

## **10. GREENHOUSE GASES**

This section describes and summarizes an assessment of the effects of the East-West Tie Transmission Project (the Project) on greenhouse gases. Greenhouse gases (GHGs) have the potential to affect future climate as they contribute to the greenhouse effect by absorbing infrared radiation in the atmosphere, increasing temperature and changing weather patterns. The assessment follows the general approach and concepts described in Section 5. The main steps in the assessment include:

- considering input from Indigenous communities, government representatives and agencies, other communities, property owners, and people or groups interested in the Project during the ongoing consultation and engagement process (Section 10.1);
- identifying information and data sources used in the assessment (Section 10.2);
- identifying and rationale for selection of criteria and indicators for GHGs (Section 10.3);
- establishing temporal boundaries (i.e., construction and operation phases) and study areas for the assessment of effects on GHGs (Section 10.4);
- describing the existing environment (i.e., baseline characterization) and identifying environmentally sensitive features specific to each criterion (Section 10.5);
- identifying potential Project-environment interactions (Section 10.6);
- undertaking the net effects assessment (Section 10.7):
  - identifying potential environmental effects;
  - identifying mitigation measures;
  - predicting the net effects; and
  - characterizing the net effects (i.e., after mitigation) of the Project on environmental criteria (Section 10.8).
- assessing the significance of the net effects (Section 10.9);
- conducting a cumulative effects assessment of the net effects in combination with other past, present, or reasonably foreseeable developments (RFDs) and activities and assessing significance (Section 10.10), if applicable;
- determining the degree of certainty in the net effects prediction and associated assessment of significance (Section 10.11); and
- identifying follow-up, inspection, and monitoring programs that will be completed during and after construction (Section 10.12).

## 10.1 Input from Consultation and Engagement

Consultation and engagement for the Project considered Indigenous communities, regulatory agencies, property owners, interest holders, Crown interests and the general public. Consultation activities are described in Section 2 of the amended Environmental Assessment (EA) Report. The draft and final EA Reports were each subject to a public review and comment period. Comments received on the draft EA Report, responses and change log are provided in Appendix 1-III. Comments received on the final EA Report and responses are provided in Appendix 1-IV. The following concerns related to GHGs were raised during consultation and engagement and from comments received on the draft and final EA Reports:

- Ministry of Environment and Climate Change (MOECC), Ministry of Natural Resources and Forestry (MNRF), and Métis Nation of Ontario (MNO) expressed concern that many responses to comments on the draft EA Report were provided in Appendix 1-III of the final EA Report and not integrated into the body of the final EA Report. Suggested changes acknowledged in responses to comments on the draft EA Report but not incorporated into the final EA Report have been incorporated into the amended EA Report where appropriate.
- MOECC, MNRF and Indigenous communities expressed concern with the pathway screening methodology employed in the draft and final EA Reports. The EA methods have been revised and feedback has been incorporated. The terms “effect pathway” and “assessment endpoint” were removed from the amended EA Report. This revision is reflected throughout this section of the amended EA Report.
- MOECC, MNRF and Indigenous communities expressed concerns about the use of the pathway screening method excluding some potential Project effects from being carried forward to the net effects assessment. All potential Project effects are considered in the net effects assessment and a net effects assessment table was added as Table 10-10 to this section.
- Red Sky Métis Independent Nation and Missinabie Cree First Nation expressed concerns regarding the burning of wood fibre on site and the potential increase in GHGs during consultation and engagement for the Project. Emissions from GHGs from land clearing and the associated biomass burning are assessed in Section 10.7.1.1. Effects to forestry and associated mitigation measures are assessed in Section 17.7.14 of the amended EA Report. As discussed in this section of the amended EA Report, it is assumed that merchantable timber would not be burned but that the merchantable timber will be sold.

A detailed public and Indigenous consultation and engagement record is provided in Appendices 2-III and 2-IX, respectively.

