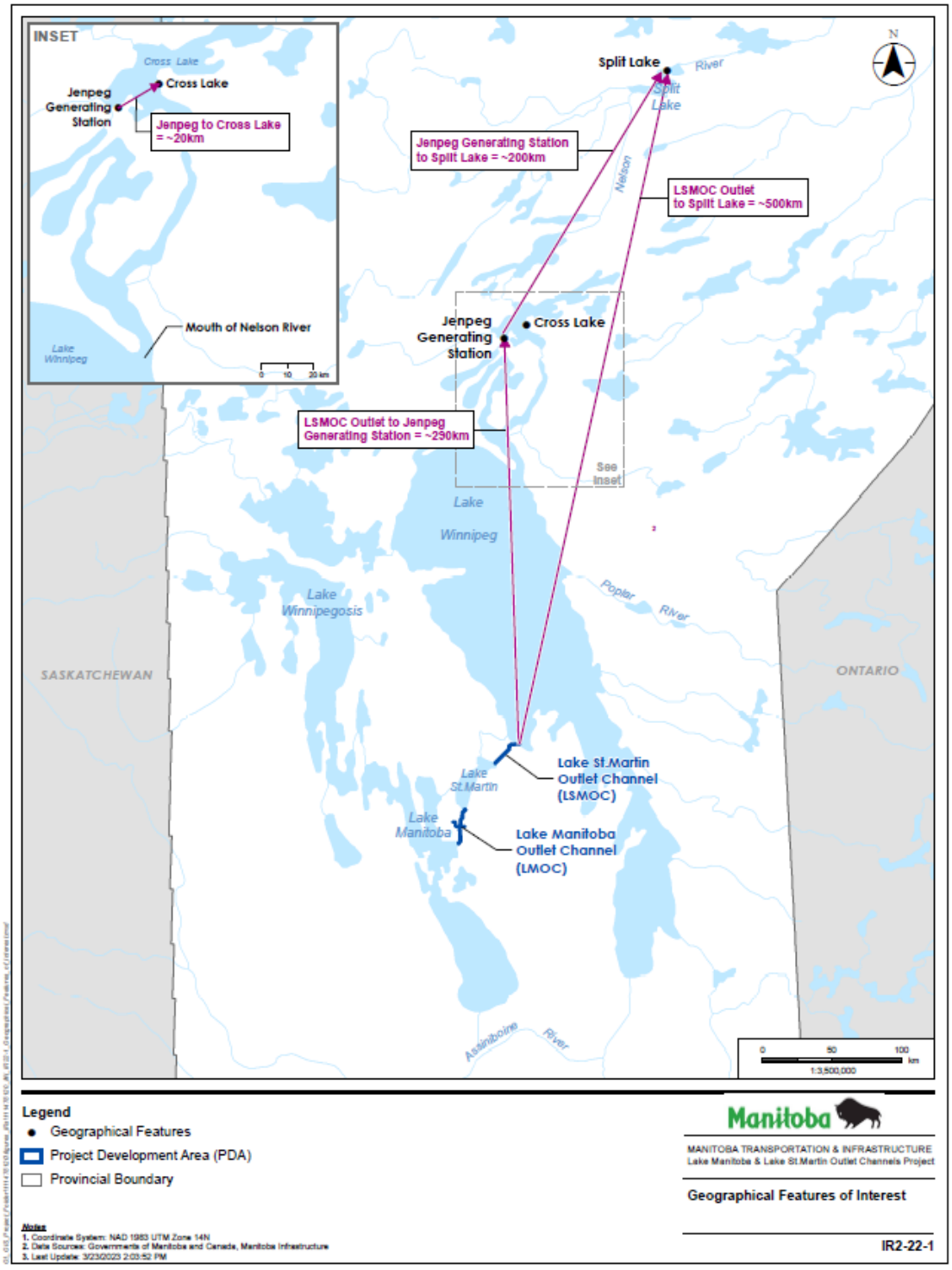
Figure IAAC-R2-22-1 Geographical Features of Interest Showing Relative Distances



Demonstrating this further in a visually different way, Figure IAAC-R2-22-2 (prepared by Manitoba Transportation and Infrastructure), a hydrograph (elevation over time) shows observed lake elevations for almost the same period (45 years; 1977-2022). Of note, the year 2022 saw the highest Lake Winnipeg water level since the start of regulation. Based on Lake Manitoba water levels that year, the Project would not have operated that year and would therefore have had no impact on the peak Lake Winnipeg level. Duration Curves for Cross Lake and Split Lake (Appendix IAAC-R2-22-1, Figures 2 and 3, respectively) provide similar information for those locations.

As a last indicator of Project caused change, the maximum 5 cm (2 in) elevation increase of Lake Winnipeg represents only a 0.004% increase in lake volume (the lake has an area of 23,750 km^2 [9,170 square miles] and a volume of 284 km^3 [68 cubic miles] with an average depth of 12 m [39 ft]).

The following provides further detailed information organized by each of the three subordinate requests within request IR2-22 (a).

ii. ***Limitations in Outflow Capacity for Lake Winnipeg***

The Lake Winnipeg Regulation (LWR) *Water Power Act* Licence allows Manitoba Hydro to regulate the lake's outflow for the development of electric power and energy on the Nelson River by using a control structure at the Jenpeg Generating Station. When the lake level (all water elevations in this IR response are above sea level) is between 216.7 m (711 ft) and 217.9 m (715 ft), the licence allows Manitoba Hydro to set the outflows as required for power production purposes along the Nelson River. When the water level is above 217.9 m (715 ft), Manitoba Hydro in accordance with the terms of the licence must ensure the maximum possible discharge through the Jenpeg control structure until the lake level returns to 217.9 m (715 ft). During low flow periods when the Lake Winnipeg water level is below 216.7 m (711 ft), Manitoba Hydro must operate the Jenpeg control structure following the order issued by the Minister of Environment and Climate. Since the optimization of power production is complex and the relative contribution from the Project is minor in the context of the entire Lake Winnipeg inflow, the analysis used historic outflows at Jenpeg while Lake Winnipeg was within the power generation range and used new outflows corresponding to the flood levels when above 715 ft (217.9 m).

Manitoba Transportation and Infrastructure also wishes to ensure clarity regarding any inclusion or intent regarding Project-associated power generation; specifically, the proposed Project does not include nor is part of any power production scheme. Appendix IAAC-R2-22-2 provides a letter from Manitoba Hydro to Manitoba Transportation and Infrastructure further stating this.

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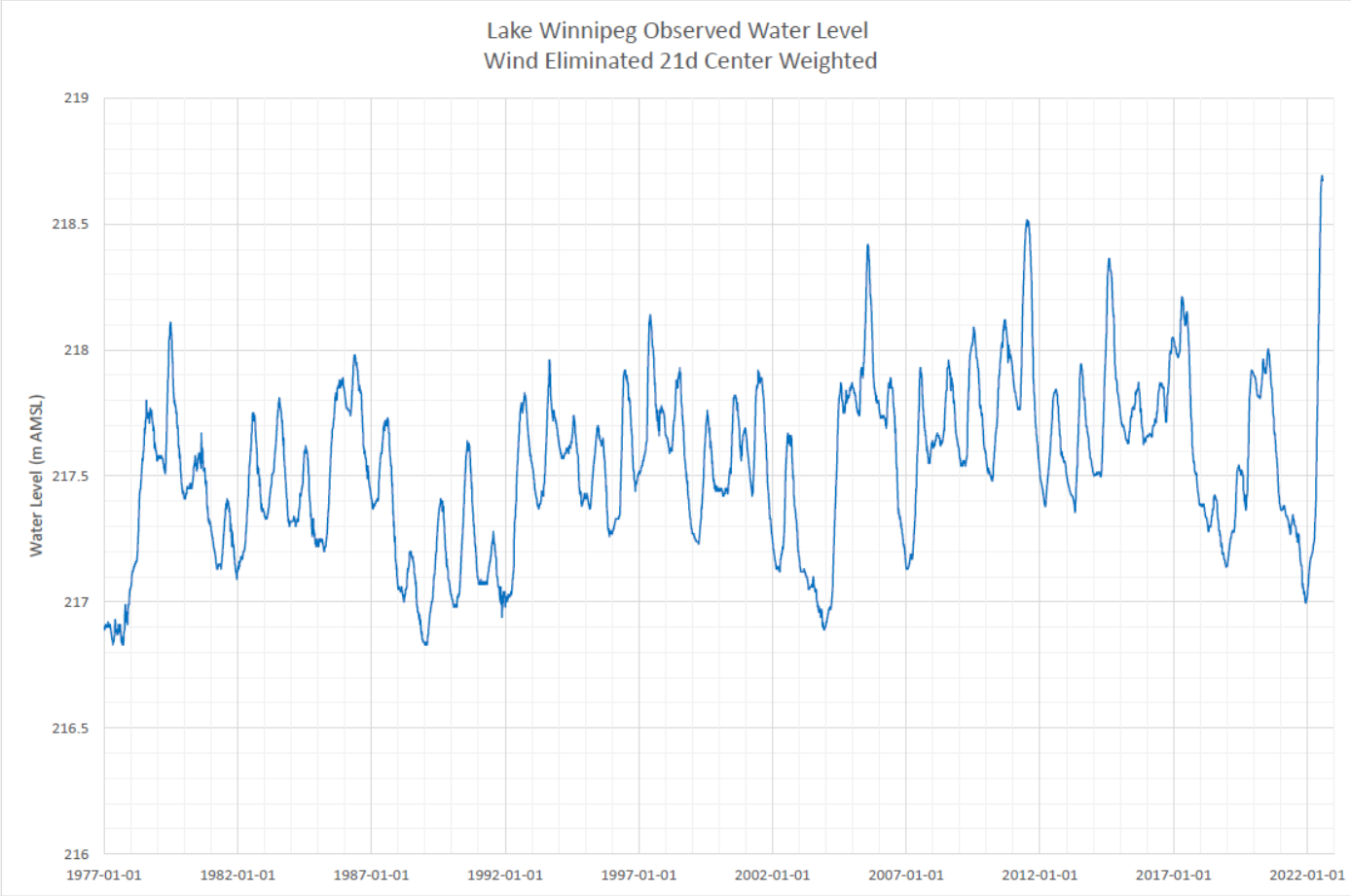
Figure IAAC-R2-22-2 Lake Winnipeg elevations over 45 Years (1977-2022)



ii. ***Duration of Increased Water Levels***

Operation of the Project is anticipated to increase the duration of time that water levels and volume flow are elevated in Lake Winnipeg. This is due to increased volume flow of water into Lake Winnipeg and longer retention of that additional water as it then flows downstream into the Nelson River. However, as the data identified below demonstrates, the effects are negligible.

Figure IAAC-R2-22-3 (prepared by Manitoba Transportation and Infrastructure) shows observed water levels in Lake Winnipeg without the Project and simulated levels with the Project for a period of time representative of the 2011 flood. The duration of flood conditions starts and ends approximately half a year before and after 2011, respectively. The following can be interpreted from this:

- The briefest duration of time of observable/measurable Project change to duration is 8 days, representing approximately an additional week when post-Project water levels are above the LWR power production range of 217.9 m (715 ft) compared to without the Project.
- The intermediate duration of time of observable/measurable Project change to duration is 52 days, representing approximately 1.7 months when post-Project water levels are peaking greater than the peak without the Project.
- The longest duration of time of observable/measurable Project change to duration is 575 days, representing approximately 1.5 years when levels are above (> 5 millimetres [mm]) that without the Project.

For Cross Lake, the intermediate duration is 48 days, and the longest duration is 556 days. For Split Lake the intermediate duration is 7 days, and the longest duration is 527 days.

Figure IAAC-R2-22-4 (prepared by Manitoba Transportation and Infrastructure) shows observed volume flow rates without the Project and simulated with the Project, also for a period of time representative of the 2011 flood. In summary, Project operation is anticipated to increase volume flow rate by at least 0.5% for 189 days, and for a peak of 11 days by at least 5% within that longer period of time. These changes in flow are not anticipated to cause change in effects, and their conclusions, as assessed in the Project EIS.

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Figure IAAC-R2-22-3 Lake Winnipeg Elevations and Durations during the 2011 Flood

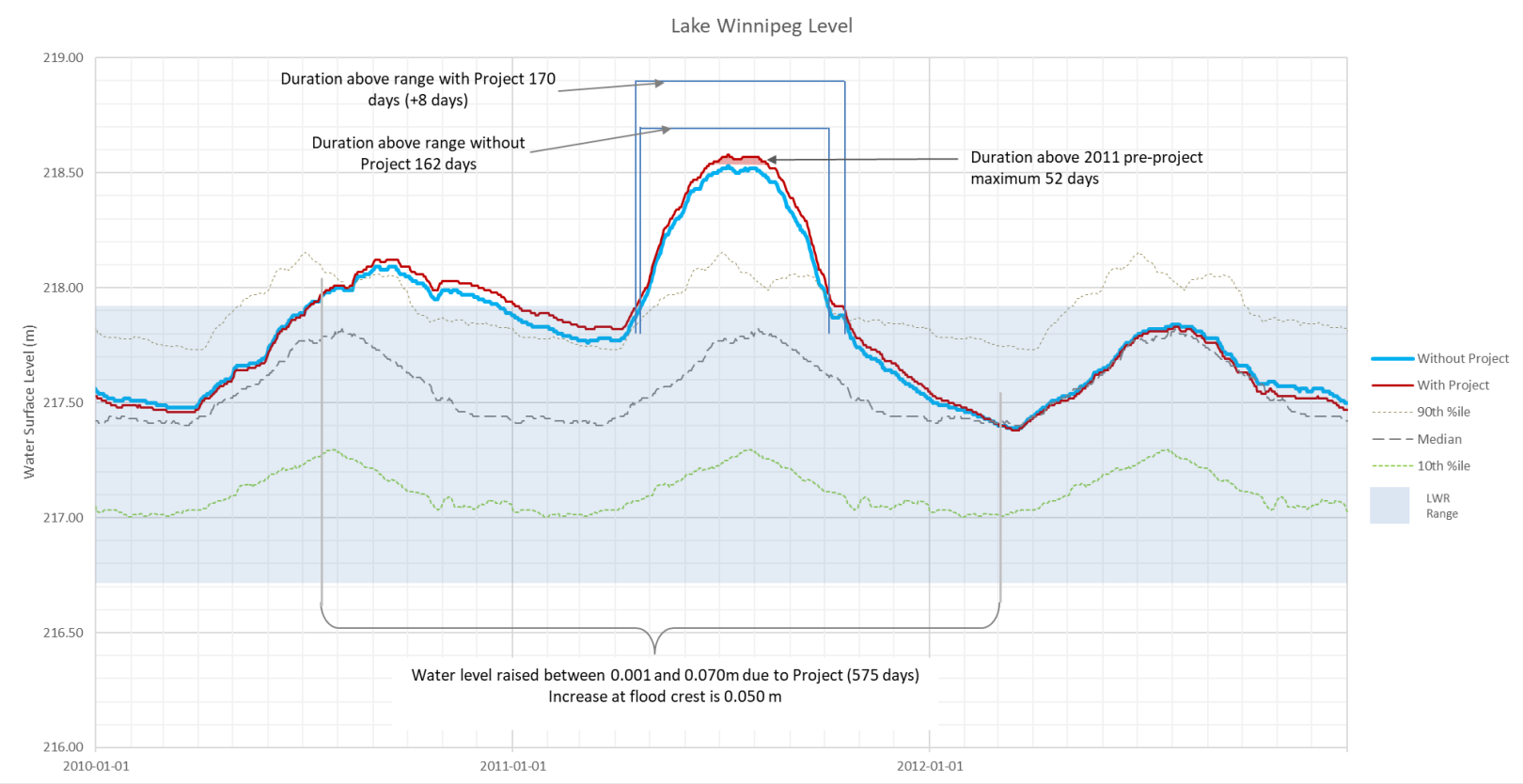

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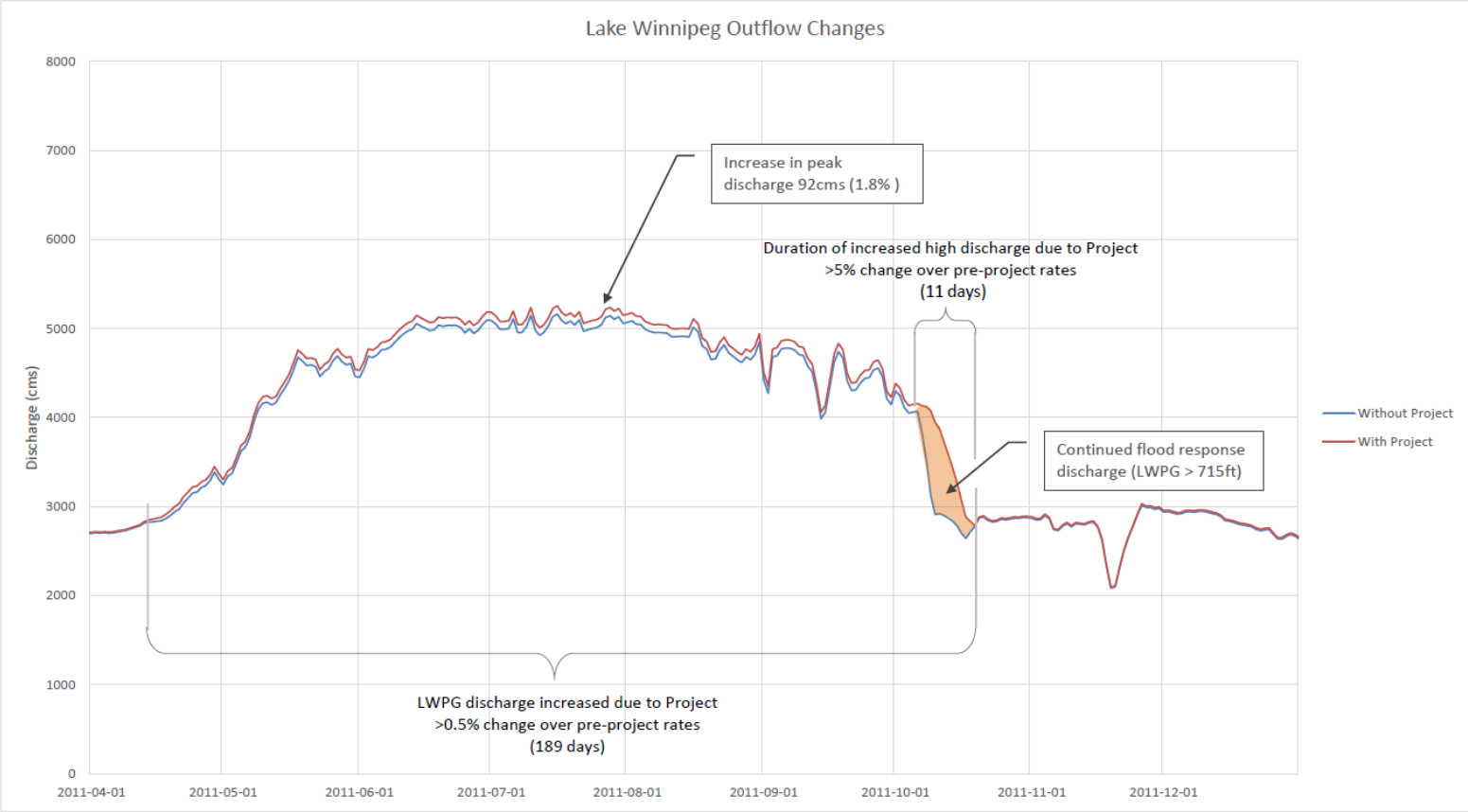
Figure IAAC-R2-22-4 Lake Winnipeg Flows during the 2011 Flood



iii. ***Effects of Climate Change on Predicted Water levels of Lake Winnipeg and Downstream Waterbodies***

Appendix IAAC-R2-22-1, Technical Appendix (Climate Change) provides a discussion and modeling of climate change sensitivities of the Lake Winnipeg Basin (Figure 1) projected 50 years into the future. Analysis was based on Global Climate Model (GCM) projections carried forward in regional WATFLOOD hydrological models. Such analysis represents Manitoba Hydro's continuing effort in evaluating climate change implications to its operations of the Lake Winnipeg Regulation.

Modeling of climate change scenarios decades into the future for regional landscape scale areas subject to complex multiple hydraulic dynamics represents a considerable challenge anywhere. This includes provision of reasonable accuracy (degree by which modeled results reflect a "true" outcome) and precision (degree by which results arithmetically are "correct"), both influencing degree of confidence.

In summary, of the various insights and results provided, the most informative for the purposes of this IR response is the degree by which Project operation changes inflow of water (volume flow rate) into the basin. This approach is in recognition of the implication of a key climate change variable, change in precipitation (also associated with change in temperature), to the overall movement of water in the basin. That change has direct relevance to the Project as the Project conveys water in the basin system. This approach also reflects the multiple inflow contributors to Lake Winnipeg, as described in the Round 3 response to IAAC-IR1-65 Table IAAC-65-1, in which the Project (specifically, the LSMOC) would (using updated values for current Project design) displace 2.2% of the Dauphin River's 4.4% inflow to Lake Winnipeg, the balance of the inflow (95.6%) from seven other named rivers and other flows. As such, the Project would increase total inflow into Lake Winnipeg by 0.3% on average for the 1976-2021 historical record. This also indicates the relatively minimal contribution of water by the Project into Lake Winnipeg.

There is general agreement between Global Climate Models and the methods used to estimate changes to runoff that runoff (and, hence, inflow to waterbodies) will increase in the future, and that this will lead to higher peak levels on waterbodies in Manitoba. Because of the large size of its catchment area, Lake Winnipeg experiences some buffering of this change (i.e., responds with relatively small elevation changes and long periods of time for change).

As shown in Appendix IAAC-R2-22-1, Figure 3 and associated discussion, changes to basin mean monthly inflow due to the Project under historic inflow conditions ranges from -20 m^3/s (-706 cfs) to +37 m^3/s (+1306 cfs; Panel C). This represents a change in mean monthly inflow due to the Project ranging from -1.2% to +1.3% depending on the month. Changes to basin mean monthly inflow due to the Project under climate change conditions ranges from -22 m^3/s (-777 cfs) under the dry future scenario to +40 m^3/s (1412 cfs) under the wet future scenario (Panel F). This represents a change in mean monthly inflow due to the Project under climate change conditions ranging from -1.3% to +1.4% respectively depending on the month which is within +/- 0.1% from the historic climate condition.

As such, in conclusion, climate change implications to Project operation and hydraulic effects are negligible.

b. **Effects to Indigenous Groups, Mitigation Measures, Monitoring and Follow-up Programs**

Due to the negligible measurable changes by the Project to elevations and flows, as discussed in response (a) above, no measurable changes are anticipated to effects to Indigenous groups, mitigation measures, monitoring and follow-up programs as already assessed in the Project EIS and responses to IAAC IRs. Additional information about concerns related to changes to water levels in Lake Winnipeg on Indigenous health and socio-economic conditions can be found in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

c. **Input from Indigenous groups on Mitigation, Monitoring and Follow-up Programs**

Given the predicted negligible measurable changes, the focus of Manitoba Transportation and Infrastructure engagement on this issue will be to work with Indigenous groups to explain the issue and the monitoring and management measures being proposed to verify that measurable Project effects are not extending beyond Sturgeon Bay in Lake Winnipeg. The monitoring and management plans form the Project Environmental Management Program (EMP). Indigenous groups engaged on the Project were given the opportunity to review and comment on the drafts of these plans in November and December of 2020. Feedback received to date from Indigenous groups and as part of the continued environmental assessment process has and will inform continued improvement to the EMP. There will be further opportunities to advance Indigenous content in the EMP plans.

The monitoring results of this Program will be shared with the Environmental Advisory Committee (EAC). As described in the response to Information Request IAAC-R2-30, the purpose of the EAC is to facilitate information sharing and provide advice or recommendations to Manitoba Transportation and Infrastructure on the ongoing refinement of the EMP as well as on the implementation of the EMP for the Project in a coordinated and collaborative manner. The intent is to provide opportunities for rights-holders and stakeholders to have meaningful input into Project planning, plan implementation, and follow up processes associated with the Project. This would include opportunities to provide input on mitigation, monitoring and follow-up programs that relate to potential downstream effects to the health and socio-economic condition of Indigenous groups, and the current use of lands and resources for traditional and recreational purposes.

d. **Lake Winnipeg Regulation Operations in Relation to Project Operation**

Manitoba Transportation and Infrastructure's operations are not subject to The Water Power Act or the LWR licence. Manitoba Hydro’s operations are subject to those provisions. Under the LWR Water Power licence Manitoba Hydro is required, among other things, to provide to the satisfaction of the Director monthly forecasts of water levels and flows in connection with the operation of the LWR. Manitoba Transportation and Infrastructure will continue to provide relevant information about Lake Manitoba system outflows to Manitoba Hydro to inform, where necessary, Manitoba Hydro’s LWR forecasting and operations.

In the appendices to this IR, Manitoba Hydro provides clarifying statements regarding the degree by which it anticipates its operations (under the LWR) to be influenced by the Project. In Appendix IAAC-R2-22-1, Manitoba Hydro states that they "...may alter its operations to mitigate the effect of higher intensity Lake Winnipeg inflows resulting from LSM/LMB releases if provided forecast information in advance and would be consistent with Manitoba Hydro's operations planning process." In Appendix IAAC-R2-22-2, Manitoba Hydro states that their "...analysis of the changes to the flows that may result from Manitoba's proposed operation of the outlet channels will not impose a material change on our operations in the province."

