July 2016

REPORT

AIR QUALITY REPORT

Municipal Class EA for Proposed Expansion of Portage Parkway Vaughan, Ontario

Submitted to:
CIMA Canada Inc.
3027 Harvester Road, Suite 400
Burlington, ON L7N 3G7

Report Number: 1522372

Distribution:

1 copy - CIMA
1 copy - Golder Associates Ltd., Mississauga

Golder Associates

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by CIMA Canada Inc. (CIMA) to conduct a semi-qualitative air quality assessment for the proposed widening and extension of Portage Parkway in the City of Vaughan (the Project). This assessment was conducted to support Schedule C Road Improvement Municipal Class EA Environmental Study Report.

The primary goal of the air quality assessment is to provide a semi-qualitative assessment of the air quality impacts resulting from the anticipated widening of Portage Parkway from Applewood Crescent to Jane Street and the construction of an extension of Portage Parkway from Jane Street to Creditstone Road. Existing air quality data will be compared to relevant federal and provincial standards and guidelines. Using the available background air quality data, a qualitative assessment was prepared to discuss the following:

- Background Air Quality, including:
  - existing background air quality in the vicinity of Portage Parkway; and
  - contribution of emissions from the existing road to background air quality.
- Project Impacts, including:
  - potential impacts of the proposed road widening on local air quality; and
  - effects of any potential impacts that arise as a result of the proposed road widening.

2.0 METHODOLOGY

As per the general guidance provided in the Ministry of Transportation Guidance Document *"Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions for Provincial Transportation Projects, June 2012"*, the list of parameters should focus on the key pollutants released from mobile sources such as, but not limited to, the following:

- particulate matter, including suspended particulate matter (SPM), particles nominally smaller than 10 micrometres (µm) in diameter (PM_{10}), and particles nominally smaller than 2.5 µm in diameter ($PM_{2.5}$);
- nitrogen oxides (NOx), expressed as nitrogen dioxide (NO_2);
- carbon monoxide (CO); and
- volatile organic compounds (VOCs).

The air quality assessment includes two main tasks, namely characterizing the existing conditions and assessing the net effects of the Project on air quality. This assessment will be limited to the operational phase of the roadway (i.e. routine traffic) and will not address air quality impacts related to the construction activities to complete the expansion work. It is assumed that emissions from construction operations will be managed through best management practices for construction operations and monitoring and mitigation requirements will be considered as part of the special provisions that are typically written to the construction tender documents.

3.0 BACKGROUND AIR QUALITY

The background air quality in the area around the proposed Project has been described by considering regional concentrations, based on publicly available monitoring data. The background air quality represents the existing conditions of air quality before the operation of the proposed Project. Sources include roadways, long range transboundary air pollution, small regional sources and large industrial sources.

This section details the selection of compounds considered in the assessment, applicable guidelines for this assessment, selection of the monitoring stations, and comparison of the selected data to the ambient air quality criteria (AAQCs).

3.1 Indicator Compounds

The assessment of background air quality is focused on criteria air contaminants (CACs), compounds that are expected to be released from mobile sources, and VOCs for which relevant air quality criteria exist, and which are generally accepted as indicative of changing air quality. These compounds result from fuel combustion, brake wear, tire wear and fugitive dust emitted from the movement of vehicles on roadways. The indicator compounds include:

- particulate matter, including SPM, PM_{10} and $PM_{2.5}$;
- NOx, expressed as NO_2;
- CO; and
- VOCs, including benzene, 1,3-butadiene.acrolein, acetaldehyde and formaldehyde.

Although CACs typically also include sulphur dioxide and ammonia, these emissions are considered as insignificant for transportation projects, and therefore were not included in the assessment (MTO, 2012).

3.2 Applicable Guidelines

The air quality criteria used for assessing the air quality effects of the Project include the Ontario criteria, and federal standards and objectives where provincial guidelines are not available. The Ministry of the Environment and Climate Change (MOECC) has issued guidelines related to ambient air concentrations, which are summarized in *Ontario's Ambient Air Quality Criteria* (MOECC, 2012). There are two sets of federal objectives and criteria: the Canadian Ambient Air Quality Standards (CAAQSs) (formerly National Ambient Air Quality Standards (NAAQS)), and the National Ambient Air Quality Objectives (NAAQOs).

The NAAQOs are benchmarks that can be used to facilitate air quality management on a regional scale, and provide goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment (CCME, 1999b). The federal government has established the following levels of NAAQOs (Health Canada, 1994):

- the maximum desirable level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for unpolluted parts of the country and for the continuing development of control technology; and
- the maximum acceptable level is intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and well-being.

The CAAQSs have been developed under the Canadian Environmental Protection Act, and include standards for $PM_{2.5}$ that must be achieved by 2020. There are two phase-in dates, 2015 and 2020 (Government of Canada, 2013).

A summary of the applicable Ontario and federal objectives and criteria are listed in Table 1.

