Submitted by: **Hollow Water First Nation**

REVIEW OF ENVIRONMENTAL IMPACT STATEMENT FOR LAKE MANITOBA AND LAKE ST. MARTIN OUTLET CHANNELS:

RESPONSE 1

HOLLOW WATER FIRST NATIONS

With Contributors:

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HOLLOW WATER FIRST NATIONS

Manitoba Infrastructure
Lake Manitoba/Lake St. Martin Outlet Project

Response 1: Approved as to Content and Accuracy

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Lake Manitoba and Lake St. Martin Outlet Channel Project

Information Request Responses - Technical Review: Optional Feedback Form- Hollow Water First Nation

Objective: Taking into account the information provided in the information request responses, please provide your views on the potential for significant adverse environmental effects. Identify any areas in the responses to the information requests that require further information to understand the potential environmental effects of the project and their significance, mitigation measures, and follow-up and monitoring programs. For areas where concerns have been identified, when possible, please describe potential mitigation measures that would address the concerns presented.

Please provide us with your comments on the information request responses by January 20, 2020. If you are unable to provide comments by this time, please contact the Agency to discuss further.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
Identify which information request response and/or gap response your comments are related to (e.g. IR-01)	Provide applicable background or rationale for the comment provided, or information requested, including why it is important for understanding the effects of the project, especially as they pertain to Section 5 of CEAA 2012 and potential impacts to rights.	Identify if the concerns raised in the initial technical review have been addressed. Please provide your comment, and/or ask a specific question, request specific additional information, or clarification. When possible, please describe potential mitigation measure that would address the concerns presented.
IR-07	- Present the details of the assessment used to conclude the 500 m geographic extent of changes to the environment perpendicular to the LMOC and to the LSMOC. Include associated modelling, summarized data, and source of the data. Discuss the degree of confidence in the conclusions and any limitations of the existing data or methods. - Provide an interpretation with supporting data and resource material for the magnitude, duration and	Watershed modelling of the full Buffalo Lake, Buffalo Creek and Birch Creek watersheds would provide an understanding of project effects to wetlands, natural water courses, proposed drainage systems, natural habitats and change in soil moisture adjacent to the channels. This modelling would identify flow paths, inundation areas and change of soil moisture conditions within the watershed for drought, moderate and extreme runoff events. Removing a portion of the

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	seasonality, and reversibility of changes to soil moisture regimes and hydrologic function relative to baseline conditions. - Provide any additional data gathered since the compilation of the EIS and provide a plan to fill information gaps in the analysis of effects. - Discuss the interconnected nature of the predicted changes to soil moisture regimes and hydrologic function and the affected VCs. Include a mitigation strategy that considers the interconnected nature of the changes and resulting effects. Include an evaluation of the effectiveness of mitigations	watersheds will impact the flow variability of Birch Creek and Buffalo Creek. Specific to the LMOC, MI proposes the interception of 18 km of municipal and provincial drainage ditches which outlet to a parallel upslope drain to the LMOC having a 10% frequency summer precipitation design capacity. Precipitation and spring flood events that exceed the capacity of this drain will impound water on agriculture fields or surplus waters will run parallel to the drain impacting road infrastructure in its path to Lake St Martin. How will the contributions of this new drain, particularly events beyond its design capacity impact Lake St Martin Birch Creek Bay? Proposed Mitigation Measure: To restore the natural flow variability of Birch Creek, diversion conduits should outlet from the LMOC to be operated to replicate the natural flow to Birch Creek.Due to the length of the LMOC outside drain, inline silt traps should be installed on a frequent basis to intercept silt transport. LSMOC should also have diversion culverts to supplement the flow to Buffalo Creek to restore the natural flow varability.
IR-08	- Provide rationale for the selection of reclamation suitability and discuss the applicability of a reclamation suitability system that was developed for agricultural capability for northern Alberta forest region to the LSMOC portion of the LAA which is predominately natural vegetation and wetlands.	

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	Discuss how the selected reclamation suitability will affect mitigation of effects to other relevant VCs	
IR-09	- Clarify and describe the area (ha) and type of land disturbances existing in the LSMOC sections of the PDA and LAA. If the area (ha) and type of land disturbances differ from those described in the EIS, discuss implications for the assessment of effects to all relevant VCs, including surface water.	No modelling has been provided to understand the interaction of surface water with the shallow ground water systems to understand the impact of the LSMOC and LMOC on wetlands, aquatic ecosystems, natural vegetation and traditional lands. A specific concern is the impact of a deepened portion of the LSMOC where there are proposed drop structures near the outlet to Lake Winnipeg. This deepened segment of LSMOC will intercept groundwater surface discharge and lower the water table in this area. This groundwater interception will impact the Mantagoo River and the wetlands between LSMOC and the river. It is expected that the base flow of the Mantagoo River will be significantly reduced for all seasons and that the wetlands between LSMOC and Mantagoo river will recede due to loss of groundwater recharge.
IR-10	- Provide plan view maps showing the locations of all major project components and the locations of boreholes/drillholes used to develop the description of the geology. - Provide a geological/stratigraphic cross-section in the area of the LSMOC which includes the boreholes/drillholes and preliminary channel invert, similar to Figure 6.3B-5.	3-D finite element modelling needs to be completed for the Carbonate Aquifer to determine the operational impacts of the LMOC and LSMOC and associated depressurization system impacts during the construction period and the long term depressurization systems.post construction. The modelling would provide site specific aquifer impacts under various operating and climatic scenarios. Mitigation for impacted wells should include lift pump requirements, long term maintenance and energy operating costs.

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		The 3-D model should be coupled with a water quality model to provide change in water quality of of domestic wells under various LMOC operating scenarios and climatic conditions. As a result of losing artesian pressure the domestic wells could be subject to a condition of Groundwater Under Direct Influence (GUDI) of Surface Water as specified in the Manitoba Drinking Water act.
IR-11	- Provide a specific reference list for published and unpublished sources of information relevant to the RAA. Provide any reference documents not yet submitted to the Agency and/or present a summary of relevant information. - Describe pre-2011 flood baseline conditions, including a summary of baseline data and relevant references, for surface water quality, flow, and drainage	It should be noted that the pre 2011 surface water (Hilbre hydrometric station) data being reported for Lake St Martin is for the south basin. There was no hydrometric gauge on the north basin which is considerably lower than the south basin due to the head loss through the narrows. MI should compute the pre 2011 levels of the north basin to understand the project impacts on the North basin. A duration curve needs to be established for the North Basin.
IR-12	- Provide a comprehensive summary of sediment quality for all relevant water bodies. If relying on several sources, the information should be provided as a summary of relevant information used to establish sediment baseline data. Data should include a summary of statistics and sampling information, as well as raw data. Any gaps in existing sediment quality data should be identified and information should be provided on how data gaps will be filled.	No sediment data has been collected for the North Basin of Lake St Martin. Given that the narrows will be passing 28% additional flow (21,000 cfs increase to 26,780 cfs) as compared to the flow in 2011 what will be the increase erosion potential of the narrows and sediment deposition in the North Basin. Baseline data needs to be collected for the North Basin LSM. LMOC and LSMOC sideslopes and channel bed erosion will be significant. This channel will have approximately 3 to 5 meters of water in it full time.

