September 2017

AIR QUALITY REPORT

Municipal Class EA for Ninth Line (Regional Road 13) Transportation Corridor Improvements from Dundas Street (Regional Road 5) To 407 ETR (Express Toll Route)

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REPORT

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by CIMA+ to conduct a semi-qualitative air quality assessment for the proposed widening of Ninth Line (Regional Road 13) in the Town of Oakville and Town of Milton (the Project). This assessment was conducted to support a 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 Ninth Line from Dundas Street (Regional Road 5) to 407 ETR from two to four lanes. 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 proposed Project; 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 road widening. 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 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 dioxides (NOx) (expressed as nitrogen dioxide [NO_2]);
- carbon monoxide (CO); and
- Volatile Organic Compounds (including acrolein, acetaldehyde, 1,3- butadiene, benzene and formaldehyde which are typically associated with road traffic).

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, 1999). The federal government has established the following levels of NAAQOs (Health Canada, 1994):

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

- the maximum acceptable level is intended to provide adequate protection against 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.

A summary of the applicable Ontario and federal standards, objectives and criteria are listed in Table 1, along with the selected project criteria, which were selected to be the most stringent.

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

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

(a) MOECC 2012.
(b) CAAQS for $PM_{2.5}$ published in the Canada Gazette Volume 147, No. 21 - May 25, 2013. The standards for $PM_{2.5}$ 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) SPM in Ontario is defined as Suspended Particulate Matter (<44 µm diameter).
(e) Geometric Mean Value.
(f) Interim Ambient Air Quality Criteria (AAQC).
(g) 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 (NAPS) Network. 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 2010 to 2014 was used, which is a recent five year period for which all data is Quality Assured by Environment Canada.

The two stations identified as being most relevant to the proposed Project are located at 8th Line and Glenashton Drive (the Halton Reserve Station) and the station located at 3359 Mississauga Road North (the Mississauga Station). However, the Mississauga Station does not have data for the contaminants of interest within the 2010 to 2014 time period, therefore this station has been excluded from the assessment. The Halton Reserve Station is located approximately 3 km from the Project and is near Highway 403. 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 Halton Road Station does not monitor VOCs or CO. Only a select number of air monitoring stations in the Greater Toronto Area (GTA) provide VOC or CO monitoring data. The most representative station for which CO monitoring data is available is located at Elgin and Kelly in downtown Hamilton (the Beasley Park Station). This station is not as close to the Project however it is predicted to have similar influences as those at the Project such as nearby highways and roadways. The most representative station for which VOC monitoring data is available is located at 461 Kipling in Etobicoke South (the Etobicoke South Station). Again, this station has surrounding land uses that are similar to the Project and therefore is predicted to best represent the Project. Details of these stations are provided in Table 2.

Table 2: Ambient Air Quality Monitoring Parameters

Station Name	NAPS Station ID	Data Available				Distance from Project
		$PM_{2.5}$	NO_2	CO	VOCs	
Halton Reserve	61603	Y	Y	—	—	Approximately 3 km south
Beasley Park	60512	—	—	Y	—	Approximately 31 km south-south west
Etobicoke South	60435	—	—	—	Y	Approximately 18 km north east

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

For analyzing 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 Halton Reserve, Beasley Park, and Etobicoke South Stations

Indicator Compound	Averaging Period	Background Concentration [µg/m³]	Regulatory Criteria [µg/m³]	% of AAQC
SPM	24-Hour	53.00	120	44%
	Annual	27.70	60	46%
PM_{10}	24-Hour	26.5	50	53%
$PM_{2.5}$	24-Hour	19.70	27	73%
	Annual	6.93	8.8	79%
NO_X (expressed as NO_2)	1-Hour	37.62	400	9%
	24-Hour	31.36	200	16%
	Annual	17.29	60	29%
CO	1-Hour	458.10	36,200	1%
	8-Hour	615.57	15,700	4%
Benzene	24-Hour	1.3	2.3	56%
	Annual	0.5	0.45	120%
1,3,-Butadiene	24-Hour	0.2	10	2%

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 98th 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 $PM_{2.5}$, the 98th percentile meets 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.

