C3. Air Quality Report

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Dixie Road Widening (Queen Street to 2 KM North of Mayfield Road) – Region of Peel

Brampton, Ontario

Final Report

Air Quality Assessment

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EXECUTIVE SUMMARY

The **Region of Peel (the Region)** is undertaking the planning and preliminary design for the widening of Dixie Road from the Queen Street to 2 km north of Mayfield Road in the Region of Peel,

RWDI AIR Inc. (RWDI) was retained by AECOM to conduct an air quality assessment of the proposed improvements. The objective of the assessment was to quantify air contaminant emissions from vehicular traffic along, entering, exiting, and crossing Dixie Road and to determine how these emissions will affect air quality in the vicinity of the proposed upgrades. The detailed scope of this study is listed below:

- Identify the contaminants of interest;
- Use representative historical monitoring data to establish background concentrations for each contaminant, i.e., concentrations that are due to other emission sources in the area besides those associated with the project;
- Use vehicle emissions modelling techniques to predict tailpipe and road dust emissions associated with the project-related traffic, for the future build scenario (2031).
- Use a computer simulation of atmospheric dispersion to predict maximum contaminant concentrations at representative sensitive receptors due to emissions from project-related traffic, for the future build scenario.
- Combine the maximum predicted incremental concentrations attributable to the roadway with reasonable maximum background concentrations and assess the results relative to applicable ambient air quality guidelines.

As a screening-level approach, the study examined four main contaminants of concern for motor vehicles, specifically: carbon monoxide (CO), oxides of nitrogen (NO_X) including nitrogen dioxide (NO_2), inhalable (coarse) particulate matter (PM_{10}), and respirable (fine) particulate matter ($PM_{2.5}$).

The air quality assessment used maximum emission rates (winter condition), worst-case meteorological conditions based on a 1-hour simulation period, and reasonable worst-case background concentrations (90th percentile). The conclusions of the assessment can be summarized as follows:

- Incremental pollutant concentrations attributable to the roadway are much lower than background pollutant concentrations, and, when combined with representative high background concentrations (90^{th} percentile level), are below the applicable thresholds.
- PM_{10} was the contaminant with the highest percentage of its respective standard.
- The collective results indicate that overall, air quality is acceptable and the potential for unacceptable health impacts due to the project is low.

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1. INTRODUCTION

The Region of Peel (the Region) is undertaking the planning and preliminary design for the widening of Dixie Road from the Queen Street to 2 km north of Mayfield Road in the Region of Peel,

RWDI AIR Inc. (RWDI) was retained by AECOM to conduct an air quality assessment of the proposed improvements. The objective of the assessment was to quantify air contaminant emissions from vehicular traffic along, entering, exiting, and crossing Dixie Road and to determine how these emissions will affect air quality in the vicinity of the proposed upgrades. The detailed scope of this study is listed below:

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2. STUDY AREA

This study area consists of a mixture of residential and commercial areas at the south end of the study area, primarily residential areas through the centre of the study area, and a mixture of residential and open land at the north end of the study area. As can be seen from Figures 1 to 3, the residential areas are found on both the east and west sides of Dixie Road. Air quality impacts were assessed at 26 sensitive locations (known as sensitive receptors). These receptors were selected to represent worst-case impacts at sensitive locations surrounding the project area. A sensitive receptor was defined as a residence, church, school, hospital, daycare, or senior housing facility. The receptor locations are labelled R1 through R26 on Figures 1 to 3.

3. PROJECT DESCRIPTION

The purpose of the project is to address existing operational concerns and future transportation needs by considering a widening of existing Dixie Road beginning from the intersection of Queen Street to 2 km north of Mayfield Road in the City of Brampton. Detailed design changes and proposed improvements include:

1. Widening of the existing Dixie Road (3 lanes) beginning at the intersection of the Queen Street to the intersection of Country Side Drive
2. Widening of the existing Dixie Road (2 lanes) beginning at the intersection of the Country Side Drive to 2 km north of Mayfield Road
3. New exiting and entering turning lanes for many of the side roads which intersect Dixie Road.

Table 3.1 shows the traffic volumes, percentage of Heavy Duty Vehicles (HDV) and posted speeds at different intersections of the proposed study area. The posted speed limit along the Dixie Road varies from 60 km/h to 80 km/hr/. The new widening will bring the road closer to the main residential developments, as they exist on both sides of the road.

Table 3.1: Traffic Volumes and Posted Speeds for the Proposed Study Area for the Year 2031

Name	Northbound Traffic		Southbound Traffic		Posted Speed (km/hr)
	Volumes (AADT)	% HDV	Volumes (AADT)	% HDV	
Dixie Road South of Queen Street	28540	8%	17660	1%	60
Dixie Road South of Hillside Drive	26200	7%	12780	1%	60
Dixie Road South of Hazelwood Drive	25550	3%	12470	1%	60
Dixie Road South of Howden Blvd	25340	3%	12410	2%	60
Dixie Road South of Lascelles Blvd	23520	3%	11280	2%	60
Dixie Road South of Williams Pkwy	22230	4%	11240	1%	60
Dixie Road South of Northampton Street	21630	2%	10250	1%	60
Dixie Road South of North Park Drive	19610	1%	10130	1%	60
Dixie Road South of Northcliff Street-Moregate	18260	3%	10440	1%	60
Dixie Road South of Bovaird Drive	17670	2%	9870	3%	60
Dixie Road South of Peter Robertson Blvd	24430	5%	10330	1%	60
Dixie Road South of Springtown Trail	21700	4%	8100	2%	60
Dixie Road South of Sandalwood Pkwy	20760	3%	8420	3%	60
Dixie Road South of Octillo Blvd	16990	3%	10530	6%	60
Dixie Road South of Father Tobin Rd	16230	12%	9500	2%	60
Dixie Road South of Countryside Drive	17050	3%	8540	3%	60
Dixie Road South of Mayfield Road	17020	7%	11350	2%	**80**
Dixie Road North of Mayfield Road	15180	2%	14740	2%	**80**

Notes:
% HDV – The percentage of Heavy Duty Vehicles (based on actual count data)
Traffic volumes shown are for major roads and highways only
Please see Figures 1 to 3 for Traffic details

4. CONTAMINANTS OF INTEREST

Vehicular traffic produces a variety of air contaminants as a result of combustion of fuel inside the engine, evaporation of fuel from the tank, brake and tire wear, and re-suspension (also known as re-entrainment) of material on the road surface (silt) as the vehicle travels over the road surface. The selected contaminants represent those that are typically of the greatest concern to Provincial and Federal regulatory authorities and are those typically associated with local human health or regional smog. Table 4.1 outlines the Chemical Compounds of Concern (CoCs).

Table 4.1: Chemical Compounds of Concern

Contaminant	Symbol or Chemical Formula
Carbon Monoxide	CO
Nitrogen Dioxide	NO_2
Respirable Particulate Matter	$PM_{2.5}$
Inhalable Particulate Matter	PM_{10}
Benzene	C_6H_6
1-3 Butadiene	C_4H_6
Formaldehyde	CH_2O
Acetaldehyde	CH_3CHO
Acrolein	C_3H_4O

5. RELEVANT GUIDELINES

The Ontario Ministry of the Environment (MOE) has developed Ambient Air Quality Criteria (AAQCs) for numerous pollutants, including those that are typically emitted from vehicular traffic and are known to have the potential to cause human health or environmental impacts [1]. Environment Canada (EC) has established National Ambient Air Quality Objectives (NAAQOs) for some of the same pollutants [2]. In general, these objectives represent desirable or acceptable ambient pollutant levels. Finally, the Canadian Council of Ministers of the Environment (CCME) developed a Canada Wide Standard (CWS) for $PM_{2.5}$ [3]. The CWS for $PM_{2.5}$ was established for the year 2010 and is based on the 98th percentile ambient measurement (24-hour) annually averaged over three consecutive years.

These aforementioned air quality criteria, objectives and standards are collectively referred to as air quality thresholds in this report. The thresholds used to assess potential impacts from transportation projects are summarized in Table 5.1. It should be noted that these values represent the concentrations in ambient air that are considered acceptable and protective of human health. They are not specifically enforceable for motor vehicle emissions within any of the jurisdictions.