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	- Complete an assessment of how sediment quality may interact with the environment and potential pathways of effects to fish and fish habitat and current use by Indigenous peoples.	Given that on average it will be operated once every 3 years the sideslopes will soften due to groundwater infiltration as the depressurization system will not effectively control infiltration of carbonate aquifer water into the channel. MI cites that sideslope revegetation will control erosion. In fact, no vegetation will establish below the channel waterline. MI has no means to shut the channel down to effect repairs on the channel sideslopes. A substantial plume will occur for to 2 days on initial operation. Sediment transport will occur from Watchhorn Bay and LSM north basin when wind mobilizes lake sediments. The HWFN recommends the channels wetted surface (sideslopes and bed) be rock armoured to minimize sideslope erosion and to minimize future erosion maintenance costs. HWFN requests that MI provide an understanding of the impact of increased flow of water through the Narrows and the impact to the islands in the south basin. Will erosion increase? Best Management practices for operation of the LMOC and LSMOC for mitigating sediment transport and fish mortality are not incorporated in the operating guidelines. It is likely these BMP operations will be counter productive to objective of flood damage reduction. What guarantees are there that these BMPs will be acted upon?

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IR-13	- Provide a specific reference list for published and unpublished sources of information relevant to baseline surface water quality. Provide any referenced documents not yet submitted to the Agency and/or present a summary relevant information, including: i. the data used from the National Hydro Network for the RAA as listed on page 6.167; ii. NSC 2013 report referenced on page 6.170; and iii. both NSC and KGS Group 2016 a, and b reports referenced in Appendix 6D. - Provide available water quality baseline data for all parameters listed in the EIS guidelines, including any seasonal data. i. Provide raw datasets for data used in establishment of baseline water quality. ii. Provide a map depicting the locations of monitoring stations that have been included in the baseline water quality dataset. iii. Provide a table of summary statistics for all data used in establishment of baseline that includes all parameters required under the EIS guidelines. Summary statistics should include, at a minimum, mean, standard deviation, 95th percentiles, minimum, maximum, and number of samples. This table should also include comparisons to relevant water quality guidelines. Summary statistics should be broken down by season.	Trend analysis on critical data such as phosphorus, nitrogen, TSS would be helpful in understanding baseline data trends.

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	- Provide a discussion on potential gaps in water quality baseline data, and if appropriate, information on how data gaps will be addressed. i. Discuss methodology used to screen historical water quality data for inclusion in the baseline water quality dataset. Discuss the applicability and limitation of data used, given that some historical data may not have been sampled using proper QA/QC or detection limits.	
IR-14	- Present an updated assessment of effects of the Project on surface water quality that applies the Agency's guidance. To support this analysis: i. Present a detailed description of methodology used to assess residual effects of the Project on surface water quality. Include data analyses to support/demonstrate conclusions drawn regarding residual environmental effects on surface water quality. ii. Address all the surface water quality and associated sediment quality/quantity parameters including: • temperature changes in surface water as a result of groundwater-surface water interactions; • changes to surface water quality, including seasonal changes in runoff entering watercourses;	MI states there will be no change to Surface Water Quality. Just as the Portage Diversion has moved greater volumes of sediment into Lake Manitoba, so too will the LMOC and LSMOC be able move more sediment to their receiving water bodies. Ultimately more flow is being diverted through Lake St Martin resulting in greater sediment transport loading to the Lake. Over a 50 year period what will be the distribution and build up of sediment in the south basin of Lake St Martin? Sturgeon Bay is an undeveloped Beach at this time. Groins or Jetties will disrupt offshore littoral drifting of sand causing accretion upwind of the jetty and erosion downstream of the Jetty. Is the future value of this beach being discounted? LMOC jetties at the outlet will also experience shoreline morphology changes. The Portage Diversion which diverts significant flows of the Assiniboine River is a major contributor of pollutants to Lake Manitoba and Lake St Martin. If expansion or more aggressive

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	• changes to total suspended solids (TSS), total dissolved solids, turbidity, oxygen level, water temperature, pH, dissolved oxygen, water quality including metals, methyl mercury, nutrients, algae blooms, dissolved/total organic carbon, biochemical oxygen demand (BOD)/carbonaceous biochemical oxygen demand (CBOD), pesticides, aquatic indicators, sediment quality; • temperature changes in surface water as a result of water diversion and retention; • changes to water quality and quantity and sediment quality and quantity during all phases of the Project associated with Project-related: drainage areas, flow paths, and seepage of groundwater into surface water; erosion and sedimentation; excavation, blasting, and stock-piling of materials and waste rock; wastes, wastewater, fuels, chemicals, hazardous materials, contaminated soils, including run off from agricultural lands; spills and releases; mercury methylation; metal leaching and acid rock drainage;	operation is being considered in the future for the Portage Diversion these Lakes will see higher concentrations of pollutants. A water quality component should be added to the hydraulic model to predict water quality impacts to all lakes and rivers associated with this project for various operating scenarios.

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	• water quality and sediment quality changes as a result of storing water in, and releasing water from one lake to another and from the channels - Drawing upon the updated assessment above, present an assessment of how residual effects to water quality may interact with the environment and potential pathways of effects to all relevant VCs.	
IR-15	- Provide all proposed plans or details of draft plans that include mitigation measures for surface water quality, including the Surface Water Management Plan and the Sediment Management Plan. Specify how the following are or will be addressed in management/monitoring plans: i. temperature changes in surface water as a result of groundwater-surface water interactions; ii. temperature changes in surface water as a result of water diversion and retention; iii. changes to surface water quality, including seasonal changes in runoff entering watercourses; iv. changes to total suspended solids (TSS), total dissolved solids, turbidity, oxygen level, water temperature, pH, dissolved oxygen, water quality including metals, methyl mercury, nutrients, algae blooms,	• These management plans have significant monitoring programs associated with them and require specific corrective measures to mitigate the impact. Is MI committing to implementing these plans for the full life of the operation of the channels?

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	dissolved/total organic carbon, biochemical oxygen demand (BOD)/carbonaceous biochemical oxygen demand (CBOD), pesticides, aquatic indicators, sediment quality; v. changes to water quality and sediment quality during all phases of the Project associated with Project-related to: • drainage areas, flow paths, and seepage of groundwater into surface water; • erosion and sedimentation; • excavation, blasting, and stock-piling of materials and waste rock; • wastes, wastewater, fuels, chemicals, hazardous materials, contaminated soils, including run off from agricultural lands; • spills and releases; • mercury methylation. - If any of the details requested above cannot be provided at the time of response, present a discussion of the gap in information, related uncertainty with regards to potential effects and mitigation, and any additional mitigation measures and/or monitoring and follow up that will be implemented on a precautionary basis.	