Table 1: Ontario and Canadian Regulatory Air Quality Objectives and Criteria

Indicator Compound	Averaging Period	Ontario Ambient Air Quality Guidelines[a]	Canadian Ambient Air Quality Standards[b]	National Ambient Air Quality Standards and Objectives[c]	
				Desirable	Acceptable
SPM (µg/m³)	24-Hour	120	—	—	120
	Annual	60[d]	—	60	70
PM_{10} (µg/m³)	24-Hour	50[e]	—	—	—
$PM_{2.5}$ (µg/m³)	24-Hour	30[f]	28/27	—	—
	Annual	—	10/8.8	—	—
NO_2 (µg/m³)	1-Hour	400	—	—	400
	24-Hour	200	—	—	200
	Annual	—	—	60	100
CO (µg/m³)	1-Hour	36,200	—	15,000	35,000
	8-Hour	15,700	—	6,000	15,000
Benzene (µg/m³)	24-Hour	2.3	—	—	—
	Annual	0.45	—	—	—
1,3-Butadiene (µg/m³)	24-Hour	10	—	—	—
	Annual	2	—	—	—
Acrolein (µg/m³)	24-Hour	0.4	—	—	—
	1-hour	4.5	—	—	—
Acetaldehyde (µg/m³)	24-Hour	500	—	—	—
	½ hour	500	—	—	—
Formaldehyde (µg/m³)	24-Hour	65	—	—	—

Notes:

(a) MOECC, 2012.

(b) CAAQS published in the Canada Gazette Volume 147, No. 21 - May 25, 2013. The standards will be phased in in 2015 and 2020, with both numbers shown in the table. The larger (first) value represents the CAAQS for 2015.

(c) CCME, 1999

(d) Geometric Mean Value.

(e) Interim Ambient Air Quality Criteria (AAQC).

(f) Compliance is based on the 98th percentile of the annual monitored data averaged over three years of measurements.

— = No guideline available.

3.3 Monitoring Data

In Ontario, regional air quality is monitored through a network of air quality monitoring stations operated by the MOECC and Environment Canada National Air Pollution Surveillance Network (NAPS). These stations are operated under strict quality assurance and quality control procedures. Existing air quality was characterized using background air concentrations from monitoring data sources in the Project area. For this assessment, data from 2009 to 2013 was used, which is a recent five year period for which all data is Quality Assured by Environment Canada.

The station identified as being most relevant to the Project is located at 125 Resources Road in Etobicoke (the Resources Road Station). This air monitoring data is located close to Highway 401, in a similar industrial environment. The monitoring data for this station is therefore anticipated to be appropriate to represent the combined effect of emissions from local sources, as well as the effect of emissions transported into the region. The Resources Road Station does not monitor VOCs, however. Only a select number of air monitoring stations in the Greater Toronto Area (GTA) provide VOC monitoring data. The most representative station for which VOC monitoring data is available is located at 461 Kipling Avenue in South Etobicoke (the Etobicoke South Station). Although this station is not as close to the Project as the Resources Road station, the Etobicoke South Station is predicted to have similar influences by the surrounding highways and roadways as well as industrial land use. Details of these stations are provided in Table 2.

Table 2: Ambient Air Quality Monitoring Parameters

Station Name	NAPS Station ID	Monitoring Period Available					Distance from Project
		$PM_{2.5}$	NO_2	Benzene	1,3-Butadiene	CO	
Resources Road	60430	2003-2012	2003-2012	—	—	2006-2013	Approximately 9.7 km South West
Etobicoke South	60435	—	—	2009-2013	2009-2013	—	Approximately 21 km South West

Note: "—" Station not used for obtaining compound data.

For analysing monitoring data, the 90th percentile of the available monitoring data is typically considered a conservative estimate of background air quality (CEA Agency and CNSC, 2009). As a result, the 90th percentile of the measured concentrations were used to represent background air quality for parameters with shorter averaging periods (i.e., 1-hour and 24-hour). Annual background concentrations were calculated based on the mean of the available data. A summary of the background air quality concentrations for all compounds is provided below in Table 3 with further discussion in the following sections.

Table 3: Air Quality Monitoring Data from the Resources Road Station and the Etobicoke South Station

Indicator Compound	Averaging Period	Background Concentration [µg/m³]	Regulatory Criteria [µg/m³]	% of AAQC
SPM	24-Hour	52.7	120	44%
	Annual	28.3	60	47%
PM_{10}	24-Hour	26.4	50	53%
$PM_{2.5}$	24-Hour	19.4	27	72%
	Annual	7.1	8.8	80%
NO_X (expressed as NO_2)	1-Hour	62.1	400	16%
	24-Hour	51.0	200	25%
	Annual	34.1	60	57%
CO	1-Hour	458.2	36,200	1%
	24-Hour	501.1	15,700	3%
Benzene	24-Hour	1.3	2.3	56%
	Annual	0.5	0.45	120%
1,3,-Butadiene	24-Hour	0.2	10	2%
	Annual	0.1	2	3%

Note: All values are based on 90th percentile with the exception of annual averages as well as the $PM_{2.5}$ 24-hour value which used the 98^{th} percentile averaged over three rolling years.

3.3.1 Particulate Matter (SPM, PM_{10} and $PM_{2.5}$)

Particulate emissions occur due to anthropogenic activities, such as agricultural, industrial and transportation sources, as well as natural sources. Particulate matter is classified based on its aerodynamic particle size, primarily due to the different health effects that can be associated with the particles of different diameters. Fine particulate matter ($PM_{2.5}$) is of primary concern related as they can penetrate deep into the respiratory system and cause health impacts (MOECC, 2015). In Ontario, these emissions have been demonstrating a steady decline since 2003 (MOECC, 2015).

