hydro one

WAASIGAN
TRANSMISSION LINE

# FINAL ENVIRONMENTAL ASSESSMENT

## Section 6.7 Air Quality

## November 2023

# Acknowledgements

We wish to acknowledge that the Waasigan Transmission Line Project is located within lands that represent the traditional territories and homelands of the Robinson-Superior Treaty (1850) and Treaty #3 (1873) First Nations, and traverse the Red Sky Métis Independent Nation, Northwestern Ontario Métis Community and Northern Lake Superior Métis Community.

Hydro One also wishes to acknowledge Indigenous artist, Storm Angeconeb, for developing the covering page and wildlife designs throughout the Final Environmental Assessment. Storm is a highly recognized visual artist from Lac Seul First Nation in Treaty #3 and currently resides in Red Lake. Many of her works include animals and birds as representations of herself or those close to her. The artist's description of the covering page is presented below.

Hydro One Environmental Study Art:

What stands out in this art piece is the symbolic representation of solar rays as "Bringing Power"; we can see the environment represented through the wildlife and Ojibwe floral visuals. This artwork is an excellent representation of Hope, Life, and Opportunity, visually portrayed through the Black Bear and her two cubs. The colour theme of this artwork comes from the Waasigan Transmission Line Project brand identity.

Artist: Storm Angeconeb

# Table of Contents

## Tables

## Figures

## 6.7 Air Quality

### *Bagidanaamowin*

This section describes and summarizes the baseline studies undertaken for the Waasigan Transmission Line (the Project) and presents an assessment of the effects of the Project on air quality.

The assessment follows the general approach and concepts described in Section 5.0.

### 6.7.1 Input from Engagement

Comments pertaining to air quality that were raised by Indigenous communities, government officials and agencies, and interested persons and organizations during engagement, and how they are addressed in the environmental assessment (EA), are listed in Table 6.7-1. Comments, responses and follow-up actions are provided in the Engagement Summary (Section 4.0). In addition, the Draft EA Report was provided to Indigenous communities, government officials and agencies, and interested persons and organizations for review and comment on May 17, 2023. A high-level summary of the key themes from the comments on the Draft EA Report are included in Table 6.7-1. The detailed responses to these comments are included in Appendix 4.0-A.

**Table 6.7-1: Summary of Comment Themes Raised during Engagement Related to Air Quality**

| Comment Theme | How addressed in the Environmental Assessment | Indigenous Community or Stakeholder |
|---|---|---|
| Descriptions of Receptors included in the study (i.e., distance from transmission line) are important. | The number of receptors at different distances from the transmission line are provided in Table 6.7-21. The distances used also correspond to the distances at which predicted concentrations were calculated (Table 6.7-20). | Ministry of the Environment, Conservation and Parks (MECP) |
| Existing air quality should be established using representative information for the study area. | Data was reviewed from three ECCC air quality monitoring stations and is further described in Section 6.7.5. | MECP |
| Concern regarding local air quality | This section assesses the potential effects on air quality and includes mitigation measures to limit those potential effects. | Members of the public |

| Comment Theme | How addressed in the Environmental Assessment | Indigenous Community or Stakeholder |
| --- | --- | --- |
| Concern regarding recent forest fires in northern Ontario and whether this recent data was used in the assessment | Forest fires can impact concentrations of $PM_{2.5}$ during these occurrences. While the most recent forest fires that occurred since 2020 are not included in the background air quality data, a five-year data base was used to establish existing air quality. The 90th percentile of this data was used to establish background air quality for periods of 24 hours or less. The maximum annual average was used to establish background. This is a conservative approach as it assumes higher than typical background air quality concentrations. The Project may be a source of $PM_{2.5}$ emissions during construction and/or maintenance. If poor air quality due to forest fires occurs during construction, operations or maintenance, activities will be reviewed and halted if necessary. | Gwayakocchigewin Limited Partnership |
| Concern regarding use of dust suppressants | Construction will implement effective dust suppression techniques, such as on-site watering and calcium chloride, as appropriate, to minimize fugitive dust at worksites and access roads as required. A Dust Control/Air Quality Plan will also be included as part of the EPP that will be provided to Indigenous communities for review. | Gwayakocchigewin Limited Partnership<br><br>Lacs des Mille Lacs First Nation<br><br>Métis Nation of Ontario NWOMC and Region 2 |
| Concern regarding the inclusion of blasting as an emission source | Additional detail has been added to Section 6.7.7.1 to note how the emissions are anticipated to be very localized and not expected to overlap with the main ROW construction activities. | Métis Nation of Ontario NWOMC and Region 2 |
| Feedback on the modelling scenario | Based on engagement with MECP, the assessment was revised to consider a smaller construction area of 5 km in distance and other modelling parameters were revised to avoid an overly conservative modelling scenario. | MECP |

ECCC – Environment and Climate Change Canada, $PM_{2.5}$ – Particulate matter smaller than 2.5 microns in diameter, EPP – Environmental Protection Plan, ROW – Right of Way

## 6.7.2 Information Sources

Information for the air quality baseline was collected from review of the Ontario Ministry of the Environment, Conservation and Parks (MECP) and Environment and Climate Change Canada's (ECCC) National Air Pollution Surveillance Network (NAPS) database (ECCC 2022). The review of this data allowed for characterization of baseline air quality conditions in the air quality local study area (LSA), which is described in Section 6.7.4.2. Field studies were not completed to characterize the existing air quality in the Project footprint or LSA because there was sufficient data available from existing data sources.

For the purposes of the EA, sufficient information was deemed to be available from the NAPS database to understand the existing conditions and assess the potential effects of the Project on air quality.

## 6.7.3 Criteria and Indicators

**Criteria** are components of the environment that are considered to have economic, social, biological, conservation, aesthetic, or ethical value, as described in Section 5.2. **Indicators** are an aspect or characteristic of a criterion that, if changed as a result of the Project, may demonstrate a physical, biological or socio-economic effect.

The criteria and indicators for air quality were initially outlined in the Draft ToR. Feedback from Indigenous communities, government officials and agencies, and interested persons and organizations received during engagement was incorporated into the preliminary criteria and indicators approved in the Amended ToR.

No concerns have been raised during the EA process regarding the preliminary criteria and indicators proposed in the Amended ToR. The criteria and indicators selected for the assessment of Project effects on air quality, and the rationale for their selection, are provided in Table 6.7-2.

Table 6.7-2: Air Quality Criteria and Indicators

| Criteria | Rationale | Indicators | Measurement of Potential Effects |
|---|---|---|---|
| Air quality | • Indigenous Knowledge and Indigenous community feedback regarding the importance of air quality.<br>• Commitment to avoid or minimize adverse effects to nearby residents and/or other sensitive land uses.<br>• Sensitivity of human health and the environment (e.g., soils, plants, animals) to air quality changes. | • Change to ambient criteria air contaminants and fugitive dust in the study area, including:<br>• SPM<br>• $PM_{10}$ and $PM_{2.5}$<br>• CO<br>• $NO_2$<br>• $SO_2$ | • Quantitative assessment of predicted changes in ambient concentrations of SPM, $PM_{10}$ and $PM_{2.5}$, CO, $NO_2$ and $SO_2$. |

SPM = Suspended Particulate Matter <44 micrometres (µm); $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 µm in diameter; CO = carbon monoxide; $NO_2$ = nitrogen dioxide; $SO_2$ = sulphur dioxide.

**Indicators** are an aspect or characteristic of a criterion that, if changed as a result of the Project, may demonstrate a physical, biological or socio-economic effect. The indicators for air quality, commonly referred to as tailpipe emissions (i.e., Criteria Air Contaminants (CACs), are defined as follows:

- **Ambient concentrations of Suspended Particulate Matter (SPM)**: SPM collectively describes airborne particles or aerosols less than 44 micrometres (µm) in size (MECP 2022). SPM is commonly known as dust and results in reduced visibility and potential nuisance.

- **Ambient concentrations of PM ($PM_{10}$ and $PM_{2.5}$)**: $PM_{10}$ is airborne particles nominally smaller than 10 µm in diameter and $PM_{2.5}$ is airborne particles nominally smaller than 2.5 µm in diameter. Emissions of $PM_{10}$ can result in local nuisance effects. Emissions of $PM_{2.5}$ can penetrate deep into the respiratory system and cause health effects (MECP 2022).

- **Ambient concentrations of carbon monoxide (CO)**: CO is a colourless, odourless, tasteless gas, and at high concentrations can cause negative health effects. It is produced primarily from the incomplete combustion of fossil fuels, as well as natural sources (MECP 2022).

- **Ambient concentrations of sulphur dioxide ($SO_2$):** The presence of $SO_2$ in the atmosphere has known health (e.g., respiratory tract and eyes irritation) and environmental (e.g., acid precipitation) effects (MECP 2022).

- **Ambient concentrations of nitrogen dioxide ($NO_2$)**: The presence of $NO_2$ in the atmosphere has known health (e.g., lung irritation) and environmental (e.g., acid precipitation, and ground level ozone formation) effects (MECP 2022).

While ozone ($O_3$) will not be directly emitted into the atmosphere from the Project, it is associated with the reaction of Nitrogen Oxides ($NO_X$) and volatile organic compounds (VOCs) to create $NO_2$ (MECP 2022). Ozone baseline data is used to calculate the $NO_2$ emissions from the Project.

The CAC above are focused on the concentrations in the environment of those compounds that are anticipated to be emitted as a result of the Project, for which relevant air quality criteria exist, and that are generally accepted as indicative of changing air quality.

The MECP has issued guidelines related to ambient air concentrations that are summarized in Ontario's Ambient Air Quality Criteria (MECP 2020). These guidelines represent indications of good air quality, based on protection against negative effects on health or the environment. The guidelines are not regulatory enforceable limits (MECP 2020).

There are two sets of federal objectives and standards – the National Ambient Air Quality Objectives (NAAQOs) and the Canadian Ambient Air Quality Standards (CAAQSs) (formerly the National Ambient Air Quality Standards [NAAQS]). The NAAQOs are benchmarks that can be used to facilitate air quality management on a regional scale and provide goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment (Canadian Council of Ministers of the Environment [CCME] 1999). The federal government has established the following levels of NAAQOs (Health Canada 1994):

- The maximum desirable level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for unpolluted parts of the country and for the continuing development of control technology; and

- The maximum acceptable level is intended to provide adequate protection against negative effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and wellbeing.

In 2010, the CCME agreed to move forward with a new collaborative air quality management system that included the development of CAAQSs, designed to better protect human health. The CAAQSs were developed under the *Canadian Environmental Protection Act, 1999*, and include standards for $SO_2$, $PM_{2.5}$ and ozone, which are not addressed by the NAAQS. There are two standards for $SO_2$, the first standard came into effect in 2020 and will be superseded by a more stringent standard in 2025. Similar to the NAAQOs, the CAAQSs are not regulatory limits, but rather, are used as national targets for $PM_{2.5}$ and ozone (CCME 2014).

The air quality criteria, objectives, or standards described above do not set regulatory limits. Their purpose is to serve as an indicator of good air quality and as a comparison benchmark for monitoring data. Monitoring data in Canada periodically exceeds these criteria, objectives, and standards at different locations. This does not result in an immediate effect to human health, but serves as guidance for identifying areas where air quality could potentially be improved.

A summary of provincial and federal criteria, objectives and standards applicable to the Project is provided in Table 6.7-3. The Project criteria were selected for each of the indicator compounds based on the applicable criteria, objective or standard to establish a conservative limit for the effects of the Project on air quality. The Project criteria selected are identified in Table 6.7-3. The different averaging periods in Table 6.7-3 represent the different periods of concern over which the health, environmental or aesthetic effects are usually measured in the relevant criteria, objective or standard.