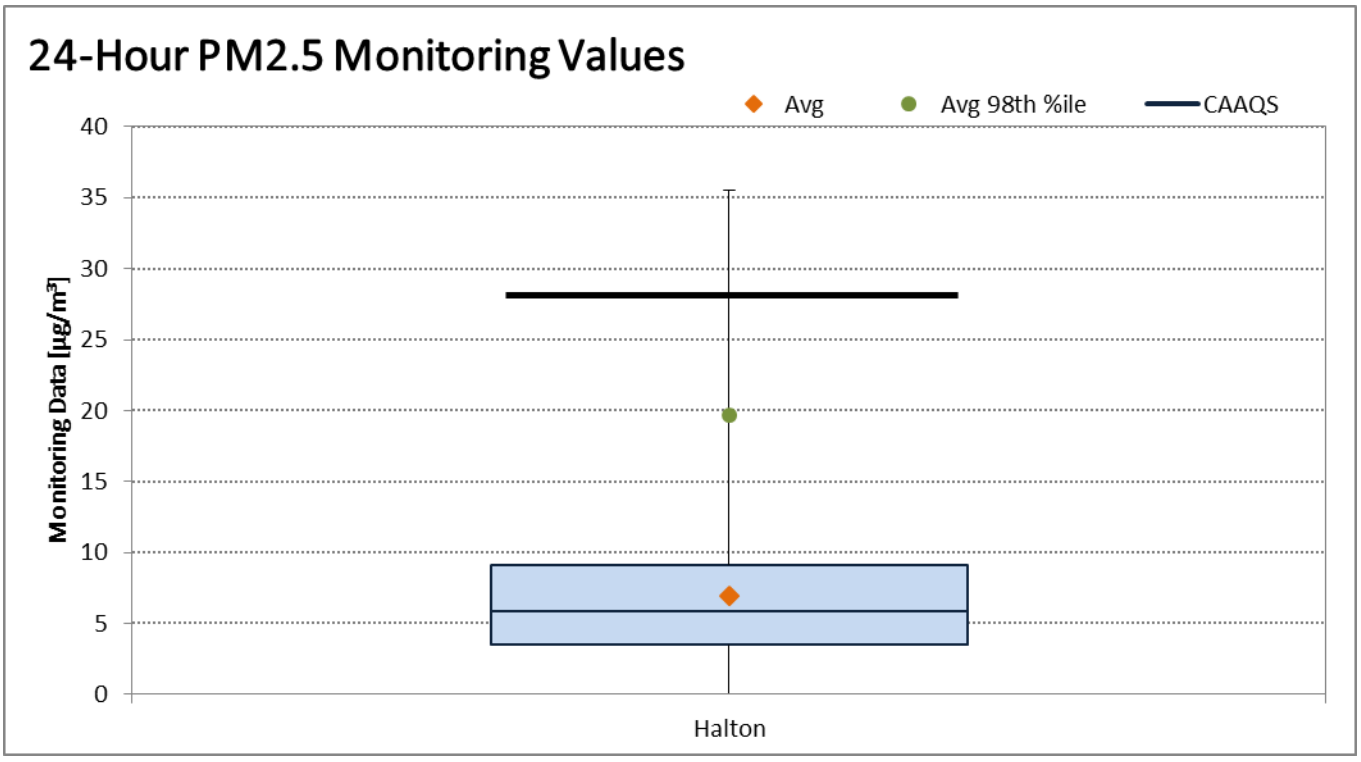


Figure 1: Monitored Fine Particulate Matter ($PM_{2.5}$) from the Halton Road Station

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).