Table 5.1: Summary of Relevant Air Quality Thresholds (μg/m3)

Pollutant	Criterion (μg/m³)	Averaging Period	Source	Reference
$PM_{2.5}$	30	24-hour	CWS	[3]
	30	24-hour	AAQC	[1]
PM_{10}	50	24-hour	AAQC	[1]
CO	36,200	1-hour	AAQC	[1]
	15,700	8-hour	AAQC	[1]
NO_2	400	1-hour	AAQC	[1]
	200	24-hour	AAQC	[1]
Benzene	2.3	24-hour	AAQC (proposed)	[4]
	0.45	Annual	AAQC (proposed)	[4]
1,3-Butadiene	10	24-hour	AAQC (proposed)	[5]
	2	Annual	AAQC (proposed)	[5]
Acrolein	4.5	1-hour	AAQC	[6]
	0.4	24-hour	AAQC	[6]

Pollutant	Criterion (µg/m³)	Averaging Period	Source	Reference
Acetaldehyde	500	30-minute	AAQC	[1]
	500	24-hour	AAQC	[1]
Formaldehyde	65	24-hour	AAQC	[1]

Prior to the dispersion modelling, the CoCs shown in Table 5.1 were screened to identify a short list of CoC for further analysis. The CoCs of greatest concern are those that have a combination of relatively low health-based threshold and relatively high emission rates from motor vehicles. Table 5.2 compares typical future motor vehicle emission rates to health-based AAQCs applicable to a 24-hour averaging period. The ranking shows that those having the highest emission rates relative to the criterion are benzene, NO_X, particulate matter (PM_{10} and $PM_{2.5}$), CO and 1,3-butadiene. In the case of benzene and 1,3-butadiene, however, the AAQC is a proposed threshold that has not yet been formally adopted.

Table 5.2: Ranking of CoCs

Pollutant	Criterion (µg/m³)	Average Vehicle Emission Rate in 2021 (g/km) [1]	Rank
$PM_{2.5}$	30	0.03	4
PM_{10}	50	0.1	2
CO	15,700	3.7	6
NO_X	200	0.3	3
Benzene	2.3	0.006	1
1,3-Butadiene	10	0.0006	5
Acrolein	4.5	0.0001	7
Acetaldehyde	500	0.0007	8
Formaldehyde	65	0.002	9

Notes:
[1] Emission rates based on 60 km/h, 6% heavy duty vehicles and winter conditions.

For the detailed assessment, NO_2, particulate matter ($PM_{2.5}$ and PM_{10}) and CO were carried forward to represent all CoC's for the dispersion modelling.

6. BACKGROUND AIR QUALITY CONDITIONS

Background air pollutant levels, due to emissions from other sources besides the project-related sources in the Dixie Road study area can be generally characterized with air quality monitoring data from Ontario Ministry of Environment (MOE) [8]. There is one air quality monitoring station in proximity to the study area, located in Brampton, Ontario (MOE Station No. 46089) at 525 Main Street North/Peel Manor. This station is located in an urban setting, and is near the study area (approximately 4km from the study area), as such, the station should provide reasonably representative levels for estimating background concentrations. However, data for CO was not available for certain years from this site. In those cases, data were taken from the nearest monitoring site with data available (Toronto West – MOE Station No. 35125).

Table 6.1 provides a description of the stations used for the contaminants referenced in Section 4 and Table 6.2 provides a summary of the data. The mean values are representative of typical conditions, 90th percentile values (exceeded only 10% of the time) are representative of credible worst-case conditions, and maximum values are representative of rare peak events.

Typical measured values reported in Table 6.2 result from a combination of local, regional and transboundary sources. In the case of $PM_{2.5}$, most elevated levels are associated with regional smog events involving complex photochemical processes. According to the MOE's "Air Quality in Ontario – 2005 Report" and "Transboundary Air Quality in Ontario – 2005 Report", transboundary air pollution (mainly from the United States) is one of the largest contributors to Ontario's smog events in the summer.

Table 6.1: Ambient Station Information

Contaminant	Station ID	City	Location	Year
CO	MOE #46089	Brampton	Main Street North/Peel Manor	2003-2004
	MOE #35125	Toronto West	Resources Road	2005-2007
NO_2	MOE #46089	Brampton	Main Street North/Peel Manor	2003-2007
$PM_{2.5}$ [1]	MOE #46089	Brampton	Main Street North/Peel Manor	2003-2007
PM_{10} [2]	N/A	N/A	N/A	N/A

Table 6.2: Summary of Ambient Air Measurements (μg/m³)

Pollutant	Statistic	2003	2004	2005	2006	2007	Average
CO (μg/m³)	1-hr Max	6230	4134	3194	3591	1711	3772
	8-hr Max	2808	2567	2000	2989	1061	2285
	Annual Mean	819	615	458	422	313	525
	1hr-90th Percentile	1133	1097	759	663	530	836
	Times > 1-hr AAQC (36,200)	0	0	0	0	0	0
	Times > 8-hr AAQC (15,700)	0	0	0	0	0	0
NO_2 (μg/m³)	1-hr Max	162	172	176	148	123	156
	24-hr Max	115	105	107	83.2	75.2	97
	Annual Mean	34.8	32.1	33.5	29.9	27.5	32
	1hr-90th Percentile	73.3	67.3	71.3	65.3	59.4	67
	Times > 1-hr AAQC (200)	0	0	0	0	0	0
	Times > 24-hr AAQC (100)	0	0	0	0	0	0
$PM_{2.5}$ (μg/m³)	1-hr Max	64.0	65.0	59.0	51.0	65.0	61
	24-hr Max	42.0	39.0	48.0	33.0	39.0	40
	Annual Mean	8.2	7.7	8.8	7.2	7.4	8
	24hr-90th Percentile	18.0	18.0	22.0	16.0	17.0	18
	Times > CWS (30)	7	10	12	2	5	7

Pollutant	Statistic	2003	2004	2005	2006	2007	Average
PM_{10} (μg/m³) [1]	1-hr Max	118.5	120.4	109.3	94.4	120.4	113
	24-hr Max	77.8	72.2	88.9	61.1	72.2	74
	Annual Mean	15.2	14.3	16.3	13.3	13.7	15
	24hr-90th Percentile	33.3	33.3	40.7	29.6	31.5	34
	Times > 24-hr AAQC (50)	n/a	n/a	n/a	n/a	n/a	n/a

Notes:
[1] PM_{10} concentrations are no longer routinely monitored in Ontario. The 90th percentile for PM10 was calculated based on the 90th percentile for $PM_{2.5}$ concentration times a factor of 1.7.

Background concentrations (i.e., concentrations due to natural, nearby, and unidentified sources of all types) are an important part of the total air quality concentration. The dispersion model predicts the incremental impact of the project. Background levels (90th percentile) from this monitoring site for Year 2003 to 2007 are added to the modeled concentrations in determining the worst-case combined impact of the project and the background.

7. METHODOLOGY

The following summarizes the methodology used for the local air quality assessment. This methodology included emission estimates, dispersion modelling, and addition of background concentration. Further details of the methodology for the emission estimates and dispersion modelling are provided in Appendix A.

7.1 Emission Rate Calculations

The emissions from a motor vehicle depend on a large number of factors, including the type, age, and weight of the vehicle, the mode of operation, the weather conditions, and the maintenance condition of the vehicle and of the road. The standard approach for estimating vehicular emissions is to use computer simulation techniques that are based on extensive previous testing of a wide range of vehicles. The most widely used software for this purpose was developed by the U.S. Environmental Protection Agency, and the latest version of the software is known as MOBILE6.2. Key model inputs including climate data and vehicle classification information are provided in Appendix A and discussed in Section 8 of this report.

MOBILE6.2 provides default percentages of each vehicle type. The heavy duty gasoline vehicles (HDGV) and heavy duty diesel vehicles (HDDV) were categorized as heavy-duty vehicle (HDV) and the remaining vehicle types were categorized as light duty vehicles (LDV). AECOM provided a breakdown of LDV and HDV traffic volumes, which were used to calculate composite emission factors for each vehicle type. The resultant emission factors are presented in Appendix A.

MOBILE6.2 was applied to determine average emissions per vehicle under typical winter temperature conditions. The winter condition was chosen to represent worst-case emissions, since vehicle tend to operate less efficiently and produce higher emissions at colder temperatures. Information on how MOBILE6.2 emission factors vary by vehicle speed, temperature, and regulatory changes is given in Appendix A. For both the future build scenario, vehicles were assumed to be operating at the posted speed limits, with no change in average travel speed between scenarios.

In addition to tailpipe emissions, emissions of particulate matter also result from the re-suspension of dust as vehicles travel over a roadway surface. The road dust emissions were calculated based on the U.S. EPA's AP-42, Chapter 13.2.1 emission factors for paved roads. For particulate matter, the tailpipe emission factor is added to the road dust emission factor in order to account for both emission sources. Details of the assumptions applied in the emission estimates are provided in Appendix A.

7.2 Meteorological Data

Two meteorological datasets are needed in order to perform a dispersion modelling analysis using the CAL3QHCR model: upper air data and surface data. Upper air data were obtained from the Buffalo Airport station (i.e., the nearest upper air measurement site) for the year 2007 and surface data were obtained from Toronto Pearson International Airport for the year 2007. These meteorological datasets were processed using PCRAMMET prior to use with CAL3QHCR.

The choice of meteorological year was based on the results of a screening level analysis of three years of met data (i.e. 2003, 2005 and 2007). This screening level assessment involved running the CAL3HCQR model for a single contaminant using each of the three years of met data, and comparing the results. The analysis indicated that year-to-year variations met conditions and the associated effects on dispersion are relatively small, especially with respect to pollutant concentrations under worst-case meteorological conditions over shorter averaging times (1-hour and 24-hour).

