

5.4 Climate Change

This section describes and summarizes an assessment of the effects of the Phase 1 New Transmission Line to Pickle Lake Project (the Project) on greenhouse gas (GHG) emissions. The assessment follows the general approach and concepts described in Section 4.0. In addition, the assessment will follow the guidance provided by the Ministry of the Environment and Climate Change (MOECC 2016), which is consistent with the guidance prepared for practitioners by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (FPTCCCEA 2003). The guidance documents from the MOECC and FPTCCCEA require climate change to be addressed through the following considerations:

- How will potential changes in climate affect the Proposed Project (including supporting and/or ancillary facilities and infrastructure)?
- How will the operation of the Proposed Project affect climate change (e.g., the Project's contribution to climate through the emission of Greenhouse Gases [GHGs])?

The purpose of this section is to quantify the current GHG emissions at the provincial federal and global scales. The current climate and projected future climate trends are considered an intermediate component and are discussed in Appendix 5.4A. Section 5.4 solely focuses on the assessment of GHG emissions that are a result of the Project. Before beginning the assessment of the impact of the Project on climate through GHG emissions in Section 5.4, it is important to put the Project in a greater context. The Project represents the first phase of the Wataynikaneyap Power Project. Phase 2, planned for construction between 2019 and 2023, focuses on the electrification of remote 17 remote First Nation communities. Electrification of remote Aboriginal communities will avoid complete reliance on diesel generators. Diesel generators are much more carbon intensive than the electricity grid. Phase 2 is estimated to result in a reduction of 6.6 million tonnes CO₂ equivalent at the remote communities over a 40-year period (PwC 2015). Furthermore, the operation of diesel generators requires fuel delivery, which could be hindered by future projections of climate change effecting transportation routes (e.g., ice roads). While Phase 2 is dependent on Phase 1, the benefits of the Wataynikaneyap Power Project, as a whole, will be discussed in the assessment of effects of the Phase 2 Project as this is where the majority of benefits will be realized.

5.4.1 Input from Engagement

Issues pertaining to GHGs or climate change that were raised by Aboriginal communities, Aboriginal groups and stakeholders during engagement and how they were addressed in the EA are listed for the Project are listed in Table 5.4-1. Comments, responses and follow-up actions are provided in Appendix 2.3A – Aboriginal Engagement Summary Report and Appendix 2.4A – Stakeholder Engagement Summary Report.

Table 5.4-1: Summary of Issues Raised during Engagement Related to Greenhouse Gases or Climate Change

Issue	How Addressed in the Environmental Assessment	Aboriginal Community or Aboriginal Group/ Stakeholder
Will need to address potential climate change effects on the Project. MOECC is preparing a guide on climate change requirements in EAs and will provide some guidance on this requirement.	Potential effects of climate change on the Project are addressed according to the draft Provincial guidance (MOECC 2016) and through Project design (Section 3.0) and in the Climate Change Discussion (Appendix 5.4A).	Engagement on the criteria and indicators with the MOECC

Note:

EA = environmental assessment; MOECC = Ontario Ministry of the Environment and Climate Change.

5.4.2 Information Sources

Information for the GHGs baseline was collected from review of the Environment and Climate Change Canada (ECCC) *National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada* (ECCC 2016a). A national inventory report is prepared and submitted annually to the United Nations Framework Convention on Climate Change (UNFCCC) to satisfy Canada's requirements under the convention to update, publish, and make available the national inventory of anthropogenic emissions by sources and removals by sinks. The UNFCCC provides reporting guidelines for the preparation of GHG inventory reports (UNFCCC 2014). This report also includes the total Canada-wide (federal) GHG emissions from 2014, which are the most recent annual data set available, and presents annual GHG emissions by province and territory.

Ontario Regulation (O. Reg.) 143/16 governs the documentation and reporting of GHG emissions in Ontario (MOECC 2017). The *Guideline for Greenhouse Gas Emissions Reporting* (MOECC 2015; the O. Reg. 143/16 Guideline) provides the emission estimation methods that are required to be used under this reporting regulation. In Ontario, only stationary combustion is currently required to report under O. Reg. 143/16. The *Technical Guidance on Reporting Greenhouse Gas Emissions* (ECCC 2016b) provides direction in determining if facilities are required to submit a GHG report to ECCC under the GHG Reporting Program (GHGRP). The GHGRP has not been used for construction projects.