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IR-16	- Provide details of the proposed surface water quality monitoring program, including GCDWQ parameters, and measures to be taken if the findings refute EIS conclusions. - Provide a clear rationale if any parameters or contaminants of potential concerns (COPCs) have been scoped out from the sampling program. - Identify (in table and map format) the proposed surface water locations to be sampled, how often each water body will be sampled, and how traditional knowledge was incorporated into the development of the monitoring plans. - Provide a description of available groundwater samples for LMOC and LSMOC in a table and map format, including depth (e.g. near-surface groundwater samples (Surficial Aquifer) vs. bedrock (Confided Carbonate Aquifer)), and information on reported observations and parameters that exceed the GCDWQ, with consideration of potential sources of well contamination (see the 2019 Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Manganese. https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadiandrinking-water-quality-guideline-technical-document-manganese.html)	It was identified that the Carbonate Aquifer met the CCME and MWSQSOG potable drinking water criteria. How much potable water is being wasted in the construction phase? How much potable water is being wasted in the operations of the channel over the life time of the channel. How does the depressurization system wastage of groundwater and channel infiltration of groundwater and exfiltration of Lake Manitoba water going to affect the sustainability of the Carbonate Aquifer in terms of water quality and quantity? The future development of the potable water for economic development and for the needs of the environment are being discounted.
IR-17	- Provide details of proposed monitoring plans for construction and operations that will be used to monitor for: suspended sediment levels during in-water excavation and slope contouring required to construct the LMOC and LSMOC inlet and outlet	Birch Creek should not be a discharge zone for waste water during construction. High silt loads could cover the natural substrate of the creek. Groundwater from depressurization wells during construction and long term operations should also

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	areas; release and transport of sediment from work sites to area waterways; increase in suspended sediments at inlet and outlet areas when the water control structure (WCS) gates are opened; and sediment quality changes as a result of storing water in, and releasing water from one lake to another and from the channels. Describe: i. methods and approach to monitor suspended sediment levels and sediment quality in the Project area during construction, operation and maintenance activities, including comparison of collected samples to baseline/ reference levels and to recommended guidelines; ii. methods that will be used to assess the effectiveness of mitigation measures, including erosion and sediment control measures during in-stream construction and during operations and to verify EIS conclusions. iii. action levels to trigger specific management actions to protect surface water quality during construction, operation and maintenance activities; and iv. monitoring parameters, locations, frequency, action levels, and response actions quality assurance/quality control methods.	not be wasted in Birch Creek. Groundwater is anoxic and will be harmful to the Birch Creek fishery possibly causing fish kills particularly in the winter. Will MI commit to monitoring groundwater quality with respect to domestic wells over the life of the project? The threshold limits for groundwater quality monitoring should be the CCME potable water guidelines.

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	- If any of the details requested above cannot be provided at the time of response, present a discussion of the gap in information, related uncertainty with regards to potential effects and mitigation, and any additional mitigation measures and/or monitoring and follow up that will be implemented on a precautionary basis.	
IR-18	- Provide details of groundwater monitoring plans that identify groundwater quality thresholds that will be applied in groundwater quality monitoring and indicate what adaptive management actions will be taken if the thresholds are exceeded (such as changes in monitoring frequency and other actions to protect surface water quality). Include description of a monitoring program for runoff and groundwater seepage which also includes water quality thresholds for adaptive management. - If any of the details requested above cannot be provided at the time of response, present a discussion of the gap in information, related uncertainty with regards to potential effects (assessment predictions) and mitigation, and any monitoring and follow up that will be implemented on a precautionary basis to verify assessment predictions as well as additional mitigation measures required to adaptively manage.	HWFN believes Lakes such as Birch Lake, Goodman Lake and Reed Lake and possibly locations along Birch Creek benefit from artesian groundwater discharge to supplement base flows of the creek. Ground water seeps near the southern shores of the south basin of LSM maintain critical wildlife habitat. The Carbonate aquifer also discharges in the LSM lake bottom creating critical habitat for white fish spawning. Diminishing ground water pressure and volume will impact the Birch Creek and LSM ecosystems. Injection of large quantities of groundwater from short and long term aquifer depressurization into the Birch Creek will unbalance dissolved oxygen levels and impact the Birch Creek hydrograph natural variability. MI indicates that monitoring could be discontinued after two years in the operational phase. Given that aquifer depressurization will continue in the operation phase it is recommended monitoring be committed for the full life span of the project. Continuous monitoring is required to address

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		seasonal and annual variations in precipitation, aquifer recharge and to understand their impact on the Birch Creek Hydrograph. This same concept of continuous monitoring is justified for Buffalo Lake/Creek to understand the changes to the Buffalo Creek hydrograph.
IR-19	- Provide a scientifically based rationale for why a 20 km buffer has been selected for the LMOC groundwater LAA and a 5 km buffer has been selected for the LSMOC groundwater LAA to describe how these areas were defined	LMOC aquifer depressurization for construction requirements will be 14m below ground. Predictions are that domestic wells could lose artesian pressure up to 5 km from LMOC. The GW Management Plan indicates 5 to 7 km impact distance. The LSMOC impact to the aquifer is unquantified.
IR-20	- Provide maps of overburden thickness and bedrock topography in the LAA. Show data points used to generate the maps. Include the groundwater elevations within the till unit at both LMOC and LSMOC and in proximity to surface water features where available. Where data is not available, infer the information and provide the rationale. Where available, the locations of surface water features and groundwater springs should also be shown on this map. - Provide a cross-section showing bedrock topography, overburden stratigraphy, channel inverts, channel operation levels, and groundwater	The aquifer modelling is totally inadequate. This project warrants a 3-D Finite element model to predict the piezometric levels within the LAA of the two channels for construction depressurization, non-operation steady state and project operations steady state. Long term operations modelling should be performed for the drought, average and flood conditions to understand the long term project impacts and the impacts of the dewatering operations. This modelling is required to understand the sustainability of this aquifer after project completion.

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	elevations required for construction and operation for both LMOC and LSMOC. - Provide information on the seasonal variability in groundwater elevations within the till. Describe the hydraulic conductive and groundwater elevations with the bedrock aquifer. This assessment should include information on the magnitude and direction of the hydraulic gradients between the bedrock and the till and the till and surface water features where available.	
IR-21	- Present an assessment of the reduction in groundwater elevations associated with the construction and operation of the LSMOC. The assessment should include a discussion of potential changes in the quantity of groundwater discharging to surface water. The assessment should include: i. A cross-section showing bedrock topography, overburden stratigraphy, channel inverts, channel operation levels, and groundwater elevations required for construction and operation. ii. An assessment of the hydraulic conductivity of the bedrock aquifer. iii. An assessment of the groundwater elevations within the bedrock aquifer.	Agreed that there are no domestic well impacts. But impacts to Buffalo Lake, Buffalo Creek and adjacent wetlands will impact the fishery and wildlife habitat. The aquifer modelling is totally inadequate. This project warrants a 3-D Finite element model to predict the piezometric levels within the LAA.

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	iv. An assessment of changes in bedrock and overburden groundwater levels associated with the construction and operation of the LSMOC.	
IR-22	- Discuss applicability of the RAA for surface water and given Buffalo Lake watershed boundaries. If warranted, presented revised figures to demonstrate consideration of the Buffalo Lake watershed boundaries in the selection of the RAA for surface water. i. Provide baseline data of the Buffalo Lake watershed including but not limited to drainage areas, flow paths, and seepage of groundwater into surface water (and erosion and sedimentation) to inform understanding of the watershed boundaries and to support understanding of changes in flows. Present an updated figure to define the likely Buffalo Lake watershed boundaries. ii. Provide field assessment data of the surface and shallow subsurface drainage flow in the LSMOC LAA considering the Buffalo Lake watershed.	Difficult to quantify impacts in surface water flow regime for Buffalo Lake and Creek. Mitigation of loss of surface flow should be by means of diversion conduits from LSMOC to Buffalo Lake.
IR-23	- Clarify the potential effects of the construction and operation of the LSMOC on groundwater and	The LSMOC upslope drain will mitigate eastern wetland level fluctuations. In general Buffalo Lake