In conclusion, the Project minimally affects Lake Winnipeg and downstream water bodies. Its impact will not be discernable when the lake is within the power production regulated range of 711 to 715 ft (216.7 to 217.9 m). If the outflow from the Project is contributing to Lake Winnipeg when the lake level is above 715 ft (217.9 m), then Manitoba Hydro in accordance with the terms of the licence must ensure the maximum possible discharge through the Jenpeg control structure until the lake level returns to 715 ft (217.9 m).

e. **Cumulative Effects Assessment on Project and Lake Winnipeg Regulation**

Due to the negligible measurable changes by the Project to elevations and flows, as discussed above, no changes are anticipated to the cumulative effects assessment as provided in the Project EIS and responses to IAAC IRs.

References

Firelight Research Inc. (Firelight) with Dauphin River First Nation (DRFN). 2023. Draft Report. Dauphin River First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Firelight Research Inc. (Firelight) with Kinonjeoshtegon First Nation (KFN). 2023b. Draft Report. Kinonjeoshtegon First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023

Firelight Research Inc. (Firelight) with Lake Manitoba First Nation (LMFN). 2023. Draft Report. Lake Manitoba First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet. May 31, 2023.

Firelight Research Inc. (Firelight) with Lake St. Martin First Nation (LSMFN). 2023. Draft Report. Lake St. Martin First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

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Firelight Research Inc. (Firelight) with Peguis First Nation (PFN). 2023. Draft Report. Peguis First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

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Malone, Molly, Firelight Research Inc. (Firelight) with the Little Saskatchewan First Nation (LSFN). 2023. Draft Report. Little Saskatchewan First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Malone, Molly, Firelight Research Inc. (Firelight) with the Peguis First Nation (PFN). 2023. Draft Report. Peguis First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Malone, Molly, Firelight Research Inc. (Firelight) with the Pinaymootang First Nation (PMFN). 2023. Draft Report. Pinaymootang First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

QUESTION IAAC-R2-24

Referenced Round 1 IR(s): IAAC-03, IAAC-122, CEMP

Expert Dept. or group: IAAC
Fisher River Cree Nation
Hollow Water First Nation

EIS Guideline Reference: 7.1.10 Indigenous peoples

7.3.3 Indigenous peoples

9. Monitoring and Follow up Programs

Context and Rationale

The EIS Guidelines require the Proponent to assess current use of lands and resources for traditional purposes including changes in access to areas and resources without difficulty or additional costs to conduct an activity or practice, as well as areas allowing access to non-Indigenous populations for use, and consideration of preferred areas, timing of harvest, options for traveling in a preferred manner and to consider the experience by Indigenous peoples.

The CEMP states that there are no nearby residents that will be affected by the increased noise associated with heavy machinery and equipment during construction of the LSMOC. Monitoring of the acoustic environment is proposed in the event of residential complaints related to construction noise. However, these measures are only in place for the LMOC whereas the LSMOC monitoring of the acoustic environment is absent and relies entirely on the Complaint Resolution Process (CRP). This statement fails to account for the possibility of existing traditional land users in the area. For example, Fisher River Cree Nation has expressed concerns that the impact of long-term noise and activity from the construction will affect recovery of the moose population in the LAA. Fisher River Cree Nation also noted noise will affect the eco-tourism and bear hunting experiences offered by their outfitting business in the LAA and RAA. In the response to IAAC-122 (Table IAAC-122-1). Kinonjeoshtegon First Nation and Peguis First Nation also indicated concerns about wildlife such as moose and deer being affected by construction and traffic noise. Brokenhead Ojibway Nation, Bloodvein First Nation, Black River First Nation and Fisher River Cree also indicated concerns around experience on the land.

Regarding acoustic impacts to wildlife, the CEMP states “If noise abatement barriers are ineffective, a reduction in intensity of construction should be considered”. There are no means described for what would constitute the ineffectiveness of noise abatement barriers. Therefore, a methodology for determining the effectiveness of noise abatement barriers needs to be defined in order to clarify when and if construction intensity will be reduced. The CRP indicates additional mitigation measures may be implemented where the complaint is in relation to a commitment of the Proponent. It is not clear what

commitments have been made to traditional land users with respect to those potentially affected by noise from construction of the LSMOC.

An assessment of potential effects of noise on Indigenous people and wildlife along the LSMOC is required for the development of mitigations, monitoring and adaptive management thresholds of residual effects. Noise monitoring plan and adaptive management measures should be implemented for both LMOC and LSMOC construction phases in order to address possible impacts to traditional land users' health and socio-economic conditions, current use of lands and resources for traditional purposes, and cultural experience.

Information Requests

a. Provide an assessment of noise for the LSMOC for effects to health socio-economic conditions, current use of lands and resources for traditional purposes, and cultural experience of Indigenous peoples.

b. With respect to effects to wildlife, provide a methodology for determining the effectiveness of noise abatement barriers used and sensitivity limits for adaptive management. Include the measures and effects entailed by a reduction in construction intensity.

c. For the acoustic environment, describe a plan to monitor noise levels during the construction phase in addition to the CRP. Describe adaptive management measures to address potential impacts based on monitoring results and how Indigenous groups will be involved in evaluating the effectiveness of mitigation for effects on wildlife, health and socio-economic conditions, current use of lands and resources for traditional purposes, and cultural experience.

d. Describe the additional mitigation measures and follow-up program components that may be implemented through the CRP.

Response IAAC-R2-24

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) provided on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups and key stakeholders such as the Rural Municipality (RM) of Grahamdale. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN

2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

Since responses to the previous IRs were filed on May 31, 2022, Fisher River Cree Nation, Pinaymootang First Nation, Little Saskatchewan First Nation, the Manitoba Metis Federation and the RM of Grahamdale have shared additional concerns regarding Project related sensory disturbances, including noise. Fisher River Cree Nation is concerned that noise will affect the eco-tourism and bear hunting experiences offered by their outfitting business in the local assessment area (LAA) and regional assessment area (RAA; FRCN 2022). Pinaymootang First Nation has indicated that the Project will contribute to a loss of sense of place, confidence, and safety due to land clearing and other Project construction and operations activities (e.g., noise, dust) (Tam 2022). Pinaymootang is concerned about the Project's effects on cultural experience (including increased noise, dust and light pollution) or knowledge transmission that could result from loss of fishing opportunities in preferred, culturally important areas (PFN 2022). The RM of Grahamdale has stated that higher traffic levels, additional noise pollution and severance of roads by the channels will impact their residences (RM of Grahamdale 2022). The Manitoba Metis Federation and Little Saskatchewan First Nation have requested that Manitoba Transportation and Infrastructure provide further details on the potential impacts of noise and vibration resulting from construction activities on fish and fish habitat and provide details of related mitigation measures (LSFN 2022; MMF 2022). Fisher River Cree Nation expressed concerns that noise and dust from construction activities may affect sustenance hunting, fishing and cultural experience, as well as outfitting and ecotourism in and around the Mantagao River area where it empties into Sturgeon Bay (FRCN 2023). Peguis First Nation is concerned that the Project will contribute to a loss of sense of place, and confidence and safety on the land due to Project construction and operations activities (e.g., noise, dust, flooding) (Firelight with PFN 2023). Pinaymootang First Nation is concerned that their sense of place and peaceful enjoyment of the lands and waters will continue to be disrupted during construction and operation through increased activities in the area, worker presence, noise pollution, air pollution, and increased vehicular traffic (Firelight with PMFN 2023).

a. **Assessment of LSMOC Noise Effects to Indigenous Groups**

As described in the May 31, 2022, response to IR IAAC-29 and IAAC-122, Indigenous groups engaged on the Project have expressed concerns that Project-related sensory disturbances, including noise, may affect the distribution of traditionally harvested species, disrupt the cultural experience of Indigenous groups, and deter land users. As there are no Indigenous group's reserve or community lands located within the acoustic LAA, direct effects to Indigenous health or socio-economic conditions at Indigenous residences are not anticipated. Indirect effects to Indigenous socio-economic conditions will be primarily through effects to traditional resources for current use, country foods, food security and mental and social well-being. Section 10.2.4.4 of the Project Environmental Impact Statement (EIS), states that noise from Project construction could temporarily change movement patterns of wildlife, which may result in changes in the availability of the traditional resource for current use. As stated in Volume 4, Section 10.3.3.1 of the Project EIS, Project noise may result in potential effects to the health and socio-economic conditions of Indigenous groups. Construction

noise and noise from vehicles and machinery during operation and maintenance pose a potential annoyance risk for humans and wildlife near the Project. Indigenous groups harvesting country foods or practicing other traditional activities in the LAA may be exposed to noise from activities during the construction phase.

Project effects associated with noise are introduced in Volume 2, Section 6.2 of the Project EIS, and the section notes that the LAA for noise extends 1 km beyond the Project development area (PDA), as the majority of residual noise effects are not expected to extend beyond this distance from Project activities. It is recognized that increased noise emissions may also occur along the provincial and municipal roads used for access and transport of materials, equipment and crews in the Project area during construction activities. It is also noted that the acoustic LAA around the LSMOC, where Indigenous land use has been reported to occur, does not contain any communities or major roads, and the duration of noise emissions from Project activities will largely be limited to the construction phase. Residual effects on the acoustic environment associated with Project operation and maintenance are expected to be lower in magnitude, duration, and extent than during the construction phase due to the reduced use of vehicles and equipment and infrequent nature of Project activities. Effects during the operation and maintenance phase are expected to be negligible and limited mainly to the PDA, including activities associated with maintenance of the water control structure, channel and outside drain, and transportation on the access road, or within the right-of-way (ROW).

Based on expressed concerns, noise effects to Indigenous groups include direct effects to health, and indirect effects through potential changes in availability of fish and wildlife that are harvested in the LAA. The largest potential source of noise will be blasting, although noise associated with this activity will be infrequent and of very short duration. As noted in Volume 1, Section 3.5.2.3 of the Project EIS, based on current designs, blasting may not be required for the LSMOC. Given the uncertainty, the assessment conservatively assumed that blasting would occur in all instances where bedrock is encountered. Volume 1, Section 3.5.2.3 of the Project EIS notes that to the extent possible, the timing of blasting activities will consider area-specific environmental sensitivities, such as minimizing disturbance to Indigenous groups, rights holders, and other stakeholders, avoiding disturbance to rare species and sensitive time periods, and to minimize potential effects on wildlife populations used by Indigenous groups for hunting. Other sources of noise are typically associated with heavy machinery. Mitigation for noise is discussed in several sections of the Project Environmental Requirements (PERs), filed as part of the June 2022 supplemental information response to IAAC IRs. These include measures such as a requirement for machinery and factory-supplied noise abatement equipment (e.g., mufflers) to be maintained in good working order and minimizing machinery idling; and that equipment for use on the Project will need to be effectively “sound-reduced” by means of proper silencers, mufflers, acoustic linings, acoustic shields, or acoustic sheds.

As described in the May 31, 2022, response to IR IAAC-108, effects to Indigenous health would be primarily limited to the construction phase of the Project, and at discrete locations as activities progress along the channels. As a result, Indigenous groups and non-Indigenous people in the area are expected to be able to continue pre-Project activities in the area. As described in the May 31, 2022, response to IR IAAC-111, the majority of Project construction will take place during daytime

hours. The Access Management Plan (AMP), filed as part of the June 2022 supplemental information response to IAAC IRs, contains measures to notify and manage people travelling in the vicinity of the PDA and avoid areas of intense activity from a safety perspective.

Volume 3, Section 7.2.4.4 of the Project EIS describes the effects of noise on fish. The May 31, 2022, response to IR IAAC-79 also discusses noise effects to fish. It is noted that most construction activities occur in dry areas away from fish-bearing waters, and that work in the inlet and outlet areas will follow Fisheries and Oceans Canada (DFO) “Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters” (Wright and Hopky 1998). If blasting is to occur near water and has the potential to affect fish it will be discussed with DFO if/as required, on a case-by-case basis. Monitoring plans for any specific required blasting events near water will be developed in consultation with DFO and in accordance with measures outlined in associated federal *Fisheries Act* approvals process.

Volume 3, Section 8.3.6 of the Project EIS states that Project-related noise from construction activities (e.g., heavy equipment operation, infrastructure construction, increased traffic volumes) has the potential to disturb wildlife such as migratory birds, elk, moose, and furbearers and change the way wildlife use habitat around the PDA (e.g., habitat avoidance). However, these effects are expected to be short-term in duration and be reversible following the conclusion of construction. The May 31, 2022, response to IR IAAC-91 notes that during construction, noise and activity are expected to deter furbearer use of the PDA including movement across both channels. It notes that for most species, a change in movement will be temporary because wildlife will resume regular movements once construction has completed and noise disturbance abates. However, for species adverse to open environments, such as marten, movement patterns may not resume until adequate vegetation cover has reestablished on the channel ROW.

Volume 4, Section 10.2.4.4 of the Project EIS and the May 31, 2022, responses to IR IAAC-108 and IAAC-122 conclude that noise effects are anticipated to be temporary, confined to the construction phase, and are not expected to extend beyond the LAA. Residual effects of the Project on the availability of traditional resources for current use will occur during construction and operation and maintenance. Overall, effects are predicted to be adverse due to a loss in habitat for harvested resources, but low in magnitude as it is anticipated that current land and resource use practices will be able to continue at or near baseline levels. As stated in Volume 4, Section 10.3.3.1, and May 31, 2022, response to IR IAAC-103 and IAAC-111, IAAC-79, IAAC-91, while Project noise may result in temporary annoyance, direct residual effects on the health of Indigenous groups are not anticipated, as the residential receptors at which noise level exceedances are not located within an Indigenous group’s reserve or community lands. In addition to mitigations such as noise abatement equipment, a schedule of construction and Project activities will be made available to all Indigenous groups engaged on the Project, so that areas and time periods of activity can be avoided. Manitoba Transportation and Infrastructure will continue to solicit information from Indigenous groups regarding effects of noise on the availability of the traditional resource for current use and health socio-economic conditions and review any subsequent information provided for incorporation into the Project, as appropriate. Additional information about noise impacts on the availability of the traditional

resource for current use, as well as proposed mitigation and monitoring programs can be found in Attachment 4 - Table IAAC-122-1 in the May 31, 2022, response to IR IAAC-122. Additional information about the effects of noise on the health and socio-economic conditions of Indigenous groups can be found in the response to IR IAAC-R2-29.

b. **Noise Mitigation for Wildlife**

It is recognized that during construction, wildlife entering the LAA maybe exposed to noise if in proximity to active construction and may avoid the area due to sensory disturbance. The effect will be temporary and where habitat persists or regenerates after the Project has been constructed it is expected that wildlife will return.

As described in Volume 1, Section 3.4.3.1 of the Project EIS, the channel will be excavated below grade with the excavated material placed in permanent spoil piles along both sides of the channel. In addition, it will involve construction of permanent water-retaining dikes located on both sides of the excavated channel. The spoil piles for the excavated material will be located outside of the channel dikes. The resulting spoil piles and/or dikes will provide a level of sound mitigation for adjacent areas.

As described in the current version of the Construction Environmental Management Program (CEMP) filed as part of the June 2022 supplemental information response to IAAC IRs, mitigation will focus on:

a) a requirement for machinery and factory supplied noise-abatement equipment (e.g., mufflers) to be maintained in good working order and for machinery idling to be minimized; and,

b) implementation of a Complaint Resolution Process (CRP) (also filed as part of the June 2022 supplemental information response to IAAC IRs) as a formal mechanism to respond to noise complaints.

In addition, the PERs (Section 2.9) list measures regarding noise, including a commitment that all equipment supplied for use on the Project shall be effectively “sound-reduced” by means of proper silencers, mufflers, acoustic linings, acoustic shields or acoustic sheds. Construction monitoring may also reveal the need to apply additional measures on a case-by-case basis (e.g., reducing noise and activity near an active bear den). The Wildlife Management Plan (WMP; Appendix 1, Table 2-1) identifies disturbance setbacks and activity restriction periods for several species of wildlife including for migratory birds, species at risk, and culturally important wildlife features. An environmental monitor would assess the effectiveness of applied mitigation measures, and adaptively manage by adopting additional measures (e.g., increasing setback distance, adding sound barriers such as temporary spoil piles), if required. Berms have been demonstrated to be effective in attenuating noise effects (Wakefield 1997).

c. **Noise Monitoring and Adaptive Management Protocols**

Manitoba Infrastructure and Transportation will incorporate noise monitoring into the duties of the Environmental Monitors and Construction Inspectors for both the LSMOC and LMOC, and locations of any excessive noise will form part of the regular reporting process. Monitoring will primarily occur near major construction activities at locations nearest potential receptors. Measured noise levels will be compared to the thresholds in Health Canada Guidance (Health Canada 2017) and Manitoba Environmental Management Division Guidelines for Sound Pollution (MEMD 2000). Manitoba Infrastructure and Transportation will implement an adaptive management approach to noise monitoring and mitigation that includes tracking monitor activities and measured sound levels, identifying the need to investigate elevated noise levels that result in, or have the potential to result in complaints, and developing and implementing corrective and preventative actions. For instances where excessive noise is anticipated, but cannot be mitigated (i.e., pile driving, or vibratory hammers), additional communication efforts will be made to share construction activity schedules with landowners or Indigenous groups. Efforts will be made to schedule these activities for daytime hours so as to minimize potential impacts. Corrective (noise mitigation) actions will be assigned and implemented as appropriate, including actions to prevent their reoccurrence. Should the measured noise levels be consistent, less than regulatory thresholds, or not result in noise complaints over the first year, noise sampling would subsequently be conducted only for select activities with heightened noise levels, or on a complaint basis or following the start of new construction activities.

In addition, the CRP, filed as part of the June 2022 supplemental information response to IAAC IRs, will provide a venue to record issues associated with noise that require follow up measures. This may include adaptive mitigation measures appropriate to the situation, such as the placement of temporary barriers (e.g., temporary material stockpiles or berms) to reduce sound emissions extending outward from construction sites.

The noise complaint investigation process will be shared with regulators, Indigenous groups and other stakeholders. This process may include, as appropriate, stakeholder/resident communication, proactive notifications of high noise intensity construction activities, noise complaint logging and initial response, noise complaint investigation, sound level measurements, and complaint resolution and adaptive mitigation. Noise modeling may also be used as one of the tools for complaint investigation, where deemed appropriate, to assist in mitigation planning, including the requirement for additional noise abatement measures.

d. **Additional Mitigation Measures and Follow-up Program Through the Complaint Resolution Process**

As indicated, Manitoba Transportation and Infrastructure has developed a CRP to monitor Project-related construction and operation complaints, including those for the acoustic environment, as detailed in the May 2022 responses to IR IAAC-03. Manitoba Transportation and Infrastructure will continue to involve Indigenous groups in the additional monitoring of these topics within the Project area. Addressing noise complaints and results of acoustic monitoring will likely be tasks addressed by

the Environmental Advisory Committee (EAC), on a consensus-based approach with participating Indigenous groups and local communities. Manitoba Transportation and Infrastructure is currently working with the potentially most affected Indigenous groups and local communities to establish terms of reference for an EAC and anticipates this committee would have a role in finalizing the Environmental Management Program (EMP) plans prior to construction, as well as to act as an avenue to share information and discuss Project-related concerns, and to recommend plan modifications if required. The intent is that the EAC will provide a venue to discuss any issues, concerns and potential environmental effects that are being addressed through the various monitoring and management plans that form the Project EMP. The results of monitoring, observations and feedback from the CRP would be presented with recommendations made for adjustments to mitigation measures and monitoring, if required. Additional information on the EAC is presented in the response to IR IAAC-R2-30.

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QUESTION IAAC-R2-27

Referenced Round 1 IR(s): IAAC-132

Expert Dept. or group: IAAC

EIS Guideline Reference: Section 7.6.3 Cumulative Effects Assessment

Context and Rationale

The EIS Guidelines require an assessment of the cumulative effects on each VC selected by comparing the future scenario with the Project and without the Project. Mitigation measures for addressing the potential effects related to the spread of zebra mussels downstream of the Project have not been provided. These could include measures to prevent the spread of zebra mussels.

IAAC-132 Part D asks for an assessment of the cumulative effects of water regulation on the spread of aquatic invasive species (AIS). Indigenous groups have expressed concerns surrounding the introduction of AIS into Lake St. Martin, especially with respect to zebra mussels, on the current use of land and resources for traditional purposes and socio-economic conditions. Section 7.2.4.2 of the EIS states, “Spiny water flea and zebra mussel veligers cannot disperse upstream because they are poor swimmers or only passively drift downstream or in lake currents. Because spiny water flea and zebra mussels are currently known only to reside in Lake Winnipeg, operation of the LMOC and LSMOC will not provide new or additional conduits for these species to colonize Lake St. Martin or Lake Manitoba.” The response to IAAC 132 indicates that since the filing of the EIS, zebra mussels have been found in Lake Manitoba – upstream of the Project. Because Lake St. Martin is already connected to Lake Manitoba via the Fairford River, the response concludes, “As the Project is not expected to increase the risk of spread of AIS relative to current conditions the Project is not expected to contribute to the effects of AIS on the current use of lands and resources for traditional purposes, or on Indigenous health and socio-economic conditions.” The response does not evaluate the spread of zebra mussels to Lake St. Martin with and without the Project by considering the Channels would create additional conduits to both Lake St. Martin and to Sturgeon Bay of Lake Winnipeg south of Willow Point.

Mitigation measures to prevent the spread of zebra mussels downstream of the Project have not been provided. The Agency understands that the Fairford River Water Control Structure (FRWCS) is operated by the Proponent and could contribute to the implementation of mitigation measures to prevent the spread of zebra mussels downstream of the Project.

An assessment of the effects from zebra mussels considering scenarios with and without the Project is required to understand effects to fish and fish habitat as well as current use of land and resources for traditional purposes and the socio-economic conditions of Indigenous people.

Question IAAC-R2-27
July 24, 2023

Information Requests

a. Provide an assessment of the effects to fish and fish habitat as well as current use of land and resources for traditional purposes and the socio-economic conditions of Indigenous people from a spread of zebra mussels into Lake St. Martin. Compare the future scenario with and without the Project.

b. Describe any technically and economically feasible mitigation measures that could be employed at the FRWCS and the LMOC to prevent the spread of zebra mussels to Lake St. Martin.

Response IAAC-R2-27

Preamble

In addition to providing responses to the Impact Assessment Agency (IAAC) Information Requests (IR), responses are provided for any other input that has been received, as applicable to the specific IR. This response integrates a reply to questions raised in October 24, 2022 correspondence from Pinaymootang First Nation, Sagkeeng First Nation and Sandy Bay Ojibway First Nation regarding a monitoring program and proactive response measures for potential aquatic invasive species (AIS) transport vectors, including monitoring of the water bodies and Project infrastructure which may be colonized by AIS as a result of Project activities. This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

a. **Assessment of Lake St. Martin Zebra Mussel Effects to Fish and Fish Habitat, and Indigenous groups**

   An assessment of Lake St. Martin zebra mussel (*Dreissena polymorpha*) effects to fish and fish habitat, and Indigenous groups is discussed in the May 31, 2022 response to IR IAAC-77 and Information Request IAAC-132. This response provides some updates to information previously provided.

Question IAAC-R2-27
July 24, 2023

The Province of Manitoba has identified the following potential adverse effects in waters affected by zebra mussel:

- Impact fish populations by consuming organisms at the base of the aquatic food chain.
- Clogging water intake systems and increasing costs to operate water treatment plants.
- Reducing water-front property values of homes and cottages.
- Blocking watercraft engine cooling systems.
- Killing endemic mussel species by attaching themselves to their shells in large numbers.
- Increasing water clarity and therefore the photic zone, thereby potentially allowing the spread of rooted aquatic vegetation in lakes and rivers.
- Potentially supporting larger and more frequent algal blooms.
- Accumulation of dead shells on shorelines, in particular beaches, which affects swimming and other beach-going activities.

Some of the above-stated effects have already been observed in Lake Winnipeg (e.g., accumulation of mussels on the beaches) while other effects (e.g., impacts to fish populations) are more difficult to discern from the many other factors that affect fish populations. In addition to effects to fish and fish habitat, the above list includes effects to current use of land and resources for traditional purposes and the socio-economic conditions of Indigenous groups. Additional information regarding Indigenous concerns about zebra mussels and impacts on the availability of the traditional resources for current use, as well as proposed mitigation and monitoring programs can be found in Attachment 4 – Table IAAC-122-1 in the May 31, 2022, response to IR IAAC-122. Additional information regarding concerns about potential effects from zebra mussels on Indigenous health and socio-economic conditions, as well as proposed mitigation measures, is available in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

Zebra mussels have spread in Manitoba after they were first recorded in southern Lake Winnipeg in 2013. The Province of Manitoba (Manitoba 2023) provides the following information for the first records of zebra mussel:

- Lake Winnipeg in 2013.
- The Manitoban portion of the Red River in 2015.
- Cedar Lake in 2015 and 2021.
- The upper reaches of the Nelson River in 2019.
- The middle reaches of the Nelson River to Limestone in 2020.
- The lower reaches of the Nelson River to Hudson Bay 2021.
- Assean Lake, northwest of Split Lake in 2020.