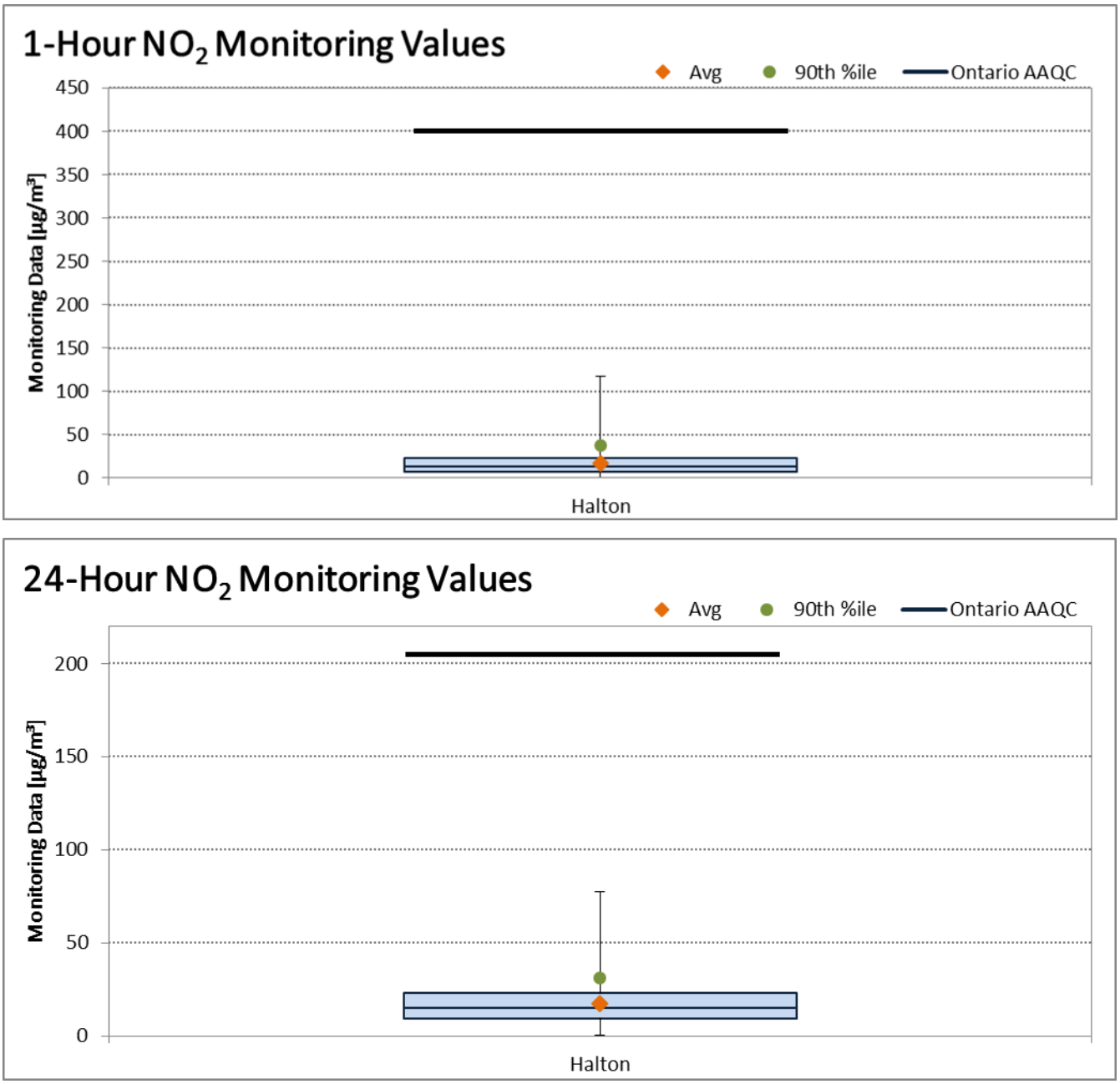