**Table 6.7-3: Available Provincial and Federal Air Quality Criteria, Objectives and Standards for the Indicator Compounds (μg/m³)**

| CAC | Averaging Period | Ontario Ambient Air Quality Criteria[(a)] (μg/m$^3$) | Canadian Ambient Air Quality Criteria[(b)] (μg/m$^3$) | National Ambient Air Quality Objectives[(c)] Desirable (μg/m$^3$) | National Ambient Air Quality Objectives[(c)] Acceptable (μg/m$^3$) | Project Criteria (μg/m³) |
|---|---|---|---|---|---|---|
| SPM | 24-Hour | 120 | — | — | 120 | 120 |
| SPM | Annual | 60$^{++}$ | — | 60 | 70 | 60 |
| PM10(g) | 24-Hour | 50[(d)] | — | — | — | 50 |
| PM2.5(g) | 24-Hour | 27[(e)] | 27(e) | — | — | 27 |
| PM2.5(g) | Annual | 8.8 | 8.8 | — | — | 8.8 |
| NO2 | 1-Hour | 400 | 79[(e)] | — | 400 | 400/79 |
| NO2 | 24-Hour | 200 | — | — | 200 | 200 |
| NO2 | Annual | — | 22.5 | 60 | 100 | 22.5 |
| SO2 | 10-min | 178 | — | — | — | 178 |
| SO2 | 1-Hour | 106 | 172[(f)] | 450 | 900 | 106 |
| SO2 | 24-Hour | — | — | 150 | 300 | 150 |
| SO2 | Annual | 10.6 | 10.6 | 30 | 60 | 10.6 |
| CO | 1-Hour | 36,200 | — | 15,000 | 35,000 | 15,000 |
| CO | 8-Hour | 15,700 | — | 6,000 | 15,000 | 6,000 |

Notes:

a) MECP 2020.

b) Canadian Ambient Air Quality Standards (CAAQS) published in the Canada Gazette Volume 147, No. 21 - May 25, 2013 (Government of Canada 2013). The values presented in the table are for the 2020 phase-in date.

c) CCME 1999.

d) Interim Ambient Air Quality Criteria (MECP 2020).

e) Based on the 98th percentile of the annual monitored data averaged over three years of measurements.

f) The 3-year average of the annual 99th percentile of the $SO_2$ daily maximum 1-hour concentrations.

g) $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$= particles nominally smaller than 2.5 µm in diameter; CO = carbon monoxide; $NO_2$ = nitrogen dioxide; $SO_2$ = sulphur dioxide.

++Geometric Mean Value.

— = No guideline available.

## 6.7.4 Assessment Boundaries

### *6.7.4.1 Temporal Boundaries*

The Project is planned to occur during three stages:

- **Construction stage**: the period from the start of construction to the start of operation (approximately 48 months).
- **Operation and maintenance stage:** the period from the start of operation and maintenance activities through to the end of the Project life.
- **Retirement stage**: the period from the end of the Project life and start of retirement activities through to the end of final reclamation of the Project.

As described in Section 5.3.2, the Project will be operated for an indefinite period and the timing of retirement, or decommissioning, is not known at this time as it is anticipated that upgrades to reinforce or rebuild portions of the Project may occur over its lifetime to maintain its longevity. Further, potential effects and mitigation measures to be identified during the EA for the construction of the Project will likely equally apply to the potential removal of the Project at a future point in time, should it ever be required. Therefore, the construction scenario assessed as part of the EA is considered bounding and potential effects and mitigation measures for retirement are not identified separately in this EA.

The assessment of Project effects on air quality considers effects that occur during the construction stage as emissions, which 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 lifecycle and a separate assessment of emissions during the operation, maintenance and retirement stages is not required.

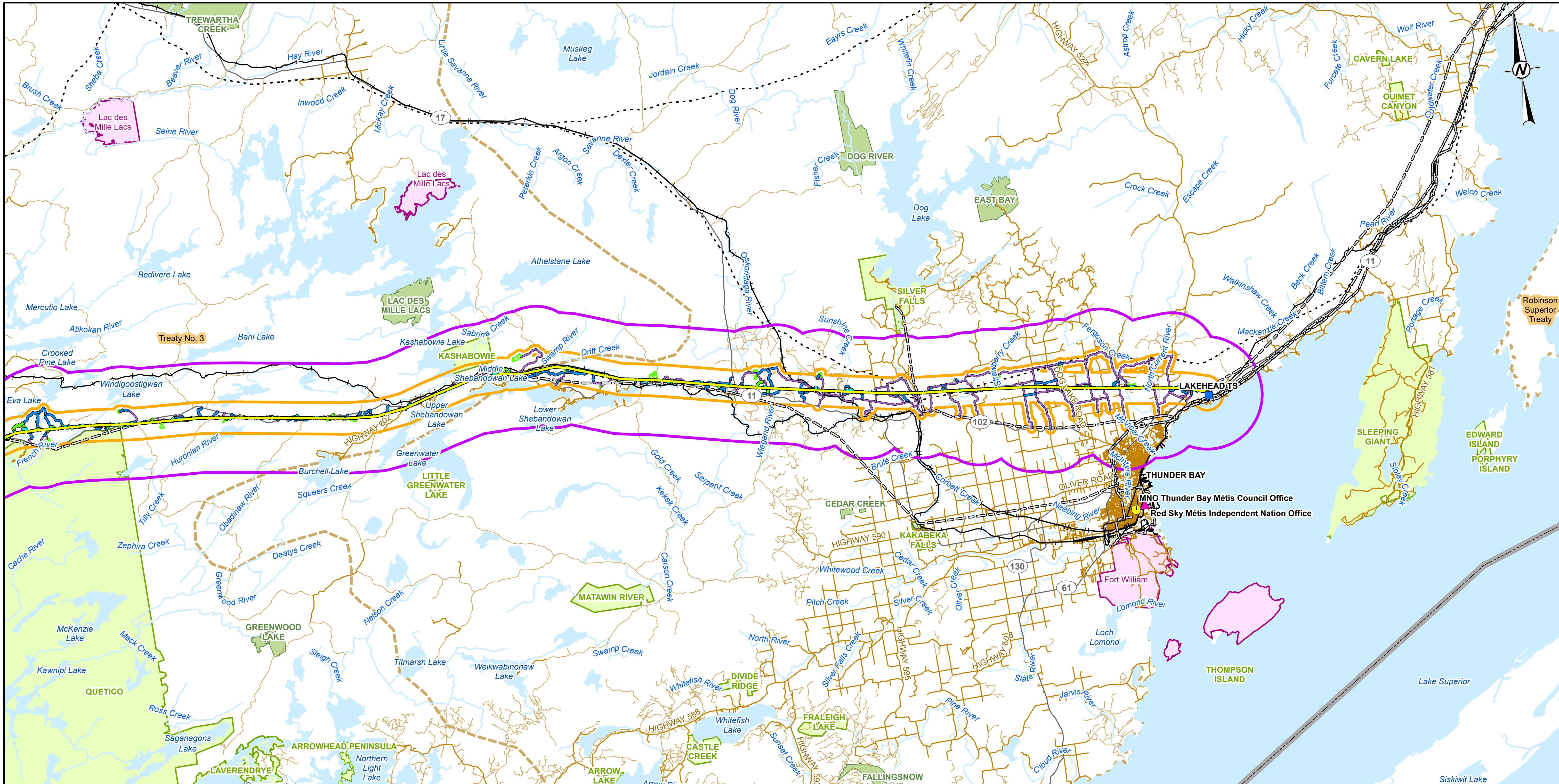
### 6.7.4.2 Spatial Boundaries

Spatial boundaries for the assessment are described in Table 6.7-4 and shown on Figure 6.7-1.

**Table 6.7-4: Area of the Air Quality Spatial Boundaries**

| Spatial Boundaries | Area (ha) | Description | Rationale |
|---|---|---|---|
| Project footprint | 5,124 | The Project footprint includes:<br>• Typical 46 m wide transmission line ROW;<br>• Widened 1 km of ROW for the separation of circuits F25A and D26A;<br>• Modification of the Lakehead TS, Mackenzie TS, and Dryden TS;<br>• Access roads (existing and new);<br>• Temporary supportive infrastructure associated with construction including fly yards, construction/stringing pads, laydown areas, construction camps, and helicopter pads; and<br>• Aggregate pits. | To capture the potential direct effects of the Project on air quality criteria within the physical footprint of the Project. |
| Local study area | 174,682 | Includes the Project footprint and a 2 km buffer on the transmission line ROW, 1.5 km buffer on the TS footprints and a 500 m buffer on access roads, supporting structures and aggregate pits. | To capture potential local direct and indirect effect of the Project on air quality criteria that may extend beyond the Project footprint. |
| Regional study area | 632,545 | Includes a 5 km buffer on the LSA. | To capture potential regional direct and indirect effect of the Project on air quality criteria that may extend beyond the Project footprint. |

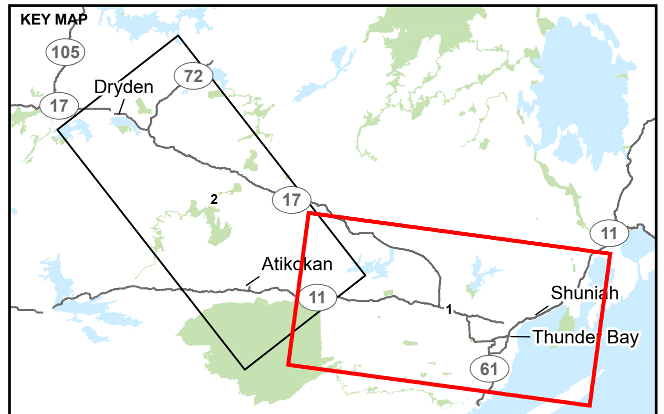
ha = hectares; km = kilometres; m = metres; ROW = right-of-way.




**LEGEND**

| | |
|---|---|
| 230 kV TRANSFORMER STATION (TS) | NEW ACCESS ROAD - PREFERRED |
| RED SKY MÉTIS INDEPENDENT NATION OFFICE | NEW ACCESS ROAD - ALTERNATE |
| MNO COUNCIL OFFICE | PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY |
| RAILWAY | AGGREGATE SITE |
| LOCAL ROAD | FLY YARD |
| SECONDARY HIGHWAY | LOCAL STUDY AREA |
| RESOURCE / RECREATION | REGIONAL STUDY AREA |
| WATERCOURSE | FIRST NATIONS RESERVE |
| NATURAL GAS PIPELINE | TREATY BOUNDARY |
| INTERNATIONAL BORDER | CONSERVATION RESERVE |
| EXISTING TRANSMISSION LINE | PROVINCIAL PARK |
| EXISTING ACCESS ROAD - NO IMPROVEMENTS REQUIRED | WATERBODY |
| EXISTING ACCESS ROAD - POTENTIAL IMPROVEMENTS | |

KEY MAP




0 20 40

1:500,000 KILOMETRES

REFERENCE(S)
BASE DATA COURTESY OF LAND INFORMATION ONTARIO MNRF. IMAGERY COPYRIGHT © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: NAD 1983 CSRS UTM ZONE 15N

CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

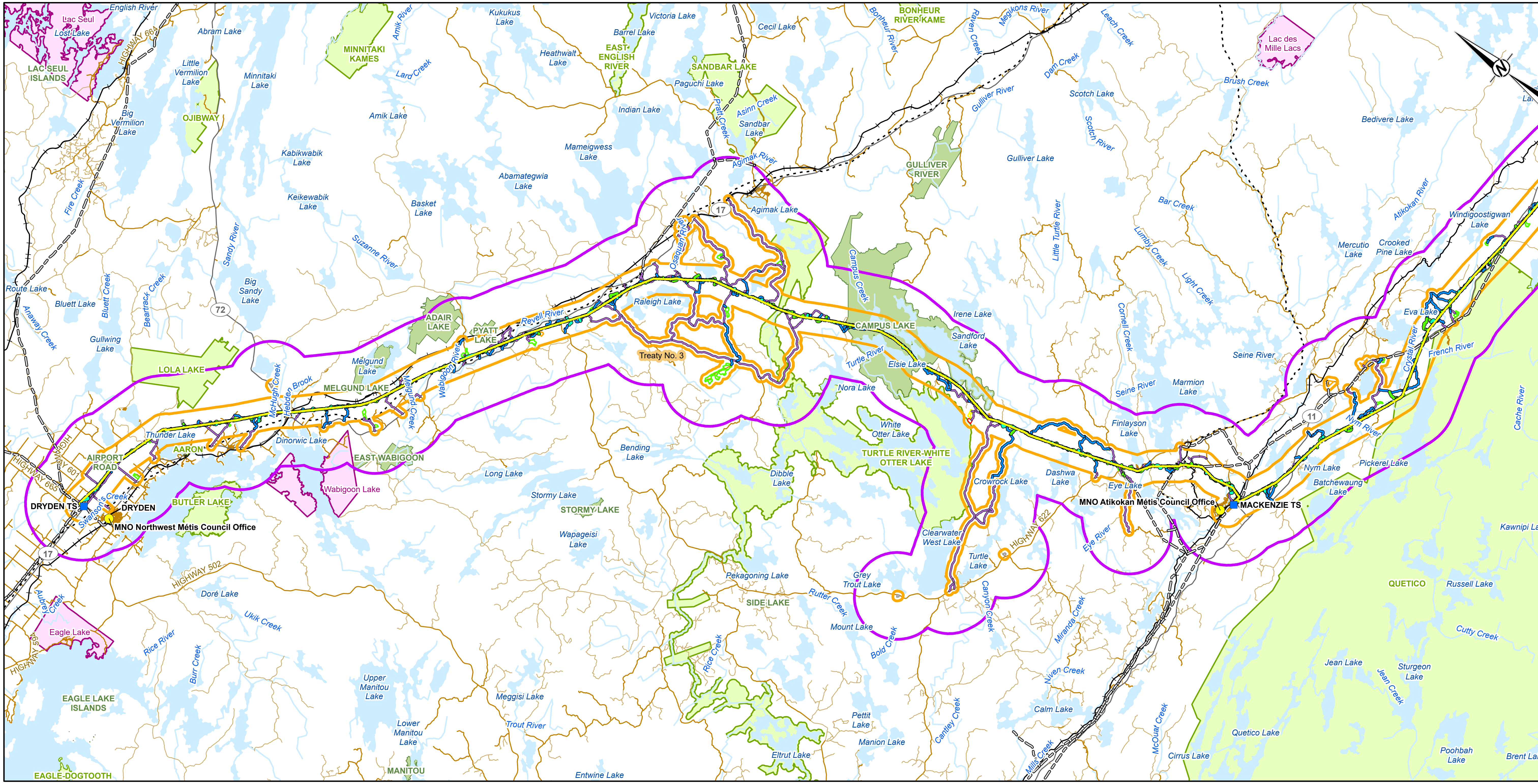
CONSULTANT

wsp

| | |
|---|---|
| YYYY-MM-DD | 2023-09-27 |
| DESIGNED | KA |
| PREPARED | DB |
| REVIEWED | HK |
| APPROVED | CS |

TITLE
**LOCAL AND REGIONAL STUDY AREA FOR AIR QUALITY**

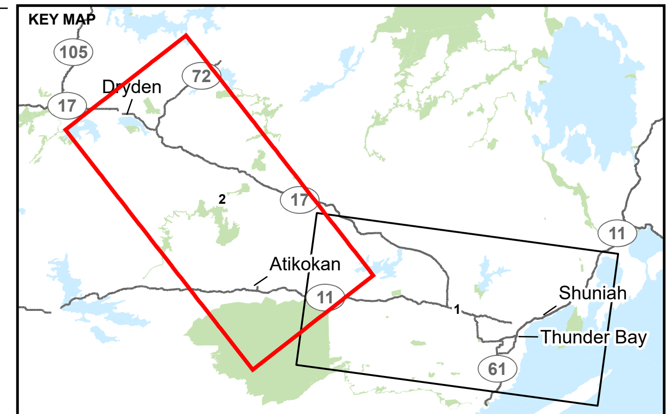
| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20137728 | 0033 | 1 | 6.7.1-1 |




**LEGEND**

- 230 kV TRANSFORMER STATION (TS)
- MNO COUNCIL OFFICE
- RAILWAY
- LOCAL ROAD
- SECONDARY HIGHWAY
- RESOURCE / RECREATION
- WATERCOURSE
- NATURAL GAS PIPELINE
- EXISTING TRANSMISSION LINE
- EXISTING ACCESS ROAD - NO IMPROVEMENTS REQUIRED
- EXISTING ACCESS ROAD - POTENTIAL IMPROVEMENTS
- NEW ACCESS ROAD - PREFERRED
- NEW ACCESS ROAD - ALTERNATE
- PREFERRED ROUTE TRANSMISSION LINE RIGHT-OF-WAY
- D26A / F25A CIRCUIT SEPARATION
- AGGREGATE SITE
- FLY YARD
- CAMP / LAYDOWN
- FLY YARD / CAMP / LAYDOWN
- CONSTRUCTION CAMP (NO LONGER TO BE USED)
- LOCAL STUDY AREA
- REGIONAL STUDY AREA
- FIRST NATIONS RESERVE
- TREATY BOUNDARY
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERBODY

**KEY MAP**




0 20 40

1:500,000 KILOMETRES

**REFERENCE(S)**

BASE DATA COURTESY OF LAND INFORMATION ONTARIO MNRF. IMAGERY COPYRIGHT © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: NAD 1983 CSRS UTM ZONE 15N

CLIENT
HYDRO ONE NETWORKS INC.

PROJECT
WAASIGAN TRANSMISSION LINE

CONSULTANT

wsp

| | |
|---|---|
| YYYY-MM-DD | 2023-10-26 |
| DESIGNED | KA |
| PREPARED | DB |
| REVIEWED | HK |
| APPROVED | CS |

TITLE
**LOCAL AND REGIONAL STUDY AREA FOR AIR QUALITY**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20137728 | 0033 | 1 | 6.7.1-2 |

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

PATH: S:\Clients\HydroOne\Waasigan\99_PROJ\20137728\40_PROD\0033_AirQuality_6_7\20137728-0033-G-XXXX.aprx PRINTED ON: AT: 9:33:38 AM

## 6.7.5 Description of the Existing Environment

This section provides a summary of the existing conditions for air quality as determined through desktop review.

A desktop review was completed to identify baseline conditions in the LSA. Background air quality in the LSA has been described by considering regional concentrations of CACs based on publicly available monitoring data. The background air quality represents the existing conditions of air quality before the Project commences. Sources of emissions include vehicles on roadways, long range transboundary air pollution, such as industrial sources in the United States, and small regional sources, such as local industry. Available air quality data sources were reviewed, and relevant information assembled to provide a general understanding of air quality conditions in the LSA.

In Ontario, regional air quality is monitored through a network of air quality monitoring stations operated by the MECP and ECCC's NAPS. The air quality monitoring stations are owned and operated by the MECP, but are also part of the larger NAPS network and adhere to the operating principles of the network. These stations are operated under strict quality assurance and quality control procedures (ECCC 2022). The Thunder Bay Station is located close to the east end of the Project footprint and was consequently used for baseline data. There are no other stations located within 200 km of the Project footprint, with the exception of a station located in the Experimental Lakes area, which only records concentrations of $O_3$. The MECP typically installs monitors in locations where air quality is an issue. Northern Ontario does not typically have air quality issues as much of the landscape is natural and undisturbed.

There are no major human-made influences on air quality within the LSA, with the exception of the Atikokan Generating Station, operated by Ontario Power Generation, located just outside of the Town of Atikokan, approximately 2.5 km from the Project. This facility primarily generates emissions from combustion. Emissions include NOx and SPM (including $PM_{10}$ and $PM_{2.5}$), which are reported annually to the National Pollutant Release Inventory. Contributions to air quality from the Atikokan Generating Station would be greatest in the immediate area surrounding its location but no sensitive receptors were identified in the area between the Project and Atikokan Generating Station. The only sources that could potentially influence the Project include naturally occurring sources and those from long range transport. The predominant west wind limits contributions are from southern Ontario and the Atikokan Generating Station; therefore, the Thunder Bay Station is considered most appropriate to characterize the air quality in this area. This station is located in a much more urban environment than most of the Project and is therefore considered to provide a conservative representation of existing/background air quality in the study area. No data are available for $SO_2$ or CO from either of these stations; therefore, data was taken from Winnipeg Station, located at 65 Ellen Street in Winnipeg, Manitoba. This station is also located in a much more urban environment than most of the Project and is therefore considered to provide a conservative representation of existing/background air quality in the study area.

Table 6.7-5 provides station information for each of the relevant monitoring locations from which data were obtained.

**Table 6.7-5: Monitoring Station Information**

| Station ID | Location | NAPS ID | Type of Area | Approximate Distance and Direction from Project Site |
|---|---|---|---|---|
| Experimental Lakes | Ontario | 64001 | Rural | 67 km (west southwest) |
| Thunder Bay | Ontario | 60809 | Urban | 16 km (southeast) |
| Winnipeg (65 Ellen Street) | Manitoba | 70118 | Urban | 320 km (west) |

NAPS = National Air Pollution Surveillance Network; km = kilometre.

Table 6.7-6 provides a summary of the monitoring data available from each of the identified stations from 2015 to 2019. At the time of this assessment, complete datasets were available up until 2020; however, 2020 datasets were not used due the impacts of the COVID-19 pandemic on many air quality emission sources including industry and transportation.

**Table 6.7-6: Availability of Ambient Air Quality Data**

| CAC | Experimental Lakes | Thunder Bay | Winnipeg Station (65 Ellen Street) |
|---|---|---|---|
| SPM | n/a | n/a | n/a |
| $PM_{10}$ | n/a | n/a | 2015–2019 |
| $PM_{2.5}$ | n/a | 2015–2019 | 2015–2019 |
| $NO_2$ | n/a | 2015–2019 | 2015–2019 |
| NO | n/a | 2015–2019 | 2015–2019 |
| $SO_2$ | n/a | n/a | 2015–2019 |
| CO | n/a | n/a | 2015–2019 |
| $O_3$ | 2015–2019 | 2015–2019 | 2015–2019 |

CO = carbon monoxide; NO = nitric oxide; $NO_2$ = nitrogen dioxide; $O_3$ = ozone; $PM_{10}$ = particles nominally smaller than 10 μm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 μm in diameter; $SO_2$ = sulphur dioxide; SPM = Suspended Particulate Matter <44 μm; n/a = data for the criteria were not available at that station.

The 90th percentile of the 1-hour, 8-hour and 24-hour measurements are typically used to represent the background air quality value when conducting an effects assessment because this value is exceeded only 10% of the time. Air quality is not a normally distributed dataset; therefore, using the maximum would be overly conservative. The industry common practice is to use the 90th percentile as the background concentration to avoid the influence of outlier data. The annual average concentration is used for annual background levels (Alberta Environment and Sustainable Resource Development 2013). The MECP does not provide specific guidance for this; therefore, guidance from another Canadian jurisdiction was used.