- Lake Manitoba in 2021.
- Ebb and Flow Lake in 2022.

Given the spread of zebra mussels along natural waterways, the incremental effect of the operation of the LMOC on the spread of zebra mussel is considered negligible (i.e., future scenario with and without the outlet channels is the same). Based on the provincial distribution records (Manitoba 2023), zebra mussels moved approximately 1,000 km (621 miles) along the Nelson River within eight years. They were recorded in Lake Manitoba less than 100 km (62 miles) from Lake St. Martin in 2021 and so would be expected to colonize Lake St. Martin prior to commissioning of the outlet channels, assuming the same downstream colonization rate as was seen in the Nelson River. As indicated in the May 31, 2022, response to IR IAAC-77, the existence of the Project is not expected to increase the likelihood of spread to Lake St. Martin. The armored channel will provide habitat for zebra mussels and zebra mussel larvae (veligers) will settle out and attach to almost any hard surface. Addressing zebra mussel impacts to Manitoba Infrastructure and Transportation infrastructure will become part of the ongoing channel maintenance process, particularly the water control structures; however, the habitat provided by the channels is not expected to increase their downstream spread.

As indicated in the May 31, 2022, response to IR IAAC-77, given that the Project is not expected to measurably increase the risk of spread of zebra mussels over current conditions, targeted monitoring is not proposed. However, water quality, fish and benthic aquatic invertebrate monitoring programs, and fish salvages conducted as part of the Aquatic Effects Monitoring Plan (AEMP), filed as part of the June 2022 supplemental information response to IAAC IRs, may provide incidental observations on the presence of zebra mussels during construction and operation. Conditions of scientific collection permits issued by the Province of Manitoba require immediate reporting of all invasive species encountered. AEMP studies will adhere to the conditions in a Project-specific AIS permit, including adhering to Manitoba's AIS regulatory requirements.

b. **Mitigation Measures at the FRWCS and the LMOC to Prevent Zebra Mussel Spread to Lake St. Martin**

There are not any technically and economically viable means of preventing the downstream colonization of zebra mussels from Lake Manitoba through the Fairford River due the combination of high-water volumes and the microscopic life stage of zebra mussels. As indicated in the May 31, 2022, response to IR IAAC-77, while it will be difficult to control the spread of zebra mussels, the Project has measures to reduce the likelihood as much as is feasible. Construction equipment moving from Lake Winnipeg and any zebra mussel invaded area to Lake St. Martin presents a potential mode of transmission that could increase the rate of spread. However, adherence to provincial AIS regulations in *The Water Protection Act* will mitigate this potential effect. Measures prescribed in the Project Environmental Management Program (EMP) plans, as filed as part of the June 2022 supplemental information response to IAAC IRs, will confirm that AIS regulations are followed. Key documents in the EMP are the Construction Environmental Management Program (CEMP), that builds on Section 2.5.13 of the Project Environmental Requirements (PERs) and outlines the

following preventative measures for transfer of invasive species that must be implemented by the contractor:

- The contractor shall properly clean equipment which has previously been in contact with a waterbody, including but not limited to rivers, lakes, and marshes, to prevent the spread of AIS.
    - equipment of particular concern includes water tanks, tank trucks, pumps, hoses, intake screens, boats and motors, and fish and water monitoring equipment
    - equipment coming in contact with a waterbody must be cleaned and drained completely, dried, and inspected before and after contact. Cleaning is defined as the removal of all aquatic plants, animals, and sediments
    - equipment that has or will come in contact with listed control zones must be decontaminated. (See MNRND's website: https://www.gov.mb.ca/stopais/ for details)
- In the event that AIS are discovered during inspection, the contractor shall inform the contract administrator and shall remove the equipment or machinery from the work site until it has been cleaned to the satisfaction of the contract administrator. The Province of Manitoba shall also be notified by the contract administrator per the website that follows:
    - http://www.gov.mb.ca/stopais
- According to the website, documentation of measures to prevent the spread of aquatic and terrestrial invasive species shall be incorporated into Project plans and will include:
    - history of equipment work locations and potential sources of contamination
    - details of cleaning / decontamination plan and procedures (methods)
    - documentation of cleaning and decontamination (date, personnel, confirmation of methods used)

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QUESTION IAAC-R2-28

Referenced Round 1 IR(s): IAAC-109

Expert Dept. or group: IAAC
Hollow Water First Nation
Lake St. Martin First Nation

EIS Guideline Reference: 7.3.3 Indigenous Peoples

3.2.1 Site Preparation and Construction

Context and Rationale

The EIS Guidelines require the Proponent to identify changes to the environment caused by the project that will affect health and socio economic conditions of individual Indigenous groups and to provide an analysis and detailed description of the proposed effects.

The EIS states that temporary work camps will be used during Project construction and that their locations for the LSMOC have not yet been determined.

Although the exact location for temporary construction camps and staging areas are not known at this time, Indigenous groups are concerned that the proximity to Indigenous communities will introduce potential new effects pathways to Indigenous health on vulnerable members of Indigenous communities. Construction camps and staging areas can also affect the current use of lands and resources for traditional purposes affecting access to preferred sites and experience. The response to IAAC-109 indicated that as part of the EMP review process Indigenous groups were engaged in discussions on the EMP plans. As a result of input received from Indigenous groups, meetings were held to discuss proposed mitigation, monitoring and offsetting measures. Mitigations to potential effects do not appear to have not been described and the response does not include an assessment of effects to Indigenous peoples. The response defers to an Environmental Advisory Committee, however it is not clear how Environmental Advisory Committee will assess, mitigate and monitor project effects See (IAAC-R2-30).

Additional concerns raised include that construction camps have the potential to increase crime rates and traffic violations which require extra police enforcement to prevent and manage potential community impacts. Local emergency protection and health services will be stressed due to the influx of project construction workers.

Further information on the potential effects to the health and socio-economic conditions of Indigenous communities is required, including regarding effects to Indigenous communities from temporary construction camps and staging areas and associated mitigation measures and follow-up program components.

Question IAAC-R2-28
July 24, 2023

Information Requests

a. Provide an assessment of the potential effects of the Project to the health and socio-economic conditions of Indigenous peoples due to temporary construction camps and staging areas along with any mitigation measures, management controls and methods to inform communities with respect to work camps and temporary use locations.

b. Provide an assessment of effects from the influx of workers to the Project area on traditional harvesting, ceremony and heritage features.

c. Indicate how areas used for temporary activities (camps, haul roads, aggregate areas, etc.) will be restored (specifically to what standards of best practice) and how restoration goals and Indigenous community interests will be incorporated in those plans.

d. Indicate how areas used for temporary activities such as camps, haul roads, aggregate areas, etc… will be restored, and how the restoration goals, measures of completeness and measures of effectiveness will be achieved. Include a discussion of how input from Indigenous groups was incorporated in the assessment, mitigation measures, and restoration goal-setting.

Response IAAC-R2-28

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) provided on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Infrastructure and Transportation to Indigenous groups. This response considers relevant information from the Fisher River Cree Nation *Socio-economic Impact Assessment Report* (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN. 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

Since responses to the previous IRs were filed on May 31, 2022, Indigenous groups engaged on the Project have shared additional concerns regarding potential effects to Indigenous health and socio-economic conditions. Pine Dock Northern Affairs Community expressed concern that the Project workforce cause additional pressure to community services and undue stress on community members (PDNAC 2023). Hollow Water First Nation and Lake St. Martin First Nation noted concern that construction camps have the potential to increase crime rates and traffic violations which would require additional police enforcement to prevent and mitigate potential community impacts as well as cause an

increase of stress among emergency protection and health services due to the influx of Project workers (HWFN 2022; LSMFN 2022). Dauphin River First Nation, Little Saskatchewan First Nation, Lake St. Martin First Nation, Peguis First Nation, and Pinaymootang First Nation are concerned that nearby work camps have the potential to increase the presence of drugs and alcohol in their communities and may also indirectly increase substance dependence by exacerbating existing vulnerabilities and eroding community strengths (Firelight with DRFN 2023; Firelight with LSFN 2023; Firelight with LSMFN 2023; Firelight with PFN. 2023; Firelight and PMFN 2023). Pinaymootang First Nation has also expressed concerns with temporary work camps and potential impacts on vulnerable populations during construction period (e.g., prostitution, increased risk of STIs, unwanted pregnancy, physical or mental abuse, substance abuse, etc.) (Firelight and PMFN 2023).

Effects to Indigenous health and socio-economic conditions may also occur through effects to country foods. The Interlake Reserves Tribal Council (IRTC), Pinaymootang First Nation, Little Saskatchewan First Nation, Peguis First Nation, and Lake St. Martin First Nation have expressed concerns about the fragmentation of wildlife habitat due to Project roads and the effects on hunting (Malone 2023). The Manitoba Metis Federation and Pinaymootang First Nation have concerns that the influx of non-local residents as well as the increased access due to Project roads will cause declines in key wildlife populations and place pressure on Indigenous hunters and trappers (MMF 2023a; Tam 2022). Manitoba Metis Federation, Pinaymootang First Nation and Hollow Water First Nation expressed concern about the revegetation of areas impacted from temporary construction work and the restoration of those areas with native and culturally important plants, used for traditional purposes such as medicines, and crops (MMF 2023b; PFN 2023; HWFN 2022). Pinaymootang First Nation expressed concern that workers may disturb or manage heritage sites without proper protocols (Tam 2022). Poplar River First Nation requested that Manitoba Transportation and Infrastructure provide the decommissioning plans for all temporary works associated with the Project (Poplar River First Nation 2020).

a. **Effects to Health and Socio-economic Conditions of Indigenous Groups Due to Temporary Work Areas, Mitigation and Communication**

Temporary work areas such as construction camps and staging areas are discussed in Volume 1, Section 3.4.2.7 of the May 2023 Project Description Update, and Volume 4, Section 10.3 of the Project Environmental Impact Statement (EIS) examines the effects of these areas on Indigenous health and socio-economic conditions. Potential effects to Indigenous health and socio-economic conditions related to temporary work areas include increased demand on local infrastructure and services, social disruption, increased sensory disturbance, and direct and indirect effects to the availability of country foods. The May 31, 2022, response to IR IAAC-109 provides an updated analysis, including a description of engagement with Indigenous groups regarding site selection, and an updated assessment of potential effects to Indigenous health and socio-economic well-being, taking into consideration mitigations to avoid or minimize effects. The response to the May 31, 2022, response to IR IAAC-109 includes a summary of concerns expressed on this issue at that time. Brokenhead Ojibway Nation expressed concern about worker camps and outsiders staying in Indigenous-run accommodations, which may present potential socio-cultural effects (Shared Value Solutions 2020). Poplar River First Nation also expressed concern about the impact of work areas on

nearby communities (Poplar River First Nation 2020). Fisher River Cree Nation stated that potential work camp areas should be identified (FRCN 2022). Additional information about potential effects of temporary work camps on Indigenous health and socio-economic conditions is available in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

As described in the response to IR IAAC-R2-12, the planning process for temporary work camps and staging areas has further advanced, and potential locations for these features have been identified in the vicinity of the Project development area (PDA). In addition to identifying potential locations, IR IAAC-R2-12 discusses the mitigation measures, follow-up program components, and monitoring that would be implemented to address the potential effects of these components on plants, wildlife, and Indigenous groups. Furthermore, the response to IR IAAC-R2-30 provides an update on proposed mechanisms to communicate with Indigenous groups, most notably the Environmental Advisory Committee (EAC).

The potential camp locations described in the response to IR IAAC-R2-12 are based on an environmental screening process that included an analysis of vegetation and wetlands, wildlife and wildlife habitat, water quality, fish and fish habitat, and heritage. In addition, as described in the May 31, 2022, response to IR IAAC-109, camp locations will be required to adhere to relevant management plans that form the Project Environmental Management Program (EMP), filed as part of the June 2022 supplemental information response to IAAC IRs. The response summarized relevant mitigation measures from the various applicable EMP plans. These plans include the Environmental Protection Plan (EPP), as filed as part of the June 2022 supplemental information response to IAAC IRs, in which mapbooks are developed to be used as a resource in camp site selection to avoid sensitive areas, including areas used by Indigenous groups on a seasonal/temporary basis, drinking water sources, key harvesting areas, as well as important recreational areas. They include the Access Management Plan (AMP), as filed as part of the June 2022 supplemental information response to IAAC IRs, which outlines the communication plan that Manitoba Transportation and Infrastructure will implement during construction to share information between the construction site staff and local Indigenous groups. Information about Project activities and any restrictions put in place for public safety will be provided to local Indigenous groups prior to the commencement of construction. As discussed in the AMP, Manitoba Transportation and Infrastructure will continue to provide effective and timely communication with Indigenous groups and the public about Project activities and any restrictions put in place. While details are now available on potential locations, the potential effects and proposed mitigation measures are relatively unchanged since filing the Project EIS, and as described in the May 31, 2022, response to IR IAAC-109.

Volume 4, Section 9.3.4.3 of the Project EIS discusses issues such as crime and health care (e.g., two RCMP detachments in the socio-economic local assessment area (LAA), hospital in Ashern, rapid emergency medical care and transport services to Winnipeg). It recognizes that the Project will increase demands on community infrastructure and services during construction in the socio-economic regional assessment area (RAA), but with the implementation of mitigation measures, during construction, effects are expected to be short-term in duration and regular/continuous in terms of frequency.

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Volume 4, Section 9.3.5 of the Project EIS notes that the construction of self-contained, well-sited construction camps will serve to mitigate some of the adverse effects such as demands on accommodations, and local infrastructure. Positive effects to infrastructure and services may result from opportunities for Indigenous-owned businesses located within the socio-economic LAA to provide, services to support temporary work areas. Due to their proximity, these businesses are well-positioned to benefit from Project spending. Additional information is provided the response to IR IAAC-R2-29.

The Manitoba Government is committed to community economic development as a key component of Manitoba's economic strategy. It intends to develop a provincial economy that is more inclusive, equitable and sustainable. Procurement practices are one of the means that can be used to contribute to Indigenous economic development.

Manitoba Procurement and Supply Chain (PSC) branch introduced an Indigenous Procurement Initiative (IPI) to increase the participation of Indigenous groups and suppliers in providing goods and services to government. This initiative provides a number of benefits, including:

- Stimulation of Indigenous business development.
- Creation of new employment opportunities.
- Increased procurement from Indigenous business through sub-contracting and/or joint ventures with non-Indigenous firms when bidding on contracts.
- Increased competitiveness.
- Relationship building between Indigenous suppliers, non-Indigenous contractors and government buyers.
- Better understanding of the process by suppliers, increased knowledge of Indigenous supplier base by government buyers.

Manitoba Transportation and Infrastructure is committed to supporting Indigenous economic development by increasing contracting opportunities for businesses owned by First Nation and Métis people by helping to grow Indigenous businesses via increased access to the government procurement process. Manitoba Transportation and Infrastructure endeavors to increase the participation of Indigenous businesses and workforce during construction of the proposed Project, to assist with achieving the intended benefits of the IPI.

Manitoba Transportation and Infrastructure uses established in-house practices, which include mandatory Indigenous Involvement clauses for construction projects. Involvement can include undertaking the work as a contractor, subcontractor or joint venture, and/or the provision of services, materials, fuel, labour, and equipment from the local community. Involvement targets are typically 10%, but additional percentages may be considered for projects including both general and specific community involvement as a set-aside.

The department is considering further modifications to increase the Indigenous inclusion within the department's tendering process. The upcoming tender process for the Project will include Indigenous procurement clauses.

Manitoba Transportation and Infrastructure is currently reviewing options and requesting appropriate permissions for increasing Indigenous participation, in construction contracts, including Indigenous set-asides. If approved, certain contracts could be limited to competition among Indigenous businesses. Further discussions are needed to determine the scope of work and magnitude of these contracts, but Manitoba Transportation and Infrastructure expects that this will serve as another avenue to increase economic opportunities in the region.

Manitoba's PSC branch maintains an Indigenous Business Directory that serves as resource guide for all government. The Directory is a listing of businesses that have formally registered under the IPI. Each business is categorized according to the information on goods and services provided in the registration profile. The Directory is comprised of a wide variety of business sectors, including construction and consulting services. The Directory is updated on a regular basis as registrations by Indigenous business are received. In addition, Manitoba Transportation and Infrastructure has reached out to Indigenous groups to request information regarding available resources in their communities. IRTC has indicated that they are developing a business directory for the communities they represent and will be sharing with Manitoba Transportation and Infrastructure. Manitoba Transportation and Infrastructure will request similar information from all 39 Indigenous groups potentially affected by the proposed Project. With inputs received, Manitoba Transportation and Infrastructure endeavours to create and manage a listing of available Indigenous resources from the 39 Indigenous groups throughout the duration of construction, should the proposed Project obtain regulatory approvals to process. Manitoba Transportation and Infrastructure will ensure potential bidders are made aware of available business directories and listings to encourage increased Indigenous involvement.

Furthermore, Manitoba Transportation and Infrastructure has been collaborating with Manitoba Economic Development and Training, Indigenous Services Canada, and First Peoples Development Inc. (FPDI) to identify Project labour force requirements, procurement requirements and anticipated schedules which could assist in the development of training opportunities for Indigenous groups to support potential employment as part of construction and environmental monitoring activities.

Provincial and federal funding is available to support this type of training and ongoing coordination with provincial, federal, and FPDI representatives will help to identify and develop applicable training for the Project. This is all to facilitate opportunities for Indigenous groups to have a trained and ready workforce to participate in the Project. Discussions with FPDI are ongoing and anticipated to continue as a means of facilitating training opportunities for Indigenous groups for technical positions, in addition to cleaning, cooking, or other services that would otherwise be possible. Additionally, FPDI is developing a web-based database to connect local workers with construction contractors. The database, once operational, will contain valuable information that will assist contractors in finding local workers based on their skillset and contractor requirements.

The result of this collaboration will directly or indirectly increase the IPI with the various Project contracts.

In addition to those described above, mitigation measures include managing noise from the presence of equipment and people. All equipment supplied for use on the Project will be effectively "sound-reduced" by means of proper silencers, mufflers, acoustic linings, acoustic shields, or acoustic sheds. Existing roads, road allowances, trails, portages, and other travel ways will not be blocked or altered as a result of clearing and grubbing activities so as not to interfere with other users. Employees, workers, and other staff will not harass wildlife at the construction site or during working hours, or remove, disturb, spring or in any way interfere with any trap set out lawfully by any other person for the purpose of taking furbearing animals. An EPP will be developed that will include measures to address the disposal of waste, emergency response communications, 24-hour emergency transport to hospital for occupational and non-occupational injuries and a plan for fire response and evacuation.

One of the key mitigation measures will be ongoing engagement with Indigenous groups that live and/or use the area. Manitoba Transportation and Infrastructure will continue to engage with Indigenous groups in order to better understand the use and importance of local trails. Manitoba Transportation and Infrastructure will continue to share Project information with Indigenous groups and Indigenous business operators so that advanced planning can occur. A schedule of construction and Project activities will be made available to all Indigenous groups engaged on the Project, so that areas and time periods of activity can be avoided.

As discussed in the May 31, 2022, response to IR IAAC-109, the need for, and extent of temporary work camps will be discussed with Indigenous groups as part of Manitoba Transportation and Infrastructure's continuing engagement process for the Project. Manitoba Transportation and Infrastructure recognizes there are concerns and uncertainties expressed by Indigenous groups and communities about the validity of the assessment results, as summarized above. To address these uncertainties, which are typical for most large, complex Projects, the assessment involves the following important components:

- Emphasis is placed on making conservative predictions.
- Implementing a robust environmental management program involving mitigation measures and monitoring programs to confirm Project EIS predictions and mitigation effectiveness and allow for adaptive management of unanticipated effects.
- Sharing the results with Indigenous groups and affected communities on an on-going basis.
- Follow-up programs with commitments to address issues that may arise.

Through the consultation and engagement program for the Project, Manitoba Transportation and Infrastructure is committed both to working with Indigenous groups to understand how resource users may be affected, and to the design and implementation of appropriate mitigation strategies through a process of adaptive management that incorporates input from engagement. As Indigenous knowledge, land uses, concerns, and recommendations are made available to Manitoba

Transportation and Infrastructure from Indigenous groups, they will be considered in the context of the results of the Project EIS and will be used for Project planning, further engagement, and regulatory purposes, where applicable.

Manitoba Transportation and Infrastructure will continue to involve Indigenous groups in the additional monitoring of the effects of temporary work areas within the Project area. This will be achieved by the implementation activities of the EAC, on a consensus-based approach with participating Indigenous groups and local communities. There will be further opportunities to advance Indigenous content in the EMP plans. Manitoba Transportation and Infrastructure is currently working with the potentially most affected Indigenous groups and local communities to establish terms of reference for an EAC and anticipates this committee would have a role in finalizing the EMP plans prior to construction, as well as act as an avenue to share information and discuss Project-related concerns, and to recommend plan modifications if required. The intent is that the EAC will provide a venue to discuss any issues, concerns and potential environmental effects that are being addressed through the various EMP plans. The results of monitoring, observations and feedback from the Complaint Resolution Process (CRP) would be presented with recommendations made for adjustments to mitigation measures and monitoring, if required. Additional information on the EAC is presented in the response to IR IAAC-R2-30.

Additional information about temporary work areas and socio-economic conditions, as well as proposed mitigation and monitoring programs can be found in the response to IR IAAC-R2-29. Volume 4, Section 10.3.3 of the Project EIS characterizes effects to Indigenous health conditions as adverse and low to moderate in magnitude as some alteration of behavior is required to continue harvesting country foods but changes do not represent an unacceptable change to public health. Residual effects on Indigenous socio-economic conditions are characterized as both adverse and positive, short term to long-term and moderate in magnitude. Project residual effects on employment are expected to be positive in direction with the addition of direct, indirect, and induced employment income for Indigenous workers. The subsequent Project planning with respect to construction camps and staging areas described in the response to IAAC-R2-12, including identification of potential locations, mitigation measures and monitoring and follow up components do not result in a change to the residual effects characterizations for Indigenous health and socio-economic conditions.

b. **Effects from the Influx of Workers on Traditional Harvesting, Ceremony and Heritage Features**

As indicated in Part a, temporary work areas such as construction camps and staging areas are discussed in Volume 1, Section 3.4.2.7 of the Project EIS, and Volume 4, Section 9.3 and 10.3 of the Project EIS examines the effects of these areas on Indigenous health and socio-economic conditions. The response to IR IAAC-R2-12 provides a current assessment of effects to vegetation, habitat, and heritage resources.

As indicated, the anticipated number of workers for both the LMOC and LSMOC has not changed since the March 2020 Project EIS[2]. For the LMOC, the peak workforce is estimated to be approximately 325 personnel, to be housed at either existing local accommodations or construction camps. For the LSMOC, due to the remoteness, construction camps would be developed, and the peak camp capacity is anticipated to be approximately 250 workers. Details are provided in Section 3.5.2.16 of the May 2023 Project Description Update. The contractor will submit plans and details for designated areas, including proposed locations, access and traffic management, and utility impacts for review by Manitoba Transportation and Infrastructure prior to mobilizing personnel or equipment to the site. While details are now available on potential locations, the potential effects and proposed mitigation measures are relatively unchanged since filing the Project EIS, and as described in the May 31, 2022, response to IR IAAC-109. Specific locations for temporary work camps will include consideration of minimizing travel times to work areas, use of previously disturbed sites to reduce the effort for site development, selecting locations further away from residences, avoiding heritage resources and for camps to be self-contained for essential facilities and services. The response to Part (a) above describes the measures in place to site temporary work areas to avoid sensitive areas. Additional information about the influx of workers and traditional harvesting, ceremony, and heritage features, as well as proposed mitigation and monitoring programs can be found in Attachment 4 - Table IAAC-122-1 in the May 31, 2022, response to IR IAAC-122.

As noted in the AMP, restrictions will be placed on firearms (e.g., rifles, handguns, shotguns, bows) as a measure to manage the safety of personnel at the site. Project workers will not be permitted to possess, transport, use, or store firearms within the PDA. In the event that a worker is found to have a firearm within the PDA, the worker will be disciplined accordingly. Signs will be posted at various locations indicating areas where public access and is restricted, where firearms are not allowed, and in areas where people need to be informed about potential safety issues, such as at the inlet, outlet and water control structure areas, as a further precautionary measure.