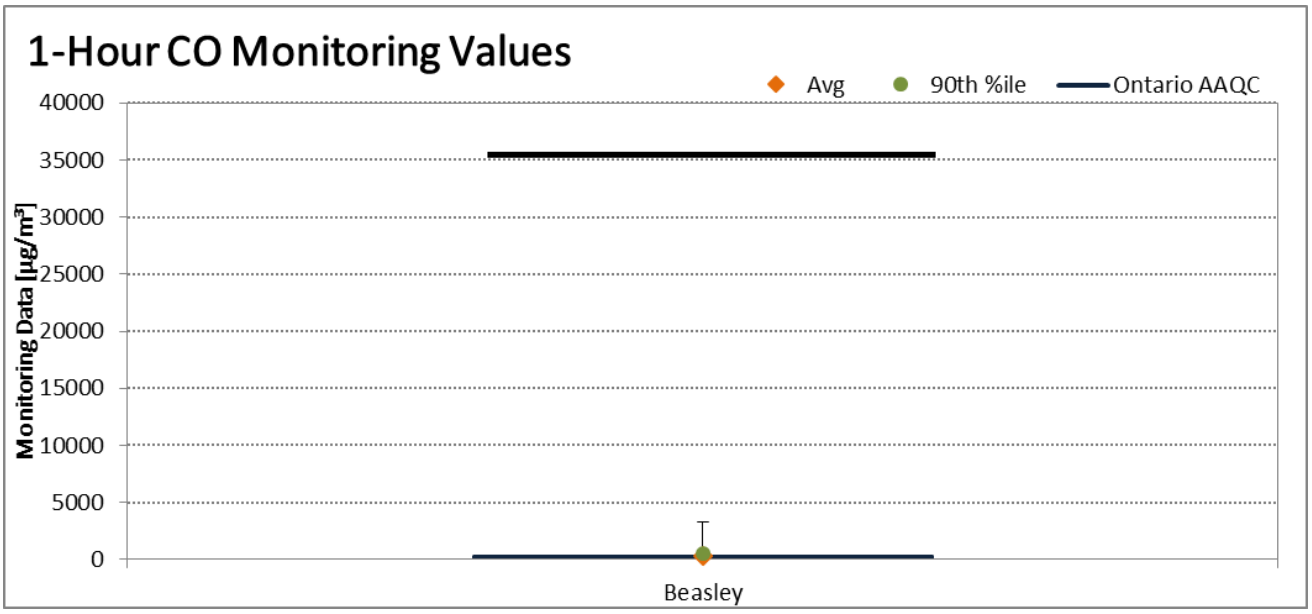