No local monitoring data was available for SPM and PM_{10}, however, an estimate of the background SPM and PM_{10} concentrations can be determined from the available $PM_{2.5}$ monitoring data. Fine particulate matter (i.e., $PM_{2.5}$) is a subset of PM_{10}, and PM_{10} is a subset of SPM. Therefore, it is reasonable to assume that the ambient concentrations of SPM will be greater than corresponding PM_{10} levels, and PM_{10} concentrations will be greater than the corresponding levels of $PM_{2.5}$. The overall levels of $PM_{2.5}$ in Canada were found to be about 50% of the PM_{10} concentrations and about 25% of the SPM concentrations (Canadian Environmental Protection Act/FPAC, 1988). By applying this ratio it was possible to estimate the background SPM and PM_{10} concentrations for the region.

For 24-hour $PM_{2.5}$, measurements meet the pending CAAQS values of 27 µg/m³ (2020 phase in date). The annual average $PM_{2.5}$ values are below the pending CAAQS of 8.8 µg/m³ (2020 phase in date).

Larger particles (i.e., SPM) can result in nuisance effects, such as soiling or visibility and, therefore, must be taken into consideration as part of the study. All derived SPM and PM_{10} values are below the relevant Ontario ambient air quality criteria and NAAQOs.

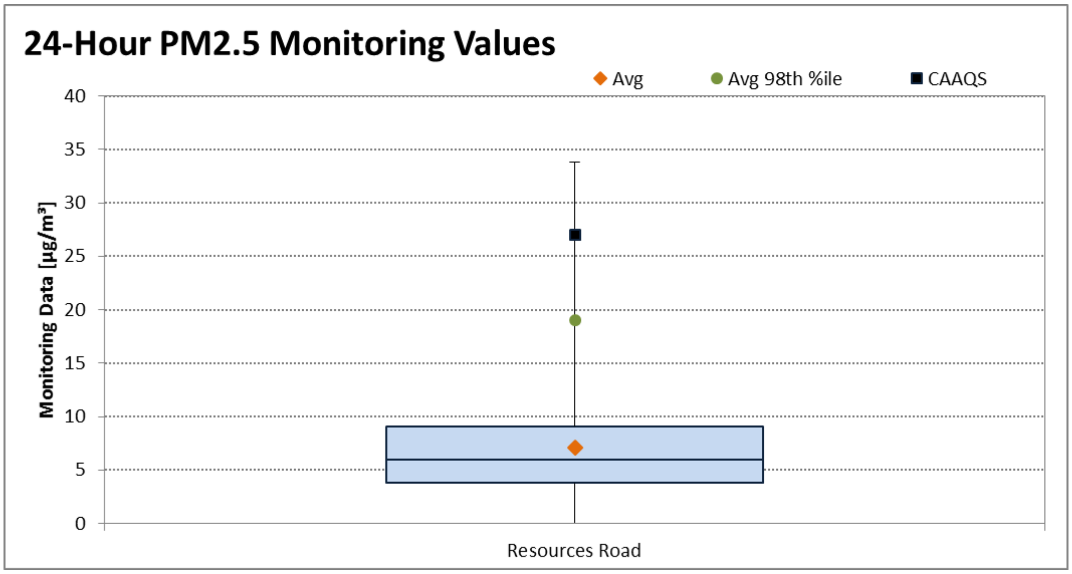

Figure 1: Monitored Fine Particulate Matter ($PM_{2.5}$) from the Resources Road Station

3.3.2 NO_X and NO_2 Concentrations

NO_X is emitted in two primary forms: nitric oxide (NO) and NO_2. NO reacts with ozone in the atmosphere to create NO_2. The primary source of NO_X in the region is the combustion of fossil fuels. Emissions of NO_X result from the operation of stationary equipment such as incinerators, boilers, and generators, as well as the operation of mobile sources such as vehicles, haul trucks, and other equipment.

The presence of NO_2 in the atmosphere has known health effects (e.g., lung irritation) and environmental effects (e.g., acid precipitation, ground-level ozone formation) (MOECC, 2015). As a result, regulatory guideline levels are based on NO_2 emissions and concentrations. Emissions of NO_2 in Ontario have shown a steady decline from 2004 (MOECC, 2015). The monitoring data assessed shows that no exceedances of the 1-hour or 24-hour AAQC for NO_2 were recorded (Figure 2).