No local monitoring data were available for SPM and $PM_{10}$; however, an estimate of the background SPM and $PM_{10}$ concentrations can be determined from available $PM_{2.5}$ monitoring data. Fine particulate matter (i.e., $PM_{2.5}$) is a subset of $PM_{10}$, and $PM_{10}$ is a subset of SPM (Figure 6.7-2). Therefore, it is reasonable to assume that the ambient concentrations of SPM will be greater than corresponding $PM_{10}$ levels, and $PM_{10}$ concentrations will be greater than the corresponding levels of $PM_{2.5}$. The mean levels of $PM_{2.5}$ in Canadian locations are found to be about 54% of the $PM_{10}$ concentrations and about 30% of the SPM concentrations (Lall et. al. 2004). By applying this ratio, it was possible to estimate the SPM and $PM_{10}$ concentrations for the monitoring stations. It is acknowledged that the Winnipeg Station reported $PM_{10}$ concentrations; however, given that $PM_{2.5}$ data was taken from the Thunder Bay Station, this data was used to calculate concentrations of $PM_{10}$ both for consistency and conservatism as it results in a higher background concentration of $PM_{10}$ than using the Winnipeg data.

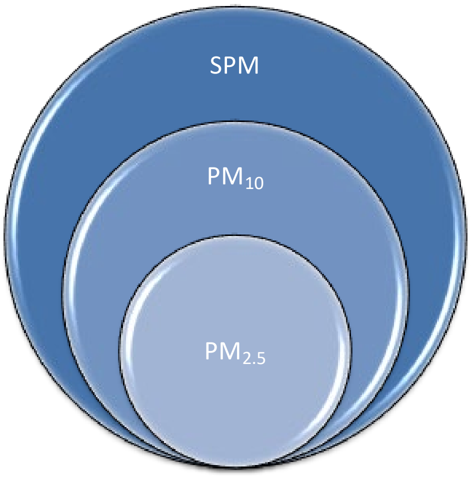



**Figure 6.7-2: Relationship between Particulate Size Fractions**

### *6.7.5.1 Summary of Existing Environment*

A summary of the background air quality concentrations for indicator compounds is provided in Table 6.7-7. Overall, the monitoring data indicate that background air quality surrounding the Project is below the relevant provincial and federal ambient air quality guidelines, criteria and standards.

**Table 6.7-7: Air Quality Background Concentrations**

| CAC | Averaging Period | Background Concentration (µg/m³) | Project Criteria (µg/m³) | % of Project Criteria |
|---|---|---|---|---|
| SPM | 24-Hour | 48 | 120 | 40% |
| SPM | Annual | 18 | 60 | 30% |
| $PM_{10}$ | 24-Hour | 24 | 50 | 48% |
| $PM_{2.5}$ | 24-Hour | 14 | 27 | 53% |

| CAC | Averaging Period | Background Concentration (µg/m³) | Project Criteria (µg/m³) | % of Project Criteria |
|---|---|---|---|---|
| $PM_{2.5}$ | Annual | 5 | 8.8 | 61% |
| $NO_2$ | 1-Hour | 52 | 79 | 65% |
| $NO_2$ | 1-hour | 52 | 400 | 13% |
| $NO_2$ | 24-Hour | 24 | 200 | 12% |
| $NO_2$ | Annual | 13 | 22.5 | 59% |
| $SO_2$ | 10-minute | 11 | 175 | 6% |
| $SO_2$ | 1-Hour | 2.6 | 106 | 6% |
| $SO_2$ | Annual | 0.8 | 10.6 | 25% |
| CO | 1-Hour | 572.7 | 35,000 | 2% |
| CO | 8-hour | 687.4 | 15,000 | 5% |
| $O_3$ | 1-Hour | 84 | 165 | 51% |
| $O_3$ | 8-Hour | 110 | 117.8 | 94% |

1-hour, 8-hour and 24-hour values are based on 90th percentile, while annual values are averaged over the five annual values available in the period. The 24-hour $PM_{2.5}$ is calculated according to the requirements of the standard, which uses the three-year rolling average of the 98th percentile of the 24-hour observations.

Data are taken from the Thunder Bay Station, where data are measured. Where data are not measured, data were taken from the Winnipeg Station.

SPM and $PM_{10}$ concentrations are derived from $PM_{2.5}$ monitored data.

µg/m³ = microgram per cubic metre; CO = carbon monoxide; $O_3$ = ozone; $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 µm in diameter; $NO_2$ = nitrogen dioxide; $SO_2$ = sulphur dioxide; SPM = Suspended Particulate Matter <44 µm; % = percent.

## 6.7.6 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 air quality are identified in Table 6.7-8. As described in Section 6.7.4.1, the assessment of Project effects on air quality considers effects that occur during the construction stage as emissions are considered to be greatest during this stage of the Project. This timeframe is intended to be sufficient to capture the effects of the Project lifecycle and a separate assessment of emissions during the operation, maintenance and retirement stages is not required.

**Table 6.7-8: Project-Environment Interactions for Air Quality**

| Criteria | Indicator | Project Phase Construction[(a)*] | Project Phase Operation and Maintenance | Description of Potential Project-Environment Interaction |
|---|---|---|---|---|
| Air Quality | • Predicted ambient concentrations of:<br>• SPM<br>• $PM_{10}$ and $PM_{2.5}$<br>• CO<br>• $NO_2$<br>• $SO_2$ | ✓ | ✓* | Change in CAC and fugitive dust emissions from construction and maintenance activities |

✓ = A potential Project-environment interaction could result in an environmental or socio-economic effect.

_ = No plausible interaction was identified.

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

a) As described in Section 6.7.4.1, the construction scenario assessed as part of the EA is considered bounding and potential effects and mitigation measures for other phases of the Project lifecycle are not identified separately in this EA.

## 6.7.7 Potential Effects, Mitigation Measures, and Net Effects

This section presents the potential effects, appropriate mitigation measures, and predicted net Project effects for air quality. A summary of the potential effects, mitigation measures, and net effects are presented in Table 6.7-22.

### *6.7.7.1 Change in Criteria Air Contaminants and Fugitive Dust Emissions*

**Potential Effects**

The potential sources of air and fugitive dust emissions are from equipment, vehicles and activities associated with construction of the Project. Specifically, construction activities have the potential to temporarily affect local air quality in the immediate vicinity of the Project. Emissions from construction are primarily comprised of fugitive dust (i.e., particulate matter that is suspended in air by wind action and human activity) and tailpipe emissions (i.e., CAC) from the movement and operation of construction equipment and vehicles.

Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. Construction activities are not static and will only occur at one location for a short period before they progress along the ROW. Some activities may occur simultaneously at the same location for a short period, but typically different activities will occur at different locations (e.g., land clearing and stringing). As a result, a screening assessment was completed to assess potential short-term effects on local air quality assuming a worst-case scenario of all activities occurring concurrently at the same location.

The emission sources associated with construction of the Project include the following:

- land clearing and material handling (e.g., earth moving and excavating);
- construction vehicle emissions;
- fugitive dust from vehicles travelling on unpaved roads; and
- diesel generators at the construction camps.

It is acknowledged that the Project will also generate short-term emissions from workers travelling between local communities and either the ROW or construction camps in personal vehicles, but these are not expected to be significant compared to the emissions from construction vehicles, which are subject to less stringent emission standards than personal vehicles and would typically only occur at the start/end of a shift. Vehicle emissions from pick-up trucks travelling along access roads are considered in the assessment.

It is also understood that slash pile burning may be required as part of the construction activities. Slash pile burning may result in the release of particulate matter, including SPM, $PM_{10}$ and $PM_{2.5.}$ Slash pile burning will be completed in accordance with Ontario Regulation 207/96 and will be conducted in locations away from any sensitive receptors, for both safety and environmental reasons. Emissions from slash pile burning were therefore not quantified as they are anticipated to be very localized and would not be expected to overlap with the main ROW construction activities.

It is understood that blasting may be required on rare occasion for aggregate production at some locations to support access development. This activity may result in the release of particulate matter, including SPM, $PM_{10}$ and $PM_{2.5}$. Blasting, if required, is not expected to occur concurrently with any other construction activities and will be very short term and infrequent in nature. Emissions from blasting were therefore not quantified as they are anticipated to be very localized and would not be expected to overlap with the main ROW construction activities.

These activities will be sequentially staggered and therefore it is not reasonable to include all construction activities in the modelled scenario. For example, clearing activities are anticipated to occur at more than one location simultaneously. A summary of the equipment used in each construction activity is provided in Table 6.7-9, below.

**Table 6.7-9: Construction Scenarios and Corresponding Equipment**

| Construction Equipment | Total Equipment | Clearing/ Access[(a)] | Foundations/ Anchors[(a)] | Assembly[(a)] | Erection [(a)] | Stringing [(a)] | Maximum Equipment that may operate within a 5 km Stretch |
|---|---|---|---|---|---|---|---|
| Pickup truck | 23 | ✓ | ✓ | ✓ | ✓ | ✓ | 10 |
| 1 ton truck | 58 | ✓ | ✓ | ✓ | ✓ | ✓ | 20 |
| Picker - 17 ton | 1 | – | ✓ | – | – | – | 1 |
| Picker - 36 ton | 5 | – | – | – | – | ✓ | 2 |
| 130T All-terrain Crane | 1 | – | – | – | ✓ | – | 1 |
| 200T All-terrain Crane | 1 | – | – | – | ✓ | – | 1 |
| Digger Truck | 1 | – | – | – | – | ✓ | 1 |
| Man Lift | 1 | – | – | ✓ | ✓ | ✓ | 1 |
| Zoom Boom | 2 | – | ✓ | ✓ | ✓ | ✓ | 2 |
| Tractor Trailer | 6 | ✓ | ✓ | ✓ | ✓ | ✓ | 6 |
| Gravel Truck | 1 | ✓ | ✓ | – | – | – | 1 |
| Articulating Dump Truck | 2 | ✓ | ✓ | – | – | – | 1 |
| 200 Class Excavator | 10 | ✓ | ✓ | ✓ | – | – | 5 |
| 300 Class Excavator | 6 | ✓ | ✓ | – | ✓ | ✓ | 3 |
| 400 Class Excavator | 1 | ✓ | ✓ | – | – | – | 1 |
| Drill | 1 | – | ✓ | – | – | – | 1 |
| Pile Driver | 1 | – | ✓ | – | – | – | 1 |

| Construction Equipment | Total Equipment | Clearing/ Access[a] | Foundations/ Anchors[a] | Assembly[a] | Erection (a) | Stringing (a) | Maximum Equipment that may operate within a 5 km Stretch |
|---|---|---|---|---|---|---|---|
| Loader | 6 | – | ✓ | ✓ | ✓ | ✓ | 4 |
| Back-hoe | 1 | – | ✓ | – | – | – | 1 |
| Dozer | 1 | ✓ | ✓ | – | ✓ | ✓ | 1 |
| Large Tensioner | 2 | – | – | – | – | ✓ | 2 |
| Large Puller | 2 | – | – | – | – | ✓ | 2 |
| 1 Drum Puller | 1 | – | – | – | – | ✓ | 1 |
| Single Tensioner | 1 | – | – | – | – | ✓ | 1 |
| Pilot Line Winder | 2 | – | – | – | – | ✓ | 2 |

a) ✓ refers to equipment potentially being used for the activity and "–" refers to the equipment not generally being used for the activity.

The following outlines the key assumptions that were made and used for the assessment of air quality during the construction stage:

- The general construction activities will be limited to the Project footprint.
- Equipment used for each activity will be operating up to ten hours per day and generally limited to the daytime period (i.e., 07:00 to 18:00). Nighttime construction work is generally not anticipated; however, it may be required in specific circumstances.

