Appendix N AIR QUALITY ASSESSMENT

Bass Pro Mills Drive Extension Municipal Class Environmental Assessment Air Quality Impact Assessment Report

FINAL REPORT

March 15, 2022

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Prepared for:

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Limitations and Sign-off

This document entitled Bass Pro Mills Drive Extension Municipal Class Environmental Assessment Air Quality Impact Assessment Report was prepared by Stantec Consulting Ltd. ("Stantec") for the account of The City of Vaughan (the "Client") to support the regulatory review process for its Municipal Class Environmental Assessment (the "Application") for the Bass Pro Mills Drive Extension (the "Project"). In connection therewith, this document may be reviewed and used by the Ontario Ministry of the Environment, Conservation and Parks participating in the review process in the normal course of its duties. Except as set forth in the previous sentence, any reliance on this document by any other party or use of it for any other purpose is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The information and conclusions in the document are based on the conditions existing at the time the document was published and does not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by the Client or others, unless expressly stated otherwise in the document. Any use which another party makes of this document is the responsibility and risk of such party. Such party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other party as a result of decisions made or actions taken based on this document.

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Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by the City of Vaughan to conduct a Municipal Class Environmental Assessment for the extension of Bass Pro Mills Drive westerly from the Highway 400 to Weston Road (the Project). The distance of the extension is approximately 0.57 km. The extension of Bass Pro Mills Drive is a key initiative to expand and extend the existing transportation network to improve mobility and support future growth and development in the area. The Vaughan Mills Center Secondary Plan (VMCSP, 2014) recommends the extension of Bass Pro Mills Drive to help distribute east-west traffic, alleviating Rutherford Road to the north, and provide another route connection for York Region Transit (YRT).

The Study Area for this Air Quality Assessment encompasses the Project footprint and the land in a 500 m radius of its boundaries. The objective of this study is to characterize existing air pollutant emissions (2020) and predict air quality effects within the Study Area after implementation of the Project in the future build (2031) scenario. Predicted future emissions and effects with Project implementation (Future Build) are compared to existing emissions (Baseline), and to the predicted future emissions and effects without implementation of the Project (Future No-Build). Changes in greenhouse gas (GHG) emissions are also assessed in this study. This study has been completed following relevant guidance from the MTO Guide (MTO, 2020).

The contaminants of interest (COIs) selected for this study are based on the most relevant transportation-related contaminants listed in the MTO Guide (MTO, 2020) and include nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter with diameter less than 10 micrometres (PM_{10}), particulate matter with diameter less than 2.5 micrometres ($PM_{2.5}$), acrolein, benzene, 1,3-butadiene, benzo(a)pyrene (B(a)P), acetaldehyde and formaldehyde. Greenhouse gas (GHG) emissions in the form of CO_2e were also quantified.

Baseline ambient air quality conditions were characterized from historical data obtained from the National Air Pollution Surveillance Network and the Ministry of the Environment, Conservation and Parks for nearby stations to the Study Area.

US EPA's Motor Vehicle Emission Simulator (MOVES) model (US EPA MOVES3) was used to estimate current and future emissions rates from motor vehicles. The US EPA dispersion model AERMOD was used to predict the maximum 1-hour, 8-hour, 24-hour and annual average ground level concentrations at sensitive receptors for the following three scenarios:

- 2020 – Baseline scenario – existing traffic conditions in 2020 within the Study Area
- 2031 – Future No Build – future traffic conditions in 2031 without the extension of Bass Pro Mills Drive
- 2031 – Future Build – future traffic conditions in 2031 with the extension of Bass Pro Mills Drive from Highway 400 South loop on-ramp to Weston Road

The predicted ambient air quality results for each scenario were compared against relevant Ambient Air Quality Criteria (AAQC) and Canadian Ambient Air Quality Standards (CAAQS) while GHG emissions were compared to National and Provincial totals for 2019 and 2030 emissions targets. The following conclusions were made from the air quality and greenhouse gas impact assessment:

Operation Phase - Project Alone

- Maximum predicted Project alone ground level concentrations (GLCs) of COIs other than benzo(a)pyrene (B(a)P) are below their relevant AAQC at all special receptors for all assessed scenarios.

- The Project Alone maximum 24-hour and annual average GLCs of B(a)P for all assessed scenarios are predicted to exceed their respective AAQCs, with the exception of the 24-hour GLC for the Future No Build scenario. The maximum predicted concentrations are 7 times the 24-hour AAQC and 9 times the annual average AAQC for Baseline. However, the maximum concentrations are predicted to decrease by approximately 80% for the future scenarios compared with Baseline. For future scenarios, the maximum predicted concentrations are 99% (Future No Build) and 136% (Future Build) of the 24-hour AAQC, and 138% (Future No Build) and 191% (Future Build) of the annual AAQC. At a sensitive receptor where the exceedance occurs, B(a)P concentrations from the Project alone were predicted to potentially exceed the 24-hour AAQC by no more than 2 hours in a 5-year period (less than 0.11%) for Future No Build, and no more than 30 hours in a 5-year period (less than 1.6% of the time) for Future Build.

Operation Phase - Cumulative (Project Plus Background Levels)

- Maximum predicted cumulative concentrations for CO, 1, 3 butadiene, formaldehyde, acetaldehyde and acrolein are below their relevant AAQC and/or CAAQS at all special receptors for all assessed scenarios.

- The air quality assessment has identified that exceedances of daily average PM_{10}, and annual average $PM_{2.5}$ may occur for the Project when background air quality levels are added to Project alone predictions. Annual cumulative benzene is also predicted to exceed its AAQC; however, background benzene levels are above the annual criterion with the Project having a negligible contribution to ambient levels. The maximum predicted Project alone and the background concentrations for these contaminants are compared with their respective AAQC or CAAQS and presented in Figure ES.1 below. The figure presents the Project alone, background and cumulative predictions as a percentage of the relative criteria for the three scenarios.

- Exceedances above the 2025 CAAQS were also predicted for hourly and annual average NO_2. However, it should be noted that the AAQC is currently used by the MECP and the NO_2 CAAQS has not been adopted by Ontario. The predicted cumulative NO_2 concentrations for all scenarios are well below the 1-hour and 24-hour AAQCs (between 28% and 34% of their respective AAQCs). The CAAQS is intended as a long-term, Canada-wide air quality objective. Figure ES.1 presents a comparison of maximum predicted hourly NO_2 concentrations compared with both the AAQC and 2025 CAAQS, as well as annual average NO_2 compared with the 2025 CAAQS.

- Maximum predicted cumulative concentrations of B(a)P exceed the daily and annual average AAQC for all scenarios. Background levels are the major contributor to the cumulative exceedances, with the background concentrations alone being more than 2 times and 8 times of the daily and annual average AAQCs, respectively.
- Measured concentrations of benzene, $PM_{2.5}$, and NO_2 across Ontario have shown decreasing trends between 2009 and 2018 (MECP, 2021). It is likely that background levels of these contaminants will continue to improve in the future and therefore the background concentrations used in the assessment are conservative.
- The addition of background levels as cumulative results in the analysis is conservative as the emission impact from the existing traffic is expected to be included in the background level (i.e., existing traffic emissions is part of ambient air quality measurements used for background).
- Although the Project may lead to minor increases of air contaminant concentrations (when compared with Future No Build) at the sensitive receptors within the Study Area of the Project, implementation of the Project is expected to improve the future traffic flow and smoothness (less congestion than the Future No Build scenario) in the local road network and minimize the impact on air quality.

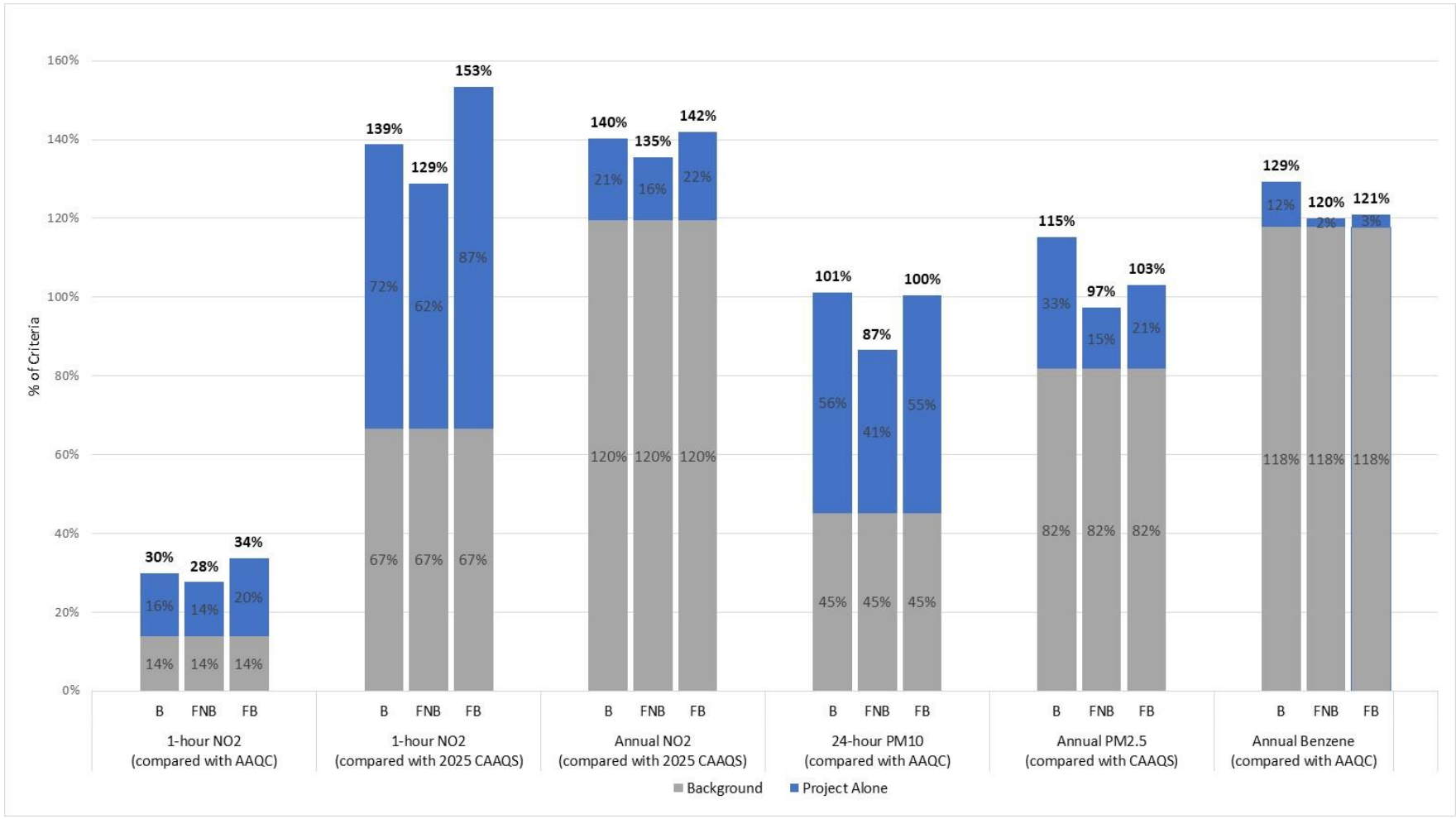
Construction Phase

- During Project construction, best management practices should be followed to minimize emissions. With implementation of proper mitigation measures, emissions from the construction phase and resulting adverse changes in local air quality can be controlled and reduced.

Greenhouse Gas

- Releases of GHGs from the Project are expected to be insignificant in comparison to the 2019 Canada and Ontario totals and the 2030 emissions targets.

Figure ES.1 Comparison with Air Quality Criteria - Select Contaminants



Legend: B – Baseline Scenario (2020) FNB – Future No Build Scenario (2031) FB – Future Build Scenario (2031)

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Abbreviations

ADT	Average Daily Traffic
AAQC	Ambient Air Quality Criteria
ADMGO	Air Dispersion Modelling Guideline for Ontario
AP-42	U.S. Environmental Protection Agency Compilation of Air Pollution Emission Estimation Factors Document
CAAQS	Canadian Ambient Air Quality Standards
CAC	Criteria Air Contaminants
CAS	Chemical Abstracts Service
CCME	Canadian Council of Ministers of the Environment
COIs	Contaminants of Interest
ECCC	Environment and Climate Change Canada
EA	Environmental Assessment
EPA	*Environmental Protection Act*
GHG	Greenhouse gas
GLC	Ground Level Concentrations
GWP	Global Warming Potential
Max	Maximum
MECP	Ontario Ministry of the Environment, Conservation and Parks
MTO	Ministry of Transportation
N/A	Not Applicable
NAPS	National Air Pollution Surveillance
NEMI	Northeastern Manitoulin and the Islands
O. Reg.	Ontario Regulation
Stantec	Stantec Consulting Ltd.
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VMT	Vehicle Mile Travelled
UNITS OF MEASUREMENT	
cm	centimetre
km	kilometre
m	metre

mm	millimetre	
Mass/Weight		
Re. Orders of Magnitude: x 10^2 = x 100, x10^3 = x 1000, etc.		
g	gram	
mg	milligrams	1 x 10^{-3} grams
µg	microgram	1 x 10^{-6} grams
pg	picrogram	1 x 10^{-12} grams
kg	kilogram	1 x 10^3 g
Mg	Megagram	1 x 10^6 g
t	metric tonne	1 x 10^3 kg
lb	pound	1 lb = 453.592 grams
Concentration		
ppm	parts per million	
µg/m^3	micrograms per cubic metre	
Temperature		
°C	degrees Celsius	
Speed		
km/h	kilometres per hour	
Time		
s	second	
hr	hour	
y	year	
Compounds		
B(a)P	Benzo(a)pyrene	
CH_4	Methane	
CO	Carbon Monoxide	
CO_2e	Carbon Dioxide Equivalent	
THC	Total Hydrocarbons	
N_2O	Nitrous Oxide	
NO_x	Nitrogen Oxides	
NO_2	Nitrogen Dioxide	
NO	Nitric Oxide	
O_3	Ozone	
PAH	Polycyclic Aromatic Hydrocarbon	

PM_{10}	Particulate Matter smaller than 10 microns
$PM_{2.5}$	Particulate Matter smaller than 2.5 microns
VOC	Volatile Organic Compounds

Glossary

Air Contaminant Emissions	For stationary or mobile sources, the release or discharge of a pollutant (i.e., air contaminant) from a facility or operation into the ambient air either by means of a stack, vent or as a fugitive dust, mist or vapour.
Canadian Council of Ministers of the Environment (CCME)	A council made up of environmental ministers from provincial and federal levels of government that proposes nationally consistent environmental standards and objectives to achieve high levels of environmental quality for waste management, air pollution, and toxic chemicals across Canada.
Carbon Monoxide (CO)	A colourless, odourless gas produced by incomplete fossil fuel combustion.
Combustion Product	Substance produced during the burning or oxidation of a material.
Combustion	1. Burning, or rapid oxidation, accompanied by the release of energy in the form of heat and light. 2. Refers to controlled burning of waste, in which heat chemically alters organic compounds, converting into stable compounds such as carbon dioxide and water.
Concentration	In air quality, concentration is defined as the abundance (mass or volume) of a substance suspended in a unit volume of ambient air.
Dust	A term used to describe particles of a solid or liquid that are suspended in air. Also referred to as particulate or suspended particulate.
Mitigation	Measures taken to reduce adverse effects on the environment.
Monitoring	Periodic or continuous surveillance or testing to determine the characteristics of a substance or the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.
Particulate	A particle of a solid or liquid that is suspended in air.
Particulate Matter	A particle in solid or liquid phase that is suspended in air.
Pollutant	Generally, any substance introduced into the environment that can adversely affect the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution	Generally, the presence of a substance in the environment that because of its chemical composition or quantity can prevent the functioning of natural processes and produce undesirable environmental and health effects
Receptor	A person, plant or wildlife species that may be affected due to exposure to a contaminant.
United States Environmental Protection Agency AP-42 (US EPA AP-42)	US EPA document Compilation of Air Emission Factors, Volume 1: Stationary Point and Area Sources.

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the City of Vaughan, Ontario to conduct a Municipal Class Environmental Assessment for the extension of Bass Pro Mills Drive westerly to Weston Road (the Project). The current Bass Pro Mills Drive is approximately 1.2 km of road with a loop on-ramp to Highway 400 South. The distance of the extension from the west end of the road to Weston Road is approximately 0.57 km.

The extension of Bass Pro Mills Drive is a key initiative to expand and extend the existing transportation network to improve mobility and support future growth and development in the area. The Vaughan Mills Center Secondary Plan (VMCSP, 2014) recommends the extension of Bass Pro Mills Drive to help distribute east-west traffic, alleviating traffic on Rutherford Road to the north, and provide another route connection for York Region Transit (YRT).

1.1 PROJECT FOOTPRINT AND STUDY AREA

A Study Area has been identified based on the Project footprint and the geographic limits within which the air quality impact is assessed. The Project footprint encompasses the total area potentially affected by the extent of proposed design and physical works of the Project.

Per the *Ministry of Transportation Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects* (MTO Guide) (MTO 2020), transportation related impacts are expected to be limited to the area within approximately 500 m surrounding a project. For the purpose of this report, the Study Area for the air quality assessment encompasses the Project footprint and the land in a 500 m radius of its boundaries. The Project footprint and Study Area are shown in Figure 1.1.

Stantec

Legend

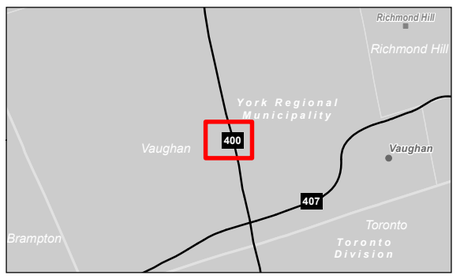
- Project Footprint
- Study Area
- Watercourse (Permanent)

0 150 300 450 m

1:7,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © First Base Solutions, 2021, imagery date 2020.



Project Location
City of Vaughan

160540006 REV4
Prepared by BCC on 2022-01-31
Technical Review by TD on 2021-06-23

Client/Project
CITY OF VAUGHAN
BASS PRO MILLS DRIVE EXTENSION

Figure No.
1.1

Title
Project Footprint and Study Area

1.2 STUDY OBJECTIVES

The objective of this study is to characterize existing Baseline ambient air quality (2020) and to predict the potential impacts on air quality within the Study Area associated with the Project activities. This is done by considering the implementation of the Project in the Future Build scenario (i.e., in 2031) and comparing this to the predicted future emissions and effects without implementation of the Project (in 2031) referred to as the Future No-Build scenario.

Changes in greenhouse gas (GHG) emissions are also assessed in this study.

This study has been completed following guidance from the MTO Guide (MTO, 2020).

1.3 PROJECT DESCRIPTION

Bass Pro Mills Drive is currently a two-lane arterial road running in an east-west direction, located just south of the Vaughan Mills shopping mall. It is bound by Romina Drive to the east and Highway 400 to the west and has a single on ramp to access Highway 400 South. Bass Pro Mills Drive can also be accessed from Highway 400 North via an off ramp. The current development to the east of Weston Road is mainly commercial/industrial or undeveloped land. To the west of Weston Road are established residential developments.

The Vaughan Mills Center Secondary Plan (VMCSP, 2014) recommends the extension of Bass Pro Mills Drive westerly to Weston Road. This would service the area for future development and help alleviate traffic in the area, as well as provide another route connection for York Region Transit and tie into the planned network for active transportation. The Preliminary Preferred Design for the Project is provided in Appendix A.

2.0 METHODOLOGY

2.1 OVERVIEW

The potential impacts of the Project activities on air quality were assessed by conducting dispersion modelling to predict the downwind concentrations of the most relevant transportation-related air contaminants and comparing these predictions to regulatory criteria and standards.

The assessment of potential air quality impacts related to the Project consisted of the following elements:

- Review the contaminants of interest (COI) for consistency with the MTO Guide.
- Establish background concentrations for each relevant transportation-related air contaminant using representative historical monitoring data from the nearest Ministry of the Environment, Conservation and Parks (MECP) or National Air Pollution Surveillance (NAPS) monitoring station.
- Establish current quantities of greenhouse gas (GHG) released to the atmosphere using published provincial and national GHG emissions data.
- Predict tailpipe emissions using the US EPA Motor Vehicle Emission Simulator (MOVES) and estimate road dust emissions using the US EPA AP-42 calculation methodology for Project operation related traffic.
- Identify critical and representative sensitive receptor locations in the Study Area.
- Predict maximum contaminant concentrations using the US EPA AERMOD atmospheric dispersion model at the critical and sensitive receptors due to emissions from Project-related traffic.
- Estimate cumulative air quality concentrations by combining the maximum predicted concentrations with background air quality concentrations and compare the results relative to the applicable current and future ambient air quality criteria and standards.
- For receptors where the maximum concentration of relevant air contaminants exceeds a criterion or a standard, assess the potential frequency of exceeding the air quality criteria or standard, through a more detailed assessment of the Project-related concentrations.
- Estimate GHG emissions for each operation scenario and compare to the provincial and national GHG emissions levels and targets.
- Qualitatively assess the potential air quality impacts during construction and provide recommendations on construction mitigation measures.

2.2 CONTAMINANTS OF INTEREST

The air contaminant emission sources expected from the Project operation phase are mobile sources that emit combustion gases from burning fossil fuels (e.g., gasoline and diesel) and fugitive dust from road traffic. Combustion emissions depend on the combustion device type (engine type), the fuel composition, the fuel consumption rate and operating time. Fugitive dust emissions are generated by road traffic during the movement of mobile sources (e.g., cars and trucks). The contaminants of interest (COIs) selected for this study are based on the most relevant transportation-related contaminants as listed in the MTO Guide, (MTO, 2020).

2.2.1 Air Quality Contaminants

The expected COIs that would likely be emitted during the Project operation for transportation projects are primarily criteria air contaminants (CACs), volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). The CACs include nitrogen oxides (NO_X), carbon monoxide (CO), particulate matter less than 10 µm in diameter (PM_{10}) and particulate matter less than 2.5 µm in diameter ($PM_{2.5}$) (MTO, 2020).

Nitrogen oxides or NO_x is produced in most combustion processes, consisting of nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen monoxide or NO is a colourless gas with no direct effects on health or vegetation at ambient levels and with no regulatory criteria. NO_2 is the regulated form of NO_x. Particulate effects on human health are primarily associated with PM_{10} and $PM_{2.5}$ as particles of these sizes can become trapped by the upper airways or in the case of $PM_{2.5}$, can make their way deep into the lungs and become lodged.

Total hydrocarbons (THC) and volatile organic compounds (VOCs) constitute two other groupings of COIs for the Project. The key toxic VOCs from fuel combustion processes which are included in the study are benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein. The compliance status of these speciated VOCs can be used as representatives for determination of compliance of other VOCs.

Polycyclic aromatic hydrocarbons (PAHs) is a subset of total hydrocarbons, of which the key representative substance is benzo(a)pyrene (B(a)P) which can be considered as a surrogate of total PAHs.

A summary of the applicable Ontario Ambient Air Quality Criteria (AAQC) and Canadian Ambient Air Quality Standards (CAAQS) used in this study are presented in Table 2.1.

Table 2.1 Summary of Applicable Air Quality Criteria and Standards

COI	CAS	Averaging Period (hours)	Air Quality Criteria/Standard (µg/m^3)	Regulatory Framework
CO	630-08-0	1	36,200	AAQC
		8	15,700	
NO_2	10102-44-0	1	400	AAQC
			119 [A, B]	2020 CAAQS
			83 [A, B]	2025 CAAQS
		24	200	AAQC
		Annual	34 [A, C]	2020 CAAQS
			24 [A, C]	2025 CAAQS
PM_{10}	N/A	24	50 [D]	AAQC
$PM_{2.5}$	N/A	24	27 [E]	2020 CAAQS
		Annual	8.8 [F]	2020 CAAQS
Benzene	71-43-2	24	2.3	AAQC
		Annual	0.45	AAQC
Benzo(a)pyrene [G]	50-32-8	24	0.00005	AAQC
		Annual	0.00001	AAQC
1,3-Butadiene	106-99-0	24	10	AAQC
		Annual	2	AAQC
Formaldehyde	50-00-0	24	65	AAQC
Acetaldehyde	75-07-0	0.5	500	AAQC
		24	500	AAQC
Acrolein	107-02-8	1	4.5	AAQC
		24	0.4	AAQC

Notes:

A. Converted to µg/m^3 assuming 10°C and 760 mmHg, consistent with the approach for converting AAQCs (MTO, 2020).
B. The 3-year average of the annual 98th percentile daily maximum 1-hour average concentrations.
C. The average over a single calendar year of all the 1-hour average concentrations.
D. AAQC for PM_{10} is an interim AAQC provided as a guide for decision-making.
E. The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
F. The 3-year average of the annual average concentrations.
G. As a surrogate of total polycyclic aromatic hydrocarbons (PAHs).

2.2.2 Greenhouse Gases

A greenhouse gas (GHG) is any gas that contributes to potential climate change by trapping heat in the atmosphere. GHGs are known to contribute to warming of the climate, leading to many other changes around the world: in the atmosphere; on land; and in the oceans (IPCC, 2021).

Common GHGs include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Other GHGs include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). HFCs and PFCs are used mainly as refrigerants, SF_6 is commonly found in electrical equipment, and NF_3 is used in the plasma etching of silicon wafers. The Project is expected to emit CO_2, CH_4, and N_2O from the combustion of fuels in vehicles and all three of these GHGs are assessed in this study. The other GHGs, such as HFCs, PFCs, SF_6 and NF_3, are not expected to occur in notable quantities related to the Project. Therefore, these gases are not assessed in this study.

The GHGs absorb heat radiated by the earth and subsequently warm the atmosphere, leading to what is commonly known as the greenhouse effect. The relative measure of how much heat a GHG absorbs in the atmosphere is characterized as the global warming potential (GWP), relative to CO_2. The GWPs of CO_2, CH_4 and N_2O are 1, 25, and 298, respectively, based on Canada's National Inventory Report 1990-2019 (Environment and Climate Change Canada (ECCC, 2020a). Because different GHGs contribute to different extents to the greenhouse effect, the unit of kilotonnes of carbon dioxide equivalent (kt CO_2e) is used to express the total quantity of GHGs. This unit is calculated by multiplying the tonnage emission of each GHG by its global warming potential, then summing the contributions from all relevant GHGs. For this assessment, CO_2e emissions are predicted based on CO_2e emission factors from MOVES2014a.

As identified in guidance provided on assessing climate change in environmental assessments, "the contribution of an individual project to climate change cannot be measured" (Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003). Therefore, evaluation of Project effects will focus on estimation of GHG releases and evaluation of Project GHG releases in relation to provincial (Ontario) and national (Canada) GHG totals.

3.0 EXISTING CONDITIONS

Ambient air quality in the Study Area is primarily influenced by emissions from vehicular traffic. Meteorology and climatology play an important role in air contaminant formation, dispersion and transport. The local meteorology and ambient air quality data are discussed in this section.

3.1 CLIMATE

The following sections describe the general climatology of the Study Area. The climatology is based on 30-year (1981 to 2010) Canadian Climate Normal data obtained from Environment and Climate Change Canada (ECCC) for the Woodbridge meteorological station and the Toronto Lester B. Pearson International Airport. These are the closest stations to the Study Area that contain complete climate normal data.

3.1.1 Temperature

A summary of the daily average, daily maximum and daily minimum temperatures on a monthly basis over the period 1981 to 2010 is presented in Table 3.1. The daily average temperature for the area varies from -6.6°C to 20.8°C with an annual average temperature of 7.6°C.

Table 3.1 Summary of Average Temperature Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Daily Average (°C)	-6.6	-4.8	-0.4	6.6	12.9	18.1	20.8	19.6	15.4	9	3.1	-2.8	7.6
Daily Maximum (°C)	-2.5	-0.5	4.3	12	18.8	24.1	26.9	25.4	20.9	13.9	6.9	0.8	12.6
Daily Minimum (°C)	-10.7	-9.2	-5.2	1.2	6.8	12	14.7	13.8	9.8	4	-0.8	-6.4	2.5

SOURCE: Environment and Climate Change Canada Canadian Climate Normal – Woodbridge meteorological station

3.1.2 Precipitation

A summary of the monthly average rainfall, snowfall, total precipitation (as equivalent rainfall based on a conversion factor for snowfall to equivalent rainfall of 0.1) and average snow depth on a monthly basis over the period 1981 to 2010 is presented in Table 3.2. The annual average total precipitation for the area is about 799.8 millimetres (mm).

Table 3.2 Summary of Average Precipitation Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall [(1)] (mm)	20.4	23.2	31.4	59.6	79.1	76.3	70.4	80.4	84.6	66	71.1	34.6	697
Snowfall [(1)] (cm)	29.9	21.1	17.8	3.7	0	0	0	0	0	0.5	7.2	22.8	102.8
Precipitation [(1)] (mm)	50.3	44.2	49.2	63.3	79.1	76.3	70.4	80.4	84.6	66.5	78.3	57.4	799.8

Note:

[1] SOURCE: Environment and Climate Change Canada Canadian Climate Normal – Woodbridge meteorological station

3.1.3 Humidity

A summary of the average morning and afternoon relative humidity on a monthly basis over the period 1981 to 2010 is presented in Table 3.3. The annual average relative humidity in the morning is 81.3% and in the afternoon is 61.3%.

Table 3.3 Summary of Average Relative Humidity Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Relative Humidity - 0600LST (%)	80.8	79.3	78.1	75.4	77.2	79.8	81.9	85.7	87.4	85.2	83.3	81.8	81.3
Average Relative Humidity - 1500LST (%)	72	68.4	61.4	54.4	53.5	54.9	53.3	55.8	58.5	62.1	69.2	72.5	61.3

SOURCE: Environment and Climate Change Canada Canadian Climate Normal – Toronto Lester B. Pearson International Airport meteorological station

3.1.4 Wind Speed and Direction

The climate normal data with respect to wind speed and directionality are presented in Table 3.4. The annual average wind speed for the area is 15 km/h and the most frequent wind direction, on an annual basis, is wind blowing from the west.

Table 3.4 Summary of Wind Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Speed (km/h)	17.6	17	16.9	16.8	14.4	13.2	12.9	11.9	12.7	14	15.7	16.7	15
Most Frequent Direction (1)	W	W	N	N	N	N	W	N	W	W	W	W	W
Max Hourly Speed (km/h)	77	77	97	81	71	63	61	71	77	92	80	76	97
Max Gust Speed (km/h)	115	105	124	115	109	107	135	115	106	104	122	109	135
Direction of Max Gust [1]	E	W	SW	W	W	W	NW	NE	NW	NW	SW	S	NW

SOURCE: Environment and Climate Change Canada Canadian Climate Normal – Toronto Lester B. Pearson International Airport meteorological station

Note: [1] denotes the direction *from which* the wind is blowing most frequently

3.2 SPECIAL RECEPTORS

The assessment of impacts on air quality is carried out at locations in the Study Area referred to as special receptors. Special receptors are placed (i.e., located) to assess air quality at locations where human activity more regularly takes place. The MTO Guide recommends that the local air quality impacts be studied within a distance of 500 m from a Project at both sensitive (residences) and critical receptors (schools, hospitals, retirement homes, childcare centres, and similar institutional buildings.). Forty-five (45) receptors were identified within the Study Area and include representative residences, schools/ daycares and hotels. These receptors were considered in the assessment. No potential future receptors were identified within the Study Area based on review of zoning maps and land use information for potential future developments (Stantec, 2020).

A list of sensitive and critical receptors and their locations are presented in the table and figure in Appendix B.

3.3 LOCAL AIR QUALITY

3.3.1 Available Published Ambient Monitoring Data

Ambient air quality monitoring has been conducted by the National Air Pollution Surveillance Program (NAPS) operated by ECCC in populated regions of Canada. NAPS was established in 1969 with the goal of the program to provide accurate and long-term air quality data of a uniform standard across Canada. The NAPS program continuously measures the ambient concentrations of NO_2, CO, O_3, and $PM_{2.5}$. The NAPS network data for the most recent five years currently available (2016-2020) at the nearest monitoring stations to the Project were reviewed to establish background air quality concentrations.

Monitoring station data were reviewed considering the proximity of the station to the Study Area, the data completeness, the proximity of the monitoring station to an existing major roadway, having a similar land use to the Study Area, and/or similar population size. These features were considered in the selection of the best monitoring station to represent background concentrations in the Study Area. The NAPS stations that were considered for this study are presented in Table 3.5.

Table 3.5 NAPS Locations Assessed in the Study

NAPS ID	Location	Station Name	COI [A]	Availability of Data
060430	125 Resources Road	Toronto West	CO	2016-2020
			NO_2 , $PM_{2.5}$	2016-2020
			B(a)P	2016-2018[C]
060438	401W – 125 Resources Road	Roadside – 401W – Toronto	B(a)P	2017-2019[D]
			1,3-butadiene, benzene	2017-2020[E]
			formaldehyde, acetaldehyde	2017-2019[D]
			acrolein	2017-2018[F]
060440 [I]	4905 Dufferin Street	Toronto North	CO	2017-2019[D]
			NO_2 , $PM_{2.5}$	2017-2020[E]
			B(a)P	2017-2018[G]
			1,3-butadiene, benzene	2017-2020[H]

Notes:

A. Only contaminants pertinent to this study are listed.
B. Grey shaded data were selected for the study. Non-shaded data were not selected as noted in Notes C and I.
C. No data available for 2019 and 2020. Data availability is less than 75% for 2018.
D. No data available for 2016 and 2020.
E. No data available for 2016.
F. No data available for 2016, 2019 and 2020.
G. No data available for 2016, 2019 and 2020. Data availability is less than 75% for 2018.
H. No data available for 2016. Data availability is less than 75% for 2020.
I. Data from this station was not selected as the Project is located next to a major highway. Data from the other two stations were considered to be more representative.

3.3.2 Background Concentration Levels

Background concentrations are used in dispersion modelling to represent the effect of the existing sources of air contaminants, both anthropogenic and biogenic, in the area. The background values are added to the values predicted from the modelling of the Project emissions to arrive at a total value to be compared against the regulatory thresholds, guidelines or standards. The MTO Guide (MTO, 2020) recommends that the background pollutant concentrations to be used in this analysis are the 90th percentile of the most recently measured and complete concentration data from the nearest MECP or ECCC monitoring stations. The use of 90th percentile levels is to account for spatial and temporal variations between the monitoring location(s) and the Study Area, while still providing a conservative

assessment. The background levels used in this study were therefore the 90th percentile values for short-term averages. For annual averages, an annual average value was used as the background level.

The maximum, minimum, average and 90th percentile concentrations for applicable time periods for each COI are presented in Table 3.6. The following observations were made from the ambient monitoring data:

- The measured maximum 1-hour and 8-hour average CO concentrations at the Toronto West station were well below the applicable 1-hour and 8-hour AAQC of 36,200 µg/m^3 and 15,700 µg/m^3, respectively.
- The measured maximum 1-hour and 24-hour average NO_2 concentrations at the Toronto West station were below the applicable 1-hour and 24-hour AAQC of 400 µg/m^3 and 200 µg/m^3, respectively. However, maximum 1-hour NO_2 concentration exceeds the 2020 CAAQS. The annual average NO_2 concentration is below the current (34 µg/m^3) and above the future (24 µg/m^3) CAAQS.
- Ambient PM_{10} concentrations were estimated based on $PM_{2.5}$ measurements at the Toronto West station using a ratio of $PM_{2.5}$ / PM_{10} = 0.54 (Lall et al 2004). Based on this estimation methodology, the maximum PM_{10} background concentrations exceed the interim PM_{10} AAQC of 50 µg/m^3.
- The maximum measured 24-hour average $PM_{2.5}$ concentration is above the 2020 CAAQS of 27 µg/m^3. The maximum annual average $PM_{2.5}$ concentration is also below the 2020 CAAQS of 8.8 µg/m^3.
- The maximum measured 24-hour concentration for benzene at the Roadside 401W Toronto station was below the 24-hour AAQC. The maximum measured annual average concentration of benzene exceeds the annual average AAQC of 0.45 µg/m^3.
- The maximum measured 24-hour and annual average concentrations of B(a)P at the Roadside 401W Toronto station are above the AAQC.
- The maximum measured 24-hour and annual average 1,3-butadiene concentrations at the Roadside 401W Toronto station were well below the applicable 24-hour and annual average AAQC of 10 µg/m^3 and 2 µg/m^3, respectively.
- The maximum measured 24-hour average formaldehyde concentration at the Roadside 401W Toronto station was below the applicable 24-hour AAQC of 65 µg/m^3.
- The maximum measured 24-hour average acetaldehyde concentration at the Roadside 401W Toronto station was well below the applicable half-hour and 24-hour AAQC of 500 µg/m^3. Since acetaldehyde is not measured for shorter averaging periods, the 24-hour average concentration was converted to a half-hour concentration using the MECP averaging period conversion factor equation per the Air Dispersion Modelling Guideline for Ontario (ADMGO) (MECP, 2017).
- The maximum measured 24-hour average acrolein concentration at the Roadside 401W Toronto station was well below the applicable 1-hour and 24-hour AAQC of 4.5 and 0.4 µg/m^3, respectively. Since acrolein is not measured for shorter averaging periods, the 24-hour average concentration was converted to a 1-hour concentration using the MECP averaging period conversion factor equation (MECP, 2017).

Table 3.6 Summary of COI Background Concentrations

COI	CAS	Averaging Period	Background Concentration (µg/m³)				Air Quality Criteria	Source	% of Criteria [A]
		(hours)	Maximum	Minimum	Mean	90th Percentile	(µg/m³)		
CO	630-08-0	1	2013 [B]	0 [B]	288 [B]	410 [B]	36,200	AAQC	1%
		8	1487 [B]	24 [B]	288 [B]	401 [B]	15,700		3%
NO_2	10102-44-0	1	150 [B]	0 [B]	28 [B]	55 [B]	400	AAQC	14%
							119	2020 CAAQS	-[C]
							83	2025 CAAQS	-[C]
		24	95 [B]	4 [B]	28 [B]	45 [B]	200	AAQC	23%
		Annual	-	-	28 [B]	-	34	2020 CAAQS	84%
							24	2025 CAAQS	120%
PM_{10}	N/A	24	74.9 [E]	0.7 [E]	13.4 [E]	22.6 [E]	50	AAQC	45%
$PM_{2.5}$	N/A	24	40	0	7.2	12.2	27	2020 CAAQS	-[D]
		Annual	-	-	7.2	-	8.8	2020 CAAQS	-[D]
Benzene	71-43-2	24	1.4	0.241	0.53	0.77	2.3	AAQC	34%
		Annual	-	-	0.53	-	0.45	AAQC	119%
Benzo(a)pyrene	50-32-8	24	0.00051	0	8.58E-5	0.00014	0.00005	AAQC	278%
		Annual	-	-	8.58E-5	-	0.00001	AAQC	858%
1,3-Butadiene	106-99-0	24	0.15	0.0160	0.055	0.082	10	AAQC	1%
		Annual	-	-	0.055	-	2	AAQC	3%
Formaldehyde	50-00-0	24	37.5	0.04	2.21	3.1	65	AAQC	5%
Acetaldehyde	75-07-0	0.5	59.4	0.2	6.0	9.3 [F]	500	AAQC	2%
		24	20.1	0	2.03	3.1	500	AAQC	1%
Acrolein	107-02-8	1	0.47	0	0.09	0.20 [F]	4.5	AAQC	4%
		24	0.19	0	0.035	0.082	0.4	AAQC	21%

Notes:

A. Background concentrations compared with criteria. For short term averages, background concentrations used in this study were 90th percentile values. For annual averages, an annual average value was used.

B. The monitoring data were converted to µg/m³ based on a standard temperature of 10°C and pressure of 1 atm.

C. The background hourly NO_2 concentration is not explicitly compared with the CAAQS as the 1-hour CAAQS for NO_2 is referenced to the three-year average of the annual 98th percentile of the daily maximum one-hour average concentrations while the background concentration is the 90th percentile of hourly values, and therefore the calculation basis for these two parameters are inconsistent.