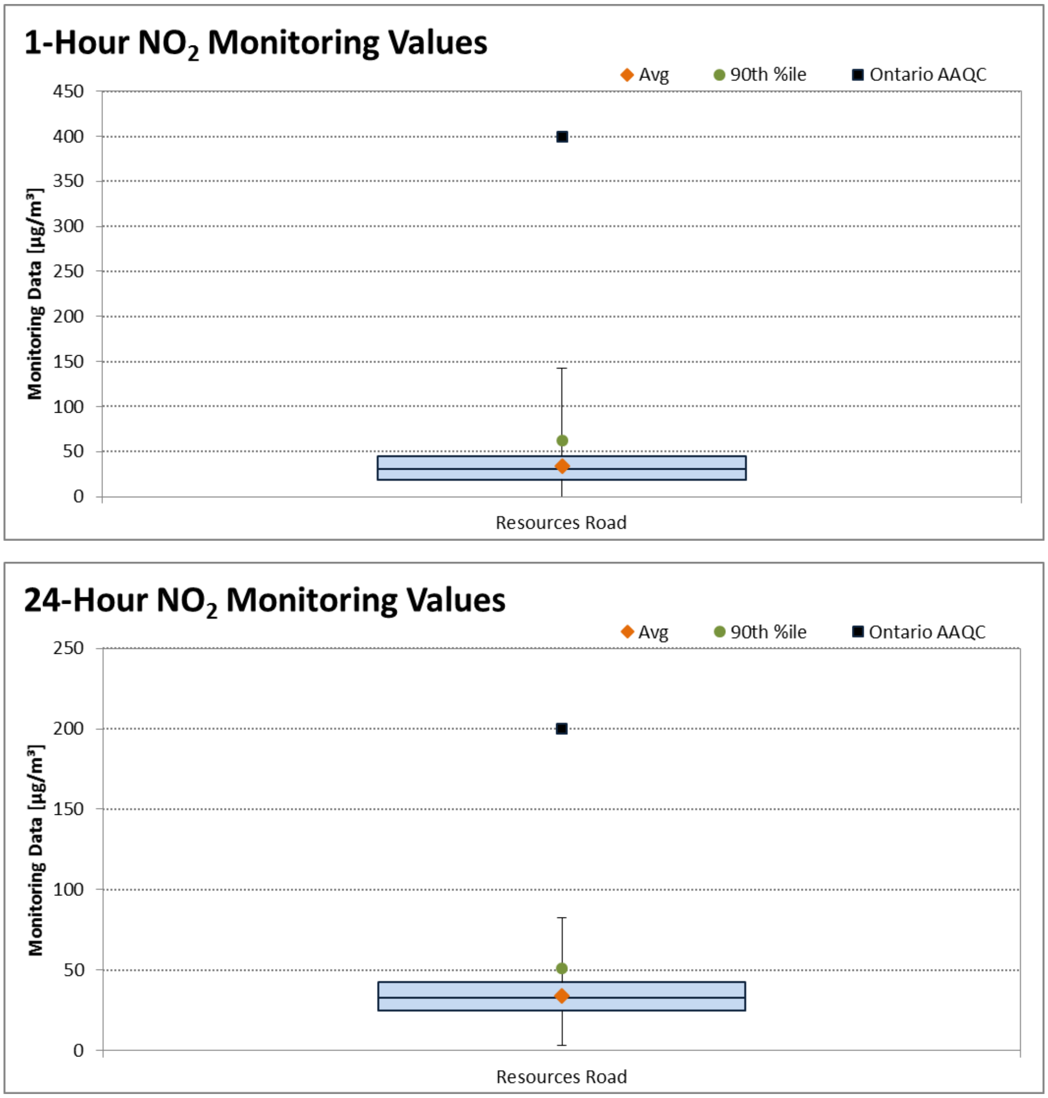

Figure 2: Monitored Nitrogen Dioxide (NO_2) from the Resources Road Station

3.3.3 CO Concentrations

Carbon monoxide is a colourless, odourless, tasteless gas, and at high concentrations can cause adverse health effects. It is produced primarily from the incomplete combustion of fossil fuels, as well as natural sources. The monitoring data assessed indicates that no exceedances of the 1-hour or 8-hour AAQC for CO were recorded (Figure 3).