It is anticipated that typically no more than three construction activities will occur simultaneously less than 5 km apart along the transmission line ROW within a 24-hour period. However, it was assumed that, as a worst case, all activities could occur within any 24-hour period and within an approximate 5 km stretch along the ROW. Corresponding equipment data for these activities were used in combination with published emission factors to prepare emission rate estimates for a representative, approximate 5 km stretch of construction activities. Published emission factors were taken from the United States Environmental Protection Agency (US EPA) database. This is an MECP-approved data source and industry standard, given that Ontario does not publish emission factors to the same level of detail. A description of how emission calculations were prepared for each type of emission source is provided in the following sections. Mitigation measures were assumed to be implemented and were incorporated into the fugitive dust and material handling calculations. Mitigation measures planned to reduce the effects of air emissions associated with the Project include practices to control dust and other air emissions (e.g., maintenance of vehicles and equipment, wetting areas). In areas where there are residences or sensitive receptors located within approximately 200 m of the Project footprint, emphasis will be placed on comprehensive implementation of mitigation measures, in particular dust suppression activities, such as watering and/or applying dust suppressants (i.e., calcium chloride). Fugitive dust controls on unpaved roads and material handling activities range from a 10% to 90% control efficiency; in particular, the use of dust suppressant on unpaved roads has a published control efficiency of 84% (Western Governors' Association 2006). In this assessment, a conservative midrange control efficiency of 80% was used for material handling activities and unpaved roads.

**Land Clearing and Material Handling**

Land clearing and material handling activities include the use of excavators, dozers and dump trucks to extract and move material. Emissions from these activities include fugitive dust from material movements.

**Emission Calculation – Bulldozing**

An equation from US EPA AP-42 Chapter 11.9 *Western Surface Coal Mining* (1998) was used to calculate the emission factors associated with bulldozing activities. The equation for SPM, $PM_{10}$ and $PM_{2.5}$ are as follows:

$$EF_{SPM} = \frac{2.6 \times s^{1.2}}{M^{1.3}}$$

$$EF_{PM10} = EF_{PM15} \times 0.75$$

$$EF_{PM2.5} = EF_{SPM} \times 0.105$$

*where: $EF_{xxx}$ = particulate emission factor (kg/hour)*
*s = silt content (%)*
*M= material moisture content (%)*

The following equation was used to determine the emission rates for SPM, $PM_{10}$ and $PM_{2.5}$ from bulldozing using the emission factor equation above.

$$ER_{BZ} = EF_{xxx} \times \frac{1{,}000\ g}{1\ kg} \times \frac{1\ hr}{3600\ seconds} \times \frac{H}{24\ hr} \times (1 - C)$$

*where: $ER_{BZ}$= emission rate from bulldozing (g/s)*
*$EF_{xxx}$ =particulate emission factor (kg/hour)*
*H = hours per day grading is occurring (hr)*
*C=Control Efficiency (%)*

**Emission Calculation – Material Handling**

A primary source of fugitive dust in construction is the result of transfer of materials to and from stockpiles. The emission factors will vary depending on the moisture content of the material being moved.

The emissions from material handing include SPM, $PM_{10}$ and $PM_{2.5}$. To quantify emissions from these activities, an equation in US EPA AP-42 Chapter 13.2.4 *Aggregate Handling and Storage Piles* (2006) was used to calculate the fugitive dust emission factors associated with material handling activities. The equation is as follows:

$$EF_{MH} = k \times 0.0016 \times \frac{(U/2.2)^{1.3}}{(M/2)^{1.4}}$$

*where: $EF_{MH}$ = particulate emission factor (kg/Mg),*
*k = particle size multiplier for particle size range (*Table 6.7-10*)*
*U = Wind speed (m/s), and*
*M =moisture content of material (%)*

**Table 6.7-10: Particle Size Multipliers – Material Handling**

| Size Range | Particle Size Multiplier (k) |
|---|---|
| $PM_{2.5}$ | 0.053 |
| $PM_{10}$ | 0.35 |
| SPM | 0.74 |

Note: k = particle size multiplier for particle size range.

$PM_{10}$ = particles nominally smaller than 10 μm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 μm in diameter; SPM = Suspended Particulate Matter <44 μm.

The following equation was used to determine the emission rates for SPM, $PM_{10}$ and $PM_{2.5}$ from material handling using the emission factor equation above.

$$ER_{MH} = EF_{MH} \times DT \times \frac{1{,}000, g}{1\ kg} \times \frac{1\ day}{24\ hour} \times \frac{1\ hr}{3600\ seconds} \times (1 - C)$$

*where: $ER_{MH}$ = emission rate (g/s)*
*DT = daily throughput (Mg/day)*
*$EF_{MH}$ = emission factor (kg/Mg)*
*C=Control Efficiency (%)*

Emission rates for land clearing and material handling were calculated using the following inputs (Table 6.7-11):

**Table 6.7-11: Land Clearing and Material Handling Emission Calculation Inputs**

| Emission Activity | Input/Emission Factor | Notation | Value | Notes |
|---|---|---|---|---|
| Bulldozing | Silt content (%) | *s* | 6.9% | Typical silt content of overburden (US EPA 1998) |
| Bulldozing | Hours per day bulldozing is occurring | *H* | 10 | Typical length of a construction day |
| Bulldozing | Dust suppressant control efficiency (%) | *C* | 80% | Mid-range of typical dust control efficiencies |
| Material handling | Moisture content | *M* | 3.4% | Typical moisture content of exposed ground (US EPA 2006) |

| Emission Activity | Input/Emission Factor | Notation | Value | Notes |
|---|---|---|---|---|
| Material handling | Wind speed (m/s) | *U* | 3.48 | ECCC climate normal for Thunder Bay |
| Material handling | Material hauling | *DT* | 600 tonnes/day | n/a |
| Material handling | Dust suppressant control efficiency (%) | *C* | 80% | Mid-range of typical dust control efficiencies |

n/a = not applicable; km/h = kilometres per hour; m/s = metres per second; VKT = vehicle kilometres travelled; % = percent.

**Vehicular Emissions**

Vehicle engine emission rates for all off-road vehicles (i.e., the mobile fleet) were derived using the emission standards for off-road engines outlined in the *Canadian Off-Road Compression Engine Emission Regulation SOR/2005-32,* promulgated under the *Canadian Environmental Protection Act, 1999* (CEPA) (ECCC 1999). This regulation aligns engine certification values to those of US EPA Tier 2, Tier 3 and Tier 4 standards (US EPA 2010). Vehicle exhaust emissions were conservatively estimated, assuming vehicles comply with US EPA Tier 3 emission standards. Tier 3 emission standards are the minimum emission standards that vehicle exhausts are required to meet in Ontario on equipment purchased after 2010. New equipment is typically designed to meet more stringent Tier 4 emission standards that can be less than 10% of Tier 3 emission standards. Vehicles were assumed to be operating for 10 hours per day, 365 days per year. This is a conservative assumption, based on the construction schedule provided, construction of a 5 km stretch of the Project would take less than 1 month for each of the construction stages (e.g., clearing, foundations, structure assembly, structure erection and stringing).

Tier 3 emission standards are provided for $NO_X$, CO, and total SPM. Within these limits all SPM is in the form of $PM_{10}$, and $PM_{2.5}$ emissions are 97% of $PM_{10}$ emissions.

The following equation was used to determine the emission rates of contaminants with criteria based on a 24-hour or longer averaging period, for non-road vehicles exhaust:

$$ER = EF \times Engine\ Horsepower\ Rating \times V \times LF \times \frac{Hours\ of\ Operation}{24\ hr} \times \frac{1\ hr}{3600\ seconds}$$

*where: ER = emission rate (g/s)*
*V = number of vehicles*
*EF = emission factor (g/hp-hr), and*
*LF = load factor*

Load factors were derived from published literature for the respective vehicle categories.

For contaminants with criteria that have averaging periods less than 24 hours, it was conservatively assumed that the equipment could be operating for the full averaging period and the following equation was therefore used:

$$ER = EF \times Engine\ Horsepower\ Rating \times V \times LF \times \frac{1\ hr}{3600\ seconds}$$

*where: ER = emission rate (g/s)*
*V = number of vehicles*
*EF = emission factor (g/hp-hr), and*
*LF = load factor*

For $SO_2$, emissions were calculated based on fuel consumption rates for each specific equipment type. The sulphur content of fuel was assumed to be 15 parts per million (ppm), and is based on the Sulphur in Diesel Fuel Regulations SOR/2002-254, dated June 2012, promulgated under CEPA (CEPA 1999). The following equation was used to determine the $SO_2$ emission factor:

$$ER = Fuel\ Density \times Sulphur\ Content \times \frac{MM\ SO_2}{MM\ Sulphur}$$

*where: MM = molar mass (g/mol)*

Table 6.7-12 outlines the inputs used (i.e., horsepower, number and load factors) to calculate the emissions from the construction fleet engine exhaust.

**Table 6.7-12: Off-Road Vehicles Exhaust Emission Rate Calculation Parameters**

| Equipment | Maximum Number of Vehicles | Engine Size (hp) | Load Factor | Daily Operating Hours per Vehicle |
|---|---|---|---|---|
| Pickup Truck | 10 | 430 | 0.58 | 10 |
| 1 ton truck | 20 | 430 | 0.58 | 10 |
| Picker 17 Ton | 1 | 240 | 0.53 | 10 |
| Picker 25 Ton | 1 | 350 | 0.53 | 10 |
| Picker 36 Ton | 2 | 425 | 0.53 | 10 |
| 130T all-terrain crane | 1 | 496 | 0.43 | 10 |
| 200T all-terrain crane | 1 | 300 | 0.43 | 10 |
| Man lift | 1 | 74 | 0.43 | 10 |
| Zoom boom | 2 | 130 | 0.43 | 10 |

| Equipment | Maximum Number of Vehicles | Engine Size (hp) | Load Factor | Daily Operating Hours per Vehicle |
|---|---|---|---|---|
| Gravel Truck | 1 | 321 | 0.58 | 10 |
| Articulating dump truck | 2 | 354 | 0.58 | 10 |
| 200 class excavator | 5 | 146 | 0.53 | 10 |
| 300 class excavator | 3 | 223 | 0.53 | 10 |
| 400 class excavator | 1 | 271 | 0.53 | 10 |
| Pile Driver | 1 | 310 | 0.43 | 10 |
| Loader | 4 | 180 | 0.21 | 10 |
| Back-hoe | 1 | 117 | 0.21 | 10 |
| Dozer | 1 | 176 | 0.58 | 10 |
| Large tensioner | 2 | 45 | 0.58 | 10 |
| Large puller | 2 | 45 | 0.58 | 10 |
| 1 drum puller | 1 | 45 | 0.58 | 10 |
| Single tensioner | 1 | 45 | 0.58 | 10 |
| Pilot line winder | 2 | 49 | 0.58 | 10 |

hp = horsepower.

**Fugitive Dust from Vehicles Travelling on Unpaved Roads**

Emissions from unpaved roads occur as the result of the entrainment of dust from the road as a result of vehicle traffic. Particles are lifted from the surface and entrained. The turbulent wake behind the vehicle continues to act on the road after the vehicle has passed.

The predictive emission equation in US EPA AP-42 Chapter 13.2.2 *Unpaved Roads* (2006) was used to calculate the emissions of SPM, $PM_{10}$ and $PM_{2.5}$ from unpaved roadways. The equation applicable to vehicles travelling on unpaved surfaces at industrial sites (Equation 1a) was used, and is as follows:

$$EF = k \times (s/12)^{a} \times (W/3)^{b}$$

*where: EF = emission factor (lb/VMT)*
*k = particle size multiplier (lb/VMT) (*Table 6.7-13*)*
*s = surface silt content (%)*
*W = mean vehicle weight (tons)*
*a = empirical constant (*Table 6.7-13*)*
*b = empirical constant (*Table 6.7-13*), and*
*1 lb/VMT = 281.9 g/VKT*

This emission factor is then multiplied by the number of vehicles travelling the roadway and the length of the roadway (denoted as VKT) to derive a SPM emission rate. Due to the high variability from site to site, surface silt content is highly variable. For example, a 1% change in silt content will result in a 34% reduction in the pounds per vehicle mile travelled (lbs/VMT). In the absence of site-specific information, data from published references have been assumed to be representative.