Figure 2: Monitored Nitrogen Dioxide (NO_2) from the Halton Road Station

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).



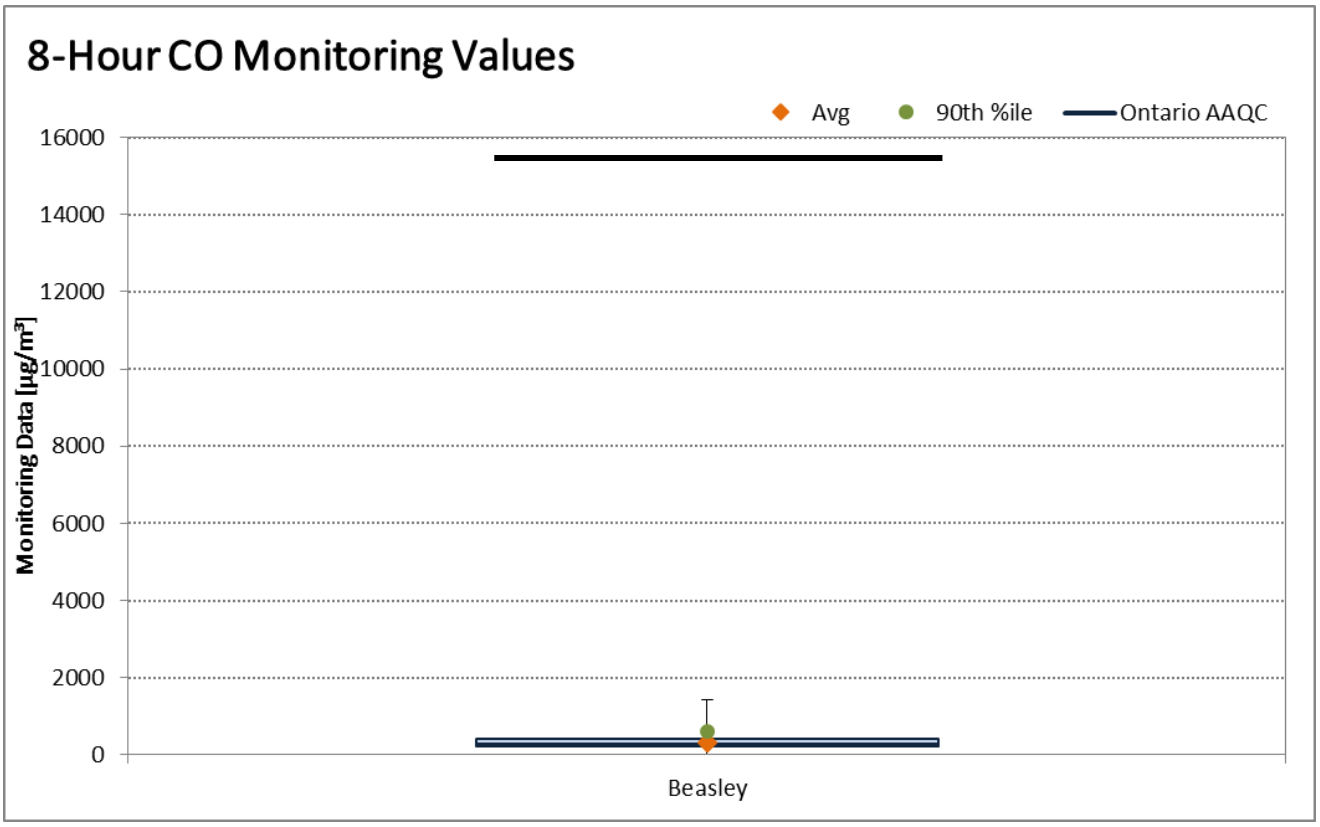


Figure 3: Monitored Carbon Monoxide (CO) from the Beasley Park Station

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, 2015a). 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, 2015b). 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, 2015c). 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.