Volume 4, Section 10.2.4 of the Project EIS documents an assessment of the change in availability of traditional resources for current use and change to cultural and spiritual sites and areas. Residual effects on the availability of traditional resources for current use are predicted to be adverse due to a loss in habitat for harvested resources, but low in magnitude as it is anticipated that current land and resource use practices will be able to continue with minor alteration of behaviour by Indigenous groups. The direct and indirect loss of habitat for harvested species is relatively small compared to the remaining habitat available in the RAA, and the habitat reclaimed (for example, due to fewer riparian plants being inundated) by reversing the effects of flooding. Residual effects on wildlife, fish and plant species will not pose a threat to the long-term persistence and viability of species in the RAA. The residual environmental effects to cultural or spiritual sites or areas are considered adverse

[2] Volume 1, Section 3 of the May 2023 Updated Project Description, reflecting the various refinements that have occurred since the Project EIS was filed. While the construction work force numbers remain the same as those predicted in the March 2020 version, it should be noted that Appendix 3A Summary of Project Refinements table in the May 2023 version incorrectly lists the LMOC work force as increasing from 250 to 325 people. However, as described in the text, the workforce was originally estimated at 325 and has not increased. The 250 number was inadvertently transcribed from the LSMOC estimates.

and are expected through construction and operation and maintenance phases of the Project. Assuming a conservative approach, the likelihood of disturbance, alteration, or removal of cultural and spiritual sites in the LAA is moderate, based on Traditional Knowledge information provided by participating Indigenous groups, desktop review of available traditional land and resource use information, and professional judgement. The information presented in this response does not result in a change to the residual effects characterizations presented in the Project EIS.

c. **Restoration of Temporary Work Areas and Indigenous Input**

As stated in Volume 1, Section 3.5.4.2 of the May 2023 Project Description Update, temporary works, including access routes, laydown areas and some constructions camps will be decommissioned after construction has concluded. The Site Decommissioning Plan, filed as part of the June 2022 supplemental information response to IAAC IRs, describes the process and environmental requirements for closure and reclamation of temporary construction facilities and borrow pits. This includes references to the Revegetation Management Plan (RVMP), as filed as part of the June 2022 supplemental information response to IAAC IRs, which includes having the organic materials stripped from the areas being redistributed to encourage natural vegetation regeneration of the area, as well as seeding and monitoring to confirm success. As indicated, these plans form part of the proposed engagement through the EAC, where the proposed management details and monitoring results will be shared, discussed, and adjusted if necessary. Additional details can be found in the response to IR IAAC-R2-12. More detail regarding the proposed structure and function of the EAC is available on response to IR IAAC-R2-30.

d. **Assessment of Effectiveness of Temporary Work Area Restoration and Indigenous Input**

The response to Part a and Part b addresses this question. Plans dealing with site restoration were part of the EMP plans that have been reviewed by Indigenous groups and updated based on feedback. The Site Decommissioning Plan, filed as part of the June 2022 supplemental information response to IAAC IRs, indicates that the contractor is responsible for developing a report after completion of any decommissioning works. Reporting will generally include the location of site, a description of decommissioning activities, mitigation measures required for construction activities, environmental monitoring plans and activities required for reclamation, and records of actions taken to address environmental incidents such as accidents, spills, leaks, and releases, the reporting and clean-up procedures used. As indicated, the RVMP includes a monitoring requirement to assess effectiveness. These reports are anticipated to be shared with the EAC and may be made available to other Indigenous groups. As indicated, the intent is that the EAC will provide a venue to discuss issues, concerns and potential environmental effects that are being addressed through the various EMP plans.

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Referenced Round 1 IR(s): IAAC-108, IAAC-122, IAAC-109

Expert Dept. or group: IAAC
Hollow Water First Nation
Pinaymootang First Nation
Lake St. Martin First Nation

EIS Guideline Reference: 7.1.10 Health and Socio-economic Conditions;

7.3.3 Indigenous Peoples

Context and Rationale

The EIS Guidelines require baseline conditions for health conditions, including the state of physical, mental and social well-being and requires the Proponent to identify changes to the environment caused by the project that will affect health and socio economic conditions of individual Indigenous groups and to provide an analysis and detailed description of the proposed effects.

The characterization of potential significant effects on Indigenous health conditions (human health) in the EIS focuses primarily on physical determinants (air, water, soil, noise) and does not consider the full scope of determinants of health and well-being in Indigenous communities, including social determinants (such as health care systems, cultural continuity, food security, employment, etc). Changes at the community level that affect socio-economic conditions for Indigenous peoples as a result of increased population, economic activity, cost of living, transportation delays are among the factors that may affect community members.

This information is required to understand the potential effects of the Project on the health and socio-economic conditions of Indigenous peoples.

Information Requests

a. Provide a description and analysis of how changes to the environment could affect the health and socio-economic conditions of Indigenous peoples. The assessment should include, but should not be limited to, the changes in:

   i. current and future availability of country foods;

   ii. water quality (drinking, recreational and cultural uses);

   iii. mental and social well-being;

   iv. economic conditions;

v. use of navigable waters; and

vi. food security

b. Provide an outline of how the concerns and recommendations from Indigenous groups are addressed and identify how traditional knowledge is incorporated into the development of operation and monitoring plans.

c. Provide a description of technologically and economically feasible mitigation measures and follow-up program components that could be implemented.

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Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) provided on August 25, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response integrates a reply to questions raised in a meeting held on October 31, 2022, from the Interlake Reserves Tribal Council (IRTC) requesting details regarding the following: clarification on the monitoring plans described in the Access Management Plan; detail on the mitigation, monitoring, and follow-up plans described in Table IAAC-122-1, filed on May 31, 2022; updates to effects assessments for socio-economic conditions; plans for Indigenous engagement for socio-economic baselines and trajectories of change for health and socio-economic conditions; inclusion of Indigenous information in monitoring and follow-up plans; provision for Indigenous monitoring; and how key discrepancies with Indigenous groups will be addressed. Manitoba Transportation and Infrastructure's development of environmental management plans and offsetting commitments for wetland and fisheries provide the foundation for reducing or avoiding potential effects to health and socio-economic conditions of Indigenous peoples. In addition, Manitoba Transportation and Infrastructure has also established the Indigenous Economic Development Fund to address potential economic effects of the Project.

This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

Question IAAC-R2-29
July 24, 2023

a. **Effects to Health and Socio-economic Conditions of Indigenous Peoples**

Manitoba Transportation and Infrastructure has developed Table IAAC-R2-29-1 to provide a consolidated description and analysis of how changes to the environment could affect the health and socio-economic conditions of Indigenous groups. Table IAAC-R2-29-1 provides a comprehensive response to this request by summarizing available information from Indigenous groups regarding potential effects for Indigenous health and socio-economic conditions with reference to potential Project effects and proposed mitigation measures identified in the Project Environmental Impact Statement (EIS) and relevant IRs. The methodology for compiling Table IAAC-R2-29-1 is provided below; Table IAAC-R2-29-1 is appended to this response (Appendix IAAC-R2-29-1).

As described in the May 31, 2022, responses to Information Request IAAC-14 and IAAC-103, the purpose of the Project is to mitigate flooding, and the various significant regional adverse socioeconomic effects associated with flooding on Lake Manitoba and Lake St. Martin, including effects on the Indigenous groups that live in and use the region. As described in Volume 1, Section 2.2 of the Project EIS, during the 2011 flood, natural watercourses were overwhelmed, natural areas were flooded, and damages resulted in the evacuation of Indigenous communities located around Lake St. Martin, displacing individuals from their homes and traditional land use areas for years.

Volume 4, Section 10.3.3 of the Project EIS, provides an assessment of potential effects on Indigenous health and socio-economic conditions for Indigenous groups engaged on the Project. This assessment was conducted in accordance with the requirements of the *Canadian Environmental Assessment Act*, 2012, and the Guidelines for the Preparation of an EIS (CEAA 2018) issued to the Proponent by the Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada). Table 10.3-11 summarizes issues and concerns relevant to Indigenous health and socio-economic conditions identified through the Indigenous engagement and consultation processes for the proposed Project. This information was obtained through Project-specific traditional land and resource use (TLRU) studies, and technical reviews and other submissions from Indigenous groups to the Agency, as well as consultation and engagement meetings, workshops, correspondence undertaken by Manitoba Transportation and Infrastructure. Manitoba Transportation and Infrastructure also conducted a review of publicly available literature containing relevant information for Indigenous groups engaged on the Project.

The assessment of Indigenous health and Indigenous socio-economic conditions considers the interactions among changes to valued components (VCs) and change in conditions, attributes, sites, lands, resources, or structures of relevance for Indigenous groups. The interrelationship between VCs plays an important role in how changes to the environment may affect conditions and material circumstances of Indigenous groups. For example, changes in surface water quality may influence fish health, which could, in turn, affect country foods and Indigenous health and socio-economic conditions. Consequently, the assessment of Indigenous health and socio-economic conditions carries forward the effects pathways and potential Project effects identified for other VCs. Relevant VCs considered for assessment of Indigenous health include human health (Volume 4, Section 9.5),

infrastructure and services (Volume 4, Section 9.3), and traditional land and resource use (Volume 4, Section 10.2). Relevant VCs considered for assessment of Indigenous socio-economic conditions include land and resource use (Volume 4, Section 9.2), infrastructure and services (Volume 4, Section 9.3), economy (Volume 4, Section 9.4), and traditional land and resource use (Volume 4, Section 10.2). The assessment of Indigenous health and socio-economic conditions also considers potential Project effects on the ecological environment (water, wildlife, fish, and vegetation) and the potential effects these may have on TLRU activities such as hunting, fishing, trapping, plant harvesting. As well, potential Project effects from various biophysical and socio-economic environmental conditions, such as the changes in air or water quality, noise, or altered visual aesthetics, are also presented as they may deter individuals from harvesting traditional resources close to the Project. Table IAAC-R2-29-2 (reproduced from Table 10.3-2 in Volume 4, Section 10.3.1.3 of the EIS) summarizes the potential effects and effects pathways carried forward for the assessment of Indigenous health and socio-economic conditions.

Table IAAC-R2-29-2 Effects Pathways and Potential Effects Carried Forward for Indigenous Health and Socio-Economic Conditions

Valued Component	Effect pathway assessed in related VC	Potential Effect carried forward
Health	Change in Human Health	Construction of the Project may change Indigenous health conditions through changes in air quality, changes in noise, and changes in surface water quality and drinking water quality.
Traditional Land and Resources Use	Change in availability of lands and resources currently used for traditional purposes	Project construction and operations have the potential to affect Indigenous health conditions through a reduction in the quantity of country foods to harvest.
	Change in access to lands and resources currently used for traditional purposes	Project construction and operations have the potential to affect Indigenous health conditions through a reduction in access to country foods to harvest. Project construction and operations have the potential to affect Indigenous health conditions through effects to navigation, including by boat or trails.
	Changes to the cultural value or importance associated with current use	Construction activities have the potential to affect Indigenous health conditions through a reduction in the value and perceived quality of country foods. Project construction and operations have the potential to affect spiritual and cultural experiences, as well as a sense of place and well-being, and the applicability and transmission of Indigenous knowledge, laws, customs, and traditions.

Valued Component	Effect pathway assessed in related VC	Potential Effect carried forward
Land and Resource Use	Change in resource use	Construction and operation of the Project may change Indigenous socio-economic conditions by affecting commercial activities that Indigenous people are engaged in such as fishing, hunting, trapping and gathering, and recreation and tourism.
	Change in agriculture	Construction and operation of the Project may change Indigenous socio-economic conditions by affecting farming and agricultural activities that Indigenous people are engaged in.
	Change in parks, recreation and tourism	Construction and operation of the Project may change Indigenous socio-economic conditions by affecting parks, recreation and tourism.
Infrastructure and Services	Change in temporary accommodations	The Project's construction workforce may increase demand for the temporary accommodations which may also be used by Indigenous people.
	Change in community infrastructure and services	The Project workforce and activities may increase demand for fire and police services, health services, potable water which may also be used by Indigenous people.
	Change in road traffic	Construction related traffic may cause congestion of roads (e.g., PTH 6) used by Indigenous people.
Economy	Change in regional labour force	Project employment, expenditures and population growth related to development can result in positive and adverse effects which will extend to Indigenous people because they account for a large proportion of the population near the Project area.
	Change in regional economy	Local, regional, and provincial businesses, including Indigenous-owned businesses, could benefit from Project and consumer-related spending. Adverse economic effects might occur when the labour, goods and services required for the Project exceed the existing capacity potentially leading to supply issues and cost increases and subsequently effect Indigenous people living in the immediate Project region.

Volume 4, Section 10.2.2 of the Project EIS, offers a community overview for each Indigenous group engaged on the Project providing details, where available, about location of reserves or communities, population, governance, community infrastructure and services, Indigenous businesses, and access to health care. Volume 4, Section 10.3.3 of the Project EIS recognizes that the overall social context in which effects on Indigenous health and socio-economic conditions are considered is below standard condition. Indigenous groups who were evacuated 2011 and 2014, and specifically Indigenous groups whose housing, and infrastructure was severely damaged, have unfavourable social determinants of health as well as economic conditions, including unemployment rates that exceed provincial average and household incomes which are below the provincial average. The

Project is proposed to alleviate the problem of ongoing flooding that, for decades, has caused adverse effects on people, the economy, and the environment in the Lake St. Martin region. The long-term displacement due to the flooding events in 2011 and 2014 has been identified by Indigenous residents as a strain on livelihoods and well-being of community members.

The purpose of the Project is to mitigate flooding on Lake Manitoba and Lake St. Martin, and to reduce the various adverse health and social effects associated with flooding. Mitigating flooding will have positive health effects by reducing dislocation of Indigenous groups and concern regarding potential future events. In 2011 and 2014, flooding resulted in severe damage to housing and infrastructure in several First Nations, particularly those located on Lake St. Martin. Volume 4, Section 10.3.3. of the Project EIS concludes that mitigating flooding will have adverse and positive effects of low to moderate magnitude on Indigenous health and socio-economic conditions. The Project will remove plant species and may affect the distribution of animals and fish harvested for country foods, however availability of and access to country foods is currently limited by the effects of periodic flooding and the purpose of the Project is predicted to reduce these effects. Direct and indirect loss of habitat for harvested species is expected to be relatively small compared to the remaining habitat available in the regional assessment area (RAA), and the habitat no longer flooded because of the Project. Project employment, expenditures and population growth related to development are expected to result in positive and adverse effects on the regional economy which will extend to Indigenous groups because they account for a large proportion of the population near the Project area. Indigenous owned businesses located within the local assessment area (LAA) could provide fuel, accommodation and potentially other services to support Project construction. Due to their proximity, these businesses are well-positioned to benefit from Project spending. Residual effects on commercial activities, including trapping and forestry, and recreation and tourism are anticipated to be affected but be able to continue at similar levels as under baseline conditions. The reductions in lake levels and flood levels in Lake St. Martin as a result of the Project will provide positive effects to agricultural land use within Lake St. Martin First Nation, Little Saskatchewan First Nation and Pinaymootang First Nation. A Traffic Management Plan and Emergency Response Plan will be implemented to mitigate residual effects on community infrastructure and services. Positive effects on infrastructure and services are anticipated during operations when the Project will alleviate flooding in low-lying areas and roadways and other infrastructure that may otherwise be flooded may remain operational.

Following the submission of the Project EIS and responses to the May 2022 Information Requests, Manitoba Transportation and Infrastructure has provided support for socio-economic studies by IRTC, Fisher River Cree Nation, Manitoba Metis Federation and York Factory First Nation. As of April 2023, final reports have been received from Manitoba Metis Federation and York Factory First Nation as well as an Interim report from IRTC, representing Dauphin River First Nation, Kinonjeoshtegon First Nation, Lake Manitoba First Nation, Lake St. Martin First Nation, Little Saskatchewan First Nation, Peguis First Nation, and Pinaymootang First Nation. In addition, Manitoba Transportation and Infrastructure received feedback on the Socio-Economic Conditions Survey shared with Indigenous groups engaged on the Project in January 2023 from Pine Dock Northern Affairs Community. Manitoba Transportation and Infrastructure has also received additional TLRU reports from Peguis

First Nation and Pinaymootang First Nation, which have been reviewed for information related to Indigenous health and socio-economic conditions. These reports have been reviewed and incorporated into the current responses to IRs as appropriate. Conclusions related to specific Project effects on health and socio-economic conditions can also be found in IAAC-R2-01, IAAC-R2-04, IAAC-R2-06, IAAC-R2-07, IAAC-R2-09, IAAC-R2-14, IAAC-R2-27, IAAC-R2-28, and IAAC-R2-32.

Overview of Table IAAC-R2-29-1

For each Indigenous group engaged on the Project, Manitoba Transportation and Infrastructure has summarized in Table IAAC-R2-29-1 available information regarding health and socio-economic conditions, including, as requested by the Agency: current and future availability of country foods; water quality (drinking, recreational and cultural uses); mental and social well-being; economic conditions; use of navigable waters, and food security. Additional information on topics such as health care systems, cultural continuity, employment, increased population, cost of living, transportation delays or other factors that may affect Indigenous health and socio-economic conditions have also been included in Table IAAC-R2-29-1 under the aforementioned headings where such concerns and issues have been brought forward by Indigenous groups.

Table IAAC-R2-29-1 also includes relevant mitigation measures that have been developed to reconcile and address concerns and issues raised by Indigenous groups related to potential Project effects on Indigenous health and socio-economic conditions. As outlined in the Indigenous Consultation and Stakeholder Engagement Report (ICSER), which is included in Attachment 2 of Manitoba Transportation and Infrastructure's formal response to the Round 2 IRs on July 24, 2023, Manitoba Transportation and Infrastructure has undertaken a Project-specific Indigenous consultation and engagement process. This process provided reasonable and meaningful opportunities for Indigenous groups to identify and discuss their views and concerns related to the potential Project effects with Manitoba Transportation and Infrastructure and for these views and concerns to be gathered and considered by Manitoba Transportation and Infrastructure. Information about socio-economic and health conditions has been gathered through Project-specific socio-economic studies, community consultation reports, community meetings, socio-economic surveys, and results of the Indigenous consultation and engagement process for the Project. It is Manitoba Transportation and Infrastructure's view that if Indigenous groups have not presented specific issues and concerns about health and socio-economic conditions, this lack of information should not be construed as a lack of interest in or use of the Project area. In keeping with this conservative approach, Table IAAC-R2-29-1 identifies potential effects to health and socio-economic conditions for each Indigenous group engaged on the Project and discusses proposed mitigation and monitoring to avoid, reduce and manage potential effects, and residual effects after mitigation.

Table IAAC-R2-29-1 employs the following organizational structure:

- **Column 1**: The "Consultation/Engagement Input" column includes information shared by Indigenous groups regarding existing conditions for health and socio-economic conditions, including identification of country food species, socio-economic sites and areas, navigable waterbodies, and observations about community health, food security and source, environmental conditions, and other relevant factors. Column 1 also presents issues and concerns and potential Project effects identified by Indigenous groups, as well as any recommendations made. Where Manitoba Transportation and Infrastructure has not received specific health and socio-economic conditions information from a particular Indigenous group through either the Indigenous consultation and engagement process for the Project or a review of publicly available literature, this is noted in Column 1.

  The information in Column 1 is organized according to the following health and socio-economic categories:

  - Current and Future Availability of Country Foods
  - Water Quality (drinking, recreational, and cultural uses)
  - Mental and Social Well-being
  - Economic Conditions
  - Use of Navigable Waters
  - Food Security

  Information from this column includes all information received from a given Indigenous group. The content has been presented as close as possible as to the way it was submitted so as to capture key phrasing and in order to not misconstrue information. While Manitoba Transformation and Infrastructure may not agree with some specific items, for completeness and transparency, all information received from the Indigenous group has been presented in the table as per the six topics listed above. Manitoba Transportation and Infrastructure also recognizes that this column may not represent every concern an Indigenous group has with the Project and remains open to continued discussion as these or new concerns evolve.

- **Column 2**: The information included in the "Species/Locations Identified" column lists the species of cultural importance identified by Indigenous groups, as well as species commonly understood to be harvested by Indigenous groups. This latter list was compiled through the Indigenous consultation and engagement process for the Project, a review of publicly available literature, and past project experience. While Manitoba Transportation and Infrastructure acknowledges that this list is not comprehensive, it captures many of the key species harvested by Indigenous groups.

Column 2 also identifies where the specific sites, areas or locations mentioned by Indigenous groups are in relation to the Project, including Project development area (PDA), LAA, or RAA. Where sites or locations mentioned by Indigenous groups are outside the RAA, that is noted. No locations are associated with food security as it is related to the supply of food through both market and traditional food networks and is not site or location specific.

- **Column 3**: The "Project Effects" column presents potential Project effects on health and socio-economic conditions with reference to effects pathways, the nature and extent of the effect, and in consideration of Project effects assessed for other VCs with a demonstrable link to socio-economic conditions (e.g., country foods and the wildlife and wildlife habitat VC). An effort has been made to discuss potential Project effects in plain language and focus on direct or indirect effects the Project may have on health and socio-economic conditions (e.g., effects on water quality impacting commercial fishing). The Project effects presented in Column 3 reflect Project interactions, effects pathways, and measurable parameters defined and assessed in the Project EIS and represent potential effects before the application of proposed mitigation measures.
- **Column 4:** Information included in the "Mitigation, Monitoring, and Follow up" column identifies the relevant mitigation measures that have been proposed by Manitoba Transportation and Infrastructure that may serve to avoid or reduce effects to health and socio-economic conditions. Monitoring plans and follow up studies described in the Environmental Management Program (EMP) plans developed for the Project, which will be conducted to verify predicted environmental effects, detect unanticipated Project effects, and inform adaptive management processes are also presented. Opportunities for Indigenous participation in monitoring programs, efforts to share updated monitoring plans with Indigenous groups, and the completed and ongoing consultation and engagement with Indigenous groups engaged on the Project, as outlined in the ICSER, which was included as Attachment 3 of Manitoba Transportation and Infrastructure's response to the Round 1 IRs on May 31, 2022, are discussed. As well, some project effects are addressed through regulatory-driven instruments, such as for fisheries offsetting under the *Fisheries Act*.
- **Column 5:** The "Residual Effects after Mitigation" column presents residual effects after mitigation as assessed in the Project EIS, which relies on plain language to avoid the jargon of residual effects characterizations. As well, pertinent information from responses to Information Requests has been included in column 5. Full residual effects characterizations for Indigenous health and socio-economic conditions can be found in Volume 4, Section 10.3.3 of the Project EIS.

Note: Manitoba Transportation and Infrastructure has engaged Treaty 2 First Nations/Anishinaabe Agowidiiwinan on the Project; however, this organization has not been included in Table IAAC-R2-29-1, since the individual First Nations that comprise this organization have been included separately. Similarly, IRTC has not been included in this table as separate entries for each of the IRTC communities represented on this Project have been included.

b. **Input from Indigenous Groups**

Since the issuance of the Project EIS in March 2020, Manitoba Transportation and Infrastructure has continued to conduct community meetings and workshops as well as receiving Indigenous input through TLRU studies, socio-economic studies, community consultation reports, feedback on EMP plans, technical reviews of the Project EIS, and Indigenous feedback on draft and final responses to the May 2022 IRs. This information has been included in response to this IR as relevant and appropriate. Further, Project information, including preliminary EMP plans and the Project EIS, were sent for review by Indigenous groups engaged on the Project. As of April 2023, written responses have been received by 13 Indigenous groups and the RM of Grahamdale. In addition, informal input and comments during early Project dialogue have been considered in the furtherment of the Project.

The summary of this information in Table IAAC-R2-29-1 demonstrates that Manitoba Transportation and Infrastructure has received a considerable amount of information regarding Indigenous health and socio-economic conditions, especially for the ten Potentially Most Affected Indigenous groups. At the time the response to IAAC-R2-29 was submitted, anticipated socio-economic studies from the IRTC and Fisher River Cree Nation had not yet been received by Manitoba Transportation and Infrastructure. At such time as Manitoba Transportation and Infrastructure receives these reports, they will be reviewed against the results of the Project EIS according to the categories outlined above and included in the updated version of the ICSER that Manitoba Transportation and Infrastructure will submit to IAAC.

c. **Mitigation and Follow-up**

As noted above under Part a., mitigation measures, monitoring and follow-up plans that may serve to reduce or avoid potential effects to Indigenous health and socio-economic conditions are presented in column 4 of Table IAAC-R2-29-1. Through the Indigenous consultation and engagement process, Manitoba Transportation and Infrastructure is committed both to working with Indigenous groups to understand how the social, economic, and health conditions of Indigenous groups in the Project area may be affected; and to designing and implementing appropriate mitigation strategies through a process of adaptive management that incorporates input from Indigenous groups. As feedback from Indigenous groups about land uses, concerns, and recommendations are made available to Manitoba Transportation and Infrastructure, they will be considered in the context of the results of the Project EIS and will be used for Project planning, further engagement, and regulatory purposes, where applicable. Specific monitoring and follow-up plans for Project components and VCs are described in the responses to Information Requests IAAC-R2-01, IAAC-R2-04, IAAC-R2-06, IAAC-R2-9, IAAC-R2-12, and IAAC-R2-30.

As described in Volume 4, Section 9.6.4.1 of the Project EIS and the text above, detailed discussions to review mitigation and monitoring programs have been and will continue to be incorporated into community-specific work plans that support consultation. An Environmental Management Program has been developed to manage, monitor, and mitigate potential environmental effects during the construction and operating phases of the Project and is being shared with Indigenous groups for input

prior to finalization. Revisions to plans have been informed by and will be based on information received from the Indigenous consultation and engagement process, the Environmental Assessment process, Project planning activities, and on conditions of provincial and federal environmental regulatory approvals received for the Project. As these will be living documents, any changes to the plans that occur after Project approvals are received will be shared with regulators, rights-holders and stakeholders prior to implementation of the change. An Environmental Protection Plan, complete with mapbooks of the PDA, has been developed and will provide site-specific detailed protection measures to be followed to minimize potential effects to environmentally sensitive sites (ESSs). ESSs are locations, features, areas, activities, or facilities that were identified to be ecologically, socially, economically, culturally, or spiritually important or sensitive to disturbance and require protection during construction of the Project. The determination of an ESS includes the consideration of relevant information shared by Indigenous groups engaged on the Project. Additional information can be found in IAAC-R2-34.