**Table 6.7-13: Particle Size Constants for Fugitive Dust from Unpaved Roads Equation**

| Particle Size Range | Particle Size Multiplier k (lb/VMT) | Empirical Constant a | Empirical Constant b |
|---|---|---|---|
| $PM_{2.5}$ | 0.15 | 0.9 | 0.45 |
| $PM_{10}$ | 1.5 | 0.9 | 0.45 |
| SPM | 4.9 | 0.7 | 0.45 |

lb/VMT = pound per vehicle mile travelled; $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 µm in diameter; SPM = Suspended Particulate Matter <44 µm.

In addition, the effect of routine watering to control emissions was applied, the control efficiency assumed is based on the upper range of control efficiencies; however, unpaved road dust emissions were calculated without an adjustment for natural mitigation measures. This is conservative as the majority of construction activities are anticipated to occur in winter which provides natural mitigation measures through precipitation.

The emission rate calculation for unpaved roads was as follows:

$$ER = EF \times VKT/day \times \frac{1\ day}{24\ hr} \times \frac{1\ hr}{3600\ s} \times C$$

*where: EF = emission factor in g/VKT*
*VKT/day = vehicle kilometre travelled per day*
*C= Control Efficiency (%)*

Table 6.7-14 outlines the inputs used to calculate the fugitive dust emissions from the trucks travelling on the access roads. The required information to calculate the vehicle kilometres travelled per day (VKT/day) and the fugitive dust emissions from the unpaved roads are presented in Table 6.7-14.

**Table 6.7-14: Unpaved Road Dust Emission Rate Calculation Parameter**

| Emission Activity | Input/Emission Factor | Notation | Value | Notes |
|---|---|---|---|---|
| Unpaved Road Dust | Silt content (%) | *s* | 8.5% | Typical silt content of construction site roads (US EPA 2006). |
| Unpaved Road Dust | Dust Suppressant Control Efficiency (%) | *C* | 80% | Mid-range of typical dust control efficiencies. |

% = percent.

**Table 6.7-15: Off-road Vehicles Fugitive Dust Emission Rate Calculation Parameters**

| Equipment | Number of Vehicles | Weight (tons) | Maximum VKT/day | Daily Operating Hours per Vehicle |
|---|---|---|---|---|
| Pickup Truck | 10 | 2.58 | 580 | 10 |
| 1 ton truck | 20 | 2.67 | 1160 | 10 |
| Picker 17 Ton | 1 | 12.83 | 10 | 10 |
| Picker 25 Ton | 1 | 25.00 | 10 | 10 |
| Picker 36 Ton | 2 | 36.00 | 20 | 10 |
| 130T all-terrain crane | 1 | 62.00 | 4 | 10 |
| 200T all-terrain crane | 1 | 59.92 | 4 | 10 |
| Man lift | 1 | 21.22 | 4 | 10 |
| Zoom boom | 2 | 2.23 | 9 | 10 |
| Gravel Truck | 1 | 45.95 | 58 | 10 |
| Articulating dump truck | 2 | 50.17 | 116 | 10 |
| 200 class excavator | 5 | 20.18 | 50 | 10 |
| 300 class excavator | 3 | 30.90 | 30 | 10 |
| 400 class excavator | 1 | 38.15 | 10 | 10 |
| Pile Driver | 1 | 63.97 | 4 | 10 |
| Loader | 4 | 15.50 | 84 | 10 |
| Back-hoe | 1 | 8.05 | 21 | 10 |
| Large tensioner | 2 | 4.20 | 12 | 10 |
| Large puller | 2 | 4.20 | 12 | 10 |
| 1 drum puller | 1 | 4.20 | 6 | 10 |
| Single tensioner | 1 | 4.20 | 6 | 10 |
| Pilot line winder | 2 | 5.35 | 12 | 10 |

Vehicle weight shown in Table 6.7-15 is a mean vehicle weight.

VKT/day = vehicle kilometres travelled per day

### Electricity Generation

It is anticipated that each temporary construction camp will utilize two diesel electricity generators; one to provide electricity to the camp and the second to provide back-up or standby electricity. Emissions occur from diesel combustion. Emission factors were taken from manufacturer specification sheets for a generator of the size expected to be employed and are provided in Table 6.7-16.

**Table 6.7-16: Electricity Generation Emission Factors**

| CAC | Emission Factor (g/hp-hr) |
|---|---|
| NOx | 5.15 |
| CO | 0.41 |
| SPM | 0.02 |
| $SO_2$ | 0.055 |

CO = carbon monoxide; NOx = nitrogen oxides; $SO_2$ = sulphur dioxide; SPM = Suspended Particulate Matter <44 µm; g/hp-hr = grams per horsepower-hour.

It was assumed that all SPM is in the form $PM_{10}$ and also in the form $PM_{2.5}$. Table 6.7-17 presents the parameters for the emission rates used for electricity generation calculations.

**Table 6.7-17: Electricity Generation Emission Rate Calculation Parameter**

| Emission Activity | Input/ Emission Factor | Notation | Value | Notes |
|---|---|---|---|---|
| Electricity generation | Maximum Capacity | hp-hr | 671 | n/a |
| Electricity generation | Hours per day operational | H | 24 | Assumed to be continuously operational |

H = hours; hp-hr = horsepower-hour; n/a = not applicable.

### Emissions Summary

A summary of the total emission rates (estimated construction emissions including mitigation measures for fugitive dust) for each indicator compound is provided in Table 6.7-18.

Table 6.7-18: Construction Emission Rates for a Representative Construction Segment

| CAC | Averaging Period | Material Handling Activities Emission Rate (g/s) | Vehicle Exhaust Emission Rate (g/s) | Unpaved Road Dust Emission Rate (g/s) | Electricity Generation at Construction Camp Emission Rate (g/s) | Total Emission Rate for Representative 5 km Segment of Transmission Line Construction (g/s) | Total Emission Rate for Construction Camp (g/s) |
|---|---|---|---|---|---|---|---|
| SPM | 24-Hour | 0.24 | 0.20 | 7.35 | 5.63 | 7.78 | 5.63 |
| SPM | Annual | 0.24 | 0.20 | 7.35 | 5.63 | 7.78 | 5.63 |
| $PM_{10}$ | 24-Hour | 0.04 | 0.20 | 2.10 | 1.71 | 2.34 | 1.71 |
| $PM_{2.5}$ | 24-Hour | 0.02 | 0.19 | 0.21 | 0.32 | 0.42 | 0.32 |
| $PM_{2.5}$ | Annual | 0.02 | 0.19 | 0.21 | 0.32 | 0.42 | 0.32 |
| NOx | 1-Hour | — | 8.03 | — | 6.56 | 8.03 | 6.56 |
| NOx | 24-Hour | — | 3.34 | — | 6.56 | 3.34 | 6.56 |
| NOx | Annual | — | 3.34 | — | 6.56 | 3.34 | 6.56 |
| $SO_2$ | 10-minute | — | 0.02 | — | 0.01 | 0.02 | 0.01 |
| $SO_2$ | 1-Hour | — | 0.02 | — | 0.01 | 0.02 | 0.01 |
| $SO_2$ | Annual | — | 0.01 | — | 0.01 | 0.01 | 0.01 |
| CO | 1-Hour | — | 0.68 | — | 1.15 | 0.68 | 1.15 |
| CO | 8-hour | — | 0.68 | — | 1.15 | 0.68 | 1.15 |

g/s = gram per second; SPM = Suspended Particulate Matter <44 µm; $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 µm in diameter; $NO_2$ = nitrogen dioxide; NOx = nitrogen oxides; $SO_2$ = sulphur dioxide; CO = carbon monoxide.

A screening assessment was completed using the emission rates presented in Table 6.7-18 and the US EPA AERMOD dispersion model to predict air quality concentrations at 50 m and 100 m from the ROW then at approximately 100 m intervals to the outer boundary of the LSA. AERMOD is a Gaussian plume model that calculates maximum ground level concentrations from point, area, flare and volume sources. It is used for compliance assessments in Ontario to estimate concentrations from stationary sources (MECP 2019).

For emissions from the transmission line construction, emission rates were modelled as a series of volume sources located along a 5 km stretch of the transmission line to represent the emission sources operating at once in the same volume of air. This is a conservative representation of construction activities, which is likely to result in an overestimate of predicted concentrations as the activities are assumed to be stationary instead of mobile. This is appropriate for the screening level approach used for the assessment. During construction, emission sources will be spread out across the width of the 46 m-wide transmission line ROW and other Project components (e.g., access roads), and the maximum ground level concentrations resulting from each activity will not occur in the same location.

Emissions from the temporary construction camps were calculated to be considerably less than emissions from construction activities and were not modelled further because effects would be lesser in magnitude than those from the construction activities. Eleven potential construction camp locations are included in the Project footprint; however, it is anticipated that only three will be required once detailed planning is completed. The other sites may still be used as laydown areas. Of the 11 potential construction camp locations, seven of the identified potential locations are planned to be located over 1 km from the ROW with the remaining four located within 1 km of the ROW. These four locations are all in areas where no existing potential sensitive receptors have been identified, as a result, the maximum impacts from the two activities are not expected to overlap.

Results were calculated based on 1-hour, 8-hour, and 24-hour averaging periods. Annual results were also calculated for comparison to annual air quality criteria. This is a conservative comparison as the construction period for an approximate 5 km segment of the transmission line is anticipated to require much less than one year.

Emissions of oxides of nitrogen (NOx) were used as inputs to the AERMOD model. The modelled predictions of NOx were then used to calculate the nitrogen dioxide ($NO_2$) concentration, one of the indicator compounds, using the Ozone Limiting Method (OLM) suggested by Cole and Summerhays (Cole et al. 1979). The 1-hour and 24-hour $NO_2$ concentrations were calculated using the background ozone conservatively determined as the 90th percentile of the 1-hour measured ground-level ozone concentration (see Table 6.7-7).

The OLM (Cole et al. 1979) assumes that 10% of the NOx emissions are in the form of $NO_2$, and the remaining 90% in the form of NO. Some or all of the NO will be converted to $NO_2$ by reaction with ozone ($O_3$). If the NOx concentration in ppm is multiplied by 0.9 and this value is less than the ozone concentration in ppm, then the $NO_2$ concentration is equal to the NOx concentration. However, if the NOx concentration in ppm is multiplied by 0.9 and the value is equal to or greater than the ozone concentration in ppm, then the $NO_2$ concentration is given by the following equations:

$$NO_2(ppm) = O_3(ppm) + 0.1 * NO_X(ppm)$$

For example, the maximum 1-hr modelled concentration of NOX was 78.53 µg/m³. This can be translated into a concentration in ppm using the equation below at standard temperature and pressure.

$$1ppm = \frac{V_m}{M}\frac{1\mu g}{1Lair}$$

Using a molar volume of 22.414 L ($V_m$) at standard temperature and pressure and the molecular weight of $NO_2$ (M) at ambient temperature, the equation for the NOx concentration becomes:

$$NO_X(ppm) = 78.53\frac{\mu g}{m^3} \times \frac{1m^3}{1000L} \times \frac{22.414L}{(14.0067 + 2 \times 15.9994)} \times \frac{273.15 + 25}{273.15}$$

$$NO_X = 0.042\,ppm$$

Since this value multiplied by 0.9 is 0.037 ppm which is less than the ozone concentration of 0.043 ppm, the $NO_2$ concentration is assumed to be equal to the NOx concentration.