## 10.2 Information Sources

Information for the assessment of GHGs was collected from review of the following sources:

- *National Inventory Report 1990 – 2014: Greenhouse Gas Sources and Sinks in Canada* (ECCC 2016);
- *Reported Facility Greenhouse Gas Data* (ECCC 2015a);
- *Ontario Regulation 452/09: Greenhouse Gas Emissions Reporting* (MOECC 2016);
- *United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines* (UNFCCC 2014);
- *Guideline for Greenhouse Gas Emissions Reporting* (MOECC 2015);
- *Technical Guidance on Reporting Greenhouse Gas Emissions* (ECCC 2015b);

# EAST-WEST TIE TRANSMISSION PROJECT

## AMENDED ENVIRONMENTAL ASSESSMENT REPORT

---

- *Chapter 2 of Guidelines for National Greenhouse Gas Inventories: Vol.4* (IPCC 2006a); and
- *Chapter 4 of Guidelines for National Greenhouse Gas Inventories: Vol.4* (IPCC 2006b).

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 2016). A national inventory report is prepared and submitted annually to the United Nations Framework Convention on Climate Change 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. This report also includes the total Canada-wide (federal) GHG emissions from 2014, which is the most recent annual data set available at the time of the assessment, and presents annual GHG emissions by province and territory (ECCC 2015a).

Ontario Regulation (O. Reg.) 452/09 governs the documentation and reporting of GHG emissions in Ontario. The *Guideline for Greenhouse Gas Emissions Reporting* (MOECC 2015; the O. Reg. 452/09 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. 452/09. The *Technical Guidance on Reporting Greenhouse Gas Emissions* (November 2015; ECCC 2015b) provides direction in determining if facilities are required to submit a GHG report to ECCC under the Greenhouse Gas Reporting Program. The Greenhouse Gas Reporting Program has not been used for construction projects.

In addition, chapters from the *Guidelines for National Greenhouse Gas Inventories: Volume 4* provides emission estimation methods for land clearing and biomass burning. This methodology is used in absence of methodology provided by *Guideline for Greenhouse Gas Emissions Reporting* (MOECC 2015).

For the purposes of the amended EA Report, sufficient information was deemed to be available from these references to assess the potential effects of the Project on GHGs.

### 10.3 Criteria and Indicators

**Criteria** are components of the environment that are considered to have economic, social, biological, conservation, aesthetic, or ethical value (Section 5.1). GHGs have been selected as a criterion because they have the potential to affect future climate as they contribute to the greenhouse effect by absorbing infrared radiation in the atmosphere, increasing temperature and changing weather patterns.

**Indicators** represent attributes of the environment that can be used to characterize changes to criteria in a meaningful way. GHG emissions include the following compounds: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulphur hexafluoride (SF<sub>6</sub>), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Consideration of these GHG emissions is required as part of the Ontario Provincial Greenhouse Gas Reporting Program under the Ontario Greenhouse Gas Emissions Reporting regulation (O. Reg. 452/09) and Canada's Greenhouse Gas Emissions Reporting Program under the *Canadian Environmental Protection Act, 1999*. Of the GHG emissions requiring consideration, the Project is expected to emit CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O from the combustion of mobile equipment. The indicators for the GHGs criterion are defined as follows:

- **Predicted CO<sub>2</sub> emissions:** CO<sub>2</sub> is a GHG that has a Global Warming Potential (GWP) of one under UNFCCC reporting guidelines (UNFCCC 2014).
- **Predicted CH<sub>4</sub> emissions:** CH<sub>4</sub> is a GHG that has a GWP of 21 under UNFCCC reporting guidelines (UNFCCC 2014).
- **Predicted N<sub>2</sub>O emissions:** N<sub>2</sub>O is a GHG that has a GWP of 310 under UNFCCC reporting guidelines (UNFCCC 2014).