For the purposes of the environmental assessment (EA), sufficient information was deemed to be available from these references to assess the potential effects of the Project on GHGs.

5.4.3 Criteria and Indicators

The criteria and indicators selected for the assessment of Project effects on GHGs, and the rationale for their selection, are provided in Table 5.4-2.

Table 5.4-2: Greenhouse Gases Criteria and Indicators

Criteria	Rationale	Indicators
Greenhouse gases (GHGs)	<ul style="list-style-type: none"> ■ Greenhouse gases contribute to climate change. ■ Federal and provincial concerns with GHG emissions and climate change. 	<ul style="list-style-type: none"> ■ Predicted GHG emissions of CO₂. ■ Predicted GHG emissions of N₂O. ■ Predicted GHG emissions of CH₄.

Notes:

CH₄ = methane; CO₂ = carbon dioxide; GHG = greenhouse gas; N₂O = nitrous oxide.

Greenhouse gas emissions include the following compounds: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Consideration of these GHG emissions is required as part of the Ontario Provincial GHGRP under the Government of Ontario *Greenhouse Gas Emissions Reporting* regulation (O. Reg. 143/16; MOECC 2017) and Canada's GHGRP under the *Canadian Environmental Protection Act 1999*. Of the GHG emissions requiring consideration, the Project is predicted to emit CO₂, CH₄ and N₂O from the combustion of mobile equipment. The indicators for the GHGs criteria are defined as follows:

- **Predicted CO₂ emissions:** CO₂ is a GHG that has a Global Warming Potential (GWP) of 1 under UNFCCC reporting guidelines (UNFCCC 2014).
- **Predicted CH₄ emissions:** CH₄ is a GHG that has a GWP of 25 under UNFCCC reporting guidelines (UNFCCC 2014).
- **Predicted N₂O emissions:** N₂O is a GHG that has a GWP of 298 under UNFCCC reporting guidelines (UNFCCC 2014).

5.4.4 Assessment Boundaries

5.4.4.1 Temporal Boundaries

Development of the Project is planned to occur during two stages:

- **Construction stage:** the period from the start of construction to the start of operation (approximately 18 to 24 months); and
- **Operation and maintenance stage:** encompasses operation and maintenance activities throughout the life of the Project.

The assessment of Project effects on GHG emissions considers effects that occur during the construction stage, as GHG emissions are considered to be largest during this stage of the Project. Therefore, the construction stage acts as a bounding phase for the Project. These periods are sufficient to capture the effects of the Project. Please note that this assessment does not include the GHG benefits of the project related to the electrification of remote Aboriginal communities through the avoidance of diesel combustion, this will be assessed through the Phase 2 Project.

5.4.4.2 Spatial Boundaries

A spatial boundary for the assessment has not been defined because GHG emissions are by nature considered at the global scale. Provincial and federal GHG emissions are provided in this section for context.

5.4.5 Description of the Existing Environment

This section provides a summary of the existing environment relevant to GHGs as determined through desktop review. As there are no spatial boundaries, due to the global nature of GHG emissions, the baseline characterization will be the same across all corridor options considered (Preliminary Proposed Corridor and the Corridor Alternatives Around and Through Mishkeegogamang).

5.4.5.1 Methods

A desktop review was completed to identify baseline conditions. While GHG emissions are monitored at a federal scale by the ECCC, they can also be quantified using published emission factors. For the purposes of this assessment, federal and provincial reported GHG emissions data were used to characterize existing GHG emissions at the federal and provincial levels using the ECCC *National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada* (ECCC 2016a).

5.4.5.2 Results

It is most appropriate to consider GHG emissions on a national or provincial scale. The primary sources of GHG emissions in Canada and Ontario are from anthropogenic sources that include the transportation sector (e.g., vehicles on 400 series highways in Ontario) and large industrial activities (e.g., manufacturing facilities) (ECCC 2016a). Estimates of GHG emissions are expressed as million metric tonnes (Mt) of carbon dioxide equivalent (CO₂e), which are calculated based on the GWP for each gas relative to the GWP of CO₂.