Manitoba Transportation and Infrastructure will continue to involve Indigenous groups in additional Project monitoring. Manitoba Transportation and Infrastructure has proposed establishing an Environmental Advisory Committee (EAC) to facilitate information sharing and provide opportunities for local Indigenous communities to provide advice or recommendations to Manitoba Transportation and Infrastructure on the refinement and implementation of the EMP plans for the Project in a coordinated and collaborative manner. The EAC is intended to support the meaningful participation of local communities in environmental monitoring for the Project, promote the inclusion of local and Indigenous knowledge in the EMP plans, and provide a direct point of contact for local communities with Manitoba Transportation and Infrastructure. Additional information regarding the EAC is available in response to IAAC-R2-30.

References

Firelight Research Inc. (Firelight) with Dauphin River First Nation (DRFN). 2023. Draft Report. Dauphin River First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Firelight Research Inc. (Firelight) with Kinonjeoshtegon First Nation (KFN). 2023b. Draft Report. Kinonjeoshtegon First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023

Firelight Research Inc. (Firelight) with Lake Manitoba First Nation (LMFN). 2023. Draft Report. Lake Manitoba First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet. May 31, 2023.

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Firelight Research Inc. (Firelight) with the Little Saskatchewan First Nation (LSFN). 2023. Little Saskatchewan First Nation Socio-Economic and Well Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023

Firelight Research Inc. (Firelight) with Peguis First Nation (PFN). 2023. Draft Report. Peguis First Nation Socio-Economic and Well-Being Study for Manitoba Transportation and Infrastructure's Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

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Malone, Molly, Firelight Research Inc. (Firelight) with the Dauphin River First Nation (DFN). 2023. Draft Report. Dauphin River First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

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Malone, Molly, Firelight Research Inc. (Firelight) with the Lake St. Martin First Nation (LSMFN). 2023. Draft Report. Lake St. Martin First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Malone, Molly, Firelight Research Inc. (Firelight) with the Little Saskatchewan First Nation (LSFN). 2023. Draft Report. Little Saskatchewan First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Malone, Molly, Firelight Research Inc. (Firelight) with the Peguis First Nation (PFN). 2023. Draft Report. Peguis First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

Malone, Molly, Firelight Research Inc. (Firelight) with the Pinaymootang First Nation (PMFN). 2023. Draft Report. Pinaymootang First Nation Rights Impact Assessment for the Lake Manitoba and Lake St. Martin Outlet Channels Project. May 31, 2023.

QUESTION IAAC-R2-31

Referenced Round 1 IR(s): IAAC-33, IAAC-34, IAAC-35, IAAC-36, IAAC-37, IAAC-82, IAAC-105

Expert Dept. or group: Hollow Water First Nation
Pinaymootang First Nation
Little Saskatchewan First Nation
Lake St. Martin First Nation
Manitoba Metis Federation

EIS Guideline Reference: 7.1.5 Fish and Fish Habitat

7.3.3 Indigenous Peoples

Context and Rationale

The EIS Guidelines requires the assessment of baseline conditions for fish and fish habitat including maps, at a suitable scale, indicating the surface area of potential or confirmed fish habitat for spawning, rearing, nursery, feeding, overwintering, migration routes, etc. This should be provided combined with the baseline information for commercial fishing in order to understand potential effects to the socio-economic conditions of Indigenous peoples.

The responses recognize the concerns expressed by Indigenous groups regarding decline in local fish populations, and that information collected regarding commercial harvest returns will be recorded and responded to, as required.

The response to IAAC-82 provides a general description of habitat and a map at a 1:50 000 that only outlines the LAA for Fish and Fish habitat. A detailed description of the surface area of fish habitat used by fish, including the surface area of fish habitat used for spawning, for all potentially affected waterbodies, has not been provided as requested in IAAC-82.

The mapping of habitat areas showing quantity and quality of habitat for each of the focal species is needed to understand potential effects to fish and fish habitat, effects to the current use of lands and resources for traditional purposes, and the socio-economic conditions of Indigenous peoples. Mapping is also needed to understand the mitigation measures and the amount and types of habitat where effects cannot be avoided or mitigated and must be offset.

Indigenous groups rely on fish for food, recreation, and socio-economic wellbeing. It is understood that the Proponent plans to incorporate Indigenous monitors and use the Environmental Advisory Committee (EAC) in planning and overseeing monitoring and follow-up. However, it is unclear what the mitigation measures and offsetting will be for all potential effects to fish and fish habitat, which is needed to inform effects to Indigenous peoples and their participation in decision-making through the EAC.

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Information Requests

a. Provide a detailed description of the surface area of fish habitat used by fish, including the surface area of fish habitat used for spawning, for all potentially affected waterbodies.

b. Provide the population data and analysis that can be shown from commercial catch record information and habitat mapping and associated quantification. Using the updated habitat assessment, describe the potential effects of the Project to the current use of lands and resources for traditional purposes and the socio-economic conditions of Indigenous peoples. The assessment of effects must consider the baseline current use of fish resources for traditional, recreational and socio-economic purposes.

c. Provide a description of mitigation measures that will be implemented to avoid adverse effects to commercial fishing and describe how effects to commercial fishing will be monitored to evaluate effects to the socio-economic conditions of Indigenous peoples.

d. Describe any plans for engagement with Indigenous groups to discuss effects to the current use of lands and resources for traditional purposes and to socio-economic conditions, specifically related to fishing, and how input from Indigenous groups will be incorporated into mitigation and follow-up programs.

Response IAAC-R2-31

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IRs) provided on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups.

This response integrates a reply to questions raised in October 24, 2022, correspondence from Pinaymootang First Nation, Sagkeeng First Nation and Sandy Bay Ojibway First Nation on effects to culturally and commercially important fish species/habitat and Indigenous fishing practices; mitigation for any adverse effects to cultural experience; and Indigenous involvement in monitoring, including for socioeconomic and cultural impacts. This includes an updated assessment of the magnitude, duration, and spatial extent of effects on fish and fish habitat, and anticipated changes in habitat availability.

This response also integrates a reply to questions raised in September 30, October 17 and October 31, 2022, submissions from the Interlake Reserves Tribal Council Inc. requesting information on issues such as fish habitat (including for culturally and commercially important fish species, and including Dauphin and Fairford rivers); effects to fish (including stranding); effects to fisheries; and mitigation, monitoring (including harvest records) and follow-up programs, including participation of commercial harvesters and the Environmental Advisory Committee.

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This response also addresses comments received by Fisher River Cree Nation on February 27, 2023, regarding concerns about spatial boundaries for the assessment of fish and fish habitat, and effects to fishing operations from the fouling of nets.

This response also considers relevant information from the Fisher River Cree Nation Socio-economic Impact Assessment Report (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023).

a. **Surface Area of Fish Habitat**

As noted in the May 31, 2022, response to Information Request (IR) IAAC-82, the Fish and Fish Habitat local assessment area (LAA) for the Project encompasses more than 800 square kilometres (km^2) (309 square miles [mi^2]) of aquatic (fish) habitat and includes: Watchorn Bay and the inlet to the Fairford River; the Fairford River; Pineimuta Lake; Lake St. Martin; the Dauphin River; and Sturgeon Bay. The May 31, 2022, response to IRs IAAC-82 and IAAC-103, both note that Volume 4, Section 10.2.4.4 of the Project Environmental Impact Statement (EIS) discusses how changes in fish and fish habitat can result in changes in the availability of this traditional resource for current use. The May 31, 2022, response to IR IAAC-76, discusses the relationship between fish habitat and potential effects to the socio-economic conditions of Indigenous peoples. It notes that Volume 4, Section 10.2.4.4 of the Project EIS explains that the Project could lead to changes in fish habitat for traditionally used resources which support activities such as fishing, and that many of the Indigenous groups in the regional assessment area (RAA) rely on fishing for sustenance and income. It also notes that Volume 4, Section 10.2.4.4 of the Project EIS recognizes that unmitigated effects to fish spawning areas could affect the fisheries resource. It further notes that Volume 4, Section 10.2.4.4 of the Project EIS concludes that there will be a loss of fish habitat, but that this is predicted to be relatively small compared to the remaining habitat available in the RAA and after mitigation, there is no expectation of noticeable residual effects on fish abundance and therefore recreational, subsistence, and commercial fishing should be able to continue with minimal disruption to Indigenous peoples.

While the overall assessment conclusions regarding fish habitat have not changed, work to further investigate fish habitat has been ongoing since the filing of the Project EIS in March 2020; primarily involving an extensive desktop mapping exercise. This included the collation of existing habitat information presented in the Project EIS with additional data collected subsequent to production of the Project EIS and data derived from available satellite imagery using remote sensing techniques. The spatial area considered for this exercise included potentially affected waterbodies in the LAA

(Figure IAAC-R2-31-1), except for the northern part of Sturgeon Bay in Lake Winnipeg, where habitat data were not collected and could not be derived from satellite imagery.

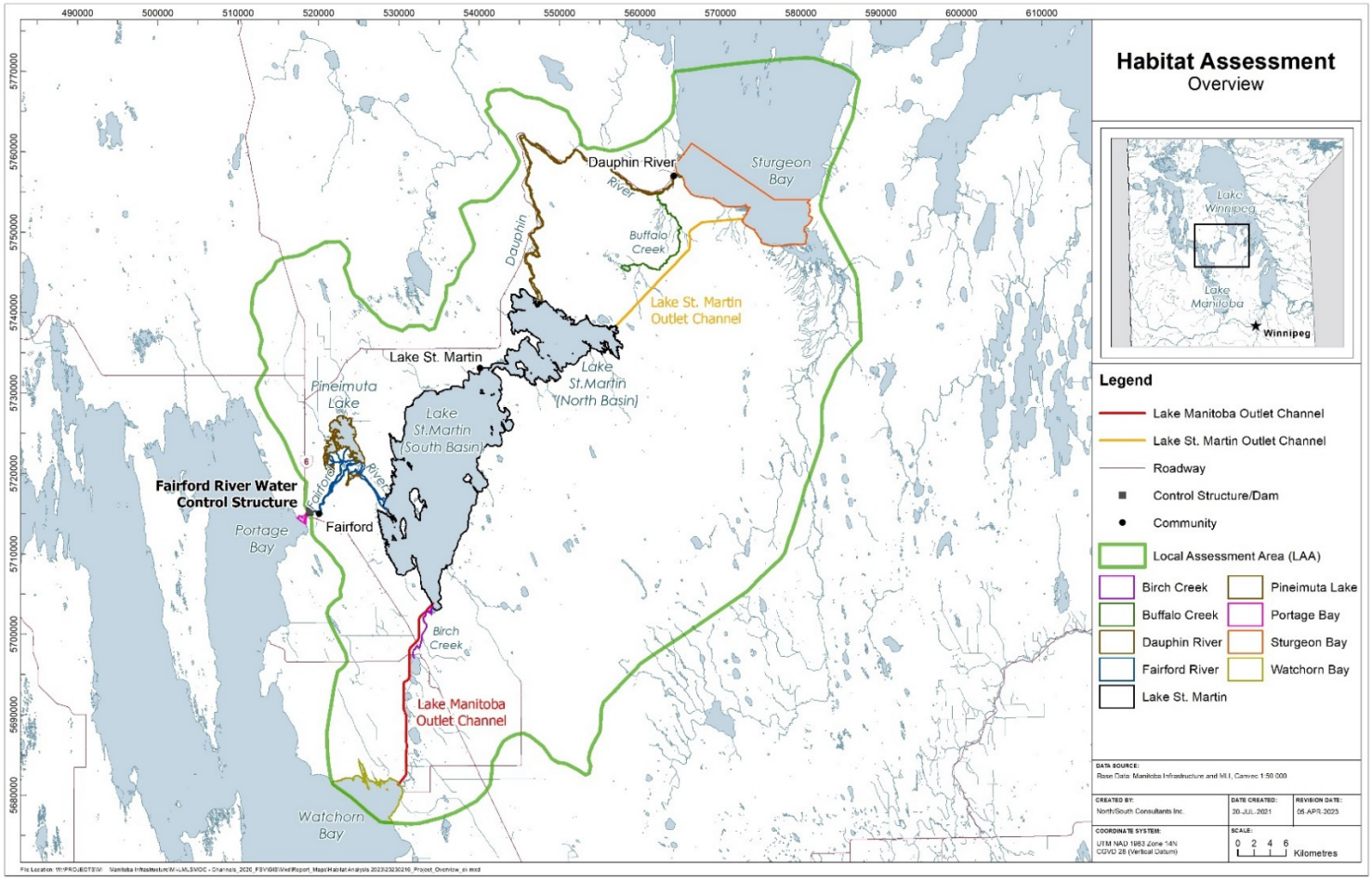
The aquatic habitat mapping exercise covers the following waterbodies potentially affected by construction and operation of the channels:

- Watchorn Bay (Lake Manitoba) near the Lake Manitoba Outlet Channel (LMOC) inlet structure.
- Portage Bay and the Fairford River outlet at Lake Manitoba.
- Fairford River.
- Pineimuta Lake.
- Lake St. Martin.
- Dauphin River.
- Southern Sturgeon Bay in Lake Winnipeg.
- Birch Creek.
- Buffalo Creek.

Habitat parameters used in the mapping process include water depth, distribution of substrate classes, and presence/distribution of aquatic macrophytes. Geographical Information Systems (GIS) methods and analyses were used to combine:

- Habitat data presented in the Project EIS with supplemental habitat data collected subsequent to the Project EIS production.
- Depth and substrate information for shallow and nearshore areas extracted from satellite imagery collected during low water level conditions.
- Spatial boundaries of perennial submergent and emergent aquatic vegetation extracted from satellite imagery collected during low water level conditions.

Figure IAAC-R2-31-1 Location of the Lake Manitoba and Lake St. Martin Outlet Channels relative to the LAA identified in the Project EIS. Key waterbodies for habitat mapping are highlighted.



Additional analyses were conducted to define shoreline boundaries for each waterbody at a high water level (HWL) condition coinciding with the ordinary high water mark (HWM) – approximately corresponding to the 1:2-year flood, and under low water level (LWL) conditions to illustrate the variation in habitat availability existing under current conditions. Habitat maps illustrating bathymetry, the distribution of substrate classes, and the distribution of submergent and emergent aquatic vegetation beds were produced for each waterbody where sufficient data existed. In general, detailed maps of bathymetry, substrate conditions, and aquatic vegetation distribution were produced for most lake environments, maps of HWM and LWL wetted areas were generated for the Fairford and Dauphin rivers, and maps of wetted area under HWM conditions were produced for Birch and Buffalo creeks. Limited bathymetric and substrate data have been collected in the Fairford and Dauphin rivers, but spatial coverage was insufficient to support production of bathymetry or substrate maps of the two rivers. Flow in Birch and Buffalo creeks varies widely between seasons and years. Typically, peak flow and habitat availability occur during the spring freshet and decline to minimal flows by fall. In some years, flow in Birch Creek ceases and the creek dries up. A summary of habitat maps produced during this exercise is provided in Table IAAC-R2-31-1.

The habitat maps were then used to define the distribution of potential spawning habitat within the LAA for key fish species, including walleye, northern pike, and lake whitefish. Optimal spawning conditions were defined based on water depth, preferred substrate and occurrence of aquatic vegetation provided in published scientific literature. Lake whitefish spawn during fall, with the eggs incubating through winter and hatching in the spring. Consequently, ice thickness was included as a factor in defining potential lake whitefish spawning habitat. Both the spring-spawning walleye and fall-spawning lake whitefish spawn on a diverse array of substrate classes over their natural range, but large substrates (gravels, cobbles, and small boulders) are most commonly used (Bozek et al. 2011; Scott and Crossman 1998). Furthermore, known lake whitefish spawning areas and suspected walleye spawning locations in LAA waterbodies are comprised of coarse substrates. To simplify identification of optimal spawning habitat for walleye and lake whitefish, the detailed substrate class distribution maps were simplified to create two substrate classes including a Rocky/Coarse class, which included gravels, cobbles, and boulders (preferred spawning substrate), and a Sand/Silt class that included sands, clays, and silts. Criteria used to define potential spawning habitat are provided in Table IAAC-R2-31-2.

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Table IAAC-R2-31-1 Summary of habitat maps produced for LAA waterbodies

Waterbody	Wetted Area		Bathymetry	Substrate			Aquatic Vegetation
	High Water Level[1]	Low Water Level[2]		Project EIS Substrate	Updated Substrate	Simplified Substrate	
Watchorn Bay	yes	yes	limited coverage	limited coverage	no	no	no
Fairford River/Portage Bay	yes	yes	limited coverage	limited coverage	no	no	no
Fairford River	yes	yes	limited coverage	limited coverage	no	no	yes
Pineimuta Lake	yes	yes	yes	yes	yes	yes	yes
Lake St. Martin	yes	yes	yes	yes	yes	yes	yes
Dauphin River	yes	yes	limited coverage	limited coverage	no	no	no
Sturgeon Bay	yes	yes	yes	yes	no	yes	no
Birch Creek	yes	no	no	no	no	no	no
Buffalo Creek	yes	yes	no	no	no	no	no

Notes:

1 HWL - the ordinary high water mark in flowing waters is an indicator of the active channel or bank-full level often associated with the 1:2 year flood flow return level (DFO 2020)

2 LWL - an approximate 5th percentile water level condition on Lake St. Martin

Table IAAC-R2-31-2 Criteria used to define potential spawning habitat

Species	Depth (m)	Substrate [1]	Aquatic Vegetation	Reference
Walleye	0.5-3.0	Coarse composition	none	Bozek et al. 2011 Scott and Crossman 1998
Northern Pike	<1.0	well vegetated detritus	present	Casselman and Lewis 1996 Scott and Crossman 1998
Lake Whitefish	>1.2 m to account for ice	Coarse composition	none	Bégout Anras et al. 1999 Scott and Crossman 1998

ESRI ArcGIS 10.8 software was used to conduct a series of spatial query and overlay geoprocessing steps to produce the final potential spawning habitat area maps. The mapping results provide what should be considered as a simple model of potential fish spawning habitat because other factors that contribute to the suitability of habitat for spawning (e.g., water velocity, wave energy, shoreline exposure) were not included in the analysis. A summary of total available habitat and potential spawning habitat, where that analysis was conducted, summarized by designated area within the LAA under high and low water conditions is provided in Table IAAC-R2-31-3.

A brief discussion of results of the fish habitat assessment is provided for potentially affected waterbodies in the LAA by waterbody in the following sections. Where available, known information on fish habitat use was used in conjunction with habitat characteristics to identify potential spawning areas for a given waterbody. Detailed methods and results of this process are provided in Appendix IAAC-R2-31-1.

Watchorn Bay

Based on the mapping analysis there are currently 2,968 hectares (ha) (7,334 acres [ac]) of wetted habitat under high water level conditions and 2,864 ha (7,077 ac) of wetted habitat under low water conditions in the portion of Watchorn Bay included within the LAA (Table IAAC-R2-31-3). Bathymetry and substrate mapping within Watchorn Bay was limited to a small area at the proposed inlet for the LMOC (AAE Tech Services Inc. 2016). Additional beach and nearshore substrate descriptions in the vicinity of the LMOC were provided by J.D. Mollard and Associates (2019). Insufficient data was available to produce potential spawning habitat maps.

From these studies, Watchorn Bay is a shallow bay with flat topography and nearshore substrates comprised of gravel, cobbles, and boulders. Substrate offshore to approximately 1.5 metres (m) (4.9 feet [ft]) water depth is predominantly sand, with scattered boulders and boulder fields. At depths exceeding 1.5 m (4.9 ft), substrate consists of a finer gravel, sand, and silt mixture interspersed with pockets of coarser sand and gravel, as well as occasional boulders and boulder fields.

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Table IAAC-R2-31-3 Total available habitat, and potential spawning habitat summarized by designated area within LAA waterbodies under high and low water conditions

	Total Available Wetted Habitat (ha)			Potential Walleye Spawning Habitat (ha)		Potential Northen Pike Spawning Habitat (ha)		Potential Lake Whitefish Spawning Habitat (ha)	
	HWL[1]	LWL[2]	IEZ %[3]	HWL	LWL	HWL	LWL	HWL	LWL
Watchorn Bay	2,968	2,864	4	-	-	-	-	-	-
Portage Bay/ Fairford River	78	34	56	-	-	-	-	-	-
Fairford River	314	264	16	-	-	-	-	-	-
Pineimuta Lake	1,527	1,119	27	405	77	246	478	204	-
Lake St. Martin	34,001	31,403	8	4,872	3,360	477	3,033	4,904	2,745
Dauphin River	785	541	31	-	-	-	-	-	-
Sturgeon Bay	8,506	8,276	3	246	1,081	-	-	4,189	4,166
Birch Creek	19	-	-	-	-	-	-	-	-
Buffalo Creek	120	88	27	-	-	-	-	-	-

Notes:

1 HWL - the ordinary high water mark in flowing waters is an indicator of the active channel or bank-full level often associated with the 1:2 year flood flow return level (DFO 2020)

2 LWL - an approximate 5th percentile water level condition on Lake St. Martin

3 IEZ - intermittently exposed zone – percentage of area exposed under low water conditions

The extent to which this area of Watchorn Bay is utilized by fish for spawning is not known but is believed to be limited. Although some larval fish and small numbers of adult northern pike, white suckers, walleye and lake whitefish in a pre-spawn condition were captured during field investigations conducted in 2015 and 2016, no direct evidence indicative of spawning (i.e., collection of fish eggs) in the immediate area of the LMOC inlet was collected (AAE Tech Services Inc. 2016). Watchorn and Mercer creeks, both of which enter the bay adjacent to the LMOC inlet, are used by white sucker, northern pike, and a small number walleye for spawning (AAE Tech Services Inc. 2016).

Portage Bay/Fairford River

This area of the LAA includes the Fairford River upstream of the Fairford River Water Control Structure (FRWCS) and Portage Bay (Lake Manitoba; see Figure IAAC-R2-31-1). Based on the mapping study there are 78 ha (193 ac) of wetted habitat under high water level conditions and 34 ha (84 ac) of wetted habitat under low water conditions in this area of the LAA (Table IAAC-R2-31-3). Available bathymetry and substrate mapping within this area are restricted to a small area immediately upstream of the FRWCS (NSC 2018). Insufficient data was available to produce potential spawning habitat maps.

The Fairford River upstream of the FRWCS consists of two channels that are separated by a small island. Most of the river flow is carried by the north channel; under low flow conditions the south channel becomes dry. Water depth within the north channel ranges up to more than 2 m (6.6 ft), but depth over most of Portage Bay is less than 2 m (6.6 ft) and large portions of nearshore areas of the bay become exposed under low water level conditions. Field observations indicate that substrate throughout the area included gravels, cobbles, and boulders, optimal spawning substrates for species such as white sucker, walleye, and lake whitefish.

It is not known whether fish utilize the area to spawn. Larval fish have been captured in the Fairford River upstream of the FRWCS, but it is not known if they originated in the Fairford River, Portage Bay, or from farther afield in Lake Manitoba (NSC 2022a; NSC 2023a). As noted, substrate conditions suitable to support spawning by several species occur throughout the area, and it is likely that some spawning may occur.

Fairford River

Based on the mapping study there are 314 ha (776 ac) of wetted habitat under high water level conditions and 264 ha (652 ac) of wetted habitat under low water conditions in the Fairford River downstream of the FRWCS, including the river mainstem and river delta complex near Pineimuta Lake but not including Pineimuta Lake proper (Table IAAC-R2-31-3; Figure IAAC-R2-31-1). Available bathymetry and substrate mapping in the Fairford River is restricted to a small area immediately downstream of the FRWCS and portions of the downstream-most reach of river (NSC 2018). Insufficient data was available to produce potential spawning habitat maps for the river.

Water depth within the Fairford River fluctuates with discharge and can range up to 2 m (6.6 ft) in depth under high flow conditions. Field observations indicate that substrates throughout most of the river are comprised of gravels, cobbles, and boulders, optimal spawning conditions for species such as white sucker, walleye, and lake whitefish.

Spring and fall fish utilization and spring larval fish studies indicate that numerous large-bodied fish such as white sucker, shorthead redhorse, walleye, freshwater drum, carp, cisco, and lake whitefish utilize habitat in the Fairford River to spawn (NSC 2022a; NSC 2022b; NSC 2023a). Exact spawning locations are not known and likely differ among years due to variable water level and flow conditions in the Fairford River. The fishway at the FRWCS is locally thought to restrict upstream movements of fish and, during some years when fish cannot ascend the fishway, many species of fish likely spawn in the downstream vicinity of the FRWCS.

Pineimuta Lake

Pineimuta Lake is a shallow lake/ wetland complex situated along the Fairford River between Lake Manitoba and Lake St. Martin (Figure IAAC-R2-31-1). The lake receives flow from the Fairford River via a series of channels that form a delta prior to entering the lake and is returned to the Fairford River via a single exit channel on the east side of the lake. Based on the mapping study there are 1,527 ha (3,773 ac) of wetted habitat under high water level conditions and 1,119 ha (2,765 ac) of wetted habitat under low water conditions in the lake (Table IAAC-R2-31-3). Existing bathymetric and substate data supplemented with data derived from available satellite imagery (augmented data using remote sensing techniques) were used to map potential spawning habitat for walleye, northern pike and lake whitefish spawning habitat in Pineimuta Lake.