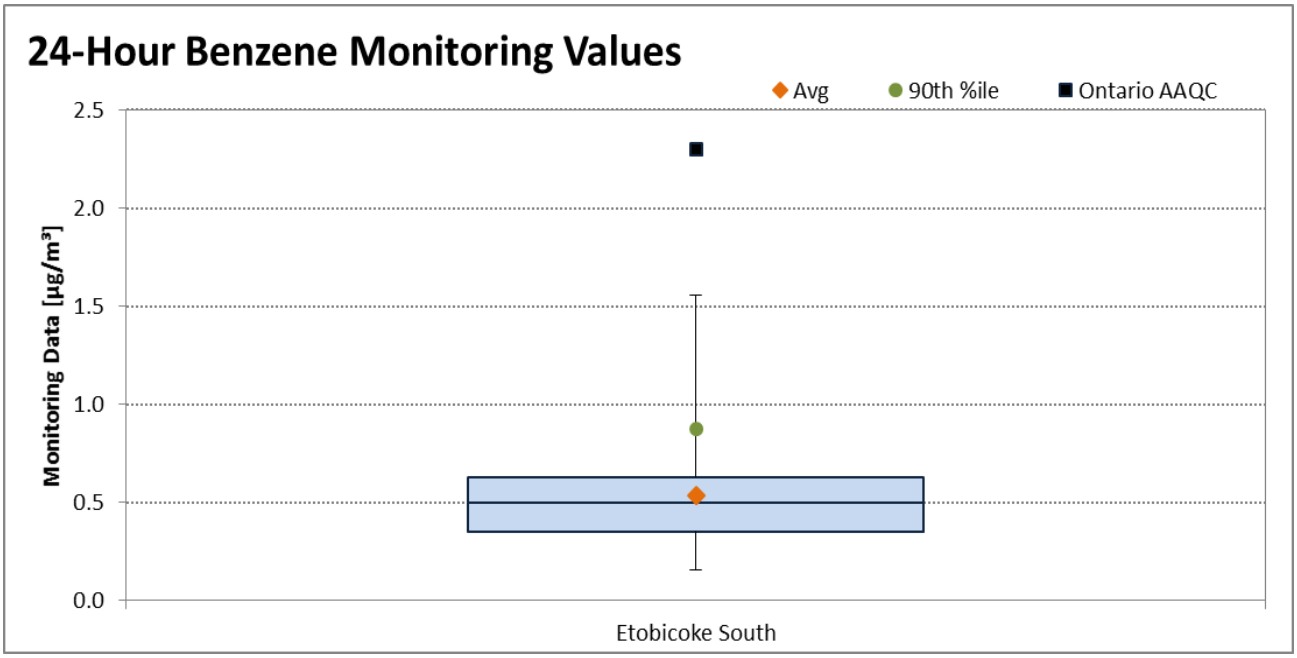


Figure 4: Monitored Benzene from Etobicoke South Station

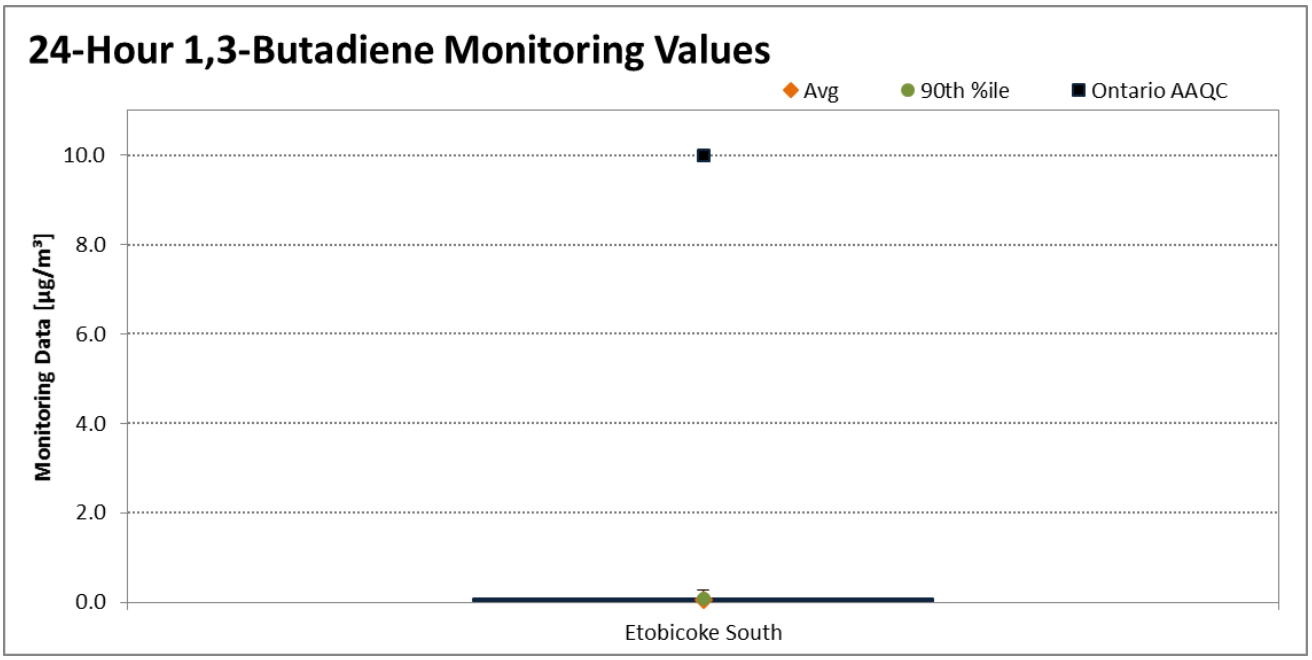


Figure 5: 24- hour Monitored Benzene from Etobicoke South Station

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 portions of the Town of Oakville, City of Mississauga and Town of Milton. There are 8 industrial Facilities from various sectors that reported to the National Pollutant Release Inventory in 2015 for the indicator compounds (Environment Canada, 2016). 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. None of the 8 facilities reported speciated concentrations of acetaldehyde, acrolein, 1,3- butadiene, benzene or formaldehyde therefore only total VOC releases are presented below.

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

Company Name	Facility Name	NOx	CO	VOC	SPM	PM_{10}	$PM_{2.5}$
Royal Ready Mix Inc.	Royal Windsor Drive	0.940	0.208	0.022	0.800	0.448	0.189
Nestle Purina Petcare	Mississauga Plant	—	—	—	—	3.981	3.981
Nexco Solutions Canada Corporation	Mississauga Distribution	—	—	0.624	—	—	—
ISC Universal Drum Reconditioning Ltd. Partnership	Universal Drum (Missisauga) – 2460 Royal Windsor Drive	—	—	102.804	0.943	—	0.334
Stackpole Powertrain International ULC	Stackpole PMDM	—	—	—	—	1.2	0.3

Company Name	Facility Name	NOx	CO	VOC	SPM	PM_{10}	$PM_{2.5}$
Region of Peel North	Sheridan Landfill Site (Closed)	—	—	—	—	—	0.4
Genpak	Division of Great Pacific Enterprises LP, Genpak Mississauga	—	—	120	—	—	—
Trillium Health Partners	Credit Valley Hospital	—	—	—	—	0.6	0.6
Total Emissions		0.9	0.2	223.4	1.7	6.2	5.8
Ontario Total Emissions		67,304	69,665	43,404	35,054	18,983	9,689
% of Study Area Emissions to Ontario Total		<1%	<1%	<1%	<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 Town of Oakville and the City of Mississauga. These include 407 ETR, Highway 403, and Dundas Street E. 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.