7.3 Dispersion Modelling

Air contaminants emitted from vehicles on a roadway will drift downwind and disperse as they travel. The degree to which the contaminants disperse depends on the weather-related factors, such as wind speed and amount of turbulence. The only approach to determine potential future downwind concentrations from a proposed project is through the use of computer simulation that predicts the dispersal of air pollutants as they drift away from the roads. These simulations are referred to as dispersion models.

Dispersion modelling is a very common approach for assessing local air quality near an emission source such as vehicular traffic. The U.S. EPA developed a model known as CAL3QHCR that is intended specifically to predict air contaminant levels along segmented sections of the roadway, referred to as links. The model takes the emission data and combines it with historical hourly meteorological data, information on traffic volumes, and the configuration of the roadway. It uses this information to predict roadway contributions to air quality levels at selected locations (sensitive receptors) adjacent to the highway under a variety of weather conditions. Appendix A provides a summary of key input parameters.

The CAL3QHCR dispersion model predicts air pollutant concentrations near highways and arterial roads by allocating emissions from motor vehicles to a series of linear emission sources, known as roadway links. A new link must be defined whenever the road width, traffic volume, speed, alignment, or type of traffic movement (free flow or queue) changes. The sections of roadway that were included in the modelling are shown in Figure 1 to Figure 3.

A free flow link is defined as a straight segment of roadway having a constant width, grade height, traffic volume, travel speed, and vehicle emission factor. A queue link is defined as a straight segment of roadway with constant width and emission source strength, on which vehicle idling takes place for specified periods of time (e.g., signalized intersections). The model calculates the contribution from all of the relevant links to each individual receptor so that the cumulative impact can be determined [9,10]. Vehicles were assumed to be traveling at the posted speed limit for each of the roads in the modelled study area. The roadway segments considered in the modelling had speeds of 60 km/hr. A vehicle speed of 4 km/hr was assigned to the queue links, as this is the lowest speed that can be used to calculate tailpipe emissions from the MOBILE6.2 model.

In the context of this air quality assessment, sensitive receptors refer to resicences, churches, daycare facilities. hospitals and senior housing facilities throughout the study area. Special consideration is given to sensitive receptors because of the increased potential for adverse health effects at these locations.
A total of 26 receptors were identified within 500 m distance along and in the vicinity of the proposed study area and have been included in the model. Refer to Figures 1 to 3 for the sensitive receptor locations considered in the assessment.

7.4 Addition of Background Data

The predicted maximum concentrations resulting from the project as well as significant existing arterial roads in the local study area, as predicted by the dispersion model, were added to the 90th percentile background concentrations in order to determine the reasonable worst-case combined (cumulative) effect.

The 90th percentile is the value below which 90% of all monitored data falls. It excludes unusual events at the monitoring stations that are unrepresentative of general background air quality in the area. It is also considered to be the maximum background level that is likely to coincide with worst-case contributions from the modelled sources in the study area. In order to assess attainment, the maximum cumulative concentrations of the contaminants were compared to their applicable ambient thresholds.

7.5 Ozone Limiting Method

When oxides of nitrogen (NO_x) are emitted in diesel exhaust, their initial composition is dominated by nitric oxide (NO). Once in the outside air, some of the NO is oxidized in reactions with other pollutants (principally ground-level ozone) to produce NO_2, which is a contaminant of concern with established air quality thresholds.

For the purposes of this assessment, the Ozone Limiting Method (OLM) was used to estimate the maximum short-term NO_2 concentrations resulting from emissions of NO_x. This method assumes that the conversion of NO to NO_2 is limited only by the amount of ozone (O_3) present in the outside air. If the concentration of available O_3 (ppm) is less than that of the NO contributed by the modeled roadway emissions, then the portion of NO that is converted to NO_2 equals the available O_3. On the other hand, if the concentration of available O_3 exceeds that of the NO contributed by the modeled roadway, then all of the NO is converted to NO_2. The OLM method also assumes that approximately 10% of the emitted NO_x is already in the form of NO_2 before exiting the tailpipe. The OLM is expressed mathematically as follows:

$$\text{If } 0.9NO_x < O_3, \text{ then } NO_2 = NO_x$$
$$\text{If } 0.9NO_x > O_3, \text{ then } NO_2 = 0.1NO_x + O_3$$

For initial worst-case estimates of cumulative NO_2 concentrations, a fixed concentration of O_3 was used in this calculation. It was set equal to the 90^{th} percentile of measured values from historical monitoring data. For subsequent detailed analysis of cumulative effects, hour-by-hour O_3 data were used.

8. RESULTS

8.1 Assessment of Maximum Credible Impacts

Table 8.1 present a summary of the worst-case predicted combined concentrations (incremental plus background) at the most impacted sensitive receptors. The resultant concentrations are compared to applicable thresholds in order to assess attainment. The predicted concentrations for each contaminant at each sensitive receptor location are provided in Appendix B.

In all cases, the predicted contributions from the modelled roadway are very small compared to the applicable threshold. When added to a representative high background level (the 90^{th} percentile) the combined concentration in all cases is below the threshold. The contaminant that had the highest combined concentration as a percentage of its threshold was PM_{10}, with a percentage of 90%. Therefore, the proposed project is not expected to cause any air contaminant concentrations to exceed their applicable thresholds.

Table 8.1: Worst-Case Predicted Concentrations (μg/m³) for the Future-Build Alternative (2031)

Contaminant	Averaging Period	Most Impacted Receptors	Predicted Concentration (μg/m³)	90th Percentile Background (μg/m³)	Cumulative Concentration (μg/m³)	Threshold (μg/m³)	Attainment
CO	1 hr	R4	783	836	1619	36,200	Yes
	8 hr	R4	470	502	971	15,700	Yes
NO_2	1 hr	R4	39	67	106	400	Yes
	24 hr	R4	12.2	30.4	42.6	200	Yes
$PM_{2.5}$	24 hr	R13	1.08	18.2	19.3	30	Yes
PM_{10}	24 hr	R13	11.3	33.7	45.0	50	Yes

8.2 Concentration Profiles

Concentration profiles illustrate how the maximum predicted 24-hr average concentrations vary with increasing downwind distance away from the roadway. The concentration distance profiles generated for all the pollutants are shown in Figures 4 to 7. For this study, a section of roadway between Hillside Dr. and Hazelwood Dr. was selected, since this is one of the worst-case sections in terms of traffic volumes. The profiles extended 300 m at right angles on either side of the highway, with receptors placed at 20 m intervals. The resulting concentration profiles can be applied to all sections along Dixie Road, as a worst-case representation, to provide an understanding of impacts at locations not explicitly modelled.

The section with the highest traffic volumes was between Queen St. and Hillside Dr., however, it was expected that the similarly higher traffic volumes along Queen St. would have an impact on the receptors in the profile, resulting in a concentration profile which is not representative of the impacts from Dixie Road itself. The section chosen was assumed to be reasonably conservative as the traffic volumes were similar to the actual worst-case section (total traffic volume approximately 2% less than the worst-case).

The concentration profiles illustrate that as the downwind distance from the highway increases, the predicted concentrations decrease. This is expected to occur, since atmospheric dilution of the pollutants increases with distance.

8.3 Discussion of Health Impacts

A qualitative assessment was conducted to evaluate the overall air quality effects as an initial screen for evaluating potential health impacts. The previous sections detail the worst-case predicted concentrations at receptors of varying distance from the roadway (Section 8.2) and comparisons of receptor impacts with the applicable thresholds (Section 8.1). The thresholds adopted for this assessment are effect-based air quality criteria and are set at levels that represent desirable or acceptable levels in ambient air [11]. Ambient concentrations of pollutants less than these criteria are unlikely to represent a significant risk to human health.

From the concentration profiles (Figures 4 to 7) and Table 8.1, it can be seen that concentrations attributable to the roadway are generally much lower than background pollutant concentrations. Importantly, the combined pollutant concentrations for all substances are less than the applicable thresholds for contaminants. Collectively, the results indicate that overall air quality is acceptable and that adverse health impacts are unlikely. A further explanation of the significance of the predicted pollutant concentrations with respect to human health is provided below.

Carbon Monoxide: The results show that the contribution of carbon monoxide across all receptors is on average less than 60% of background levels and the combined concentration is less than 5% of the threshold. The incremental change from existing conditions would be an even smaller percentage. Based on this finding, it was concluded that any incremental increase in CO concentrations due to the widening of Dixie Road is unlikely to result in adverse health impacts.