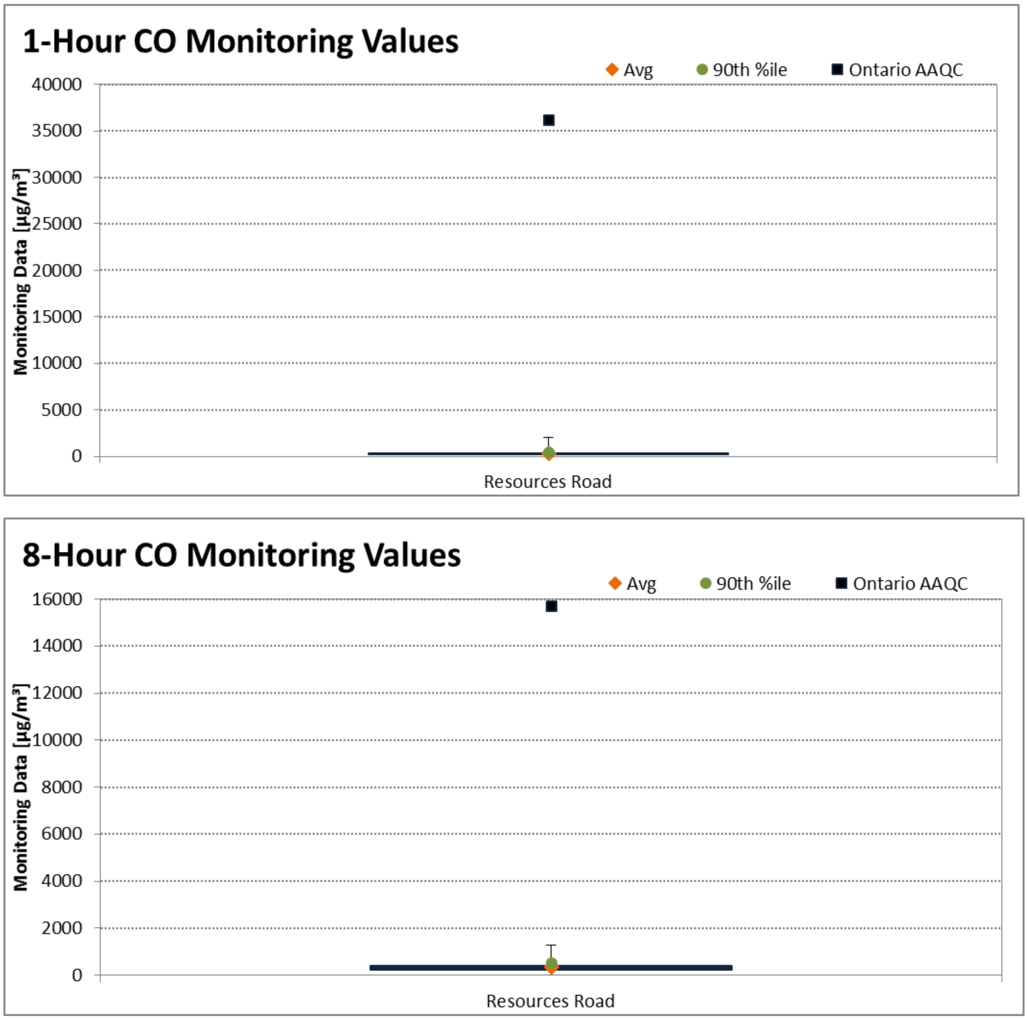

Figure 3: Monitored Carbon Monoxide (CO) from the Resources Road Station

3.3.4 VOCs Concentrations

Volatile organic compounds are primary precursors to the formation of ground level ozone and particulate matter which are the main components of smog, known to have adverse effects on human health and the environment (EC, 2015b). Ontario's major sources of VOCs includes transportation and general solvent use (MOECC, 2015). The primary VOCs associated with traffic include benzene, 1,3- butadiene, acrolein, acetaldehyde and formaldehyde. However, only benzene and 1,3- butadiene monitoring data was available for assessment.

Benzene is mainly released from vehicle exhausts due to fuel combustion (EC, 2015c). Similarly, 1,3-butadiene is typically a product of incomplete combustion, released into the atmosphere from transportation vehicle exhausts or fuel/biomass combustion in non-transportation sources (EC, 2015d). 1,3-butadiene may also be released from industrial facilities. The presence of both benzene and 1,3-butadiene in the atmosphere have known health effects and environmental effects.

From the monitoring data assessed, no exceedances of the 24-hour AAQC for benzene were recorded; however, the annual benzene concentration was exceeded every year, where the average annual benzene concentration was 120% of the AAQC. It should be noted, however, that annual monitored benzene concentrations exceed the AAQC across the GTA at all monitoring stations for which data is available.

The monitoring data for 1,3-butadiene indicates that there were no exceedances for the 24-hour or annual AAQC for 1,3-butadiene (Figure 5) and additionally that monitored values were observed to be significantly below the standards.