Analysis of habitat modeling outputs suggests that there is an estimated 405 ha (1,001 ac) of potential spawning habitat for walleye during high water level conditions (Table IAAC-R2-31-3). Much of this habitat is available peripheral to the marsh/delta complex in the area as well as along the eastern shoreline where coarse substrates are abundant. This habitat is reduced to an estimated 77 ha (190 ac) under low water level conditions (Table IAAC-R2-31-3).

In contrast to walleye habitat, the estimated potential spawning habitat for northern pike increases to 478 ha (1,181 ac) under low water level conditions from 246 ha (608 ac) estimated under high water conditions (Table IAAC-R2-31-3). Much of the potential spawning habitat during high water occurs around the fringe of the shoreline where aquatic vegetation is, and the water is shallow. Under low water conditions, much more aquatic vegetation occurs in the range of water depths preferred by pike.

Potential lake whitefish spawning habitat in Pineimuta Lake varies considerably with water level in the lake. There are an estimated 204 ha (504 ac) of potential whitefish spawning habitat during high water level conditions (Table IAAC-R2-31-3), much of which occurs along the eastern half of the lake. During low water level conditions, water depth becomes too shallow to protect incubating eggs from becoming crushed or frozen into ice. The suitability of this habitat to support eggs through the winter

will be variable and dependent on thickness of ice cover and overwinter flows coming from the Fairford River.

Little information describing fish spawning in Pineimuta Lake has been documented, but anecdotal information has indicated that walleye spawn used to be collected from a small creek draining into the north part of Lake Pineimuta and local knowledge has indicated that walleye, lake whitefish and northern pike spawn in the lake (Lake St. Martin First Nation; 12 March 2023). Larval fish were captured in the Fairford River downstream of Lake Pineimuta, but it is not known if they originated in Pineimuta Lake or the Fairford River (NSC 2022a; NSC 2023a).

Lake St. Martin

Based on the mapping study, Lake St. Martin has a total surface area of 349 km^2 (135 mi^2) and is comprised of two basins connected by a narrow constriction (the Narrows). There are 34,001 ha (84,018 ac) of wetted habitat under high water level conditions and 31,403 ha (77,599 ac) under low water level conditions (Table IAAC-R2-31-3). In general, the Narrows and north basin of the lake are much shallower and lower-sloped relative to the south basin. Consequently, there is a much larger area of exposed habitats in those areas under low water conditions compared to the south basin. Bathymetry and substrate information have been collected throughout most of Lake St. Martin except for shallow areas near shorelines and in parts of the Narrows. Potential spawning habitat for walleye, northern pike and lake whitefish spawning habitat in Lake St. Martin was mapped using existing bathymetric and substate data supplemented with data derived from augmented data, which was in turn derived from available satellite imagery using remote sensing techniques.

There is an estimated total of 1,433 ha (3,541 ac) of potential spawning habitat for walleye under high water level conditions (Table IAAC-R2-31-3), much of which occurs in the Narrows and north basin of the lake. Potential walleye spawning habitat in the south basin occurs along rocky shorelines and shoals to the north of the Fairford River outlet and in Birch Bay and other areas of the southern part of the basin (see Figure IAAC-R2-31-1). The extent of potential walleye spawning habitat declines to 1,070 ha (2,644) at low water level conditions (Table IAAC-R2-31-3). Much of the potential spawning habitat available in the north basin and the Narrows during high water becomes much less suitable due to shallow water. However, more potential habitat becomes available in the south basin as water level reduction improves the suitability of deeper rocky shoals and reefs.

During high water level conditions, habitat modeling estimates that there are 477 ha (1,179 ac) of potential spawning habitat for northern pike in Lake St. Martin (Table IAAC-R2-31-3), most of which is located along shorelines where aquatic vegetation is present. A large increase in potential northern pike spawning habitat occurs under low water level conditions, when water depth decreases to preferred spawning depths in areas of submerged macrophytes that are too deep for northern pike spawning under high water level conditions. Habitat modeling estimates that 3,033 ha (7,495 ac) of potential spawning habitat becomes available during low water conditions (Table IAAC-R2-31-3). Much of the low water level habitat occurs in the Narrows and north basin of the lake.

For fall-spawning lake whitefish, there is an estimated 4,904 ha (12,118 ac) of potential spawning habitat available under high water levels (Table IAAC-R2-31-3). Much of this habitat is found in the southern half of the south basin of Lake St. Martin, including Birch Bay and along the southeastern shore. Only limited potential spawning habitat for fall spawning species including lake whitefish and cisco occurs in the north basin where shallow water increases the potential for eggs to be destroyed by ice. Under low water level conditions, potential spawning habitat for whitefish is reduced to 2,745 ha (6,783 ac) (Table IAAC-R2-31-3), almost all of which occurs in the south basin.

Walleye spawning areas within Lake St. Martin have not been identified during fisheries investigations, but local knowledge and anecdotal information indicate that many of the tributaries to the lake including the Fairford River historically or currently provide walleye spawning habitat (AAE Tech Services Inc. 2016; NSC 2013; 2022a, 2022b,2022c). The extent to which walleye may spawn in the lake is not known. Similarly, preferred northern pike spawning areas within Lake St. Martin have not been identified, but tributaries such as Birch Creek, which enters Birch Bay in the southern part of the lake, provide habitat utilized by northern pike for spawning (AAE Tech Services Inc. 2016; NSC 2022e; 2023b).

The Narrows has long been known to provide spawning habitat for lake whitefish that move into Lake St. Martin from Sturgeon Bay each fall. Local knowledge and recent fisheries investigations suggest that whitefish spawning also occurs in the southern part of Lake St. Martin near Hilbre Beach (W. Galbraith, Indigenous Services Canada, pers comm; 18 November 2022) and in Birch Bay (NSC 2022a, 2023a).

Dauphin River

There are 785 ha (1,940 ac) of wetted habitat under high water level conditions and 541 ha (1,337 ac) of wetted habitat under low water conditions in the Dauphin River (Table IAAC-R2-31-3; Figure IAAC-R2-31-1). Available bathymetry and substrate mapping in the Dauphin River is restricted to the lower-most 4.5 kilometres (km) (2.8 miles [mi]) and, consequently, insufficient data was available to produce potential spawning habitat maps for the entire river.

Water depth within the Dauphin River fluctuates with discharge and can range up to 2 m (6.6 ft) in depth under high flow conditions. The lower-most 4.5 km (2.8 miles) of the river is comprised of gravels, cobbles, and boulders, interspersed with small pockets of sand (NSC 2016a). Field observations indicate that substrates throughout most of the upper portions of the river are also comprised of gravels, cobbles, and boulders.

Fisheries investigations have shown that many fish species utilize habitat within the Dauphin River for spawning. Species that currently spawn in the river include walleye, yellow perch, white sucker, shorthead redhorse, carp, freshwater drum, lake whitefish, and cisco, as well as several species of small-bodied fish (NSC 2016b; 2022a). Spawning locations in the river vary with water level and discharge. For example, lake whitefish, white sucker, and possibly shorthead redhorse spawned in the Dauphin River at the confluence of Buffalo Creek during high water level conditions occurring in

2011-2014 (NSC 2016b) but spawned elsewhere during low water level conditions occurring in 2020 and 2021 (NSC 2022f).

Sturgeon Bay

Existing habitat information for Sturgeon Bay in Lake Winnipeg was available for an approximate 4 km (2.5 mi) wide swath extending across the southern part of the bay. Although the LAA extends farther north, the habitat analysis presented here is restricted to the area where existing information was available. Based on the mapping study there are 8,506 ha (21,019 ac) of wetted habitat under high water level conditions in the southern part Sturgeon Bay and 8,267 ha (20,428 ac) of wetted habitat under low water conditions (Table IAAC-R2-31-3). Existing bathymetric and substate data were used to map potential spawning habitat for walleye and lake whitefish spawning habitat in the bay. Information describing the distribution of aquatic macrophytes has not been collected and could not be derived from satellite imagery and, consequently, potential spawning habitat maps for northern pike were not prepared.

Analysis of habitat modeling outputs suggests that there are an estimated 246 ha (608 ac) of potential spawning habitat for walleye in southern Sturgeon Bay under high water level conditions (Table IAAC-R2-31-3). Much of this habitat occurs in a narrow band located 100-500 m (328-1640 ft) offshore and extending from the Dauphin River around the southern shore to the east side of the bay. Under low water level conditions, the extent of potential spawning habitat increases to an estimated 1,081 ha (2,679 ac) (Table IAAC-R2-31-3) as water depth decreases to suitable spawning depth over broad areas of coarse substrates.

Analysis of habitat modeling outputs suggests that more potential spawning habitat exists for lake whitefish than for walleye in southern Sturgeon Bay. There are an estimated 4,175 ha (10,317 ac) of potential lake whitefish spawning habitat under high and low water level conditions (Table IAAC-R2-31-3) that occurs over coarse substrates extending across the southern part of the bay.

Fisheries investigations and local knowledge have indicated that many species of fish spawn in southern Sturgeon Bay including walleye, yellow perch, sauger, white sucker, shorthead redhorse, lake whitefish, cisco, northern pike and numerous small-bodied species (NSC 2013; NSC 2016b, 2018). Spawning likely can occur over broad portions of the southern part of the bay as suggested by the habitat modeling, but areas to the east and west of Willow Point have been identified as spawning areas for several species (NSC 2013; NSC 2016b, 2018).

Birch Creek

Birch Creek originates at Goodison Lake and flows for approximately 9 km (5.5 mi) before entering Lake St. Martin at the southern tip of Birch Bay. The creek is channelized and fish habitat within the creek is uniform for much of its length. Water supply to the creek is primarily through surface run off and flow in the creek is therefore largely dependent upon precipitation. Typically, water level is highest during the spring freshet and declines throughout summer and, in some years, can dry up by

late fall. The creek freezes to the bottom in most years and does not provide wintering habitat for fish. During high water level conditions in a wet year such as spring 2022, there are approximately 19 ha (47 ac) of wetted habitat within the creek (Table IAAC-R2-31-3).

Birch Creek provides spawning habitat for a variety of spring-spawning species including white sucker, northern pike and, to a lesser extent, walleye (AAE Tech Services Inc. 2016; NSC 2022e, 2023b). Numerous small-bodied fish species also spawn the creek (NSC 2022c, 2023b). Known spawning areas occur in the upper reaches of the creek.

Buffalo Creek

Buffalo Creek enters into the Dauphin River approximately 4 km (2.5 mi) upstream of Sturgeon Bay. The watershed is comprised of several areas that provide differing aquatic habitat conditions. The upper part of the watershed lies within a large bog/fen complex that contains Big Buffalo Lake, from which Buffalo Creek originates. Small tributaries drain into Big Buffalo Lake and Buffalo Creek within the bog complex. Most aquatic habitat in the bog/fen complex is characterized by slow-moving water flowing over the surface or through narrow channels cut through underlying peat. The substrate within the channels is primarily comprised of peat and emergent grasses. Downstream of the bog complex, Buffalo Creek flows through a more defined channel and is characterized by a greater gradient and provides more habitat diversity (NSC 2016a). The availability of aquatic habitat for fish, particularly downstream of the bog complex, is dependent upon surface water runoff and ground water inputs into the bog. Based on the mapping study there are 120 ha (297 ac) of wetted habitat under high water level conditions and 88 ha (217 ac) of wetted habitat under low water level conditions.

Currently, Buffalo Creek provides spawning habitat for spring spawning species including white sucker, northern pike, and several other small bodied species (NSC 2022c, 2023b). Spawning areas with the creek are not known, but likely change with different water level conditions.

Changes to Fish Habitat

As described in the May 31, 2022, response to IR IAAC-38, the Project is designed to manage flooding in Lake Manitoba and Lake St. Martin (i.e., during high water events), and is anticipated to operate once in every three years on average. Outside of this, the Project does not operate and conditions in the LAA remain unchanged – lake levels and habitat availability remain within the existing variability currently experienced. As described in the May 31, 2022, response to IR IAAC-74, during the period of flood operation, the Project is designed to divert flows from the Fairford and Dauphin rivers to the LMOC and Lake St. Martin Outlet Channel (LSMOC) to manage lake levels on Lake Manitoba and Lake St. Martin. The timing and duration of operation will vary and will depend on the severity of the flood event and climatic conditions. The channels will be used primarily to convey flows that cannot be conveyed by the rivers without flooding the upstream lakes or spilling over the river banks. Flows in the Fairford and Dauphin rivers will still experience seasonal variations (i.e., highest flows in spring, lower flows in summer and fall and lowest flows in winter) and will remain within historical ranges but will not be as intense as during past flood events. As a result, localized

flow patterns and associated habitat in the Fairford and Dauphin rivers, and at the inlets and outlets of these rivers during flood events are expected to be similar to those that fish would experience at near median or normal conditions.

The Project will cause local changes to fish habitat in the inlet and outlet areas of both channels, and in some of the local drainage areas surrounding the channels. As described in the May 31, 2022 response to IR IAAC-07, the assessment of potential effects to local drainage areas and local drainage patterns is addressed in Volume 2, Section 6.4.7.4 of the Project EIS. The response explains that the construction and operation of the LMOC will result in some decreases in the total drainage area of the Birch Creek and the Watchorn Creek drainage basins, resulting in a low to moderate magnitude reduction in flows in the Birch Creek system and a negligible change in flows in the Watchorn Creek system. It also explains that the construction and operation of the LSMOC will result in an overall decrease of the total drainage area of the Buffalo Creek drainage basin, resulting in a reduction in flows in Buffalo Creek. The May 31, 2022 response to IR IAAC-37, summarizes the current anticipated losses in quality and amount of fish habitat, including the excavations in the inlet and outlet areas, decreases in Buffalo Creek, Birch Creek and Watchorn Creek drainage areas. Manitoba Transportation and Infrastructure is working with the Department Fisheries and Oceans Canada to determine the type and quantity of habitat affected so that offset measures can be developed.

b. **Fish Populations and Effects to Current Use of Lands and Resources and Socio-economic Conditions of Indigenous Peoples**

Background

Manitoba Transportation and Infrastructure recognizes the importance of the fishery in the rivers and lakes in the RAA and LAA to Indigenous groups, and that there are ongoing issues and past effects, including from the construction and operation of the Emergency Outlet Channel (EOC), that have created concerns about how the Project might adversely affect this important resource. Part b summarizes the existing information available on fish populations from commercial fishing and other data, and then summarizes the potential effects to the fishery and fishing, in terms of current use of lands and resources and socio-economic conditions of Indigenous peoples.

Fish Population Data From Commercial Fishing

Volume 3, Section 7.2.2 of the Project EIS summarizes commercial, recreational, and Indigenous fisheries in Lake Winnipeg, Lake St. Martin, Dauphin River, and Lake Manitoba, including annual commercial harvest from 1997 to 2017. Results of commercial harvest and other fish monitoring data from various sources can be found in Volume 7.2-A of Volume 3. Commercial fishing is also summarized in Volume 4, Section 9.2.2 of the Project EIS. The May 31, 2022 response to IR IAAC-36, , summarizes methods and results of fish population studies for the Project.

The Manitoba Department of Natural Resources and Northern Development (MNRND) is responsible for managing commercial fisheries in the province. MNRND conducts fish community assessments that describe the state of a fish stock and provides an estimate of maximum sustainable yield (MSY); that is, an estimate of the number of fish that can be removed without causing a decline in the fish stock. Stock assessments are developed based on annual monitoring programs conducted by provincial fisheries biologists and annual catch data from the commercial fishery. The condition of fish stocks and estimates of MSY are re-evaluated yearly, on most major commercial fisheries. Currently, MNRND has completed a stock assessment for Lake Manitoba and Winnipegosis (published in 2020) and is currently developing one for Lake Winnipeg. A stock assessment is currently not planned for Lake St. Martin, but data collected during the fish community monitoring plan presented in the Aquatic Effects Monitoring Plan (AEMP), filed as part of the June 2022 supplemental information response to IAAC IRs, this data could be shared with MNRND to assist in completing a full stock assessment for the lake.

As described in Part c), as results of MNRND stock assessments become available, Manitoba Transportation and Infrastructure will report on those results in conjunction with AEMP monitoring results and note whether there are marked changes in commercial fish stocks that could be related to effects of the Project.

Effects to Commercial Fishing

Overview

Volume 1, Section 5.3.4.5 of the Project EIS summarizes input received from Indigenous groups concerning potential effects to recreational, subsistence, and commercial fishing. Volume 3, Section 7.2.1.3 of the Project EIS summarizes perspectives of Indigenous groups through engagement and through Traditional Knowledge studies, including concerns regarding recreational, subsistence, and commercial fisheries. This input includes potential declines in fish population, concern about impacts to spawning sites, fish movement and the effect on fish production. Indigenous groups also recommended using data from fish harvest records, having Fisheries and Oceans Canada (DFO) involved in reviewing the Project, and having Indigenous participation in sampling/data collection. In addition to fish habitat and associated effects to fish populations, concerns about effects to fish harvest also relate to issues such as debris fouling nets, disruptions to access and the presence of constructions workers.

Information on fish harvest data is provided in the previous section, with information also provided by socioeconomic studies carried out by Indigenous groups and funded by Manitoba Transportation and Infrastructure. DFO is reviewing the Project as part of the federal approvals process. Potential effects to habitat and Indigenous participation in sampling/data collection are discussed in the response below.

Habitat

Changes to fish habitat are summarized in the response to Part a. Volume 4, Section 10.2 of the Project EIS uses the information gathered from engagement, and from the assessment of effects to Fish and Fish Habitat from Volume 3, Section 7.2.4, to assess effects on Indigenous traditional and commercial fishing.

As noted in Part a, and Volume 4, Section 10.2.4.4 of the Project EIS, the Project is not anticipated to result in a loss of fish habitat and affect the distribution and abundance of fish species in the LAA. In addition, the physical area removed (temporarily) from fish harvesting (i.e., the inlet and outlet areas) will be negligible in proportion within the LAA to overall sizes of Lake Manitoba, Lake St. Martin, and Lake Winnipeg. GIS spatial data analysis was undertaken to determine the potential change or disruption to commercial fishing activities and fish harvesting areas affected by Project activities. It was concluded that access to commercially important lakes will be negligibly affected by the Project. Furthermore, the physical area temporarily removed from fish harvesting at the inlet and outlet areas will be negligible in proportion to the overall sizes of Lake Manitoba (1.4%), Lake St. Martin (0.2%), and Lake Winnipeg (0.1%). Predicted residual effects from the Project on fish habitat in Lake Manitoba, Lake St. Martin and Lake Winnipeg are predicted to be negligible in magnitude. As such, the residual effect is considered low due to the small area of commercial fisheries affected, limited to the LAA, medium-term in duration, infrequent, and reversible (short-term). As indicated in Part a, Manitoba Transportation and Infrastructure is working with the DFO to determine the type and quantity of habitat affected so that offset measures can be developed.

Volume 3, Section 7.2.2.2 of the Project EIS provides data on fish habitat and fish communities within the RAA and LAA and Volume 4, Section 10.2.2 of the Project EIS generally describes recreational, subsistence, and commercial fishing activities conducted by Indigenous groups. The May 31, 2022 response to IR IAAC-76, , describes potential effects of the Project on Indigenous socioeconomic conditions, culture, and the current use of lands and resources for traditional purposes resulting from potential effects of the Project on recreational, subsistence, and commercial fishing.

As noted in Part a, it is anticipated there will be limited impact from the Project on important fish habitat such as spawning areas. Furthermore, as noted in Part c, mitigation measures will be implemented during the construction and operation phases to mitigate the potential negative effects to fish and fish habitat, which will mitigate impacts to commercially important fish populations. As stated above and in Volume 3, Section 7.2.2.2 of the Project EIS, the habitats that will be temporarily or permanently altered by Project construction in Watchorn Bay, Birch Bay, the northeastern basin of Lake St. Martin and Sturgeon Bay are not unique and are abundant within each of the affected waterbodies. Fish will have access to similar habitat very close by or immediately adjacent to the affected habitats during construction of the channels. Habitat impacted by construction is anticipated to return to pre-construction productivity levels and therefore is not expected to have a measurable impact on any fish populations in the LAA or RAA. Therefore, based on this updated assessment, Manitoba Transportation and Infrastructure does not anticipate that changes in fish habitat will result

in adverse effects to the current use of lands and resources for traditional purposes and the socio-economic conditions of Indigenous peoples.

Effects From Debris

Volume 4, Section 9.2.4 of the Project EIS describes how the assessment of change in commercial fishing considered the effects from disruption to commercial fishing activities and the potential to damage equipment (e.g., boats, nets). The May 31, 2022, response to IR IAAC-81, noted pathways of effects relating to sediments and debris are described in Volume 2, Section 6.4.7.5 of the Project EIS; and pathways to Indigenous socioeconomic conditions, culture, and the current use of lands and resources are discussed in Volume 4, Section 10.2.3 of the Project EIS. Potential effects identified by Indigenous groups and commercial fishers relate to changes in substrate condition that may affect fish populations (i.e., spawning habitat) and introduction of sediments and other debris that may accumulate in fishing nets.

Current design and operational management planning will reduce sediment mobilization and debris introduction from the LMOC and LSMOC to downstream waterbodies. This includes armouring the channels with rock to minimize erosion within the channels and subsequent sediment deposition within downstream waters (Lake St. Martin and Sturgeon Bay). Flows will be managed during the initial operation (commissioning) so that residual sediment from construction is moved slowly out of the channels and that water quality in downstream waterbodies remains within water quality guidelines. Overall, channel armouring is expected to minimize sediment and aquatic vegetation inputs from the channels and minimize potential effects to fishing nets and fishing success.

In addition, operation of the channels is not expected to mobilize peat or terrestrial and aquatic vegetation, as occurred during operation of the EOC. The majority of the EOC used natural waterways (i.e., the wetlands surrounding Big Buffalo Lake, Big Buffalo Lake, and Buffalo Creek) which naturally carried small amounts of flow through peatland and heavily vegetated waterways. EOC flows removed a large amount of organic material and discharged into Sturgeon Bay, after which it may have been carried over time into Lake Winnipeg including the area around McBeth Point. The use of constructed channels, rather than small natural streams, to convey flood flows is expected to avoid the mobilization of inorganic and organic materials as was seen during EOC operation.

Access and Presence of Construction Workers

As noted in Volume 4, Section 10.3.3.2 of the Project EIS, Indigenous access to resources could be temporarily disrupted and potentially affect the harvest of commercial fishers during construction. These residual effects, while limited to construction, may affect income sources for Indigenous groups engaged on the Project. Volume 4, Section 9.4 of the Project EIS discusses the potential economic effects on commercial fishing, including in areas such as Sturgeon Bay. Volume 4, Section 9.2 of the Project EIS notes that residual adverse effects on commercial fishing are anticipated as there will be

a net loss in resource use; however, access to the commercial fishing lakes will not be permanently affected by the Project.

In Volume 4, Section 10.3.3.2 of the Project EIS, it was noted that during the construction phase, the presence of workers and equipment in the LAA will generate noise, dust, and a visual disturbance from their presence. This may detract from the traditional and subsistence fishing experience causing Indigenous users to reduce or avoid use of areas near Project work sites during periods of construction activity. In addition, without some form of mitigation there is the potential for the construction workforce to compete for fish resources that are of interest to commercial fishers in the LAA.

The May 31, 2022, response to IR IAAC-76, described Project access issues which are addressed in the Access Management Plan (AMP), as filed as part of the June 2022 supplemental information response to IAAC IRs. The AMP notes that the channels will be a critical component of provincial flood mitigation infrastructure and will also be registered as a provincial waterway. Consequently, public access to the outlet channels and associated infrastructure will be restricted for the life of the Project. Therefore, during Project operation and maintenance, potential interactions with recreational use/activities will be limited, but will include the presence and visibility of the outlet channels.

Volume 4, Section 9.2.4 of the Project EIS noted that the presence of a construction workforce could lead to increased competition for fish resources that are of interest to commercial fishers in the LAA, but existing access is already available to commercial fishing lakes and the residual effect is expected to be low, given the small area of commercial fishing lakes affected. It concluded that no residual effects on commercially fished areas would be expected from the Project during the operation and maintenance phase because habitat alteration from channel construction would have already occurred.

Summary of Effects

The May 31, 2022, response to IR IAAC-76, summarizes effects to commercial fishing activities. As described above, effects from debris are not anticipated and Part c describes the monitoring that will occur on this issue. Effects to access and presence of construction workers are expected to be temporary and not of a magnitude to measurably affect regional fisheries. As summarized in Part a, and described in Volume 4, Section 10.2.4.4, it is recognized that the Project will result in a loss of fish habitat and affect the distribution and abundance of fish species in the LAA, but the direct and indirect loss of fish habitat is relatively small compared to the remaining habitat available in the RAA.

While the Project will result in loss or alteration of fish habitat, Manitoba Transportation and Infrastructure anticipates that availability of and access to fish species traditionally harvested by Indigenous groups in the RAA will be maintained and that recreational, subsistence and commercial fishing should be able to continue with minimal disruption to Indigenous peoples. As indicated in Part a, effects and habitat losses that cannot be fully mitigated will be addressed through offsetting, as

described in the Aquatic Offset Plan, which will be submitted to DFO for approval as part of an Authorization under the *Fisheries Act*.