Nitrogen Dioxide: The results show that the contribution of nitrogen oxides across all receptors is on average less than 40% of background levels and the combined concentration is less than 26% of the threshold. This level is not only within the MOE's air quality thresholds but also within a lower guideline level, for 1-hour NO_2 of 200 μg/m³, set by the World Health Organization based on a potential for increased bronchial effects in asthmatics [12]. The incremental change from existing conditions would be an even smaller percentage. Based on this finding, it was concluded that any incremental increase in NO_2 concentrations due to the widening of Dixie Road is unlikely to result in adverse health impacts.

PM_{10}: The data show that the combined concentration of PM_{10} at the worst-case receptor is approximately 90% of the threshold. However, the road contributes on average less than 15% of the background levels across all receptors. The incremental change from existing conditions would be an even smaller percentage. While it is possible that there might be a few days after application of road salt or sand for ice control when PM_{10} levels are higher, these would occur during the winter when the background PM_{10} concentrations will be lower. Therefore, the proposed project will not significantly increase the potential for the threshold to be exceeded.

$PM_{2.5}$: The model results indicate that although the combined concentration of $PM_{2.5}$ is roughly 64% of the AAQC at a worst-case receptor, the concentration attributable to the highway across all receptors is on average less than 3% of the background. However, as identified above there would be periods of a few days after application of road salt or sand for ice control when the road surface silt loading may be significantly higher, which would contribute to increased $PM_{2.5}$ concentrations. However, during the winter the background PM concentrations will generally be lower as mentioned.

Recent epidemiological studies indicate that exposure to $PM_{2.5}$ at concentrations below the threshold may be associated with an increased level of risk in sensitive individuals [13]. The World Health Organization concluded that the low end of the range of $PM_{2.5}$ concentrations at which health effects have been demonstrated is not much above pristine background levels [12]. However, the project roadway's incremental contribution is so small and localized, that any effect to the population is unlikely to be discernable.

9. CONCLUSIONS

The conclusions of the assessment can be summarized as follows:

- Incremental pollutant concentrations attributable to the roadway are much lower than background pollutant concentrations, and, when combined with representative high background concentrations (90th percentile level), are below the applicable thresholds.
- PM_{10} was the contaminant with the highest percentage of its respective standard.
- The collective results indicate that overall, air quality is acceptable and the potential for unacceptable health impacts due to the project is low.
- Based on the findings, it was concluded that any health impacts associated with emissions from the project would be essentially indistinguishable from those attributable to normal background.

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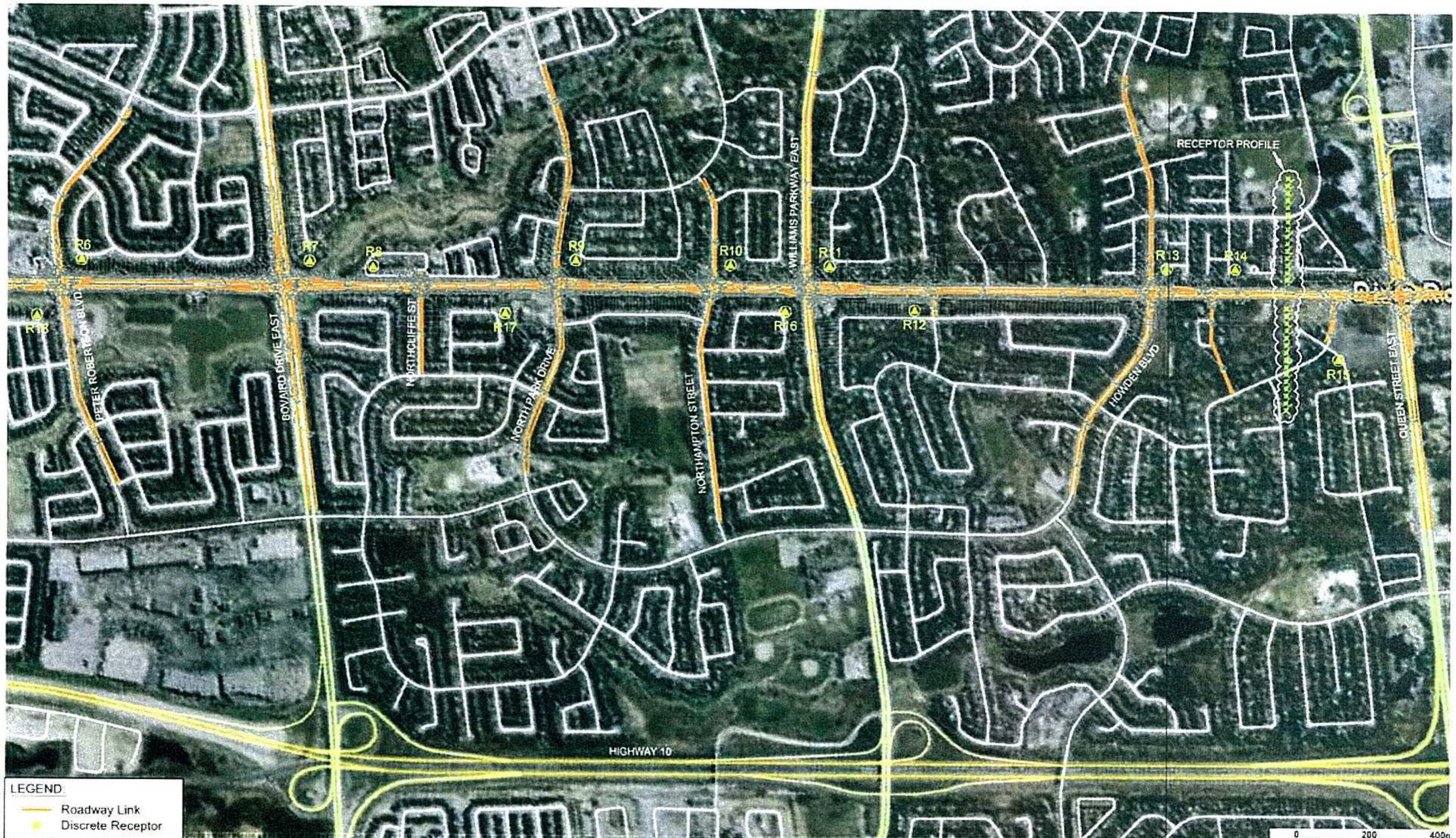
FIGURES

Site Plan Showing Location of Roadway Links and Discrete Receptors 2km North of Mayfield Road to Mayfield Road Dixie Rd Widening EA - Peel Region, Ontario	True North Project #0925103	Drawn by: NTN	Figure: 1	RWDI
		Approx. Scale: 1:10 000		
		Date Revised: Nov. 26, 2010		

Site Plan Showing Location of Roadway Links and Discrete Receptors
Mayfield Road to Peter Robertson Boulevard

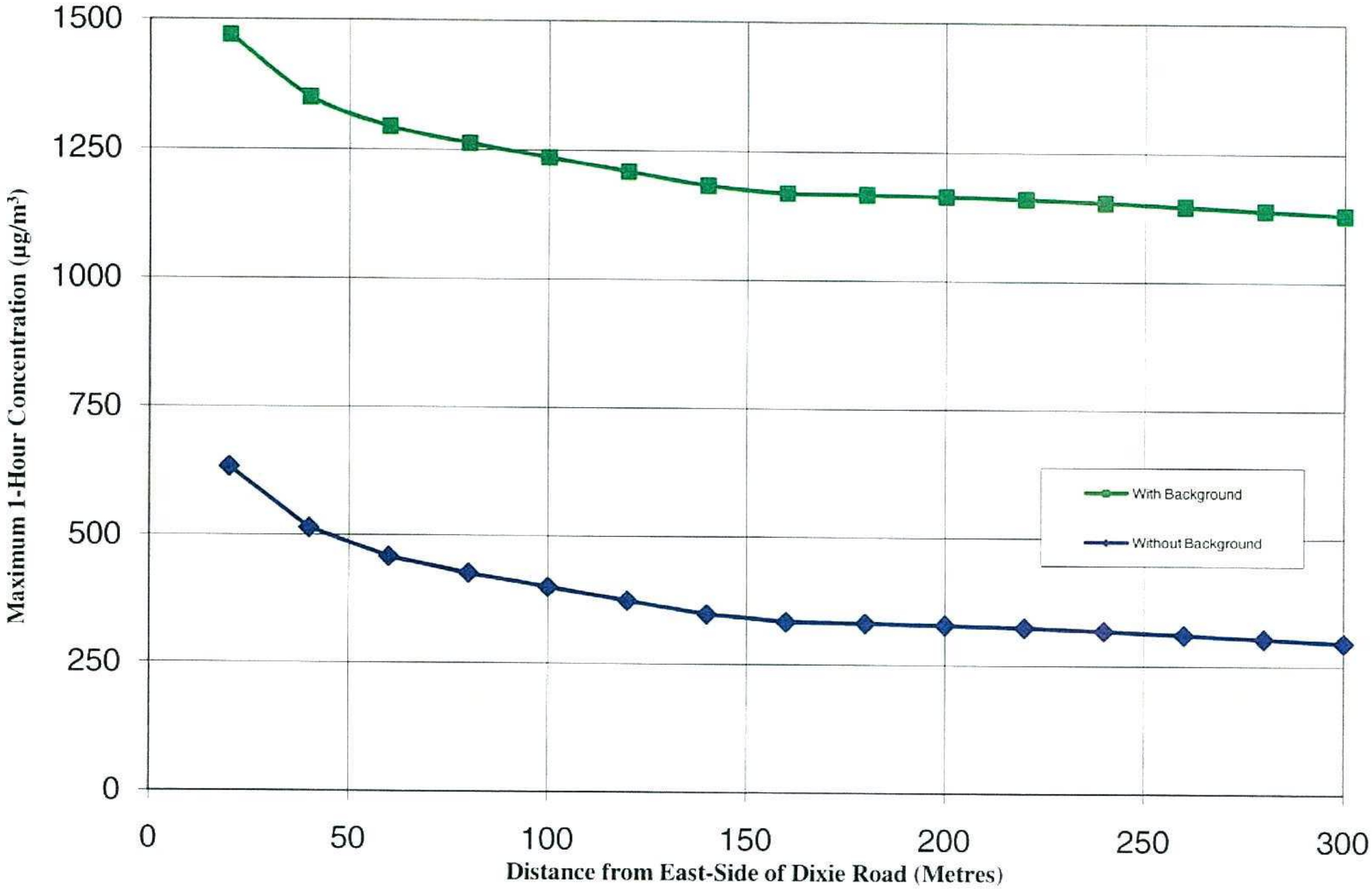
Dixie Rd Widening EA - Peel Region, Ontario