The latest available national and provincial GHG data were used to describe current GHG emissions. The latest available data are from the 2014 reporting year. In 2014, approximately 732 Mt of CO₂e emissions were reported nationally. Ontario was accountable for 23% of these emissions. The national and provincial emissions reported in 2014 are summarized in Table 5.4-3 (ECCC 2016a).

Table 5.4-3: Baseline Greenhouse Gas Emissions

Source ^(a)	GHG Emissions (Mt CO ₂ e)
Canada-wide 2014 GHG emissions	732
Ontario-wide 2014 GHG emissions	170

Notes:

a) ECCC 2016a.

GHG = greenhouse gas; Mt CO₂e = million metric tons of carbon dioxide equivalent.

5.4.6 Potential Project-Environment Interactions

Potential Project-environment interactions were identified through a review of the Project Description and existing environmental conditions. The linkages between Project components and activities and potential effects to GHG emission are identified in Table 5.4-4.

Table 5.4-4: Project-Environment Interactions for Climate Change

Criteria	Indicator	Project Phase		Description of Potential Project Environment Interaction
		Construction (includes access road and ROW preparation, installation, and reclamation activities)	Operation (includes operation and maintenance activities)	
GHG emissions	<ul style="list-style-type: none"> ■ Predicted CO₂ emissions ■ Predicted CH₄ emissions ■ Predicted N₂O emissions 	✓	✓ ⁽¹⁾	GHG emissions from construction activities.

Notes: CH₄ = methane; CO₂ = carbon dioxide; GHG = greenhouse gasses; N₂O = nitrous oxide; ✓ = A potential Project-environment interaction could result in an environmental or socio-economic effect; _ = No plausible interaction was identified

1) The assessment of Project effects on air quality considers effects that occur during the construction stage as emissions are considered to be largest during this stage of the Project. This timeframe is intended to be sufficient to capture the effects of the Project.

5.4.7 Potential Effects, Impact Management Measures, and Net Effects

This section presents the potential effects, appropriate impact management measures, and predicted net Project effects for climate change. Unless otherwise noted, the discussion of potential effects, impact management measures and net effects apply to all corridors. A summary of the potential effects, impact management measures and net effects are presented in Table 5.4-9.

5.4.7.1 Greenhouse Gas Emissions from Construction Activities

5.4.7.1.1 Potential Effects

The primary sources of GHG emissions during the construction stage of the Project are the land clearing and associated biomass burning, as well as off-road and on-road equipment. Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. A secondary screening assessment was completed to confirm potential effects. When assessing the GHG emissions during construction, a bounding condition was created which would result in the highest likely GHG emissions in one year to be used in the effects assessment. The following sections outline this bounding condition for the primary sources of GHG emissions.

It was conservatively assumed that 100% of the Project footprint (1,630 ha) will be cleared and burned for the Project, as a bounding condition. The land clearing emissions represent the loss of the carbon sink associated with the forest growth. Over time the vegetation will regrow providing additional carbon sinks in the region of the Project, lowering the net GHG emissions. The highest land clearing emissions occur when there is a loss of

the existing carbon sink with negligible regrowth of vegetation, forming the bounding condition. The biomass burning represents a one-time emission of GHGs due to the combustion of the vegetation and release of CO₂ to the atmosphere. The conservative assumption that 100% of the Project footprint will be burned does not take into account the presence of merchantable timber or that the merchantable timber will be not be burned. In addition, the construction scheduling may not result in biomass burning over the entire Project footprint and may result in some burning in the future. Therefore, the most conservative assumption of 100% of the Project footprint was used. A summary of the data used for the land clearing and biomass burning calculations is provided in Table 5.4-5.

Table 5.4-5: Data Used for Land Clearing Emission Calculations

Emission Source	Data Used in Emission Rate Calculations	References
Land clearing ^(a)	<ul style="list-style-type: none"> ■ area to be cleared (assumed 100% of the Project footprint); ■ vegetation type (assumed boreal coniferous forest), including: ■ mean above-ground biomass growth ■ above-ground biomass ratios ■ carbon fraction 	Intergovernmental Panel on Climate Change (IPCC) 2006. <i>Guidelines for National Greenhouse Gas Inventories</i> , Volume 4, Chapter 4. (IPCC 2006a)
Biomass burning ^(b)	<ul style="list-style-type: none"> ■ area to be cleared (assumed 100% of the Project footprint); ■ vegetation type (assumed boreal coniferous forest), including: ■ mass of fuel available for combustion ■ combustion factor; and ■ emission factors. 	Intergovernmental Panel on Climate Change (IPCC) 2006. <i>Guidelines for National Greenhouse Gas Inventories</i> , Volume 4, Chapter 2. (IPCC 2006b)

Notes:

a) The land clearing emission estimates account for the removal of a carbon sink and thus the loss of annual removal of carbon from the atmosphere. This also occurs through the duration of the operation phase.

b) Cleared vegetation will be burned.