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	surface water interactions, groundwater and surface water quality and quantity, wetlands. Compare these to the effects to water quality and quantity as well as wetlands of the EOC, including details of anticipated similarities, differences, and mitigation. Present analysis and modelling data, where available, to support conclusions drawn and confirm if the changes in water level caused by the LSMOC on the wetland in proximity to the channel are expected to be similar to EOC. - Provide details of the follow-up program to confirm the predictions in the EIS regarding changes to the surface water levels in the project development area (PDA) and the affected wetlands in the local assessment area (LAA) and regional assessment area (RAA).	and Creek contributing flow will be less. Mitigation as specified in IR-22. 500 metre conservative impact on either side of LSMOC should be considered.
IR -24	- Regarding the LMOC, provide an assessment of changes in groundwater discharge to surface water that accounts for reductions in groundwater elevations within the till as a result of lowering of groundwater pressures within the bedrock. i. Discuss potential for groundwater surface water interactions for the small lakes along the Birch Creek drainage system and wetlands near the LSMOC. This discussion should include an approximation of lake depth, overburden	It is HWFN's understanding that springs exist in the Lakes of Birch Creek. A proposed mitigation measure would be to line the LMOC with 1.0m (or greater thickness) of low permeability clay in those areas where the aquitard is removed. This liner will prevent infiltration of GW and exfiltration of channel waters to the aquifer. The depressurization system would be required for construction purposes but the long term operational depressurization system would not be required. Artesian pressure would be returned to natural levels. Wastage of potable water would be

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	thickness, and potential seasonal variability in surface water levels as they relate to the potential for groundwater discharge. - Regarding the LSMOC, complete an assessment of the reduction in groundwater elevations associated with the construction and operation of the LSMOC. The assessment should include a discussion of potential changes in the quantity of groundwater discharging to surface water. The assessment should include: i. A cross-section showing bedrock topography, overburden stratigraphy, channel inverts, channel operation levels, and groundwater elevations required for construction and operation. ii. An assessment of the hydraulic conductivity of the bedrock aquifer iii. An assessment of the groundwater elevations within the bedrock aquifer iv. A map showing the locations of spring discharge and the associated extent of groundwater drawdown resulting from the construction and operation of the LSMOC.	eliminated and GW water quality would not be impacted on the long term. The softening of the clay till aquifer would also be eliminated resulting in smaller sediment plumes during channel start up. This would be a costly addition to the project but would ensure the sustainability of the aquifer.
IR-25	- Provide any additional information being collected for the engineering design that will identify the areas of exposed bedrock and areas of thin till over	Although bedrock outcrops do release a portion of artesian pressure in LSMOC area, the clay liner mitigation measure identified in IR-24 could be considered for the LSMOC. It should be noted that

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	the aquifer within the PDA that could cause blowouts during construction and operations and alter surface drainage patterns and flows. - Include a map of overburden thickness and potential bedrock outcrops location for both the LMOC and LSMOC. - If no additional information has been collected for the engineering design regarding locations of bedrock and/or thin till, provide the confidence level of understanding of presence of bedrock and thin till areas over the aquifer for successful engineering design. - Describe how piezometric head data for the LSMOC LAA, including areas of thin till over carbonate bedrock aquifer and bedrock outcrop areas, was used to confirm the findings of the assessment. - Describe potential design alterations or potential measures to mitigate the effects of groundwater/surface water interactions, if required. This can effect wetland habitat as well as water supply in wells.	the clay liner thickness would have to be designed to resist artesian pressure uplift for a worse case scenario.
IR-26	- Provide groundwater quality baseline date for the LSMOC assessment areas or provide rationale or justification why the groundwater sampling program has not been conducted along the LSMOC. - For both LMOC and LSMOC assessment areas:	The Carbonate aquifer water meets CCME 2017 drinking water guidelines. How long will MI sample wells after project commissioning?

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	i. Clearly indicate the methodology used to include historical groundwater quality data in the baseline groundwater quality dataset. ii. Provide raw baseline groundwater quality data, including sample depth. iii. Provide summary statistics for groundwater quality, which should include, at a minimum: mean, standard deviation, 95th percentiles, minimum, maximum, and number of samples. iv. Provide a map depicting the locations of monitoring stations that have been included in the baseline groundwater quality dataset v. Identify the potential gaps in groundwater quality baseline data and indicate how data gaps will be addressed. Discuss implications of data gaps for conclusions drawn, uncertainty, and additional follow up and monitoring that would be implemented to address uncertainty in a precautionary manner.	
IR-27	- Provide the rationale for the selection of a ten-month period for the calculation of construction phase drawdown. - Provide a detailed description of the modeling used to evaluate the drawdown associated with the construction phase of the project.	The Theisen Model is effective in calculating the drawdown cone of a single depressurization well. The influence of multiple depressurization wells with variable aquifer hydro-conductivities would best be modelled by a 3-D finite element model on a regional basis. This model would provide a more accurate assessment of basal heave at various locations along the LMOC. Blow outs in the

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	i. Describe the assumptions used in the model as they relate to the hydrogeological context of the project. - Evaluate the potential lowering of groundwater within the till based on the dewatering of the bedrock aquifer.	channel would be a source of sediment for transport to LSM. The finite element model would also provide a better estimation of impacted domestic wells. Aquifer sustainability would best be computed by means of a water balance model which could predict seasonality variations of piezometric levels and the impact of wasting large volumes of water from the depressurization system over a long period of time. Operations of the depressurization system after project commissioning would provide data to further calibrate and fine tune the model.
IR-28A	- Discuss the likely available drawdown for domestic wells within the LAA for the LMOC. Provide updated figures that show the predicted drawdown contours based on the modeling. - Provide an assessment of potential risks to the confined carbonate aquifer (a potential source for drinking water) and possible mitigation measures to minimize the potential for contamination to influence the water quality of the aquifer. - Discuss the feasibility of drilling new (deeper) groundwater wells in terms of the potential depth required, and the potential quality and quantity of water at this greater depth. - Include an analytical assessment of groundwater drawdown associated with the passive dewatering during the operations phase of the project. The assessment should be completed for steady-state	What is the baseflow expected to be wasted from the aquifer? What is the volume of water of water to be wasted on an annual basis? Over the life of the project? Are there saline zones in the aquifer particularly at greater depths? Construction depressurization would be as much as 14 metres at the channel, 3km 1.5 to 3.3 metres, 5 km 0.9 to 2.7 metres. Operation depressurization 11 metres to 1 metre. GUDI of surface water conditions will exist on domestic wells. The limit of the GUDI zone of influence is not specified and will change seasonally and when the aquifer is in drought. More accurate modelling is required.