# EAST-WEST TIE TRANSMISSION PROJECT AMENDED ENVIRONMENTAL ASSESSMENT REPORT

There are no Project activities that are expected to emit sulphur hexafluoride (SF<sub>6</sub>), perfluorocarbons (PFCs) or hydrofluorocarbons (HFCs); therefore, these compounds are not included in the GHG assessment. The emissions of the indicator compounds are calculated as described in Appendix 10-I, and only the total contribution from all indicator compounds will be considered. The criterion and indicators selected for the assessment of Project effects on GHGs, the measurement of the potential effects on each indicator, the data sources use, and the rationale for their selection, are provided in Table 10-1.

**Table 10-1: Greenhouse Gases Criteria and Indicators**

Criterion	Indicators	Measurement of Potential Effects	Data Sources	Rationale
Greenhouse gases	Predicted greenhouse gas emissions of CO <sub>2</sub>	Estimated greenhouse gas emissions are calculated using emission factors, along with information on the equipment and vegetation, and used to measure potential effects through comparison to annual provincial and federal greenhouse gas emission inventories.	<ul style="list-style-type: none"> <li>■ National Inventory Report 1990 – 2014: Greenhouse Gas Sources and Sinks in Canada (ECCC 2016);</li> <li>■ Reported Facility Greenhouse Gas Data (ECCC 2015a);</li> <li>■ United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines (UNFCCC 2014);</li> <li>■ Ontario Regulation (O. Reg.) 452/09;</li> <li>■ Guideline for Greenhouse Gas Emissions Reporting (MOECC 2015);</li> <li>■ Technical Guidance on Reporting Greenhouse Gas Emissions (ECCC 2015b);</li> <li>■ Chapter 2 of Guidelines for National Greenhouse Gas Inventories: Vol.4 (IPCC 2006a);</li> <li>■ Chapter 4 of Guidelines for National Greenhouse Gas Inventories: Vol.4 (IPCC 2006b); and</li> <li>■ Additional data sources are available in Appendix 10-I.</li> </ul>	<ul style="list-style-type: none"> <li>■ Greenhouse gases contribute to climate change</li> <li>■ Federal and provincial concerns with greenhouse gas emissions and climate change</li> </ul>
	Predicted greenhouse gas emissions of CH <sub>4</sub>			
	Predicted greenhouse gas emissions of N <sub>2</sub> O			

CO<sub>2</sub> = carbon dioxide; CH<sub>4</sub> = methane; ECCC = Environment and Climate Change Canada; IPCC = Intergovernmental Panel on Climate Change; MOECC = Ministry of the Environment and Climate Change; N<sub>2</sub>O = nitrous oxide; O. Reg. = Ontario Regulation; US EPA = United States Environmental Protection Agency.

## 10.4 Assessment Boundaries

### 10.4.1 Temporal Boundaries

The Project is planned to occur during two phases (Section 5.2.1):

- **construction phase:** the period from the start of construction to the start of operation (approximately two years); and
- **operation phase:** encompasses operation and maintenance activities throughout the life of the Project, which is anticipated to be indefinite.

The assessment of Project effects on GHGs considers changes that occur during the construction phase as GHG emissions are considered to be largest during this phase of the Project. This period is sufficient to capture the effects of the Project. There is a loss of carbon sink due to the land clearing for both the construction and operation phases. The emissions from the construction phase will be larger than the operation phase due to the combination of the loss of carbon sink, biomass burning, and construction emissions.

### 10.4.2 Study Areas

Study areas for the assessment are provided in Table 10-2.

**Table 10-2: Greenhouse Gases Study Areas**

Study Areas	Area (ha)	Description	Rationale
None	None	A study area for the assessment has not been defined because greenhouse gas emissions are by nature considered at the global scale. Regional and provincial greenhouse gas emissions are provided in this section for context.	

ha = hectares.

## 10.5 Description of the Existing Environment

This section provides a summary of the existing environment relevant to GHGs as determined through desktop review.

### 10.5.1 Baseline Data Collection Methods

A desktop review was completed to identify baseline conditions. While GHG emissions are monitored at a federal scale by 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 (2016) *National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada*.