D. Background concentrations of $PM_{2.5}$ are not explicitly compared with the CAAQS as the 24-hour and annual standards are referenced to the 98th percentile daily average concentration averaged over 3 consecutive years, and 3-year average of the annual average concentrations, respectively. The background concentrations are 90th percentile of hourly values and single year annual averages and therefore the calculation basis for these parameters are inconsistent.

E. Background concentrations of PM_{10} are estimated based on a ratio of $PM_{2.5}/PM_{10}$ = 0.54 (Lall et al 2004).

F. Monitoring data are based on 24-hour measurements. The 24-hour background concentration is converted to the appropriate averaging period following guidance in the Air Dispersion Modelling Guideline for Ontario (ADMGO) (MECP, 2017).

3.4 EXISTING GREENHOUSE GAS EMISSIONS

Existing national and provincial GHG emission totals were obtained from Canada's 2020 National Inventory Report (ECCC, 2021) and are provided in Table 3.7. The table also shows the national (ECCC, 2020) and provincial (MECP 2018a) GHG emission reduction targets for 2030.

Table 3.7 National and Provincial GHG Emissions

Year	GHG Emissions (kt CO_2e)	
	Canada	**Ontario**
2014	723,000	164,000
2015	723,000	163,000
2016	707,000	161,000
2017	716,000	158,000
2018	728,000	163,000
2019	730,000	163,000
2030 Target	**401,000**	**143,000**

4.0 EMISSION INVENTORY

The methods and results of the air and GHG emissions estimations are provided in this section for the Baseline year (2020) and Future No Build / Future Build year (2031).

4.1 VEHICLE EMISSIONS

The U.S. EPA Motor Vehicle Emission Simulator (MOVES3) was used to estimate existing and future emissions rates from motor vehicle traffic on local roads (US EPA, 2014). MOVES is the U.S. EPA's tool for estimating vehicle emissions due to the combustion of fuel, brake and tire wear, fuel evaporation, permeation and refueling leaks. It was used to estimate vehicle emissions based on vehicle type, fuel type, road type, model year, and vehicle speed. Average daily traffic (ADT) volumes in the Project footprint Study Area were determined from:

- Existing peak hour traffic volumes for Baseline year (Stantec, 2021a).
- Modelled peak hour traffic volumes for Future No Build and Future Build year (Stantec, 2021b).
- Future ADT volume on the proposed Bass Pro Mills Drive extension was provided by the traffic team (Stantec, 2021c).
- Baseline and future ADT was not available for the other roads. A multiplier of 9 applied to the total of AM and PM peak volumes was used (Stantec, 2021c).
- A vehicle distribution consisting of 90% passenger cars and 10% heavy trucks (Stantec, 2021b) was assumed for the Baseline scenario. A vehicle distribution consisting of 89% passenger cars and 11% heavy trucks (Stantec, 2021c) was assumed for the proposed Bass Pro Mills Drive extension, and 91% passenger cars and 9% heavy trucks (Stantec, 2021b) was assumed for the other roads in the Project footprint for the Future No-Build / Future Build scenarios.

Both ADT and peak hour traffic data were used as inputs to the dispersion model and are provided in Appendix D. A summary of the MOVES input parameters is provided in Table 4.1.

Table 4.1 Summary of MOVES Inputs

Parameter	Input
Scale	Project Domain
Years	2020, 2031
Months	January and July
Meteorology	Toronto and Toronto Lester B. Pearson Int'l A, ON
Source Use Types	Passenger Car Combination Short-haul Truck

Parameter	Input
Vehicle Distribution	Baseline (2020): • Passenger Car – 90% • Combination Short-haul Truck – 10% Future No-Build / Future Build (2031) Proposed Bass Pro Mills Drive Extension • Passenger Car – 89% • Combination Short-haul Truck – 11% Other roads • Passenger Car – 89% • Combination Short-haul Truck – 9%
Fuels	Passenger cars – Gasoline Combination Short-haul Truck – Diesel
Age Distribution	MOVES defaults based on modelling year
Pollutants	CO, NO_2, PM_{10}, $PM_{2.5}$, Benzene, Benzo(a)pyrene, 1,3-Butadiene, Formaldehyde, Acetaldehyde, Acrolein, CO_{2e}
Road Type	Urban Unrestricted Access, Urban Restricted Access
Average Speed	18 to 100 km/hr based on expected travel speeds in the area

Emission factors in grams of pollutant emitted per vehicle mile travelled (g/VMT) for vehicle speeds for the above listed vehicle speeds and vehicle distributions were obtained from MOVES3 and applied to the appropriate links in the dispersion model. Appendix D summarizes the emission factors obtained from MOVES.

4.2 ROAD DUST EMISSIONS

In addition to exhaust, tire wear, brake and evaporative emissions, the re-entrainment of road dust is considered as source of PM_{10} and $PM_{2.5}$ from vehicles travelling over paved roads. Emissions resulting from travel on paved roads were quantified using the US EPA AP-42 Chapter 13.2.1 calculation methodology.

The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicles travelling on the Project roadways were calculated using the equation suggested in AP-42, Section 13.2 (US EPA, 2011):

$$E = K \times (SL)^{0.91} \times (w)^{1.02}$$

Where:

E= particulate emission factor (g/VMT)

sL = road surface silt loading (g/m^2):

AADT < 500: 0.6 g/m^2
AADT between 500 – 5,000: 0.2 g/m^2
AADT between 5,000 – 10,000: 0.06 g/m^2
AADT > 10,000: 0.03 g/m^2

W = average weight (tons) of the vehicles traveling the road:

Passenger cars: 1.8 tons
Heavy Trucks: 20 tons

K = particle size multiplier of 0.25 (g/VMT) for $PM_{2.5}$ and 1 (g/VMT) for PM_{10}.

The particulate resuspension emission factors were calculated from the above equation and aggregated with the emission factors generated from MOVES for $PM_{2.5}$ and PM_{10}.

The MOVES output emission factors and detailed road dust emissions calculations are presented in Appendix D.

4.3 GREENHOUSE GAS EMISSIONS

The estimation of GHG emissions for the Project follows the same methodology described for air contaminant emissions, using MOVES3 to predict CO_2e emission factors with the same model inputs for the Baseline (2020) and Future No Build/Build (2031) scenarios. These emission factors were then used to calculate total emissions in 2020 and 2031 both with and without implementation of the Project. The total emissions for each case were based on each link's emission factor (g/VMT) and the predicted annual vehicle miles travelled (based on the length and ADT of each link). The detailed GHG emissions calculations are provided in Appendix F and are summarized in Table 4.2.

Table 4.2 Project GHG Emissions

Annual GHG Emissions (t CO_2e / year)		
Baseline 2020	**Future 2031**	
	No Build	**Build**
46,826	18,382	23,625

The 2031 Future Build scenario represents a decrease in GHG emissions of approximately 50% compared to the Baseline scenario and a 29% increase compared to the Future No Build scenario. Due to expected improvements in engine technology and cleaner fuels, overall CO_2e emissions per vehicle mile travelled are lower in the future. GHG emissions are higher in the build versus no build scenario due to the increase in traffic in the area with the proposed road extension.

5.0 AIR DISPERSION MODELLING METHODOLOGY

Dispersion modelling of COIs from vehicle traffic travel on local roads was performed for the following assessment scenarios:

- 2020 – Baseline Conditions
- 2031 – Future No Build
- 2031 – Future Build

5.1 DISPERSION MODEL USED

The US EPA AERMOD model Version 19191 was used to predict air quality concentrations at the special receptor locations for all three emission scenarios.

AERMOD is a steady-state plume model that is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including, point, area and volume sources). In the Stable Boundary Layer, the concentration distribution is assumed to be Gaussian in both the vertical and horizontal. Vertical profiles of wind speed wind direction, turbulence temperature, and temperature gradient are estimated using available meteorological observations. AERMOD accounts for the vertical inhomogeneity of the Planetary Boundary Layer (PBL). This is accomplished by “averaging” the parameters of the actual Stable Boundary Layer into “effective” parameters of an equivalent homogeneous PBL. With these effective parameters, AERMOD accounts for the inhomogeneity of the PBL, in an averaged sense.

Parameters that directly influence the dispersion of pollutants include; wind speeds and direction, atmospheric stability and mixing layer depths. High concentrations from low elevated sources, elevated sources with building or topography effects, or virtual sources are typically due to stable atmospheric stability conditions with light winds.

The dispersion model was used to predict maximum 1-hour, 8-hour, 24-hour and annual average ground level concentrations (GLCs) for each COI at the selected receptors for the assessed scenario. The predicted Project Alone concentrations were added to their corresponding background concentrations to estimate cumulative air quality levels at the special and gridded receptors. For COIs with other averaging periods (i.e., 15-minute or half-hour), the predicted 1-hour concentrations were converted to the appropriate averaging period using the MECP recommended conversion factor per Chapter 7 of the MECP’s “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” (MECP, 2018b).

5.2 METEOROLOGICAL DATA SOURCES

The local meteorology of the region must be characterized to evaluate the short-term atmospheric dispersion and transport of emissions released by the Project. The data required to predict dispersion and transport includes: wind speed and direction, temperature, atmospheric stability, and mixing layer depth. Wind and temperature data are readily available from meteorological stations, but atmospheric stability and mixing layer depth are calculated from additional raw meteorological data including upper air soundings, cloud cover and opaque sky cover.

A 5-year (2016-2020) site-specific meteorological data set preprocessed by the MECP (MECP, 2021) was used as input to the dispersion model. The site specific meteorological dataset uses upper air data from Buffalo NY, and surface data from Environment and Climate Change Canada's Toronto Buttonville Airport station.

The frequency distribution of wind speeds from the site-specific meteorological data set is shown in Figure 5.1. High wind speeds greater than 8.8 m/s occur infrequently, while wind speeds between 2.1 – 3.6 m/s occur the most frequently. A wind rose plot is presented in Figure 5.2. Wind roses are an efficient and convenient means of presenting wind data. The length of the radial barbs gives the total percent frequency of winds blowing from the indicated direction, while portions of the barbs of different widths indicate the frequency associated with each wind speed category. Winds blow most frequently from the northwest with westerly directions also being relatively frequent.

Figure 5.1 Wind Class Frequency Distribution - Toronto Buttonville Airport station (2016-2020)

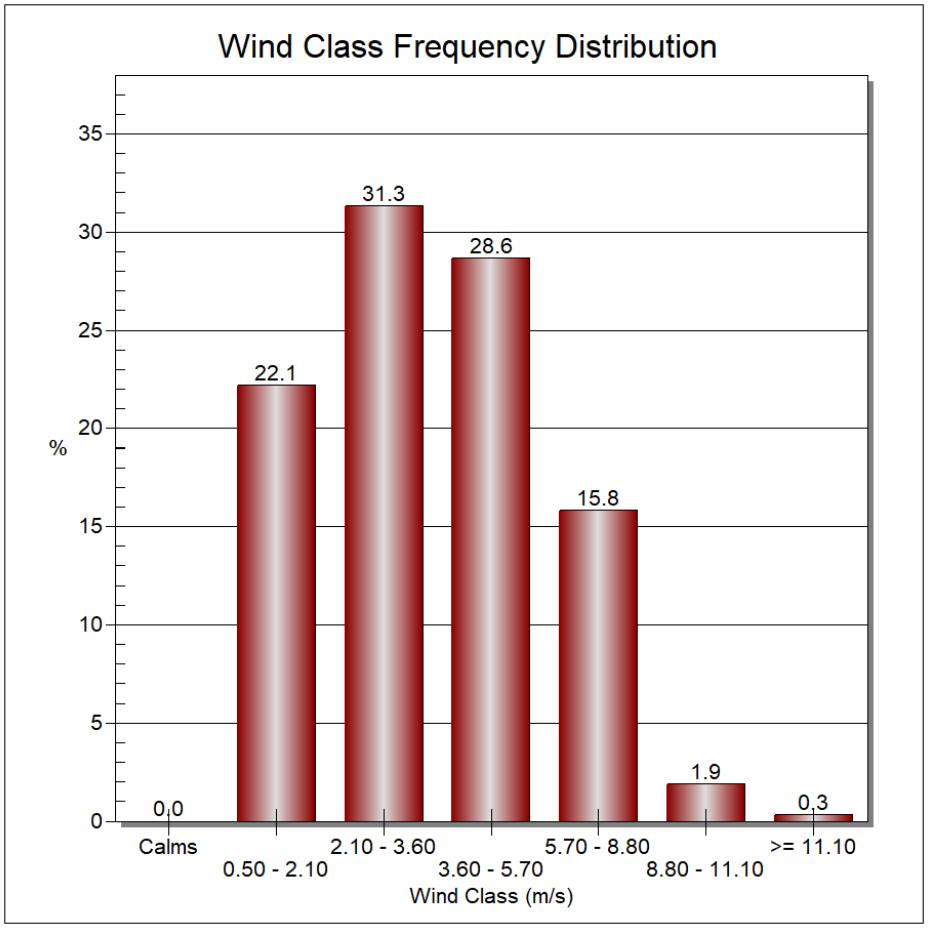
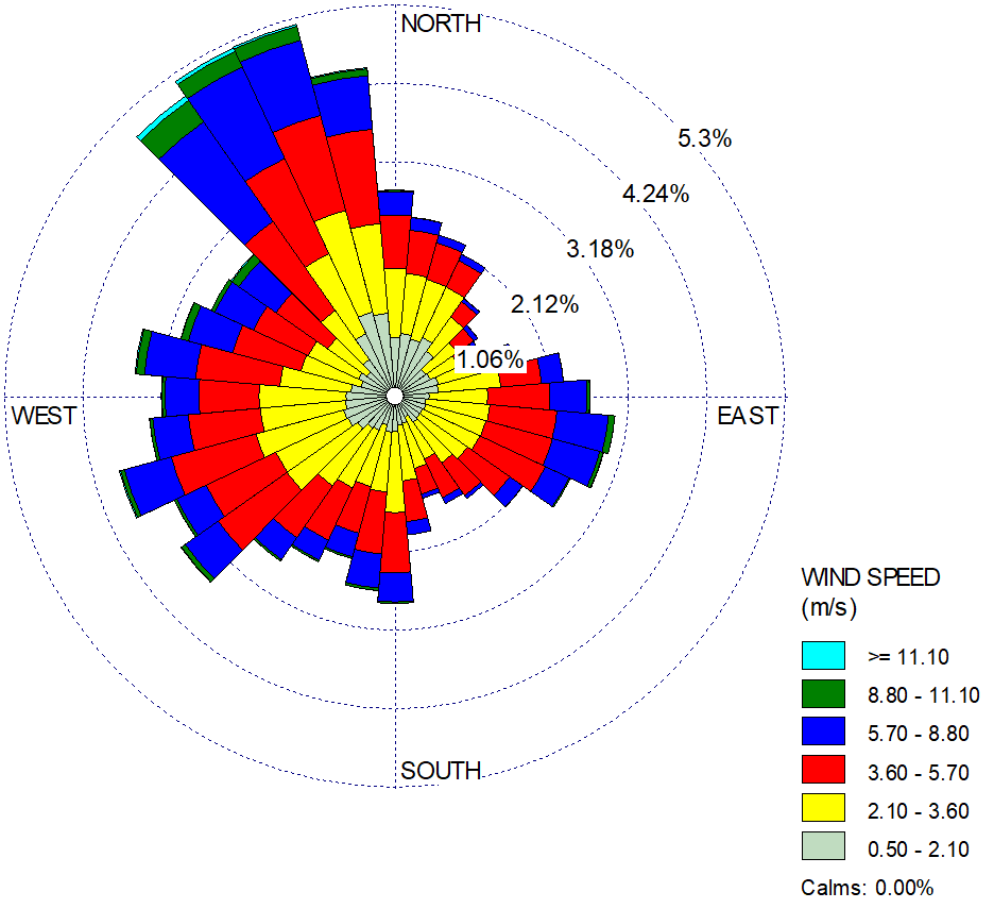


Figure 5.2 Wind Rose Plot - Toronto Buttonville Airport station (2016-2020)



5.3 BUILDING DOWNWASH

Wind dependent building/obstacle dimensions are an input to AERMOD for use in the building wake and building downwash calculations for point source emissions. As all emissions sources were modelled as line volume sources, building downwash data was not required.

5.4 TOPOGRAPHIC DATA

Terrain data used for the modelling domain is the Canadian digital elevation model mosaic (CDEM) data covering Ontario, suitable for use with AERMOD, and available at the MECP's website (MECP, 2022).

5.5 AVERAGING PERIODS

AERMOD is capable of predicting concentrations for a variety of averaging times greater than 1-hour. For this Project, the models were run for 1-hour, 24-hour, and annual averaging times to give results that can be directly compared to the relevant objectives for each COI. For objectives with other averaging periods, predicted concentrations from the nearest averaging period were converted using the conversion methodology recommended by MECP (MECP, 2017).

For comparison with the 1-hour NO_2 CAAQS, the 98th percentile of the predicted 1-hour NO_2 concentrations at the sensitive receptor where the maximum predicted GLC occurs was calculated for each of the five years in the meteorological data set. The 98th percentile concentrations were then averaged over 3-year periods and the maximum of these averages was compared with the CAAQS.

5.6 RECEPTORS

The MTO Guide recommends that the local air quality impacts be studied within a distance of 500 m from a transportation facility in all directions, and at both sensitive (residences) and critical receptors (hospitals, retirement homes, childcare centres). The choice of a 500 m limit is based on empirical evidence for heavily travelled large highways, which clearly indicates that the concentrations of road-related pollutants drop to within 10% of their background pollution levels over this distance (MTO, 2020).

There are 45 special receptors selected within 500 m of the Project. The locations of the representative sensitive and critical receptors used to assess compliance with the air quality criteria are shown in Appendix B.

5.7 EMISSION SOURCE DATA

The operation emissions sources were modelled following the protocols and procedures outlined in the ADMGO (MECP, 2017). Emissions from on-road vehicle traffic were modelled as line sources with parameters determined based on the recommended approach by the US EPA Haul Road Workgroup Final Report (US EPA, 2012). Hourly and daily emissions were estimated for these sources based on available traffic data.

A summary of the emission source parameters used in the AERMOD dispersion modelling is provided in Appendix C. The locations of the emission sources are shown in Appendix E.

6.0 AIR DISPERSION MODELLING RESULTS – PROJECT ALONE

This section presents the results of the dispersion modelling analysis of the Baseline, Future No Build and Future Build configurations at the special receptor locations discussed in Section 3.2. A summary of the maximum modelled predictions in comparison to the applicable AAQC and/or CAAQS is presented in Table 6.1. Modelled predictions at all assessed receptors are included in Appendix G.

Predictions for the COIs, except for PM_{10}, $PM_{2.5}$ and B(a)P, are presented as maximum modelled concentrations and are used for comparison to the applicable AAQC. The results are considered to be conservative. For air contaminants with predicted exceedances (either Project alone or cumulative) including PM_{10}, $PM_{2.5}$ and B(a)P, the 9th highest 1-hour modelled result and the 2nd highest 24 hour modelled result were used to assess compliance, in accordance with the ADMGO (MECP, 2017). This approach accounts for potential anomalies in the meteorological dataset. For comparison with 1-hour CAAQS for NO_2, the statistical methodology in the CCME CAAQS guidance (CCME, 2020) was used (i.e., the maximum of the 3-year average of the annual 98th percentile of daily maximum 1-hour average was used).

The maximum predicted Project alone GLCs for all COIs are below their relevant AAQC and/or CAAQS except for B(a)P in the Baseline scenario. The general trend in the model predictions is a decrease in maximum predicted concentrations over time due to advances in cleaner fuels and emissions control technology, which are anticipated to lower all vehicle contaminant tailpipe emissions in the future.

CO

Maximum predicted concentrations of CO are well below the relevant AAQC for all three scenarios. Decreases in GLCs are predicted for both the Future No Build and Future Build scenarios relative to Baseline conditions. Both the maximum 1-hr and 8-hr average GLCs are predicted to be higher for the Future Build scenario compared to the Future No Build scenario.

NO_2

Maximum predicted concentrations of NO_2 are below the relevant AAQC and CAAQS for all three scenarios. Decreases in GLCs are predicted for the Future No Build scenario compared to Baseline conditions. The maximum GLCs are predicted to be slightly higher for the Future Build scenario compared to Baseline as well as the Future No-Build scenario. This increase is reasonable considering the addition of the proposed extension resulting in increased traffic.

Particulates

Maximum predicted concentrations of PM_{10} and $PM_{2.5}$ are well below the AAQC and CAAQS, respectively, for all three scenarios. The maximum 24-hr average PM_{10} concentration, as a percent of the AAQC, is predicted to decrease from 56% for the Baseline scenario to 41% for the Future No Build and to 55% for the Future Build scenario. Decreases in the maximum 24-hr and annual average $PM_{2.5}$ concentrations are predicted for both future scenarios compared to the Baseline conditions. Slightly higher concentrations were predicted for the Future Build versus Future No Build scenario which was expected with the increase in traffic from the proposed extension.

VOCs

Maximum predicted GLCs of benzene, 1,3-butadiene, formaldehyde, acetaldehyde and acrolein show a general decrease in maximum predicted GLCs in both Future scenarios compared to Baseline conditions. The maximum predicted concentrations for the Future Build scenario are less than 3% of the relevant AAQCs for all VOCs.

Benzo(a)pyrene

The maximum 24-hour and annual average GLCs of B(a)P for the Baseline scenario are predicted to be higher than their respective AAQCs (7 times the 24-hour average and 9 times the annual average concentration).

The maximum concentrations are predicted to decrease in both future scenarios. Maximum predicted concentrations are slightly higher for the Future Build scenario relative to the Future No Build scenario.

For the Future No Build scenario, the predicted maximum 24-hr average GLC is below the AAQC (at 99%) and the annual average GLC is higher than the AAQC (at 138%).

For the Future Build scenario, the maximum predicted concentrations for both averaging periods are higher than the AAQC, and are 136% and 191% of the 24-hour and annual AAQC, respectively. At a sensitive receptor where the exceedance occurs, B(a)P concentrations from the Project alone were predicted to potentially exceed the 24-hour AAQC by no more than 30 hours in a 5-year period (less than 1.6% of the time).

B(a)P concentration plots for the three scenarios are presented in Appendix H.

Table 6.1 Maximum Predicted Concentrations at Special Receptors – Project Alone

Contaminant	Averaging Period	Air Quality Objective [2]	Regulatory Framework	Baseline Scenario		Future No Build Scenario		Future Build Scenario	
				Project Alone Maximum Predicted Concentration at Special Receptors [1]	Percentage of Objective (%)	Project Alone Maximum Predicted Concentration at Special Receptors [1]	Percentage of Objective (%)	Project Alone Maximum Predicted Concentration at Special Receptors [1]	Percentage of Objective (%)
		(µg/m^3)		(µg/m^3)	Project Alone	(µg/m^3)	Project Alone	(µg/m^3)	Project Alone
NO_2	1-hour	400	AAQC	64	16%	55	14%	79	20%
		119	2020 CAAQS	59.9	50%	51.6	43%	72.2	61%
		83	2025 CAAQS		72%		62%		87%
	24-hour	200	AAQC	20	10%	15	7%	21	10%
	Annual	34	2020 CAAQS	5.0	15%	3.8	11%	5.3	16%
		24	2025 CAAQS		21%		16%		22%
CO	1-hour	36,200	AAQC	1499	4.1%	637.5	1.8%	808.2	2.2%
	8-hour	15,700	AAQC	1009	6.4%	404.8	2.6%	498.4	3.2%
PM_{10}	24-hour	50	AAQC	28	56%	20.7	41%	27.6	55%
$PM_{2.5}$	24-hour	27	CAAQS	11	39%	5.0	18%	6.7	25%
	Annual	8.8	CAAQS	2.9	33%	1.36	15%	1.86	21%
Benzene	24-hour	2.3	AAQC	0.21	9%	0.040	2%	0.056	2%
	Annual	0.45	AAQC	0.052	12%	0.0104	2%	0.015	3%
1, 3 Butadiene	24-hour	10	AAQC	3.20E-02	0.3%	2.61E-03	<0.1%	3.75E-03	<0.1%
	Annual	2	AAQC	8.08E-03	0.4%	6.63E-04	<0.1%	9.28E-04	<0.1%
B(a)P	24-hour	0.00005	AAQC	3.50E-04	700%	4.96E-05	99%	6.79E-05	136%
	Annual	0.00001	AAQC	9.88E-05	988%	1.38E-05	138%	1.91E-05	191%
Formaldehyde	24-hour	65	AAQC	0.60	0.9%	0.11	0.2%	0.16	0.2%
Acetaldehyde	½ hour	500	AAQC	1.24	0.2%	0.31	<0.1%	0.46	<0.1%
	24-hour	500	AAQC	0.31	<0.1%	0.070	<0.1%	0.10	<0.1%
Acrolein	1-hour	4.5	AAQC	0.16	3.5%	0.034	0.8%	0.052	1%
	24-hour	0.4	AAQC	0.049	12.2%	0.009	2%	0.013	3%

Notes:

1. The maximum predicted concentration (meteorological anomalies included) is conservatively used for comparison to all Air Quality Objectives, with the exception of the following:
   - 1-hour NO2 for comparison with 2025 CAAQS - maximum of the 3-year average of the annual 98th percentile of daily maximum 1-hour average
   - 24-hour PM10, PM2.5, B(a)P -maximum concentration after removal of meteorological anomalies per MECP guidelines
2. AQ Objectives:
   - AAQC - Ambient Air Quality Criteria for Ontario
   - CAAQS - Canadian Ambient Air Quality Standards
   - For NO_2 - 2020 and 2025 CAAQS for 1-hour and annual averaging periods are converted to ug/m^3 based on 1 atm and 10 degrees C. The 1-hour and annual average 2020 CAAQS are 60 ppb and 17 ppb, respectively. The 1-hour and annual average 2025 CAAQS are 42 ppb and 12 ppb, respectively.
   - For $PM_{2.5}$ - 2020 CAAQS for 24-hour and annual averaging periods

7.0 CUMULATIVE EFFECTS ASSESSMENT

This section discusses the assessment of background air quality and GHG emissions in order to evaluate the Project's emissions cumulatively and in relation to other existing sources of emissions in the Study Area.

7.1 CUMULATIVE AIR QUALITY

The maximum predicted GLCs from the Project alone air quality dispersion modelling presented in Section 6.0 were added to the background concentrations presented in Section 3.3.2 in order to assess the cumulative effects of the Project with existing air quality levels in the Study Area. A summary of the maximum modelled predictions including background concentrations in comparison to the applicable AAQC and/or CAAQS is presented in Table 7.1.

The maximum predicted cumulative GLCs for CO, 1, 3 butadiene, formaldehyde, acetaldehyde and acrolein are below their relevant AAQC for all averaging periods for all scenarios. For NO_2, PM_{10}, $PM_{2.5}$, benzene and B(a)P, exceedances were predicted for some averaging periods when background concentrations were added.

CACs

The maximum predicted cumulative 1-hour and 8-hour average CO concentrations are well below the AAQC for all scenarios.

NO_2

- The maximum predicted cumulative 1-hour and 24-hour average NO_2 concentrations are below the AAQC for all scenarios.
- For the Baseline scenario, the maximum predicted cumulative 98th percentile 1-hour and annual averages are below the 2020 CAAQS.
- The cumulative 98th percentile 1-hour average NO_2 concentrations are 129% and 153% of the 2025 CAAQS for the Future No Build and Future Build scenarios, respectively. However, approximately half of the cumulative concentration is attributable to the background concentration.
- The cumulative annual averages are 135% (Future No Build) and 142% (Future Build) of the 2025 CAAQS, however, the background concentration alone is 120% of the 2025 CAAQS.
- It should be noted that the AAQC is currently used by the MECP and the NO_2 CAAQS has not been adopted by Ontario. The predicted cumulative concentrations for all scenarios are well below the 1-hour and 24-hour AAQCs (between 28% and 34% of their respective AAQCs). The CAAQS is intended as a long-term, Canada-wide air quality objective.

Particulates

- The maximum cumulative 24-hour PM_{10} concentrations are predicted to slightly exceed the AAQC by 1% for the Baseline scenario and 0.4% for the Future Build scenario. It is predicted to be below the AAQC for the Future No Build scenario. Approximately half of the cumulative concentration is attributable to the background concentration.
- The maximum predicted cumulative 24-hour average $PM_{2.5}$ concentrations are below the AAQC for all scenarios. The maximum predicted cumulative annual average $PM_{2.5}$ concentrations exceed the CAAQS for the Baseline and Future Build scenarios, at 115% and 103% of the CAAQS, respectively, and is below the CAAQS for Future No Build scenario. The majority (approximately 70% - 80%) of which is attributable to the existing background concentration.
- Recent ambient air quality monitoring data shows a decreasing trend in $PM_{2.5}$ concentrations in Ontario over the past decade (MECP, 2021). Based on this trend, it is likely that background $PM_{2.5}$ levels will continue to improve in the future and therefore, the background concentration used in the assessment is conservative. PM_{10} background concentrations will also follow the decreasing trend as they were estimated based on a ratio applied to the $PM_{2.5}$ background concentrations (Lall et al 2004).

VOCs

Predicted cumulative concentrations of 1,3-butadiene, formaldehyde, acetaldehyde and acrolein all remain well below their relevant AAQC with the addition of background concentrations.

Benzene

- The predicted maximum cumulative 24-hour average benzene concentrations are below the AAQC for all scenarios.
- The maximum cumulative annual average benzene concentrations are predicted to be 129%, 120%, and 121% of the AAQC for the Baseline, Future No Build and Build scenarios, respectively. The majority of which is attributable to the existing background concentrations which is at 119% of the AAQC. Ambient air quality monitoring data suggests a decreasing trend in benzene concentrations in Ontario over the past decade (MECP, 2021) with a 27% decrease over the 10 years between 2009 and 2018. Based on this trend, it is likely that background benzene levels will continue to improve in the future and therefore the background concentrations used in the assessment are conservative.

Benzo(a)pyrene

- Maximum predicted cumulative concentrations of B(a)P exceed the 24-hour and annual average AAQC for all scenarios, with the background concentrations alone being over 2 times and 8 times of the 24-hour and annual average AAQCs, respectively.
- For future scenarios, contribution from the Project is much lower compared to the Baseline scenario. Project Alone concentrations are predicted to have decreased by approximately 80% for the future scenarios. In addition, the background levels are the major contributor to the cumulative exceedances. The maximum cumulative B(a)P concentrations are predicted to decrease in the future

scenarios relative to existing conditions due to expected technological advancements and future reductions in vehicle emissions.

Table 7.1 Maximum Predicted Concentrations at Special Receptors – Cumulative

Contaminant	Averaging Period	Air Quality Objective [2]	Regulatory Framework	Baseline Scenario		Future No Build Scenario		Future Build Scenario	
				Cumulative Maximum Predicted Concentration at Special Receptors [1]	Percentage of Objective (%)	Cumulative Maximum Predicted Concentration at Special Receptors [1]	Percentage of Objective (%)	Cumulative Maximum Predicted Concentration at Special Receptors [1]	Percentage of Objective (%)
		($\mu g/m^3$)		($\mu g/m^3$)	Project Alone	($\mu g/m^3$)	Project Alone	($\mu g/m^3$)	Project Alone
NO_2	1-hour	400	AAQC	119	30%	111	28%	135	34%
		119	2020 CAAQS	115.4	97%	107.1	90%	127.6	107%
		83	2025 CAAQS		139%		129%		153%
	24-hour	200	AAQC	65	32%	60	30%	66	33%
	Annual	34	2020 CAAQS	33.4	99%	32.2	96%	34	100%
		24	2025 CAAQS		140%		135%		142%
CO	1-hour	36,200	AAQC	1908	5.3%	1047	2.9%	1218	3%
	8-hour	15,700	AAQC	1410	9.0%	806	5.1%	899	6%
PM_{10}	24-hour	50	AAQC	50.6	101%	43.3	87%	50.2	100%
$PM_{2.5}$	24-hour	27	CAAQS	22.8	85%	17.2	64%	18.9	70%
	Annual	8.8	CAAQS	10.1	115%	8.6	97%	9.1	103%
Benzene	24-hour	2.3	AAQC	0.98	42%	0.81	35%	0.83	36%
	Annual	0.45	AAQC	0.58	129%	0.54	120%	0.54	121%
1, 3 Butadiene	24-hour	10	AAQC	1.14E-01	1.1%	8.46E-02	0.8%	8.58E-02	0.9%
	Annual	2	AAQC	6.31E-02	3.2%	5.57E-02	2.8%	5.59E-02	2.8%
B(a)P	24-hour	0.00005	AAQC	4.89E-04	978%	1.88E-04	377%	2.07E-04	413%
	Annual	0.00001	AAQC	1.85E-04	1848%	9.98E-05	998%	1.05E-04	1051%
Formaldehyde	24-hour	65	AAQC	3.68	5.7%	3.19	4.9%	3.24	5.0%
Acetaldehyde	½ hour	500	AAQC	10.50	2.1%	9.57	1.9%	9.72	1.9%
	24-hour	500	AAQC	3.44	0.7%	3.20	0.6%	3.23	0.6%
Acrolein	1-hour	4.5	AAQC	0.36	8.0%	0.23	5.2%	0.252	6%
	24-hour	0.4	AAQC	0.13	32.7%	0.091	23%	0.095	24%

Notes:

1. The maximum predicted concentration (meteorological anomalies included) is conservatively used for comparison to all Air Quality Objectives, with the exception of the following:
   - 1-hour NO2 for comparison with 2025 CAAQS - maximum of the 3-year average of the annual 98th percentile of daily maximum 1-hour average
   - 24-hour PM10, PM2.5, B(a)P -maximum concentration after removal of meteorological anomalies per MECP guidelines
2. AQ Objectives:
   - AAQC - Ambient Air Quality Criteria for Ontario
   - CAAQS - Canadian Ambient Air Quality Standards
   - For NO_2 - 2020 and 2025 CAAQS for 1-hour and annual averaging periods are converted to ug/m^3 based on 1 atm and 10 degrees C. The 1-hour and annual average 2020 CAAQS are 60 ppb and 17 ppb, respectively. The 1-hour and annual average 2025 CAAQS are 42 ppb and 12 ppb, respectively.
   - For $PM_{2.5}$ - 2020 CAAQS for 24-hour and annual averaging periods.

7.2 GREENHOUSE GASES

The global climate is influenced by the presence of natural and human-made GHGs. Current scientific knowledge does not allow for the effects of an individual Project on climate change to be assessed, the Project is therefore assessed in terms of Carbon Dioxide Equivalent (CO_2e) produced and released to the atmosphere and how this compares with provincial levels/targets.

To evaluate the potential cumulative effects of GHG emissions due to the Project, estimated emissions (presented in Section 4.3) with and without implementation of the Project are compared to the existing baseline emissions in Canada and Ontario. Table 7.2 presents the GHG emissions estimates for each of the three scenarios compared to Canada and Ontario 2019 totals and the 2030 emissions targets. The estimated GHG emissions from the Future Build scenario represents 0.014% of Ontario's total emissions for 2019, and 0.003% of Canada's total emissions for 2019. Furthermore, this represents 0.017% of Ontario's and 0.005% of Canada's 2030 targets, respectively.

An incremental increase in GHG emissions due to the Future Build scenario relative to the Future No Build scenario of 5.24 kt CO_2e per year is estimated. This is equivalent to increases in GHG emissions of 0.003% and 0.0007% of the Ontario and Canada 2019 totals respectively. Relative to the 2030 targets, the future GHG increase for the Project are 0.004% and 0.0013% of the 2030 emissions targets for Ontario and Canada, respectively.

Table 7.2 GHG Emissions Estimates Compared to Canada and Ontario Totals

Scenario	Project (kt CO_2e)	Canada				Ontario			
		2019 Total (kt CO_2e)	% 2019 Total	2030 Target (kt CO_2e)	% of 2030 Target	2019 Total (kt CO_2e)	% of 2019 Total	2030 Target (kt CO_2e)	% of 2030 Target
2020 Baseline	46.83	730,000	0.006%	401,000	0.012%	163,000	0.029%	143,000	0.033%
2031 Future No Build	18.38		0.0025%		0.005%		0.011%		0.013%
2031 Future Build	23.63		0.0032%		0.006%		0.014%		0.017%

8.0 POTENTIAL IMPACTS AND MITIGATION DURING CONSTRUCTION AND OPERATION

8.1 POTENTIAL IMPACTS AND MITIGATION DURING CONSTRUCTION

During construction of the Project, dust will be the primary COI. Other COIs such as NO_2 and VOCs will also be emitted from equipment used during construction. As the construction activities will be short-term and intermittent, emissions are expected to be minor provided adequate mitigation measures are implemented. The ECCC guideline “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” (ECCC, 2005) provides recommendations for mitigation measures to reduce construction emissions. These measures include material wetting or use of chemical suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust, and equipment washing. It is recommended that these best management practices be followed during Project construction. With implementation of proper mitigation measures, emissions from the construction phase and resulting adverse changes in local air quality can be controlled and reduced.

8.2 POTENTIAL IMPACTS AND MITIGATION DURING OPERATION

The air quality assessment has identified that exceedances of daily average PM_{10}, annual average $PM_{2.5}$, and hourly and annual average NO_2 may occur for the Project when background air quality levels are added to Project alone predictions.

Exceedances of B(a)P are predicted to occur for both the Future No-Build scenario as well as the Future Build scenario, with background levels being the major contributor to the cumulative exceedances. Annual cumulative benzene is also predicted to exceed its AAQC; however, background benzene levels are above the annual criterion with the Project having a negligible contribution to ambient levels.

While the Project contributions to exceedances are expected to be small, it is expected that with ongoing advancements of on road vehicles to newer, lower emission or electric vehicles, the quantities of air contaminants released to the atmosphere from transportation sources will be lower in the future. Implementation of the Project will improve the future traffic flow and smoothness (less congestion than the Future No Build scenario) in the local road network, and thereby minimize the impact on air quality. Other measures to minimize impacts of particulate and NOx emissions that could be considered include incorporating vegetative barriers in the landscaping design. The effectiveness of trees and plants as physical barriers for particulate or gaseous contaminant control depends on the density and height of the vegetation. In general, a vegetation barrier should be thick (approximately 6-metres or more) and have full leaf and branch coverage from the ground to the top of the canopy with no gaps in-between or underneath the vegetation. Typically, evergreen species are more effective than deciduous for this objective and the barrier should be located close to the emissions sources (US EPA, 2015).

9.0 CONCLUSIONS

The following principal conclusions were made from the air quality and greenhouse gas impact assessment:

- Maximum predicted Project alone ground level concentrations (GLCs) of COIs other than benzo(a)pyrene (B(a)P) are below their relevant AAQC and/or CAAQS at all special receptors for all assessed scenarios.
- Maximum predicted cumulative concentrations for CO, 1, 3 butadiene, formaldehyde, acetaldehyde and acrolein are below their relevant AAQC at all special receptors for all assessed scenarios.
- The cumulative 98th percentile 1-hour average NO_2 concentrations are predicted to exceed the 2025 CAAQS for the Future No Build and Future Build scenarios. Approximately half of the cumulative concentrations are attributable to the background concentration. The cumulative annual averages of NO_2 are also predicted to exceed the 2025 CAAQS for both Future scenarios. However, the background concentration accounts for over 84% of the cumulative concentration, and alone exceeds the 2025 CAAQS by 20%. Therefore, the contribution from the Project is small compared with the background level. Also, it should be noted that the AAQC is currently used by the MECP and the NO_2 CAAQS has not been adopted by Ontario. The predicted cumulative NO_2 concentrations for all scenarios are well below the 1-hour and 24-hour AAQCs (between 28% and 34% of their respective AAQCs). The CAAQS is intended as a long-term, Canada-wide air quality objective.
- The maximum cumulative 24-hour PM_{10} concentrations are predicted to exceed the AAQC, however, it only exceeds the AAQC by 1% for the Baseline scenario and 0.4% for the Future Build scenario. Approximately half of the cumulative concentration is attributable to the background concentration. When compared with the Future No Build scenario, the contribution of the Project to air quality impact is predicted to be relatively small and contributes to an increase of 14% of the AAQC.
- The maximum cumulative annual average $PM_{2.5}$ concentrations exceed the CAAQS for the Baseline scenario and Future Build scenarios. The majority (approximately 70% - 80%) of the cumulative concentration is attributable to the existing background concentration. The contribution of the Project is small for Future Build as the maximum predicted Project alone annual concentration is at 21% of the CAAQS. Compared with Future No Build scenario, there is a 6% increase of the CAAQS (Future No Build is at 15% of the annual CAAQS) and a 12% decrease when compared with Baseline (Baseline is at 33% of the annual CAAQS).
- Maximum predicted cumulative 24-hour concentrations of benzene meet the AAQC for all assessed scenarios. The maximum cumulative annual average benzene concentrations are predicted to exceed the AAQC for all scenarios. However, existing background concentration account for 97% of the cumulative concentration and background alone is 119% of the AAQC. Project implementation is expected to have an insignificant impact to air quality as the maximum predicted annual concentration is only at 3% of the AAQC and accounts for a 1% increase of the AAQC (compared with Future No Build).