After mitigation, there is no expectation of noticeable residual effects on fish abundance and therefore the Project is not anticipated to pose a threat to the long-term persistence and viability of traditionally harvested fish species in the RAA. Volume 4, Section 10.2.4.4 of the Project EIS states that recreational, subsistence, and commercial fishing will be able to continue with minimal disruption to Indigenous peoples and the updated fish habitat assessments completed for this IR do not change this conclusion. Regardless of this conclusion, Manitoba Transportation and Infrastructure acknowledges that Indigenous peoples may choose not to fish in waterbodies impacted by construction and operation of the channels for recreational or cultural purposes for a variety of aesthetic, personal, cultural, or spiritual reasons. Additional information about concerns related to Indigenous health and socio-economic conditions related to fish population and fish habitat, as well as proposed mitigation and monitoring programs can be found in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

c. **Mitigation and Monitoring for Effects to Commercial Fishing**

Commercial Fishing

Adverse effects to commercial fishing will be minimized through measures intended to mitigate potential negative effects to fish and fish habitat, thereby protecting fish populations that are targeted in commercial fisheries, as well as through measures which will minimize potential effects to commercial fishers. In some instances, mitigation measures will serve to protect fish populations as well as minimize potential effects to commercial fishers. A key component will be the methods of communication and engagement described in Part d.

The AEMP, as filed as part of the June 2022 supplemental information response to IAAC IRs, indicates that data from the commercial fishery would be used to determine whether fish populations are being affected by changes in harvest amounts. The May 31, 2022, response to IR IAAC-76, notes that factors such as access to the lake, price of fish, shifting demand for new species, other costs (e.g., fuel) and experience of fishers can be more important in determining the size of commercial landings than the size of the fish stock itself. As discussed in Part b, commercial catch data will be used in conjunction with annual monitoring data collected by provincial biologists and data from monitoring programs described within the AEMP to determine whether there are marked changes that could be related to effects of the Project on commercial fish stocks.

Fish and Fish Habitat

As summarized in Part a, Manitoba Transportation and Infrastructure is working with DFO to determine the type and quantity of habitat that would be lost or altered by the Project so that offset measures can be developed. However, there are several features incorporated into the Project design or operation to protect fish that may occur within the channels and mitigate effects. Mitigation

measures that specifically address potential lost and altered fish habitat are discussed in Volume 3, Section 7.2.4.3 of the Project EIS. Measures have been developed for both the LMOC and LSMOC and are summarized below.

The LMOC is designed to remain wetted and maintain a connection to upstream and downstream lakes year-round, including under ice conditions. A small baseflow/riparian flow will be provided through the channel during periods of non-operation so that dissolved oxygen (DO) concentration within the channel is sufficient to support fish.

The LSMOC design includes several components to minimize fish stranding and potential mortality within the channel. Eight drop structures included in the channel design are intended to reduce water velocity within the channel during operation. The drop structures have been designed so that water remaining upstream of each structure is sufficiently deep so that fish remaining within the pools can survive during periods of ice cover. A small baseflow/riparian flow will be provided through the channel during periods of non-operation so that that DO concentration within the channel is sufficient to support fish during periods of ice cover and to allow fish to move downstream during periods of non-operation. A central low flow chute has been incorporated into the drop structure design to further assist downstream fish movements during periods of non-operation, while at the same time inhibiting upstream movements. In addition, the design of the lowermost drop structure will generally prevent upstream movement of fish due to high water velocity (4 metres per second)) at the crest when the channel is in operation and the steep incline of the downstream ramp prior to reaching the level of Lake Winnipeg when the channel is not in operation. In addition, the Operating Guidelines for the LSMOC include protocols for ramping down water flow within the channel during the gate opening and gate closing stages. The protocols are intended to minimize stranding during dewatering and prevent potential injury to fish by minimizing shallow flow over drop structures.

Several features have been incorporated into the Project design or operation to protect fish habitat. Both the LMOC and the LSMOC will be armoured to minimize erosion within the channels, greatly reducing sediment input to downstream water bodies that is directly attributable to operation of the channels. After Project commissioning, it is anticipated that sediment uptake in the channel will be negligible during subsequent operations. In addition, the Sediment Management Plan (SMP), as filed as part of the June 2022 supplemental information response to IAAC IRs, includes protocols that have been developed to manage sediment release during commissioning of the channels. Although the channel will be armoured, residual fine-grained materials will remain within the channels following construction. Flushing of the residual materials during commissioning will be managed by slowly ramping up flow through the channel while monitoring sediment inputs to downstream waterbodies. Flow increases will be manipulated to keep so that sediment load in the water (total suspended sediment) remains within federal and provincial water quality guidelines for the protection of aquatic life.

The AEMP describes monitoring programs that are intended to determine effectiveness of the above mitigations, as well as programs to monitor fish populations and changes to fish habitat that may arise from the Project. Results of monitoring will be used to determine whether unanticipated Project-related effects are occurring and whether modifications to planned mitigation measures are required.

Debris Monitoring

As noted in the AEMP, monitoring at McBeth Point and potentially other locations such as the southern end of Reindeer Island will indicate whether unanticipated movement of organic materials and sediments along the lake bottom is occurring out of Sturgeon Bay into Lake Winnipeg. In discussions with Fisher River Cree Nation fishers conducted during summer 2022, additional concerns with other debris types in fishing nets was identified. Manitoba Transportation and Infrastructure is developing a debris monitoring program to provide information about the potential effects of the Project on debris levels in nets once the Project is operating, and to document any unanticipated effects. The debris monitoring results will be shared with Indigenous groups and will likely be an agenda topic for the proposed EAC.

Summary

As stated, monitoring will aid in identifying potential, unanticipated impacts to fish populations that can be attributed to the Project. The results of monitoring will be used to determine mitigations for these effects that may impact Indigenous socio-economic conditions. Furthermore, as outlined in the AEMP summary presented in The May 31, 2022, response to IR IAAC-39, specific monitoring plans have been created for identified potential impacts to fish and fish habitat as well as water quality. Detailed mitigation and monitoring program review discussions have been incorporated into the community-specific work plan that supports consultation. Information shared throughout these discussions has been included in the subsequent development of mitigation strategies and environmental management and/or monitoring plans such that potential effects from the Project are appropriately assessed and mitigated. As indicated, additional information about concerns related to Indigenous health and socio-economic conditions related to fish population and fish habitat, as well as proposed mitigation and monitoring programs can be found in the response to IR IAAC-R2-29, Table IAAC-R2-29-1.

d. **Incorporation of Indigenous Engagement**

The May 31, 2022, response to IR IAAC-76, notes that Manitoba Transportation and Infrastructure recognizes there are concerns and uncertainties expressed by Indigenous groups about the validity of the assessment results, as summarized above. To address these uncertainties, which are typical for most large, complex Projects, the assessment involves the following important components:

- Emphasis is placed on making conservative predictions.

- Implementing a robust environmental management program involving mitigation measures and monitoring programs to confirm Project EIS predictions and mitigation effectiveness and allow for adaptive management of unanticipated effects.
- Sharing the results with Indigenous groups and affected communities on an on-going basis.
- Follow-up programs with commitments to address issues that may arise.

Through the engagement process Manitoba Transportation and Infrastructure is committed both to working with Indigenous groups to understand how resource users may be affected, and to the design and implementation of appropriate mitigation strategies through a process of adaptive management that incorporates input from engagement. As Indigenous knowledge, land uses, concerns, and recommendations are made available to Manitoba Transportation and Infrastructure from Indigenous groups, they will be considered in the context of the results of the Project EIS and will be used for Project planning, further engagement, and regulatory purposes, where applicable.

Manitoba Transportation and Infrastructure will continue to involve Indigenous groups in the additional monitoring of these topics within the Project area. This will be achieved by the implementation activities of the EAC, on a consensus-based approach with participating Indigenous groups and local communities. There will be further opportunities to advance Indigenous content in the Environmental Management Program (EMP) plans. Manitoba Transportation and Infrastructure is currently working with the potentially most affected Indigenous groups and local communities to establish terms of reference for an EAC and anticipates this committee would have a role in finalizing the EMP plans prior to construction, as well as act as an avenue to share information and discuss Project-related concerns, and to recommend plan modifications if required. Additional information on the EAC is presented in the response to IR IAAC-R2-30.

The Manitoba Government is committed to community economic development as a key component of Manitoba's economic strategy. It intends to develop a provincial economy that is more inclusive, equitable and sustainable. Procurement practices are one of the means that can be used to contribute to Indigenous economic development.

Manitoba Procurement and Supply Chain (PSC) branch introduced an Indigenous Procurement Initiative (IPI) to increase the participation of Indigenous peoples and suppliers in providing goods and services to government. This initiative provides a number of benefits, including:

- Stimulation of Indigenous business development;
- Creation of new employment opportunities;
- Increased procurement from Indigenous business through sub-contracting and/or joint ventures with non-Indigenous firms when bidding on contracts;
- Increased competitiveness;

- Relationship building between Indigenous suppliers, non-Indigenous contractors and government buyers;
- Better understanding of the process by suppliers, increased knowledge of Indigenous supplier base by government buyers.

Manitoba Transportation and Infrastructure is committed to supporting Indigenous economic development by increasing contracting opportunities for businesses owned by First Nation and Métis people by helping to grow Indigenous businesses via increased access to the government procurement process. Manitoba Transportation and Infrastructure endeavors to increase the participation of Indigenous businesses and workforce during construction of the proposed Project, to assist with achieving the intended benefits of the IPI.

Manitoba Transportation and Infrastructure uses established in-house practices, which include mandatory Indigenous Involvement clauses for construction projects. Involvement can include undertaking the work as a Contractor, Subcontractor or Joint Venture, and/or the provision of services, materials, fuel, labour, and equipment from the local community. Involvement targets are typically 10%, but additional percentages may be considered for projects including both general and specific community involvement as a set-aside.

The department is considering further modifications to increase the Indigenous inclusion within the department's tendering process. The upcoming tender process for the Lake Manitoba and Lake St. Martin Outlet Channels Project will include Indigenous procurement clauses.

Manitoba Transportation and Infrastructure is currently reviewing options and requesting appropriate permissions for increasing Indigenous participation, in construction contracts, including Indigenous set-asides. If approved, certain contracts could be limited to competition among Indigenous businesses. Further discussions are needed to determine the scope of work and magnitude of these contracts, but Manitoba Transportation and Infrastructure expects that this will serve as another avenue to increase economic opportunities in the region.

Manitoba's Procurement and Supply Chain Branch maintains an Indigenous Business Directory that serves as resource guide for all government. The Directory is a listing of businesses that have formally registered under the Indigenous Procurement Initiative. Each business is categorized according to the information on goods and services provided in the registration profile. The Directory is comprised of a wide variety of business sectors, including construction and consulting services. The Directory is updated on a regular basis as registrations by Indigenous business are received. In addition, Manitoba Transportation and Infrastructure has reached out to Indigenous groups to request information regarding available resources in their communities. IRTC has indicated that they are developing a business directory for the communities they represent and will be sharing with Manitoba Transportation and Infrastructure. Manitoba Transportation and Infrastructure will request similar information from all 39 Indigenous groups potentially affected by the proposed Project. With inputs received, Manitoba Transportation and Infrastructure endeavours to create and manage a listing of available Indigenous resources from the 39 Indigenous groups throughout the duration of

construction, should the proposed Project obtain regulatory approvals to process. Manitoba Transportation and Infrastructure will ensure potential bidders are made aware of available business directories and listings to encourage increased Indigenous involvement.

Furthermore, Manitoba Transportation and Infrastructure has been collaborating with Manitoba Economic Development and Training, Indigenous Services Canada, and First Peoples Development Inc. (FPDI) to identify Project labour force requirements, procurement requirements and anticipated schedules which could assist in the development of training opportunities for Indigenous peoples to support potential employment as part of construction and environmental monitoring activities.

Provincial and federal funding is available to support this type of training and ongoing coordination with provincial, federal, and FPDI representatives will help to identify and develop applicable training for the Project. This is all to facilitate opportunities for Indigenous groups to have a trained and ready workforce to participate in the Project. Discussions with FPDI are ongoing and anticipated to continue as a means of facilitating training opportunities for Indigenous groups for technical positions, in addition to cleaning, cooking, or other services that would otherwise be possible. Additionally, FPDI is developing a web-based database to connect local workers with construction contractors. The database, once operational, will contain valuable information that will assist contractors in finding local workers based on their skillset and contractor requirements.

The result of this collaboration will directly or indirectly increase the IPI with the various Channels contracts. .

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QUESTION IAAC-R2-32

Referenced Round 1 IR(s): IAAC-80, IAAC-106

Expert Dept. or group: HC
IAAC

EIS Guideline Reference: 7.3.3 Indigenous Peoples

7.1.4 Groundwater and Surface Water

7.2.2.Changes to groundwater, surface water, and fluvial morphology

7.3.1.Fish and fish habitat

Context and Rationale

The EIS Guidelines require an assessment of the potential risk of production, increase, interaction, and accumulation of contaminants, including methylmercury, in fish habitat and fish as well the consumption of country foods and associated effects to the health and socio-economic conditions of Indigenous peoples.

The response to IAAC-106 indicates, “following operation of the EOC, concentrations of MeHg in commercial fish species in Lake St. Martin and Sturgeon Bay remained below the guideline for commercial sale in Canada (0.05 parts per million).” It is not clear how the results MeHg following the operation of EOC would be analogous to the changes to the drying and rewatering of wetlands downgradient of the LSMOC in the Buffalo Creek system. The information provided does not provide an indication of the actual measured concentrations of MeHg, the species of fish tested, nor an evaluation of potential risks for human consumers. Health Canada recommends using the provisional total daily intakes (pTDI) value of 0.47 µg of MeHg per kg body weight per day (kg-bw/day) for adults and 0.2 µg MeHg per kg-bw/day for women of childbearing age and young children up to 12 years of age (Health Canada, 2007†) to assess potential risks to local consumers based on consumption patterns informed by community consultation. A conservative approach would also assume that 100% of the total mercury is MeHg in the assessment, given that MeHg is more toxic to humans. This information can be used to inform risk based thresholds and adaptive management as part of the AEMP. *†Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption.*

Health Canada acknowledges the merit of including methylmercury (MeHg) monitoring in the Project’s proposed monitoring and mitigation programs as a means to validate predicted project-related impacts to fish and human consumers. However, it is unclear if baseline data on the current MeHg concentrations in relevant fish species were sufficient for modeling predicted outcomes, and the development of plans to validate those predictions. The Proponent’s response to IAAC-80 indicates that, “The benchmark for the fish mercury monitoring program will be comparison to the baseline total mercury concentration in

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Walleye, Northern Pike, and Lake Whitefish from Lake Manitoba, Lake St. Martin and Sturgeon Bay based on recently collected data." Since the baseline data have not been provided (neither raw, nor summary statistics, e.g., mean, standard deviation); it is unclear which data the response refers to, and the current baseline conditions against which future results will be compared.

A clear understanding of the baseline conditions is necessary to determine whether any health risks currently exist for consumers, and whether the proposed Aquatic Effects Monitoring Plan (AEMP) will be sufficient to detect and mitigate potential impacts.

Information Requests

a. Provide a summary table of baseline concentrations of mercury measured in locally harvested fish tissues. Identify the measured form of mercury (i.e., MeHg or total mercury), the number of samples, and the fish species.

b. Assess the effects of methyl mercury by using the pTDI values and local consumption patterns to assess potential human health risks of MeHg in country foods, and specifically, fish tissues, under baseline conditions. If MeHg is assumed to comprise less than 100% of total mercury, provide a rationale to support this assumption.

c. Describe how the AEMP's MeHg monitoring results and supplementary health risk assessments will inform/refine risk-based thresholds that trigger appropriate mitigation and management (e.g., consumption advisories).

d. Describe any mitigation measures and management strategies that could occur under various scenarios and triggers.

Response IAAC-R2-32

Preamble

In addition to providing a response to the Impact Assessment Agency (IAAC) Information Requests (IR) provided on May 31, 2022, responses are provided for any other input that has been received since this date (as applicable to the specific IR), and prior to March 31, 2023, as per correspondence provided by Manitoba Transportation and Infrastructure to Indigenous groups. This response considers relevant information from the Fisher River Cree Nation *Socio-economic Impact Assessment Report* (FRCN 2023) submitted June 28, 2023, as well as relevant information from draft Socio-Economic and Well-Being Studies and Rights Impact Assessments submitted on May 31, 2023 by Dauphin River First Nation (Firelight with DRFN 2023; Malone, Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023; Malone, Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023; Malone, Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023; Malone, Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023; Malone, Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN 2023; Malone, Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023; Malone, Firelight with PMFN 2023). This response

integrates a reply to questions raised in an October 31, 2022, from the Interlake Reserves Tribal Council Inc. requesting an explanation of how and where methylmercury monitoring will be conducted, as it is not explicitly addressed in the Wetland Monitoring Plan (WMP) or Groundwater Monitoring Plan (GWMP), both filed as part of the June 2022 supplemental information response to IAAC IRs. They also request additional explanation of the risk associated with methylmercury in light of the comment that low concentrations can still lead to issues (due to bio-amplification effects). The response also integrates a reply to a February 27, 2023, submission from Fisher River Cree Nation on methylmercury and potential effects to commercial fishing.

a. **Baseline Concentrations of Mercury in Locally Harvested Fish Tissues**

As noted in the Context and Rationale, the May 31, 2022, response to IR IAAC-106 describes the potential effects of increased methylmercury concentrations in surface water as a result of the Project and the subsequent effects this may cause on wetlands. That response references the monitoring carried out after the flooding event that was being managed by the Emergency Outlet Channel (EOC) to demonstrate that after flood events there can be elevated levels of methylmercury in downstream rivers and lakes. From a regional perspective, the Project has the potential to reduce, not increase, the amount of flooded organic carbon and decomposing vegetation, therefore reducing mercury methylation, and eventually the bioaccumulation of methylmercury in fish. As such, it was not the intent of the IR response, as stated in the IR's Context and Rationale, to provide information "analogous to the changes to the drying and rewatering of wetlands." As noted below, most research on elevated methylmercury levels in fish is associated with reservoir impoundment, but it is important to note that it can occur in non-impounded lakes and rivers after flooding events.

Baseline concentrations of mercury in locally harvested fish species are described in Appendix IAAC-R2-32-1. Samples of walleye (*Sander vitreus*), northern pike (*Esox lucius*) and lake whitefish (*Coregonus clupeaformis*) were obtained as follows:

- Lake Manitoba 2021: 66 samples, collected from the north basin of Lake Manitoba during annual index gillnetting programs conducted in Lake Manitoba by the provincial Department of Natural Resources and Northern Development, Fisheries Branch.
- Lake St. Martin 2018 and 2021: 138 samples, collected during index gillnetting surveys conducted to supplement existing fish community data in Lake St. Martin.
- Lake Winnipeg (Sturgeon Bay) 2020: 58 samples, provided by members of the Dauphin River Commercial Fishers Association.

Effort was made to obtain an equal distribution of samples per 100 mm (4 in) length interval. In some cases where captured fish of a given species were all similar in size, the number of samples per 100 mm (4 in) length interval was limited to seven to reduce laboratory costs while maintaining sufficient sample size for future comparative analyses. For example, 30 lake whitefish 400 mm to 499 mm (16 in to 20 in) in length were collected from Sturgeon Bay in 2020; of these, seven fish were selected for sampling. Fish sampled from the commercial catch in Sturgeon Bay tended to be larger, as commercial fisheries target the larger fish in a population.

Muscle samples were taken and analyzed for total mercury concentrations in March 2022. The mercury concentration of individual fish was compared to the 0.5 µg/g guideline for the commercial sale of fish in stores used by the Canadian Food Inspection Agency (CFIA). In general, results for fish muscle concentrations are as follows:

- Lake Manitoba 2021: most fish less than 0.5 µg/g, with fish having a mercury concentration in excess of 0.5 µg/g limited to three large northern pike (greater than 600 mm [24 in] in length) and two walleye (greater than 600 mm [24 in] in length).
- Lake St. Martin 2018 and 2021: most fish less than 0.5 µg/g, with fish having a mercury concentration in excess of 0.5 µg/g limited to three large northern pike (550 mm to 683 mm [22 in to 27 in] in length).
- Lake Winnipeg (Sturgeon Bay) 2020: most fish less than 0.5 µg/g, with fish having a mercury concentration in excess of 0.5 µg/g limited to the four largest northern pike (860 mm to 945 mm [34 in to 37 in] in length).

The total number of fish and summary statistics of the total mercury concentrations are presented in Table IAAC-R2-32-1 for each waterbody and fish species. The lowest mean total mercury concentration was measured in lake whitefish (N=10 to 22) ranging from 0.03 (+/- 0.01) to 0.04 (+/- 0.01) µg/g. Northern pike collected from Sturgeon Bay (N = 28) presented the highest mean total mercury concentration with 0.32 (+/- 0.19) µg/g. Maximum total mercury concentration was recorded in northern pike collected from Sturgeon Bay (0.88 µg/g) followed by walleye from Lake Manitoba (0.73 µg/g), and northern pike from Lake St. Martin (0.63 µg/g) and Lake Manitoba (0.53 µg/g).

To provide context for the mercury concentrations measured in the local assessment area (LAA), data were obtained from other lakes in Manitoba. The Coordinated Aquatic Monitoring Program (CAMP) represents a coordinated effort between the Government of Manitoba (Manitoba) and Manitoba Hydro to implement a long-term aquatic monitoring program across Manitoba Hydro's hydraulic operating system, which includes waterbodies influenced by Manitoba Hydro's hydraulic operations as well as lakes and river reaches where water levels and flows are not affected Manitoba Hydro's operations. Data are collected at more than 30 waterbodies and are available upon request. Four lakes were selected to provide context for observed mercury concentrations in the LAA:

- Cedar Lake, which is a mature reservoir for the Grand Rapids Generating Station, is situated directly north of the Project area in the same ecozone as the Project (Boreal Plain)
- Cormorant Lake, which lies directly to the north of Cedar Lake and is unaffected by industrial development, and is in the same ecozone as the Project (Boreal Plain)
- Manigotagan Lake is not affected by hydroelectric operations and is located in southeastern Manitoba in the Boreal Shield ecozone.
- Setting Lake lies to the north of Lake Winnipeg and is not affected by industrial development. It is also in the Boreal Shield ecozone.

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Table IAAC-R2-32-1 Summary of Baseline Concentrations of Mercury Measured in Locally Harvested Fish Tissues and Fish Sampled as Part of the CAMP Program 2016-2020 (CAMP 2023).

Waterbody	Fish Species	Total Number of Fish	Min. Total Mercury Concentration (µg/g)	Max. Total Mercury Concentration (µg/g)	Mean (+/-SD) Total Mercury Concentration (µg/g)
Lake Manitoba (LAA)	Walleye	38	0.08	0.73	0.22 (+/- 0.14)
	Northern Pike	18	0.1	0.53	0.28 (+/- 0.15)
	Lake Whitefish	10	0.02	0.07	0.04 (+/- 0.01)
Lake St. Martin (LAA)	Walleye	68	0.03	0.48	0.16 (+/- 0.10)
	Northern Pike	48	0.04	0.63	0.24 (+/- 0.15)
	Lake Whitefish	22	0.02	0.05	0.03 (+/- 0.01)
Sturgeon Bay (LAA)	Walleye	16	0.1	0.44	0.20 (+/- 0.08)
	Northern Pike	28	0.08	0.88	0.32 (+/- 0.19)
	Lake Whitefish	14	0.02	0.04	0.03 (+/- 0.01)
Cedar Lake (CAMP)	Walleye	36	0.04	0.30	0.16 (+/- 0.07)
	Northern Pike	36	0.04	0.46	0.17 (+/- 0.10)
	Lake Whitefish	1	0.04	0.04	0.04
Cormorant Lake (CAMP)	Walleye	36	0.09	0.78	0.24 (+/- 0.16)
	Northern Pike	29	0.10	0.64	0.31 (+/- 0.15)
	Lake Whitefish	22	0.02	0.19	0.07 (+/- 0.04)
Manigotagan Lake (CAMP)	Walleye	36	0.07	1.22	0.32 (+/- 0.31)
	Northern Pike	14	0.16	1.21	0.42 (+/- 0.31)
	Lake Whitefish	12	0.03	0.09	0.04 (+/-0.02)
Setting Lake (CAMP)	Walleye	33	0.05	0.50	0.24 (+/- 0.10)
	Northern Pike	14	0.14	0.44	0.29 (+/- 0.09)
	Lake Whitefish	24	0.01	0.06	0.03 (+/- 0.01)

Mean mercury concentrations and ranges within these lakes were comparable to those observed in the LAA.

As mercury bioaccumulates in fish, concentrations increase as fish age. Length is generally an indicator of fish age and mercury concentration/fish length relationships for the three species in the LAA and CAMP lakes are provided in Figures IAAC R2-32-1 to IAAC R2-32-3. The relationship between fish length and mercury concentration for the LAA lakes is generally similar to that for the CAMP lakes. As was noted for the LAA lakes, few fish from the CAMP Program are above the 0.5 µg/g CFIA guideline and these are generally larger individuals. Data are available for Lake St. Martin from both 2018 and 2021. Concentrations in northern pike in 2018 are higher than in 2021 for the same size of fish (Figure IAAC R2-32-2). These fish were sampled seven years after the 2011 flood and whether concentrations had increased after the flood and were declining is not known. Northern pike inhabit shallow bays where the amount of flooded shoreline is relatively the greatest and consume fish, and therefore are a species likely to experience increases in mercury concentration after flooding.