### 10.5.2 Baseline Conditions

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 travelling on roadways, railways, domestic aviation) and large industrial activities (e.g., manufacturing facilities) (ECCC 2016). Estimates of GHG emissions are expressed as million metric tonnes (Mt) of CO<sub>2</sub> equivalent (CO<sub>2</sub>e), which is calculated based on the global warming potential for each gas relative to the global warming potential of CO<sub>2</sub>.

# EAST-WEST TIE TRANSMISSION PROJECT AMENDED ENVIRONMENTAL ASSESSMENT REPORT

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 CO<sub>2</sub>e emissions were reported nationally. Ontario was accountable for 23 percent (%) of these emissions. The national and provincial emissions reported in 2014 are summarized in Table 10-3 (ECCC 2016).

**Table 10-3: Baseline Greenhouse Gas Emissions**

Source <sup>a)</sup>	Greenhouse Gas Emissions (Mt CO <sub>2</sub> e)
Canada-wide 2014 greenhouse gas emissions	732
Ontario-wide 2014 greenhouse gas emissions	170

a) ECCC 2016 and MOECC 2016.

Mt = million metric tonnes; CO<sub>2</sub>e = carbon dioxide equivalent.

## 10.6 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 GHGs are identified in Table 10-4.

**Table 10-4: Project-Environment Interactions for Greenhouse Gases**

Criterion	Indicators	Project Phase		Description of Potential Project-Environment Interaction (Potential Effect)
		Construction (includes access road and ROW preparation, installation, and reclamation activities)	Operation (includes operation and maintenance activities)	
Greenhouse gases	<ul style="list-style-type: none"> <li>■ Predicted greenhouse gas emissions of CO<sub>2</sub></li> <li>■ Predicted greenhouse gas emissions of N<sub>2</sub>O</li> <li>■ Predicted greenhouse gas emissions of CH<sub>4</sub></li> </ul>	✓	-	Increase in federal and provincial annual greenhouse gas emissions from vehicle use during construction

CH<sub>4</sub> = methane; CO<sub>2</sub> = carbon dioxide; N<sub>2</sub>O = nitrous oxide; ROW = right-of-way; ✓ = A potential Project-environment interaction could result in an environmental or socio-economic effect; - = No plausible interaction was identified.

## **10.7 Potential Effects, Mitigation and Net Effects**

This section presents the potential effects, appropriate mitigation measures, and predicted net Project effects for GHGs.

### **10.7.1 Predicted Greenhouse Gas Emissions**

#### **10.7.1.1 Increase in Federal and Provincial Annual Greenhouse Gas Emissions**

##### **10.7.1.1.1 Potential Effects**

Emission of GHGs from construction activities can result in changes in federal and provincial annual GHG emissions. The GHG emissions from construction are considered to be the largest compared to the operation phase of the Project. The primary sources of GHG emissions during the construction of the Project are off-road and on-road equipment. The primary sources of GHG emissions during the operation phase of the Project are related with a small number of maintenance vehicles, much less than the number of vehicles associated with the construction of the Project. The emitted GHGs from the vehicles are a by-product of fossil fuel combustion by engines. Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency.

It was assumed that, as a conservative scenario, 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 provided by the Project construction team (refer to Table 9-10 in Section 9.7.1.1) were used in combination with published emission factors from the Ontario Guideline for Greenhouse Gas Emissions Reporting (MOECC 2015) to calculate estimated annual GHG emission totals.

A summary of the equipment data and emission factor references used for each source of emissions is provided in Table 10-5. Mitigation measures (Table 10-8) were assumed to be implemented and accounted for in the fuel usage information used in the emissions calculations. Detailed information on the emissions calculations and the data used for the calculations is provided in Appendix 10-I: GHG Calculation Methodology.