- The Project Alone maximum 24-hour and annual average GLCs of B(a)P for all assessed scenarios are predicted to exceed their respective AAQCs, with the exception of the 24-hour GLC for the Future No Build scenario. The maximum predicted concentrations are 7 times the 24-hour AAQC and 9 times the annual average AAQC for Baseline. However, the maximum concentrations are predicted to decrease by approximately 80% for the future scenarios compared with Baseline. For future scenarios, the maximum predicted concentrations are 99% (Future No Build) and 136% (Future Build) of the 24-hour AAQC, and 138% (Future No Build) and 191% (Future Build) of the annual AAQC. At a sensitive receptor where the exceedance occurs, B(a)P concentrations from the Project alone were predicted to potentially exceed the 24-hour AAQC by no more than 2 hours in a 5-year period (less than 0.11%) for Future No Build, and no more than 30 hours in a 5-year period (less than 1.6% of the time) for Future Build.
- Maximum predicted cumulative concentrations of B(a)P exceed the 24-hour and annual average AAQC for all scenarios. Background levels are the major contributor to the cumulative exceedances, with the background concentrations alone being more than 2 times and 8 times of the 24-hour and annual average AAQCs, respectively.
- Measured concentrations of benzene, $PM_{2.5}$, and NO_2 across Ontario have shown decreasing trends between 2009 and 2018 (MECP, 2021). It is likely that background levels of these air contaminants will continue to improve in the future and therefore the background concentrations used in the assessment are conservative.
- The addition of background levels as cumulative results in the analysis is conservative as the emission impact from the existing traffic is expected to be included in the background level (i.e., existing traffic emissions is part of ambient air quality measurements used for background).
- Although the Project may lead to minor increases of contaminant concentrations (when compared with Future No Build) at the sensitive receptors within the Study Area of the Project, implementation of the Project will improve the future traffic flow and smoothness (less congestion than the Future No Build scenario) in the local road network, and thereby minimize the impact on air quality.
- During Project construction, best management practices should be followed to minimize emissions.
- Releases of GHGs from the Project are expected to be insignificant in comparison to the 2019 Canada and Ontario totals and the 2030 emissions targets.

10.0 REFERENCES

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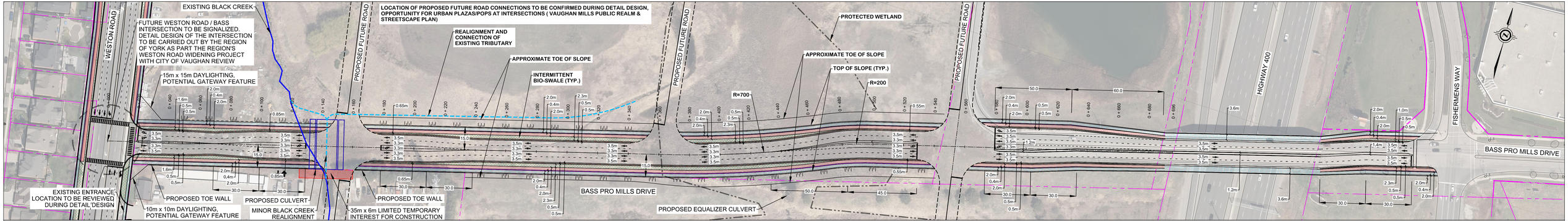
APPENDIX A
Preferred Design Plan



LEGEND:
- CONCRETE SIDEWALK
- STAMPED CONCRETE BUFFER
- BIKE PATH
- BOULEVARD
- CONCRETE STRIP
- CONCRETE BARRIER

APPENDIX B
Sensitive and Critical Receptors

Stantec

Legend

- Project Footprint
- Study Area
- Watercourse (Permanent)

LOC_TYP

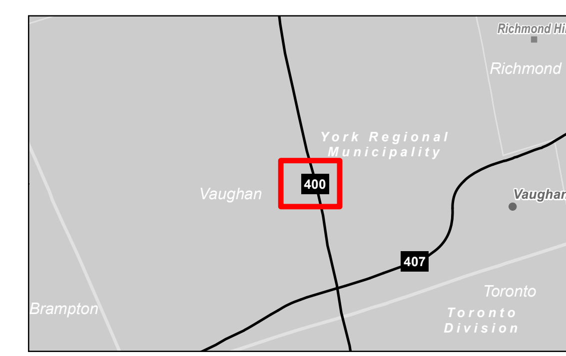
- Critical Receptor
- Sensitive Receptor

0 150 300 450 m

1:7,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © First Base Solutions, 2021, imagery date 2020.



Project Location
City of Vaughan

160540006 REV4
Prepared by BCC on 2022-01-31
Technical Review by TD on 2021-06-23

Client/Project
CITY OF VAUGHAN
BASS PRO MILLS DRIVE EXTENSION

Figure No.
B-1

Title
Sensitive and Critical Receptor Locations

Bass Pro Mills Drive Road Extension
Table B-1 - List of Special / Critical Receptors

Receptor ID#	UTM East (m)	UTM North (m)	Description	Sensitive / Critical
R01	616116.0	4853258.7	Residential house	Sensitive
R02	616138.7	4853156.0	Residential house	Sensitive
R03	616155.1	4853085.5	Residential house	Sensitive
R04	616178.0	4852926.4	Residential house	Sensitive
R05	616186.6	4852872.2	Residential house	Sensitive
R06	616194.2	4852836.0	Residential house	Sensitive
R07	616201.4	4852801.1	Residential house	Sensitive
R08	616210.1	4852762.1	Residential house	Sensitive
R09	616215.8	4852728.6	Residential house	Sensitive
R10	616224.1	4852696.6	Residential house	Sensitive
R11	616235.8	4852644.4	Residential house	Sensitive
R12	616244.4	4852588.0	Residential house	Sensitive
R13	616259.6	4852521.2	Residential house	Sensitive
R14	616271.6	4852458.6	Residential house	Sensitive
R15	616268.7	4852390.2	Residential house	Sensitive
R16	616296.3	4852294.8	Residential house	Sensitive
R17	615695.9	4852652.8	St. Clare Catholic Elementary School and Daycare	Critical
R18	617426.7	4852718.1	Koala Kids Indoor Playground	Critical
R19	617538.1	4853061.1	Novotel (hotel)	Sensitive
R20	617608.9	4853238.0	Aloft Vaughan Mills (hotel)	Sensitive
R21	616074.7	4853180.4	Residential house	Sensitive
R22	616101.4	4853075.8	Residential house	Sensitive
R23	616110.6	4852935.8	Residential house	Sensitive
R24	616135.0	4852808.5	Residential house	Sensitive
R25	616169.0	4852646.0	Residential house	Sensitive
R26	616191.9	4852476.0	Residential house	Sensitive
R27	616205.9	4852374.5	Residential house	Sensitive
R28	616041.5	4853054.7	Residential house	Sensitive
R29	616075.6	4852879.5	Residential house	Sensitive
R30	616090.8	4852708.0	Residential house	Sensitive
R31	616122.7	4852512.0	Residential house	Sensitive
R32	615890.7	4852958.5	Residential house	Sensitive
R33	615919.4	4852805.6	Residential house	Sensitive
R34	615956.8	4852616.4	Residential house	Sensitive
R35	616019.0	4852418.3	Residential house	Sensitive
R36	616089.9	4853381.1	Residential house	Sensitive
R37	615942.0	4853295.0	Residential house	Sensitive
R38	615835.6	4853101.7	Residential house	Sensitive
R39	615798.0	4852856.0	Residential house	Sensitive
R40	615848.0	4852665.0	Residential house	Sensitive
R41	615850.0	4852469.0	Residential house	Sensitive
R42	616130.2	4852242.3	Residential house	Sensitive
R43	616315.2	4852215.6	Residential house	Sensitive
R44	615691.1	4852959.0	Residential house	Sensitive
R45	615729.3	4853128.6	Residential house	Sensitive
R46	616413.55	4853588.59	Residential house	Sensitive
R47	615754.64	4853262.66	Residential house	Sensitive
R48	615947.94	4852283.69	Residential house	Sensitive

APPENDIX C
Data & Assumptions

Bass Pro Mills Drive Road Extension
Appendix C1: Summary of Variables and Assumptions Used for Emission Estimates

Speed Limits			**Reference**
Variable	**Posted Speed Limit**	**Unit**	
Bass Pro Mills Drive	50	km/hr	posted speed limit (Google Maps)
Weston Road	60	km/hr	Traffic Impact Analysis , Existing Conditions Review, Model Development and Calibration and Validation and Future Base Model Development Report (TIA Report), Stantec, Feb 22, 2021.
Fishermens Way	40	km/hr	posted speed limit (Google Maps)
Highway 400	100	km/hr	posted speed limit (Google Maps)
Highway 400 On-ramp / Bass Pro Mills	30	km/hr	posted speed limit (Google Maps)
Highway 400 NB Off-ramp	60	km/hr	posted speed limit (Google Maps)
West Creek Drive	40	km/hr	no information available. Assumed conservative posted speed limit
Creditview Road	40	km/hr	no information available. Assumed conservative posted speed limit
2031 Operational Speeds - Bass Pro Mills Drive Extension			
Bass Pro Mills Rd - Mid block sections	45	km/hr	email from Arash Mirhoseini (Nov 23, 2021) 45 - 50 km/hr, lower speed conservatively used.
Bass Pro Mills Rd - segments leading to signals	18	km/hr	email from Arash Mirhoseini (Nov 23, 2021) 18 - 25 km/hr, lower speed conservatively used.
Variable	**Cycle Time**	**Unit**	
Weston Road / Astona Blvd intersection	140	seconds	total cycle time (based on TIA Report pg791)
	92.5	seconds	cycle time - main direction N/S on Weston Road
	40	seconds	cycle time - minor direction E/W on Astona
Hwy 400 NB / Fisherman's Way & Bass Pro Mills intersection			Based on TIA Report pg 781, cycle times in each direction are not available. Cyle time is varied)
	50%		conservative assumed percent cycle time - N/S on Hwy400 NB or Fishermens Way
	50%		conservative assumed percent cycle time - E/W on Bass Pro Mills
Bass Pro Mills / Creditview Road intersection			Proposed signalized intersection, no cycle time available
	50%		conservative assumed percent cycle time - N/S on Creditview Rd
	50%		conservative assumed percent cycle time - E/W on Bass Pro Mills
Bass Pro Mills / West Creek Drive intersection			Proposed unsignalized intersection
	50%		conservatively assume that 50% of time will be stopping at intersection - N/S on West Creek Drive
Variable	**Assumed Speed for Modelling Assessment**		
Weston Road	39.0	km/hr	average speed estimated based on % green time over total cycle time
Bass Pro Mills Drive	25.0	km/hr	average speed estimated based on % green time over total cycle time
Fishermens Way	20	km/hr	average speed estimated based on % green time over total cycle time
Highway 400	100	km/hr	assumed to be the same as posted speed limit as there are no signals / intersections on the highway or ramps
Highway 400 On-ramp / Bass Pro Mills	30	km/hr	assumed to be the same as posted speed limit as there are no signals / intersections on the highway or ramps
Highway 400 NB Off-ramp	30	km/hr	Off-ramp at Bass Pro Mills is signlized. Average speed estimated based on % green time over total cycle time
West Creek Drive	20	km/hr	average speed estimated based on % green time over total cycle time
Creditview Road	20	km/hr	average speed estimated based on % green time over total cycle time
2031 Bass Pro Mills Drive Extension - assumed speed for modelling assessment			
Bass Pro Mills Rd - Mid block sections	31.5	km/hr	Assumed higher speed for links from West Creek to Hwy 400 (EB2, EB3, WB1, WB2)
Bass Pro Mills Rd - segments leading to signals	18	km/hr	Assumed lower speed for links from Weston to West Creek (EB1 and WB3)

Number of Lanes			**Reference**
Variable	**Assumed Value**	**Unit**	
Bass Pro Mills Drive	4	lanes	Google Maps
Weston Road	4	lanes	Google Maps
Fishermens Way	4	lanes	Google Maps
Highway 400 NB	5	lanes	Google Maps
Highway 400 SB	5	lanes	Google Maps
Highway 400 SB (south of on-ramp)	6	lanes	Google Maps
Highway 400 On-ramp	1	lanes	Google Maps
Highway 400 NB Off-ramp	4	lanes	Google Maps
West Creek Drive	2	lanes	Google Maps
Creditview Road	2	lanes	Google Maps

Distribution of Cars and Trucks			**Reference**
Variable	**Assumed Value**	**Unit**	
2020			Bass Pro Mills Drive Extension Environmental Assessment Transportation Impact Assessment, Nov 5, 2021, Stantec. Table 5-2 2020, 2031, 2041 Base Condition Demands
- Cars	90%		
- Trucks	10%		
2031			Bass Pro Mills Drive Extension Environmental Assessment Transportation Impact Assessment, Nov 5, 2021, Stantec. Table 5-2 2020, 2031, 2041 Base Condition Demands
- Cars	91%		
- Trucks	9%		
Bass Pro Mills between Weston Rd and Hwy 400 SB Off-ramp			email from Arash Mirhoseini (updated email Nov 18, 2021)
- Cars	89%		
- Trucks (Commercial Vehicle)	11%		
Hwy 400 NB Off-Ramp and Hwy 400 SB Off-ramp			email from Arash Mirhoseini (updated email Nov 18, 2021)
- Cars	91%		
- Trucks (Commercial Vehicle)	9%		

Bass Pro Mills Drive Road Extension
Appendix C1: Summary of Variables and Assumptions Used for Emission Estimates

Annual Average Daily Traffic			
Bass Pro Mills - between Weston Rd and Hwy 400 SB Off-ramp	19500		email from Arash Mirhoseini (updated email Nov 18, 2021)
Bass Pro Mills - between Hwy 400 NB Off-Ramp and Hwy 400 SB Off-ramp	30000		email from Arash Mirhoseini (updated email Nov 18, 2021)
Multiplier for other roads (to be applied to the **total** of AM and PM peak volumes)	9		email from Arash Mirhoseini (Nov 18, 2021)
Annual Growth			
Annual growth 2020 to 2031 - Total growth (i.e. for both cars and trucks). Growth rate used for roads that do not have future year traffic counts (i.e. Hwy 400)			Bass Pro Mills Drive Extension Environmental Assessment Transportation Impact Assessment, Nov 5, 2021, Stantec. Table 5-2 2020, 2031, 2041 Base Condition Demands
AM Peak	1.7%	% per year	
PM Peak	1.3%	% per year	

Dispersion Modelling Parameters for Line Volume Sources

Parameter	Values	Unit	Notes
Construction Area			
Model Source ID	SLINE1 - SLINE9		
Vehicle Height	1.8	m	assumed average vehicle height based on weigted average of a car (90% at 1.55 m) and truck (10% at 4.15 m)
Plume height	3.08	m	calculated height of plume (= 1.7 * vehicle height)
Release Height	1.54	m	calculated height of exhaust (= 0.5* Plume height)
Initial Vertical dimension	1.43	m	for surface based release height: (Plume Height) / 2.15
Plume Width			Single lane road - width of vehicle (estimated based on weighted average width of car and width of truck) + width of shoulder (3 m each side) Two or more lanes - width of road (measured from Google Earth) + width of shoulder (3 m each side)
SLINE1,SLINE1A, SLINE1B, SLINE1C	26.00	m	Weston Road
SLINE2, SLINE2A	24.00	m	Bass Pro Mills Road (original)
SLINE3	26.00	m	Fishermens Way
SLINE4	25.00	m	Hwy 400 Off-ramp
SLINE5	8.06	m	Hwy 400 On-ramp
SLINE6, SLINE6A, SLINE6B	56.00	m	Hwy 400
SLINE7A, SLINE7B	24.00	m	Bass Pro Mills Road (new)
Initial Lateral dimension			Plume Width / 2.15
SLINE1,SLINE1A, SLINE1B, SLINE1C	12.09	m	Weston Road
SLINE2, SLINE2A	11.16	m	Bass Pro Mills Road (original)
SLINE3	12.09	m	Fishermens Way
SLINE4	11.63	m	Hwy 400 Off-ramp
SLINE5	3.75	m	Hwy 400 On-ramp
SLINE6, SLINE6A, SLINE6B	26.05	m	Hwy 400 (north of on-ramp)
SLINE7A, SLINE7B	11.16	m	Bass Pro Mills Road (new)

APPENDIX D
Emission Estimation

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Description:

Tailpipe emissions due to the fuel combustion and fugitive dust emissions from road traffic.

Traffic emissions from the following roads are within the Study Area. The road direction, traffic data, model ID are also listed below.

Traffic Data:

Road and Direction [1]	MOVES Link ID	Available Traffic Data[2]			Travel Speed (km/h) [3]	Distribution - Cars [2]	Distribution - Trucks [2]	Road Length (m)	AERMOD Source ID
		24-hour Total	Peak Hourly[4]	Traffic Count Year					
Weston Road NB	NB1	25722	2101	2020	39	90%	10%	654	SLINE1 / SLINE1C
Weston Rd NB (north of Astona)	NB1A	27279	1992	2020	39	90%	10%	636	SLINE1A
Weston Road NB (south of Valeria)	NB1B	26055	2136	2020	39	90%	10%	351	SLINE1B
Hwy 400 Off-ramp NB	NB2	13383	542	2020	30	90%	10%	516	SLINE4
Fishermens Way NB	NB3	3204	233	2020	20	90%	10%	1062	SLINE3
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	100863	7225	2020	100	90%	10%	1239	SLINE6 / SLINE6A
Hwy 400 NB (south of off-ramp)	NB4B	114246	7767	2020	100	90%	10%	325	SLINE6B
Weston Road SB	SB1	25623	945	2020	39	90%	10%	654	SLINE1 / SLINE1C
Weston Rd SB (north of Astona)	SB1A	22185	962	2020	39	90%	10%	636	SLINE1A
Weston Road SB (south of Valeria)	SB1B	26028	925	2020	39	90%	10%	351	SLINE1B
Fishermens Way SB	SB2	3384	301	2020	20	90%	10%	1062	SLINE3
Hwy 400 SB (north of on-ramp)	SB3	109665	4506	2020	100	90%	10%	874	SLINE6
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	123003	5780	2020	100	90%	10%	690	SLINE6A / SLINE6B
Hwy 400 On-ramp	WB1	13338	1274	2020	30	90%	10%	572	SLINE5
Bass Pro Mills WB (east of Fishermens)	WB1A	10386	1023	2020	25	90%	10%	742	SLINE2A
Bass Pro Mills EB (east of Fishermens)	EB1A	10611	359	2020	25	90%	10%	742	SLINE2A
Bass Pro Mills Drive [5]	WB1	13338	1274	2020	30	90%	10%	278	SLINE2

Notes:

(1) Road directions: North bound - NB; South bound - SB; East bound - EB; Westbound - WB

(2) Peak AM / PM traffic data are based on "Traffic Impact Analysis , Existing Conditions Review, Model Development and Calibration and Validation and Future Base Model Development Report", Stantec, February 22, 2021.
Average Daily Traffic (ADT) is not available. A multiplier of 9 for these roads (to be applied to the total of AM and PM peak volumes) was recommended by the traffic team.
Distribution of cars and trucks is based on the "Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, .

(3) The average speed is estimated based on the posted speed limit and the percent green time over total cycle time in that section of the road. Highway 400 and on-ramp speed limit is assumed to be the posted speed limit as there are no traffic lights.

(4) The AM and PM Peak hour traffic were considered. As the PM Peak hour has a higher overall traffic count within the Study Area, the PM Peak Hour traffic was used for emission estimation.

(5) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Contaminant(s) of Concern:

NO_2, PM, CO, and hydrocarbons emissions are the contaminants of concern from fuel combustions in the mobile equipment engines. Primary speciated VOCs (Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein) and a key PAH (Benzo(a) pyrene) are also included in the assessment.

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Emission Calculations:

Methodology: U.S. EPA MOVES program

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. MOVES2014 is a major new revision to EPA's mobile source emission model and it replaces previous versions of MOVES and MOBILE6.2 models.
MOVES2014 project level is used in estimating the vehicle on-road emissions for the project.

Key Input Data to MOVES

Parameter	Input Description
Modelling Scale	Project level
Contaminants	CO, NOx, PM, PM10, PM2.5, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein, and Benzo(a)pyrene
Construction Year	2020
Evaluation Month and Time	January or July - the higher emission factors out of the two months are conservatively used
Meteorology (ambient temp., relative humidity)	Canadian Climate Normal, Toronto and Toronto Lester B. Pearson Int'l A, ON
Road Type	Urban Unrestricted Access, Urban Restricted Access
Fuel Type	Assumed gasoline for the cars, and diesel for heavy trucks
Fuel Data	Ontario
Traffic Volume	See table above
Traffic Speed	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year

Detailed MOVES input and output data are saved in the project folder. Summary of the emission data from the modelling for each of the road links are presented below.

Emission Data for Onsite Roads - Daily:

Contaminant	CAS#	Link NB1 - Weston Road NB - 39 km/h					Link SB1 - Weston Road SB - 39 km/h					SLINE1	SLINE1C
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - north of Bass Pro, south of Astona)	Total (Weston - south of Bass Pro)
NO_2	10102-44-0	2.12E-01				2.57E-02	2.12E-01				2.56E-02	1.98E-02	3.15E-02
CO	630-08-0	4.96E+00				6.00E-01	4.96E+00				5.97E-01	4.62E-01	7.35E-01
PM	N/A (pm)	9.80E-01				1.19E-01	9.80E-01				1.18E-01	9.13E-02	1.45E-01
PM_{10}	N/A (pm10)	3.32E-01				4.02E-02	3.32E-01				4.00E-02	3.09E-02	4.93E-02
$PM_{2.5}$	N/A (pm2.5)	1.27E-01				1.54E-02	1.27E-01				1.53E-02	1.19E-02	1.89E-02
Benzene	71-43-2	2.26E-03	25722	654	10450	2.73E-04	2.26E-03	25623	654	10410	2.72E-04	2.10E-04	3.35E-04
1,3-Butadiene	106-99-0	3.48E-04				4.21E-05	3.48E-04				4.19E-05	3.24E-05	5.16E-05
Acrolein	107-02-8	5.25E-04				6.35E-05	5.25E-04				6.33E-05	4.89E-05	7.79E-05
Acetaldehyde	75-07-0	3.39E-03				4.10E-04	3.39E-03				4.09E-04	3.16E-04	5.03E-04
Formaldehyde	50-00-0	6.51E-03				7.87E-04	6.51E-03				7.84E-04	6.06E-04	9.65E-04
Benzo(a)pyrene	50-32-8	4.28E-06				5.17E-07	4.28E-06				5.15E-07	3.98E-07	6.34E-07

Contaminant	CAS#	Link NB1A - Weston Road NB (north of Aston) - 39 km/h					Link SB1A - Weston Road SB (north of Aston) - 39 km/h					SLINE1A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - north of Astona)
NO_2	10102-44-0	2.12E-01				2.65E-02	2.12E-01				2.15E-02	4.80E-02
CO	630-08-0	4.96E+00				6.19E-01	4.96E+00				5.03E-01	1.12E+00
PM	N/A (pm)	9.80E-01				1.22E-01	9.80E-01				9.95E-02	2.22E-01
PM_{10}	N/A (pm10)	3.32E-01				4.15E-02	3.32E-01				3.37E-02	7.52E-02
$PM_{2.5}$	N/A (pm2.5)	1.27E-01				1.59E-02	1.27E-01				1.29E-02	2.88E-02
Benzene	71-43-2	2.26E-03	27279	636	10781	2.82E-04	2.26E-03	22185	636	8768	2.29E-04	5.11E-04
1,3-Butadiene	106-99-0	3.48E-04				4.34E-05	3.48E-04				3.53E-05	7.87E-05
Acrolein	107-02-8	5.25E-04				6.55E-05	5.25E-04				5.33E-05	1.19E-04
Acetaldehyde	75-07-0	3.39E-03				4.23E-04	3.39E-03				3.44E-04	7.68E-04
Formaldehyde	50-00-0	6.51E-03				8.12E-04	6.51E-03				6.60E-04	1.47E-03
Benzo(a)pyrene	50-32-8	4.28E-06				5.34E-07	4.28E-06				4.34E-07	9.68E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Contaminant	CAS#	Link NB1B - Weston Road NB (south of Valeria) - 39 km/h					Link SB1B - Weston Road SB (south of Valeria) - 39 km/h					SLINE1B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - south of Valeria)
NO_2	10102-44-0	2.12E-01				1.40E-02	2.12E-01				1.39E-02	2.79E-02
CO	630-08-0	4.96E+00				3.26E-01	4.96E+00				3.26E-01	6.53E-01
PM	N/A (pm)	9.80E-01				6.45E-02	9.80E-01				6.44E-02	1.29E-01
PM_{10}	N/A (pm10)	3.32E-01				2.19E-02	3.32E-01				2.19E-02	4.37E-02
$PM_{2.5}$	N/A (pm2.5)	1.27E-01				8.38E-03	1.27E-01				8.37E-03	1.67E-02
Benzene	71-43-2	2.26E-03	26055	351	5688	1.49E-04	2.26E-03	26028	351	5682	1.48E-04	2.97E-04
1,3-Butadiene	106-99-0	3.48E-04				2.29E-05	3.48E-04				2.29E-05	4.58E-05
Acrolein	107-02-8	5.25E-04				3.46E-05	5.25E-04				3.45E-05	6.91E-05
Acetaldehyde	75-07-0	3.39E-03				2.23E-04	3.39E-03				2.23E-04	4.47E-04
Formaldehyde	50-00-0	6.51E-03				4.28E-04	6.51E-03				4.28E-04	8.56E-04
Benzo(a)pyrene	50-32-8	4.28E-06				2.82E-07	4.28E-06				2.81E-07	5.63E-07

Contaminant	CAS#	Link NB2 - Highway 400 Off-ramp - 30 km/h (SLINE4)					Link WB1 - Highway 400 On-ramp - 30 km/h (SLINE5)					Link WB1 - Bass Pro Mills Drive [3] - 30 km/h (SLINE2)		
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)
NO_2	10102-44-0	2.40E-01				1.19E-02	2.40E-01				1.32E-02			6.39E-03
CO	630-08-0	5.98E+00				2.97E-01	5.98E+00				3.28E-01			1.59E-01
PM	N/A (pm)	1.00E+00				4.97E-02	1.00E+00				5.49E-02			2.66E-02
PM_{10}	N/A (pm10)	3.53E-01				1.75E-02	3.53E-01				1.94E-02			9.39E-03
$PM_{2.5}$	N/A (pm2.5)	1.35E-01				6.69E-03	1.35E-01				7.39E-03			3.59E-03
Benzene	71-43-2	2.56E-03	13383	516	4289	1.27E-04	2.56E-03	13338	572	4741	1.41E-04	278	2301	6.82E-05
1,3-Butadiene	106-99-0	4.04E-04				2.01E-05	4.04E-04				2.22E-05			1.08E-05
Acrolein	107-02-8	6.22E-04				3.09E-05	6.22E-04				3.41E-05			1.66E-05
Acetaldehyde	75-07-0	3.99E-03				1.98E-04	3.99E-03				2.19E-04			1.06E-04
Formaldehyde	50-00-0	7.70E-03				3.82E-04	7.70E-03				4.22E-04			2.05E-04
Benzo(a)pyrene	50-32-8	4.90E-06				2.43E-07	4.90E-06				2.69E-07			1.30E-07

Contaminant	CAS#	Link WB1A - Bass Pro Mills WB (east of Fishermens) - 25 km/h					Link EB1A - Bass Pro Mills EB (east of Fishermens) - 25 km/h					SLINE2A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Bass Pro east of Fishermens Way)
NO_2	10102-44-0	2.73E-01				1.51E-02	2.73E-01				1.55E-02	3.06E-02
CO	630-08-0	6.48E+00				3.59E-01	6.48E+00				3.67E-01	7.26E-01
PM	N/A (pm)	1.04E+00				5.74E-02	1.04E+00				5.86E-02	1.16E-01
PM_{10}	N/A (pm10)	3.88E-01				2.15E-02	3.88E-01				2.20E-02	4.35E-02
$PM_{2.5}$	N/A (pm2.5)	1.43E-01				7.91E-03	1.43E-01				8.08E-03	1.60E-02
Benzene	71-43-2	2.90E-03	10386	742	4788	1.61E-04	2.90E-03	10611	742	4892	1.64E-04	3.25E-04
1,3-Butadiene	106-99-0	4.80E-04				2.66E-05	4.80E-04				2.72E-05	5.38E-05
Acrolein	107-02-8	7.72E-04				4.28E-05	7.72E-04				4.37E-05	8.65E-05
Acetaldehyde	75-07-0	4.88E-03				2.70E-04	4.88E-03				2.76E-04	5.47E-04
Formaldehyde	50-00-0	9.53E-03				5.28E-04	9.53E-03				5.39E-04	1.07E-03
Benzo(a)pyrene	50-32-8	5.19E-06				2.88E-07	5.19E-06				2.94E-07	5.81E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Contaminant	CAS#	Link NB3 - Fishermens Way NB - 20 km/h					Link SB2 - Fishermens Way SB - 20 km/h					SLINE3
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Fishermens Way)
NO_2	10102-44-0	3.06E-01	3204	1062	2114	7.48E-03	3.06E-01	3384	1062	2233	7.90E-03	1.54E-02
CO	630-08-0	6.98E+00				1.71E-01	6.98E+00				1.80E-01	3.51E-01
PM	N/A (pm)	4.77E+00				1.17E-01	4.77E+00				1.23E-01	2.40E-01
PM_{10}	N/A (pm10)	1.13E+00				2.76E-02	1.13E+00				2.92E-02	5.68E-02
$PM_{2.5}$	N/A (pm2.5)	3.27E-01				8.01E-03	3.27E-01				8.46E-03	1.65E-02
Benzene	71-43-2	3.23E-03				7.91E-05	3.23E-03				8.36E-05	1.63E-04
1,3-Butadiene	106-99-0	5.56E-04				1.36E-05	5.56E-04				1.44E-05	2.80E-05
Acrolein	107-02-8	9.22E-04				2.26E-05	9.22E-04				2.38E-05	4.64E-05
Acetaldehyde	75-07-0	5.77E-03				1.41E-04	5.77E-03				1.49E-04	2.90E-04
Formaldehyde	50-00-0	1.14E-02				2.78E-04	1.14E-02				2.93E-04	5.71E-04
Benzo(a)pyrene	50-32-8	5.48E-06				1.34E-07	5.48E-06				1.42E-07	2.76E-07

Contaminant	CAS#	Link NB4 - Hwy 400 NB (north of on-ramp)- 100 km/h					Link SB3 - Hwy 400 NB (north of on-ramp)- 100 km/h					SLINE6
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400
NO_2	10102-44-0	1.27E-01	100863	874	54747	8.02E-02	1.27E-01	109665	874	59524	8.72E-02	1.67E-01
CO	630-08-0	2.87E+00				1.82E+00	2.87E+00				1.97E+00	3.79E+00
PM	N/A (pm)	8.52E-01				5.40E-01	8.52E-01				5.87E-01	1.13E+00
PM_{10}	N/A (pm10)	2.04E-01				1.29E-01	2.04E-01				1.41E-01	2.70E-01
$PM_{2.5}$	N/A (pm2.5)	7.51E-02				4.76E-02	7.51E-02				5.17E-02	9.93E-02
Benzene	71-43-2	1.16E-03				7.37E-04	1.16E-03				8.01E-04	1.54E-03
1,3-Butadiene	106-99-0	1.89E-04				1.20E-04	1.89E-04				1.31E-04	2.51E-04
Acrolein	107-02-8	3.09E-04				1.96E-04	3.09E-04				2.13E-04	4.09E-04
Acetaldehyde	75-07-0	1.93E-03				1.23E-03	1.93E-03				1.33E-03	2.56E-03
Formaldehyde	50-00-0	3.80E-03				2.41E-03	3.80E-03				2.61E-03	5.02E-03
Benzo(a)pyrene	50-32-8	2.13E-06				1.35E-06	2.13E-06				1.47E-06	2.82E-06

Contaminant	CAS#	Link NB4A - Hwy 400 NB (south of on-ramp)- 100 km/h					Link SB4 - Hwy 400 NB (south of on-ramp) - 100 km/h					SLINE6A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400 (south of on-ramp)
NO_2	10102-44-0	1.27E-01	100863	366	22927	3.36E-02	1.27E-01	123003	366	27959	4.10E-02	7.45E-02
CO	630-08-0	2.87E+00				7.60E-01	2.87E+00				9.27E-01	1.69E+00
PM	N/A (pm)	8.52E-01				2.26E-01	8.52E-01				2.76E-01	5.02E-01
PM_{10}	N/A (pm10)	2.04E-01				5.42E-02	2.04E-01				6.60E-02	1.20E-01
$PM_{2.5}$	N/A (pm2.5)	7.51E-02				1.99E-02	7.51E-02				2.43E-02	4.42E-02
Benzene	71-43-2	1.16E-03				3.09E-04	1.16E-03				3.76E-04	6.85E-04
1,3-Butadiene	106-99-0	1.89E-04				5.03E-05	1.89E-04				6.13E-05	1.12E-04
Acrolein	107-02-8	3.09E-04				8.21E-05	3.09E-04				1.00E-04	1.82E-04
Acetaldehyde	75-07-0	1.93E-03				5.13E-04	1.93E-03				6.26E-04	1.14E-03
Formaldehyde	50-00-0	3.80E-03				1.01E-03	3.80E-03				1.23E-03	2.24E-03
Benzo(a)pyrene	50-32-8	2.13E-06				5.66E-07	2.13E-06				6.90E-07	1.26E-06

Contaminant	CAS#	Link NB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					Link SB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					SLINE6B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400 (south of off-ramp)
NO_2	10102-44-0	1.27E-01	114246	325	23044	3.38E-02	1.27E-01	123003	325	24810	3.63E-02	7.01E-02
CO	630-08-0	2.87E+00				7.64E-01	2.87E+00				8.23E-01	1.59E+00
PM	N/A (pm)	8.52E-01				2.27E-01	8.52E-01				2.45E-01	4.72E-01
PM_{10}	N/A (pm10)	2.04E-01				5.44E-02	2.04E-01				5.86E-02	1.13E-01
$PM_{2.5}$	N/A (pm2.5)	7.51E-02				2.00E-02	7.51E-02				2.16E-02	4.16E-02
Benzene	71-43-2	1.16E-03				3.10E-04	1.16E-03				3.34E-04	6.44E-04
1,3-Butadiene	106-99-0	1.89E-04				5.05E-05	1.89E-04				5.44E-05	1.05E-04
Acrolein	107-02-8	3.09E-04				8.25E-05	3.09E-04				8.88E-05	1.71E-04
Acetaldehyde	75-07-0	1.93E-03				5.16E-04	1.93E-03				5.56E-04	1.07E-03
Formaldehyde	50-00-0	3.80E-03				1.01E-03	3.80E-03				1.09E-03	2.10E-03
Benzo(a)pyrene	50-32-8	2.13E-06				5.69E-07	2.13E-06				6.13E-07	1.18E-06

Notes:
(1) Emission factor data are produced by modelling using MOVES for all contaminants.
Emission factors for PM, PM10 and PM2.5 includes emission factors from both MOVES and US EPA, AP-42 Section 13.2.1 Paved Road for PM Emission Factors.
(2) Daily average emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Emission Data for Onsite Roads - Hourly:

Contaminant	CAS#	Link NB1 - Weston Road NB - 39 km/h					Link SB1 - Weston Road SB - 39 km/h					SLINE1	SLINE1C
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - north of Bass Pro, south of Astona)	Total (Weston - south of Bass Pro)
NO_2	10102-44-0	2.12E-01	2101	654	854	5.03E-02	2.12E-01	945	654	384	2.26E-02	2.81E-02	4.48E-02
CO	630-08-0	4.96E+00				1.18E+00	4.96E+00				5.29E-01	6.58E-01	1.05E+00
PM	N/A (pm)	9.80E-01				2.32E-01	9.80E-01				1.05E-01	1.30E-01	2.07E-01
PM_{10}	N/A (pm10)	3.32E-01				7.88E-02	3.32E-01				3.54E-02	4.41E-02	7.02E-02
$PM_{2.5}$	N/A (pm2.5)	1.27E-01				3.02E-02	1.27E-01				1.36E-02	1.69E-02	2.69E-02
Benzene	71-43-2	2.26E-03				5.35E-04	2.26E-03				2.41E-04	2.99E-04	4.76E-04
1,3-Butadiene	106-99-0	3.48E-04				8.25E-05	3.48E-04				3.71E-05	4.61E-05	7.35E-05
Acrolein	107-02-8	5.25E-04				1.24E-04	5.25E-04				5.60E-05	6.96E-05	1.11E-04
Acetaldehyde	75-07-0	3.39E-03				8.05E-04	3.39E-03				3.62E-04	4.50E-04	7.16E-04
Formaldehyde	50-00-0	6.51E-03				1.54E-03	6.51E-03				6.94E-04	8.63E-04	1.37E-03
Benzo(a)pyrene	50-32-8	4.28E-06				1.01E-06	4.28E-06				4.56E-07	5.67E-07	9.03E-07

Contaminant	CAS#	Link NB1A - Weston Road NB (north of Aston) - 39 km/h					Link SB1A - Weston Road SB (north of Aston) - 39 km/h					SLINE1A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - north of Astona)
NO_2	10102-44-0	2.12E-01	1992	636	787	4.64E-02	2.12E-01	962	636	380	2.24E-02	6.88E-02
CO	630-08-0	4.96E+00				1.08E+00	4.96E+00				5.24E-01	1.61E+00
PM	N/A (pm)	9.80E-01				2.14E-01	9.80E-01				1.04E-01	3.18E-01
PM_{10}	N/A (pm10)	3.32E-01				7.27E-02	3.32E-01				3.51E-02	1.08E-01
$PM_{2.5}$	N/A (pm2.5)	1.27E-01				2.78E-02	1.27E-01				1.34E-02	4.13E-02
Benzene	71-43-2	2.26E-03				4.93E-04	2.26E-03				2.38E-04	7.32E-04
1,3-Butadiene	106-99-0	3.48E-04				7.61E-05	3.48E-04				3.67E-05	1.13E-04
Acrolein	107-02-8	5.25E-04				1.15E-04	5.25E-04				5.54E-05	1.70E-04
Acetaldehyde	75-07-0	3.39E-03				7.42E-04	3.39E-03				3.58E-04	1.10E-03
Formaldehyde	50-00-0	6.51E-03				1.42E-03	6.51E-03				6.87E-04	2.11E-03
Benzo(a)pyrene	50-32-8	4.28E-06				9.35E-07	4.28E-06				4.52E-07	1.39E-06