True North	Drawn by: NTN	Figure: 2	RWDI
	Approx. Scale: 1:10 000		
Project #0925103	Date Revised: June 10, 2009		



Site Plan Showing Location of Roadway Links and Discrete Receptors Peter Robertson Boulevard to Queen Street East	True North	Drawn by: NTN Figure: 3	RWDI
		Approx. Scale: 1:10 000	
Dixie Rd Widening EA - Peel Region, Ontario	Project #0925103	Date Revised: June 10, 2009	

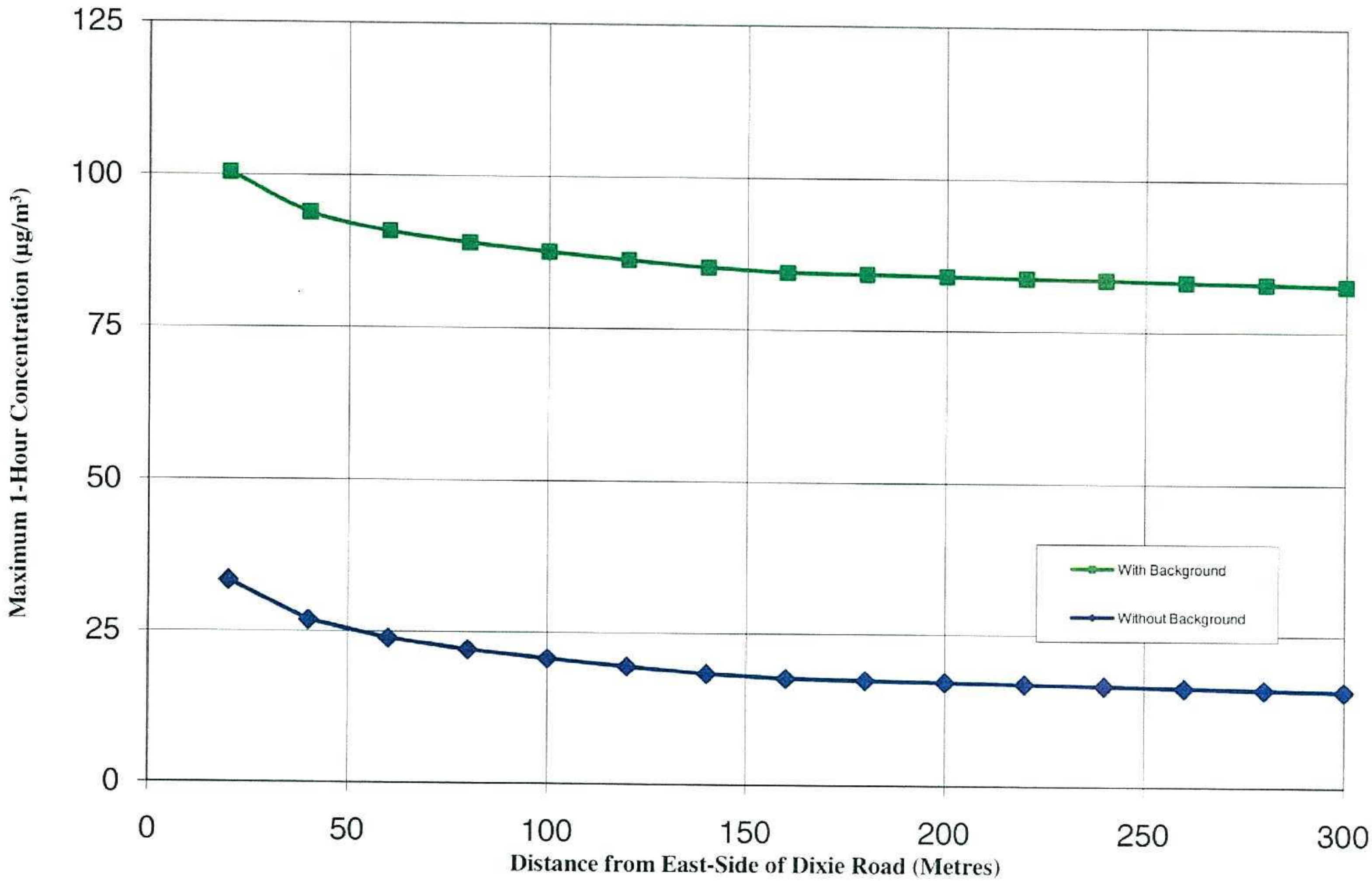
Figure 4: Concentration Profile for CO
Year 2031 Future Build



Note: MOE's 24-hr AAQC for CO is 36,200 µg/m³
The 90th percentile is 836 µg/m³ (2005 -2 007 - Toronto West MOE Station 35125, 2003-2004 - Brampton MOE Station 46089).