407 ETR and Highway 403, in particular, lie within 1 km of the proposed Project (at some points less than 100 m), and are the largest sources of road emissions in the immediate surrounding area, with average daily traffic of approximately 97,500 vehicles per day. Golder used the Canadian version of the US EPA MOBILE 6.2 on-road emissions model to calculate emission factors in grams per vehicle kilometer for a 5 km stretch of Highway 403, running perpendicular to Ninth Line 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 Highways 403 [kg/year]

Contaminant	Emissions – Hwy 403 [kg/year]
NOx	264.64
CO	4013.55
SPM	2.69
PM_{10}	2.69
$PM_{2.5}$	2.69
Benzene	5.603
1,3 Butadiene	0.567
Formaldehyde	1.777
Acetaldehyde	0.901
Acrolein	0.077

4.0 PROJECT EMISSIONS

The proposed Project involves widening Ninth Line (Regional Road 13) from Dundas Street (Regional Road 5) to 407 ETR from two to four lanes with a proposed right of way of 35 metres, in the Town of Oakville and Town of Milton. For the purposes of this assessment, emissions from vehicular traffic were the only emission sources considered. The length of road that is being widened is approximately 3.8 km. 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: Ninth Line Current and Future Traffic Data

Start Point	End Point	Approximate Length [km]	Existing AADT	Future AADT
407 ETR	Burnhamthorpe Road East	1.6	16,580	17,410
Burnhamthorpe Road East	Dundas Street East	2.2	15,040	22,295

The above traffic data was used to run the MOBILE6.2C 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	19.31	25.70	33%
CO	331.08	440.55	33%
SPM	0.50	0.67	33%
PM_{10}	0.50	0.67	33%
$PM_{2.5}$	0.50	0.67	33%
Benzene	0.570	0.759	33%
1,3 Butadiene	0.058	0.077	33%
Formaldehyde	0.190	0.252	33%
Acetaldehyde	0.095	0.126	33%
Acrolein	0.008	0.011	33%
Total VOC	15.84	21.07	33%