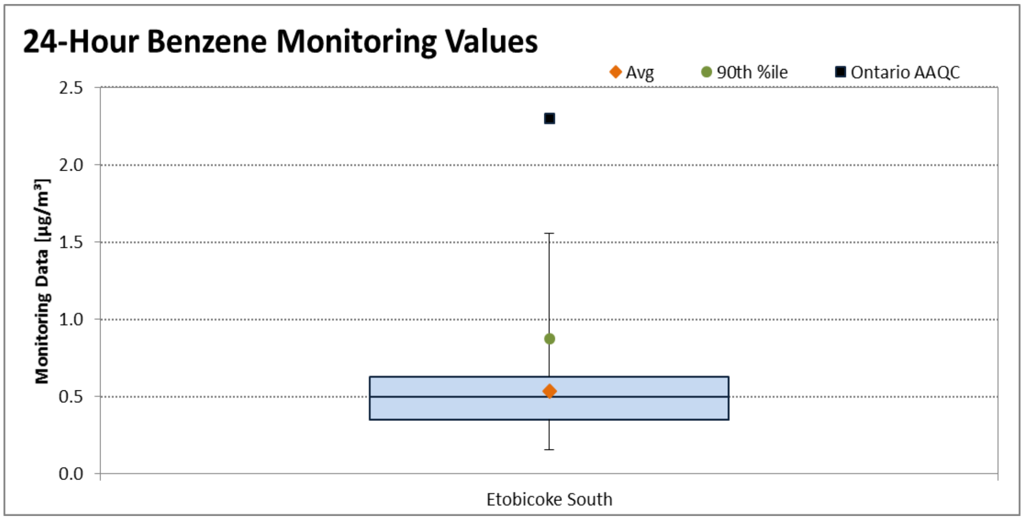

Figure 4: Monitored Benzene from Etobicoke South Station

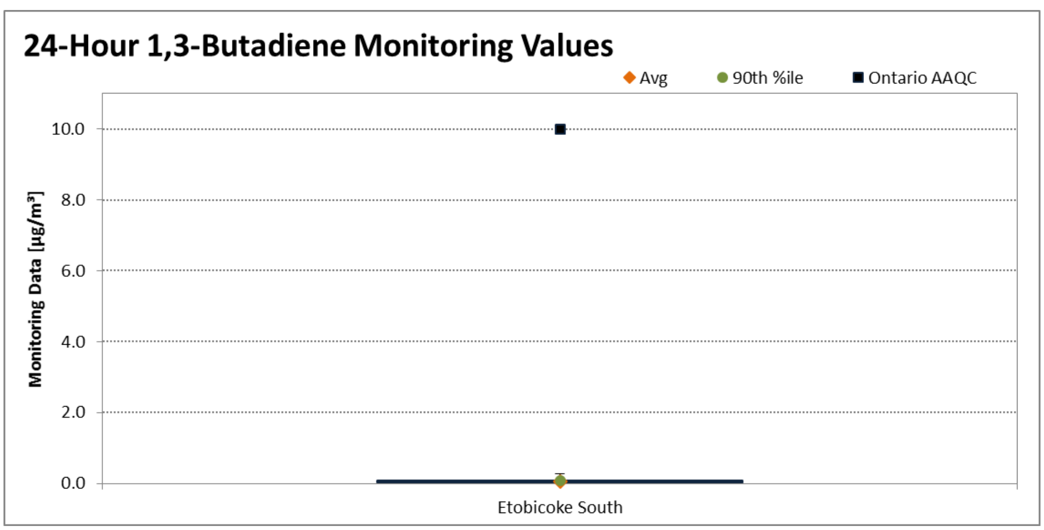

Figure 5: 24- hour Monitored Benzene from Etobicoke South Station

3.4 Industrial Emission Sources

The assessment of industrial emission sources in the Project's area was limited to a 5 kilometer radius (the Study Area) covering the City of Vaughan and the City of Toronto. There are 47 industrial Facilities from various sectors that reported to the National Pollutant Release Inventory in 2014 for the indicator compounds (Environment Canada, 2015). These emissions contribute to the local air quality and the consideration of cumulative effects. These sources are minor contributors of indicator compounds when compared to provincial totals, as summarized in Table 4.

Table 4: Emission Totals for Industry in the Study Area [Tonnes/year]

Company Name	Facility Name	NOx	CO	VOC	SPM	PM_{10}	$PM_{2.5}$
Strada Aggregates	Strada Aggregates 044	27.6	—	—	—	2.7	2.2
Coveris Flexibles (Concord) Canada Ltd.	300 Spinnaker Way	—	—	161.4	—	—	—
Magna Exteriors And Interiors Corp.	Co-Ex-Tec Industries (North Plant)	—	—	30.1	—	—	—
Magna Exteriors And Interiors Corp.	Co-Ex-Tec Industries (South Plant)	—	—	42.2	—	—	—
Magna International Inc.	P&F Tool And Die - Citation	—	—	—	—	0.5	0.5
Magna Exteriors And Interiors Corp.	Tycos Tool & Die	—	—	—	—	—	0.4
Transcontinental Printing	Transcontinental Concord	—	—	12.4	—	—	—
Wikoff Color Corp. Canada	Wikoff Color Corporation - Canada Inc.	—	—	18.8	—	—	—
Southwest United Canada Inc.	Advanced Processing Inc.	—	—	16.2	—	—	—
PPG Architectural Coatings Canada Inc.	Vaughan Plant	—	—	—	—	0.5	0.3
Arla Foods Inc.	Country Office	—	—	—	—	—	0.1
Canada Bread Co. Ltd.	Wholesome Harvest Bakery	—	—	68.2	—	—	—
K-G Spray-Pak Inc.	K-G Division	—	—	504.8	—	—	—
Sbs W Subco Inc./Zrj W Subco Inc.	Bowes Manufacturing	—	—	12.2	—	—	—
Mr. Marble	Mr. Marble	—	—	12.4	—	—	—
Décor-Rest Furniture Ltd.	Decor-Rest Furniture Ltd - Woodbridge	—	—	13.2	—	—	—

Company Name	Facility Name	NOx	CO	VOC	SPM	PM_{10}	$PM_{2.5}$
Packaging Technologies (1991)	Packaging Technologies (1991) Inc.	—	—	0.3	—	—	—
CIF Lab Solutions LP	CIF Lab Solutions	—	—	71.4	—	—	—
Royal Group Inc.	Axiall Compound Concord	—	—	—	—	1.1	0.5
St. Joseph Printing	St. Joseph Printing - Building B	—	—	15.5	—	—	—
St. Joseph Printing	St. Joseph Printing - Building A	—	—	12.6	—	—	—
Lt Custom Furnishings Inc.	Lt Custom Furnishings Inc.	—	—	46.3	—	—	—
Weston Bakeries Ltd.	Weston Bakeries Concord	—	—	24.7	—	—	—
Sanofi Pasteur Ltd.	Connaught Campus	57.7	23.0	—	—	1.5	0.5
Magna Exteriors And Interiors Corp.	Rollstamp - 90 Snidercroft Rd.	—	—	283.5	—	—	—
Valley Metal Finishing (1983) Ltd.	Valley Metal Finishing (1983) Ltd.	—	—	82.1	—	—	—
Teknion Form - A Division Of Teknion Limited	Teknion Form	—	—	—	—	2.4	2.4
Allwood Products Ltd.	Allwood Products Ltd.	—	—	20.9	—	1.2	—
Talmolder Inc.	Talmolder Inc.	—	—	31.7	—	—	—
Tekwood -A Division Of Teknion Canada Limited	Tekwood- A Division Of Teknion Canada	—	—	—	—	3.7	3.7
Apollo Health And Beauty Care	Apollo Health & Beauty Care	—	—	130.3	—	—	—
City Of Toronto	Finch Yard	—	—	—	0.0	0.0	0.0
Suncor Energy Products Partnership	Metro Depot	—	—	25.6	—	—	—
Imperial Oil	Finch Distribution Terminal	—	—	61.8	—	—	—
Shell Canada Products	Keele Street Terminal	—	—	27.7	—	—	—
City of Toronto	Dufferin Organics Processing Facility	1.0	0.3	0.0	0.5	0.5	0.5
City of Toronto	Dufferin Transfer Station	—	—	—	3.8	0.7	0.2