Contaminant	CAS#	Link NB1B - Weston Road NB (south of Valeria) - 39 km/h					Link SB1B - Weston Road SB (south of Valeria) - 39 km/h					SLINE1B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - south of Valeria)
NO_2	10102-44-0	2.12E-01	2136	351	466	2.75E-02	2.12E-01	925	351	202	1.19E-02	3.94E-02
CO	630-08-0	4.96E+00				6.42E-01	4.96E+00				2.78E-01	9.20E-01
PM	N/A (pm)	9.80E-01				1.27E-01	9.80E-01				5.50E-02	1.82E-01
PM_{10}	N/A (pm10)	3.32E-01				4.30E-02	3.32E-01				1.86E-02	6.17E-02
$PM_{2.5}$	N/A (pm2.5)	1.27E-01				1.65E-02	1.27E-01				7.14E-03	2.36E-02
Benzene	71-43-2	2.26E-03				2.92E-04	2.26E-03				1.27E-04	4.19E-04
1,3-Butadiene	106-99-0	3.48E-04				4.51E-05	3.48E-04				1.95E-05	6.46E-05
Acrolein	107-02-8	5.25E-04				6.80E-05	5.25E-04				2.94E-05	9.75E-05
Acetaldehyde	75-07-0	3.39E-03				4.39E-04	3.39E-03				1.90E-04	6.30E-04
Formaldehyde	50-00-0	6.51E-03				8.43E-04	6.51E-03				3.65E-04	1.21E-03
Benzo(a)pyrene	50-32-8	4.28E-06				5.54E-07	4.28E-06				2.40E-07	7.94E-07

Contaminant	CAS#	Link NB2 - Highway 400 Off-ramp - 30 km/h (SLINE4)					Link WB1 - Highway 400 On-ramp / Bass Pro Mills Drive - 30 km/h (SLINE5)					Link WB1 - Bass Pro Mills Drive [3] - 30 km/h SLINE2)		
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)
NO_2	10102-44-0	2.40E-01	542	516	174	1.16E-02	2.40E-01	1274	572	453	3.02E-02	278	220	1.46E-02
CO	630-08-0	5.98E+00				2.88E-01	5.98E+00				7.52E-01			3.65E-01
PM	N/A (pm)	1.00E+00				4.83E-02	1.00E+00				1.26E-01			6.11E-02
PM_{10}	N/A (pm10)	3.53E-01				1.70E-02	3.53E-01				4.44E-02			2.15E-02
$PM_{2.5}$	N/A (pm2.5)	1.35E-01				6.50E-03	1.35E-01				1.70E-02			8.23E-03
Benzene	71-43-2	2.56E-03				1.24E-04	2.56E-03				3.22E-04			1.56E-04
1,3-Butadiene	106-99-0	4.04E-04				1.95E-05	4.04E-04				5.08E-05			2.47E-05
Acrolein	107-02-8	6.22E-04				3.00E-05	6.22E-04				7.82E-05			3.80E-05
Acetaldehyde	75-07-0	3.99E-03				1.93E-04	3.99E-03				5.02E-04			2.44E-04
Formaldehyde	50-00-0	7.70E-03				3.71E-04	7.70E-03				9.68E-04			4.70E-04
Benzo(a)pyrene	50-32-8	4.90E-06				2.36E-07	4.90E-06				6.16E-07			2.99E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Contaminant	CAS#	Link WB1A - Bass Pro Mills WB (east of Fishermens) - 25 km/h					Link EB1A - Bass Pro Mills EB (east of Fishermens) - 25 km/h					SLINE2A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Bass Pro east of Fishermens)
NO_2	10102-44-0	2.73E-01	1023	742	472	3.57E-02	2.73E-01	359	742	166	1.25E-02	4.83E-02
CO	630-08-0	6.48E+00				8.49E-01	6.48E+00				2.98E-01	1.15E+00
PM	N/A (pm)	1.04E+00				1.36E-01	1.04E+00				4.76E-02	1.83E-01
PM_{10}	N/A (pm10)	3.88E-01				5.08E-02	3.88E-01				1.78E-02	6.87E-02
$PM_{2.5}$	N/A (pm2.5)	1.43E-01				1.87E-02	1.43E-01				6.56E-03	2.53E-02
Benzene	71-43-2	2.90E-03				3.80E-04	2.90E-03				1.33E-04	5.13E-04
1,3-Butadiene	106-99-0	4.80E-04				6.29E-05	4.80E-04				2.21E-05	8.50E-05
Acrolein	107-02-8	7.72E-04				1.01E-04	7.72E-04				3.55E-05	1.37E-04
Acetaldehyde	75-07-0	4.88E-03				6.39E-04	4.88E-03				2.24E-04	8.64E-04
Formaldehyde	50-00-0	9.53E-03				1.25E-03	9.53E-03				4.38E-04	1.69E-03
Benzo(a)pyrene	50-32-8	5.19E-06				6.80E-07	5.19E-06				2.39E-07	9.18E-07

Contaminant	CAS#	Link NB3 - Fishermens Way NB - 20 km/h					Link SB2 - Fishermens Way SB - 20 km/h					SLINE3
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Fishermens Way)
NO_2	10102-44-0	3.06E-01	233	1062	154	1.31E-02	3.06E-01	301	1062	199	1.69E-02	2.99E-02
CO	630-08-0	6.98E+00				2.98E-01	6.98E+00				3.85E-01	6.83E-01
PM	N/A (pm)	4.77E+00				2.04E-01	4.77E+00				2.63E-01	4.67E-01
PM_{10}	N/A (pm10)	1.13E+00				4.82E-02	1.13E+00				6.23E-02	1.11E-01
$PM_{2.5}$	N/A (pm2.5)	3.27E-01				1.40E-02	3.27E-01				1.81E-02	3.20E-02
Benzene	71-43-2	3.23E-03				1.38E-04	3.23E-03				1.78E-04	3.16E-04
1,3-Butadiene	106-99-0	5.56E-04				2.37E-05	5.56E-04				3.07E-05	5.44E-05
Acrolein	107-02-8	9.22E-04				3.94E-05	9.22E-04				5.09E-05	9.02E-05
Acetaldehyde	75-07-0	5.77E-03				2.46E-04	5.77E-03				3.18E-04	5.65E-04
Formaldehyde	50-00-0	1.14E-02				4.85E-04	1.14E-02				6.26E-04	1.11E-03
Benzo(a)pyrene	50-32-8	5.48E-06				2.34E-07	5.48E-06				3.02E-07	5.36E-07

Contaminant	CAS#	Link NB4 - Hwy 400 NB (north of on-ramp)- 100 km/h					Link SB3 - Hwy 400 NB (north of on-ramp)- 100 km/h					SLINE6
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400
NOx	10102-44-0	1.27E-01	7225	874	3922	1.38E-01	1.27E-01	4506	874	2446	8.60E-02	2.24E-01
CO	630-08-0	2.87E+00				3.12E+00	2.87E+00				1.95E+00	5.07E+00
PM	N/A (pm)	8.52E-01				9.28E-01	8.52E-01				5.79E-01	1.51E+00
PM_{10}	N/A (pm10)	2.04E-01				2.22E-01	2.04E-01				1.39E-01	3.61E-01
$PM_{2.5}$	N/A (pm2.5)	7.51E-02				8.18E-02	7.51E-02				5.10E-02	1.33E-01
Benzene	71-43-2	1.16E-03				1.27E-03	1.16E-03				7.90E-04	2.06E-03
1,3-Butadiene	106-99-0	1.89E-04				2.06E-04	1.89E-04				1.29E-04	3.35E-04
Acrolein	107-02-8	3.09E-04				3.37E-04	3.09E-04				2.10E-04	5.47E-04
Acetaldehyde	75-07-0	1.93E-03				2.11E-03	1.93E-03				1.31E-03	3.42E-03
Formaldehyde	50-00-0	3.80E-03				4.13E-03	3.80E-03				2.58E-03	6.71E-03
Benzo(a)pyrene	50-32-8	2.13E-06				2.32E-06	2.13E-06				1.45E-06	3.77E-06

Contaminant	CAS#	Link NB4A - Hwy 400 NB (south of on-ramp)- 100 km/h					Link SB4 - Hwy 400 NB (south of on-ramp) - 100 km/h					SLINE6A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400 (south of on-ramp)
NOx	10102-44-0	1.27E-01	7225	366	1642	5.77E-02	1.27E-01	5780	366	1314	4.62E-02	1.04E-01
CO	630-08-0	2.87E+00				1.31E+00	2.87E+00				1.05E+00	2.35E+00
PM	N/A (pm)	8.52E-01				3.89E-01	8.52E-01				3.11E-01	6.99E-01
PM_{10}	N/A (pm10)	2.04E-01				9.31E-02	2.04E-01				7.45E-02	1.68E-01
$PM_{2.5}$	N/A (pm2.5)	7.51E-02				3.43E-02	7.51E-02				2.74E-02	6.17E-02
Benzene	71-43-2	1.16E-03				5.31E-04	1.16E-03				4.25E-04	9.55E-04
1,3-Butadiene	106-99-0	1.89E-04				8.64E-05	1.89E-04				6.91E-05	1.56E-04
Acrolein	107-02-8	3.09E-04				1.41E-04	3.09E-04				1.13E-04	2.54E-04
Acetaldehyde	75-07-0	1.93E-03				8.83E-04	1.93E-03				7.06E-04	1.59E-03
Formaldehyde	50-00-0	3.80E-03				1.73E-03	3.80E-03				1.39E-03	3.12E-03
Benzo(a)pyrene	50-32-8	2.13E-06				9.73E-07	2.13E-06				7.79E-07	1.75E-06

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-1

Source: On-Road Vehicle Emissions - Baseline Scenario (2020)

Contaminant	CAS#	Link NB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					Link SB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					SLINE6B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400 (south of off-ramp)
NOx	10102-44-0	1.27E-01	7767	325	1567	5.51E-02	1.27E-01	5780	325	1166	4.10E-02	9.61E-02
CO	630-08-0	2.87E+00				1.25E+00	2.87E+00				9.28E-01	2.18E+00
PM	N/A (pm)	8.52E-01				3.71E-01	8.52E-01				2.76E-01	6.47E-01
PM_{10}	N/A (pm10)	2.04E-01				8.88E-02	2.04E-01				6.61E-02	1.55E-01
$PM_{2.5}$	N/A (pm2.5)	7.51E-02				3.27E-02	7.51E-02				2.43E-02	5.70E-02
Benzene	71-43-2	1.16E-03				5.06E-04	1.16E-03				3.77E-04	8.83E-04
1,3-Butadiene	106-99-0	1.89E-04				8.24E-05	1.89E-04				6.13E-05	1.44E-04
Acrolein	107-02-8	3.09E-04				1.35E-04	3.09E-04				1.00E-04	2.35E-04
Acetaldehyde	75-07-0	1.93E-03				8.42E-04	1.93E-03				6.27E-04	1.47E-03
Formaldehyde	50-00-0	3.80E-03				1.65E-03	3.80E-03				1.23E-03	2.88E-03
Benzo(a)pyrene	50-32-8	2.13E-06				9.29E-07	2.13E-06				6.91E-07	1.62E-06

Notes:

(1) Emission factor data are produced by modelling using MOVES for all contaminants.
Emission factor for PM, PM10 and PM2.5 includes emission factor from MOVES and US EPA, AP-42 Section 13.2.1 Paved Road for PM Emission Factors.

(2) Hourly emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on available traffic data, and assumed travelling speed based on posted speed limit and percent green time and total cycle time. Meteorological data (temperature and humidity) in January amd July are used in the model. The higher calculated emission rates are conservatively used.

Summary of Emissions

			Hourly Emission Rate (g/s)											
Road			Weston Road (north of Bass Pro)	Weston Road (north of Astona)	Weston Road (south of Valeria)	Weston Road (south of Bass Pro Mills)	Bass Pro Mills Road (original)	Bass Pro Mills Road (east of Fishermens)	Fishermens Way	Hwy 400 Off-ramp	Hwy 400 On-ramp	Hwy 400	Hwy 400 (south of on-ramp)	Hwy 400 (south of off-ramp)
AERMOD Model Input ID			SLINE1	SLINE1A	SLINE1B	SLINE1C	SLINE2	SLINE2A	SLINE3	SLINE4	SLINE5	SLINE6	SLINE6A	SLINE6B
	Contaminant	CAS#												
	NO_2	10102-44-0	0.0281	0.0688	0.0394	0.0448	0.0146	0.0483	0.0299	0.0116	0.0302	0.2238	0.1039	0.0961
	CO	630-08-0	6.58E-01	1.61E+00	9.20E-01	1.05E+00	3.65E-01	1.15E+00	6.83E-01	2.88E-01	7.52E-01	5.07E+00	2.35E+00	2.18E+00
	PM	N/A (pm)	1.30E-01	3.18E-01	1.82E-01	2.07E-01	6.11E-02	1.83E-01	4.67E-01	4.83E-02	1.26E-01	1.51E+00	6.99E-01	6.47E-01
	PM_{10}	N/A (pm10)	4.41E-02	1.08E-01	6.17E-02	7.02E-02	2.15E-02	6.87E-02	1.11E-01	1.70E-02	4.44E-02	3.61E-01	1.68E-01	1.55E-01
	$PM_{2.5}$	N/A (pm2.5)	1.69E-02	4.13E-02	2.36E-02	2.69E-02	8.23E-03	2.53E-02	3.20E-02	6.50E-03	1.70E-02	1.33E-01	6.17E-02	5.70E-02
	Benzene	71-43-2	2.99E-04	7.32E-04	4.19E-04	4.76E-04	1.56E-04	5.13E-04	3.16E-04	1.24E-04	3.22E-04	2.06E-03	9.55E-04	8.83E-04
	1,3-Butadiene	106-99-0	4.61E-05	1.13E-04	6.46E-05	7.35E-05	2.47E-05	8.50E-05	5.44E-05	1.95E-05	5.08E-05	3.35E-04	1.56E-04	1.44E-04
	Acrolein	107-02-8	6.96E-05	1.70E-04	9.75E-05	1.11E-04	3.80E-05	1.37E-04	9.02E-05	3.00E-05	7.82E-05	5.47E-04	2.54E-04	2.35E-04
	Acetaldehyde	75-07-0	4.50E-04	1.10E-03	6.30E-04	7.16E-04	2.44E-04	8.64E-04	5.65E-04	1.93E-04	5.02E-04	3.42E-03	1.59E-03	1.47E-03
	Formaldehyde	50-00-0	8.63E-04	2.11E-03	1.21E-03	1.37E-03	4.70E-04	1.69E-03	1.11E-03	3.71E-04	9.68E-04	6.71E-03	3.12E-03	2.88E-03
	Benzo(a)pyrene	50-32-8	5.67E-07	1.39E-06	7.94E-07	9.03E-07	2.99E-07	9.18E-07	5.36E-07	2.36E-07	6.16E-07	3.77E-06	1.75E-06	1.62E-06

			Daily Emission Rate (g/s)											
Road			Weston Road (north of Bass Pro)	Weston Road (north of Astona)	Weston Road (south of Valeria)	Weston Road (south of Bass Pro Mills)	Bass Pro Mills Road (original)	Bass Pro Mills Road (east of Fishermens)	Fishermens Way	Hwy 400 Off-ramp	Hwy 400 On-ramp	Hwy 400	Hwy 400 (south of on-ramp)	Hwy 400 (south of off-ramp)
AERMOD Model Input ID			SLINE1	SLINE1A	SLINE1B	SLINE1C	SLINE2	SLINE2A	SLINE3	SLINE4	SLINE5	SLINE6	SLINE6A	SLINE6B
	Contaminant	CAS#												
	NO_2	10102-44-0	1.98E-02	4.80E-02	2.79E-02	3.15E-02	6.39E-03	3.06E-02	1.54E-02	1.19E-02	1.32E-02	1.67E-01	7.45E-02	7.01E-02
	CO	630-08-0	4.62E-01	1.12E+00	6.53E-01	7.35E-01	1.59E-01	7.26E-01	3.51E-01	2.97E-01	3.28E-01	3.79E+00	1.69E+00	1.59E+00
	PM	N/A (pm)	9.13E-02	2.22E-01	1.29E-01	1.45E-01	2.66E-02	1.16E-01	2.40E-01	4.97E-02	5.49E-02	1.13E+00	5.02E-01	4.72E-01
	PM_{10}	N/A (pm10)	3.09E-02	7.52E-02	4.37E-02	4.93E-02	9.39E-03	4.35E-02	5.68E-02	1.75E-02	1.94E-02	2.70E-01	1.20E-01	1.13E-01
	$PM_{2.5}$	N/A (pm2.5)	1.19E-02	2.88E-02	1.67E-02	1.89E-02	3.59E-03	1.60E-02	1.65E-02	6.69E-03	7.39E-03	9.93E-02	4.42E-02	4.16E-02
	Benzene	71-43-2	2.10E-04	5.11E-04	2.97E-04	3.35E-04	6.82E-05	3.25E-04	1.63E-04	1.27E-04	1.41E-04	1.54E-03	6.85E-04	6.44E-04
	1,3-Butadiene	106-99-0	3.24E-05	7.87E-05	4.58E-05	5.16E-05	1.08E-05	5.38E-05	2.80E-05	2.01E-05	2.22E-05	2.51E-04	1.12E-04	1.05E-04
	Acrolein	107-02-8	4.89E-05	1.19E-04	6.91E-05	7.79E-05	1.66E-05	8.65E-05	4.64E-05	3.09E-05	3.41E-05	4.09E-04	1.82E-04	1.71E-04
	Acetaldehyde	75-07-0	3.16E-04	7.68E-04	4.47E-04	5.03E-04	1.06E-04	5.47E-04	2.90E-04	1.98E-04	2.19E-04	2.56E-03	1.14E-03	1.07E-03
	Formaldehyde	50-00-0	6.06E-04	1.47E-03	8.56E-04	9.65E-04	2.05E-04	1.07E-03	5.71E-04	3.82E-04	4.22E-04	5.02E-03	2.24E-03	2.10E-03
	Benzo(a)pyrene	50-32-8	3.98E-07	9.68E-07	5.63E-07	6.34E-07	1.30E-07	5.81E-07	2.76E-07	2.43E-07	2.69E-07	2.82E-06	1.26E-06	1.18E-06

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Description:

Tailpipe emissions due to the fuel combustion and fugitive dust emissions from road traffic.

Traffic emissions from the following roads are within the Study Area. The road direction, traffic data, model ID are also listed below.

Traffic Data:

Road and Direction [1]	MOVES Link ID	Available Traffic Data[2]			Travel Speed (km/h) [3]	Distribution - Cars [2]	Distribution - Trucks [2]	Road Length (m)	AERMOD Source ID
		24-hour Total	Peak Hourly[4]	Traffic Count Year					
Weston Road NB	NB1	16956	1028	2031	39	90%	10%	654	SLINE1 / SLINE1C
Weston Rd NB (north of Astona)	NB1A	20052	1294	2031	39	90%	10%	636	SLINE1A
Weston Road NB (south of Valeria)	NB1B	15705	1059	2031	39	90%	10%	351	SLINE1B
Hwy 400 Off-ramp NB	NB2	15669	1435	2031	30	90%	10%	516	SLINE4
Fishermens Way NB	NB3	7776	289	2031	20	90%	10%	1062	SLINE3
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	116367	4709	2031	100	90%	10%	1239	SLINE6 / SLINE6A
Hwy 400 NB (south of off-ramp)	NB4B	132036	6144	2031	100	90%	10%	325	SLINE6B
Weston Road SB	SB1	25605	1856	2031	39	90%	10%	654	SLINE1 / SLINE1C
Weston Rd SB (north of Astona)	SB1A	22347	1445	2031	39	90%	10%	636	SLINE1A
Weston Road SB (south of Valeria)	SB1B	23769	1854	2031	39	90%	10%	351	SLINE1B
Fishermens Way SB	SB2	5247	161	2031	20	90%	10%	1062	SLINE3
Hwy 400 SB (north of on-ramp)	SB3	127866	9080	2031	100	90%	10%	874	SLINE6
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	144966	9817	2031	100	90%	10%	690	SLINE6A / SLINE6B
Hwy 400 On-ramp	WB1	17100	737	2031	30	90%	10%	572	SLINE2
Bass Pro Mills WB (east of Fishermens)	WB1A	15795	579	2031	25	90%	10%	742	SLINE2A
Bass Pro Mills EB (east of Fishermens)	EB1A	16758	1149	2031	25	90%	10%	742	SLINE2A
Bass Pro Mills Drive [5]	WB1	17100	737	2031	30	90%	10%	278	SLINE2

Notes:

(1) Road directions: North bound - NB; South bound - SB; East bound - EB; Westbound - WB

(2) Peak AM / PM traffic data are based on "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, July 23, 2021.
Average Daily Traffic (ADT) is not available. A multiplier of 9 for these roads (to be applied to the total of AM and PM peak volumes) was recommended by the traffic team.
Distribution of cars and trucks is based on the "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, July 23, 2021.

(3) The average speed is estimated based on the posted speed limit and the percent green time over total cycle time in that section of the road. Highway 400 and on-ramp speed limit is assumed to be the posted speed limit as there are no traffic lights.

(4) The AM and PM Peak hour traffic were considered. As the AM Peak hour has a higher overall traffic count within the Study Area, the AM Peak Hour traffic was used for emission estimation.

(5) This section of Bass Pro Mills Road within the Study Area in the Future No Build Scenario is westbound only and connects to the Highway 400 on-ramp.

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Contaminant(s) of Concern:
NO_2, PM, CO, and hydrocarbons emissions are the contaminants of concern from fuel combustions in the mobile equipment engines. Primary speciated VOCs (Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein) and a key PAH (Benzo(a) pyrene) are also included in the assessment.

Emission Calculations:

Methodology: U.S. EPA MOVES program

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. MOVES2014 is a major new revision to EPA's mobile source emission model and it replaces previous versions of MOVES and MOBILE6.2 models.
MOVES2014 project level is used in estimating the vehicle on-road emissions for the project.

Key Input Data to MOVES

Parameter	Input Description
Modelling Scale	Project level
Contaminants	CO, NOx, PM, PM10, PM2.5, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein, and Benzo(a)pyrene
Construction Year	2031
Evaluation Month and Time	January or July - the higher emission factors out of the two months are conservatively used
Meteorology (ambient temp., relative humidity)	Canadian Climate Normal, Toronto and Toronto Lester B. Pearson Int'l A, ON
Road Type	Urban Unrestricted Access, Urban Restricted Access
Fuel Type	Assumed gasoline for the cars, and diesel for heavy trucks
Fuel Data	Ontario
Traffic Volume	See table above
Traffic Speed	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year

Detailed MOVES input and output data are saved in the project folder. Summary of the emission data from the modelling for each of the road links are presented below.

Emission Data for Onsite Roads - Daily:

Contaminant	CAS#	Link NB1 - Weston Road NB - 39 km/h					Link SB1 - Weston Road SB - 39 km/h					SLINE1	SLINE1C
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - north of Bass Pro, south of Astona)	Total (Weston - south of Bass Pro)
NO_2	10102-44-0	1.96E-01	16956	654	6889	1.56E-02	1.96E-01	25605	654	10402	2.36E-02	1.51E-02	2.41E-02
CO	630-08-0	2.27E+00				1.81E-01	2.27E+00				2.73E-01	1.75E-01	2.79E-01
PM	N/A (pm)	9.11E-01				7.26E-02	9.11E-01				1.10E-01	7.03E-02	1.12E-01
PM_{10}	N/A (pm10)	2.63E-01				2.09E-02	2.63E-01				3.16E-02	2.03E-02	3.23E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				5.20E-03	6.53E-02				7.86E-03	5.04E-03	8.02E-03
Benzene	71-43-2	5.34E-04				4.26E-05	5.34E-04				6.43E-05	4.12E-05	6.56E-05
1,3-Butadiene	106-99-0	3.35E-05				2.67E-06	3.35E-05				4.03E-06	2.59E-06	4.12E-06
Acrolein	107-02-8	1.21E-04				9.68E-06	1.21E-04				1.46E-05	9.38E-06	1.49E-05
Acetaldehyde	75-07-0	9.06E-04				7.23E-05	9.06E-04				1.09E-04	7.00E-05	1.11E-04
Formaldehyde	50-00-0	1.46E-03				1.16E-04	1.46E-03				1.76E-04	1.13E-04	1.80E-04
Benzo(a)pyrene	50-32-8	7.10E-07				5.66E-08	7.10E-07				8.55E-08	5.48E-08	8.73E-08

Contaminant	CAS#	Link NB1A - Weston Road NB (north of Aston) - 39 km/h					Link SB1A - Weston Road SB (north of Aston) - 39 km/h					SLINE1A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - north of Astona)
NO_2	10102-44-0	1.96E-01	20052	636	7925	1.80E-02	1.96E-01	22347	636	8832	2.00E-02	3.80E-02
CO	630-08-0	2.27E+00				2.08E-01	2.27E+00				2.32E-01	4.40E-01
PM	N/A (pm)	9.11E-01				8.35E-02	9.11E-01				9.31E-02	1.77E-01
PM_{10}	N/A (pm10)	2.63E-01				2.41E-02	2.63E-01				2.69E-02	5.10E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				5.99E-03	6.53E-02				6.67E-03	1.27E-02
Benzene	71-43-2	5.34E-04				4.90E-05	5.34E-04				5.46E-05	1.04E-04
1,3-Butadiene	106-99-0	3.35E-05				3.07E-06	3.35E-05				3.42E-06	6.49E-06
Acrolein	107-02-8	1.21E-04				1.11E-05	1.21E-04				1.24E-05	2.36E-05
Acetaldehyde	75-07-0	9.06E-04				8.31E-05	9.06E-04				9.26E-05	1.76E-04
Formaldehyde	50-00-0	1.46E-03				1.34E-04	1.46E-03				1.49E-04	2.83E-04
Benzo(a)pyrene	50-32-8	7.10E-07				6.51E-08	7.10E-07				7.26E-08	1.38E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Contaminant	CAS#	Link NB1B - Weston Road NB (south of Valeria) - 39 km/h					Link SB1B - Weston Road SB (south of Valeria) - 39 km/h					SLINE1B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - south of Valeria)
NO_2	10102-44-0	1.96E-01	15705	351	3428	7.78E-03	1.96E-01	23769	351	5189	1.18E-02	1.95E-02
CO	630-08-0	2.27E+00				9.00E-02	2.27E+00				1.36E-01	2.26E-01
PM	N/A (pm)	9.11E-01				3.61E-02	9.11E-01				5.47E-02	9.08E-02
PM_{10}	N/A (pm10)	2.63E-01				1.04E-02	2.63E-01				1.58E-02	2.62E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				2.59E-03	6.53E-02				3.92E-03	6.51E-03
Benzene	71-43-2	5.34E-04				2.12E-05	5.34E-04				3.21E-05	5.33E-05
1,3-Butadiene	106-99-0	3.35E-05				1.33E-06	3.35E-05				2.01E-06	3.34E-06
Acrolein	107-02-8	1.21E-04				4.82E-06	1.21E-04				7.29E-06	1.21E-05
Acetaldehyde	75-07-0	9.06E-04				3.60E-05	9.06E-04				5.44E-05	9.04E-05
Formaldehyde	50-00-0	1.46E-03				5.79E-05	1.46E-03				8.77E-05	1.46E-04
Benzo(a)pyrene	50-32-8	7.10E-07				2.82E-08	7.10E-07				4.26E-08	7.08E-08

Contaminant	CAS#	Link NB2 - Highway 400 Off-ramp - 30 km/h (SLINE4)					Link WB1 - Highway 400 On-ramp - 30 km/h (SLINE5)					Link WB1 - Bass Pro Mills Drive [3] - 30 km/h (SLINE2)		
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)
NO_2	10102-44-0	2.31E-01	15669	516	5021	1.34E-02	2.31E-01	17100	572	6078	1.63E-02	278	2950	7.90E-03
CO	630-08-0	2.75E+00				1.60E-01	2.75E+00				1.94E-01			9.40E-02
PM	N/A (pm)	9.26E-01				5.38E-02	9.26E-01				6.51E-02			3.16E-02
PM_{10}	N/A (pm10)	2.78E-01				1.62E-02	2.78E-01				1.96E-02			9.49E-03
$PM_{2.5}$	N/A (pm2.5)	6.85E-02				3.98E-03	6.85E-02				4.82E-03			2.34E-03
Benzene	71-43-2	6.01E-04				3.49E-05	6.01E-04				4.23E-05			2.05E-05
1,3-Butadiene	106-99-0	4.00E-05				2.32E-06	4.00E-05				2.81E-06			1.36E-06
Acrolein	107-02-8	1.44E-04				8.36E-06	1.44E-04				1.01E-05			4.91E-06
Acetaldehyde	75-07-0	1.07E-03				6.22E-05	1.07E-03				7.52E-05			3.65E-05
Formaldehyde	50-00-0	1.73E-03				1.00E-04	1.73E-03				1.21E-04			5.89E-05
Benzo(a)pyrene	50-32-8	8.22E-07				4.77E-08	8.22E-07				5.78E-08			2.81E-08

Contaminant	CAS#	Link WB1A - Bass Pro Mills WB (east of Fishermens) - 25 km/h					Link EB1A - Bass Pro Mills EB (east of Fishermens) - 25 km/h					SLINE2A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Bass Pro east of Fishermens Way)
NO_2	10102-44-0	2.77E-01	15795	742	7282	2.33E-02	2.77E-01	16758	742	7726	2.48E-02	4.81E-02
CO	630-08-0	3.00E+00				2.53E-01	3.00E+00				2.68E-01	5.21E-01
PM	N/A (pm)	9.55E-01				8.05E-02	9.55E-01				8.54E-02	1.66E-01
PM_{10}	N/A (pm10)	3.08E-01				2.59E-02	3.08E-01				2.75E-02	5.34E-02
$PM_{2.5}$	N/A (pm2.5)	7.32E-02				6.17E-03	7.32E-02				6.54E-03	1.27E-02
Benzene	71-43-2	6.71E-04				5.65E-05	6.71E-04				6.00E-05	1.16E-04
1,3-Butadiene	106-99-0	5.09E-05				4.29E-06	5.09E-05				4.55E-06	8.83E-06
Acrolein	107-02-8	1.80E-04				1.52E-05	1.80E-04				1.61E-05	3.13E-05
Acetaldehyde	75-07-0	1.33E-03				1.12E-04	1.33E-03				1.19E-04	2.31E-04
Formaldehyde	50-00-0	2.15E-03				1.81E-04	2.15E-03				1.93E-04	3.74E-04
Benzo(a)pyrene	50-32-8	8.93E-07				7.53E-08	8.93E-07				7.99E-08	1.55E-07

Contaminant	CAS#	Link NB3 - Fishermens Way NB - 20 km/h					Link SB2 - Fishermens Way SB - 20 km/h					SLINE3
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Fishermens Way)
NO_2	10102-44-0	3.23E-01	7776	1062	5131	1.92E-02	3.23E-01	5247	1062	3462	1.29E-02	3.21E-02
CO	630-08-0	3.24E+00				1.92E-01	3.24E+00				1.30E-01	3.22E-01
PM	N/A (pm)	1.69E+00				1.00E-01	1.69E+00				6.77E-02	1.68E-01
PM_{10}	N/A (pm10)	4.72E-01				2.80E-02	4.72E-01				1.89E-02	4.69E-02
$PM_{2.5}$	N/A (pm2.5)	1.11E-01				6.62E-03	1.11E-01				4.47E-03	1.11E-02
Benzene	71-43-2	7.40E-04				4.39E-05	7.40E-04				2.96E-05	7.36E-05
1,3-Butadiene	106-99-0	6.18E-05				3.67E-06	6.18E-05				2.47E-06	6.14E-06
Acrolein	107-02-8	2.17E-04				1.29E-05	2.17E-04				8.69E-06	2.16E-05
Acetaldehyde	75-07-0	1.59E-03				9.42E-05	1.59E-03				6.35E-05	1.58E-04
Formaldehyde	50-00-0	2.58E-03				1.53E-04	2.58E-03				1.03E-04	2.57E-04
Benzo(a)pyrene	50-32-8	9.65E-07				5.73E-08	9.65E-07				3.86E-08	9.59E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Contaminant	CAS#	Link NB4 - Hwy 400 NB (north of on-ramp)- 100 km/h					Link SB3 - Hwy 400 NB (north of on-ramp)- 100 km/h					SLINE6
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400
NO_2	10102-44-0	2.84E-02	116367	874	63162	2.08E-02	2.84E-02	127866	874	69403	2.28E-02	4.36E-02
CO	630-08-0	2.61E-01				1.91E-01	2.61E-01				2.10E-01	4.00E-01
PM	N/A (pm)	8.87E-01				6.49E-01	8.87E-01				7.13E-01	1.36E+00
PM_{10}	N/A (pm10)	2.40E-01				1.75E-01	2.40E-01				1.92E-01	3.68E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				3.70E-02	5.06E-02				4.06E-02	7.76E-02
Benzene	71-43-2	1.11E-04				8.13E-05	1.11E-04				8.93E-05	1.71E-04
1,3-Butadiene	106-99-0	9.83E-06				7.18E-06	9.83E-06				7.89E-06	1.51E-05
Acrolein	107-02-8	3.31E-05				2.42E-05	3.31E-05				2.66E-05	5.08E-05
Acetaldehyde	75-07-0	2.37E-04				1.73E-04	2.37E-04				1.90E-04	3.63E-04
Formaldehyde	50-00-0	3.96E-04				2.89E-04	3.96E-04				3.18E-04	6.07E-04
Benzo(a)pyrene	50-32-8	1.09E-07				7.95E-08	1.09E-07				8.73E-08	1.67E-07

Contaminant	CAS#	Link NB4A - Hwy 400 NB (south of on-ramp)- 100 km/h					Link SB4 - Hwy 400 NB (south of on-ramp) - 100 km/h					SLINE6A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400 (south of on-ramp)
NO_2	10102-44-0	2.84E-02	116367	366	26451	8.71E-03	2.84E-02	144966	366	32951	1.08E-02	1.96E-02
CO	630-08-0	2.61E-01				7.99E-02	2.61E-01				9.95E-02	1.79E-01
PM	N/A (pm)	8.87E-01				2.72E-01	8.87E-01				3.38E-01	6.10E-01
PM_{10}	N/A (pm10)	2.40E-01				7.34E-02	2.40E-01				9.14E-02	1.65E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.55E-02	5.06E-02				1.93E-02	3.48E-02
Benzene	71-43-2	1.11E-04				3.40E-05	1.11E-04				4.24E-05	7.64E-05
1,3-Butadiene	106-99-0	9.83E-06				3.01E-06	9.83E-06				3.75E-06	6.75E-06
Acrolein	107-02-8	3.31E-05				1.01E-05	3.31E-05				1.26E-05	2.28E-05
Acetaldehyde	75-07-0	2.37E-04				7.25E-05	2.37E-04				9.03E-05	1.63E-04
Formaldehyde	50-00-0	3.96E-04				1.21E-04	3.96E-04				1.51E-04	2.72E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.33E-08	1.09E-07				4.15E-08	7.47E-08

Contaminant	CAS#	Link NB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					Link SB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					SLINE6B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400 (south of off-ramp)
NO_2	10102-44-0	2.84E-02	132036	325	26632	8.77E-03	2.84E-02	144966	325	29240	9.62E-03	1.84E-02
CO	630-08-0	2.61E-01				8.04E-02	2.61E-01				8.83E-02	1.69E-01
PM	N/A (pm)	8.87E-01				2.74E-01	8.87E-01				3.00E-01	5.74E-01
PM_{10}	N/A (pm10)	2.40E-01				7.39E-02	2.40E-01				8.11E-02	1.55E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.56E-02	5.06E-02				1.71E-02	3.27E-02
Benzene	71-43-2	1.11E-04				3.43E-05	1.11E-04				3.76E-05	7.19E-05
1,3-Butadiene	106-99-0	9.83E-06				3.03E-06	9.83E-06				3.33E-06	6.35E-06
Acrolein	107-02-8	3.31E-05				1.02E-05	3.31E-05				1.12E-05	2.14E-05
Acetaldehyde	75-07-0	2.37E-04				7.30E-05	2.37E-04				8.01E-05	1.53E-04
Formaldehyde	50-00-0	3.96E-04				1.22E-04	3.96E-04				1.34E-04	2.56E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.35E-08	1.09E-07				3.68E-08	7.03E-08

Notes:
(1) Emission factor data are produced by modelling using MOVES for all contaminants.
Emission factors for PM, PM10 and PM2.5 includes emission factors from both MOVES and US EPA, AP-42 Section 13.2.1 Paved Road for PM Emission Factors.
(2) Daily average emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Future No Build Scenario is westbound only and connects to the Highway 400 on-ramp.