Figure 5: Concentration Profile for NO_2

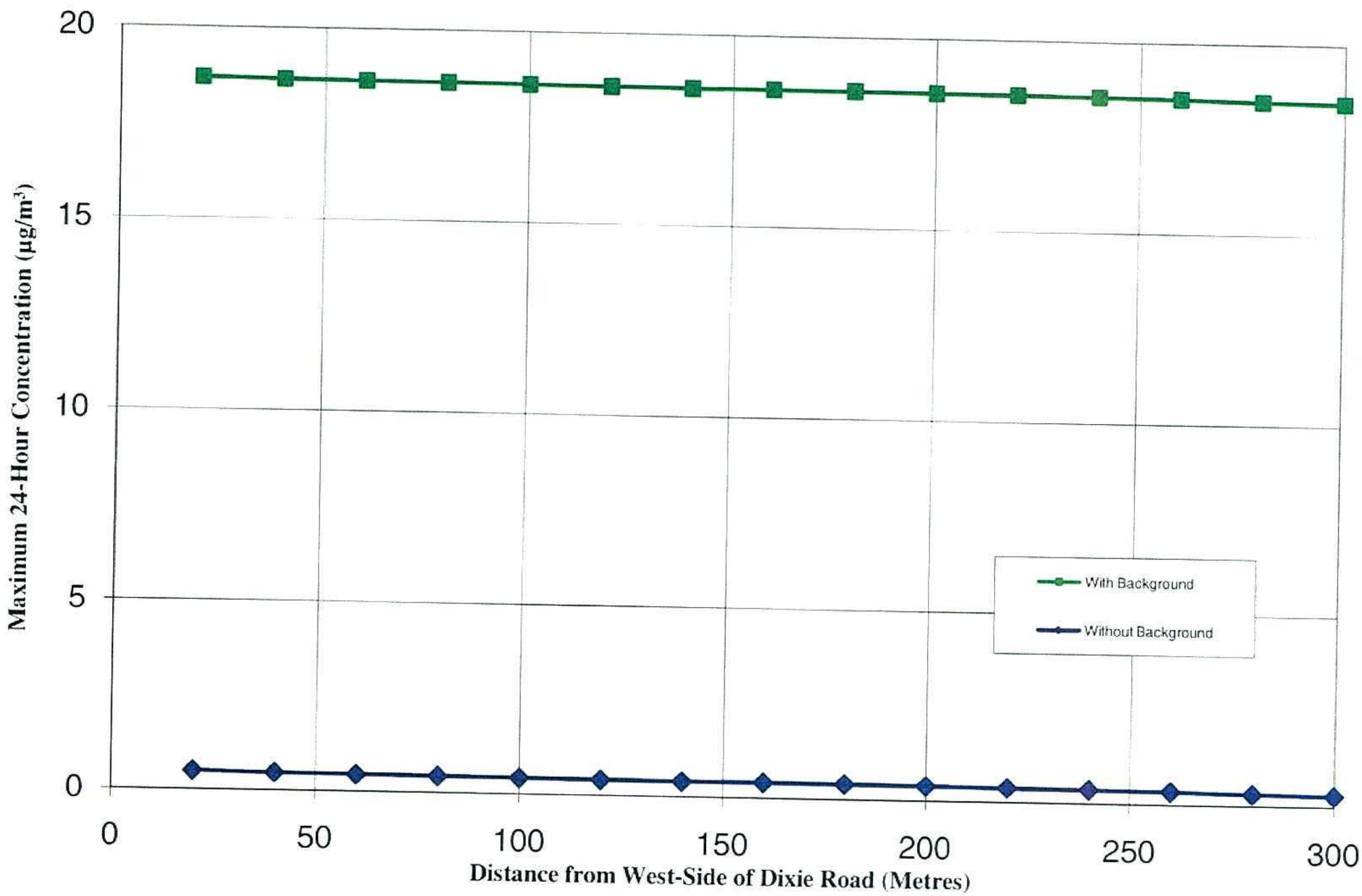
Year 2031 Future Build



Note: MOE's 24-hr AAQC for NO_2 is 400 µg/m³
The 90th percentile from 2003-2007 is 67 µg/m³ (Brampton: MOE 46089).

Figure 6: Concentration Profile for $PM_{2.5}$

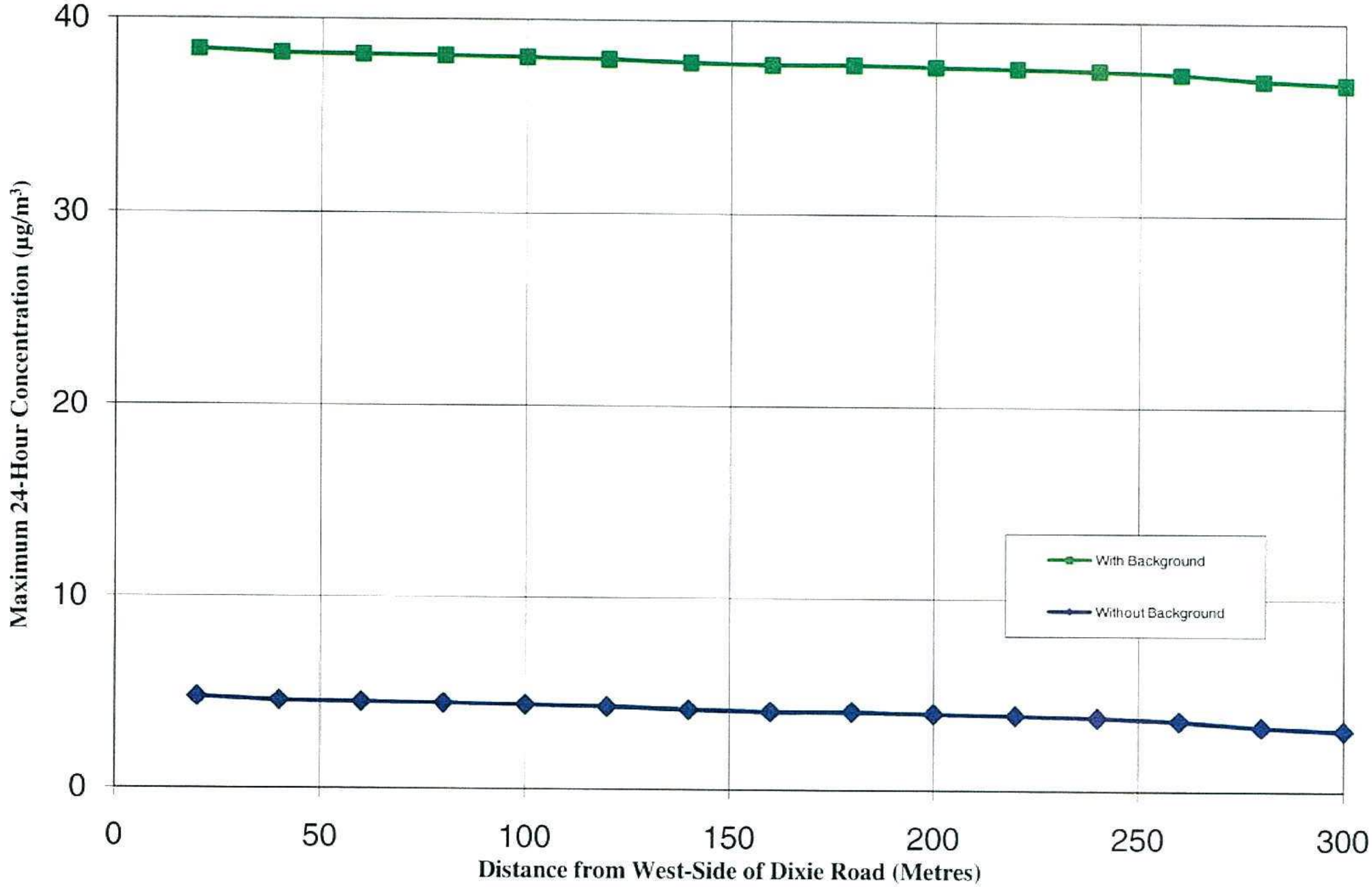
Year 2031 Future Build



Note: Canada Wide Standard for $PM_{2.5}$ is 30 µg/m³
The 90th percentile from 2003-2007 is 18.2 µg/m³ (Brampton, MOE 46089)

Figure 7: Concentration Profile for PM_{10}

Year 2031 Future Build



Note: MOE's 24-hr AAQC for PM_{10} is 50 µg/m³
The 90th percentile from 2003-2007 is 33.7 µg/m³ (Brampton, MOE 46089).

APPENDIX A

Table A1: MOBILE6.2 Key Model Input Parameters [1]

Parameter	Input
Pollutants	CO, NO_X, PM_{10}, and $PM_{2.5}$.
Operating Year	2031
Evaluation Month	January
Ambient Temperature	Minimum Daily Temperature = 13.1 °F (-10.5 °C) Maximum Daily Temperature = 28.2 °F (-2.1 °C) (Canadian Climate Normals, Toronto Lester B. Pearson International Airport Station)
Altitude	Low
Absolute Humidity	20 Grains /lb
Fuel Volatility	Reid Vapor Pressure (RVP) = 9 psi
Fuel Program	Conventional Gasoline East
Vehicle Speed	60 km/hr and 4 km/hr

Note: [1] The idle condition is represented by a speed of 4km/hr since this is the lowest speed MOBILE6.2 can model

Table A2: MOBILE6.2 Vehicle Classification System [1]

Vehicle Class	Description
LDGV	Light-Duty Gas Vehicles (Passenger Cars)
LDGT1	Light-Duty Gas Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs LVW)
LDGT2	Light-Duty Gas Trucks 2 (0-6,000 lbs GVWR, 3,751-5,750 lbs LVW)
LDGT3	Light-Duty Gas Trucks 3 (6,001-8,500 lbs GVWR, 0-5,750 lbs ALVW)
LDGT4	Light-Duty Gas Trucks 4 (6,001-8,500 lbs GVWR, > 5,750 lbs ALVW)
HDGV2b	Class 2b Heavy-Duty Gasoline Vehicles (8,501-10,000 lbs GVWR)
HDGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs GVWR)
HDGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs GVWR)
HDGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs GVWR)
HDGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs GVWR)
HDGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs GVWR)
HDGV8a	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs GVWR)
HDGV8b	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs GVWR)
LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
LDDT12	Light-Duty Diesel Trucks 1and 2 (0-6,000 lbs GVWR)
HDDV2b	Class 2b Heavy-Duty Diesel Vehicles (8,501-10,000 lbs GVWR)
HDDV3	Class 3 Heavy-Duty Diesel Vehicles (10,001-14,000 lbs GVWR)
HDDV4	Class 4 Heavy-Duty Diesel Vehicles (14,001-16,000 lbs GVWR)
HDDV5	Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs GVWR)
HDDV6	Class 6 Heavy-Duty Diesel Vehicles (19,501-26,000 lbs GVWR)
HDDV7	Class 7 Heavy-Duty Diesel Vehicles (26,001-33,000 lbs GVWR)
HDDV8a	Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs GVWR)
HDDV8b	Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs GVWR)
MC	Motorcycles (Gasoline)
HDGB	Gasoline Buses (School, Transit and Urban)
HDDBT	Diesel Transit and Urban Buses
HDDBS	Diesel School Buses
LDDT34	Light-Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs GVWR)

Notes: GVWR – Gross vehicle weight rating
LVW – Loaded vehicle weight

Table A3.1: Summary of LDV Emission Factors from MOBILE6.2 (g/VMT)