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	conditions, and should consider the potential range in required drawdown based on the range in operating levels in the LMOC. - Provide details of the additional investigations and modelling proposed for the Groundwater Management Plan. Include information on groundwater wells to be used in the follow-up program to monitor the effects on groundwater quality. Include a discussion of likely groundwater level monitoring locations, and depth interval. The discussion should also include the intended purpose of the monitoring location.	
IR 28B	- Clarify the discrepancy between the text in the EIS describing Manitoba Water Resources Branch Wells WRB122050 and WRB116766 and the information in Volume 2 Appendix 6B Figure 6.4B-3.	
IR-29	- Clarify if there are plans for the EOC, including conditions under which it would be operated, plans for repurposing, and considerations for potential future decommissioning. - Describe how the cumulative effects assessment accounts for the plans described in response to a) as reasonably foreseeable future physical activities or provide an updated discussion of cumulative effects associated with the EOC and the Project	MI has not made a commitment not to operate the EOC. The EOC maybe used in the future for flood control prior to project completion. MI has not provided DFO compensation for past operations. Past compensation should be resolved before consideration of future operations.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
IR-30	- Provide information on potential erosion rates under maximum flow conditions, and the potential effects of erosion to fish and fish habitat. - Describe associated mitigation measures, including a discussion of the effectiveness informed by the test plot studies, and assess significance of residual effects to fish and fish habitat. - Discuss associated monitoring and follow up.	Construction sediment control will be accomplished by standard methods. Operation will be on average once every 3 years resulting in a sediment plume (plume duration up to 2 days) generated by flushing the softened clay till (mm to cms in thickness) LMOC substrate. This silt deposition in LSM can impact LSM fishery during spawning, fishery habitat and drinking water sources. An impact in the Lake St Martin fishery can impact the Lake Winnipeg fishery. Whitefish and pickerel spawn in Lake St Martin and the associated waterways supporting the Lake Winnipeg fishery. Can an infield test be conducted on the degree and thickness of softening of the clay till substrate? 5 cm substrate softening represents 36,000 cm of sediment for the LMOC! EOC operations estimated 8,900 cm 2011-2012 and 11,000 cm 2014-2015. It is reasonable to expect greater sediment loads for the longer LMOC which has GW infiltration softening of the clay till substrate. The clay liner should be considered as a mitigation option. HWFN is very concerned as to the potential negative impact to the Lake Winnipeg fishery which will result in lower harvest yields, greater harvesting effort and will impact our treaty rights as they pertain to our traditional aboriginal fishing rights.
IR-31	- Provide information regarding under-ice water quality and fish survival in the LMOC and LSMOC.	Dissolved oxygen under ice conditions can affect fish mortality. Will minimum oxygenation flows be considered for the LMOC and LSMOC? Will in

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	i. Provide water quality information for the outlet channels under minimum flow and maximum ice-cover winter conditions. - Complete an assessment of the potential effects of the Project on fish and fish habitat from changes in water quality in the LMOC and LSMOC. Describe associated mitigation measures and assess significance of residual effects. Discuss associated monitoring and follow up.	channel oxygen monitoring be considered to minimize fish mortality?
IR-32	- Present the results, or preliminary results of studies related to shoreline geomorphology. - Present the results, or preliminary results, of the engineering designs intended to mitigate effects to shoreline geomorphology. - Using study results, assess the potential effects of changes to hydraulic conditions and sediment transport on fish and fish habitat. Describe applicable mitigation measures and assess significance of residual effects. Discuss associated monitoring and follow up.	Watchhorn Bay beach generation is driven by onshore and offshore sediment transport during open water. Ice driven accumulation (lake Ice rafting). No formal modelling such as Mike 21 2D has been done. Strictly air photograph analysis was performed. Cross sections need to be taken of Watchhorn Provincial Park shoreline and resurveyed every year to monitor impact of disturbance of littoral drift of sand. It is forecast that the excavation of 377,000 cubic metres for the LMOC inlet to the immediately north of the provincial park will create a sink for southern movement of sand resulting in the loss of regenerative sand deposition during storm events. Jetties at the outlet structures will accrete sediment on the windward side. In conclusion, monitoring of Watchhorn beaches is necessary. Modelling needs to be done to evaluate the interaction of jetties in disruption of offshore sediment mobilization Should degradation of the beaches occur, sand

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
		could be hauled in to restore the beach and dune erosion. Mike 21 modelling must be done to understand what potential changes may occur to the shoreline morphology. The results of the Mike 21 modelling were not provided for Sturgeon Bay. Inadequate models further complicate the capability for predictive determination of impacts to fish habitat suitability and introduce a high level of uncertainty. If model assumptions are inaccurate, how what contingencies does MI have in place to account for unforeseen impacts to fish and wildlife habitat?
IR-33	- Discuss the applicability of the effects assessment to fish and fish habitat to all fish species present in the LAA and RAA. Demonstrate that the CRA species used in the assessment are adequately representative of the unique life history and habitat requirements of all fish species in the LAA and RAA. i. If it is determined that the CRA fish species used in the assessment do not cover the unique life history and habitat requirements of all fish species in the LAA, complete an assessment of the potential for the Project to impact all fish species. Describe mitigation measures and assess the significance of residual effects. Discuss associated monitoring and follow up.	HWFN aboriginal fishing rights have been severely impacted by Fairford Control Structure past operations. HWFN has been advised by LSMFN that they have seen a significant decline in fishing resulting in an increased effort of harvesting and many Fishers discontinuing exercising treaty rights. Of particular concern to HWFN is the potential impact of the project on Lake Manitoba, Lake St Martin and Lake Winnipeg fishery. It is clear that the LMOC and LSMOC will impact fish spawning grounds, will alter fish abundance diversity, distribution and spawning movement and will cause fish mortality. With increased regulation of the lakes shoreline habitat will be altered and spawning grounds will be disrupted or exposed to the elements. Winter operations could expose whitefish spawning grounds and freeze eggs.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	- Discuss the effects of the Project on fish passage applying a broader definition of migration (i.e. fish movements possible within the current system).	This project will further the impact on our Lake Winnipeg fishing rights. No compensation has been provided to date for this intrusion on our treaty rights.
IR-34	- Discuss the potential for the Project to result in significant adverse effects to fish and fish habitat, and present a significance determination, applying the criteria and methodology described in the Agency's guidance. Discuss the use of not fully avoided or mitigated death of fish or harmful alteration, disruption, or destruction of fish habitat as a threshold of significance.	It is generally thought that groundwater percolation to the LSM lake bed provides spawning beds for white fish. More study needs to be done in this area especially given the impact of lowering artesian pressure in the Carbonate aquifer upstream of LSM. The response indicates given the aquatic and fish offset plan that the project does not reach the threshold level of significant. HWFN disagrees with this statement.
IR-35	- Clearly describe the sources of baseline data for primary and secondary productivity, including the methodologies used for data collection. - Provide a description of primary and secondary productivity with a characterization of season variability for LAA waterbodies	Chlorophyll is a primary data collected to evaluate productivity of water bodies.
IR-36	- Provide an analysis of baseline collection methods for the studies cited in the EIS. Similarities and differences should be provided. Provide a discussion on the validity of conclusions in the EIS if disparate methodologies were applied.	Much data was collected with EOC operations. Habitat classification, bathymetric and substrate distribution maps have been developed. Gill netting, drift nets for Fairford R, Dauphin R, Buffalo Creek. Little data collected on Birch Creek Lake Winnipeg and lake Manitoba.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	- Describe proposed further baseline studies methodology and provide any available results or preliminary results. Consider and discuss the need for additional mitigation, including offsetting, to address uncertainties, given baseline data limitations.	To date HWFN has not been approached as to our understanding of the impacts of the EOC operations on our reserve, traditional lands, natural resources and socio-economic well being..
IR-37	- Provide details pertaining to mitigation of effects to fish and fish habitat, including offsetting. i. Discuss the proposed offsetting relative to the habitat types affected by the project and update the assessment of residual effects to fish and fish habitat; - Discuss the degree to which the proposed offsetting would counterbalance the residual impacts to fish and fish habitat. While not required for the environmental assessment, the proponent may choose to present this in the form of offsetting measures for the Fisheries Act Authorization Offsetting Plan. Under the Fisheries Act, offsetting must be undertaken to restore, enhance, rehabilitate or create fish habitat.	MI lists numerous EMPs to mitigate effects to fish and fish habitat. Given that the MI has indicated that the existing fish ladder is to be removed from the Fairford Control Structure as part of the project. MI must commit to a replacement fish ladder as a component of this project. A state of the art more effective fish ladder would be an effective fish offset in restoring the only fish passage between Lake St Martin and Lake Manitoba. The effectiveness of any constructed fish passage structure will then need to be evaluated to ensure their long-term effectiveness and the ability for all species to utilize such passage structure and the ability to maintain habitat connectivity between upstream and downstream waterbodies. HWFN should be consulted as to the plans, configuration and predicted effectiveness of the proposed fish passage structure. Proposed offsetting measures have been identified- Birch Bay spawning substrate, Sturgeon Bay offshore reef, Mercer Creek spawning substrate, Watershed improvements. It should be noted that Mercer Creek is a very small watershed and the effectiveness of the spawning bed is questionable