This method is widely accepted as being a reasonable approach that recognizes the most important mechanism for NOx conversion, namely reactions with ozone.

A summary of results is provided in Table 6.7-19.

**Table 6.7-19: Predicted Air Quality Concentrations at Increasing Distance from the Right-of-Way**

| CAC (µg/m³) | Averaging Period | Relevant Project Criteria | Distance from Right-of-Way (m) 50 | Distance from Right-of-Way (m) 100 | Distance from Right-of-Way (m) 200 | Distance from Right-of-Way (m) 300 | Distance from Right-of-Way (m) 400 | Distance from Right-of-Way (m) 500 | Distance from Right-of-Way (m) 1,000 | Distance from Right-of-Way (m) 1,500 | Distance from Right-of-Way (m) 2,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPM | 24-Hour | 120 | 63.76 | 40.56 | 24.42 | 17.75 | 13.98 | 11.53 | 5.95 | 3.81 | 2.68 |
| SPM | Annual | 60 | 13.83 | 8.15 | 4.52 | 3.10 | 2.34 | 1.87 | 0.88 | 0.53 | 0.36 |
| $PM_{10}$ | 24-Hour | 50 | 19.18 | 12.20 | 7.35 | 5.34 | 4.21 | 3.47 | 1.79 | 1.15 | 0.81 |
| $PM_{2.5}$ | 24-Hour | 27 | 3.41 | 2.17 | 1.31 | 0.95 | 0.75 | 0.62 | 0.32 | 0.20 | 0.14 |
| $PM_{2.5}$ | Annual | 8.8 | 0.74 | 0.44 | 0.24 | 0.17 | 0.13 | 0.10 | 0.05 | 0.03 | 0.02 |
| $NO_2$ | 1-Hour | 79/ 400 | 83.02 | 53.69 | 32.85 | 26.10 | 23.18 | 19.88 | 11.82 | 8.98 | 8.19 |
| $NO_2$ | 24-Hour | 200 | 27.40 | 17.43 | 10.50 | 7.63 | 6.01 | 4.96 | 2.56 | 1.64 | 1.15 |
| $NO_2$ | Annual | 22.5 | 5.94 | 3.50 | 1.94 | 1.33 | 1.01 | 0.80 | 0.38 | 0.23 | 0.16 |
| $SO_2$ | 10-minute | 175 | 0.26 | 0.17 | 0.10 | 0.08 | 0.07 | 0.06 | 0.04 | 0.03 | 0.03 |
| $SO_2$ | 1-Hour | 106 | 0.16 | 0.10 | 0.06 | 0.05 | 0.04 | 0.04 | 0.02 | 0.02 | 0.02 |
| $SO_2$ | Annual | 10.6 | 0.0111 | 0.0066 | 0.0036 | 0.0025 | 0.0019 | 0.0015 | 0.0007 | 0.0004 | 0.0003 |
| CO | 1-Hour | 35,000 | 7.00 | 4.53 | 2.77 | 2.20 | 1.96 | 1.68 | 1.00 | 0.76 | 0.69 |
| CO | 8-hour | 15,000 | 56.03 | 36.23 | 22.17 | 17.61 | 15.64 | 13.42 | 7.98 | 6.06 | 5.53 |

1-hour, 8-hour and 24-hour values are based on 90th percentile, while annual values are averaged over the five annual values available in the period. The 24-hour $PM_{2.5}$ is calculated according to the requirements of the standard, which uses the three-year rolling average of the 98th percentile of the 24-hour observations. Data are taken from the Thunder Bay Station, where data are available. Where data are not available, data were taken from the Winnipeg Station.

SPM and $PM_{10}$ concentrations are derived from $PM_{2.5}$ monitored data.

µg/m³ = microgram per cubic metre; m = metre; SPM = Suspended Particulate Matter <44 µm; $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 µm in diameter; $NO_2$ = nitrogen dioxide; $SO_2$ = sulphur dioxide; CO = carbon monoxide.

The screening assessment indicates that predicted concentrations from Project activities of indicator compounds are below the relevant Project criteria (i.e., the lowest applicable criteria) within approximately 100 m of the 46 m wide transmission line ROW. Predicted concentrations from Project activities were added to background data, where available, and summarized in Table 6.7-20. Predicted concentrations from Project activities in combination with background air quality are below the relevant criteria within approximately 300 m of the 46 m wide transmission line ROW after effective implementation of standard mitigation measures.

**Table 6.7-20: Predicted Air Quality Concentrations (Including Background) at Increasing Distance from Right-of-Way**

| CAC (µg/m³) | Averaging Period | Relevant Project Criteria | Distance from Right-of-Way (m) 50 | Distance from Right-of-Way (m) 100 | Distance from Right-of-Way (m) 200 | Distance from Right-of-Way (m) 300 | Distance from Right-of-Way (m) 400 | Distance from Right-of-Way (m) 500 | Distance from Right-of-Way (m) 1,000 | Distance from Right-of-Way (m) 1,500 | Distance from Right-of-Way (m) 2,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPM | 24-Hour | 120 | 111.45 | 88.25 | 72.12 | 65.44 | 61.68 | 59.22 | 53.65 | 51.50 | 50.37 |
| SPM | Annual | 60 | 31.78 | 26.10 | 22.47 | 21.05 | 20.29 | 19.82 | 18.83 | 18.48 | 18.31 |
| $PM_{10}$ | 24-Hour | 50 | 43.03 | 36.05 | 31.19 | 29.19 | 28.05 | 27.32 | 25.64 | 24.99 | 24.65 |
| $PM_{2.5}$ | 24-Hour | 27 | 17.72 | 16.48 | 15.62 | 15.26 | 15.06 | 14.93 | 14.63 | 14.51 | 14.45 |
| $PM_{2.5}$ | Annual | 8.8 | 6.12 | 5.82 | 5.63 | 5.55 | 5.51 | 5.48 | 5.43 | 5.41 | 5.40 |
| $NO_2$ | 1-Hour | 79/400 | 134.56 | 105.24 | 84.39 | 77.64 | 74.72 | 71.42 | 63.36 | 60.53 | 59.74 |
| $NO_2$ | 24-Hour | 200 | 30.34 | 27.91 | 26.34 | 25.74 | 25.41 | 25.21 | 24.78 | 24.63 | 24.56 |
| $NO_2$ | Annual | 22.5 | 13.36 | 13.36 | 13.36 | 13.36 | 13.36 | 13.36 | 13.36 | 13.36 | 13.36 |
| $SO_2$ | 10-minute | 175 | 11.02 | 11.01 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 10.99 | 10.99 |
| $SO_2$ | 1-Hour | 106 | 6.81 | 6.76 | 6.72 | 6.70 | 6.70 | 6.69 | 6.68 | 6.67 | 6.67 |
| $SO_2$ | Annual | 10.6 | 2.64 | 2.64 | 2.63 | 2.63 | 2.63 | 2.63 | 2.63 | 2.63 | 2.63 |
| CO | 1-Hour | 35,000 | 433.17 | 430.69 | 428.94 | 428.37 | 428.12 | 427.84 | 427.16 | 426.92 | 426.86 |
| CO | 8-hour | 15,000 | 449.23 | 429.44 | 415.37 | 410.81 | 408.84 | 406.62 | 401.18 | 399.26 | 398.73 |

1-hour, 8-hour and 24-hour values are based on $90^{th}$ percentile, while annual values are averaged over the five annual values available in the period. Data are taken from the Thunder Bay Station, where data are available. Where data are not available, data were taken from the Winnipeg Station.

SPM and $PM_{10}$ concentrations are derived from $PM_{2.5}$ monitored data.

µg/m³ = microgram per cubic metre; m = metre; SPM = Suspended Particulate Matter <44 µm; $PM_{10}$ = particles nominally smaller than 10 µm in diameter; $PM_{2.5}$ = particles nominally smaller than 2.5 µm in diameter; $NO_2$ = nitrogen dioxide; $SO_2$ = sulphur dioxide; CO = carbon monoxide.

A conservative screening assessment was completed to assess potential effects on air quality. In Ontario, there are no applicable regulatory limits for air quality emissions from construction activities. Therefore, predicted concentrations were assessed against the Project indicators that provide an indicator of good air quality. The results of the screening assessment indicate that predicted concentrations from Project activities, and predicted concentrations from Project activities in combination with background air quality for indicator compounds, are below the relevant regulatory criteria within approximately 50 m of the Project footprint for assessed averaging periods, with the exception of $NO_2$ over a 1 hour averaging period. Predicted concentrations of $NO_2$ over a 1 hour averaging period are greater than the Project Indicator (CAAQS) within 50 m of the ROW, however when combined with background air quality, the predicted concentrations are greater than the Project Indicator at distances up to 300 m from the ROW. It should be noted however, that the CAAQS are not regulatory criteria and represent an indicator of good air quality. The Ontario AAQC over the same averaging period is over four times greater than the CAAQS and is also not a regulatory value but is protective against adverse effects on health and/or the environment (MECP 2020). Predicted concentrations of $NO_2$ over a 1-hour averaging period are below the Ontario AAQC within 50 m of the ROW both with and without the inclusion of background air quality concentrations. Furthermore, this assessment is considered to be conservative as it considers consistent operation of all equipment within the 5 km stretch of construction activities. In reality, not all equipment would be operated concurrently within the same area, it is likely to be more spread out with multiple areas of the Project being constructed simultaneously and idling will be minimised where practical.

A series of potential air sensitive receptors were identified using Ministry of Natural Resources and Forestry (MNRF) Land Information Ontario (LIO) datasets. The MNRF LIO spatial dataset identifies existing structures that include, but are not limited to, dwellings, garages, sheds and barns. These structures have been conservatively considered as sensitive receptors, but it is anticipated that a number of these structures may not qualify as sensitive receptors and would require further verification. In addition, conservation reserves, conservation authority administrative areas, First Nation reserve lands, provincial parks, Ontario trail network segments and Ministry of Health service provider locations were also identified using these datasets and included as potential sensitive receptors. The number of existing potential receptors, within given distances to the Project footprint in the air quality LSA, is summarized in Table 6.7-21.

**Table 6.7-21: Potential Receptors**

| Distances | Number of Potential Receptors |
|---|---|
| Within ROW | 15 |
| 0 to 50 | 689 |
| 50 to 100 m | 542 |
| 100 to 200 m | 507 |
| 200 to 300 m | 355 |
| 300 to 400 m | 311 |

| Distances | Number of Potential Receptors |
|---|---|
| 400 to 500 m | 327 |
| 500 to 1,000 m | 2,114 |
| 1,000 to 1,500 m | 2989 |
| 1,500 m to edge of LSA | 2,981 |
| **Total** | **10,830** |

LSA = local study area; m = metre.

Of the 15 receptors located within the ROW, seven are identified as buildings in the LIO dataset. These buildings are existing structures that include, but are not limited to, dwellings, garages, sheds and barns and would require verification as construction approaches these locations. Verified buildings within the ROW would be removed prior to construction and no longer considered as potential receptors. Of the remaining eight receptors within the ROW, five are sections of trails that are part of Ontario Trail Network (OTN) and the remaining three are areas of land designated as Conservation Reserve or Provincial Park within the MNRF LIO dataset.

Of the receptors located outside of the ROW but within 300 m of the ROW, the majority (over 95%) are identified as buildings. There are also six ministry of health service provider locations, OTN trail crossings and areas of Provincial Parks and Conservation Authority lands. Predicted concentrations of all contaminants (including background) are below the relevant Project Criteria at these locations for all contaminants with the exception of $NO_2$. Predicted concentrations are above the CAAQS of 79 µg/m³ but are significantly below the Ontario AAQC of 400 µg/m³, which is protective against adverse effects on health and/or the environment (MECP 2020).