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Emission Data for Onsite Roads - Hourly:

Contaminant	CAS#	Link NB1 - Weston Road NB - 39 km/h					Link SB1 - Weston Road SB - 39 km/h					SLINE1	SLINE1C
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - north of Bass Pro, south of Astona)	Total (Weston - south of Bass Pro)
NO_2	10102-44-0	1.96E-01	1028	654	418	2.27E-02	1.96E-01	1856	654	754	4.11E-02	2.46E-02	3.92E-02
CO	630-08-0	2.27E+00				2.63E-01	2.27E+00				4.75E-01	2.85E-01	4.53E-01
PM	N/A (pm)	9.11E-01				1.06E-01	9.11E-01				1.91E-01	1.14E-01	1.82E-01
PM_{10}	N/A (pm10)	2.63E-01				3.05E-02	2.63E-01				5.50E-02	3.30E-02	5.25E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				7.57E-03	6.53E-02				1.37E-02	8.19E-03	1.30E-02
Benzene	71-43-2	5.34E-04				6.20E-05	5.34E-04				1.12E-04	6.70E-05	1.07E-04
1,3-Butadiene	106-99-0	3.35E-05				3.88E-06	3.35E-05				7.01E-06	4.20E-06	6.69E-06
Acrolein	107-02-8	1.21E-04				1.41E-05	1.21E-04				2.54E-05	1.52E-05	2.43E-05
Acetaldehyde	75-07-0	9.06E-04				1.05E-04	9.06E-04				1.90E-04	1.14E-04	1.81E-04
Formaldehyde	50-00-0	1.46E-03				1.69E-04	1.46E-03				3.06E-04	1.83E-04	2.92E-04
Benzo(a)pyrene	50-32-8	7.10E-07				8.24E-08	7.10E-07				1.49E-07	8.91E-08	1.42E-07

Contaminant	CAS#	Link NB1A - Weston Road NB (north of Aston) - 39 km/h					Link SB1A - Weston Road SB (north of Aston) - 39 km/h					SLINE1A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - north of Astona)
NO_2	10102-44-0	1.96E-01	1294	636	511	2.78E-02	1.96E-01	1445	636	571	3.11E-02	5.89E-02
CO	630-08-0	2.27E+00				3.22E-01	2.27E+00				3.60E-01	6.82E-01
PM	N/A (pm)	9.11E-01				1.29E-01	9.11E-01				1.44E-01	2.74E-01
PM_{10}	N/A (pm10)	2.63E-01				3.73E-02	2.63E-01				4.17E-02	7.90E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				9.27E-03	6.53E-02				1.04E-02	1.96E-02
Benzene	71-43-2	5.34E-04				7.59E-05	5.34E-04				8.47E-05	1.61E-04
1,3-Butadiene	106-99-0	3.35E-05				4.76E-06	3.35E-05				5.31E-06	1.01E-05
Acrolein	107-02-8	1.21E-04				1.73E-05	1.21E-04				1.93E-05	3.65E-05
Acetaldehyde	75-07-0	9.06E-04				1.29E-04	9.06E-04				1.44E-04	2.73E-04
Formaldehyde	50-00-0	1.46E-03				2.07E-04	1.46E-03				2.32E-04	4.39E-04
Benzo(a)pyrene	50-32-8	7.10E-07				1.01E-07	7.10E-07				1.13E-07	2.13E-07

Contaminant	CAS#	Link NB1B - Weston Road NB (south of Valeria) - 39 km/h					Link SB1B - Weston Road SB (south of Valeria) - 39 km/h					SLINE1B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - south of Valeria)
NO_2	10102-44-0	1.96E-01	1059	351	231	1.26E-02	1.96E-01	1854	351	405	2.20E-02	3.46E-02
CO	630-08-0	2.27E+00				1.46E-01	2.27E+00				2.55E-01	4.00E-01
PM	N/A (pm)	9.11E-01				5.85E-02	9.11E-01				1.02E-01	1.61E-01
PM_{10}	N/A (pm10)	2.63E-01				1.69E-02	2.63E-01				2.95E-02	4.64E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				4.19E-03	6.53E-02				7.34E-03	1.15E-02
Benzene	71-43-2	5.34E-04				3.43E-05	5.34E-04				6.00E-05	9.43E-05
1,3-Butadiene	106-99-0	3.35E-05				2.15E-06	3.35E-05				3.76E-06	5.91E-06
Acrolein	107-02-8	1.21E-04				7.80E-06	1.21E-04				1.37E-05	2.15E-05
Acetaldehyde	75-07-0	9.06E-04				5.82E-05	9.06E-04				1.02E-04	1.60E-04
Formaldehyde	50-00-0	1.46E-03				9.38E-05	1.46E-03				1.64E-04	2.58E-04
Benzo(a)pyrene	50-32-8	7.10E-07				4.56E-08	7.10E-07				7.98E-08	1.25E-07

Contaminant	CAS#	Link NB2 - Highway 400 Off-ramp - 30 km/h					Link WB1 - Highway 400 On-ramp / Bass Pro Mills Drive - 30 km/h					Link WB1 - Bass Pro Mills Drive [3] - 30 km/h		
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)
NO_2	10102-44-0	2.31E-01	1435	516	460	2.95E-02	2.31E-01	737	572	262	1.68E-02	278	127	8.17E-03
CO	630-08-0	2.75E+00				3.52E-01	2.75E+00				2.00E-01			9.72E-02
PM	N/A (pm)	9.26E-01				1.18E-01	9.26E-01				6.74E-02			3.27E-02
PM_{10}	N/A (pm10)	2.78E-01				3.55E-02	2.78E-01				2.02E-02			9.82E-03
$PM_{2.5}$	N/A (pm2.5)	6.85E-02				8.75E-03	6.85E-02				4.98E-03			2.42E-03
Benzene	71-43-2	6.01E-04				7.68E-05	6.01E-04				4.38E-05			2.12E-05
1,3-Butadiene	106-99-0	4.00E-05				5.10E-06	4.00E-05				2.91E-06			1.41E-06
Acrolein	107-02-8	1.44E-04				1.84E-05	1.44E-04				1.05E-05			5.08E-06
Acetaldehyde	75-07-0	1.07E-03				1.37E-04	1.07E-03				7.78E-05			3.78E-05
Formaldehyde	50-00-0	1.73E-03				2.20E-04	1.73E-03				1.26E-04			6.10E-05
Benzo(a)pyrene	50-32-8	8.22E-07				1.05E-07	8.22E-07				5.98E-08			2.90E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Contaminant	CAS#	Link WB1A - Bass Pro Mills WB (east of Fishermens) - 25 km/h					Link EB1A - Bass Pro Mills EB (east of Fishermens) - 25 km/h					SLINE2A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Bass Pro east of Fishermens)
NO_2	10102-44-0	2.77E-01	579	742	267	2.05E-02	2.77E-01	1149	742	530	4.07E-02	6.13E-02
CO	630-08-0	3.00E+00				2.22E-01	3.00E+00				4.41E-01	6.63E-01
PM	N/A (pm)	9.55E-01				7.08E-02	9.55E-01				1.41E-01	2.11E-01
PM_{10}	N/A (pm10)	3.08E-01				2.28E-02	3.08E-01				4.53E-02	6.81E-02
$PM_{2.5}$	N/A (pm2.5)	7.32E-02				5.43E-03	7.32E-02				1.08E-02	1.62E-02
Benzene	71-43-2	6.71E-04				4.97E-05	6.71E-04				9.87E-05	1.48E-04
1,3-Butadiene	106-99-0	5.09E-05				3.77E-06	5.09E-05				7.48E-06	1.13E-05
Acrolein	107-02-8	1.80E-04				1.34E-05	1.80E-04				2.65E-05	3.99E-05
Acetaldehyde	75-07-0	1.33E-03				9.84E-05	1.33E-03				1.95E-04	2.94E-04
Formaldehyde	50-00-0	2.15E-03				1.60E-04	2.15E-03				3.17E-04	4.76E-04
Benzo(a)pyrene	50-32-8	8.93E-07				6.62E-08	8.93E-07				1.31E-07	1.98E-07

Contaminant	CAS#	Link NB3 - Fishermens Way NB - 20 km/h					Link SB2 - Fishermens Way SB - 20 km/h					SLINE3
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Fishermens Way)
NO_2	10102-44-0	3.23E-01	289	1062	191	1.71E-02	3.23E-01	161	1062	106	9.52E-03	2.66E-02
CO	630-08-0	3.24E+00				1.72E-01	3.24E+00				9.56E-02	2.67E-01
PM	N/A (pm)	1.69E+00				8.94E-02	1.69E+00				4.98E-02	1.39E-01
PM_{10}	N/A (pm10)	4.72E-01				2.50E-02	4.72E-01				1.39E-02	3.89E-02
$PM_{2.5}$	N/A (pm2.5)	1.11E-01				5.90E-03	1.11E-01				3.29E-03	9.19E-03
Benzene	71-43-2	7.40E-04				3.92E-05	7.40E-04				2.18E-05	6.10E-05
1,3-Butadiene	106-99-0	6.18E-05				3.27E-06	6.18E-05				1.82E-06	5.09E-06
Acrolein	107-02-8	2.17E-04				1.15E-05	2.17E-04				6.40E-06	1.79E-05
Acetaldehyde	75-07-0	1.59E-03				8.40E-05	1.59E-03				4.68E-05	1.31E-04
Formaldehyde	50-00-0	2.58E-03				1.37E-04	2.58E-03				7.61E-05	2.13E-04
Benzo(a)pyrene	50-32-8	9.65E-07				5.11E-08	9.65E-07				2.85E-08	7.96E-08

Contaminant	CAS#	Link NB4 - Hwy 400 NB (north of on-ramp)- 100 km/h					Link SB3 - Hwy 400 NB (north of on-ramp)- 100 km/h					SLINE6
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400
NOx	10102-44-0	2.84E-02	4709	874	2556	2.02E-02	2.84E-02	9080	874	4928	3.89E-02	5.91E-02
CO	630-08-0	2.61E-01				1.85E-01	2.61E-01				3.57E-01	5.42E-01
PM	N/A (pm)	8.87E-01				6.30E-01	8.87E-01				1.21E+00	1.84E+00
PM_{10}	N/A (pm10)	2.40E-01				1.70E-01	2.40E-01				3.28E-01	4.98E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				3.59E-02	5.06E-02				6.93E-02	1.05E-01
Benzene	71-43-2	1.11E-04				7.89E-05	1.11E-04				1.52E-04	2.31E-04
1,3-Butadiene	106-99-0	9.83E-06				6.97E-06	9.83E-06				1.35E-05	2.04E-05
Acrolein	107-02-8	3.31E-05				2.35E-05	3.31E-05				4.54E-05	6.89E-05
Acetaldehyde	75-07-0	2.37E-04				1.68E-04	2.37E-04				3.24E-04	4.92E-04
Formaldehyde	50-00-0	3.96E-04				2.81E-04	3.96E-04				5.42E-04	8.23E-04
Benzo(a)pyrene	50-32-8	1.09E-07				7.72E-08	1.09E-07				1.49E-07	2.26E-07

Contaminant	CAS#	Link NB4A - Hwy 400 NB (south of on-ramp)- 100 km/h					Link SB4 - Hwy 400 NB (south of on-ramp) - 100 km/h					SLINE6A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400 (south of on-ramp)
NOx	10102-44-0	2.84E-02	4709	366	1070	8.45E-03	2.84E-02	9817	366	2231	1.76E-02	2.61E-02
CO	630-08-0	2.61E-01				7.76E-02	2.61E-01				1.62E-01	2.39E-01
PM	N/A (pm)	8.87E-01				2.64E-01	8.87E-01				5.50E-01	8.14E-01
PM_{10}	N/A (pm10)	2.40E-01				7.12E-02	2.40E-01				1.49E-01	2.20E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.50E-02	5.06E-02				3.14E-02	4.64E-02
Benzene	71-43-2	1.11E-04				3.31E-05	1.11E-04				6.89E-05	1.02E-04
1,3-Butadiene	106-99-0	9.83E-06				2.92E-06	9.83E-06				6.09E-06	9.01E-06
Acrolein	107-02-8	3.31E-05				9.85E-06	3.31E-05				2.05E-05	3.04E-05
Acetaldehyde	75-07-0	2.37E-04				7.04E-05	2.37E-04				1.47E-04	2.17E-04
Formaldehyde	50-00-0	3.96E-04				1.18E-04	3.96E-04				2.45E-04	3.63E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.23E-08	1.09E-07				6.74E-08	9.97E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Contaminant	CAS#	Link NB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					Link SB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					SLINE6B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400 (south of off-ramp)
NOx	10102-44-0	2.84E-02	6144	325	1239	9.79E-03	2.84E-02	9817	325	1980	1.56E-02	2.54E-02
CO	630-08-0	2.61E-01				8.98E-02	2.61E-01				1.43E-01	2.33E-01
PM	N/A (pm)	8.87E-01				3.05E-01	8.87E-01				4.88E-01	7.94E-01
PM_{10}	N/A (pm10)	2.40E-01				8.25E-02	2.40E-01				1.32E-01	2.14E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.74E-02	5.06E-02				2.78E-02	4.53E-02
Benzene	71-43-2	1.11E-04				3.83E-05	1.11E-04				6.12E-05	9.94E-05
1,3-Butadiene	106-99-0	9.83E-06				3.38E-06	9.83E-06				5.40E-06	8.79E-06
Acrolein	107-02-8	3.31E-05				1.14E-05	3.31E-05				1.82E-05	2.96E-05
Acetaldehyde	75-07-0	2.37E-04				8.15E-05	2.37E-04				1.30E-04	2.12E-04
Formaldehyde	50-00-0	3.96E-04				1.36E-04	3.96E-04				2.18E-04	3.54E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.74E-08	1.09E-07				5.98E-08	9.72E-08

Notes:

SLINE6B

(2) Hourly emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on available traffic data, and assumed travelling speed based on posted speed limit and percent green time and total cycle time. Meteorological data (temperature and humidity) in January amd July are used in the model. The higher calculated emission rates are conservatively used.

Summary of Emissions

			Hourly Emission Rate (g/s)											
Road			Weston Road	Weston Road (north of Astona)	Weston Road (south of Valeria)	Weston Road (south of Bass Pro Mills)	Bass Pro Mills Road (original)	Bass Pro Mills Road (east of Fishermens)	Fishermens Way	Hwy 400 Off-ramp	Hwy 400 On-ramp	Hwy 400	Hwy 400 (south of on-ramp)	Hwy 400 (south of off-ramp)
AERMOD Model Input ID			SLINE1	SLINE1A	SLINE1B	SLINE1C	SLINE2	SLINE2A	SLINE3	SLINE4	SLINE5	SLINE6	SLINE6A	SLINE6B
	Contaminant	CAS#												
	NO_2	10102-44-0	0.0246	0.0589	0.0346	0.0392	0.0082	0.0613	0.0266	0.0295	0.0168	0.0591	0.0261	0.0254
	CO	630-08-0	2.85E-01	6.82E-01	4.00E-01	4.53E-01	9.72E-02	6.63E-01	2.67E-01	3.52E-01	2.00E-01	5.42E-01	2.39E-01	2.33E-01
	PM	N/A (pm)	1.14E-01	2.74E-01	1.61E-01	1.82E-01	3.27E-02	2.11E-01	1.39E-01	1.18E-01	6.74E-02	1.84E+00	8.14E-01	7.94E-01
	PM_{10}	N/A (pm10)	3.30E-02	7.90E-02	4.64E-02	5.25E-02	9.82E-03	6.81E-02	3.89E-02	3.55E-02	2.02E-02	4.98E-01	2.20E-01	2.14E-01
	$PM_{2.5}$	N/A (pm2.5)	8.19E-03	1.96E-02	1.15E-02	1.30E-02	2.42E-03	1.62E-02	9.19E-03	8.75E-03	4.98E-03	1.05E-01	4.64E-02	4.53E-02
	Benzene	71-43-2	6.70E-05	1.61E-04	9.43E-05	1.07E-04	2.12E-05	1.48E-04	6.10E-05	7.68E-05	4.38E-05	2.31E-04	1.02E-04	9.94E-05
	1,3-Butadiene	106-99-0	4.20E-06	1.01E-05	5.91E-06	6.69E-06	1.41E-06	1.13E-05	5.09E-06	5.10E-06	2.91E-06	2.04E-05	9.01E-06	8.79E-06
	Acrolein	107-02-8	1.52E-05	3.65E-05	2.15E-05	2.43E-05	5.08E-06	3.99E-05	1.79E-05	1.84E-05	1.05E-05	6.89E-05	3.04E-05	2.96E-05
	Acetaldehyde	75-07-0	1.14E-04	2.73E-04	1.60E-04	1.81E-04	3.78E-05	2.94E-04	1.31E-04	1.37E-04	7.78E-05	4.92E-04	2.17E-04	2.12E-04
	Formaldehyde	50-00-0	1.83E-04	4.39E-04	2.58E-04	2.92E-04	6.10E-05	4.76E-04	2.13E-04	2.20E-04	1.26E-04	8.23E-04	3.63E-04	3.54E-04
	Benzo(a)pyrene	50-32-8	8.91E-08	2.13E-07	1.25E-07	1.42E-07	2.90E-08	1.98E-07	7.96E-08	1.05E-07	5.98E-08	2.26E-07	9.97E-08	9.72E-08

			Daily Emission Rate (g/s)											
Road			Weston Road	Weston Road (north of Astona)	Weston Road (south of Valeria)	Weston Road (south of Bass Pro Mills)	Bass Pro Mills Road (original)	Bass Pro Mills Road (east of Fishermens)	Fishermens Way	Hwy 400 Off-ramp	Hwy 400 On-ramp	Hwy 400	Hwy 400 (south of on-ramp)	Hwy 400 (south of off-ramp)
AERMOD Model Input ID			SLINE1	SLINE1A	SLINE1B	SLINE1C	SLINE2	SLINE2A	SLINE3	SLINE4	SLINE5	SLINE6	SLINE6A	SLINE6B
	Contaminant	CAS#												
	NO_2	10102-44-0	1.51E-02	3.80E-02	1.95E-02	2.41E-02	7.90E-03	4.81E-02	3.21E-02	1.34E-02	1.63E-02	4.36E-02	1.96E-02	1.84E-02
	CO	630-08-0	1.75E-01	4.40E-01	2.26E-01	2.79E-01	9.40E-02	5.21E-01	3.22E-01	1.60E-01	1.94E-01	4.00E-01	1.79E-01	1.69E-01
	PM	N/A (pm)	7.03E-02	1.77E-01	9.08E-02	1.12E-01	3.16E-02	1.66E-01	1.68E-01	5.38E-02	6.51E-02	1.36E+00	6.10E-01	5.74E-01
	PM_{10}	N/A (pm10)	2.03E-02	5.10E-02	2.62E-02	3.23E-02	9.49E-03	5.34E-02	4.69E-02	1.62E-02	1.96E-02	3.68E-01	1.65E-01	1.55E-01
	$PM_{2.5}$	N/A (pm2.5)	5.04E-03	1.27E-02	6.51E-03	8.02E-03	2.34E-03	1.27E-02	1.11E-02	3.98E-03	4.82E-03	7.76E-02	3.48E-02	3.27E-02
	Benzene	71-43-2	4.12E-05	1.04E-04	5.33E-05	6.56E-05	2.05E-05	1.16E-04	7.36E-05	3.49E-05	4.23E-05	1.71E-04	7.64E-05	7.19E-05
	1,3-Butadiene	106-99-0	2.59E-06	6.49E-06	3.34E-06	4.12E-06	1.36E-06	8.83E-06	6.14E-06	2.32E-06	2.81E-06	1.51E-05	6.75E-06	6.35E-06
	Acrolein	107-02-8	9.38E-06	2.36E-05	1.21E-05	1.49E-05	4.91E-06	3.13E-05	2.16E-05	8.36E-06	1.01E-05	5.08E-05	2.28E-05	2.14E-05
	Acetaldehyde	75-07-0	7.00E-05	1.76E-04	9.04E-05	1.11E-04	3.65E-05	2.31E-04	1.58E-04	6.22E-05	7.52E-05	3.63E-04	1.63E-04	1.53E-04
	Formaldehyde	50-00-0	1.13E-04	2.83E-04	1.46E-04	1.80E-04	5.89E-05	3.74E-04	2.57E-04	1.00E-04	1.21E-04	6.07E-04	2.72E-04	2.56E-04
	Benzo(a)pyrene	50-32-8	5.48E-08	1.38E-07	7.08E-08	8.73E-08	2.81E-08	1.55E-07	9.59E-08	4.77E-08	5.78E-08	1.67E-07	7.47E-08	7.03E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Description:

Tailpipe emissions due to the fuel combustion and fugitive dust emissions from road traffic.

Traffic emissions from the following roads are within the Study Area. The road direction, traffic data, model ID are also listed below.

Traffic Data:

Road and Direction [1]	MOVES Link ID	Available Traffic Data[2]			Travel Speed (km/h) [3]	Distribution - Cars [2]	Distribution - Trucks [2]	Road Length (m)	AERMOD Source ID
		24-hour Total	Peak Hourly[4]	Traffic Count Year					
Weston Road NB (north of Bass Pro Mills)	NB1	29124	880	2031	39	91%	9%	252	SLINE1
Weston Rd NB (north of Astona)	NB1A	29178	1032	2031	39	91%	9%	636	SLINE1A
Weston Road NB (south of Valeria)	NB1B	26190	984	2031	39	91%	9%	351	SLINE1B
Hwy 400 Off-ramp NB	NB2	22338	1675	2031	30	91%	9%	516	SLINE4
Fishermens Way NB	NB3	6975	396	2031	20	91%	9%	1062	SLINE3
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	116367	4709	2031	100	91%	9%	1239	SLINE6 / SLINE6A
Hwy 400 NB (south of off-ramp)	NB4B	138705	6384	2031	100	91%	9%	325	SLINE6B
Weston Rd NB (south of Bass Pro Mills)	NB5	25560	1010	2031	39	91%	9%	402	SLINE1C
Hwy 400 On-ramp (north of Bass Pro Mills)	NB8	22797	888	2031	30	91%	9%	572	SLINE5
Weston Road SB	SB1	34515	2601	2031	39	91%	9%	252	SLINE1
Weston Rd SB (north of Astona)	SB1A	29817	2085	2031	39	91%	9%	636	SLINE1A
Weston Road SB (south of Valeria)	SB1B	26739	1934	2031	39	91%	9%	351	SLINE1B
Fishermens Way SB	SB2	7632	324	2031	20	91%	9%	1062	SLINE3
Hwy 400 SB (north of on-ramp)	SB3	127866	9080	2031	100	91%	9%	874	SLINE6
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	156900	10474	2031	100	91%	9%	690	SLINE6A / SLINE6B
Weston Rd SB (south of Bass Pro Mills)	SB5	26667	1951	2031	39	91%	9%	402	SLINE1C
Bass Pro Mills Drive (to Hwy400 on-ramp) [5]	WB1	24545	1394	2031	30	91%	9%	278	SLINE2
Bass Pro Mills WB (east of Fishermens)	WB1A	17775	757	2031	25	91%	9%	742	SLINE2A
Bass Pro Mills Dr WB (west of on-ramp)	WB2	8976	527	2031	32	89%	11%	500	SLINE7B
Bass Pro Mills Dr WB (at Weston Rd intersection)	WB3	8976	527	2031	18	89%	11%	98	SLINE7A
Bass Pro Mills Dr EB (at Weston Rd intersection)	EB1	10524	990	2031	18	89%	11%	98	SLINE7A
Bass Pro Mills EB (east of Fishermens)	EB1A	17784	1437	2031	25	91%	9%	742	SLINE2A
Bass Pro Mills Dr EB (west of on-ramp)	EB2	10524	990	2031	32	89%	11%	500	SLINE7B
Bass Pro Mills Dr WB (east of Creditview)	EB3	5455	479	2031	32	91%	9%	278	SLINE2

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Notes:

(1) Road directions: North bound - NB; South bound - SB; East bound - EB; Westbound - WB

(2) Peak AM / PM traffic data are based on "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, July 23, 2021.
Average Daily Traffic (ADT) is not available. A multiplier of 9 for these roads (to be applied to the total of AM and PM peak volumes) was recommended by the traffic team.
Distribution of cars and trucks is based on the "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, July 23, 2021.

(3) The average speed is estimated based on the posted speed limit and the percent green time over total cycle time in that section of the road. Highway 400 and on-ramp speed limit is assumed to be the posted speed limit as there are no traffic lights.

(4) The AM and PM Peak hour traffic were considered. As the AM Peak hour has a higher overall traffic count within the Study Area, the AM Peak Hour traffic was used for emission estimation.

(5) This section of Bass Pro Mills Road within the Study Area in the Future No Build Scenario is westbound only and connects to the Highway 400 on-ramp.

Contaminant(s) of Concern:

NO_2, PM, CO, and hydrocarbons emissions are the contaminants of concern from fuel combustions in the mobile equipment engines. Primary speciated VOCs (Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein) and a key PAH (Benzo(a) pyrene) are also included in the assessment.

Emission Calculations:

Methodology: U.S. EPA MOVES program

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. MOVES2014 is a major new revision to EPA's mobile source emission model and it replaces previous versions of MOVES and MOBILE6.2 models.
MOVES2014 project level is used in estimating the vehicle on-road emissions for the project.

Key Input Data to MOVES

Parameter	Input Description
Modelling Scale	Project level
Contaminants	CO, NOx, PM, PM10, PM2.5, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein, and Benzo(a)pyrene
Construction Year	2031
Evaluation Month and Time	January or July - the higher emission factors out of the two months are conservatively used
Meteorology (ambient temp., relative humidity)	Canadian Climate Normal, Toronto and Toronto Lester B. Pearson Int'l A, ON
Road Type	Urban Unrestricted Access, Urban Restricted Access
Fuel Type	Assumed gasoline for the cars, and diesel for heavy trucks
Fuel Data	Ontario
Traffic Volume	See table above
Traffic Speed	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year

Detailed MOVES input and output data are saved in the project folder. Summary of the emission data from the modelling for each of the road links are presented below.

Emission Data for Onsite Roads - Daily:

Contaminant	CAS#	Link NB1 - Weston Road NB - 39 km/h					Link SB1 - Weston Road SB - 39 km/h					SLINE1
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - south of Astona)
NO_2	10102-44-0	1.96E-01	29124	252	4564	1.04E-02	1.96E-01	34515	252	5409	1.23E-02	2.26E-02
CO	630-08-0	2.27E+00				1.20E-01	2.27E+00				1.42E-01	2.62E-01
PM	N/A (pm)	9.11E-01				4.81E-02	9.11E-01				5.70E-02	1.05E-01
PM_{10}	N/A (pm10)	2.63E-01				1.39E-02	2.63E-01				1.64E-02	3.03E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				3.45E-03	6.53E-02				4.09E-03	7.53E-03
Benzene	71-43-2	5.34E-04				2.82E-05	5.34E-04				3.34E-05	6.16E-05
1,3-Butadiene	106-99-0	3.35E-05				1.77E-06	3.35E-05				2.10E-06	3.87E-06
Acrolein	107-02-8	1.21E-04				6.42E-06	1.21E-04				7.60E-06	1.40E-05
Acetaldehyde	75-07-0	9.06E-04				4.79E-05	9.06E-04				5.67E-05	1.05E-04
Formaldehyde	50-00-0	1.46E-03				7.71E-05	1.46E-03				9.14E-05	1.69E-04
Benzo(a)pyrene	50-32-8	7.10E-07				3.75E-08	7.10E-07				4.45E-08	8.20E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Contaminant	CAS#	Link NB5 - Weston Rd NB (south of Bass Pro Mills) - 39 km/h					Link SB5 - Weston Rd SB (south of Bass Pro Mills) - 39 km/h					SLINE1C
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - south of Astona)
NO_2	10102-44-0	1.96E-01	25560	402	6378	1.45E-02	1.96E-01	26667	402	6655	1.51E-02	2.96E-02
CO	630-08-0	2.27E+00				1.67E-01	2.27E+00				1.75E-01	3.42E-01
PM	N/A (pm)	9.11E-01				6.72E-02	9.11E-01				7.01E-02	1.37E-01
PM_{10}	N/A (pm10)	2.63E-01				1.94E-02	2.63E-01				2.02E-02	3.96E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				4.82E-03	6.53E-02				5.03E-03	9.85E-03
Benzene	71-43-2	5.34E-04				3.94E-05	5.34E-04				4.11E-05	8.06E-05
1,3-Butadiene	106-99-0	3.35E-05				2.47E-06	3.35E-05				2.58E-06	5.05E-06
Acrolein	107-02-8	1.21E-04				8.97E-06	1.21E-04				9.36E-06	1.83E-05
Acetaldehyde	75-07-0	9.06E-04				6.69E-05	9.06E-04				6.98E-05	1.37E-04
Formaldehyde	50-00-0	1.46E-03				1.08E-04	1.46E-03				1.12E-04	2.20E-04
Benzo(a)pyrene	50-32-8	7.10E-07				5.24E-08	7.10E-07				5.47E-08	1.07E-07

Contaminant	CAS#	Link NB1A - Weston Road NB (north of Aston) - 39 km/h					Link SB1A - Weston Road SB (north of Aston) - 39 km/h					SLINE1A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - north of Astona)
NO_2	10102-44-0	1.96E-01	29178	636	11531	2.62E-02	1.96E-01	29817	636	11784	2.67E-02	5.29E-02
CO	630-08-0	2.27E+00				3.03E-01	2.27E+00				3.09E-01	6.12E-01
PM	N/A (pm)	9.11E-01				1.22E-01	9.11E-01				1.24E-01	2.46E-01
PM_{10}	N/A (pm10)	2.63E-01				3.51E-02	2.63E-01				3.58E-02	7.09E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				8.71E-03	6.53E-02				8.90E-03	1.76E-02
Benzene	71-43-2	5.34E-04				7.13E-05	5.34E-04				7.28E-05	1.44E-04
1,3-Butadiene	106-99-0	3.35E-05				4.47E-06	3.35E-05				4.57E-06	9.04E-06
Acrolein	107-02-8	1.21E-04				1.62E-05	1.21E-04				1.66E-05	3.28E-05
Acetaldehyde	75-07-0	9.06E-04				1.21E-04	9.06E-04				1.24E-04	2.45E-04
Formaldehyde	50-00-0	1.46E-03				1.95E-04	1.46E-03				1.99E-04	3.94E-04
Benzo(a)pyrene	50-32-8	7.10E-07				9.48E-08	7.10E-07				9.68E-08	1.92E-07

Contaminant	CAS#	Link NB1B - Weston Road NB (south of Valeria) - 39 km/h					Link SB1B - Weston Road SB (south of Valeria) - 39 km/h					SLINE1B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Weston Rd - south of Valeria)
NO_2	10102-44-0	1.96E-01	26190	351	5717	1.30E-02	1.96E-01	26739	351	5837	1.32E-02	2.62E-02
CO	630-08-0	2.27E+00				1.50E-01	2.27E+00				1.53E-01	3.03E-01
PM	N/A (pm)	9.11E-01				6.02E-02	9.11E-01				6.15E-02	1.22E-01
PM_{10}	N/A (pm10)	2.63E-01				1.74E-02	2.63E-01				1.78E-02	3.51E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				4.32E-03	6.53E-02				4.41E-03	8.73E-03
Benzene	71-43-2	5.34E-04				3.53E-05	5.34E-04				3.61E-05	7.14E-05
1,3-Butadiene	106-99-0	3.35E-05				2.22E-06	3.35E-05				2.26E-06	4.48E-06
Acrolein	107-02-8	1.21E-04				8.04E-06	1.21E-04				8.21E-06	1.62E-05
Acetaldehyde	75-07-0	9.06E-04				6.00E-05	9.06E-04				6.12E-05	1.21E-04
Formaldehyde	50-00-0	1.46E-03				9.66E-05	1.46E-03				9.87E-05	1.95E-04
Benzo(a)pyrene	50-32-8	7.10E-07				4.70E-08	7.10E-07				4.80E-08	9.50E-08

Contaminant	CAS#	Link NB2 - Highway 400 Off-ramp - 30 km/h (SLINE4)					Link NB8 - Highway 400 On-ramp - 30 km/h (SLINE5)				
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)
NO_2	10102-44-0	2.31E-01	22338	516	7158	1.92E-02	2.31E-01	22797	572	8103	2.17E-02
CO	630-08-0	2.75E+00				2.28E-01	2.75E+00				2.58E-01
PM	N/A (pm)	9.26E-01				7.67E-02	9.26E-01				8.68E-02
PM_{10}	N/A (pm10)	2.78E-01				2.30E-02	2.78E-01				2.61E-02
$PM_{2.5}$	N/A (pm2.5)	6.85E-02				5.68E-03	6.85E-02				6.42E-03
Benzene	71-43-2	6.01E-04				4.98E-05	6.01E-04				5.64E-05
1,3-Butadiene	106-99-0	4.00E-05				3.31E-06	4.00E-05				3.75E-06
Acrolein	107-02-8	1.44E-04				1.19E-05	1.44E-04				1.35E-05
Acetaldehyde	75-07-0	1.07E-03				8.86E-05	1.07E-03				1.00E-04
Formaldehyde	50-00-0	1.73E-03				1.43E-04	1.73E-03				1.62E-04
Benzo(a)pyrene	50-32-8	8.22E-07				6.81E-08	8.22E-07				7.71E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Contaminant	CAS#	Link WB1 - Bass Pro Mills Drive WB (to Hwy400 on-ramp) - 30 km/h					Link EB3 - Bass Pro Mills Drive EB (east of Creditview) - 32 km/h					SLINE2
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Bass Pro Mills (btn Creditview and Fishermens)
NO_2	10102-44-0	2.31E-01	24545	278	4234	1.13E-02	2.22E-01	5455	278	941	2.42E-03	1.38E-02
CO	630-08-0	2.75E+00				1.35E-01	2.64E+00				2.87E-02	1.64E-01
PM	N/A (pm)	9.26E-01				4.54E-02	1.62E+00				1.77E-02	6.31E-02
PM_{10}	N/A (pm10)	2.78E-01				1.36E-02	4.07E-01				4.44E-03	1.81E-02
$PM_{2.5}$	N/A (pm2.5)	6.85E-02				3.36E-03	1.01E-01				1.10E-03	4.46E-03
Benzene	71-43-2	6.01E-04				2.95E-05	5.85E-04				6.37E-06	3.58E-05
1,3-Butadiene	106-99-0	4.00E-05				1.96E-06	3.83E-05				4.17E-07	2.37E-06
Acrolein	107-02-8	1.44E-04				7.05E-06	1.38E-04				1.50E-06	8.56E-06
Acetaldehyde	75-07-0	1.07E-03				5.24E-05	1.03E-03				1.12E-05	6.36E-05
Formaldehyde	50-00-0	1.73E-03				8.46E-05	1.66E-03				1.80E-05	1.03E-04
Benzo(a)pyrene	50-32-8	8.22E-07				4.03E-08	7.96E-07				8.67E-09	4.89E-08

Contaminant	CAS#	Link WB1A - Bass Pro Mills WB (east of Fishermens) - 25 km/h					Link EB1A - Bass Pro Mills EB (east of Fishermens) - 25 km/h					SLINE2A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Bass Pro east of Fishermens Way)
NO_2	10102-44-0	2.77E-01	17775	742	8194	2.63E-02	2.77E-01	17784	742	8199	2.63E-02	5.25E-02
CO	630-08-0	3.00E+00				2.84E-01	3.00E+00				2.84E-01	5.69E-01
PM	N/A (pm)	9.55E-01				9.06E-02	9.55E-01				9.07E-02	1.81E-01
PM_{10}	N/A (pm10)	3.08E-01				2.92E-02	3.08E-01				2.92E-02	5.84E-02
$PM_{2.5}$	N/A (pm2.5)	7.32E-02				6.94E-03	7.32E-02				6.95E-03	1.39E-02
Benzene	71-43-2	6.71E-04				6.36E-05	6.71E-04				6.36E-05	1.27E-04
1,3-Butadiene	106-99-0	5.09E-05				4.82E-06	5.09E-05				4.83E-06	9.65E-06
Acrolein	107-02-8	1.80E-04				1.71E-05	1.80E-04				1.71E-05	3.42E-05
Acetaldehyde	75-07-0	1.33E-03				1.26E-04	1.33E-03				1.26E-04	2.52E-04
Formaldehyde	50-00-0	2.15E-03				2.04E-04	2.15E-03				2.04E-04	4.09E-04
Benzo(a)pyrene	50-32-8	8.93E-07				8.47E-08	8.93E-07				8.47E-08	1.69E-07

Contaminant	CAS#	Link NB3 - Fishermens Way NB - 20 km/h					Link SB2 - Fishermens Way SB - 20 km/h					SLINE3
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total (Fishermens Way)
NO_2	10102-44-0	3.23E-01	6975	1062	4602	1.72E-02	3.23E-01	7632	1062	5036	1.88E-02	3.60E-02
CO	630-08-0	3.24E+00				1.73E-01	3.24E+00				1.89E-01	3.62E-01
PM	N/A (pm)	1.69E+00				9.00E-02	1.69E+00				9.84E-02	1.88E-01
PM_{10}	N/A (pm10)	4.72E-01				2.51E-02	4.72E-01				2.75E-02	5.26E-02
$PM_{2.5}$	N/A (pm2.5)	1.11E-01				5.94E-03	1.11E-01				6.50E-03	1.24E-02
Benzene	71-43-2	7.40E-04				3.94E-05	7.40E-04				4.31E-05	8.25E-05
1,3-Butadiene	106-99-0	6.18E-05				3.29E-06	6.18E-05				3.60E-06	6.89E-06
Acrolein	107-02-8	2.17E-04				1.15E-05	2.17E-04				1.26E-05	2.42E-05
Acetaldehyde	75-07-0	1.59E-03				8.45E-05	1.59E-03				9.24E-05	1.77E-04
Formaldehyde	50-00-0	2.58E-03				1.37E-04	2.58E-03				1.50E-04	2.88E-04
Benzo(a)pyrene	50-32-8	9.65E-07				5.14E-08	9.65E-07				5.62E-08	1.08E-07

Contaminant	CAS#	Link NB4 - Hwy 400 NB (north of on-ramp)- 100 km/h					Link SB3 - Hwy 400 NB (north of on-ramp)- 100 km/h					SLINE6
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400
NO_2	10102-44-0	2.84E-02	116367	874	63162	2.08E-02	2.84E-02	127866	874	69403	2.28E-02	4.36E-02
CO	630-08-0	2.61E-01				1.91E-01	2.61E-01				2.10E-01	4.00E-01
PM	N/A (pm)	8.87E-01				6.49E-01	8.87E-01				7.13E-01	1.36E+00
PM_{10}	N/A (pm10)	2.40E-01				1.75E-01	2.40E-01				1.92E-01	3.68E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				3.70E-02	5.06E-02				4.06E-02	7.76E-02
Benzene	71-43-2	1.11E-04				8.13E-05	1.11E-04				8.93E-05	1.71E-04
1,3-Butadiene	106-99-0	9.83E-06				7.18E-06	9.83E-06				7.89E-06	1.51E-05
Acrolein	107-02-8	3.31E-05				2.42E-05	3.31E-05				2.66E-05	5.08E-05
Acetaldehyde	75-07-0	2.37E-04				1.73E-04	2.37E-04				1.90E-04	3.63E-04
Formaldehyde	50-00-0	3.96E-04				2.89E-04	3.96E-04				3.18E-04	6.07E-04
Benzo(a)pyrene	50-32-8	1.09E-07				7.95E-08	1.09E-07				8.73E-08	1.67E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Contaminant	CAS#	Link NB4A - Hwy 400 NB (south of on-ramp)- 100 km/h					Link SB4 - Hwy 400 NB (south of on-ramp) - 100 km/h					SLINE6A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400 (south of on-ramp)
NO_2	10102-44-0	2.84E-02	116367	366	26451	8.71E-03	2.84E-02	156900	366	35664	1.17E-02	2.04E-02
CO	630-08-0	2.61E-01				7.99E-02	2.61E-01				1.08E-01	1.88E-01
PM	N/A (pm)	8.87E-01				2.72E-01	8.87E-01				3.66E-01	6.38E-01
PM_{10}	N/A (pm10)	2.40E-01				7.34E-02	2.40E-01				9.89E-02	1.72E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.55E-02	5.06E-02				2.09E-02	3.64E-02
Benzene	71-43-2	1.11E-04				3.40E-05	1.11E-04				4.59E-05	7.99E-05
1,3-Butadiene	106-99-0	9.83E-06				3.01E-06	9.83E-06				4.06E-06	7.06E-06
Acrolein	107-02-8	3.31E-05				1.01E-05	3.31E-05				1.37E-05	2.38E-05
Acetaldehyde	75-07-0	2.37E-04				7.25E-05	2.37E-04				9.77E-05	1.70E-04
Formaldehyde	50-00-0	3.96E-04				1.21E-04	3.96E-04				1.63E-04	2.84E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.33E-08	1.09E-07				4.49E-08	7.82E-08

Contaminant	CAS#	Link NB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					Link SB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					SLINE6B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Hwy 400 (south of off-ramp)
NO_2	10102-44-0	2.84E-02	138705	325	27977	9.21E-03	2.84E-02	156900	325	31647	1.04E-02	1.96E-02
CO	630-08-0	2.61E-01				8.45E-02	2.61E-01				9.55E-02	1.80E-01
PM	N/A (pm)	8.87E-01				2.87E-01	8.87E-01				3.25E-01	6.12E-01
PM_{10}	N/A (pm10)	2.40E-01				7.76E-02	2.40E-01				8.78E-02	1.65E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.64E-02	5.06E-02				1.85E-02	3.49E-02
Benzene	71-43-2	1.11E-04				3.60E-05	1.11E-04				4.07E-05	7.67E-05
1,3-Butadiene	106-99-0	9.83E-06				3.18E-06	9.83E-06				3.60E-06	6.78E-06
Acrolein	107-02-8	3.31E-05				1.07E-05	3.31E-05				1.21E-05	2.29E-05
Acetaldehyde	75-07-0	2.37E-04				7.66E-05	2.37E-04				8.67E-05	1.63E-04
Formaldehyde	50-00-0	3.96E-04				1.28E-04	3.96E-04				1.45E-04	2.73E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.52E-08	1.09E-07				3.98E-08	7.50E-08

Contaminant	CAS#	Link WB3 - Bass Pro Mills Dr WB (btn Weston and Westcreek) - 18 km/h					Link EB1 - Bass Pro Mills Dr EB (btn Weston and Westcreek) - 18 km/h					SLINE7A
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Bass Pro Mills Road (new, between Weston and Westcreek)
NO_2	10102-44-0	4.18E-01	8976	98	544	2.63E-03	4.18E-01	10524	98	638	3.08E-03	5.72E-03
CO	630-08-0	3.39E+00				2.14E-02	3.39E+00				2.51E-02	4.64E-02
PM	N/A (pm)	1.73E+00				1.09E-02	1.02E+00				7.55E-03	1.84E-02
PM_{10}	N/A (pm10)	5.09E-01				3.20E-03	3.74E-01				2.76E-03	5.97E-03
$PM_{2.5}$	N/A (pm2.5)	1.20E-01				7.55E-04	8.62E-02				6.37E-04	1.39E-03
Benzene	71-43-2	8.04E-04				5.07E-06	8.04E-04				5.94E-06	1.10E-05
1,3-Butadiene	106-99-0	8.19E-05				5.16E-07	8.19E-05				6.05E-07	1.12E-06
Acrolein	107-02-8	2.83E-04				1.79E-06	2.83E-04				2.09E-06	3.88E-06
Acetaldehyde	75-07-0	2.05E-03				1.29E-05	2.05E-03				1.52E-05	2.81E-05
Formaldehyde	50-00-0	3.35E-03				2.11E-05	3.35E-03				2.47E-05	4.58E-05
Benzo(a)pyrene	50-32-8	1.11E-06				6.98E-09	1.11E-06				8.18E-09	1.52E-08

Contaminant	CAS#	Link WB2 - Bass Pro Mills Dr WB (btn West Creek and Creditview) - 32 km/h					Link EB2 - Bass Pro Mills Dr EB (btn Westcreek and Creditview) - 32 km/h					SLINE7B
		Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Emission Factor (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (g/s)	Total Bass Pro Mills Road (new between Westcreek and Creditview)
NO_2	10102-44-0	2.71E-01	8976	500	2787	8.75E-03	2.71E-01	10524	500	3268	1.03E-02	1.90E-02
CO	630-08-0	2.66E+00				8.57E-02	2.66E+00				1.01E-01	1.86E-01
PM	N/A (pm)	1.63E+00				5.27E-02	9.31E-01				3.52E-02	8.80E-02
PM_{10}	N/A (pm10)	4.18E-01				1.35E-02	2.83E-01				1.07E-02	2.42E-02
$PM_{2.5}$	N/A (pm2.5)	1.05E-01				3.39E-03	7.17E-02				2.71E-03	6.10E-03
Benzene	71-43-2	6.00E-04				1.93E-05	6.00E-04				2.27E-05	4.20E-05
1,3-Butadiene	106-99-0	4.68E-05				1.51E-06	4.68E-05				1.77E-06	3.28E-06
Acrolein	107-02-8	1.67E-04				5.37E-06	1.67E-04				6.30E-06	1.17E-05
Acetaldehyde	75-07-0	1.23E-03				3.97E-05	1.23E-03				4.65E-05	8.62E-05
Formaldehyde	50-00-0	1.98E-03				6.38E-05	1.98E-03				7.48E-05	1.39E-04
Benzo(a)pyrene	50-32-8	8.91E-07				2.88E-08	8.91E-07				3.37E-08	6.25E-08

Notes:
(1) Emission factor data are produced by modelling using MOVES for all contaminants.
Emission factors for PM, PM10 and PM2.5 includes emission factors from both MOVES and US EPA, AP-42 Section 13.2.1 Paved Road for PM Emission Factors.
(2) Daily average emission rates.