It was assumed that, as a worst case, construction camp power generation, flagging and clearing, access road construction, staking, geotechnical investigations, and foundation installation activities for the Project could occur at the same time. Corresponding equipment data for these activities were used in combination with published emission factors from the Ontario *Guideline for Emissions Reporting* (MOECC 2015) to calculate annual GHG emission totals.

A summary of the equipment data and emission factor references used for each source of mobile equipment emissions are provided in Table 5.4-6. Impact management measures (Table 5.4-9) were assumed to be implemented. Vehicles were assumed to be operating for up to ten hours (some vehicles only operated five hours), 365 days per year. This is a conservative assumption, as not all equipment would likely be in operation for the full planned schedule (25 days per month, per year). The construction camp power generation was assumed to be operating 24 hours, 365 days per year. This is a conservative assumption, as this is a maximum operating capacity for the generator.

Table 5.4-6: Data Used for Mobile Equipment Emission Calculations

Emission Source	Equipment/Activity Data Used in Emission Rate Calculations	Emission Factor Used in Emission Rate Calculations
Mobile equipment and vehicular exhausts	<ul style="list-style-type: none"> ■ equipment type and quantity; ■ vehicle engine size; and ■ equipment hours of operation. 	<ul style="list-style-type: none"> ■ Diesel emission factors from Table 20-2 of the <i>Ontario Guideline for Greenhouse Gas Emissions Reporting</i> document (MOECC 2015). ■ Load factors from Table 9 of the <i>Median Life, Annual Activity, and Load Factor Values for Non-road Engine Emissions Modeling</i> document (U.S. EPA 2010).
Construction camp power generation	<ul style="list-style-type: none"> ■ equipment type; ■ engine size; and ■ equipment hours of operation. 	Diesel emission factors from Table 20-2 of the <i>Ontario Guideline for Greenhouse Gas Emissions Reporting</i> document (MOECC 2015).

Notes:

MOECC = Ontario Ministry of the Environment and Climate Change; U.S. EPA = United States Environmental Protection Agency.

The estimated annual GHG emissions from the equipment (mobile and power generation) for the construction stage of the Project are summarized in Table 5.4-7. Construction stage GHG emissions are attributed to the operation of mobile equipment and likely represent an overestimate of the GHG emissions with the conservative assumptions (not all equipment would likely be in operation for the full planned schedule). The GWP used to calculate the annual total GHG emissions in CO_{2e} correspond to the GWPs from the UNFCCC (UNFCCC 2014).

Table 5.4-7: Summary of Estimated Annual Greenhouse Gas Emissions during the Project Construction Stage

Source	Construction Annual Greenhouse Gas Emissions (tonnes/year) ^(a)			Annual Total (tonnes/year) ^(a)	Percent Contribution (%)
	CO ₂	CH ₄	N ₂ O	CO _{2e}	
Mobile equipment	6,300	0.31	0.94	6,600	19%
Land clearing	4,000	n/a	n/a	4,000	11%
Biomass burning	21,000	63	3.5	24,000	69%

Notes:

a) The values have been adjusted to two (2) significant digits to represent the level accuracy. n/a = not applicable. CO₂ = carbon dioxide; CH₄ = methane; N₂O = nitrous dioxide; CO_{2e} = carbon dioxide equivalent.

A comparison of the estimated annual overall GHG emission from the construction of the Project to the federal and provincial totals is provided in Table 5.4-8. The total estimated GHG emissions from the Project represent less than 0.02% of the provincial total and 0.005% of the Canada-wide total. A comparison to the global GHG emissions total was not completed as GHG emissions from the Project, using the construction stage as a bounding stage, represent a negligible fraction of global GHG emissions. Please note that this assessment does not include the GHG reduction benefits of the Phase 2 Project related to the electrification of remote Aboriginal communities through the avoidance of diesel combustion, this will be assessed in the Phase 2 environmental assessment.