Year	Pollutant	60 km/h	4 km/hr
2031	CO	6.51	27.4
	NO_x	0.35	0.73
	PM_{10} [1]	0.02	0.02
	$PM_{2.5}$ [1]	0.01	0.01

Notes: VMT – Vehicle miles traveled
[1] MOBILE6.2 particulate matter emission factors are not speed dependant.
Vehicle particulate matter emission factors include exhaust, brake wear, and tire wear

Table A3.2: Summary of HDV Emission Factors from MOBILE6.2 (g/VMT)

Year	Pollutant	60 km/h	4 km/hr
2031	CO	2.10	13.8
	NO_x	0.39	0.70
	PM_{10} [1]	0.05	0.05
	$PM_{2.5}$ [1]	0.03	0.03

Notes: VMT – Vehicle miles traveled
[1] MOBILE6.2 particulate matter emission factors are not speed dependant.
Vehicle particulate matter emission factors include exhaust, brake wear, and tire wear

Table A4: Summary of AP-42 Re-entrained Road Dust Emission Factors

	k (g/VMT)
PM2.5	1.1
PM10	7.3

Index	Scenario	ADT Category	sL (g/m2)	LDV W (tons)	HDV W (tons)	Percent HDV	Average W (tons)	PM2.5 (with 80s Tailpipe)	PM10 (with 80s Tailpipe)	Re-Entrained - PM2.5 (80s Tailpipe Removed)	Re-Entrained - PM10 (80s Tailpipe Removed)
1	Scenario 1 (0% HDV)	< 500	2.4	1.9	16.9	0%	1.9	0.6242	4.1423	0.4625	3.9304
2	Scenario 2 (0% HDV)	< 5,000	0.6	1.9	16.9	0%	1.9	0.2535	1.6823	0.0918	1.4704
3	Scenario 3 (0% HDV)	< 10,000	0.12	1.9	16.9	0%	1.9	0.0891	0.5910	0.0000	0.3791
4	Scenario 4 (0% HDV)	> 10,000	0.03	1.9	16.9	0%	1.9	0.0362	0.2400	0.0000	0.0281
5	Scenario 5 (1% HDV)	< 5,000	0.6	1.9	16.9	1%	2.1	0.2841	1.8854	0.1224	1.6735
6	Scenario 6 (1% HDV)	< 10,000	0.12	1.9	16.9	1%	2.1	0.0998	0.6623	0.0000	0.4504
7	Scenario 7 (1% HDV)	< 10,000	0.12	1.9	16.9	1%	2.1	0.0998	0.6623	0.0000	0.4504
8	Scenario 8 (1% HDV)	> 10,000	0.03	1.9	16.9	1%	2.1	0.0405	0.2690	0.0000	0.0571
9	Scenario 9 (2% HDV)	< 500	2.4	1.9	16.9	2%	2.2	0.7777	5.1611	0.6160	4.9492
10	Scenario 10 (2% HDV)	< 5,000	0.6	1.9	16.9	2%	2.2	0.3158	2.0961	0.1541	1.8842
11	Scenario 11 (2% HDV)	< 10,000	0.12	1.9	16.9	2%	2.2	0.1110	0.7363	0.0000	0.5244
12	Scenario 12 (2% HDV)	> 10,000	0.03	1.9	16.9	2%	2.2	0.0451	0.2990	0.0000	0.0871
13	Scenario 13 (3% HDV)	< 500	2.4	1.9	16.9	3%	2.4	0.8586	5.6978	0.6969	5.4859
14	Scenario 14 (3% HDV)	< 5,000	0.6	1.9	16.9	3%	2.4	0.3487	2.3140	0.1870	2.1021
15	Scenario 15 (3% HDV)	< 10,000	0.12	1.9	16.9	3%	2.4	0.1225	0.8129	0.0000	0.6010
16	Scenario 16 (3% HDV)	> 10,000	0.03	1.9	16.9	3%	2.4	0.0497	0.3301	0.0000	0.1182
17	Scenario 17 (4% HDV)	< 5,000	0.6	1.9	16.9	4%	2.5	0.3826	2.5391	0.2209	2.3272
18	Scenario 18 (4% HDV)	< 10,000	0.12	1.9	16.9	4%	2.5	0.1344	0.8920	0.0000	0.6801
19	Scenario 19 (4% HDV)	> 10,000	0.03	1.9	16.9	4%	2.5	0.0546	0.3623	0.0000	0.1504
20	Scenario 20 (5% HDV)	< 500	2.4	1.9	16.9	5%	2.7	1.0281	6.8230	0.8664	6.6111
21	Scenario 21 (5% HDV)	< 5,000	0.6	1.9	16.9	5%	2.7	0.4175	2.7710	0.2558	2.5591
22	Scenario 22 (5% HDV)	< 10,000	0.12	1.9	16.9	5%	2.7	0.1467	0.9734	0.0000	0.7615
23	Scenario 23 (5% HDV)	> 10,000	0.03	1.9	16.9	5%	2.7	0.0596	0.3953	0.0000	0.1834
24	Scenario 24 (6% HDV)	< 5,000	0.6	1.9	16.9	6%	2.8	0.4535	3.0096	0.2918	2.7977
25	Scenario 25 (6% HDV)	< 10,000	0.12	1.9	16.9	6%	2.8	0.1593	1.0572	0.0000	0.8453
26	Scenario 26 (6% HDV)	> 10,000	0.03	1.9	16.9	6%	2.8	0.0647	0.4294	0.0000	0.2175
27	Scenario 27 (7% HDV)	< 500	2.4	1.9	16.9	7%	3.0	1.2076	8.0139	1.0459	7.8020
28	Scenario 28 (7% HDV)	< 5,000	0.6	1.9	16.9	7%	3.0	0.4904	3.2546	0.3287	3.0427
29	Scenario 29 (7% HDV)	< 10,000	0.12	1.9	16.9	7%	3.0	0.1723	1.1433	0.0106	0.9314
30	Scenario 30 (7% HDV)	> 10,000	0.03	1.9	16.9	7%	3.0	0.0700	0.4643	0.0000	0.2524
31	Scenario 31 (8% HDV)	< 5,000	0.6	1.9	16.9	8%	3.1	0.5283	3.5060	0.3666	3.2941
32	Scenario 32 (8% HDV)	> 10,000	0.03	1.9	16.9	8%	3.1	0.0754	0.5002	0.0000	0.2883
33	Scenario 33 (9% HDV)	< 5,000	0.6	1.9	16.9	9%	3.3	0.5671	3.7635	0.4054	3.5516
34	Scenario 34 (10% HDV)	< 500	2.4	1.9	16.9	10%	3.4	1.4942	9.9158	1.3325	9.7039
35	Scenario 35 (10% HDV)	< 5,000	0.6	1.9	16.9	10%	3.4	0.6068	4.0271	0.4451	3.8152
36	Scenario 36 (10% HDV)	< 10,000	0.12	1.9	16.9	10%	3.4	0.2132	1.4147	0.0515	1.2028
37	Scenario 37 (10% HDV)	> 10,000	0.03	1.9	16.9	10%	3.4	0.0866	0.5745	0.0000	0.3626
38	Scenario 38 (11% HDV)	< 5,000	0.6	1.9	16.9	11%	3.6	0.6474	4.2965	0.4857	4.0846
39	Scenario 39 (12% HDV)	< 10,000	0.12	1.9	16.9	12%	3.7	0.2420	1.6060	0.0803	1.3941
40	Scenario 40 (12% HDV)	< 5,000	0.6	1.9	16.9	12%	3.7	0.6889	4.5716	0.5272	4.3597
41	Scenario 41 (13% HDV)	< 5,000	0.6	1.9	16.9	13%	3.9	0.7312	4.8524	0.5695	4.6405
42	Scenario 42 (16% HDV)	< 5,000	0.6	1.9	16.9	16%	4.3	0.8631	5.7276	0.7014	5.5157
43	Scenario 43 (17% HDV)	< 5,000	0.6	1.9	16.9	17%	4.5	0.9086	6.0299	0.7469	5.8180
44	Scenario 44 (18% HDV)	< 5,000	0.6	1.9	16.9	18%	4.6	0.9549	6.3373	0.7932	6.1254
45	Scenario 45 (22% HDV)	< 5,000	0.6	1.9	16.9	22%	5.2	1.1477	7.6168	0.9860	7.4049
46	Scenario 46 (23% HDV)	< 5,000	0.6	1.9	16.9	23%	5.4	1.1978	7.9488	1.0361	7.7369
47	Scenario 47 (29% HDV)	< 5,000	0.6	1.9	16.9	29%	6.3	1.5124	10.0367	1.3507	9.8248
48	Scenario 48 (33% HDV)	< 5,000	0.6	1.9	16.9	33%	6.9	1.7353	11.5161	1.5736	11.3042
N/A	C - Exhaust, Brake & Tire Wear	n/a	n/a	n/a	n/a	n/a	n/a	0.1617	0.2119	n/a	n/a

