

**LAKE MANITOBA AND LAKE ST. MARTIN OUTLET CHANNELS PROJECT
RESPONSE TO IAAC TECHNICAL INFORMATION REQUESTS**

Question IAAC-58b

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Abbreviations and Acronyms

EIS	environmental impact statement
ERP	Emergency Response Plan
LM & LSMRRC	Lake Manitoba and Lake St. Martin Regulation Review Committee
MEP	Manitoba Emergency Plan
mm	millimetre
MMTP	Manitoba-Minnesota Transmission Project
NALMS	North American Lake Management Society
PDA	project development area
PER	Project Environmental Requirement

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EIS Guideline Reference: 7.6.2 Effects of the environment on the project

EIS Reference: Chapter 15 Effects of the Environment on the Project; 15.5 Effect of Long-term Climate Change on the Project

Context and Rationale

The EIS Guidelines require that the EIS take into account how local conditions and natural hazards could adversely affect the project and how this in turn could result in effects to the environment; that effects of the environment on the project be considered in different probability patterns, under a range of future climate states; and that details be provided of planning, design and construction strategies intended to minimize the potential environmental effects of the environment on the project.

The EIS does not describe how lake water dynamics may change under future climate scenarios. This information is required to understand potential effects of the environment on the Project and corresponding effects of the Project on valued components.

Information Requests

- a) Under a range of future climate states:
- i. Provide estimates of any potential changes to lake water dynamics due to climate change.
 - ii. Describe how lake water dynamics could adversely affect the project and in turn the environment.
 - iii. Provide details of the associated planning, design and construction strategies intended to minimize the potential environmental effects of the environment on the project.

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- a)
- i) Volume 5, Section 15 of the environmental impact statement (EIS) included an examination of the effects of climate change on the Project that included analysis of climate scenarios for the years 2021 to 2050 and years 2051 to 2080 time periods. The scenarios are based on the Pacific Climate Impacts Consortium's (2019) modelling. The effects of climate change on the Project is also discussed in the response to IAAC-57.

For the 2021-2050 scenario, the annual mean temperature was predicted to be more than two degrees Celsius (2°C) higher, with more +30°C days (7). There were fewer frost days (21)

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predicted and fewer -30°C days (8). An increase in the change from average mean precipitation was also predicted (2.3%), with most change (more than 12%) occurring in the winter and spring.

For the 2051-2080 scenario the annual mean temperature was predicted to be more than 4°C warmer (more than 6°C in winter), based on mean annual temperatures, and more +30°C days (25). Fewer frost days (39) and fewer -30°C days (11) were predicted. An increase in the change from average mean precipitation was predicted (8%), with most (more than 25%) occurring in the winter and spring.

Applicable climate change information from Manitoba Hydro's Manitoba – Minnesota Transmission Project (MMTP) were also reviewed and examined as part of the assessment of the effects of climate change on the Project. The results from that Manitoba Hydro (2015) study suggest that mean annual temperature and precipitation will generally increase with time, while mean annual wind speed will decrease. Additional details of the findings can be found in Volume 5, Section 15.5 of the EIS. The "*Lake Manitoba and Lake St. Martin Regulation Review Committee Report*" (LM & LSMRRC 2013) included an examination of climate change effects, and incorporated results from a 2012 hydrologic study of the impact of climate change on flows on the Assiniboine River conducted by Stantec (Stantec 2012). These studies also noted that future changes in temperature and precipitation will occur in Manitoba due to climate change.

These predicted increases in temperature and precipitation and decreases in wind speed could affect lake water dynamics in several ways, and there have been studies undertaken in the last two decades that examine these changes and the potential effects on biotic and abiotic components of lake ecosystems. The dynamics are complex, as there are many interrelationships among the physical and biological activities that occur in lake ecosystems. The North American Lake Management Society (NALMS) issued a Climate Change Position Statement that discusses projected future climate, likely changes to lakes and freshwater systems, and suggested actions for lake and water resource managers (NALMS 2015). The Statement includes a list of potential impacts to lake ecosystems, some of which may occur in the Project area lakes. An increase in annual ambient air temperatures due to climate change could result in increased lake water temperatures, which could decrease dissolved oxygen saturation levels, which could in turn affect the metabolic rates of aquatic organisms, and change the availability of habitat that provide sufficient dissolved oxygen levels. An increase in precipitation could result in higher levels of runoff and increased lake levels; however, an increase in ambient air temperature may also increase evaporation across the large shallow basin of Lake Manitoba. Please see the documents cited above for additional detailed information.

- ii) As noted above, potential changes in lake water dynamics in relation to climate change include changes in temperature, precipitation and wind levels. As stated in the response to IAAC-58a, the large storage capacities of the lakes within the watershed buffer against the worst effects of increased runoff volumes due to climate change resulting in minor to negligible increases for major flood events. Modelling found that the potential increased runoff due to climate change only raised the peak for a 2011 equivalent event by 30-90 mm for Lake Manitoba and 30-60 mm for Lake St. Martin. These potential increases are considered to be well within the safety factor

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ranges for the Project design. The effects of lake water dynamics under future climate states are assessed as being minor to negligible.

- iii) Construction of the Project is anticipated to commence immediately after approvals, and, therefore, under current climatic conditions. The primary mitigation tools to address effects of the environment on the Project is adequate engineering design, as discussed in the response to IAAC-58a, the implementation of sound planning, and follow up and monitoring programs to verify the effectiveness of mitigation, and identify and implement alternative or additional measures as required. Project designs adhere to engineering standards and reflect Manitoba Infrastructure's experience with similar flood management projects. The outlet channels and other structures will be designed to resist both normal and extreme physical environmental conditions, based on historical records and future climate predictions. These standards consider physical environmental criteria, such as temperature, wind, rain, snow and ice loading for historical climate conditions. These standards are typically based on extensive documented experience on effectiveness, with regular updating as engineering practices evolve. The anticipated effectiveness of these measures is therefore typically high.

In the event of adverse weather, contractors would implement contingency and emergency response measures and stop work if conditions are unsafe. An Emergency Response Plan (ERP) and other health and safety plans will form part of the Project Environmental Management Program (EMP) (as described in Volume 1, Section 3.7 of the EIS). Damage to infrastructure caused by adverse weather conditions would be minimized and repaired as necessary; these actions will be facilitated by immediate event-specific site inspections at sites potentially affected by an extreme event.

Project Environmental Requirements (PERs) have been developed (see Volume 1, Section 3.7 and Appendix 3F) that describe measures to address certain emergency conditions. Site-specific drainage control measures and erosion and sediment control measures would be used during construction to mitigate effects of flooding that would otherwise occur within the Project development area (PDA). In addition to the PERs, the Manitoba Emergency Plan (MEP; Province of Manitoba 2018) and a Project-specific Emergency Response Plan, to be developed document measures for prevention and mitigation, preparedness, response, and recovery.

The measures above are intended to minimize the potential environmental effects of the environment on the Project that could occur due to extreme weather events and climate change.

References

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