Table 5.4-8: Comparison of Estimated Greenhouse Gas Emissions from the Project^(a) to Ontario and Canadian Emission Totals

Source	Construction Stage Greenhouse Gas Emissions (CO ₂ e tonnes/year)
Project annual GHG emissions	35,000
Comparison to Canada-wide total	0.005%
Comparison to Ontario total	0.02%
Canada-wide 2014 GHG emissions	732,000,000
Ontario-wide 2014 GHG emissions	170,000,000

Notes:

a) Project emissions are represented using the construction phase as a bounding phase.

CO₂e tonnes/year = carbon dioxide equivalent tonnes per year; GHG = greenhouse gas; % = percent.

5.4.7.1.2 Impact Management Measures

Vehicles and equipment will be turned off when not in use, as practical, and equipment will be well maintained to maximize fuel efficiency. Slash piles will be burned in compliance with O. Reg. 207/96. Multi-passenger vehicles will be used to transport personnel, where practical.

5.4.7.1.3 Net Effect

The Project is predicted to have a negligible net effect on emission levels of CO₂, N₂O and CH₄ based on the comparison between the estimated annual emissions from the Project to both the federal and provincial GHG emissions. Provincial and federal GHG emission levels are anticipated to be maintained. Therefore, the effect pathway of GHG emissions from construction activities was classified as a net effect, and was carried forward to net effects characterization.

Table 5.4-9: Potential Effects, Impact Management Measures, and Predicted Net Effects for Greenhouse Gas Emissions

Project Component or Activity	Potential Effect	Impact Management Measures	Net Effect
<p>Project activities during the construction stage, including:</p> <ul style="list-style-type: none"> ■ clearing, grading, earth moving, grubbing of vegetation, and stockpiling of materials along the ROW and other access and construction areas, and construction of infrastructure (e.g., access roads, bridges, temporary laydown areas, turn-around areas, and temporary construction camps); ■ operation of vehicles, construction equipment, and diesel generators; ■ reclamation of decommissioned access roads, temporary laydown areas, turn-around areas, staging areas, and temporary construction camps; and ■ transportation of personnel, materials, and equipment. 	<p>Changes in Greenhouse gas emissions from construction activities</p>	<ul style="list-style-type: none"> ■ Where reasonable and practical, vehicles and equipment will be turned off when not in use, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition. ■ Wataynikaneyap with their contractor(s) will keep equipment well-maintained to maximize fuel efficiency. ■ Slash pile burning will be subject to agreements with Aboriginal communities, landowners, and to permits and approvals by appropriate regulatory agencies. Slash piles will be burned in compliance with O. Reg. 207/96. ■ Multi-passenger vehicles will be used to transport personnel, where practical. ■ Wataynikaneyap with their contractor(s) will prepare and implement a Greenhouse Gas Management Plan prior to construction. An overview of this plan is provided in Section 9.3.1.2. 	<p>Net changes in GHG emissions during construction activities</p>

Notes:

GHG = greenhouse gases; ROW = right-of-way.

5.4.8 Net Effects Characterization

5.4.8.1 Net Effects Characterization Approach

The effects assessment approach followed the general process described in Section 4.0.

Net effects are described using the significance factors identified in Table 5.4-9. Effects levels are defined for the magnitude of effects characteristics for climate change in Table 5.4-10.

Table 5.4-10: Magnitude Effect Levels for Climate Change

Indicator / Net Effect	Magnitude Level Definition			
	Negligible	Low	Moderate	High
GHG emissions during construction activities	<0.1% of the provincial emission levels, or by <0.01% of the federal emission level	>0.1% but <1% of the provincial emission levels, or by <0.01% of the federal emission levels	>1% compared to provincial totals, or by >0.1% compared to national totals.	>5% compared to provincial totals, or by >1% compared to national totals

Notes:

GHG = greenhouse gases.