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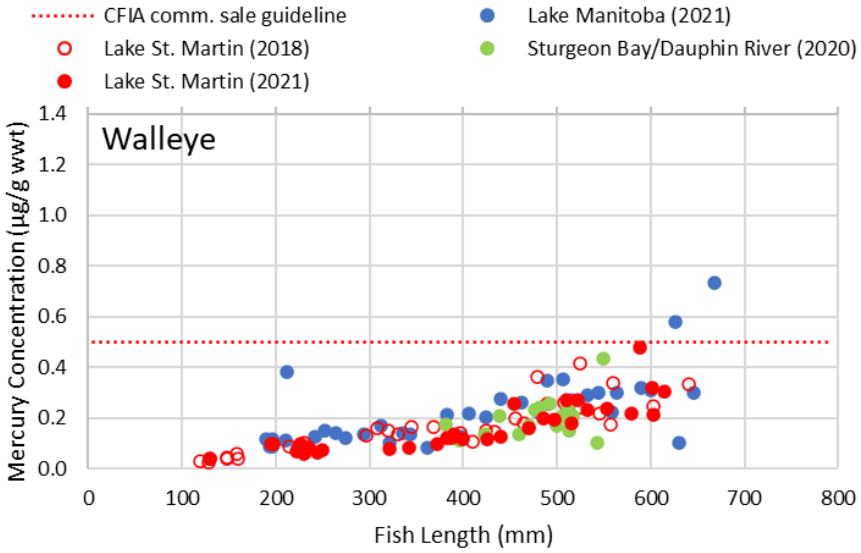
Figure IAAC-R2-32-1 Mercury concentrations measured in the tissues as a function of fish length of locally harvested Walleye (top) and Walleye sampled as part of the Coordinated Aquatic Monitoring Program (bottom).



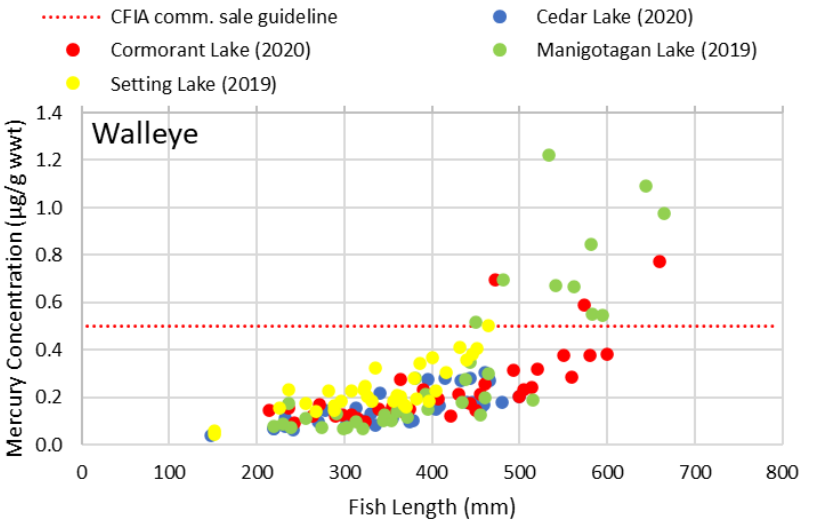


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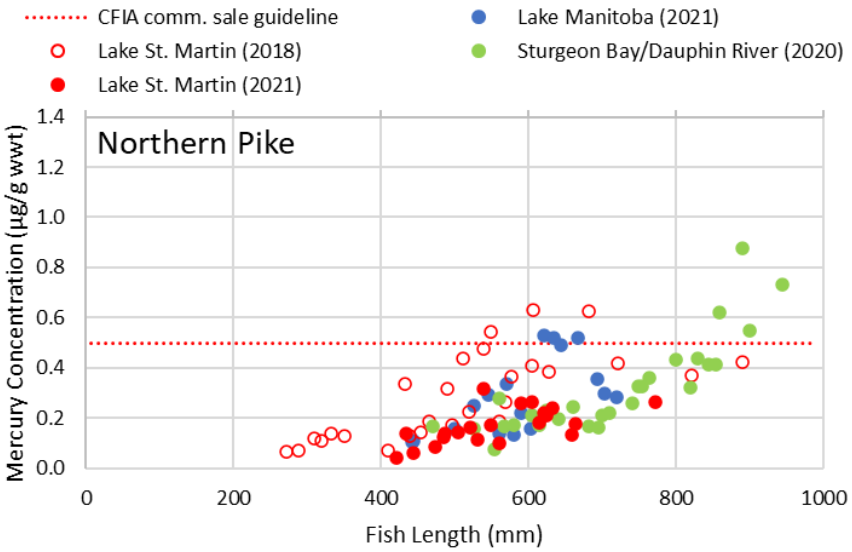
Figure IAAC-R2-32-2 Mercury concentrations measured in the tissues as a function of fish length of locally harvested Northern Pike (top) and Northern Pike sampled as part of the Coordinated Aquatic Monitoring Program (bottom).



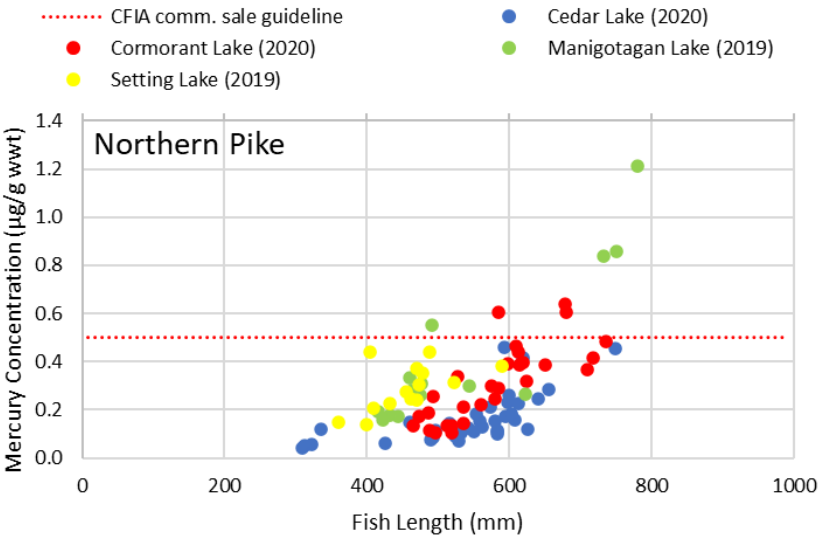
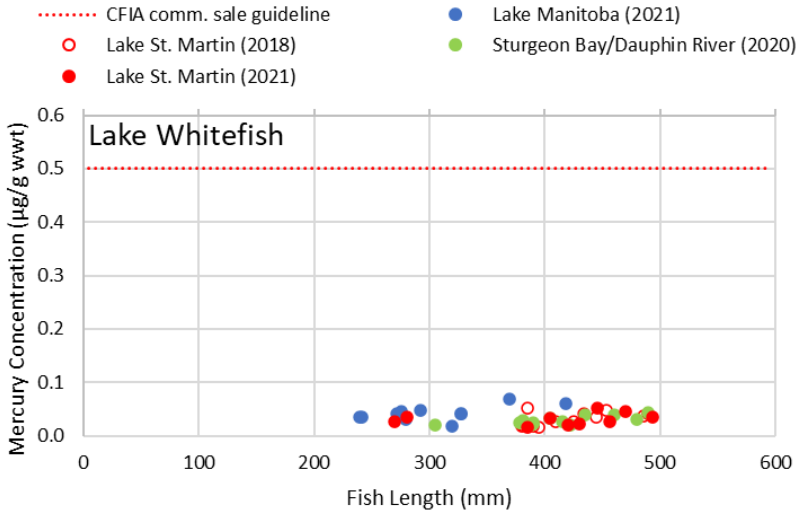
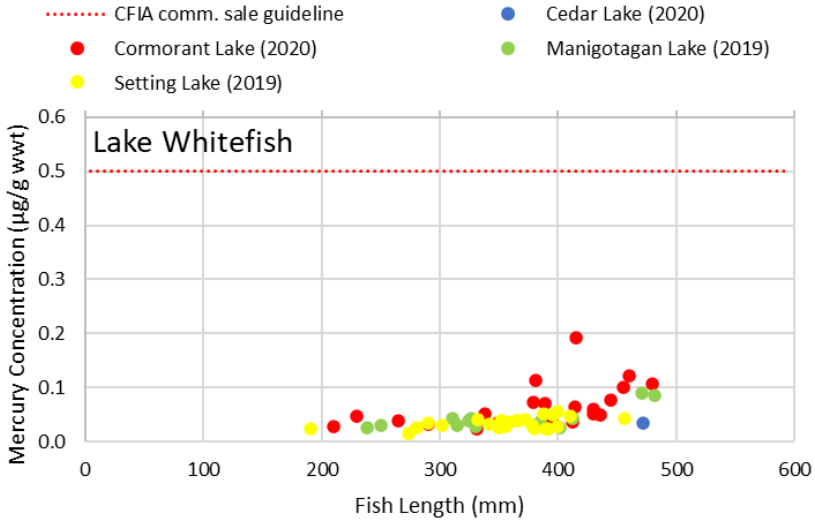


Figure IAAC-R2-32-3 Mercury concentrations measured in the tissues as a function of fish length of locally harvested Lake Whitefish (top) and Lake Whitefish sampled as part of the Coordinated Aquatic Monitoring Program (bottom).





b. **Human Health Risks of Methylmercury**

While traces of mercury are present in all foods, total diet studies have demonstrated that fish are the primary source of dietary mercury intake for the average population (Health Canada 2007). This is consistent with information from Environment and Climate Change Canada (ECCC 2013), which developed information regarding mercury in the food chain. It notes that in the water environment, plants and small organisms like plankton take up mercury through passive surface absorption or through food intake, and the amount of mercury that results in these species from even a lifetime of passive absorption is not generally harmful to the organism. It adds that it is the biomagnification process that can increase methylmercury to harmful levels. The First Nations Food, Nutrition & Environment Study – Results from Manitoba (Chan et al. 2012) notes that of the 83 different types of traditional foods collected for contaminant analysis, walleye and pike contributed to almost 90% of the total mercury intake to Indigenous groups in ecozone 2 (i.e., Boreal Plains, where the Project is located). In other words, based on the available information, fish is the country food that substantially contributes to mercury in the diet of Indigenous and non-Indigenous groups.

Greater risks would apply to large predatory fish at the top of the food pyramid (e.g., northern pike or walleye). As smaller aquatic organisms are eaten by larger ones, methylmercury biomagnifies, and becomes more concentrated in each step of the food chain. Once absorbed, fish eliminate methylmercury slowly, so it builds up in fish tissues to much greater concentrations than in the surrounding water or underlying sediment. In general, methylmercury accumulates in fish with age and position in the trophic level (Health Canada 2007). This is why piscivorous fish (i.e., fish that eat other fish, such as walleye) typically have higher methylmercury levels than non-piscivorous fish (such as lake whitefish) and, because fish typically get bigger with age, larger piscivorous fish typically have higher concentrations than smaller piscivorous fish.

The risk associated with consumption of baseline levels of methylmercury in fish was evaluated in a human health risk assessment (HHRA). The details of the HHRA are attached in Appendix IAAC-R2-32-1 and are summarized below. The HHRA was completed following a widely recognized framework that progressed from a qualitative initial Problem Formulation, through Toxicity and Exposure assessments, and culminated in a quantitative Risk Characterization and evaluation of uncertainties. Guidance published by Health Canada were used in the HHRA, including:

- Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption (Health Canada 2007)
- Guidelines for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment (Health Canada 2019)
- Federal Contaminated Sites Risk Assessment in Canada, Part I: Guidance on Human Health Risk Preliminary Quantitative Risk Assessment (PQRA), Version 3.0 (Health Canada 2021a)

- Federal Contaminated Sites Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, Version 3.0 (Health Canada 2021b)
- Guidance for Evaluating Human Health Impacts in Environmental Assessment: Country Foods (Health Canada 2018).

The HHRA involved an examination of baseline human exposures to mercury in the muscle tissue of walleye, northern pike, and lake whitefish, as reported in Appendix IAAC-R2-32-1 and summarized in Part a) and considered people from Indigenous and non-Indigenous groups. Consistent with Health Canada (2007), baseline health risks were calculated for adults, pregnant women/women of child-bearing age, children (aged 5 to 11 years) and toddlers (aged 6 months to 4 years) for each of the three water bodies - Lake Manitoba, Lake St. Martin and Lake Winnipeg (Sturgeon Bay).

Methylmercury (MeHg) was assumed to comprise 100% of total mercury measured in fish from Lake Manitoba, Lake St. Martin, and Sturgeon Bay. In accordance with Health Canada (2021b), the provisional total daily intakes (pTDI) value of 0.47 µg of MeHg per kg body weight per day (kg-bw/day) for adults and 0.2 µg MeHg per kg-bw/day for women of childbearing age and young children up to 12 years of age were used as the toxicological reference values for the HHRA. Local fish consumption patterns reported in Chan et al. (2012), representative of local Indigenous consumption patterns, were applied in the human health risk assessment, and supported by local community engagement. Through Project engagement, Indigenous groups have reported harvesting fish species, including the focus species for the HHRA, walleye, whitefish, and northern pike, as well as a variety of other fish species as listed in the response to IR IAAC-R2-29, Table IAAC-R2-29-1. Fish has been described by engaged Indigenous groups as an important country food resource and a key component of food security. Additional information about fish and other country foods can be found in IR IAAC-R2-29, Table IAAC-R2-29-1.

Manitoba Transportation and Infrastructure developed a health and socio-economic conditions survey to obtain additional health and socio-economic context as well as concerns from Indigenous groups engaged on the Project. The survey focused on six socio-economic and health value components (VCs): current and future availability of country foods, water (drinking, recreational, and cultural uses), mental and social well-being, economic conditions, use of navigable waters, and food security. The survey contained close-ended and open-ended questions regarding current conditions and the potential Project concerns related to each VC. As summarized in IR IAAC-R2-29, a total of 30 Indigenous groups were invited to participate in the survey in January 2023 (Appendix IAAC-R2-32-2) and were given two months to provide a response. While only the Pine Dock Northern Affairs Community chose to respond, some useful feedback was provided that could be used in conjunction with information provided by other Indigenous groups (described below). Within Pine Dock Northern Affairs Community responses, it was reported that walleye (pickerel), northern pike, and lake whitefish are important country foods, in addition to other fish species. Responses also conveyed that country foods are a substantial part of Pine Dock Northern Affairs Community members' everyday diet and indicated concern about Project impacts to subsistence and commercial fishing.

In addition to the health and socio-economic conditions survey, the socio-economic reports submitted by Manitoba Metis Federation (MMF 2023) and York Factory First Nation (Oni 2023) contained information about fish consumption. Information about fish consumption was also provided in Fisher River Cree Nation's Socio-economic Impact Report (FRCN 2023). This was used in conjunction with other Project engagement feedback received in the development of the HHRA.

Draft Socio-Economic and Well-Being Studies completed by Dauphin River First Nation (Firelight with DRFN 2023), Kinonjeoshtegon First Nation (Firelight with KFN 2023), Lake Manitoba First Nation (Firelight with LMFN 2023), Lake St. Martin First Nation (Firelight with LSMFN 2023), Little Saskatchewan First Nation (Firelight with LSFN 2023), Peguis First Nation (Firelight with PFN 2023), and Pinaymootang First Nation (Firelight and PMFN 2023) also reported on consumption of fish and concerns about the safety of country foods. These Nations reported harvesting and consuming pickerel (walleye), lake whitefish and jack fish (northern pike), but that due to decreasing fish populations and concerns about the health and safety of country foods, there is an increasing reliance on store-bought foods.

For those who regularly consume fish, fish constitutes the main source of dietary exposure to mercury (Health Canada 2007). The potential risk associated with exposure to methylmercury from consumption of fish was characterized in the HHRA by determining the ratio of estimated exposure to the toxicological reference value for methylmercury (pTDI). This ratio is called a hazard quotient (HQ). Values greater than 1.0 identify those exposure scenarios where the toxicological reference value may be exceeded and that require more careful evaluation (Health Canada 2007).

Exposures for Indigenous receptors were estimated based on upper range estimates of mercury concentrations in fish tissues (i.e., 95% upper confidence limits of the means) and high consumption rates (95th percentile) from Chan et al. (2012). Estimated exposures for non-Indigenous receptors were also based on 95% upper confidence limits of the mean mercury concentration in fish tissues, but consumption rates were assumed to be lower than the Indigenous receptors (mean consumption rates from Chan et al. [2012]).

None of the calculated HQs for Indigenous (Table IAAC-R2-32-2) and non-Indigenous Receptors (Table IAAC-R2-32-3) were greater than 1.0, meaning that the risk threshold was not exceeded from consumption of fish under baseline conditions for the three fish species at the waterbodies assessed. The highest HQs were calculated for Indigenous children and toddlers consuming walleye, with HQs ranging from 0.56 to 0.88. (Table IAAC-R2-32-2). As noted in Part a), the mercury concentrations in fish tissue samples from Lake Manitoba, Lake St. Martin, and Sturgeon Bay are generally similar to those elsewhere in Manitoba and therefore it is expected that the health risks in the LAA also similar to those elsewhere in Manitoba.

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Table IAAC-R2-32-2 Risk Characterization for Fish Ingestion in Indigenous Receptors

Location	Fish Species	Hazard Quotient - Fish Ingestion				
		Indigenous Receptors				
		Adult	Women of Childbearing Age	Teens	Children	Toddlers
Lake Manitoba	Walleye	0.17	0.31	0.21	0.81	0.88
	Northern Pike	0.060	0.080	0.072	0.28	0.30
	Lake Whitefish	0.010	0.015	0.012	0.047	0.051
Lake St. Martin	Walleye	0.12	0.21	0.14	0.56	0.61
	Northern Pike	0.049	0.064	0.057	0.22	0.24
	Lake Whitefish	0.0072	0.011	0.0085	0.033	0.036
Sturgeon Bay	Walleye	0.16	0.28	0.19	0.73	0.80
	Northern Pike	0.066	0.087	0.079	0.31	0.33
	Lake Whitefish	0.0060	0.0092	0.0072	0.028	0.030

Table IAAC-R2-32-3 Risk Characterization for Fish Ingestion in Non-Indigenous Receptors

Location	Fish Species	Hazard Quotient - Fish Ingestion				
		Non-Indigenous Receptors				
		Adult	Women of Childbearing Age	Teens	Children	Toddler)
Lake Manitoba	Walleye	0.0037	0.064	0.044	0.17	0.19
	Northern Pike	0.011	0.012	0.013	0.050	0.055
	Lake Whitefish	0.0026	0.0033	0.0030	0.012	0.013
Lake St. Martin	Walleye	0.026	0.045	0.031	0.12	0.13
	Northern Pike	0.0088	0.0098	0.010	0.040	0.044
	Lake Whitefish	0.0018	0.0023	0.0021	0.0083	0.0091
Sturgeon Bay	Walleye	0.034	0.058	0.040	0.16	0.17
	Northern Pike	0.012	0.013	0.014	0.055	0.060
	Lake Whitefish	0.0015	0.0020	0.0018	0.0070	0.0077

c. **Monitoring and Adaptive Management Protocols**

The monitoring and adaptive management protocols for mercury are discussed in the Aquatic Effects Monitoring Plan (AEMP), as filed as part of the June 2022 supplemental information response to IAAC IRs. Mercury concentrations in fish filets from Lake Manitoba, Lake St. Martin and Sturgeon Bay will be monitored after commissioning of the Project to determine if mercury concentrations increase and, if so, determine if it may be related to the Project. Subsequent mercury monitoring may be conducted after channel operation, generally in conjunction with fish community sampling on Lake St. Martin, if an increase in mercury concentrations is recorded after channel commissioning, as described in the paragraph below.

The time frame over which mercury concentrations continue to increase in fish following changes to the waterbody varies and can be in the order of five years (i.e., period before peak concentrations in fish are reached). Consequently, additional samples will be collected from commercial catches for five years after commissioning. If operation of flood mitigation occurs during this period, then samples will also be collected during fish community studies.

The benchmark for the fish mercury monitoring program will be compared to the baseline total mercury concentration in walleye, northern pike, and lake whitefish from Lake Manitoba, Lake St. Martin and Sturgeon Bay based on recently collected data summarized in Part a. Comparisons will also be made to the concentrations recorded during the previous monitoring and available data from the commercial fishery. If there is a statistically significant increase in mercury concentration, then further steps would be taken as set out under adaptive management.

If mercury concentrations increase (and are statistically significant) following commissioning of the channels, the HHRA will be updated and this information will be shared with other provincial government departments to determine implications regarding consumers of fish. Other data sources (e.g., other mercury monitoring done of commercial fish catches, province wide studies (such as CAMP) will be examined to determine whether this increase is attributable to the Project or other causes. If an increase in mercury concentrations attributable to the Project occurs after commissioning, then monitoring of mercury concentrations will occur again after diversion of water through the Project outlet channels for flood mitigation, and these data will be shared with other departments as described above.

d. **Mitigation and Management Strategies**

Methylmercury and fish are discussed in Volume 3, Section 7.2.4.4 of the Project EIS and the May 31, 2022, responses to IRs IAAC-14, IAAC-39, IAAC-80, and IAAC-106. These responses note that the Project is not anticipated to increase methylmercury levels in fish. Flooding of terrestrial vegetation and soil is a pathway for the potential bioaccumulation of methylmercury in fish tissue, and a considerable amount of research has been carried out on newly impounded reservoirs (Bodaly and Hecky 1979, Bodaly et al. 1984, Bodaly et al. 2004, Hall et al. 2005, Schartup et al. 2015, Calder et al. 2016). Inundation of organic carbon in soils and vegetation decomposition, such as occurs during

the impoundment of reservoirs, results in anaerobic (low oxygen) conditions that stimulates microbial activity that can cause the methylation of naturally occurring inorganic mercury to methylmercury.

As noted in Part c, the degree of mercury methylation is a function of time and may continue for many years, and in reservoirs peak levels in fish often do not occur until approximately five years. As noted in Part a), the May 31, 2022, response to IR IAAC-106 describes the increases in methylmercury levels that resulted from the flooding event that was being managed by the EOC and demonstrates that it can occur in non-impounded lakes and rivers after flooding events. From a regional perspective, the Project will result in a net reduction in flooded terrestrial habitat in Lake Manitoba and Lake St. Martin and associated water bodies during high-water periods. As noted in the May 31, 2022, response to IR IAAC-14, results of modeling have indicated that, had the Project been in place during the 2011 flood, it would have a resulted in a reduction in flooded area of 469.8 km^2 (181 mi^2; 451.6 km^2 [174 mi^2] for Lake Manitoba and 18.2 km^2 [7 mi^2] for Lake St. Martin), representing an overall 56% decrease in flooded area (55% for Lake Manitoba and 74% for Lake St. Martin). Therefore, from the perspective of the amount of flooded terrestrial habitat, the Project has the potential to reduce, not increase, the amount of flooded organic carbon and decomposing vegetation, thereby reducing mercury methylation, and, as such, eventually also the reduction of bioaccumulation of methylmercury in fish.

As discussed in the May 31, 2022, response to IR IAAC-14, from a local perspective there is a risk that local ponding and drying of wetland areas adjacent to the LSMOC could affect mercury methylation rates. At the time, it was anticipated that the proposed rewatering would mitigate any potential changes to ponding and drying and maintain the natural wetting and drying cycles in the wetlands, which would further minimize the risks of mercury methylation. However, as discussed in the May 31, 2022, response to IR IAAC-R2-14, a decision has been made not to rewater this area. Regardless of the current decision not to rewater, as indicated in the May 31, 2022, response to IR IAAC-106, wetlands undergo natural wetting and drying cycles in response to precipitation/drought events, and it is unlikely that the local changes would have measurable effects to downstream fish populations over existing conditions.

Coleman et al (2015) studied the effects of drying and rewetting events in a boreal peatland in Minnesota on methylation production and summarized other research on this issue. One of the key outputs was that severe, prolonged periods of drought, followed by wetter conditions, were required to stimulate the methylation process in wetland areas. This is consistent with the research on reservoirs, where production occurs under the anaerobic conditions in shorelines that had not previously been wetted. Wetland areas would likely need to be dried out over a complete growing period, and then rewetted. Under these conditions, the issue would be regional and not be unique to the area influenced by the Project.

Even with a slight increase in the risk of methylation in local areas adjacent to the channel, the pathway of effect from areas adjacent to the channel to local fish populations in downstream areas is unlikely. Based on the work of Trudel and Rasmussen (2006), in aquatic species, mercury uptake and accumulation from water exposure is negligible relative to diet (water exposure is approximately 0.1%

of the mercury accumulation from diet and water together). As a result, it is not expected to measurably increase risks to people over current conditions, and as indicated, monitoring of levels in fish is being carried out as part of the AEMP. In addition, monitoring of wetlands will be carried out as described in the WMP, which will provide an understanding of changes in local wetlands and whether adaptive management needs to be implemented. As a result of this assessment, adverse residual effects on Indigenous health conditions associated with the consumption of aquatic country foods are not expected due to Project activities, as concluded in Volume 4, Section 10.3.3.1 of the Project EIS.

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