**Mitigation Measures**

Where reasonable and practicable, vehicles and equipment will be turned off when not in use and will be regularly serviced, maintained, and inspected for leaks. In addition, other dust control practices (e.g., wetting with water or a chemical dust suppressant [i.e., calcium chloride]) will be implemented. Dust-generating activities will be reduced, as practicable, during periods of high wind. Multi-passenger vehicles will be used to transport personnel, where practicable. Additional mitigation measures are also provided in Table 6.7-22.

**Net Effects**

Measurable changes (i.e., net effects) to air quality may occur as a result of activities during the construction stage of the Project. Therefore, this Project environment interaction is carried forward to the net effects characterization (Section 6.7.8).

#### *6.7.7.2 Summary*

Table 6.7-25 provides a summary of the effects assessment, which is based on the previous assessment and the implementation of mitigation measures identified above, and further supplemented in the table below.

**Table 6.7-22: Potential Effects, Mitigation Measures, and Predicted Net Effects for Air Quality**

| Project Component or Activity | Potential Effect | Mitigation Measures[a] | Net Effect |
|---|---|---|---|
| **Project activities during the construction stage:**<br>• 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, aggregate pits and temporary construction camps);<br>• Operation of vehicles and construction equipment; and<br>• Decommissioning and reclamation of the decommissioned access roads, temporary laydown areas, and construction camps. | Changes in CAC and fugitive dust emissions from construction activities | • Where reasonable, 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.<br>• Vehicles and equipment will be regularly serviced, maintained and inspected for leaks.<br>• Obey all speed limits to limit fugitive dust.<br>• Slash pile burning will be subject to permits and approvals by appropriate regulatory agencies.<br>• Slash piles will be burned in compliance with O. Reg. 207/96.<br>• Dust control practices (e.g., wetting with water) will be implemented at work sites and on access roads near residential areas or other areas as appropriate.<br>• Minimize dust-generating activities, as practicable and where required, during periods of high wind to limit dust emissions and spread.<br>• Minimize vehicular traffic to exposed soils and stabilize high traffic areas with suitable cover material.<br>• Restore disturbed areas as soon as reasonably possible to minimize duration of soil exposure.<br>• Multi-passenger vehicles will be used to transport personnel, where practicable.<br>• Hydro One or its contractor(s) will prepare and implement a Dust Control/Air Quality Plan prior to construction. | Net changes in CAC and fugitive dust ambient conditions during construction activities |

a) As described in Section 6.7.4.1, the construction scenario assessed as part of the EA is considered bounding. Mitigation identified for the construction stage will be applied for other phases of the Project lifecycle as appropriate.

## 6.7.8 Net Effects Characterization

### *6.7.8.1 Net Effects Characterization Approach*

The effects assessment approach followed the general process described in Section 5.0.

Net effects are described using the significance factors identified in Table 5.6-2. Effects levels are defined for the magnitude of effects characteristics for air quality in Table 6.7-23.

**Table 6.7-23: Magnitude Effect Levels for Air Quality**

| Indicator / Net Effect | Negligible Magnitude | Low Magnitude | Moderate Magnitude | High Magnitude |
|---|---|---|---|---|
| Change in CAC and fugitive dust ambient conditions during construction activities | Maximum predicted concentration (including background) is less than 10% of Project Criteria | Maximum predicted concentration (including background) is between 10% and 50% of Project Criteria | Maximum predicted concentration (including background) is between 50% and 100% of Project Criteria | Maximum predicted concentration (including background) is greater than 100% of Project Criteria |

a) An effect that poses a management concern may require actions such as research, monitoring or recovery initiatives.

### *6.7.8.2 Net Effects Characterization*

A summary of the characterization of net effects of the Project on air quality is provided in Table 6.7-24. Net effects are described after the implementation of effective mitigation measures, and summarized according to direct/indirect, direction, magnitude, geographic extent, duration/reversibility, frequency, and probability of the effect occurring following the methods described in Section 5.6. Effective implementation of mitigation measures summarized in Table 6.7-22 and Section 6.7.7.1.2 is expected to reduce the magnitude and duration of net effects on air quality.

### *6.7.8.3 Net Change in Criteria Air Contaminants and Fugitive Dust Ambient Conditions*

Construction activities associated with the Project have the potential to have a direct negative effect that will temporarily affect local air quality in the immediate vicinity of the Project. Potential effects associated with construction are anticipated to be minimal due to their short duration and intermittent frequency. As a result, construction emissions are unlikely to have a long-term effect on local air quality.

The predicted net effects to air quality were characterized using the significance factors described in Section 5.6.4, as follows:

- Direction will be negative as there will be an adverse effect.

- Magnitude of the effect is assessed as moderate to high within 300 m of the Project footprint because predicted concentrations from air quality modelling may be greater than Project Criteria, which are typically used as an indicator of good air quality. However, receptors located within this distance will be verified in advance of construction and administrative controls will be undertaken to minimize simultaneous construction within a 5 km radius.

- Geographic extent will be local because the effect is expected to be confined to the LSA with air quality impacts from the Project generally confined to within 500 m, but may occur outside of the Project footprint.

- Duration is short-term because the effect will occur during construction and/or operation and maintenance, and persist for the duration of the activity, but will be reversible.

- Frequency will be frequent (or periodic) during construction when the effect is expected to occur intermittently, though it is likely to be infrequent during operation and maintenance.

- Likelihood of occurrence is possible because the likelihood of all construction equipment operating simultaneously within a 5 km stretch, within 300 m of sensitive receptors during “worst case” meteorological conditions, when the wind is blowing towards the receptors and during conditions which result in the $90^{th}$ percentile of background air quality concentrations is possible but not likely.

**Table 6.7-24: Characterization of Predicted Net Effects for Air Quality**

| Criteria | Indicators | Net Effect | Direct/ Indirect | Direction | Magnitude | Geographic Extent | Duration/ Reversibility | Frequency | Likelihood of Occurrence | Significance Determination |
|---|---|---|---|---|---|---|---|---|---|---|
| Air Quality | • Change to ambient criteria air contaminants and fugitive dust in the study area, including:<br>• SPM<br>• $PM_{10}$ and $PM_{2.5}$<br>• CO<br>• $NO_2$<br>• $SO_2$ | Net change in CAC and fugitive dust ambient conditions during construction activities | Direct | Negative | Moderate to High | Local - LSA | Short-term – reversible | Frequent | Possible | Not Significant |

## 6.7.9 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 raised by Indigenous communities, government officials and agencies, and interested persons and organizations during consultation and engagement and through review comments on the EA report. Net effects to a criterion would be considered significant if the majority of the net effects for its indicators are assessed as high magnitude, long-term or permanent in duration, at any geographic extent, and represent a management concern.

Implementation of proven mitigation measures is expected to avoid or reduce the magnitude and duration of net effects on air quality.

- The magnitude of the predicted net effect on air quality is predicted to be moderate to high as (maximum predicted concentration [including background] is between 50% and 100% of Project Criteria).
- The geographic extent of the predicted net effect is expected to be local.
- The duration of the predicted net effect is predicted to be short-term and reversible.
- The predicted net effect on air quality 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 result in changes that are within provincial and federal guidelines.

Therefore, the predicted net effect on air quality is assessed as not significant.

## 6.7.10 Cumulative Effects Assessment

In addition to assessing the net environmental effects of the Project itself, the assessment also evaluates the significance of the net and cumulative effects from the Project that overlap temporally and spatially with effects from all other past, present and reasonably foreseeable development and activities. Importantly, not all net effects from the Project on air quality may require an assessment of cumulative effects. The factors used to determine if a net effect should be carried forward for further analysis in the cumulative effects assessment are outlined in Section 5.7.

Based on these factors, the magnitude of the net effect for air quality was predicted to be moderate to high for receptors within 300 m of the Project footprint; however, the likelihood of occurrence of the effect is considered possible (the effect may occur but is not likely) based on mitigation and conservatism in the assessment. As set out in the approach presented in Section 5.7, net effects assessed as ‘possible’ are not considered likely to contribute to cumulative effects and are not carried forward to the cumulative effects assessment.

Considered with the limited geographic extent of the net effect, short duration, intermittent frequency and the evaluated likelihood of occurrence, the predicted net effect on air quality is assessed as not significant. Therefore, a cumulative effects assessment was not completed for this net effect.

### 6.7.11 Monitoring

This section identifies recommended monitoring to verify the accuracy of the prediction of the effects assessment and to verify the effectiveness of the mitigation measures to evaluate whether the Project has been constructed, implemented, and operated in accordance with the commitments made in the EA Report.

If the construction activities (e.g., clearing, foundations, structure assembly, structure erection and stringing) are being undertaken within 300 m of a confirmed occupied residence, Hydro One will assess the construction schedule, environmental conditions, and season and evaluate the need for monitoring. Monitoring will be undertaken when these emission-generating activities have the potential to impact the receptor.

### 6.7.12 Prediction Confidence in the Assessment

The confidence in the effects assessment for air quality is high.

For the purposes of the EA, sufficient information was available from the NAPS database to understand the existing conditions and assess the potential effects of the Project on air quality.

Uncertainty in the assessment has been further reduced by making conservative assumptions in the calculation and modelling methodologies used in the screening assessment, implementation of known and effective mitigation measures and available best management practices, and measures to address unforeseen circumstances should they arise.

For the calculations, it was assumed that equipment was operating at the same time, in the same representative, 5 km segment of the 46 m wide transmission line ROW. Additionally, for fugitive dust and material handling, a lower control efficiency factor than what is likely to be achieved in practice was selected to increase conservatism. For these reasons, it is highly likely that the emission estimates for the Project are overestimated. As well, Project activities were modelled as a series of volume sources. Modelling the emissions as volume sources is conservative since this model source type does not take advantage of favourable dispersion characteristics such as plume buoyancy and initial exit velocity of emissions from point sources. Further, the dispersion modelling source dimensions selected for the volume source result in a dispersion modelling source that is smaller than the corresponding real-life source. This is conservative since estimated emissions occur over a smaller area, and thus, are more concentrated (and therefore less dispersed) at the point of release. With this approach, it is assumed that the maximum concentrations from each activity would occur in the same location, which is unlikely given that the activities will likely be more spread out. Again, the results of the assessment are likely to overestimate the effects of the Project on air quality in the LSA given the conservative approach of the assessment described above.

It is expected that the conservative emission rates, when combined with the conservative operating conditions and conservative dispersion modelling assumptions description herein, are not likely to under-predict the modelled concentrations.

Furthermore, confidence in the effects assessment for air quality is high considering that the mitigation measures described in Table 6.7-22 are based on accepted and proven best management practices that are well understood and have been applied to transmission line projects throughout North America. In particular, as the best management practices for dust control are revised through continuous improvements, the emissions from construction are likely to decrease even further.

## 6.7.13 Information Passed on to Other Components

Results of the air quality assessment were reviewed and incorporated into the following:

- Surface water (Section 6.2);
- Vegetation and wetlands (Section 6.4);
- Wildlife and wildlife habitat (Section 6.5);
- Land and resource use (Section 7.1);
- Community well-being (Section 7.2);
- First Nations rights, interests, and use of land and resources (Section 7.7); and
- Métis rights, interests, and use of land and resources (Section 7.8).

## 6.7.14 Criteria Summary

Table 6.7-25 presents a summary of the assessment results for air quality by criteria.

**Table 6.7-25: Air Quality Assessment Summary**

| Criteria | Assessment Summary |
|---|---|
| Air quality | • Net effects are assessed to be not significant.<br>• The Project is not predicted to contribute to cumulative effects. |

**hydroone.com**