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
		as an offset. The Province needs to justify how these offsets will fully mitigate project impacts. Habitat Alterations include- Watchhorn BayLMOC inlet 377,000 m3 of substrate Diversion of 27% Birch Creek Excavation of 434,000 m3 Birch Bay LMOC outlet Excavation of 521,000 m3 LSMOC inlet Diversion of 40% Buffalo watershed to LSMOC drainage system Excavation of 434,000 m3 of Sturgeon Bay LSMOC outlet Given that the substrates at the inlet and outlet are unstable or will experience extensive sediment deposition there is a need for channel stabilization modifications to resolve channel side slope and bed softening such as clay lining and erosion protection armouring. There is no definitive justification that recommended offsets compensate for the project habitat alterations The EMPs which include monitoring and reaction to unforeseen conditions are not offsets. More monitoring is needed for whitefish spawning bed impacts in LSM and Birch Bay due to aquifer depressurization affecting ground water upwelling.
IR-38	- The Agency understands that detailed design has advanced since the EIS was submitted. Provide an updated project design, including an assessment of	Both channels will have a baseflow of 50 cfs to prevent anoxic conditions under ice cover? Not sure LMOC has 50cfs baseflow? Predatory fish

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	how these updates may change the assessment of effects to fish and fish habitat. - Provide a discussion of how continued unknowns in project design affect uncertainty in conclusions regarding effects to fish and fish habitat.	will prey on stranded fish in LSMOC drop structure pools. The reliance on an EMP to address changes in DO by monitoring and to make changes in control structures to compensate would not be reactive and effective. These operational objectives to protect fish are not incorporated in the project operating guidelines.
IR-39	- Provide detailed monitoring plans and fish rescue plans. If full plans are not yet available, present preliminary plan details that describe methods, principles, and objectives of the plans and discuss means of ensuring effectiveness of monitoring and contingency measures.	Additional monitoring is required to understand impacts in changes in flows in Dauphin and Fairford river on fish movements in these rivers.
IR-40	- Provide an assessment of effects under all possible operating scenarios. Alternatively, provide a justification for why the conclusions in the EIS are valid for all operating scenarios.	No comments
IR-41	- Provide information on proposed flow allocation plans for the outlet channels and the existing Fairford and Dauphin Rivers, and explain how flow allocation was determined. - Identify potential changes to the hydrographs for the Fairford and Dauphin Rivers based on the flow allocation plan with a focus on the potential reduction in higher flow events in the natural rivers and the potential effects of these flow reductions.	The 2011 flood was provided as the high flow event to provide flow allocations. 2011 Fairford R flow 21,080 cfs 2011 Dauphin R flow 20,680 cfs With LMO and LSMOC operations for 2011 flows: Fairford R 17,930 cfs Dauphin R 9,400 cfs What MI failed to reveal is that both LMOC and LSMOC will have to operate significantly beyond

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	Describe the effects of these changes to fish and fish habitat, present mitigation measures and provide an updated significance determination.	their design capacity. Ie LMOC - 9000 cfs, 1500 cfs above it's 7500 cfs capacity. LSMOC will have to operate at 16,500 cfs, 5000 cfs beyond it's 11,500 cfs capacity. In other words, both channels will be operating in their freeboard and will be experiencing much higher erosive velocities. Lake Manitoba will be at elevation 815.6 feet and Lake St Martin north basin 801.3 feet. Lake St Martin south basin will be at 803 feet due to the 1.7 feet head loss due to the Narrows. The flood damage reduction benefits on both Lakes has been reduced resulting in a change in a lowering of the benefit cost ratio. The estimated $660M expenditure project will only reduce Lake Manitoba by 1.6 feet and will still be 3.1 feet above it's 812.5 feet upper operating level. This information is not transparent in MI's EIS or response 1. The operating guidelines need to recognize the 2011 flood as an emergency event as both channels will be operated above their design capacity. The operating rules are designed to maximize flood benefits only. It is HWFN's opinion that fish friendly objectives could be incorporated in the LSMOC operating rules that provide a flow split between LSMOC and Dauphin River that will be more beneficial for the Dauphin River fishery particularly for small or intermediate sized floods.
IR-42	List of Corrections	No comment

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
IR-43	- Conduct Hydraulic Modelling of LMOC and LSMOC, Fairford Control structure with the Denil Fish Ladder, Fairford R, LSM, Dauphin R, under various conditions - Using modelling results complete an assessment as to how fish and fish habitat are impacted, apply mitigation measures and discuss follow up monitoring -update surface water management plan with updated hydraulic modelling - If the proponent is of the view that hydraulic modelling cannot be conducted or is not required, present a rationale, discuss the validity of conclusions drawn, the related uncertainty with regards to potential effects (assessment predictions) and mitigation, and any monitoring and follow up that will be implemented on a precautionary basis to verify assessment predictions as well as additional mitigation measures required to adaptively manage potential effects of channel hydraulics and sediment transport to fish and fish habitat	MI indicates that modelling has been updated. The model now simulates LSM north and south basin but all outputs represent fish impacts as to the channel design capacities for LMOC 7500 cfs, LSMOC 11,500 cfs. Fishery impacts and mitigation measures should be re-evaluated at the 2011 flood levels with corresponding capacities for LMOC of 9,000 cfs and LSMOC 16,500cfs as the channels are intended to be deployed for a future 2011 flood scenario. Please provide clarification of what is depicted of Figure IAAC-43-1 and 2. Is the sediment deposition depicted for a single flood event and at what flow capacity? This sediment transport modelling needs to be fully developed for assessment of Fishery habitat impacts over the life of the project. MI is committing to further deliverables in hydraulic modelling.
IR-44	- Using sediment transportation models, identify the potential range of sediment deposits in Birch Bay and Sturgeon Bay through all phases of the Project, including under the operational flow conditions. If sediment transport modelling is not conducted, present estimates for the range of sediment deposits including a rationale and a discussion of areas of uncertainty.	Upon channel start up, TSS concentrations can be elevated for hours or days. Flows could be controlled at the time of channel commissioning. DFO should incorporate reduced risk timing should be incorporated in the operating guidelines for LMOC and LSMOC to reduce impact on Fish and Fish Habitat. Ice cover operation provides lower sediment loading and more even distribution. When open water conditions occur the sediment is