Additional sources of GHG emissions during the construction of the Project from land clearing, composed of both the reduction in the carbon sink and any biomass burning associated with the clearing, are included. It is assumed that any merchantable timber will not be included in biomass burning. As a conservative measure, provincial parks and conservation areas have not been excluded from the biomass burning calculations. In practice, no burning will be occurring in the provincial parks and conservation areas. The Intergovernmental Panel on Climate Change (IPCC) guidelines from *Guidelines for National Greenhouse Gas Inventories: Vol.4* (IPCC, 2006) were used to calculate GHG emissions from land clearing (Table 10-5). Approximately 1,999 ha (57%) of the Project footprint contains vegetation that will be cleared, including merchantable and non-merchantable timber and other vegetation types. Approximately 1,846 ha of merchantable timber is expected to be cleared and approximately 153 ha of non-merchantable timber and other vegetation types is expected to be cleared. During the construction phase, the disturbance of wetlands will be minimized or avoided, where practicable. The wetlands will not be drained and it was assumed that no net disturbance to the carbon stores below the surface would result from the vegetation clearing in the wetlands (e.g., vegetation will be cut to ground level).

# EAST-WEST TIE TRANSMISSION PROJECT AMENDED ENVIRONMENTAL ASSESSMENT REPORT

**Table 10-5: Data Used for 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"> <li>■ Equipment type and quantity</li> <li>■ Vehicle engine size</li> <li>■ Equipment hours of operation</li> </ul>	<ul style="list-style-type: none"> <li>■ Diesel emission factors from Table 20-2 of the <i>Ontario Guideline for Greenhouse Gas Emissions Reporting</i> document (MOECC 2015).</li> <li>■ Load factors from Table 9 of the Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling document (US EPA 2010).</li> </ul>
Land clearing	Reduction of carbon sink	Chapter 4 of Guidelines for National Greenhouse Gas Inventories: Vol.4 (IPCC 2006b)
Biomass burning	Burning of biomass	Chapter 2 of Guidelines for National Greenhouse Gas Inventories: Vol.4 (IPCC 2006a)

MOECC = Ministry of the Environment and Climate Change; US EPA = United States Environmental Protection Agency; IPCC = Intergovernmental Panel on Climate Change.

The estimated annual GHG emissions from mobile equipment, land clearing and biomass burning for the construction phase of the Project are summarized in Table 10-6. Construction phase 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). Emission of GHGs from biomass burning likely represent an overestimate using the conservative assumption that the full non-merchantable timber and other vegetation types footprint (153 ha) will be burned. The GWP used to calculate the annual total GHG emissions in CO<sub>2e</sub> correspond to the GWPs from the UNFCCC reporting guidelines (UNFCCC 2014).

**Table 10-6: Summary of Estimated Annual Greenhouse Gas Emissions during the Project Construction Phase**

Source	Construction Annual Greenhouse Gas Emissions (tonnes/year) <sup>(a)</sup>			Annual Total (tonnes per year)	Percentage Contribution of Annual Total (%)
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2e</sub>	
Mobile equipment	24,000	1.2	3.6	25,000	78
Land clearing	4,800	—	—	4,800	15
Biomass burning	2,000	5.9	0.33	2,200	7

Notes: All values are shown as significant figures.

a) Values have not been multiplied by the respective global warming potentials.

CO<sub>2</sub> = carbon dioxide; CH<sub>4</sub> = methane; N<sub>2</sub>O = nitrous oxide; CO<sub>2e</sub> = carbon dioxide equivalent; — = no greenhouse gas emissions.

A comparison of the estimated annual overall GHG emission from the construction of the Project (bounding case) to the federal and provincial totals is provided in Table 10-7. The construction of the Project is selected to act as a bounding case for the Project as it is expected to have the highest emissions of all phases when the number of vehicles and amount of vegetation clearing/biomass burning is considered. The total estimated GHG emissions from the Project represent approximately 0.02% of the provincial total and approximately 0.004% of the Canada-wide total. It should be noted that these GHG emission estimates are conservative relative to reported federal data as the total estimated GHG emissions from the Project includes CO<sub>2</sub> emissions anticipated from biomass burning, which are not reportable under the federal program. A comparison to the global GHG emissions total was not completed as GHG emissions from the Project represent a negligible fraction of global GHG emissions.