As evident from Table 7, the proposed Project results in a 33% increase in annual emissions from Ninth Line. However, the road expansion is necessary to alleviate projected traffic growth in the area. The widening of Ninth Line 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 Ninth Line are compared to emissions from major highways in the area. Table 8, below compares emissions from the future conditions (proposed road widening) to emissions from a 5 km stretch of Highway 403 and neighbouring industrial sources within a 5 km radius of the Project. Emissions from the Project contribute less than 10% to total road and industrial emissions in a 5 km radius of the Project for all contaminants assessed and less than 1% for particulate matter and VOC emissions.

Table 8: Comparison of Project Emissions to Background Emissions

Contaminant	Industrial NPRI Emissions (within 5 km radius)	Highway 403 Emissions[1] [kg/year]	Future Project Emissions [kg/year]	Ninth Line Emissions as a Percentage of Total Background Emissions within 5 km radius
NOx	900	264.64	25.70	2%
CO	200	4013.55	440.55	9%
SPM[2]	6200	2.69	0.67	<1%
PM_{10}	6200	2.69	0.67	<1%
$PM_{2.5}$	5800	2.69	0.67	<1%
Total VOC	223,400	150.79	21.07	<1%

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 contains various land use types, including industrial, commercial and natural, however various sensitive receptors have also been identified within 500 m of the Project and are as follows:

- Residences:
  - A residential area is located east of Ninth Line at the northern end of the Project (with the closest houses approximately 500m from 9th Line but within 250 m from 407 ETR).
  - A residential area is located south-west of Ninth Line at the southern end of the Project (with the closest houses approximately 350 m from 9th Line and directly adjacent to Dundas Street).
  - It is estimated that there are less than 10 individual residences located along 9th Line, all of which are less than 500 m from Highway 403.
- Place of Worship: The Kingdom Hall of Jehovah's Witnesses is located along Ninth Line within the Project limits (approximately 300 m north of Burnhamthorpe Road East).

- Schools:
  - Fern Hill School is located along Ninth Line Road within the project limits (approximately 900 m south of Burnhamthorpe Road East).
  - Loyola Catholic Secondary School is approximately 150 m east of Ninth line within the Project limits. The school is located directly east of Highway 403 near Burnhamthorpe Road East.
- Recreational areas:
  - A recreational facility (including tennis courts, volleyball and baseball) is located along Ninth Line and within 300m of Highway 403.

All of the above identified receptors are located close to other major arterial and highways roads, in particular Highway 403 and 407 ETR. These roads have a much higher traffic volume than the proposed Project and in many cases are located closer than the Project. As a result, they are likely to have a greater influence on air quality at the sensitive receptors. As previously mentioned, the proposed Project increases emissions from Ninth line by 33%, however, it 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, however, the Project contributes less than 1% of total VOC emissions within a 5 Km radius. Overall, the Project results in a 33% change in emissions from Ninth Line, however contributions to air quality from the Project are small compared to emissions from other large roadways that are located close to the Project. 407 ETR and Highway 403, in particular, lie within 1 km of the proposed Project (at some points less than 100 m), and are the largest sources of road emissions in the immediate surrounding area, each with average daily traffic approximately 5 times greater than the Project. 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 March 29, 2017.

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

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

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

Environment Canada (2016). NPRI Online Data Search. Available at http://open.canada.ca/data/en/dataset/1fb7d8d4-7713-4ec6-b957-4a882a84fed3. Retrieved March 8, 2016.

Government of Canada (2013). Canada Gazette Vol 147, 21. Available at http://ec.gc.ca/lcpe-cepa/eng/orders/OrderDetail.cfm?intOrder=532. Retrieved March 29, 2017.

Health Canada. 1994. Canadian National Ambient Air Quality Objectives: Process and Status

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

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.

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