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	- Update the assessment effects to fish and fish habitat informed by the range of sediment deposits in Birch Bay and Sturgeon Bay identified in a). Identify mitigation measures and assess significance of residual effects. Discuss associated monitoring and follow up	resuspended. Can MI project silt load volumes for various annual operating scenarios?
IR-45	- Present the rationale for the discrepancy between wildlife LAA chosen for the EIS compared to that considered in the referenced wildlife reports. Describe the implications for the assessment of effects to wildlife of using one km buffer instead of the five km buffer. - Discuss how the temporal boundaries considered the time required for reclamation to re-establish habitat as an effective mitigation for wildlife effects. Provide leading indicators for successful reclamation of suitable habitat for SAR, migratory birds, and species of cultural significance.	HWFN is concerned that the channels provide no wildlife passage in the east or west directions in the summer as both channels will be full of water. During late fall and early winter weak channel ice may cause mortality in wildlife trying to cross the channel.
IR-46	- Discuss how the limitations of the SAR baseline data collected to date are likely to affect the conclusions of the assessment of effects. Explain the omission of potential SAR from the surveys. - Discuss how ongoing baseline information collection for SAR will occur to improve the confidence in the residual effects assessment and	No comment

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	support the development of the Wildlife Mitigation Plan and compensation offsetting plans. For surveys, include the types, quantities, and methodologies. Describe the specific survey methods that will be used, to provide greater certainty the extent of occupancy of the following SAR in the RAA: Northern Leopard Frog, Snapping Turtle, Yellow Rail, Least Bittern, and Piping Plover. - Provide details of the Environmental Management Plan, Wildlife Mitigation Plan, and compensation offsetting plans that outline measures to mitigate the residual effects of the Project on wildlife, including SAR.	
IR-47	- Describe the potential use of project components by migratory birds and SAR, and the potential effects of the Project on migratory birds at each stage of the Project (including operation) including: i. Migration patterns ii. Flyways iii. Local movement iv. Seasonal habitat use - Describe proposed measures to prevent and mitigate bird collision and electrocution from the Project's power distribution line. Identify migratory bird species and SAR which may interact with the power distribution line, and evaluate the predicted effects	No comment

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	of the Project on migratory bird species and SAR, including mortality.	
IR-48	- Identify hibernacula and maternity roosts used by little brown myotis and northern myotis in the Project LAA and: i. describe the elevation of hibernacula features, and ii. ii. assess the potential for Project effects to these key wildlife sensitive areas as a result of abiotic environmental changes (humidity, temperature, moisture) that may occur as a result of Project related landscape changes in the area (such as potential ground water/surface water fluctuations - Describe mitigation measures to avoid and lessen Project effects to little brown myotis and northern myotis during the life of the Project, including mortality effects and disturbances to or loss of hibernacula and maternal roosting habitat. c) Discuss the amount of possible maternity roosting habitat that is available for little brown myotis and northern myotis in the RAA and describe the potential indirect effects to critical habitat in the RAA. Discuss potential loss of possible maternity roosting within the Project area or LAA, relative to	No comment

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	overall available maternity roosting habitat in the RAA.	
IR-49	- Describe the details of commitments associated with Project scheduling and setbacks: i. Provide a definition of "known sensitive wildlife habitat." ii. Describe critical lifecycle periods for each SAR and migratory bird species potentially affected by the Project. iii. Define the intended avoidance periods for Project activities that coincide with bird breeding and nesting seasons. iv. Define the intended avoidance periods for Project activities that coincide with reproduction of other wildlife, including SAR. v. Describe the provincial terrestrial setback distances proposed for the Project.	No comment
IR-50	- Describe mitigation measures to address adverse effects to migratory birds associated with release of harmful substances to waters frequented by migratory birds. Include measures to mitigate the effects of the Project on waters frequented by migratory birds caused by road salt, oil and other contaminants from road construction and use.	MI advises roads were routed further from Goodman Lake to avoid road impacts.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	- Discuss the potential effects of the Project on migratory birds, taking into account these proposed mitigation measures. - Describe monitoring and follow up programs that will be used to confirm the predictions of the assessment.	
IR-51	- Estimate the number of suitable decadent trees in the LAA and quantify those that may be removed by construction in the PDA within Red-headed woodpecker critical habitat. - Describe planned steps to ensure the effectiveness of mitigation measures to protect Red-headed Woodpecker such as additional measures to retain standing snags and to reduce the likelihood of snags falling over given the potential uncertainty regarding the effectiveness of erected removed snags postconstruction along new ROW edges as mitigation for loss of critical habitat for Red Headed Woodpecker: i. i. Assess and identify the likelihood of partial and complete failure of the proposed mitigation. Identify contingency measures to be taken if the mitigation is not functioning as planned.	Response identifies approximates a 7.8 percent loss (165.75 ha) of critical habitat for Red Headed Woodpecker in the LMOC PDA

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
IR-52	- Describe how occupied habitat and key areas of seasonal use, where Project activities such as construction may introduce risk of mortality through heavy machinery use and ground disturbance, has been or will be identified. Provide measures to mitigate this effect. i. i. Provide seasonal species-specific mitigation measures for overwintering amphibian and mammal SAR species within the Project affected area.	HWFN is also concerned as to the loss of traditional herbs and medicines taken by the foot print of the project.
IR-53	- Describe interactions of predicted project abiotic changes in project-area waterbodies, wetlands and riparian areas with habitat quality, quantity and wetland function for migratory birds and SAR. - Evaluate functional changes to habitat quality in the assessment of changes to wetland function. Explain how residual effects of the Project on wetlands relate to loss of habitat functions for migratory birds and SAR. - Identify mitigation measures for altered habitat functions resulting from the Project, and consider timing of Project changes with seasonality of habitat use. Include details regarding proposed wetland compensation offsetting and how habitat function will be considered in offset planning.	On LMOC east side, down gradient, drying-down could occur which could reduce the area of open water, shift plant composition, favouring species adapted to less frequently flooded and shallower conditions, and reduce wetland extent. A mitigation measure could be to provide numerous conduit diversions from the LMOC to supplement flows to the wetlands of Birch Creek. This same mitigation measure could apply to the LSMOC also. The use of diverted channel water as opposed to depressurization aquifer would provide supplemental water that is oxygenated and comparable temperature as the receiving water body Birch Creek or Buffalo Creek). Changes to drainage flows and water residence in wetlands may alter nutrient uptake, sediment deposition and filtration function provided by wetlands. Need to better model flows through wetlands and the impacts that changes to these wetland functions may have on downstream