# EAST-WEST TIE TRANSMISSION PROJECT AMENDED ENVIRONMENTAL ASSESSMENT REPORT

**Table 10-7: Comparison of Estimated Greenhouse Gas Emissions from the Project to Ontario and Canadian Emission Totals**

Source	Construction Phase Greenhouse Gas Emissions (CO <sub>2</sub> e tonnes per year)
Project annual greenhouse gas emissions	32,000
Portion of Canada-wide total	0.004%
Portion of Ontario total	0.02%
<b>Canada-wide 2014 greenhouse gas emissions</b>	<b>732,000,000</b>
<b>Ontario-wide 2014 greenhouse gas emissions</b>	<b>170,000,000</b>

CO<sub>2</sub>e = carbon dioxide equivalent; % = percent.

## 10.7.1.1.2 Mitigation

Fuel usage and the associated emissions of GHGs from fuel combustion will be reduced by turning off vehicles and equipment when not in use, as practicable, and keeping equipment well maintained to maximize fuel efficiency. Multi-passenger vehicles will be used to transport personnel, where practicable and the frequency of the transport of goods and equipment will be minimized, where practicable. Mitigation measures are summarized in Table 10-8. The effectiveness of mitigation will be evaluated during construction and measures will be modified or enhanced as necessary through adaptive management.

## 10.7.1.1.3 Net Effects

There is a predicted net effect after implementation of the mitigation described above and in Table 10-8. The amount of GHG emissions resulting from the Project can be reduced by implementation of the mitigation measures but not avoided completely and GHG emissions will result from construction activities. Therefore, this effect (Increase in federal and provincial annual greenhouse gas emissions) is carried forward to the net effects characterization (Section 10.8).

## 10.7.2 Summary of Potential Effects, Mitigation and Net Effects

A summary of the potential effects assessment is provided in Table 10-8, which is based on the assessment discussion and the implementation of mitigation measures identified above and further supplemented in Table 10-8.

**EAST-WEST TIE TRANSMISSION PROJECT  
AMENDED ENVIRONMENTAL ASSESSMENT REPORT**

**Table 10-8: Potential Effects, Mitigation and Predicted Net Effects for Greenhouse Gases**

Criteria	Indicators	Project Component or Activity	Potential Effect	Mitigation	Inspection and Monitoring Details	Net Effect
Greenhouse gases	<ul style="list-style-type: none"> <li>■ Predicted greenhouse gas emissions of CO<sub>2</sub></li> <li>■ Predicted greenhouse gas emissions of N<sub>2</sub>O</li> <li>■ Predicted greenhouse gas emissions of CH<sub>4</sub></li> </ul>	<p>Project activities during the construction phase, including:</p> <ul style="list-style-type: none"> <li>■ site access development, site preparation and soil salvage (e.g., clearing and grubbing);</li> <li>■ material handling and hauling;</li> <li>■ vehicular exhaust;</li> <li>■ construction of temporary workspaces;</li> <li>■ decommissioning of temporary access roads and workspaces; and</li> <li>■ clean-up and reclamation.</li> </ul>	Increase in federal and provincial annual greenhouse gas emissions from vehicle use during construction	<p><b>Construction Phase:</b> <u>Air Quality/Emission Mitigation:</u></p> <ul style="list-style-type: none"> <li>■ Turn off vehicles and equipment when not in use and minimize idling, unless weather and/or safety conditions dictate the need for them to remain turned on and in a safe operating condition.</li> <li>■ Noise abatement, emission and pollution control equipment on machinery should be in place, properly maintained and in good working order.</li> <li>■ Keep equipment well-maintained.</li> <li>■ Use multi passenger vehicles to transport workers to site when practicable.</li> <li>■ Minimize the frequency of the transport of goods and equipment, where practicable.</li> </ul>	<p><b>Construction Phase:</b></p> <ul style="list-style-type: none"> <li>■ The Owner will employ the services of qualified Environmental Inspector(s) to guide implementation, monitor and report on the effectiveness of the construction procedures and mitigation measures for minimizing potential impacts.</li> </ul>	Net effect – Increase in federal and provincial annual greenhouse gas emissions

CO<sub>2</sub> = carbon dioxide; N<sub>2</sub>O = nitrous oxide; CH<sub>4</sub> methane.