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Emission Data for Onsite Roads - Hourly:

Contaminant	CAS#	Link NB1 - Weston Road NB - 39 km/h					Link SB1 - Weston Road SB - 39 km/h					SLINE1
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - south of Astona)
NO_2	10102-44-0	1.96E-01	880	252	138	7.51E-03	1.96E-01	2601	252	408	2.22E-02	2.97E-02
CO	630-08-0	2.27E+00				8.68E-02	2.27E+00				2.57E-01	3.44E-01
PM	N/A (pm)	9.11E-01				3.49E-02	9.11E-01				1.03E-01	1.38E-01
PM_{10}	N/A (pm10)	2.63E-01				1.01E-02	2.63E-01				2.97E-02	3.98E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				2.50E-03	6.53E-02				7.39E-03	9.89E-03
Benzene	71-43-2	5.34E-04				2.05E-05	5.34E-04				6.05E-05	8.09E-05
1,3-Butadiene	106-99-0	3.35E-05				1.28E-06	3.35E-05				3.79E-06	5.07E-06
Acrolein	107-02-8	1.21E-04				4.65E-06	1.21E-04				1.38E-05	1.84E-05
Acetaldehyde	75-07-0	9.06E-04				3.47E-05	9.06E-04				1.03E-04	1.37E-04
Formaldehyde	50-00-0	1.46E-03				5.59E-05	1.46E-03				1.65E-04	2.21E-04
Benzo(a)pyrene	50-32-8	7.10E-07				2.72E-08	7.10E-07				8.04E-08	1.08E-07

Contaminant	CAS#	Link NB5 - Weston Rd NB (south of Bass Pro Mills) - 39 km/h					Link SB5 - Weston Rd SB (south of Bass Pro Mills) - 39 km/h					SLINE1C
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - south of Astona)
NO_2	10102-44-0	1.96E-01	1010	402	252	1.37E-02	1.96E-01	1951	402	487	2.65E-02	4.02E-02
CO	630-08-0	2.27E+00				1.59E-01	2.27E+00				3.07E-01	4.65E-01
PM	N/A (pm)	9.11E-01				6.37E-02	9.11E-01				1.23E-01	1.87E-01
PM_{10}	N/A (pm10)	2.63E-01				1.84E-02	2.63E-01				3.55E-02	5.39E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				4.57E-03	6.53E-02				8.83E-03	1.34E-02
Benzene	71-43-2	5.34E-04				3.74E-05	5.34E-04				7.22E-05	1.10E-04
1,3-Butadiene	106-99-0	3.35E-05				2.34E-06	3.35E-05				4.53E-06	6.87E-06
Acrolein	107-02-8	1.21E-04				8.50E-06	1.21E-04				1.64E-05	2.49E-05
Acetaldehyde	75-07-0	9.06E-04				6.35E-05	9.06E-04				1.23E-04	1.86E-04
Formaldehyde	50-00-0	1.46E-03				1.02E-04	1.46E-03				1.97E-04	3.00E-04
Benzo(a)pyrene	50-32-8	7.10E-07				4.97E-08	7.10E-07				9.60E-08	1.46E-07

Contaminant	CAS#	Link NB1A - Weston Road NB (north of Aston) - 39 km/h					Link SB1A - Weston Road SB (north of Aston) - 39 km/h					SLINE1A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - north of Astona)
NO_2	10102-44-0	1.96E-01	1032	636	408	2.22E-02	1.96E-01	2085	636	824	4.49E-02	6.71E-02
CO	630-08-0	2.27E+00				2.57E-01	2.27E+00				5.19E-01	7.76E-01
PM	N/A (pm)	9.11E-01				1.03E-01	9.11E-01				2.08E-01	3.12E-01
PM_{10}	N/A (pm10)	2.63E-01				2.98E-02	2.63E-01				6.01E-02	8.99E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				7.39E-03	6.53E-02				1.49E-02	2.23E-02
Benzene	71-43-2	5.34E-04				6.05E-05	5.34E-04				1.22E-04	1.83E-04
1,3-Butadiene	106-99-0	3.35E-05				3.79E-06	3.35E-05				7.66E-06	1.15E-05
Acrolein	107-02-8	1.21E-04				1.38E-05	1.21E-04				2.78E-05	4.16E-05
Acetaldehyde	75-07-0	9.06E-04				1.03E-04	9.06E-04				2.07E-04	3.10E-04
Formaldehyde	50-00-0	1.46E-03				1.65E-04	1.46E-03				3.34E-04	5.00E-04
Benzo(a)pyrene	50-32-8	7.10E-07				8.04E-08	7.10E-07				1.63E-07	2.43E-07

Contaminant	CAS#	Link NB1B - Weston Road NB (south of Valeria) - 39 km/h					Link SB1B - Weston Road SB (south of Valeria) - 39 km/h					SLINE1B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total (Weston Rd - south of Valeria)
NO_2	10102-44-0	1.96E-01	984	351	215	1.17E-02	1.96E-01	1934	351	422	2.30E-02	3.47E-02
CO	630-08-0	2.27E+00				1.35E-01	2.27E+00				2.66E-01	4.01E-01
PM	N/A (pm)	9.11E-01				5.43E-02	9.11E-01				1.07E-01	1.61E-01
PM_{10}	N/A (pm10)	2.63E-01				1.57E-02	2.63E-01				3.08E-02	4.65E-02
$PM_{2.5}$	N/A (pm2.5)	6.53E-02				3.89E-03	6.53E-02				7.65E-03	1.15E-02
Benzene	71-43-2	5.34E-04				3.19E-05	5.34E-04				6.26E-05	9.45E-05
1,3-Butadiene	106-99-0	3.35E-05				2.00E-06	3.35E-05				3.93E-06	5.93E-06
Acrolein	107-02-8	1.21E-04				7.25E-06	1.21E-04				1.42E-05	2.15E-05
Acetaldehyde	75-07-0	9.06E-04				5.41E-05	9.06E-04				1.06E-04	1.60E-04
Formaldehyde	50-00-0	1.46E-03				8.71E-05	1.46E-03				1.71E-04	2.58E-04
Benzo(a)pyrene	50-32-8	7.10E-07				4.24E-08	7.10E-07				8.33E-08	1.26E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Contaminant	CAS#	Link NB2 - Highway 400 Off-ramp - 30 km/h (SLINE4)					Link NB8 - Highway 400 On-ramp - 30 km/h (SLINE5)				
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)
NO_2	10102-44-0	2.31E-01	1675	516	537	3.45E-02	2.31E-01	888	572	316	2.03E-02
CO	630-08-0	2.75E+00				4.11E-01	2.75E+00				2.41E-01
PM	N/A (pm)	9.26E-01				1.38E-01	9.26E-01				8.12E-02
PM_{10}	N/A (pm10)	2.78E-01				4.15E-02	2.78E-01				2.44E-02
$PM_{2.5}$	N/A (pm2.5)	6.85E-02				1.02E-02	6.85E-02				6.01E-03
Benzene	71-43-2	6.01E-04				8.97E-05	6.01E-04				5.27E-05
1,3-Butadiene	106-99-0	4.00E-05				5.96E-06	4.00E-05				3.50E-06
Acrolein	107-02-8	1.44E-04				2.15E-05	1.44E-04				1.26E-05
Acetaldehyde	75-07-0	1.07E-03				1.59E-04	1.07E-03				9.38E-05
Formaldehyde	50-00-0	1.73E-03				2.57E-04	1.73E-03				1.51E-04
Benzo(a)pyrene	50-32-8	8.22E-07				1.23E-07	8.22E-07				7.20E-08

Contaminant	CAS#	Link WB1 - Bass Pro Mills Drive WB (to Hwy400 on-ramp) - 30 km/h					Link EB3 - Bass Pro Mills Drive EB (east of Creditview) - 32 km/h				
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)
NO_2	10102-44-0	2.31E-01	1394	278	240	1.54E-02	2.22E-01	479	278	83	5.11E-03
CO	630-08-0	2.75E+00				1.84E-01	2.64E+00				6.05E-02
PM	N/A (pm)	9.26E-01				6.18E-02	1.62E+00				3.73E-02
PM_{10}	N/A (pm10)	2.78E-01				1.86E-02	4.07E-01				9.35E-03
$PM_{2.5}$	N/A (pm2.5)	6.85E-02				4.58E-03	1.01E-01				2.32E-03
Benzene	71-43-2	6.01E-04				4.02E-05	5.85E-04				1.34E-05
1,3-Butadiene	106-99-0	4.00E-05				2.67E-06	3.83E-05				8.79E-07
Acrolein	107-02-8	1.44E-04				9.61E-06	1.38E-04				3.17E-06
Acetaldehyde	75-07-0	1.07E-03				7.14E-05	1.03E-03				2.36E-05
Formaldehyde	50-00-0	1.73E-03				1.15E-04	1.66E-03				3.80E-05
Benzo(a)pyrene	50-32-8	8.22E-07				5.49E-08	7.96E-07				1.83E-08

SLINE2
Bass Pro Mills (btn Creditview and Fishermens)
2.06E-02
2.44E-01
9.91E-02
2.79E-02
6.90E-03
5.36E-05
3.55E-06
1.28E-05
9.50E-05
1.53E-04
7.32E-08

Contaminant	CAS#	Link WB1A - Bass Pro Mills WB (east of Fishermens) - 25 km/h					Link EB1A - Bass Pro Mills EB (east of Fishermens) - 25 km/h				
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)
NO_2	10102-44-0	2.77E-01	757	742	349	2.68E-02	2.77E-01	1437	742	662	5.10E-02
CO	630-08-0	3.00E+00				2.91E-01	3.00E+00				5.52E-01
PM	N/A (pm)	9.55E-01				9.26E-02	9.55E-01				1.76E-01
PM_{10}	N/A (pm10)	3.08E-01				2.98E-02	3.08E-01				5.66E-02
$PM_{2.5}$	N/A (pm2.5)	7.32E-02				7.10E-03	7.32E-02				1.35E-02
Benzene	71-43-2	6.71E-04				6.50E-05	6.71E-04				1.23E-04
1,3-Butadiene	106-99-0	5.09E-05				4.93E-06	5.09E-05				9.36E-06
Acrolein	107-02-8	1.80E-04				1.75E-05	1.80E-04				3.32E-05
Acetaldehyde	75-07-0	1.33E-03				1.29E-04	1.33E-03				2.44E-04
Formaldehyde	50-00-0	2.15E-03				2.09E-04	2.15E-03				3.96E-04
Benzo(a)pyrene	50-32-8	8.93E-07				8.66E-08	8.93E-07				1.64E-07

SLINE2A
Total (Bass Pro east of Fishermens)
7.78E-02
8.42E-01
2.68E-01
8.64E-02
2.06E-02
1.88E-04
1.43E-05
5.07E-05
3.73E-04
6.05E-04
2.51E-07

Contaminant	CAS#	Link NB3 - Fishermens Way NB - 20 km/h					Link SB2 - Fishermens Way SB - 20 km/h				
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)
NO_2	10102-44-0	3.23E-01	396	1062	261	2.34E-02	3.23E-01	324	1062	214	1.92E-02
CO	630-08-0	3.24E+00				2.35E-01	3.24E+00				1.92E-01
PM	N/A (pm)	1.69E+00				1.23E-01	1.69E+00				1.00E-01
PM_{10}	N/A (pm10)	4.72E-01				3.42E-02	4.72E-01				2.80E-02
$PM_{2.5}$	N/A (pm2.5)	1.11E-01				8.09E-03	1.11E-01				6.62E-03
Benzene	71-43-2	7.40E-04				5.37E-05	7.40E-04				4.39E-05
1,3-Butadiene	106-99-0	6.18E-05				4.48E-06	6.18E-05				3.67E-06
Acrolein	107-02-8	2.17E-04				1.57E-05	2.17E-04				1.29E-05
Acetaldehyde	75-07-0	1.59E-03				1.15E-04	1.59E-03				9.42E-05
Formaldehyde	50-00-0	2.58E-03				1.87E-04	2.58E-03				1.53E-04
Benzo(a)pyrene	50-32-8	9.65E-07				7.00E-08	9.65E-07				5.73E-08

SLINE3
Total (Fishermens Way)
4.26E-02
4.28E-01
2.23E-01
6.22E-02
1.47E-02
9.76E-05
8.15E-06
2.86E-05
2.09E-04
3.41E-04
1.27E-07

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Contaminant	CAS#	Link NB4 - Hwy 400 NB (north of on-ramp)- 100 km/h					Link SB3 - Hwy 400 NB (north of on-ramp)- 100 km/h					SLINE6
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400
NOx	10102-44-0	2.84E-02	4709	874	2556	2.02E-02	2.84E-02	9080	874	4928	3.89E-02	5.91E-02
CO	630-08-0	2.61E-01				1.85E-01	2.61E-01				3.57E-01	5.42E-01
PM	N/A (pm)	8.87E-01				6.30E-01	8.87E-01				1.21E+00	1.84E+00
PM_{10}	N/A (pm10)	2.40E-01				1.70E-01	2.40E-01				3.28E-01	4.98E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				3.59E-02	5.06E-02				6.93E-02	1.05E-01
Benzene	71-43-2	1.11E-04				7.89E-05	1.11E-04				1.52E-04	2.31E-04
1,3-Butadiene	106-99-0	9.83E-06				6.97E-06	9.83E-06				1.35E-05	2.04E-05
Acrolein	107-02-8	3.31E-05				2.35E-05	3.31E-05				4.54E-05	6.89E-05
Acetaldehyde	75-07-0	2.37E-04				1.68E-04	2.37E-04				3.24E-04	4.92E-04
Formaldehyde	50-00-0	3.96E-04				2.81E-04	3.96E-04				5.42E-04	8.23E-04
Benzo(a)pyrene	50-32-8	1.09E-07				7.72E-08	1.09E-07				1.49E-07	2.26E-07

Contaminant	CAS#	Link NB4A - Hwy 400 NB (south of on-ramp)- 100 km/h					Link SB4 - Hwy 400 NB (south of on-ramp) - 100 km/h					SLINE6A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400 (south of on-ramp)
NOx	10102-44-0	2.84E-02	4709	366	1070	8.45E-03	2.84E-02	10474	366	2381	1.88E-02	2.73E-02
CO	630-08-0	2.61E-01				7.76E-02	2.61E-01				1.73E-01	2.50E-01
PM	N/A (pm)	8.87E-01				2.64E-01	8.87E-01				5.87E-01	8.51E-01
PM_{10}	N/A (pm10)	2.40E-01				7.12E-02	2.40E-01				1.58E-01	2.30E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.50E-02	5.06E-02				3.35E-02	4.85E-02
Benzene	71-43-2	1.11E-04				3.31E-05	1.11E-04				7.35E-05	1.07E-04
1,3-Butadiene	106-99-0	9.83E-06				2.92E-06	9.83E-06				6.50E-06	9.42E-06
Acrolein	107-02-8	3.31E-05				9.85E-06	3.31E-05				2.19E-05	3.18E-05
Acetaldehyde	75-07-0	2.37E-04				7.04E-05	2.37E-04				1.57E-04	2.27E-04
Formaldehyde	50-00-0	3.96E-04				1.18E-04	3.96E-04				2.62E-04	3.79E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.23E-08	1.09E-07				7.19E-08	1.04E-07

Contaminant	CAS#	Link NB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					Link SB4B - Hwy 400 NB (south of off-ramp)- 100 km/h					SLINE6B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Hwy 400 (south of off-ramp)
NOx	10102-44-0	2.84E-02	6384	325	1288	1.02E-02	2.84E-02	10474	325	2113	1.67E-02	2.69E-02
CO	630-08-0	2.61E-01				9.33E-02	2.61E-01				1.53E-01	2.46E-01
PM	N/A (pm)	8.87E-01				3.17E-01	8.87E-01				5.21E-01	8.38E-01
PM_{10}	N/A (pm10)	2.40E-01				8.57E-02	2.40E-01				1.41E-01	2.26E-01
$PM_{2.5}$	N/A (pm2.5)	5.06E-02				1.81E-02	5.06E-02				2.97E-02	4.78E-02
Benzene	71-43-2	1.11E-04				3.98E-05	1.11E-04				6.52E-05	1.05E-04
1,3-Butadiene	106-99-0	9.83E-06				3.51E-06	9.83E-06				5.77E-06	9.28E-06
Acrolein	107-02-8	3.31E-05				1.19E-05	3.31E-05				1.94E-05	3.13E-05
Acetaldehyde	75-07-0	2.37E-04				8.47E-05	2.37E-04				1.39E-04	2.24E-04
Formaldehyde	50-00-0	3.96E-04				1.42E-04	3.96E-04				2.32E-04	3.74E-04
Benzo(a)pyrene	50-32-8	1.09E-07				3.89E-08	1.09E-07				6.38E-08	1.03E-07

Contaminant	CAS#	Link WB3 - Bass Pro Mills Dr WB (btn Weston and Westcreek) - 18 km/h					Link EB1 - Bass Pro Mills Dr EB (btn Weston and Westcreek) - 18 km/h					SLINE7A
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Bass Pro Mills Road (new, between Weston and Westcreek)
NOx	10102-44-0	4.18E-01	527	98	32	3.71E-03	4.18E-01	990	98	60	6.96E-03	1.07E-02
CO	630-08-0	3.39E+00				3.01E-02	3.39E+00				5.66E-02	8.67E-02
PM	N/A (pm)	1.73E+00				1.53E-02	1.02E+00				1.70E-02	3.24E-02
PM_{10}	N/A (pm10)	5.09E-01				4.52E-03	3.74E-01				6.24E-03	1.08E-02
$PM_{2.5}$	N/A (pm2.5)	1.20E-01				1.06E-03	8.62E-02				1.44E-03	2.50E-03
Benzene	71-43-2	8.04E-04				7.14E-06	8.04E-04				1.34E-05	2.06E-05
1,3-Butadiene	106-99-0	8.19E-05				7.27E-07	8.19E-05				1.37E-06	2.09E-06
Acrolein	107-02-8	2.83E-04				2.52E-06	2.83E-04				4.73E-06	7.24E-06
Acetaldehyde	75-07-0	2.05E-03				1.82E-05	2.05E-03				3.43E-05	5.25E-05
Formaldehyde	50-00-0	3.35E-03				2.97E-05	3.35E-03				5.58E-05	8.55E-05
Benzo(a)pyrene	50-32-8	1.11E-06				9.83E-09	1.11E-06				1.85E-08	2.83E-08

Emission Inventory - Bass Pro Mills Road Extension
Appendix D-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Contaminant	CAS#	Link WB2 - Bass Pro Mills Dr WB (btn West Creek and Creditview) - 32 km/h					Link EB2 - Bass Pro Mills Dr EB (btn Westcreek and Creditview) - 32 km/h					SLINE7B
		Emission Factor[1] (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Emission Factor (g/VMT)	Peak Hourly Traffic	Road Length (m)	Hourly VMT	Hourly Emission Rate[2] (g/s)	Total Bass Pro Mills Road (new between Westcreek and Creditview)
NOx	10102-44-0	2.71E-01				1.23E-02	2.71E-01				2.32E-02	3.55E-02
CO	630-08-0	2.66E+00				1.21E-01	2.66E+00				2.27E-01	3.48E-01
PM	N/A (pm)	1.63E+00				7.43E-02	9.31E-01				7.95E-02	1.54E-01
PM_{10}	N/A (pm10)	4.18E-01				1.90E-02	2.83E-01				2.42E-02	4.32E-02
$PM_{2.5}$	N/A (pm2.5)	1.05E-01				4.78E-03	7.17E-02				6.12E-03	1.09E-02
Benzene	71-43-2	6.00E-04	527	500	164	2.73E-05	6.00E-04	990	500	307	5.12E-05	7.84E-05
1,3-Butadiene	106-99-0	4.68E-05				2.13E-06	4.68E-05				3.99E-06	6.12E-06
Acrolein	107-02-8	1.67E-04				7.57E-06	1.67E-04				1.42E-05	2.18E-05
Acetaldehyde	75-07-0	1.23E-03				5.59E-05	1.23E-03				1.05E-04	1.61E-04
Formaldehyde	50-00-0	1.98E-03				8.99E-05	1.98E-03				1.69E-04	2.59E-04
Benzo(a)pyrene	50-32-8	8.91E-07				4.05E-08	8.91E-07				7.61E-08	1.17E-07

Notes:

(1) Emission factor data are produced by modelling using MOVES for all contaminants.
Emission factor for PM, PM10 and PM2.5 includes emission factor from MOVES and US EPA, AP-42 Section 13.2.1 Paved Road for PM Emission Factors.

(2) Hourly emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on available traffic data, and assumed travelling speed based on posted speed limit and percent green time and total cycle time. Meteorological data (temperature and humidity) in January amd July are used in the model. The higher calculated emission rates are conservatively used.

Summary of Emissions

			Hourly Emission Rate (g/s)													
Road			Weston Road (north of Bass Pro Mills)	Weston Road (north of Astona)	Weston Road (south of Valeria)	Weston Road (south of Bass Pro Mills)	Bass Pro Mills Road (between Fishermens and Creditview)	Bass Pro Mills Road (east of Fishermens)	Fishermens Way	Hwy 400 Off-ramp	Hwy 400 On-ramp	Hwy 400	Hwy 400 (south of on-ramp)	Hwy 400 (south of off-ramp)	Bass Pro Mills Road (new, between Weston and Westcreek)	Bass Pro Mills Road (new between Westcreek and Creditview)
AERMOD Model Input ID			SLINE1	SLINE1A	SLINE1B	SLINE1C	SLINE2	SLINE2A	SLINE3	SLINE4	SLINE5	SLINE6	SLINE6A	SLINE6B	SLINE7A	SLINE7B
	Contaminant	CAS#														
	NO_2	10102-44-0	0.0297	0.0671	0.0347	0.0402	0.0206	0.0778	0.0426	0.0345	0.0203	0.0591	0.0273	0.0269	0.0107	0.0355
	CO	630-08-0	3.44E-01	7.76E-01	4.01E-01	4.65E-01	2.44E-01	8.42E-01	4.28E-01	4.11E-01	2.41E-01	5.42E-01	2.50E-01	2.46E-01	8.67E-02	3.48E-01
	PM	N/A (pm)	1.38E-01	3.12E-01	1.61E-01	1.87E-01	9.91E-02	2.68E-01	2.23E-01	1.38E-01	8.12E-02	1.84E+00	8.51E-01	8.38E-01	3.24E-02	1.54E-01
	PM_{10}	N/A (pm10)	3.98E-02	8.99E-02	4.65E-02	5.39E-02	2.79E-02	8.64E-02	6.22E-02	4.15E-02	2.44E-02	4.98E-01	2.30E-01	2.26E-01	1.08E-02	4.32E-02
	$PM_{2.5}$	N/A (pm2.5)	9.89E-03	2.23E-02	1.15E-02	1.34E-02	6.90E-03	2.06E-02	1.47E-02	1.02E-02	6.01E-03	1.05E-01	4.85E-02	4.78E-02	2.50E-03	1.09E-02
	Benzene	71-43-2	8.09E-05	1.83E-04	9.45E-05	1.10E-04	5.36E-05	1.88E-04	9.76E-05	8.97E-05	5.27E-05	2.31E-04	1.07E-04	1.05E-04	2.06E-05	7.84E-05
	1,3-Butadiene	106-99-0	5.07E-06	1.15E-05	5.93E-06	6.87E-06	3.55E-06	1.43E-05	8.15E-06	5.96E-06	3.50E-06	2.04E-05	9.42E-06	9.28E-06	2.09E-06	6.12E-06
	Acrolein	107-02-8	1.84E-05	4.16E-05	2.15E-05	2.49E-05	1.28E-05	5.07E-05	2.86E-05	2.15E-05	1.26E-05	6.89E-05	3.18E-05	3.13E-05	7.24E-06	2.18E-05
	Acetaldehyde	75-07-0	1.37E-04	3.10E-04	1.60E-04	1.86E-04	9.50E-05	3.73E-04	2.09E-04	1.59E-04	9.38E-05	4.92E-04	2.27E-04	2.24E-04	5.25E-05	1.61E-04
	Formaldehyde	50-00-0	2.21E-04	5.00E-04	2.58E-04	3.00E-04	1.53E-04	6.05E-04	3.41E-04	2.57E-04	1.51E-04	8.23E-04	3.79E-04	3.74E-04	8.55E-05	2.59E-04
	Benzo(a)pyrene	50-32-8	1.08E-07	2.43E-07	1.26E-07	1.46E-07	7.32E-08	2.51E-07	1.27E-07	1.23E-07	7.20E-08	2.26E-07	1.04E-07	1.03E-07	2.83E-08	1.17E-07

			Daily Emission Rate (g/s)													
Road			Weston Road (north of Bass Pro Mills)	Weston Road (north of Astona)	Weston Road (south of Valeria)	Weston Road (south of Bass Pro Mills)	Bass Pro Mills Road (between Fishermens and Creditview)	Bass Pro Mills Road (east of Fishermens)	Fishermens Way	Hwy 400 Off-ramp	Hwy 400 On-ramp	Hwy 400	Hwy 400 (south of on-ramp)	Hwy 400 (south of off-ramp)	Bass Pro Mills Road (new, between Weston and Westcreek)	Bass Pro Mills Road (new between Westcreek and Creditview)
AERMOD Model Input ID			SLINE1	SLINE1A	SLINE1B	SLINE1C	SLINE2	SLINE2A	SLINE3	SLINE4	SLINE5	SLINE6	SLINE6A	SLINE6B	SLINE7A	SLINE7B
	Contaminant	CAS#														
	NO_2	10102-44-0	2.26E-02	5.29E-02	2.62E-02	2.96E-02	1.38E-02	5.25E-02	3.60E-02	1.92E-02	2.17E-02	4.36E-02	2.04E-02	1.96E-02	5.72E-03	1.90E-02
	CO	630-08-0	2.62E-01	6.12E-01	3.03E-01	3.42E-01	1.64E-01	5.69E-01	3.62E-01	2.28E-01	2.58E-01	4.00E-01	1.88E-01	1.80E-01	4.64E-02	1.86E-01
	PM	N/A (pm)	1.05E-01	2.46E-01	1.22E-01	1.37E-01	6.31E-02	1.81E-01	1.88E-01	7.67E-02	8.68E-02	1.36E+00	6.38E-01	6.12E-01	1.84E-02	8.80E-02
	PM_{10}	N/A (pm10)	3.03E-02	7.09E-02	3.51E-02	3.96E-02	1.81E-02	5.84E-02	5.26E-02	2.30E-02	2.61E-02	3.68E-01	1.72E-01	1.65E-01	5.97E-03	2.42E-02
	$PM_{2.5}$	N/A (pm2.5)	7.53E-03	1.76E-02	8.73E-03	9.85E-03	4.46E-03	1.39E-02	1.24E-02	5.68E-03	6.42E-03	7.76E-02	3.64E-02	3.49E-02	1.39E-03	6.10E-03
	Benzene	71-43-2	6.16E-05	1.44E-04	7.14E-05	8.06E-05	3.58E-05	1.27E-04	8.25E-05	4.98E-05	5.64E-05	1.71E-04	7.99E-05	7.67E-05	1.10E-05	4.20E-05
	1,3-Butadiene	106-99-0	3.87E-06	9.04E-06	4.48E-06	5.05E-06	2.37E-06	9.65E-06	6.89E-06	3.31E-06	3.75E-06	1.51E-05	7.06E-06	6.78E-06	1.12E-06	3.28E-06
	Acrolein	107-02-8	1.40E-05	3.28E-05	1.62E-05	1.83E-05	8.56E-06	3.42E-05	2.42E-05	1.19E-05	1.35E-05	5.08E-05	2.38E-05	2.29E-05	3.88E-06	1.17E-05
	Acetaldehyde	75-07-0	1.05E-04	2.45E-04	1.21E-04	1.37E-04	6.36E-05	2.52E-04	1.77E-04	8.86E-05	1.00E-04	3.63E-04	1.70E-04	1.63E-04	2.81E-05	8.62E-05
	Formaldehyde	50-00-0	1.69E-04	3.94E-04	1.95E-04	2.20E-04	1.03E-04	4.09E-04	2.88E-04	1.43E-04	1.62E-04	6.07E-04	2.84E-04	2.73E-04	4.58E-05	1.39E-04
	Benzo(a)pyrene	50-32-8	8.20E-08	1.92E-07	9.50E-08	1.07E-07	4.89E-08	1.69E-07	1.08E-07	6.81E-08	7.71E-08	1.67E-07	7.82E-08	7.50E-08	1.52E-08	6.25E-08

APPENDIX E
Emission Source Layout

Figure E.1: Emission Source Layout – Baseline Scenario and Future No Build Scenario

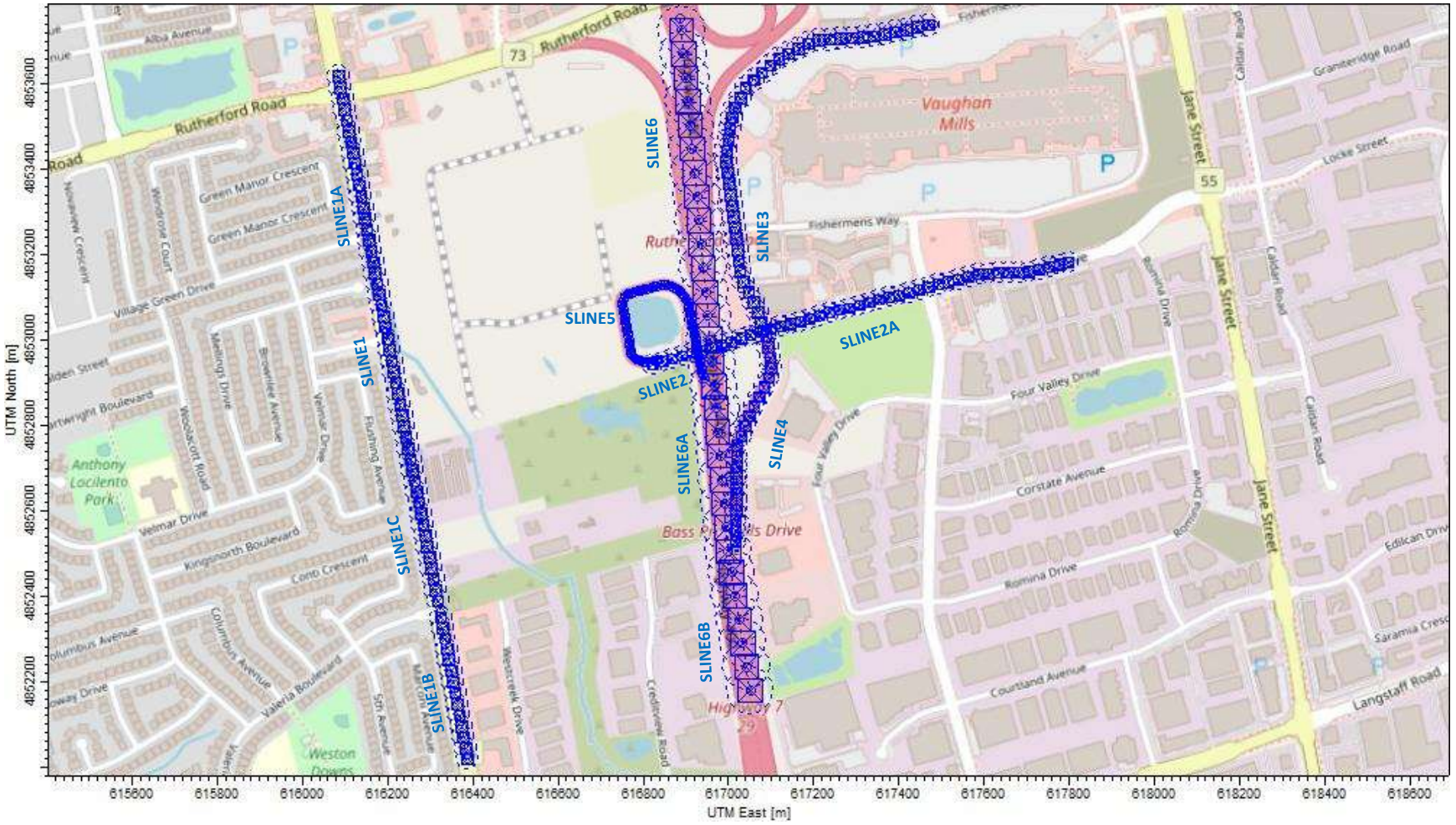
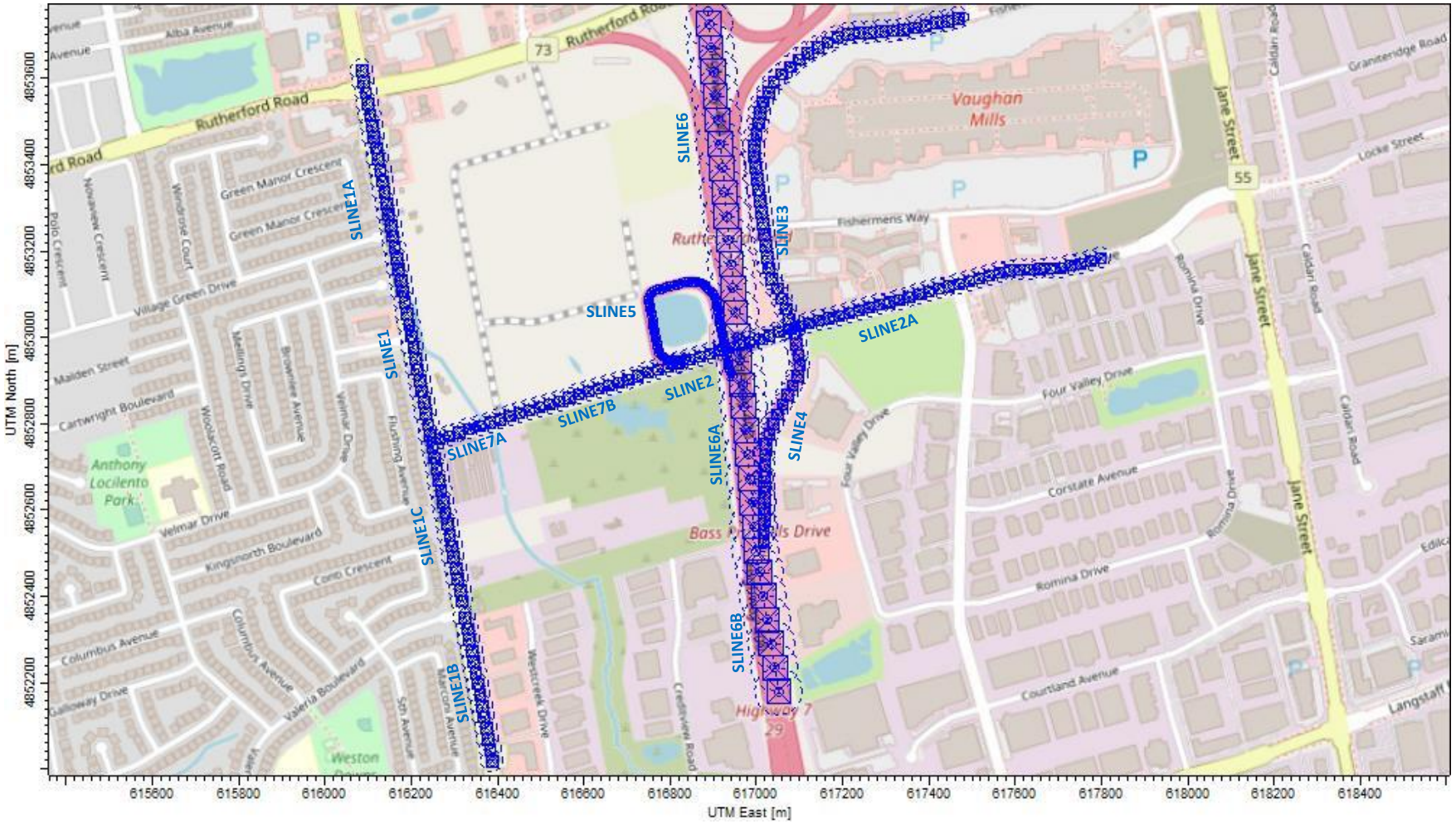


Figure E.2: Emission Source Layout – Future Build Scenario



APPENDIX F
Greenhouse Gas Emissions

Emission Inventory - Bass Pro Mills Road Extension
Appendix F-1

Source: On-Road Vehicle GHG Emissions - Baseline Scenario (2020)

Description:

Greenhouse gas (GHG) emissions are generated as a result of fuel combustion from road traffic.

Traffic emissions from the following roads are within the Study Area. The road direction, traffic data, model ID are also listed below.

Traffic Data:

Road and Direction [1]	MOVES Link ID	Available Traffic Data[2]			Travel Speed (km/h) [3]	Distribution - Cars [2]	Distribution - Trucks [2]	Road Length (m)
		24-hour Total	Peak Hourly[4]	Traffic Count Year				
Weston Road NB	NB1	25722	2101	2020	39	90%	10%	654
Weston Rd NB (north of Astona)	NB1A	27279	1992	2020	39	90%	10%	636
Weston Road NB (south of Valeria)	NB1B	26055	2136	2020	39	90%	10%	351
Hwy 400 Off-ramp NB	NB2	13383	542	2020	30	90%	10%	516
Fishermens Way NB	NB3	3204	233	2020	20	90%	10%	1062
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	100863	7225	2020	100	90%	10%	1239
Hwy 400 NB (south of off-ramp)	NB4B	114246	7767	2020	100	90%	10%	325
Weston Road SB	SB1	25623	945	2020	39	90%	10%	654
Weston Rd SB (north of Astona)	SB1A	22185	962	2020	39	90%	10%	636
Weston Road SB (south of Valeria)	SB1B	26028	925	2020	39	90%	10%	351
Fishermens Way SB	SB2	3384	301	2020	20	90%	10%	1062
Hwy 400 SB (north of on-ramp)	SB3	109665	4506	2020	100	90%	10%	874
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	123003	5780	2020	100	90%	10%	690
Hwy 400 On-ramp	WB1	13338	1274	2020	30	90%	10%	572
Bass Pro Mills WB (east of Fishermens)	WB1A	10386	1023	2020	25	90%	10%	742
Bass Pro Mills EB (east of Fishermens)	EB1A	10611	359	2020	25	90%	10%	742
Bass Pro Mills Drive [5]	WB1	13338	1274	2020	30	90%	10%	278

Notes:

(1) Road directions: North bound - NB; South bound - SB; East bound - EB; Westbound - WB

(2) Peak AM / PM traffic data are based on "Traffic Impact Analysis , Existing Conditions Review, Model Development and Calibration and Validation and Future Base Model Development Re
2021.
Average Daily Traffic (ADT) is not available. A multiplier of 9 for these roads (to be applied to the total of AM and PM peak volumes) was recommended by the traffic team.
Distribution of cars and trucks is based on the "Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, .