Company Name	Facility Name	NOx	CO	VOC	SPM	PM_{10}	$PM_{2.5}$
York University	York University - Keele Campus	62.0	—	—	—	0.9	0.9
Crown Metal Packaging Canada LP	Crown Metal Packaging Canada LP - Plt. 245	—	—	157.5	—	—	—
The Toronto Star	The Toronto Star Press Centre	—	—	15.6	—	—	—
Martinrea International Inc. (Alfield Industries Ltd.)	Alfield Industries Ltd	—	—	—	—	2.2	2.2
Magna Exteriors And Interiors Corp.	MYTOX	—	—	—	—	0.8	0.8
Woodbridge Foam Corp.	Kipling Plant	—	—	136.9	—	—	—
Spectra Anodizing Ltd.	Spectra Anodizing - Woodbridge	1.2	—	—	—	—	—
Egan Visual Inc.	Egan Visual Inc	—	—	8.8	—	—	—
Apotex Inc.	Apotex Inc. 150 Signet Drive	—	—	44.1	—	—	—
Multy Home LP	Fenmar Plant	—	—	—	—	0.6	0.1
Total Emissions		149.5	23.3	2204.6	4.3	21.6	17.3
Ontario Total Emissions		63,642	67,879	41,794	33,922	18,772	9,727
% of Study Area Emissions to Ontario Total		<1%	<1%	5.3%	<1%	<1%	<1%

Note: "—" indicates the substance was not reported for the facility

3.5 Local Road Emissions

The proposed Project is located close to several major arteries serving both the City of Toronto and the City of Vaughan. These include Highway 400, Highway 407, Highway 7, Weston Road and Jane Street. Each of these roads has a high traffic flow and emissions from vehicles travelling along them contribute to the local air quality and the consideration of cumulative effects.

Highway 400, in particular, lies within 300m of the proposed Project and is the largest single source of road emissions in the immediate surrounding area, with average daily traffic of approximately 100,000 vehicles per day. The U.S. EPA Motor Vehicle Emissions Simulator (MOVES) model was used to estimate annual emissions from a 5 km stretch of Highway 400, running perpendicular to Portage Parkway.

MOVES is the U.S. EPA's new official model to calculate air pollutants from vehicles. MOVES replaces the MOBILE emission factor model for on-road vehicle emissions, and represents a significant expansion of capabilities compared to MOBILE. MOVES covers multiple geographic scales (from county to national level) and can generate emissions for different time periods (hour, day, month, and year).

MOVES was used to estimate emission rates for a 5 km stretch of Highway 400 using the average daily traffic data and default highway vehicle types and speeds. Annual emissions in kg/year are provided in table 5, below.

Table 5: Estimated Annual Emissions from a 5 km stretch of Highway 400 [kg/year]

Contaminant	Emissions [kg/year]
NOx	79,820
NO	68,223
NO_2	8,651
CO	170,556
SPM	2,807
PM_{10}	2,807
$PM_{2.5}$	2,537
Benzene	351
1,3- Butadiene	49
Formaldehyde	490
Acetaldehyde	265
Acrolein	36
Total VOC	18,261

4.0 PROJECT EMISSIONS

The proposed Project includes the widening of Portage Parkway from Applewood Crescent to Jane Street and the construction of an extension of Portage Parkway from Jane Street to Creditstone Road. For the purposes of this assessment, emissions from vehicular traffic were the only emission sources considered. The existing stretch of road is approximately 1 km in length with the proposed extension to add approximately 500 m. Annual average daily traffic (AADT) data was provided by CIMA for both current conditions (existing) and proposed future conditions. A summary of the data provided is included in Table 6, below.

AADT based on peak PM traffic data was selected for use in this assessment as it results in a greater traffic volume for each scenario (compared to the AADT for peak AM traffic), and a greater increase in projected traffic.

Table 6: Portage Parkway Current and Future Traffic Data

Start Point	End Point	Approximate Length [m]	Existing AADT	Future AADT
Applewood Crescent	Edgeley Boulevard	305	2,234	6,298
Edgeley Boulevard	Buttermill Avenue	225	1,414	4,067
Buttermill Avenue	Millway Avenue	195	1,214	3,468
Millway Avenue	Jane Street	190	1,015	3,805
Jane Street	Creditstone Road	550	0	7,850

The above traffic data was used to run the MOVES model and estimate annual emissions from each scenario. Annual emission rates are summarized in Table 7, below.

Table 7: Project Emission Rates for Current and Future Scenarios [kg/year]

Contaminant	Current Emissions [kg/year]	Future Emissions [kg/year]	Percentage Increase
NOx	72.937	316.026	333%
NO	62.342	270.088	333%
NO_2	10.012	43.411	334%
CO	184.617	793.328	330%
SPM	3.159	13.688	333%
PM_{10}	3.159	13.688	333%
$PM_{2.5}$	2.891	12.529	333%
Benzene	0.154	0.643	318%
1,3- Butadiene	0.02	0.085	325%
Formaldehyde	0.356	1.51	324%
Acetaldehyde	0.165	0.696	322%
Acrolein	0.024	0.104	333%
Total VOC	7.48	31.716	324%

As evident from Table 7, the proposed Project results in an increase in annual emissions from Portage Parkway. However, the road expansion is necessary to alleviate projected traffic growth in the area. The widening and extension of Portage Parkway will provide an alternative route for vehicles and will act to minimize the air quality impact of increased traffic through improved traffic flows and reduced queuing times at intersections within the local vicinity of the Project.