## 10.8 Net Effects Characterization

The effects assessment approach followed the general process described in Section 5.5 (methods section). Net effects are described using the factors of significance in Table 5-5. Effect levels are defined for the magnitude factors of significance for GHGs in Table 10-9.

**Table 10-9: Magnitude Effect Levels for Greenhouse Gases**

Indicator / Net Effect	Effects Level Definition			
	Negligible	Low	Moderate	High
Greenhouse gas emissions during construction activities	<0.1% of the provincial emission levels, or <0.02% of the federal emission level	>0.1% but <1% of the provincial emission levels, or >0.1% but <0.02% of the federal emission levels	>1% compared to provincial totals, or >0.2% compared to national totals.	>5% compared to provincial totals, or >2% compared to national totals

>= greater than; <= less than; % = percent.

Net effects are described after the implementation of effective mitigation, and summarized according to direction, magnitude, geographic extent, duration/irreversibility, frequency, and likelihood of the effect occurring following the methods described in Section 5.5.1. The mitigation summarized in Table 10-8, Section 10.7, and the Construction Environmental Protection Plan (CEPP; Appendix 4-II) is expected to reduce the magnitude and duration of net effects on GHGs by reducing fuel use.

### 10.8.1 Predicted Greenhouse Gas Emissions

#### 10.8.1.1 Change in Greenhouse Gas Emissions from Construction

GHG emissions associated with Project construction activities were predicted to increase provincial and federal GHG emissions and contribute to global cumulative GHG emissions; therefore, the study area was assessed as beyond regional, the direction negative and the effect irreversible when considering the long atmospheric lifetimes of GHGs. Construction activities associated with the Project were considered to be short-term duration and the sources of GHG emissions will not be continuous but will be used frequently. Although the likelihood of occurrence was assessed as probable, the magnitude was assessed as negligible because the emissions, although measurable, are approximately 0.02% of the provincial emissions and approximately 0.004% of the federal emissions, as shown in Table 10-7.

### 10.8.2 Summary of Net Effects Characterization

A summary of the characterization of net effects of the Project on GHGs is provided in Table 10-10.

# EAST-WEST TIE TRANSMISSION PROJECT AMENDED ENVIRONMENTAL ASSESSMENT REPORT

**Table 10-10: Characterization of Predicted Net Effects for Greenhouse Gases**

Criteria	Indicator	Net effect	Direct/ Indirect	Direction	Factors of Significance				
					Magnitude	Geographic Extent	Duration/ Irreversibility	Frequency	Likelihood of Occurrence
Greenhouse gases	<ul style="list-style-type: none"> <li>■ Predicted greenhouse gas emissions of CO<sub>2</sub></li> <li>■ Predicted greenhouse gas emissions of N<sub>2</sub>O</li> <li>■ Predicted greenhouse gas emissions of CH<sub>4</sub></li> </ul>	Increase in federal and provincial annual greenhouse gas emissions	Direct	Negative	Negligible	Beyond Regional	Short-term/ Irreversible	Frequent	Probable

CO<sub>2</sub> = carbon dioxide; N<sub>2</sub>O = nitrous oxide; CH<sub>4</sub> methane.

## 10.9 Assessing Significance

The assessment of significance of net effects from the Project is informed by the interaction between the factors of significance with magnitude being the most important factor. Consideration is also given to concerns of interested agencies, groups and individuals raised during consultation and engagement and through review comments on the draft and final EA reports.