5.4.8.2 Net Effects Characterization

A summary of the characterization of net effects of the Project on climate change is provided in Table 5.4-11. Net effects are described after the implementation of effective impact management measures, and summarized according to direction, magnitude, geographic extent, duration/reversibility, frequency, and probability of the effect occurring following the methods described in Section 4.0. Effective implementation of impact management measures summarized in Table 5.4-9 and Section 5.4.7.1.2 is expected to reduce the magnitude and duration of net effects on climate change.

**ENVIRONMENTAL ASSESSMENT REPORT FOR THE PHASE 1
NEW TRANSMISSION LINE TO PICKLE LAKE PROJECT
SECTION 5.0: PHYSICAL ENVIRONMENT BASELINE
CHARACTERIZATION AND EFFECTS ASSESSMENT**

Table 5.4-11: Characterization of Predicted Net Effects for Climate Change

Criteria	Indicators	Net Effect	Direct/ Indirect	Significance Factors						Significance
				Direction	Magnitude	Geographic Extent	Duration/ Irreversibility	Frequency	Likelihood of Occurrence	
GHGs	<ul style="list-style-type: none"> ■ Predicted CO₂ emissions ■ Predicted CH₄ emissions ■ Predicted N₂O emissions 	GHG emissions during construction activities	Direct	Negative	Negligible	Beyond regional	Short-term – irreversible	Frequent	Probable	Not Significant

Notes:

CH₄ = Methane; GHG = Green House Gases.

5.4.8.3 Net Change in Greenhouse Gas Emissions from Construction

GHG emissions associated with Project construction activities will increase provincial and Canadian GHG emissions, and contribute permanently to global cumulative GHG emissions, therefore, the spatial boundary is beyond regional, the direction negative and the reversibility permanent. Construction activities associated with the Project are of short-term duration and intermittent frequency (frequent). Although the likelihood of occurrence is probable, the magnitude is negligible because the emissions, although detectable, would be small and not reportable when taking into account the implementation of impact management measures described in Section 5.4.7.1.2.

5.4.9 Assessment of Significance

The assessment of significance of net effects of the Project is informed by the interaction between the significance factors, with magnitude, duration and geographic extent being the most important factors. Consideration is also given to concerns of interested agencies, groups and individuals raised during consultation and engagement and through review comments on the EA reports. Implementation of proven impact management measures is expected to avoid or reduce the duration and magnitude of net effects on climate change. The magnitude of the predicted net effect on GHG Emissions is negligible (<0.1% of the provincial emission levels), direct, and beyond regional (extending out of the RSA). The net effect is anticipated to be irreversible.

Net effects to a criterion would be considered to be significant if the majority of the net effects are assessed as high magnitude, long-term or permanent duration, at any geographic extent and represent a management concern. The predicted net effect on GHG emissions is not anticipated to result in a change to the criteria that will alter the sustainability of the criterion beyond a manageable level and the net effects do not result in changes that are not in accordance with provincial and federal guidelines. Therefore, the predicted net effects on GHG emissions is assessed as not significant.

5.4.10 Cumulative Effects Assessment

The magnitude of the net effect was predicted to be negligible; therefore, a cumulative effects assessment with future Projects was not completed.

A positive effect to the cumulative effects is identified through electrification of remote First Nation communities, which avoids the GHG emissions from relying on diesel combustion for power. Major reduction in GHG emissions due to replacement of diesel fuel requirements with grid based electricity. The estimate is 6.6 million tonnes CO₂¹ equivalent reduction in GHG emissions at remote off-grid Aboriginal communities over a 40-year period. This positive effect will be assessed in detail as part of the Wataynikaneyap Phase 2 project environmental assessment.

¹ CO₂ equivalent – represents the amount of CO₂ that would have the equivalent global warming potential as the selected greenhouse gas.

5.4.11 Prediction Confidence in the Assessment

The confidence in the effects assessment for GHGs is moderate to high, considering that the impact management measures described in Section 5.4.6 and in the ESMP (Section 9.0) is based on accepted and proven best management practices that are well-understood and have been applied to transmission line projects throughout North America. Uncertainty in the assessment has been further reduced by making conservative assumptions, planned implementation of known effective impact management measures and monitoring measures, and available adaptive management measures to address unforeseen circumstances should they arise.