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	- Explain how habitat loss will be quantified for wetland dependent SAR and how this will be used to calculate wetland function compensation offsets. - Describe monitoring and follow-up for habitat function of wetlands and effects of habitat changes or loss to migratory birds and SAR.	aquatic habitat (nutrient and contaminant loading, sediment deposition, etc).
IR-54	- Describe interactions of predicted project abiotic changes in project-area waterbodies, wetlands and riparian areas with habitat quality, quantity and wetland function for migratory birds and SAR. - Evaluate functional changes to habitat quality in the assessment of changes to wetland function. Explain how residual effects of the Project on wetlands relate to loss of habitat functions for migratory birds and SAR. - Identify mitigation measures for altered habitat functions resulting from the Project, and consider timing of Project changes with seasonality of habitat use. Include details regarding proposed wetland compensation offsetting and how habitat function will be considered in offset planning. - Explain how habitat loss will be quantified for wetland dependent SAR and how this will be used to calculate wetland function compensation offsets. e) Describe monitoring and follow-up for habitat	MI predicts that 239 Ha of Class 3, 4 and 5 wetlands will be impacted by the LMOC on Birch Creek. This wetland is high quality wetland and should be compensated for at a ratio. Not sure what is predicted wetland impact on LSMOC. All compensation wetlands should be implemented in the project locality, not in other watersheds.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	function of wetlands and effects of habitat changes or loss to migratory birds and SAR.	
IR-55	NIL	
IR-56	Describe the potential effects of the Project on shoreline habitats, including on federal lands within the LAA and RAA. Include a discussion of the seasonal timing of operational disturbance to these habitat types due to water level controls in relation to species breeding, nesting, and rearing of young activities.	Generally thought to be an improvement in shoreline habitat with less nesting mortality as flooding will be less.
IR-57	Describe the source, rationale, and details (e.g., data source, study methods and assumptions) of the climate change information used in the development of the EIS. Consider and discuss relevant climate projections for the region for the full lifetime of the Project (including any post-closure periods where Project components remain sensitive to climate) from a range of emission scenarios (low to high forcing) from multiple climate models to reflect uncertainty in future climate projection.	Manitoba Hydro climate change model and GCM models were used to predict future climate scenarios for 2021 to 2050 and 2050 to 2080. The project life is considered indefinite. The climate change analysis computed by MI indicated little impact to Lake Manitoba (0.1 to 0.3 feet increase) for a 2011 (300 year event) flood. For Lake St Martin it was determined to be 0.05 to 0.2 feet. Climate change is not the driving force for change in flow for the Upper Assiniboine Basin (ie upstream of Portage Diversion). Dr John Pomeroy, Centre of Hydrology of the University of Saskatoon has looked at the affects of land use change in the Upper Assiniboine basin has resulted in drainage of wetlands and potholes resulting in a reduction of wetlands from 24% area coverage to 11% area coverage in the past 50 years. The end result is that future floods will be higher peaks and larger volume for an equivalent runoff event. This

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
		drainage of wetlands is still continuing at a rapid pace in the upper Assiniboine Basin. The LMOC and LSMOC flood damage reduction effectiveness will be diminished in the future as wetlands are continued to be drained. The Portage Diversion will have to be used more aggressively to protect the Lower Assiniboine River and City of Winnipeg. Another adverse impact to Lake Manitoba and Lake St Martin is that water quality will further diminish in the future water quality due to runoff of phosphorous from agricultural lands. The loss of further wetlands which act as a buffer to trap nutrients will continue to degrade Assiniboine river water quality. MI needs to project the continued loss of Upper Assiniboine river basin wetlands as to how effective the project channels will be to manage future floods.
IR-58a)	Provide an assessment of how the project will perform over its lifetime in the context of climate change, climate uncertainty, and increasing frequency, duration, and magnitude of extreme weather events. Specifically: i. Confirm the design flood of the project. ii. Provide estimates of the frequency and magnitude of floods, and methodologies used to develop estimates, under a range of future climate states.	Same response as above.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	iii. Describe how these estimates compare to the design flood and were considered in the design of the outlet channels and other infrastructure. Original Response iv. Describe the frequency at which flood events under different climate scenarios are estimated to exceed the design capacity of the outlet channels and infrastructure. v. Provide details of the planning, design and construction strategies (or measures) intended to minimize the potential environmental effects of the environment on the project. vi. Update the effects analysis and conclusions as necessary.	
IR-58B	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.	Existing and future land use changes in the Upper Assiniboine Basin and lake Manitoba Basin is the dominant driver of change in Lake water dynamics in terms of greater flood volumes and degradation of water quality. MI needs to consider upgrading the Assiniboine dikes between Portage La Prairie and Baie St Paul to their original design capacity of 25,000 cfs. In 2011 only 18,000cfs flow was achievable due to the poor condition of the dikes. As a result in 2011, 7,000 cfs extra flow for the full duration of the flood had to be diverted by the Portage Diversion. If the Assiniboine Dikes are not upgraded in the near future, the LMOC and LSMOC will have to be operated at higher flows and longer duration to

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
		compensate for this surplus diversion to Lake Manitoba.
IR-59	In the case of a channel breach or infrastructure failure, discuss any effects to the environment that could occur due to the interaction of the project, the event and environment, e.g., interaction of infrastructure and flooding, location of effects due to project routing of water.	MI has under designed the channels to manage a 2011 flood (1:300 year event). See IR 43 response which demonstrates the channels will be operated within their freeboard to manage a 2011 flood. MI should characterize channel breach or infrastructure failure for the 2011 operation scenario.
IR-60	Describe specific measures that will be taken to: i. minimize risk of fire and explosions associated with temporary and permanent fuel storage areas, or other flammable materials, during construction and operations; and ii. ii. minimize the likelihood of wildfires spreading to the project area and interacting with temporary and permanent fuel storage areas or other flammable materials.	MI's EMP should address these impacts if the plans are implemented fully and strictly enforced. A HWFN representative should have oversight in the implementation of all of the EMPs related to the LMOC and LSMOC. This FN position should be funded by MI.
IR-61	Under a range of future climate scenarios where there is an increase the frequency, duration, and magnitude of extreme weather events, including extreme precipitation and flooding: i. Describe management, operation and capacity of the integrated system of flood management infrastructure (e.g., Fairford Water Control Structure), and how this may interact with the project. ii. ii. In the context of the integrated system of flood management infrastructure, describe	The design basis for the project is that LMOC 7500 cfs capacity will achieve a peak of 814 feet asl Lake Manitoba level and a LSMOC 11,500 cfs capacity will achieve a peak 801 Lake St Martin south basin level. But the intent of project was to manage a 2011 (1:300 year event) which requires LMOC to operate at 9000 cfs and LSMOC 16,500cfs in which Lake Manitoba and Lake St Martin south basin will peak at 815.6 and 803 feet respectively. The benefit cost ratio needs to be re-evaluated for this project.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
	how events under future climate scenarios may adversely affect the project and how this in turn could result in effects to the environment. iii. iii. Describe details of planning, design, construction, and operation strategies intended to minimize any potential environmental effects of the environment on the project.	Operation strategies should be characterized in relation to the 2011 flood event.
IR-62	For each mitigation measure proposed to address accidents and malfunctions, provide sufficient detail to enable the Agency to understand potential residual effects of an accident or malfunction. i. Discuss the anticipated effectiveness of currently proposed mitigation measures in various seasonal conditions and associated adaptations or alternate mitigation that could be required. Include details on surveillance, inspections and maintenance to help support the assessment of effectiveness. ii. ii. Identify additional known mitigation measures that could be reasonably included in the referenced plans, including enough detail to understand implementation of the measure and the environmental outcome the mitigation measure is designed to address, in addition to the assessment of the effectiveness.	No comment.

Reference to IR	Context and Rationale	Specific Question / Comment and potential mitigation
IR-63	For all phases of the project, provide an assessment of risks for accident and malfunction scenarios involving sediment, including impacts to surface waters and aquatic species. Include mitigation measures that will be put in place to help prevent the scenario(s) from occurring and/or to address effects, including an assessment of the effectiveness of the measures.	No comment