The factors considered in the assessment of significance of net effects on GHG emissions are outlined in Table 10-11. Net effects to GHGs would be considered to be significant if the net effect is assessed as high magnitude, any duration, beyond regional, and any likelihood and the net effects result in meaningful changes to the provincial and federal inventories (>5% of provincial totals and >2% of federal totals).

Implementation of proven mitigation in Table 10-8, discussed in Section 10.7, and in the CEPP (refer to Appendix 4-II) is expected to avoid or reduce the magnitude and extent of the net effect for GHG. The magnitude of the predicted net effect on GHG Emissions is negligible (<0.1% of the provincial emission levels), direct, and beyond regional. The net effect is anticipated to be irreversible when the atmospheric lifetime of GHGs are considered. The project GHG emissions are not anticipated to result in a meaningful change to the provincial and federal emission inventory totals. Therefore, the predicted net effects on GHG emissions is assessed as not significant.

**EAST-WEST TIE TRANSMISSION PROJECT  
AMENDED ENVIRONMENTAL ASSESSMENT REPORT**

**Table 10-11: Factors Considered in the Assessment of Significance of Net Effects on Greenhouse Gases**

Criterion	Indicators	Significance	Magnitude	Duration	Extent	Frequency	Likelihood	Context / Sustainability
Greenhouse gases	<ul style="list-style-type: none"> <li>■ Predicted greenhouse gas emissions of CO<sub>2</sub></li> </ul>	Significant	High	Any duration	Beyond Regional	Any frequency	Any likelihood	Effects result in meaningful changes to the provincial and federal inventories (>5% of provincial totals and >2% of federal totals).
	<ul style="list-style-type: none"> <li>■ Predicted greenhouse gas emissions of N<sub>2</sub>O</li> <li>■ Predicted greenhouse gas emissions of CH<sub>4</sub></li> </ul>	Not significant	<ul style="list-style-type: none"> <li>■ Negligible</li> <li>■ Low</li> <li>■ Moderate</li> </ul>	Any duration	Beyond Regional	Any frequency	Any likelihood	Effects do not result in meaningful changes to the provincial and federal inventories (<5% of provincial totals and <2% of federal totals).

CO<sub>2</sub> = carbon dioxide; < = greater than; > = less than; N<sub>2</sub>O = nitrous oxide; CH<sub>4</sub> methane; % = percent.

## **10.10 Cumulative Effects Assessment**

The magnitude of the net effect was predicted to be negligible and this net effect was not considered likely to additively or synergistically contribute to measurable effects from other past, present, or RFDs to the GHG criteria based on the level of change from the Project compared to baseline conditions. Therefore, a cumulative effects assessment was not completed for this net effect.

It should be noted that when completing the net effects assessment, the characterization considered GHG emissions at both the provincial and federal scale. Therefore, the net effects characterization (specifically magnitude) already includes projects that may be present in the same time and space. The provincial and federal GHG emissions from 2014 are considered representative of the annual GHG emissions that will be present during the construction phase.

## **10.11 Prediction Confidence in the Assessment**

The confidence in the effects assessment for GHGs is moderate to high, considering that the mitigation described in the CEPP (refer to Appendix 4-II) is based on accepted and proven mitigation 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 mitigation, 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 operation of mobile equipment during the construction phase. Mitigation measures 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.

## **10.12 Follow-Up, Inspection and Monitoring Programs**

The objectives of follow-up, inspection, and monitoring programs include:

- evaluating the effectiveness of mitigation and reclamation, and modifying or enhancing measures as necessary through adaptive management;
- identifying unanticipated potentially adverse effects, including possible accidents and malfunctions; and
- contributing to continual improvement.

Monitoring activities are described in Section 23 and the CEPP (refer to Appendix 4-II). A summary of the monitoring activities relevant to GHGs is described below:

- The Owner will employ the services of qualified Environmental Inspector(s) to guide implementation, monitor and report on the effectiveness of the construction procedures and mitigation measures for minimizing potential impacts. Information Passed on to Other Components.

No results of the GHGs assessment were forwarded to other components of the amended EA Report.