When considering GHG emissions from the Project, uncertainty was addressed through conservative assumptions regarding the amount of land that will potentially be cleared and burned, as well as the operation of mobile equipment during the construction stage. Best management practices for land clearing include reducing the amount of land cleared to the extent possible. Best management practices for mobile equipment include the regular maintenance of the equipment and practices to reduce the idling of mobile equipment. These measures will potentially reduce the emissions further below the conservative estimate, increasing confidence in the assessment.

5.4.12 Monitoring

This section identifies any recommended effects monitoring to verify the prediction of the effects assessment and to verify the effectiveness of the impact management measures and compliance monitoring to evaluate whether the Project has been constructed, implemented, and operated in accordance with the commitments made in the EA Report. No monitoring programs will be required for GHGs.

5.4.13 Information Passed on to Other Components

The results of the GHG assessment were not reviewed and incorporated into other components of the EA.

5.4.14 Criteria Summary

Table 5.4-12 presents a summary of the assessment results for climate change by criteria and route alternative. From a GHG perspective, there is no difference between the corridors, as each will take more than one year to construct. Therefore, the annual emission rates of GHGs are the same for each corridor.

Table 5.4-12: Climate Change Assessment Summary

Criteria	Preliminary Proposed Corridor	Corridor Alternative Around Mishkeegogamang	Corridor Alternative Through Mishkeegogamang
Greenhouse gas emissions	<ul style="list-style-type: none"> ■ Net effects are assessed to be not significant. ■ The Project is not predicted to contribute to cumulative effects. 	<ul style="list-style-type: none"> ■ Net effects are assessed to be not significant. ■ The Project is not predicted to contribute to cumulative effects. 	<ul style="list-style-type: none"> ■ Net effects are assessed to be not significant. ■ The Project is not predicted to contribute to cumulative effects.

5.4.15 References

- Canadian Environmental Protection Act*. 1999. S.C. 1999, c. 33.
- ECCC (Environment and Climate Change Canada). 2016a. *National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada*. Accessed February 10, 2017: https://www.ec.gc.ca/ges-ghg/662F9C56-B4E4-478B-97D4-BAABE1E6E2E7/2016_NIR_Executive_Summary_en.pdf
- ECCC. 2016b. *Technical Guidance on Reporting Greenhouse Gas Emissions*. Accessed February 10, 2017: <https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=47B640C5-1>
- FPTCCCEA (The Federal and Provincial Committee on Climate Change and Environmental Assessment). 2003. *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*. Prepared by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. ISBN: 0-662-35454-0. November 2003.
- Golder (Golder Associates Ltd.). 2014. *Amended Terms of Reference for the Wataynikaneyap Power Project, Phase 1: New Transmission Line to Pickle Lake Project Environmental Assessment*. Submitted to the Ministry of Environment and Climate Change.
- IPCC. 2006a. *Guidelines for National Greenhouse Gas Inventories*. Volume 4. Chapter 4. Accessed May 18, 2017; <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>
- IPCC. 2006b. *Guidelines for National Greenhouse Gas Inventories*. Volume 4. Chapter 2. Accessed May 18, 2017; <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>
- MOECC (Ontario Ministry of the Environment and Climate Change). 2017. *Ontario Regulation 143/16: Quantification, Reporting and Verification of Greenhouse Gas Emissions*. Accessed February 10, 2017: <https://www.ontario.ca/laws/regulation/160143>
- MOECC. 2016. *Consideration of Climate Change in Environmental Assessment in Ontario (Draft). Revision 0*. Accessed June 14, 2017: http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2016/012-5806%20english.pdf
- MOECC. 2015. *Guideline for Greenhouse Gas Emissions Reporting. PIBs 9906e*. Accessed February 10, 2017: http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2015/012-4549_d_Guideline.pdf
- PwC (PricewaterhouseCoopers). 2015. *Wataynikaneyap Power Project Socioeconomic Impact Analysis of Building Grid Connection to Ontario's Remote Communities*. Document on file at Golder Associates Ltd.
- UNFCCC (United Nations Framework Convention on Climate Change). 2014. *Reporting Guidelines*. Accessed August 16, 2017: http://unfccc.int/national_reports/annex_i_ghg_inventories/reporting_requirements/items/2759.php
- U.S. EPA (United States Environmental Protection Agency). 2010. *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*. Accessed February 10, 2017: <https://www3.epa.gov/otaq/models/nonrdmdl/nonrdmdl2010/420r10016.pdf>