Studies by the US EPA have found that roadways generally influence air quality within a few hundred metres downwind from a heavily travelled road. The actual distance varies by location, time of day, year and prevailing meteorology, topography and traffic patterns (US EPA, 2014). Concentrations will dissipate rapidly from the road source, therefore it is expected that this Project will have a negligible impact on regional air quality. This is further evident when the emissions from Portage parkway are compared to emissions from major highways in the area. Table 8, below compares emissions from the future conditions (proposed road expansion) to emissions from a 5 km stretch of Highway 400 and neighbouring industrial sources within a 5 km radius of the Project. Emissions from the Project contribute less than 1% to total road and industrial emissions in a 5 km radius of the Project for all contaminants assessed.

Table 8: Comparison of Project Emissions to Background Emissions

Contaminant	Industrial NPRI Emissions (within 5 km radius)	Highway 400 Emissions[1] [kg/year]	Future Project Emissions [kg/year]	Portage Parkway Emissions as a Percentage of Total Background Emissions within 5 km radius
NOx	149,517	79,820	316	0.14%
CO	23,292	170,556	793	0.41%
SPM[2]	21,559	2,807	13	0.05%
PM_{10}	21,559	2,807	13	0.05%
$PM_{2.5}$	17,254	2,537	12	0.06%
Total VOC	2,204,603	18,261	32	0.001%

Notes:
1. Emissions are based on a 5km stretch assuming uniform traffic
2. Emissions of SPM reported to NPRI were corrected to be at least as great as PM10 emissions

4.1 Sensitive Receptors

As outlined in the MTO guidance, sensitive receptors within 500 m of the study area should be identified and assessed. The area surrounding the Project is very industrial in nature and there are very few sensitive receptors within 500 m. The only sensitive receptors identified within 500 m of the Project are as follows:

- Monte Carlo Inn – Vaughan Suites at the intersection of Portage Parkway and Applewood crescent (adjacent to the Project and within 300m of Highway 400)
- Condominium Development – at the intersection of Highway 7 and Creditstone Road (approximately 330 m from the Project, adjacent to Highway 7)

Both of the identified receptors lie in an industrial area, close to other major arterial roads, in particular Highway 400 and Highway 7. These roads are much longer in length and have a much higher traffic volume than the proposed Project. As a result, they are likely to have a greater influence on air quality at the sensitive receptors. The proposed Project will provide an alternative route for traffic which may otherwise be using these roads. As previously mentioned, the proposed Project will act to minimize the air quality impact of increased traffic through improved traffic flows and reduced queuing times at intersections within the local vicinity of the Project.

5.0 CONCLUSIONS

Based on the existing monitoring data in the Project area, the levels of particulate matter, NO_X, CO and 1,3-butadiene are shown to be below the current standards and guidelines. The annual benzene concentrations are greater than the annual AAQC and are typically associated with traffic emissions. Roadways typically only have a very localised influence on air quality and predicted concentrations decline within a very short distance from the road edge. The Project itself is therefore anticipated to be a relatively minor source when compared to other larger sources within the area, therefore the impact on overall air quality in the region is expected to be negligible.

6.0 REFERENCES

Canadian Council of Ministers of the Environment (CCME) (1999). *Canadian National Ambient Air Quality Objectives: Process and Status*. Available at ceqg-rcqe.ccme.ca/download/en/133/. Retrieved November 6, 2014.

CEPA/FPAC Working Group on Air Quality Objectives and Guidelines (1998). *National Ambient Air Quality Objectives for Particulate Matter. Part 1: Science Assessment Document*, ISBN 0-662-63486-1

Environment Canada (2015). NPRI Online Data Search. Available at http://open.canada.ca/data/en/dataset/1fb7d8d4-7713-4ec6-b957-4a882a84fed3. Retrieved April 30, 2016.

Environment Canada (2015b). *Volatile Organic Compounds in Consumer and Commercial Products*. Retrieved May 11, 2016. http://www.ec.gc.ca/cov-voc/

Environment Canada (2015c). *Benzene*. Retrieved May 11, 2016. https://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=B6BEFB22-1

Environment Canada (2015d). *1,3-Butadiene*. Retrieved May 11, 2016. https://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=2A75F329-1

Government of Canada (2013). Canada Gazette Vol 147, 21. Available at http://ec.gc.ca/lcpe-cepa/eng/orders/OrderDetail.cfm?intOrder=532. Retrieved November 6, 2014.

MOECC (2012). Ontario's Ambient Air Quality Criteria, PIBS #6570e01. Standards Development Branch, Ontario Ministry of the Environment.

MOECC (2015). *Air Quality Ontario - Report for 2014*. Available at http://www.airqualityontario.com/press/publications.php. Retrieved May 11, 2016.

MTO (2012). *Ministry of Transportation Environmental Standards and Practices: Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects.*

US EPA (2014). Near Roadway Air Pollution and Health, downloaded from (http://www.epa.gov/otaq/nearroadway.htm), accessed November 5, 2014.

Report Signature Page

GOLDER ASSOCIATES LTD.

Kate Liubansky, M.Env.Sc.
Air Quality Specialist

Katherine Armstrong, M.Sc.
Air Quality Specialist

Sean Capstick, P.Eng.
Principal

KL/KSA/CST/FSC/ng

n:\active\2015\3 proj\1522372 cima_ea portageparkway_on\09 air quality\report\final\1522372 rpt july 2016 portage parkway background aq report.docx

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
210 Sheldon Drive
Cambridge, Ontario N1T 1A8
Canada
T: +1 (519) 620 1222

Golder Associates