(3) The average speed is estimated based on the posted speed limit and the percent green time over total cycle time in that section of the road. Highway 400 and on-ramp speed limit is ass

(4) The AM and PM Peak hour traffic were considered. As the PM Peak hour has a higher overall traffic count within the Study Area, the PM Peak Hour traffic was used for emission estimati

(5) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Contaminant(s) of Concern:
Emissions of CO2, CH4 and N2O in the form of CO2e.

Emission Calculations:

Methodology: U.S. EPA MOVES program

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. MOVES2014 is a major new revision to EPA's mobile source emission model and it replaces previous versions of MOVES and MOBILE6.2 models.
MOVES2014 project level is used in estimating the vehicle on-road emissions for the project.

Emission Inventory - Bass Pro Mills Road Extension
Appendix F-1

Source: On-Road Vehicle GHG Emissions - Baseline Scenario (2020)

Key Input Data to MOVES

Parameter	Input Description
Modelling Scale	Project level
Contaminants	CO2e
Construction Year	2020
Evaluation Month and Time	January or July - the higher emission factors out of the two months are conservatively used
Meteorology (ambient temp., relative humidity)	Canadian Climate Normal, Toronto and Toronto Lester B. Pearson Int'l A, ON
Road Type	Urban Unrestricted Access, Urban Restricted Access
Fuel Type	Assumed gasoline for the cars, and diesel for heavy trucks
Fuel Data	Ontario
Traffic Volume	See table above
Traffic Speed	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year

Detailed MOVES input and output data are saved in the project folder. Summary of the emission data from the modelling for each of the road links are presented below.

GHG Emissions for Onsite Roads

Road and Direction (1)	MOVES Link ID	Emission Factor(1) (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate(2) (kg/day)	Annual Emission (2) (kg/year)	Annual Emission (2) (tonnes/year)
Weston Road NB	NB1	531.379	25722	654	10450	5552.9	2026795	2026.80
Weston Rd NB (north of Astona)	NB1A	531.379	27279	636	10781	5728.7	2090960	2090.96
Weston Road NB (south of Valeria)	NB1B	531.379	26055	351	5688	3022.3	1103137	1103.14
Hwy 400 Off-ramp NB	NB2	592.747	13383	516	4289	2542.0	927846	927.85
Fishermens Way NB	NB3	728.731	3204	1062	2114	1540.5	562287	562.29
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	396.681	100863	1239	77673	30811.5	11246194	11246.19
Hwy 400 NB (south of off-ramp)	NB4B	396.681	114246	325	23044	9141.0	3336467	3336.47
Weston Road SB	SB1	531.379	25623	654	10410	5531.5	2018994	2018.99
Weston Rd SB (north of Astona)	SB1A	531.379	22185	636	8768	4658.9	1700501	1700.50
Weston Road SB (south of Valeria)	SB1B	531.379	26028	351	5682	3019.2	1101994	1101.99
Fishermens Way SB	SB2	728.731	3384	1062	2233	1627.1	593877	593.88
Hwy 400 SB (north of on-ramp)	SB3	396.681	109665	874	59524	23612.1	8618431	8618.43
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	396.681	123003	690	52769	20932.5	7640359	7640.36
Hwy 400 On-ramp / Bass Pro Mills Drive	WB1	592.747	13338	850	7042	4173.9	1523458	1523.46
Bass Pro Mills WB (east of Fishermens)	WB1A	660.739	10386	742	4788	3163.6	1154727	1154.73
Bass Pro Mills EB (east of Fishermens)	EB1A	660.739	10611	742	4892	3232.2	1179743	1179.74
Total						128289.8	46825770	46825.77

Notes:
(1) Emission factor data are produced by modelling using MOVES.
(2) Hourly emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Operating Condition, Individual Maximum Rates of Production:

The emission rate calculation for this source group is based on available traffic data, and assumed travelling speed based on posted speed limit and percent green time and total cycle time. Meteorological data (temperature and humidity) in January amd July are used in the model. The higher calculated emission rates are conservatively used.

Emission Inventory - Bass Pro Mills Road Extension
Appendix F-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Description:

Greenhouse gas (GHG) emissions are generated as a result of fuel combustion from road traffic.

Traffic emissions from the following roads are within the Study Area. The road direction, traffic data, model ID are also listed below.

Traffic Data:

Road and Direction [1]	MOVES Link ID	Available Traffic Data[2]			Travel Speed (km/h) [3]	Distribution - Cars [2]	Distribution - Trucks [2]	Road Length (m)
		24-hour Total	Peak Hourly[4]	Traffic Count Year				
Weston Road NB	NB1	16956	1028	2031	39	90%	10%	654
Weston Rd NB (north of Astona)	NB1A	20052	1294	2031	39	90%	10%	636
Weston Road NB (south of Valeria)	NB1B	15705	1059	2031	39	90%	10%	351
Hwy 400 Off-ramp NB	NB2	15669	1435	2031	30	90%	10%	516
Fishermens Way NB	NB3	7776	289	2031	20	90%	10%	1062
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	116367	4709	2031	100	90%	10%	1239
Hwy 400 NB (south of off-ramp)	NB4B	132036	6144	2031	100	90%	10%	325
Weston Road SB	SB1	25605	1856	2031	39	90%	10%	654
Weston Rd SB (north of Astona)	SB1A	22347	1445	2031	39	90%	10%	636
Weston Road SB (south of Valeria)	SB1B	23769	1854	2031	39	90%	10%	351
Fishermens Way SB	SB2	5247	161	2031	20	90%	10%	1062
Hwy 400 SB (north of on-ramp)	SB3	127866	9080	2031	100	90%	10%	874
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	144966	9817	2031	100	90%	10%	690
Hwy 400 On-ramp	WB1	17100	737	2031	30	90%	10%	572
Bass Pro Mills WB (east of Fishermens)	WB1A	15795	579	2031	25	90%	10%	742
Bass Pro Mills EB (east of Fishermens)	EB1A	16758	1149	2031	25	90%	10%	742
Bass Pro Mills Drive [5]	WB1	17100	737	2031	30	90%	10%	278

Notes:
(1) Road directions: North bound - NB; South bound - SB; East bound - EB; Westbound - WB

(2) Peak AM / PM traffic data are based on "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stante
Average Daily Traffic (ADT) is not available. A multiplier of 9 for these roads (to be applied to the total of AM and PM peak volumes) was recommended by the traffic team.
Distribution of cars and trucks is based on the "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Sta

(3) The average speed is estimated based on the posted speed limit and the percent green time over total cycle time in that section of the road. Highway 400 and on-ramp speed limit is assu

(4) The AM and PM Peak hour traffic were considered. As the AM Peak hour has a higher overall traffic count within the Study Area, the AM Peak Hour traffic was used for emission estimatic

(5) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Contaminant(s) of Concern:
Emissions of CO2, CH4 and N2O in the form of CO2e.

Emission Calculations:

Methodology: U.S. EPA MOVES program

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level fc
toxics. MOVES2014 is a major new revision to EPA's mobile source emission model and it replaces previous versions of MOVES and MOBILE6.2 models.
MOVES2014 project level is used in estimating the vehicle on-road emissions for the project.

Emission Inventory - Bass Pro Mills Road Extension
Appendix F-2

Source: On-Road Vehicle Emissions - Future No-Build Scenario (2031)

Key Input Data to MOVES

Parameter	Input Description
Modelling Scale	Project level
Contaminants	CO2e
Construction Year	2020
Evaluation Month and Time	January or July - the higher emission factors out of the two months are conservatively used
Meteorology (ambient temp., relative humidity)	Canadian Climate Normal, Toronto and Toronto Lester B. Pearson Int'l A, ON
Road Type	Urban Unrestricted Access, Urban Restricted Access
Fuel Type	Assumed gasoline for the cars, and diesel for heavy trucks
Fuel Data	Ontario
Traffic Volume	See table above
Traffic Speed	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year

Detailed MOVES input and output data are saved in the project folder. Summary of the emission data from the modelling for each of the road links are presented below.

GHG Emissions for Onsite Roads

Road and Direction [1]	MOVES Link ID	Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (kg/day)	Annual Emission [2] (kg/year)	Annual Emission [2] (tonnes/year)
Weston Road NB	NB1	408.023	16956	654	6889	2810.7	1025909	1025.91
Weston Rd NB (north of Astona)	NB1A	408.023	20052	636	7925	3233.4	1180199	1180.20
Weston Road NB (south of Valeria)	NB1B	408.023	15705	351	3428	1398.8	510572	510.57
Hwy 400 Off-ramp NB	NB2	454.634	15669	516	5021	2282.8	833213	833.21
Fishermens Way NB	NB3	557.502	7776	1062	5131	2860.3	1044002	1044.00
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	57.22	116367	1239	89613	5127.5	1871546	1871.55
Hwy 400 NB (south of off-ramp)	NB4B	57.22	132036	325	26632	1523.9	556205	556.21
Weston Road SB	SB1	408.023	25605	654	10402	4244.4	1549210	1549.21
Weston Rd SB (north of Astona)	SB1A	408.023	22347	636	8832	3603.5	1315276	1315.28
Weston Road SB (south of Valeria)	SB1B	408.023	23769	351	5189	2117.1	772733	772.73
Fishermens Way SB	SB2	557.50	5247	1062	3462	1930.0	704460	704.46
Hwy 400 SB (north of on-ramp)	SB3	57.22	127866	874	69403	3971.2	1449477	1449.48
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	57.22	144966	690	62191	3558.5	1298854	1298.85
Hwy 400 On-ramp / Bass Pro Mills Drive	WB1	454.63	17100	850	9028	4104.3	1498057	1498.06
Bass Pro Mills WB (east of Fishermens)	WB1A	506.068	15795	742	7282	3685.0	1345023	1345.02
Bass Pro Mills EB (east of Fishermens)	EB1A	506.068	16758	742	7726	3909.7	1427027	1427.03
Total						50361.0	18381763	18381.76

Notes:
(1) Emission factor data are produced by modelling using MOVES.
(2) Hourly emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on available traffic data, and assumed travelling speed based on posted speed limit and percent green time and total cycle time. I
January amd July are used in the model. The higher calculated emission rates are conservatively used.

Emission Inventory - Bass Pro Mills Road Extension
Appendix F-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Description:

Greenhouse gas (GHG) emissions are generated as a result of fuel combustion from road traffic.

Traffic emissions from the following roads are within the Study Area. The road direction, traffic data, model ID are also listed below.

Traffic Data:

Road and Direction [1]	MOVES Link ID	Available Traffic Data[2]			Travel Speed (km/h) [3]	Distribution - Cars [2]	Distribution - Trucks [2]	Road Length (m)
		24-hour Total	Peak Hourly[4]	Traffic Count Year				
Weston Road NB (north of Bass Pro Mills)	NB1	29124	880	2031	39	91%	9%	252
Weston Rd NB (north of Astona)	NB1A	29178	1032	2031	39	91%	9%	636
Weston Road NB (south of Valeria)	NB1B	26190	984	2031	39	91%	9%	351
Hwy 400 Off-ramp NB	NB2	22338	1675	2031	30	91%	9%	516
Fishermens Way NB	NB3	6975	396	2031	20	91%	9%	1062
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	116367	4709	2031	100	91%	9%	1239
Hwy 400 NB (south of off-ramp)	NB4B	138705	6384	2031	100	91%	9%	325
Weston Rd NB (south of Bass Pro Mills)	NB5	25560	1010	2031	39	91%	9%	402
Hwy 400 On-ramp (north of Bass Pro Mills)	NB8	22797	888	2031	30	91%	9%	572
Weston Road SB	SB1	34515	2601	2031	39	91%	9%	252
Weston Rd SB (north of Astona)	SB1A	29817	2085	2031	39	91%	9%	636
Weston Road SB (south of Valeria)	SB1B	26739	1934	2031	39	91%	9%	351
Fishermens Way SB	SB2	7632	324	2031	20	91%	9%	1062
Hwy 400 SB (north of on-ramp)	SB3	127866	9080	2031	100	91%	9%	874
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	156900	10474	2031	100	91%	9%	690
Weston Rd SB (south of Bass Pro Mills)	SB5	26667	1951	2031	39	91%	9%	402
Bass Pro Mills Drive (to Hwy400 on-ramp) [5]	WB1	24545	1394	2031	30	91%	9%	278
Bass Pro Mills WB (east of Fishermens)	WB1A	17775	757	2031	25	91%	9%	742
Bass Pro Mills Dr WB (west of on-ramp)	WB2	8976	527	2031	32	89%	11%	500
Bass Pro Mills Dr WB (at Weston Rd intersection)	WB3	8976	527	2031	18	89%	11%	98
Bass Pro Mills Dr EB (at Weston Rd intersection)	EB1	10524	990	2031	18	89%	11%	98
Bass Pro Mills EB (east of Fishermens)	EB1A	17784	1437	2031	25	91%	9%	742
Bass Pro Mills Dr EB (west of on-ramp)	EB2	10524	990	2031	32	89%	11%	500
Bass Pro Mills Dr WB (east of Creditview)	EB3	5455	479	2031	32	91%	9%	278

Notes:
(1) Road directions: North bound - NB; South bound - SB; East bound - EB; Westbound - WB

(2) Peak AM / PM traffic data are based on "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, July 23, 2021.
Average Daily Traffic (ADT) is not available. A multiplier of 9 for these roads (to be applied to the total of AM and PM peak volumes) was recommended by the traffic team.
Distribution of cars and trucks is based on the "Bass Pro Mills Drive Extension Environmental Assessment, Traffic Impact Analysis, Future Alternative Transportation Assessment Report", Stantec, July 23, 2021.

(3) The average speed is estimated based on the posted speed limit and the percent green time over total cycle time in that section of the road. Highway 400 and on-ramp speed limit is assumed to be the posted speed limit as traffic lights.

(4) The AM and PM Peak hour traffic were considered. As the AM Peak hour has a higher overall traffic count within the Study Area, the AM Peak Hour traffic was used for emission estimation.

(5) This section of Bass Pro Mills Road within the Study Area in the Future No Build Scenario is westbound only and connects to the Highway 400 on-ramp.

Contaminant(s) of Concern:

Emissions of CO2, CH4 and N2O in the form of CO2e.

Emission Calculations:

Methodology: U.S. EPA MOVES program

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. MOVES2014 is a major new revision to EPA's mobile source emission model and it replaces previous versions of MOVES and MOBILE6.2 models.
MOVES2014 project level is used in estimating the vehicle on-road emissions for the project.

Emission Inventory - Bass Pro Mills Road Extension
Appendix F-3

Source: On-Road Vehicle Emissions - Future Build Scenario (2031)

Key Input Data to MOVES

Parameter	Input Description
Modelling Scale	Project level
Contaminants	CO2e
Construction Year	2020
Evaluation Month and Time	January or July - the higher emission factors out of the two months are conservatively used
Meteorology (ambient temp., relative humidity)	Canadian Climate Normal, Toronto and Toronto Lester B. Pearson Int'l A, ON
Road Type	Urban Unrestricted Access, Urban Restricted Access
Fuel Type	Assumed gasoline for the cars, and diesel for heavy trucks
Fuel Data	Ontario
Traffic Volume	See table above
Traffic Speed	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year

Detailed MOVES input and output data are saved in the project folder. Summary of the emission data from the modelling for each of the road links are presented below.

GHG Emissions for Onsite Roads

Road and Direction [1]	MOVES Link ID	Emission Factor[1] (g/VMT)	ADT	Road Length (m)	Daily VMT	Daily Emission Rate[2] (kg/day)	Annual Emission [2] (kg/year)	Annual Emission [2] (tonnes/year)
Weston Road NB (north of Bass Pro Mills)	NB1	408.023	29124	252	4564	1862.3	679730	679.73
Weston Rd NB (north of Astona)	NB1A	408.023	29178	636	11531	4705.0	1717328	1717.33
Weston Road NB (south of Valeria)	NB1B	408.023	26190	351	5717	2332.7	851440	851.44
Hwy 400 Off-ramp NB	NB2	454.634	22338	516	7158	3254.4	1187843	1187.84
Fishermens Way NB	NB3	557.502	6975	1062	4602	2565.6	936460	936.46
Hwy 400 NB (north of off-ramp)	NB4 and NB4A	57.2188	116367	1239	89613	5127.5	1871546	1871.55
Hwy 400 NB (south of off-ramp)	NB4B	57.2188	138705	325	27977	1600.8	584299	584.30
Weston Rd NB (south of Bass Pro Mills)	NB5	408.023	25560	402	6378	2602.6	949938	949.94
Hwy 400 On-ramp (north of Bass Pro Mills)	NB8	454.63	22797	572	8103	3683.8	1344595	1344.60
Weston Road SB	SB1	408.02	34515	252	5409	2207.0	805552	805.55
Weston Rd SB (north of Astona)	SB1A	408.02	29817	636	11784	4808.0	1754937	1754.94
Weston Road SB (south of Valeria)	SB1B	408.02	26739	351	5837	2381.6	869288	869.29
Fishermens Way SB	SB2	557.50	7632	1062	5036	2807.3	1024668	1024.67
Hwy 400 SB (north of on-ramp)	SB3	57.22	127866	874	69403	3971.2	1449477	1449.48
Hwy 400 SB (south of on-ramp)	SB4 and SB4B	57.22	156900	690	67311	3851.5	1405780	1405.78
Weston Rd SB (south of Bass Pro Mills)	SB5	408.02	26667	402	6655	2715.3	991079	991.08
Bass Pro Mills Drive (to Hwy400 on-ramp) [5]	WB1	454.63	24545	278	4234	1924.9	702580	702.58
Bass Pro Mills WB (east of Fishermens)	WB1A	506.07	17775	742	8194	4146.9	1513630	1513.63
Bass Pro Mills Dr WB (west of on-ramp)	WB2	475.67	8976	500	2787	1325.8	483912	483.91
Bass Pro Mills Dr WB (at Weston Rd intersection)	WB3	618.32	8976	98	544	336.6	122861	122.86
Bass Pro Mills Dr EB (at Weston Rd intersection)	EB1	618.32	10524	98	638	394.6	144040	144.04
Bass Pro Mills EB (east of Fishermens)	EB1A	506.07	17784	742	8199	4149.0	1514396	1514.40
Bass Pro Mills Dr EB (west of on-ramp)	EB2	475.67	10524	500	3268	1554.3	567331	567.33
Bass Pro Mills Dr WB (east of Creditview)	EB3	443.52	5455	278	941	417.4	152335	152.33
Total						64726.2	23625045	23625

Notes:

(1) Emission factor data are produced by modelling using MOVES for all contaminants.
Emission factor for PM, PM10 and PM2.5 includes emission factor from MOVES and US EPA, AP-42 Section 13.2.1 Paved Road for PM Emission Factors.

(2) Hourly emission rates.
(3) This section of Bass Pro Mills Road within the Study Area in the Baseline Scenario is westbound only and connects to the Highway 400 on-ramp.

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on available traffic data, and assumed travelling speed based on posted speed limit and percent green time and total cycle time. Meteorological data (temperature and humidity) in January amd July are used in the model. The higher calculated emission rates are conservatively used.

APPENDIX G
Predicted Concentrations at Receptors

Table G-1 **Predicted Concentrations at Receptors - Baseline Scenario**

	BASELINE SCENARIO (2020)																		
Background Concentration (µg/m^3)	55	45	28	410	401	22.6	12.21	7.2	0.77	0.53	0.082	0.055	0.00014	0.000086	3.1	9.3	3.1	0.2	0.082
	Predicted Concentrations (µg/m^3)																		
	NO_2	NO_2	NO_2	CO	CO	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	Benzene	Benzene	1, 3 Butadiene	1, 3 Butadiene	B(a)P	B(a)P	Formaldehyde	Acetaldehyde	Acetaldehyde	Acrolein	Acrolein
Receptor ID	**1-hr**	**24-hr**	**Annual**	**1-hr**	**8-hr**	**24-hr**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**1/2-hr**	**24-hr**	**1-hr**	**24-hr**
R01	51.4	17.0	4.0	1203	829	26.9	10.2	2.4	0.18	0.042	0.028	0.0065	3.10E-04	7.94E-05	0.52	1.00	0.27	0.13	0.042
R02	58.3	18.4	4.5	1365	905	29.2	11.1	2.7	0.19	0.047	0.030	0.0073	3.40E-04	8.91E-05	0.56	1.13	0.29	0.14	0.046
R03	64.1	19.7	5.0	1499	976	31.2	11.8	3.0	0.21	0.052	0.032	0.0081	3.60E-04	9.88E-05	0.60	1.24	0.31	0.16	0.049
R04	55.0	17.0	4.1	1287	855	26.9	10.2	2.5	0.18	0.043	0.028	0.0067	1.40E-04	8.15E-05	0.52	1.07	0.27	0.14	0.042
R05	53.4	16.5	4.0	1250	834	26.1	9.9	2.4	0.17	0.041	0.027	0.0064	1.30E-04	7.84E-05	0.51	1.04	0.26	0.13	0.041
R06	54.4	16.8	4.0	1273	851	26.6	10.1	2.4	0.18	0.042	0.027	0.0066	1.20E-04	8.01E-05	0.52	1.06	0.27	0.13	0.042
R07	55.3	17.1	4.1	1293	867	27.0	10.3	2.5	0.18	0.043	0.028	0.0067	1.40E-04	8.15E-05	0.52	1.07	0.27	0.14	0.042
R08	57.5	17.7	4.3	1345	895	27.9	10.6	2.6	0.18	0.045	0.029	0.0069	2.20E-04	8.45E-05	0.54	1.12	0.28	0.14	0.044
R09	56.7	17.8	4.2	1327	896	28.0	10.7	2.5	0.19	0.045	0.029	0.0069	3.10E-04	8.41E-05	0.54	1.10	0.28	0.14	0.044
R10	59.7	18.6	4.5	1398	952	29.3	11.2	2.7	0.19	0.047	0.030	0.0073	3.50E-04	8.95E-05	0.57	1.16	0.30	0.15	0.046
R11	62.4	19.2	4.7	1461	996	30.3	11.5	2.8	0.20	0.050	0.031	0.0077	3.70E-04	9.40E-05	0.59	1.21	0.31	0.15	0.048
R12	60.5	18.2	4.5	1416	962	28.7	10.9	2.7	0.19	0.047	0.030	0.0073	3.50E-04	8.86E-05	0.56	1.17	0.29	0.15	0.045
R13	63.8	18.8	4.7	1494	1009	29.6	11.3	2.8	0.20	0.050	0.031	0.0077	3.70E-04	9.39E-05	0.58	1.24	0.30	0.16	0.047
R14	63.9	18.4	4.7	1497	1004	28.9	11.0	2.8	0.19	0.049	0.030	0.0076	3.60E-04	9.26E-05	0.56	1.24	0.29	0.16	0.045
R15	46.4	13.2	3.2	1086	765	20.8	7.9	1.9	0.14	0.033	0.021	0.0052	2.50E-04	6.27E-05	0.40	0.90	0.21	0.11	0.033
R16	53.2	14.9	3.7	1246	834	23.5	8.9	2.2	0.16	0.039	0.024	0.0061	2.90E-04	7.39E-05	0.46	1.03	0.24	0.13	0.037
R17	13.2	2.9	0.4	309	156	4.8	1.8	0.2	0.03	0.004	0.005	0.0007	5.00E-05	7.74E-06	0.09	0.26	0.05	0.03	0.007
R18	23.5	5.5	1.4	552	376	9.1	3.3	0.8	0.05	0.014	0.009	0.0022	1.00E-04	2.50E-05	0.17	0.45	0.09	0.06	0.014
R19	30.9	7.0	2.0	729	502	10.9	4.0	1.1	0.07	0.020	0.011	0.0033	1.20E-04	3.68E-05	0.22	0.63	0.11	0.08	0.018
R20	31.6	7.4	1.5	743	450	11.3	4.2	0.9	0.07	0.015	0.012	0.0025	1.30E-04	2.75E-05	0.24	0.64	0.12	0.08	0.019
R21	28.5	9.5	1.8	668	461	15.2	5.7	1.1	0.10	0.019	0.015	0.0029	1.70E-04	3.56E-05	0.29	0.56	0.15	0.07	0.024
R22	30.3	10.0	2.0	710	492	16.0	6.0	1.2	0.10	0.021	0.016	0.0032	1.60E-04	3.91E-05	0.31	0.59	0.16	0.08	0.025
R23	28.3	9.0	1.8	665	448	14.3	5.4	1.1	0.09	0.018	0.014	0.0028	1.10E-04	3.43E-05	0.27	0.55	0.14	0.07	0.022
R24	28.5	9.1	1.8	669	464	14.5	5.5	1.1	0.09	0.019	0.015	0.0029	1.10E-04	3.50E-05	0.28	0.56	0.14	0.07	0.023
R25	28.5	9.5	1.9	667	492	15.0	5.7	1.1	0.10	0.019	0.015	0.0030	1.70E-04	3.66E-05	0.29	0.56	0.15	0.07	0.024
R26	25.7	8.4	1.7	597	475	13.3	5.0	1.0	0.09	0.018	0.014	0.0028	1.60E-04	3.36E-05	0.26	0.49	0.13	0.06	0.021
R27	26.8	7.6	1.6	624	453	12.1	4.6	1.0	0.08	0.017	0.012	0.0026	1.50E-04	3.13E-05	0.23	0.52	0.12	0.07	0.019
R28	23.7	7.2	1.3	555	347	11.6	4.4	0.8	0.07	0.013	0.012	0.0020	1.10E-04	2.45E-05	0.22	0.46	0.11	0.06	0.018
R29	24.3	7.3	1.3	571	367	11.6	4.4	0.8	0.07	0.014	0.012	0.0021	8.00E-05	2.56E-05	0.22	0.48	0.12	0.06	0.018
R30	23.1	6.9	1.2	541	361	11.0	4.1	0.7	0.07	0.013	0.011	0.0020	1.10E-04	2.39E-05	0.21	0.45	0.11	0.06	0.017
R31	20.2	6.5	1.2	474	360	10.3	3.9	0.7	0.07	0.012	0.010	0.0019	1.20E-04	2.32E-05	0.20	0.39	0.10	0.05	0.016
R32	17.3	4.6	0.7	406	215	7.4	2.8	0.4	0.05	0.007	0.007	0.0011	7.00E-05	1.29E-05	0.14	0.34	0.07	0.04	0.011
R33	17.5	4.5	0.7	411	238	7.3	2.7	0.4	0.05	0.007	0.007	0.0011	7.00E-05	1.35E-05	0.14	0.34	0.07	0.04	0.011
R34	17.4	4.5	0.7	407	249	7.2	2.7	0.4	0.05	0.007	0.007	0.0012	8.00E-05	1.37E-05	0.14	0.34	0.07	0.04	0.011
R35	15.8	4.4	0.8	370	255	7.0	2.6	0.5	0.04	0.008	0.007	0.0012	8.00E-05	1.45E-05	0.14	0.31	0.07	0.04	0.011
R36	45.0	15.6	3.5	1053	764	24.7	9.4	2.1	0.16	0.037	0.025	0.0058	2.90E-04	7.06E-05	0.48	0.87	0.25	0.11	0.039
R37	19.5	5.7	0.8	458	273	9.1	3.4	0.5	0.06	0.009	0.009	0.0014	1.00E-04	1.64E-05	0.17	0.38	0.09	0.05	0.014
R38	16.3	4.3	0.6	382	195	6.9	2.6	0.4	0.04	0.006	0.007	0.0009	7.00E-05	1.12E-05	0.13	0.32	0.07	0.04	0.011
R39	15.2	3.7	0.5	357	178	6.0	2.2	0.3	0.04	0.005	0.006	0.0008	6.00E-05	9.99E-06	0.11	0.30	0.06	0.04	0.009
R40	15.4	3.7	0.6	360	208	6.0	2.2	0.3	0.04	0.006	0.006	0.0009	6.00E-05	1.06E-05	0.11	0.30	0.06	0.04	0.009
R41	13.7	3.4	0.5	321	194	5.4	2.0	0.3	0.03	0.005	0.005	0.0008	6.00E-05	9.76E-06	0.10	0.27	0.05	0.03	0.008
R42	19.1	5.0	0.9	443	304	8.0	3.0	0.6	0.05	0.010	0.008	0.0015	9.00E-05	1.79E-05	0.15	0.37	0.08	0.05	0.012
R43	57.8	16.1	4.1	1353	915	25.4	9.6	2.5	0.17	0.043	0.026	0.0067	3.10E-04	8.17E-05	0.49	1.12	0.26	0.14	0.040
R44	13.7	3.2	0.4	322	158	5.2	1.9	0.3	0.03	0.004	0.005	0.0007	5.00E-05	8.02E-06	0.10	0.27	0.05	0.03	0.008
R45	14.3	3.5	0.5	336	159	5.6	2.1	0.3	0.03	0.005	0.005	0.0007	6.00E-05	8.63E-06	0.11	0.28	0.05	0.04	0.009
R46	18.1	4.0	0.9	420	205	6.6	2.4	0.5	0.04	0.009	0.006	0.0014	7.00E-05	1.59E-05	0.12	0.34	0.06	0.05	0.010
R47	14.7	3.6	0.5	343	172	5.7	2.1	0.3	0.04	0.005	0.006	0.0008	6.00E-05	8.99E-06	0.11	0.29	0.06	0.04	0.009
R48	13.6	3.3	0.6	317	216	5.3	2.0	0.3	0.03	0.006	0.005	0.0009	6.00E-05	1.08E-05	0.10	0.26	0.05	0.03	0.008
Maximum	64.1	19.7	5.0	1499	1009	31.2	11.8	3.0	0.21	0.052	0.032	0.0081	3.70E-04	9.88E-05	0.60	1.24	0.31	0.16	0.049
AQ Objective	400 / 119	200	34	36200	15700	50	27	8.8	2.3	0.45	10	2	0.00005	0.00001	65	500	500	4.5	0.4

Notes:
1. Maximum predicted concentrations are presented in the table.
2. Concentrations highlighted in green are predicted to exceed applicable air quality criteria.
3. AQ Objective presented in the table for 1-hour NO2 is AAQC / 2020 CAAQS, and for Annual NO2 is 2020 CAAQS for Baseline scenario.

Table G-2 **Predicted Concentrations at Receptors - Future No Build Scenario**

	FUTURE NO BUILD SCENARIO (2031)																		
Background Concentration ($\mu g/m^3$)	55	45	28	410	401	22.6	12.21	7.2	0.77	0.53	0.082	0.055	0.00014	0.000086	3.1	9.3	3.1	0.2	0.082
	Predicted Concentrations ($\mu g/m^3$)																		
	NO_2	NO_2	NO_2	CO	CO	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	Benzene	Benzene	1, 3 Butadiene	1, 3 Butadiene	B(a)P	B(a)P	Formaldehyde	Acetaldehyde	Acetaldehyde	Acrolein	Acrolein
Receptor ID	**1-hr**	**24-hr**	**Annual**	**1-hr**	**8-hr**	**24-hr**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**1/2-hr**	**24-hr**	**1-hr**	**24-hr**
R01	43.5	12.6	3.0	503	331	21.0	5.0	1.1	0.035	0.008	2.26E-03	5.34E-04	4.57E-05	1.10E-05	0.10	0.25	0.06	0.03	0.008
R02	49.4	13.6	3.4	571	359	22.7	5.4	1.3	0.038	0.009	2.45E-03	5.99E-04	4.94E-05	1.24E-05	0.11	0.28	0.07	0.03	0.009
R03	54.3	14.6	3.8	628	394	24.1	5.8	1.4	0.040	0.010	2.61E-03	6.63E-04	5.28E-05	1.37E-05	0.11	0.31	0.07	0.03	0.009
R04	46.8	12.1	3.0	541	344	20.8	5.0	1.1	0.033	0.008	2.18E-03	5.37E-04	4.38E-05	1.10E-05	0.09	0.26	0.06	0.03	0.008
R05	45.6	11.7	2.9	527	334	20.3	4.8	1.1	0.032	0.008	2.12E-03	5.15E-04	4.23E-05	1.06E-05	0.09	0.26	0.06	0.03	0.008
R06	46.5	11.9	3.0	538	341	20.7	4.9	1.1	0.033	0.008	2.16E-03	5.25E-04	4.32E-05	1.08E-05	0.09	0.26	0.06	0.03	0.008
R07	47.3	12.1	3.0	547	347	20.9	5.0	1.1	0.034	0.008	2.20E-03	5.34E-04	4.39E-05	1.10E-05	0.10	0.27	0.06	0.03	0.008
R08	49.3	12.6	3.1	570	359	21.6	5.1	1.2	0.035	0.009	2.28E-03	5.53E-04	4.57E-05	1.14E-05	0.10	0.28	0.06	0.03	0.008
R09	48.7	12.7	3.1	563	358	21.7	5.2	1.2	0.035	0.009	2.30E-03	5.50E-04	4.60E-05	1.13E-05	0.10	0.28	0.06	0.03	0.008
R10	51.4	13.4	3.3	594	381	22.5	5.4	1.2	0.037	0.009	2.41E-03	5.84E-04	4.84E-05	1.20E-05	0.10	0.29	0.06	0.03	0.009
R11	53.8	13.9	3.5	621	400	23.1	5.5	1.3	0.038	0.010	2.49E-03	6.13E-04	5.01E-05	1.26E-05	0.11	0.30	0.07	0.03	0.009
R12	52.1	13.1	3.3	602	385	22.0	5.3	1.2	0.036	0.009	2.36E-03	5.77E-04	4.74E-05	1.19E-05	0.10	0.29	0.06	0.03	0.008
R13	55.1	13.5	3.5	636	405	22.4	5.4	1.3	0.037	0.010	2.43E-03	6.10E-04	4.89E-05	1.26E-05	0.11	0.31	0.06	0.03	0.009
R14	55.2	13.2	3.4	637	402	21.7	5.2	1.3	0.036	0.009	2.36E-03	6.01E-04	4.76E-05	1.24E-05	0.10	0.31	0.06	0.03	0.008
R15	39.9	9.3	2.3	460	299	16.0	3.8	0.9	0.026	0.006	1.69E-03	4.02E-04	3.37E-05	8.18E-06	0.07	0.23	0.04	0.02	0.006
R16	45.9	9.9	2.6	530	325	16.9	4.0	1.0	0.027	0.007	1.78E-03	4.54E-04	3.59E-05	9.28E-06	0.08	0.26	0.05	0.03	0.006
R17	8.9	1.8	0.3	98	49	4.7	1.1	0.1	0.005	0.001	3.70E-04	5.20E-05	6.47E-06	9.29E-07	0.02	0.06	0.01	0.01	0.001
R18	12.7	3.7	0.8	140	95	11.2	2.5	0.6	0.011	0.002	8.28E-04	1.93E-04	1.28E-05	2.92E-06	0.03	0.09	0.02	0.01	0.003
R19	25.3	7.6	2.2	274	179	13.2	3.0	0.9	0.019	0.006	1.46E-03	4.29E-04	2.46E-05	7.21E-06	0.06	0.16	0.04	0.02	0.005
R20	27.2	7.0	1.6	295	171	13.9	3.1	0.6	0.018	0.004	1.40E-03	3.14E-04	2.32E-05	5.23E-06	0.06	0.17	0.04	0.02	0.005
R21	20.6	6.7	1.3	238	174	13.0	3.0	0.5	0.019	0.004	1.25E-03	2.40E-04	2.40E-05	4.81E-06	0.05	0.12	0.03	0.01	0.004
R22	22.9	6.9	1.5	264	185	13.6	3.2	0.6	0.020	0.004	1.30E-03	2.63E-04	2.51E-05	5.28E-06	0.06	0.13	0.03	0.01	0.005
R23	20.8	6.0	1.3	236	165	12.3	2.9	0.5	0.017	0.003	1.14E-03	2.29E-04	2.17E-05	4.54E-06	0.05	0.13	0.03	0.01	0.004
R24	21.0	6.1	1.3	243	171	12.4	2.9	0.5	0.017	0.004	1.16E-03	2.32E-04	2.21E-05	4.59E-06	0.05	0.13	0.03	0.01	0.004
R25	22.1	6.5	1.3	255	181	12.8	3.0	0.6	0.018	0.004	1.23E-03	2.40E-04	2.35E-05	4.77E-06	0.05	0.13	0.03	0.01	0.004
R26	20.8	5.7	1.2	240	171	11.3	2.6	0.5	0.016	0.003	1.08E-03	2.18E-04	2.06E-05	4.31E-06	0.05	0.12	0.03	0.01	0.004
R27	20.2	5.2	1.1	233	162	10.1	2.3	0.5	0.015	0.003	9.74E-04	2.01E-04	1.88E-05	3.95E-06	0.04	0.12	0.03	0.01	0.003
R28	16.8	4.8	0.9	188	126	10.4	2.4	0.4	0.014	0.002	9.24E-04	1.65E-04	1.73E-05	3.22E-06	0.04	0.10	0.02	0.01	0.003
R29	17.5	4.7	0.9	197	131	10.4	2.4	0.4	0.013	0.003	9.14E-04	1.71E-04	1.70E-05	3.33E-06	0.04	0.11	0.02	0.01	0.003
R30	16.6	4.6	0.8	186	128	9.9	2.3	0.4	0.013	0.002	8.83E-04	1.58E-04	1.65E-05	3.06E-06	0.04	0.10	0.02	0.01	0.003
R31	14.6	4.3	0.8	166	126	9.2	2.1	0.4	0.012	0.002	8.32E-04	1.52E-04	1.56E-05	2.93E-06	0.04	0.09	0.02	0.01	0.003
R32	11.9	2.8	0.5	132	73	7.1	1.6	0.2	0.008	0.001	5.71E-04	8.70E-05	1.02E-05	1.63E-06	0.02	0.07	0.01	0.01	0.002
R33	12.1	2.8	0.5	135	80	7.0	1.6	0.2	0.008	0.001	5.64E-04	9.00E-05	1.01E-05	1.68E-06	0.02	0.08	0.01	0.01	0.002
R34	12.1	2.9	0.5	134	83	6.8	1.6	0.2	0.008	0.001	5.76E-04	9.10E-05	1.04E-05	1.70E-06	0.02	0.08	0.02	0.01	0.002
R35	10.9	2.8	0.5	122	86	6.5	1.5	0.2	0.008	0.001	5.60E-04	9.40E-05	1.02E-05	1.76E-06	0.02	0.07	0.01	0.01	0.002
R36	38.0	11.7	2.7	440	307	19.2	4.6	1.0	0.032	0.007	2.09E-03	4.75E-04	4.23E-05	9.82E-06	0.09	0.22	0.06	0.02	0.008
R37	13.3	3.8	0.6	149	91	8.2	1.9	0.3	0.011	0.002	7.36E-04	1.11E-04	1.38E-05	2.12E-06	0.03	0.08	0.02	0.01	0.003
R38	11.0	2.6	0.4	122	59	6.6	1.5	0.2	0.008	0.001	5.34E-04	7.60E-05	9.54E-06	1.41E-06	0.02	0.07	0.01	0.01	0.002
R39	10.3	2.2	0.3	115	57	5.9	1.3	0.2	0.006	0.001	4.59E-04	6.70E-05	8.07E-06	1.23E-06	0.02	0.06	0.01	0.01	0.002
R40	10.5	2.3	0.4	116	68	5.8	1.3	0.2	0.007	0.001	4.71E-04	7.10E-05	8.39E-06	1.30E-06	0.02	0.07	0.01	0.01	0.002
R41	9.5	2.2	0.3	106	64	5.2	1.2	0.2	0.006	0.001	4.38E-04	6.50E-05	7.84E-06	1.17E-06	0.02	0.06	0.01	0.01	0.002
R42	12.7	3.3	0.6	142	105	7.1	1.6	0.3	0.009	0.002	6.40E-04	1.14E-04	1.19E-05	2.17E-06	0.03	0.08	0.02	0.01	0.002
R43	50.0	10.7	2.8	578	362	18.4	4.4	1.1	0.030	0.008	1.95E-03	4.96E-04	3.89E-05	1.02E-05	0.08	0.28	0.05	0.03	0.007
R44	9.2	1.9	0.3	102	49	5.2	1.2	0.2	0.006	0.001	3.98E-04	5.40E-05	6.93E-06	9.75E-07	0.02	0.06	0.01	0.01	0.001
R45	9.5	2.1	0.3	106	48	5.5	1.2	0.2	0.006	0.001	4.31E-04	5.90E-05	7.62E-06	1.06E-06	0.02	0.06	0.01	0.01	0.002
R46	9.4	2.2	0.5	108	61	8.1	1.8	0.3	0.006	0.002	4.85E-04	1.09E-04	8.13E-06	1.86E-06	0.02	0.06	0.01	0.01	0.002
R47	9.7	2.3	0.3	107	54	5.5	1.3	0.2	0.006	0.001	4.52E-04	6.10E-05	8.15E-06	1.12E-06	0.02	0.06	0.01	0.01	0.002
R48	9.2	2.2	0.4	102	70	5.1	1.2	0.2	0.006	0.001	4.31E-04	7.00E-05	7.90E-06	1.28E-06	0.02	0.06	0.01	0.01	0.002
Maximum	55.2	14.6	3.8	637	405	24.1	5.8	1.4	0.04	0.010	2.61E-03	6.63E-04	5.28E-05	1.37E-05	0.11	0.31	0.07	0.03	0.009
AQ Objective	400 / 83	200	24	36200	15700	50	27	8.8	2.3	0.45	10	2	0.00005	0.00001	65	500	500	4.5	0.4

Notes:
1. Maximum predicted concentrations are presented in the table.
2. Concentrations highlighted in green are predicted to exceed applicable air quality criteria.
3. AQ Objective presented in the table for 1-hour NO2 is AAQC / 2025 CAAQS, and for Annual NO2 is 2025 CAAQS for Future No Build Scenario.

Table G-3 **Predicted Concentrations at Receptors - Future Build Scenario**

	FUTURE BUILD SCENARIO (2031)																		
Background Concentration (µg/m^3)	55	45	28	410	401	22.6	12.21	7.2	0.77	0.53	0.082	0.055	0.00014	0.000086	3.1	9.3	3.1	0.2	0.082
	Predicted Concentrations (µg/m^3)																		
	NO_2	NO_2	NO_2	CO	CO	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	Benzene	Benzene	1, 3 Butadiene	1, 3 Butadiene	B(a)P	B(a)P	Formaldehyde	Acetaldehyde	Acetaldehyde	Acrolein	Acrolein
Receptor ID	**1-hr**	**24-hr**	**Annual**	**1-hr**	**8-hr**	**24-hr**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**Annual**	**24-hr**	**1/2-hr**	**24-hr**	**1-hr**	**24-hr**
R01	49.8	17.6	4.2	575	381	27.7	6.7	1.5	0.05	0.012	0.003	0.0007	6.34E-05	1.54E-05	0.13	0.28	0.08	0.03	0.011
R02	56.6	19.1	4.8	653	415	30.1	7.3	1.7	0.05	0.013	0.003	0.0008	6.91E-05	1.73E-05	0.15	0.32	0.09	0.04	0.012
R03	62.3	20.6	5.3	719	453	32.2	7.8	1.9	0.06	0.015	0.004	0.0009	7.44E-05	1.93E-05	0.16	0.35	0.10	0.04	0.013
R04	55.0	18.5	4.6	634	415	29.4	7.1	1.6	0.05	0.012	0.003	0.0008	6.63E-05	1.64E-05	0.14	0.31	0.09	0.03	0.012
R05	54.3	18.3	4.4	625	411	29.0	7.0	1.6	0.05	0.012	0.003	0.0008	6.53E-05	1.59E-05	0.14	0.31	0.09	0.03	0.012
R06	56.0	19.1	4.6	643	427	29.9	7.2	1.6	0.05	0.012	0.003	0.0008	6.76E-05	1.64E-05	0.15	0.32	0.09	0.03	0.012
R07	57.8	19.9	4.8	658	449	30.8	7.4	1.7	0.05	0.013	0.004	0.0008	6.98E-05	1.69E-05	0.15	0.33	0.10	0.04	0.013
R08	79.4	20.8	5.0	808	486	31.6	7.6	1.7	0.05	0.013	0.004	0.0009	7.20E-05	1.74E-05	0.16	0.46	0.10	0.05	0.013
R09	71.1	19.9	4.7	732	497	30.5	7.3	1.6	0.05	0.012	0.004	0.0008	6.89E-05	1.64E-05	0.15	0.41	0.10	0.05	0.013
R10	61.2	18.9	4.7	701	498	29.5	7.1	1.7	0.05	0.013	0.003	0.0008	6.66E-05	1.67E-05	0.15	0.34	0.09	0.04	0.012
R11	63.4	18.3	4.7	723	486	28.8	6.9	1.7	0.05	0.013	0.003	0.0008	6.49E-05	1.68E-05	0.14	0.36	0.09	0.04	0.012
R12	61.0	16.9	4.3	693	451	26.8	6.5	1.6	0.05	0.012	0.003	0.0008	5.99E-05	1.55E-05	0.13	0.34	0.08	0.04	0.011
R13	63.5	17.1	4.5	719	458	27.0	6.5	1.6	0.05	0.012	0.003	0.0008	6.11E-05	1.61E-05	0.13	0.36	0.08	0.04	0.011
R14	62.9	16.6	4.4	713	447	26.2	6.3	1.6	0.05	0.012	0.003	0.0008	5.98E-05	1.58E-05	0.13	0.36	0.08	0.04	0.011
R15	46.1	12.2	2.9	521	334	19.8	4.7	1.1	0.03	0.008	0.002	0.0005	4.36E-05	1.06E-05	0.09	0.26	0.06	0.03	0.008
R16	51.6	13.3	3.4	585	352	21.4	5.1	1.3	0.04	0.009	0.002	0.0006	4.79E-05	1.24E-05	0.10	0.29	0.06	0.03	0.008
R17	15.9	2.5	0.4	168	63	5.6	1.3	0.2	0.01	0.001	0.000	0.0001	8.83E-06	1.29E-06	0.02	0.10	0.01	0.01	0.002
R18	16.7	4.4	1.0	186	122	12.1	2.7	0.7	0.01	0.003	0.001	0.0002	1.51E-05	3.50E-06	0.04	0.11	0.02	0.01	0.003
R19	32.8	8.3	2.5	358	229	14.7	3.3	0.9	0.02	0.006	0.002	0.0005	2.69E-05	8.15E-06	0.07	0.20	0.04	0.02	0.006
R20	35.9	8.0	1.8	388	232	15.4	3.5	0.7	0.02	0.005	0.002	0.0004	2.66E-05	5.94E-06	0.07	0.22	0.04	0.02	0.006
R21	25.0	9.4	1.9	282	204	16.6	3.9	0.7	0.03	0.005	0.002	0.0003	3.37E-05	6.72E-06	0.07	0.15	0.05	0.02	0.006
R22	27.3	10.0	2.1	307	218	17.7	4.2	0.8	0.03	0.006	0.002	0.0004	3.59E-05	7.47E-06	0.08	0.16	0.05	0.02	0.007
R23	28.0	9.2	1.9	313	204	16.6	3.9	0.7	0.03	0.005	0.002	0.0003	3.27E-05	6.66E-06	0.07	0.17	0.05	0.02	0.006
R24	35.0	9.5	2.0	378	227	16.8	4.0	0.8	0.03	0.005	0.002	0.0004	3.35E-05	6.93E-06	0.08	0.20	0.05	0.02	0.006
R25	30.1	9.3	1.9	325	241	16.4	3.9	0.7	0.03	0.005	0.002	0.0003	3.28E-05	6.71E-06	0.07	0.18	0.05	0.02	0.006
R26	26.3	7.7	1.6	285	210	13.5	3.2	0.7	0.02	0.004	0.001	0.0003	2.72E-05	5.80E-06	0.06	0.16	0.04	0.02	0.005
R27	24.7	7.1	1.5	277	191	12.5	3.0	0.6	0.02	0.004	0.001	0.0003	2.52E-05	5.28E-06	0.06	0.15	0.03	0.02	0.005
R28	21.2	7.0	1.3	237	151	13.4	3.1	0.5	0.02	0.003	0.001	0.0002	2.49E-05	4.58E-06	0.06	0.13	0.03	0.01	0.005
R29	25.1	7.3	1.4	278	166	13.7	3.2	0.6	0.02	0.004	0.001	0.0003	2.57E-05	4.91E-06	0.06	0.15	0.04	0.02	0.005
R30	35.3	7.1	1.3	363	175	13.1	3.1	0.5	0.02	0.003	0.001	0.0002	2.48E-05	4.45E-06	0.06	0.21	0.04	0.02	0.005
R31	20.0	5.8	1.1	211	162	11.1	2.6	0.5	0.02	0.003	0.001	0.0002	2.05E-05	4.03E-06	0.05	0.12	0.03	0.01	0.004
R32	16.2	4.1	0.7	180	91	8.9	2.0	0.3	0.01	0.002	0.001	0.0001	1.46E-05	2.31E-06	0.03	0.10	0.02	0.01	0.003
R33	19.9	3.9	0.7	214	102	8.5	2.0	0.3	0.01	0.002	0.001	0.0001	1.40E-05	2.41E-06	0.03	0.12	0.02	0.01	0.003
R34	22.2	4.4	0.7	233	109	8.8	2.0	0.3	0.01	0.002	0.001	0.0001	1.55E-05	2.39E-06	0.04	0.13	0.02	0.01	0.003
R35	14.5	4.0	0.7	158	112	7.8	1.8	0.3	0.01	0.002	0.001	0.0001	1.41E-05	2.42E-06	0.03	0.09	0.02	0.01	0.003
R36	43.5	16.2	3.8	502	353	25.2	6.1	1.3	0.04	0.010	0.003	0.0007	5.84E-05	1.36E-05	0.12	0.25	0.08	0.03	0.010
R37	16.3	5.3	0.8	183	113	10.2	2.4	0.4	0.01	0.002	0.001	0.0002	1.91E-05	2.94E-06	0.04	0.10	0.03	0.01	0.004
R38	14.1	3.8	0.6	156	80	8.2	1.9	0.3	0.01	0.002	0.001	0.0001	1.36E-05	1.97E-06	0.03	0.09	0.02	0.01	0.003
R39	15.6	3.1	0.5	169	81	7.1	1.6	0.2	0.01	0.001	0.001	0.0001	1.10E-05	1.74E-06	0.03	0.09	0.02	0.01	0.002
R40	19.8	3.3	0.5	207	89	7.1	1.6	0.2	0.01	0.001	0.001	0.0001	1.18E-05	1.83E-06	0.03	0.12	0.02	0.01	0.002
R41	14.1	3.2	0.5	149	82	6.5	1.5	0.2	0.01	0.001	0.001	0.0001	1.11E-05	1.61E-06	0.03	0.09	0.02	0.01	0.002
R42	17.1	4.6	0.8	186	126	8.8	2.0	0.4	0.01	0.002	0.001	0.0002	1.62E-05	2.95E-06	0.04	0.10	0.02	0.01	0.003
R43	55.0	14.5	3.8	626	384	23.4	5.6	1.4	0.04	0.010	0.003	0.0007	5.23E-05	1.37E-05	0.11	0.31	0.07	0.03	0.009
R44	12.8	2.7	0.4	140	64	6.3	1.4	0.2	0.01	0.001	0.001	0.0001	9.57E-06	1.37E-06	0.02	0.08	0.01	0.01	0.002
R45	12.2	3.0	0.4	136	65	6.7	1.6	0.2	0.01	0.001	0.001	0.0001	1.08E-05	1.48E-06	0.03	0.08	0.02	0.01	0.002
R46	12.7	3.1	0.7	139	72	8.7	1.9	0.4	0.01	0.002	0.001	0.0001	1.11E-05	2.45E-06	0.03	0.07	0.02	0.01	0.002
R47	12.1	3.2	0.4	135	70	6.8	1.6	0.2	0.01	0.001	0.001	0.0001	1.14E-05	1.54E-06	0.03	0.07	0.02	0.01	0.002
R48	11.8	3.1	0.5	129	91	6.3	1.4	0.2	0.01	0.001	0.001	0.0001	1.11E-05	1.76E-06	0.03	0.07	0.02	0.01	0.002
Maximum	79.4	20.8	5.3	808	498	32.2	7.8	1.9	0.06	0.015	0.004	0.0009	7.44E-05	1.93E-05	0.16	0.46	0.10	0.05	0.013
AQ Objective	400 / 83	200	24	36200	15700	50	27	8.8	2.3	0.45	10	2	0.00005	0.00001	65	500	500	4.5	0.4

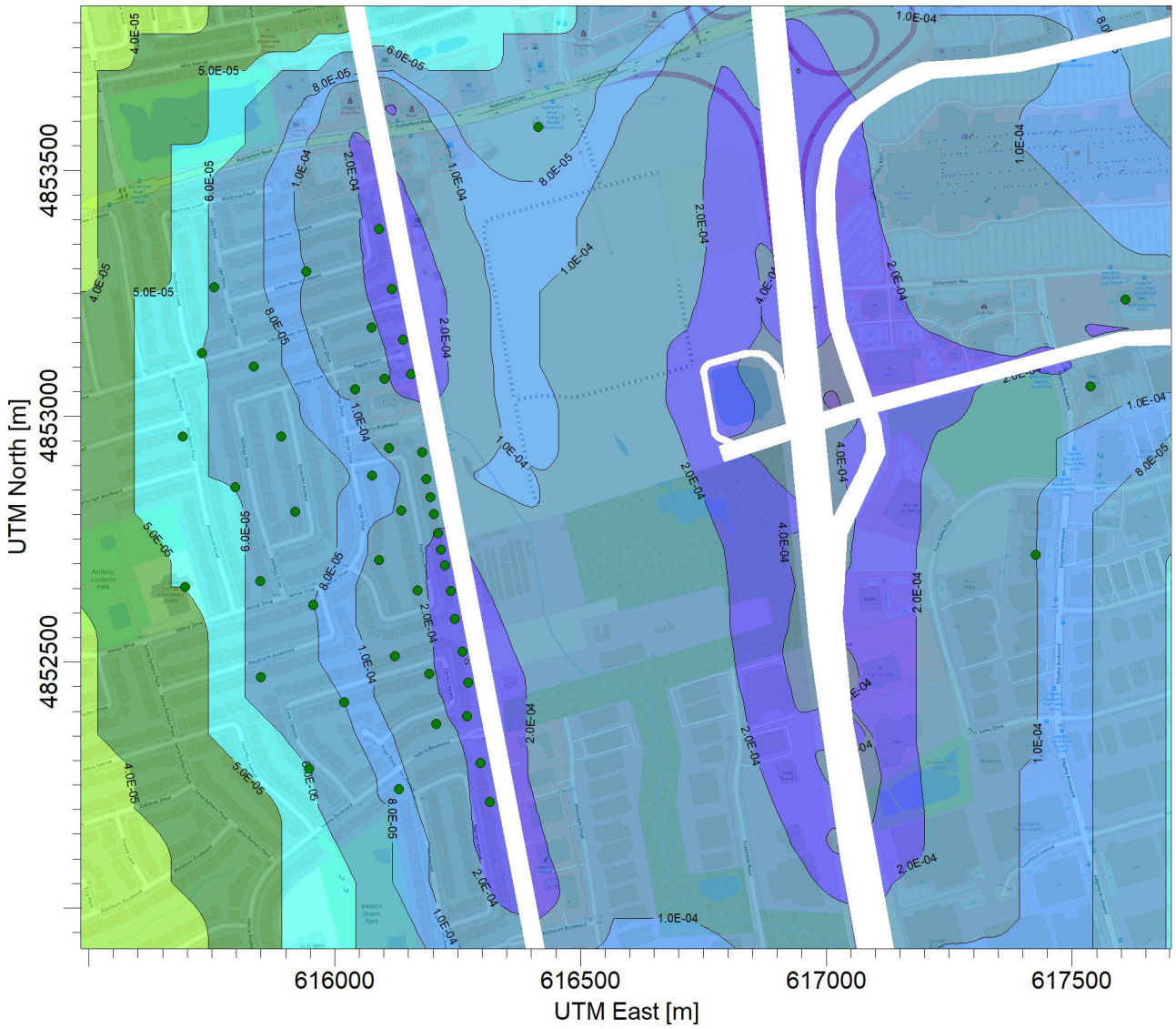
Notes:
1. Maximum predicted concentrations are presented in the table.
2. Concentrations highlighted in green are predicted to exceed applicable air quality criteria.
3. AQ Objective presented in the table for 1-hour NO2 is AAQC / 2025 CAAQS, and for Annual NO2 is 2025 CAAQS for Future Build Scenario.

APPENDIX H

Benzo(a)Pyrene Contour Plots (Project Alone)

PROJECT TITLE:

Figure H-1: Baseline Scenario (2020) - Contour Plot for Benzo(a)pyrene (B(a)P)
Predicted 24-Hour Average Concentrations



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

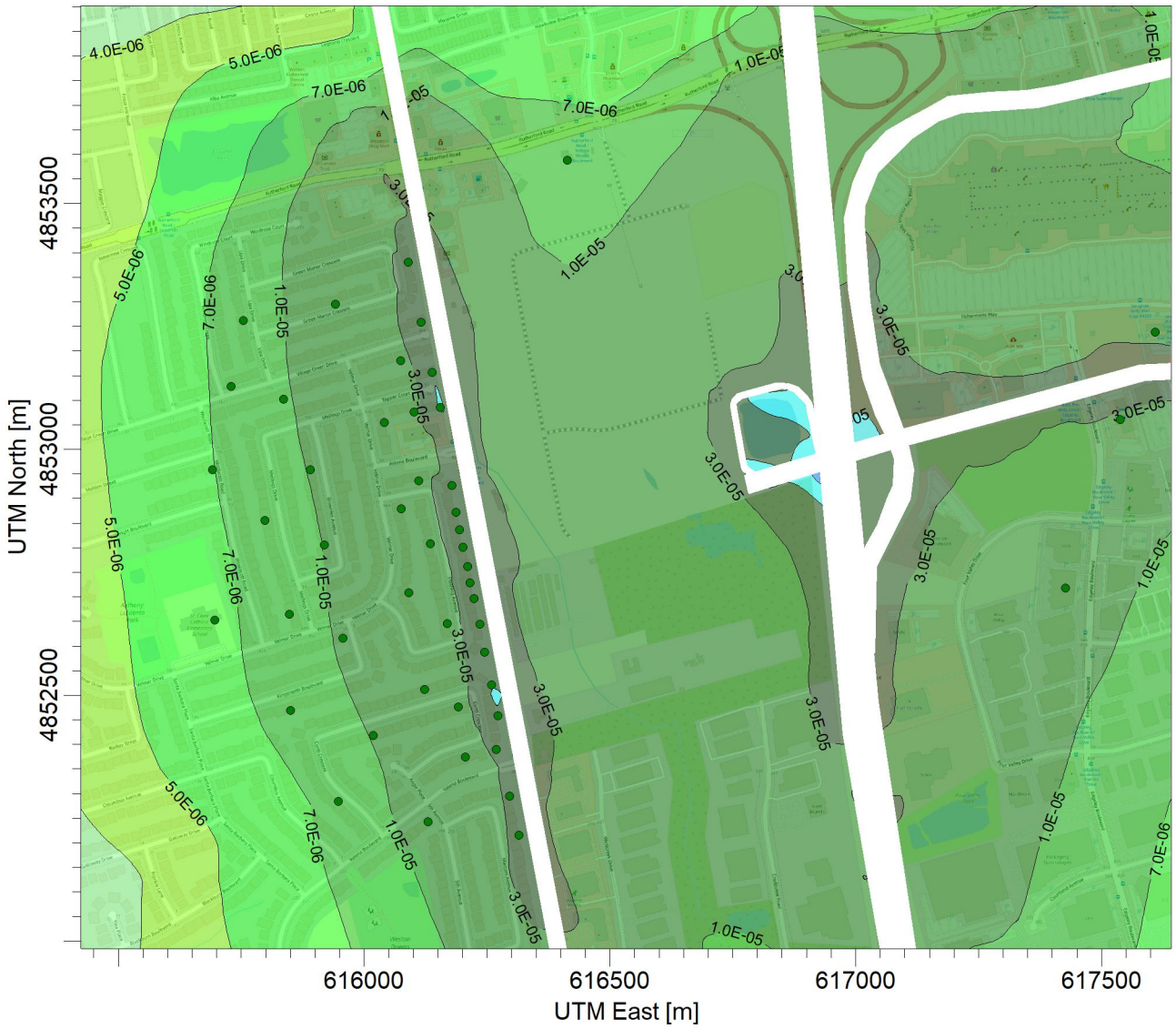
Max: 5.3E-04 [ug/m^3] at (617017.51, 4853028.27)

2.0E-05 4.0E-05 5.0E-05 6.0E-05 8.0E-05 1.0E-04 2.0E-04 4.0E-04 5.0E-04

COMMENTS: 24-Hour AAQC: 5.0 E-5 ug/m^3 Green circle - special receptor location	SOURCES: **14**	COMPANY NAME: **Stantec Consulting Ltd.**	
	RECEPTORS: **1401**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:14,000 0 0.5 km	
	MAX: **5.3E-04 ug/m^3**	DATE: **2/1/2022**	PROJECT NO.: **160540006**

PROJECT TITLE:

Figure H-2: Future No Build Scenario (2031) - Contour Plot for Benzo(a)pyrene (B(a)P)
Predicted 24-hour Average Concentrations



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

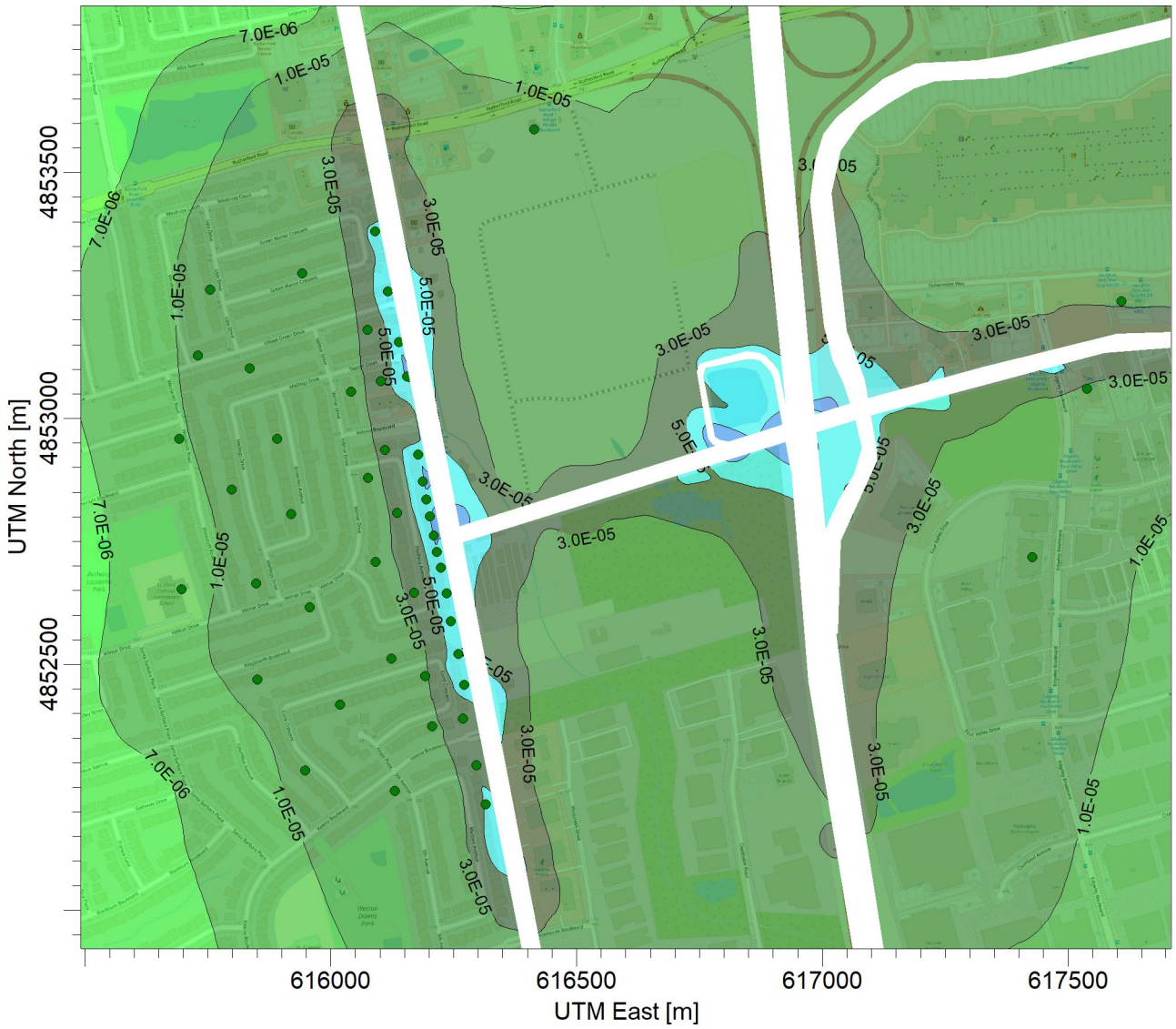
Max: 7.0E-05 [ug/m^3] at (616942.51, 4852953.27)

2.4E-06 | 4.0E-06 | 5.0E-06 | 7.0E-06 | 1.0E-05 | 3.0E-05 | 5.0E-05 | 6.0E-05 | 7.0E-05

COMMENTS: 24-hour AAQC: 5.0 E-5 ug/m^3 Green circle - special receptor location	SOURCES: **14**	COMPANY NAME: **Stantec Consulting Ltd.**	
	RECEPTORS: **1401**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:14,000 0 0.5 km	
	MAX: **7.0E-05 ug/m^3**	DATE: **2/1/2022**	PROJECT NO.: **160540006**

PROJECT TITLE:

Figure H-3: Future Build Scenario (2031) - Contour Plot for Benzo(a)pyrene (B(a)P)
Predicted 24-hour Average Concentrations



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

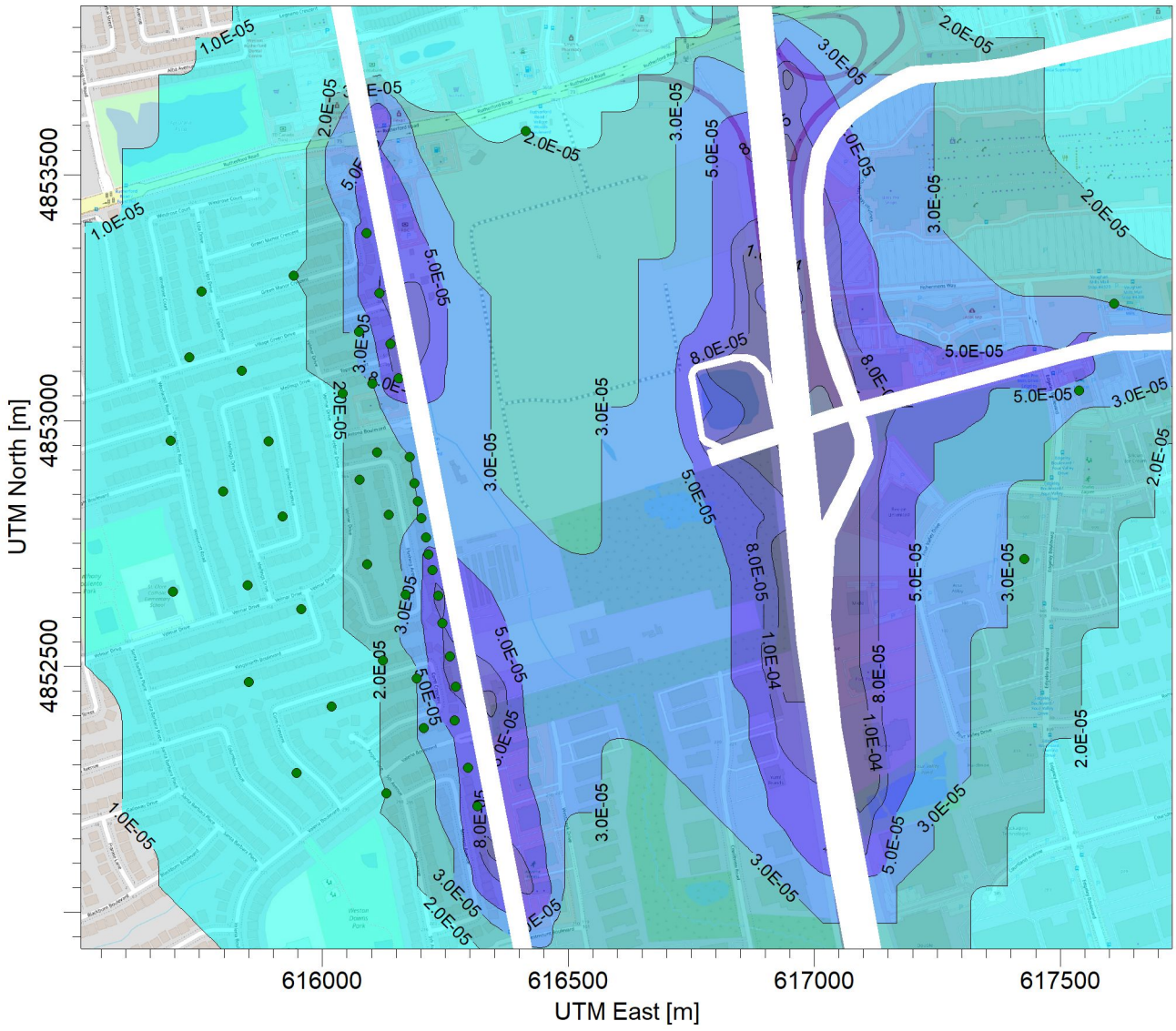
Max: 9.5E-05 [ug/m^3] at (616942.51, 4852953.27)

3.4E-06 5.0E-06 7.0E-06 1.0E-05 3.0E-05 5.0E-05 7.0E-05 9.5E-05

COMMENTS: 24-hour AAQC: 5.0 E-5 ug/m^3 Green circle - special receptor location	SOURCES: **14**	COMPANY NAME: **Stantec Consulting Ltd.**	
	RECEPTORS: **1401**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:14,000 0 0.5 km	
	MAX: **9.5E-05 ug/m^3**	DATE: **2/1/2022**	PROJECT NO.: **160540006**

PROJECT TITLE:

Figure H-4: Baseline Scenario (2020) - Contour Plot for Benzo(a)pyrene (B(a)P)
Predicted Annual Average Concentrations



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL ug/m^3

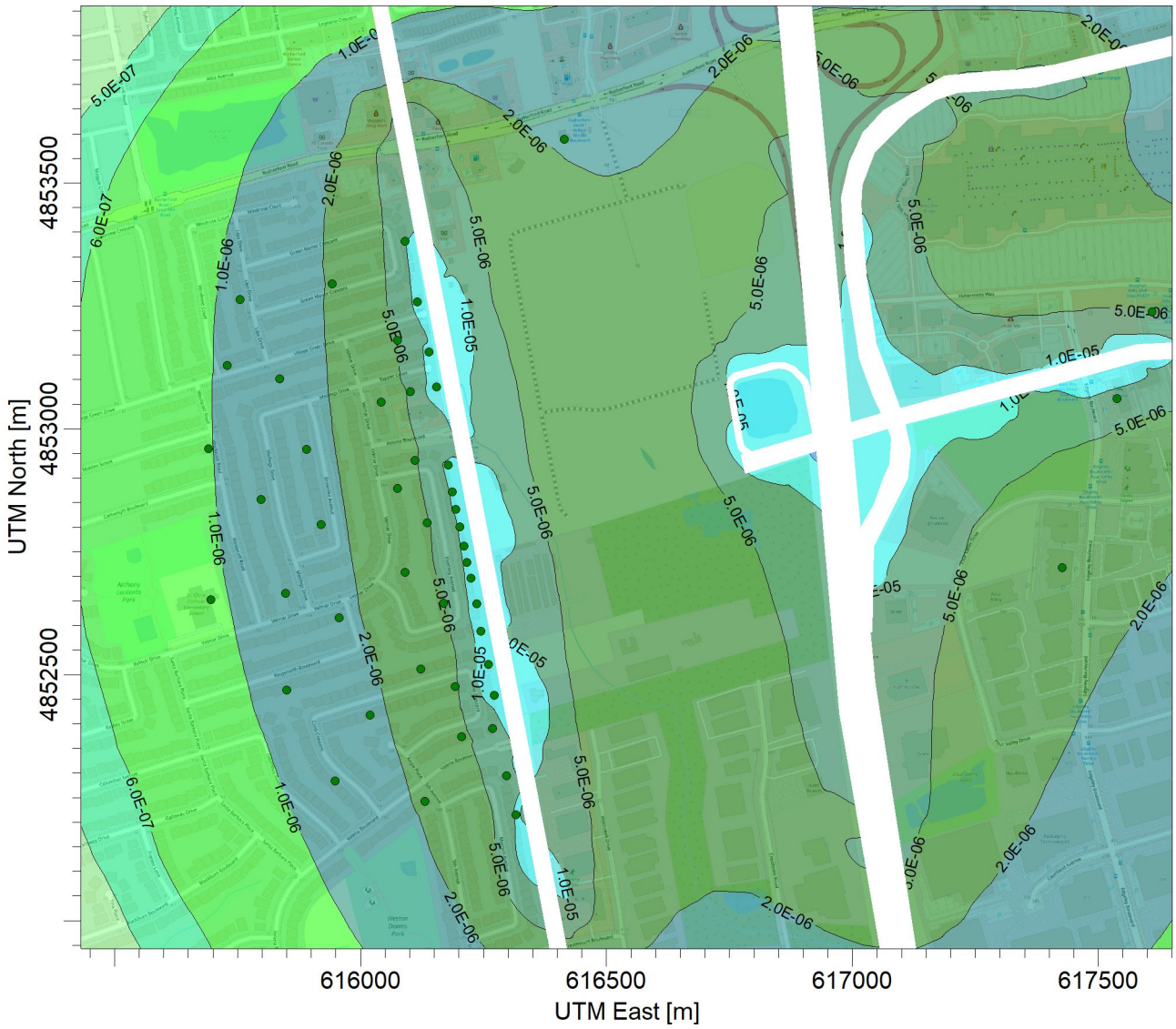
Max: 1.7E-04 [ug/m^3]

1.0E-05 2.0E-05 3.0E-05 5.0E-05 8.0E-05 1.0E-04 1.5E-04

COMMENTS: Annual AAQC: 1.0 E-5 ug/m^3 Green circle - special receptor location	SOURCES: **14**	COMPANY NAME: **Stantec Consulting Ltd.**	
	RECEPTORS: **1401**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:14,000 0 0.5 km	
	MAX: **1.7E-04 ug/m^3**	DATE: **2/1/2022**	PROJECT NO.: **160540006**

PROJECT TITLE:

Figure H-5: Future No Build Scenario (2031) - Contour Plot for Benzo(a)pyrene (B(a)P)
Predicted Annual Average Concentrations



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL ug/m^3

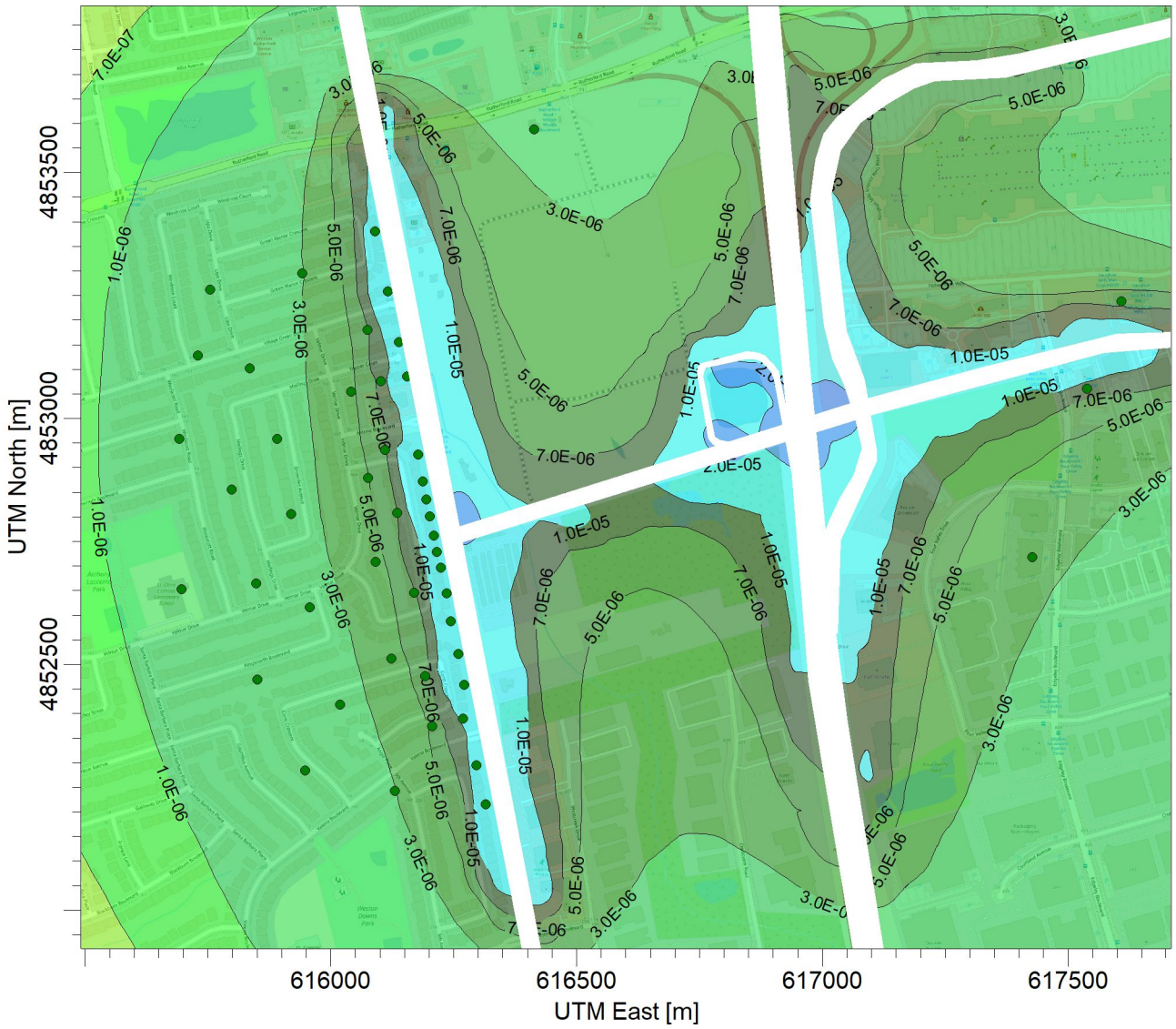
Max: 2.6E-05 [ug/m^3] at (616942.51, 4852953.27)

2.6E-07 5.0E-07 6.0E-07 1.0E-06 2.0E-06 5.0E-06 1.0E-05 2.0E-05 2.6E-05

COMMENTS: Annual AAQC: 1.0 E-5 ug/m^3 Green circle - special receptor location	SOURCES: **14**	COMPANY NAME: **Stantec Consulting Ltd.**	
	RECEPTORS: **1401**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:14,000 0 0.5 km	
	MAX: **2.6E-05 ug/m^3**	DATE: **2/1/2022**	PROJECT NO.: **160540006**

PROJECT TITLE:

Figure H-6: Future Build Scenario (2031) - Contour Plot for Benzo(a)pyrene (B(a)P)
Predicted Annual Average Concentrations



COMMENTS:	SOURCES:	COMPANY NAME:	
Annual AAQC: 1.0 E-5 ug/m^3 Green circle - special receptor location	**14**	**Stantec Consulting Ltd.**	
	RECEPTORS: **1401**		
	OUTPUT TYPE: **Concentration**	SCALE: 1:14,000 0 0.5 km	
	MAX: **3.6E-05 ug/m^3**	DATE: **2/1/2022**	PROJECT NO.: **160540006**