Notes

1. Re-entrained road dust emission rates are calculated based on equation 1 of AP-42 draft report for paved road emissions (Section 13.2.1)

Table A5: CAL3QHCR Key Input Parameters

Parameter	Input
Meteorological Data	Year 2007 hourly surface data and upper air data are from the Toronto Lester B. Pearson International Airport (12345) and Greater Buffalo International Airport in New York (14733)
Traffic Volumes (AADT)	Provided by AECOM
Hourly Traffic Volume Distribution	AECOM provided hourly traffic volume distribution for a 24-hour period.
Volume of Heavy-Duty Vehicles (HDV)	Provided by AECOM
Light Cycle Timing	Provided by AECOM
Deposition Velocity	PM_{10} = 1.1 cm/s $PM_{2.5}$ = 0.1 cm/s
Settling Velocity	PM_{10} = 0.5 cm/s PM2.5 = 0.005 cm/s
Surface Roughness	108 cm – single family residential
Dispersion Coefficient (Urban or Rural)	Urban

APPENDIX B

APPENDIX B: Tabular Results

Table B.1: Predicted 24-Hour Average PM_{10} Concentrations, Including 90th Percentile Background Concentration ($\mu g/m^3$)

Receptor No.	Predicted Concentration from Dixie Road ($\mu g/m^3$)	Future Build Predicted Cumulative Concentration ($\mu g/m^3$) [1]	MOE's Interim 24-Hour AAQC($\mu g/m^3$) [2]	Percentage of Guideline Limit (%)
R1	5.4	39.1	50	78%
R2	2.6	36.3	50	73%
R3	9.2	42.9	50	86%
R4	7.6	41.3	50	83%
R5	4.4	38.1	50	76%
R6	7.1	40.8	50	82%
R7	8.8	42.5	50	85%
R8	5.1	38.8	50	78%
R9	6.1	39.8	50	80%
R10	4.8	38.5	50	77%
R11	4.5	38.2	50	76%
R12	4.1	37.8	50	76%
R13	11.3	45.0	50	90%
R14	3.8	37.5	50	75%
R15	4.7	38.4	50	77%
R16	4.6	38.3	50	77%
R17	3.6	37.3	50	75%
R18	4.9	38.6	50	77%
R19	6.9	40.6	50	81%
R20	4.1	37.8	50	76%
R21	5.7	39.4	50	79%
R22	2.3	36.0	50	72%
R23	2.2	35.9	50	72%
R24	1.2	34.9	50	70%
R25	1.8	35.5	50	71%
R26	0.93	34.6	50	69%

Notes: [1] Background concentration data not available for PM_{10}, data calculated from $PM_{2.5}$ data.
[2] The MOE's Interim 24-Hour AAQC for PM_{10} is $50\mu g/m^3$.

Table B.2: Predicted 24-Hour Average $PM_{2.5}$ Concentrations, Including 90th Percentile Background Concentration ($\mu g/m^3$)

Receptor No.	Predicted Concentration from Dixie Road ($\mu g/m^3$)	Future Build Predicted Cumulative Concentration ($\mu g/m^3$) [1]	MOE's Interim 24-Hour AAQC($\mu g/m^3$) [2]	Percentage of Guideline Limit (%)
R1	0.33	18.5	30	62%
R2	0.20	18.4	30	61%
R3	1.05	19.3	30	64%
R4	0.82	19.0	30	63%
R5	0.35	18.6	30	62%
R6	0.57	18.8	30	63%
R7	0.80	19.0	30	63%
R8	0.38	18.6	30	62%
R9	0.41	18.6	30	62%
R10	0.44	18.6	30	62%
R11	0.46	18.7	30	62%
R12	0.42	18.6	30	62%
R13	1.08	19.3	30	64%
R14	0.38	18.6	30	62%
R15	0.44	18.6	30	62%
R16	0.41	18.6	30	62%
R17	0.26	18.5	30	62%
R18	0.38	18.6	30	62%
R19	0.67	18.9	30	63%
R20	0.35	18.6	30	62%
R21	0.43	18.6	30	62%
R22	0.17	18.4	30	61%
R23	0.19	18.4	30	61%
R24	0.098	18.3	30	61%
R25	0.18	18.4	30	61%
R26	0.090	18.3	30	61%

Notes: [1] The 90th percentile background concentration is from the years 2003-2007 from MOE Station No. 46089 (Brampton).

[2] Canada Wide Standard (CWS) for $PM_{2.5}$ is 30 $\mu g/m^3$ established for the year 2010 based on the 98th percentile ambient measurement annually, average over three consecutive years.

Table B.3: Predicted 1-Hour Average CO Concentrations, Including 90th Percentile Background Concentration (µg/m³)

Receptor No.	Predicted Concentration from Dixie Road (µg/m³)	Future Build Predicted Cumulative Concentration (µg/m³) [1]	MOE's 1-Hour AAQC [2]	Percentage of Guideline Limit (%)
R1	495	1,331	36,200	4%
R2	438	1,274	36,200	4%
R3	436	1,272	36,200	4%
R4	783	1,619	36,200	4%
R5	452	1,288	36,200	4%
R6	440	1,276	36,200	4%
R7	701	1,537	36,200	4%
R8	501	1,337	36,200	4%
R9	453	1,289	36,200	4%
R10	476	1,312	36,200	4%
R11	696	1,532	36,200	4%
R12	375	1,211	36,200	3%
R13	497	1,333	36,200	4%
R14	428	1,264	36,200	3%
R15	354	1,190	36,200	3%
R16	599	1,435	36,200	4%
R17	343	1,179	36,200	3%
R18	374	1,210	36,200	3%
R19	681	1,517	36,200	4%
R20	280	1,116	36,200	3%
R21	569	1,405	36,200	4%
R22	311	1,147	36,200	3%
R23	388	1,224	36,200	3%
R24	266	1,102	36,200	3%
R25	413	1,249	36,200	3%
R26	277	1,113	36,200	3%

__Notes:__ [1] The 90th percentile background concentration data from the years 2005-2007 are from MOE Station No. 35125 (Toronto West). Data for the years 2003-2004 are from MOE Station No. 46089 (Brampton).
[2] The MOE's 1-Hour AAQC for CO is 36,200µg/m³.

Table B.4: Predicted 8-Hour Average CO Concentrations, Including 90th Percentile Background Concentration (µg/m³)

Receptor No.	Predicted Concentration from Dixie Road (µg/m³) [1]	Future Build Predicted Cumulative Concentration (µg/m³) [1][2]	MOE's 1-Hour AAQC [3]	Percentage of Guideline Limit (%)
R1	297	799	15,700	5%
R2	263	764	15,700	5%
R3	261	763	15,700	5%
R4	470	971	15,700	6%
R5	271	773	15,700	5%
R6	264	766	15,700	5%
R7	421	922	15,700	6%
R8	301	802	15,700	5%
R9	272	773	15,700	5%
R10	286	787	15,700	5%
R11	418	919	15,700	6%
R12	225	727	15,700	5%
R13	298	800	15,700	5%
R14	257	758	15,700	5%
R15	213	714	15,700	5%
R16	359	861	15,700	5%
R17	206	708	15,700	5%
R18	224	726	15,700	5%
R19	409	910	15,700	6%
R20	168	669	15,700	4%
R21	342	843	15,700	5%
R22	187	688	15,700	4%
R23	233	734	15,700	5%
R24	160	661	15,700	4%
R25	248	749	15,700	5%
R26	166	668	15,700	4%

Notes: [1] Predicted concentrations and background concentration data was scaled from 1-hour to 8-hour using a 0.6 conversion factor.
[1] The 90th percentile background concentration data from the years 2005-2007 are from MOE Station No. 35125 (Toronto West). Data for the years 2003-2004 are from MOE Station No. 46089 (Brampton).
[2] The MOE's 8-Hour AAQC for CO is 15,700µg/m³.

Table B.5: Maximum Predicted 1-Hour Average NO_2 Concentrations, Including 90th Percentile Background Concentration ($\mu g/m^3$)

Receptor No.	Predicted Concentration from Dixie Road ($\mu g/m^3$)	Future Build Predicted Cumulative Concentration ($\mu g/m^3$) [1]	MOE's 1-Hour AAQC [2]	Percentage of Guideline Limit (%)
R1	26	93	400	23%
R2	24	91	400	23%
R3	24	91	400	23%
R4	39	106	400	26%
R5	24	91	400	23%
R6	23	90	400	22%
R7	37	104	400	26%
R8	26	93	400	23%
R9	24	91	400	23%
R10	25	92	400	23%
R11	36	103	400	26%
R12	20	87	400	22%
R13	26	93	400	23%
R14	23	90	400	22%
R15	18	85	400	21%
R16	31	98	400	24%
R17	18	85	400	21%
R18	20	87	400	22%
R19	36	103	400	26%
R20	15	82	400	21%
R21	30	97	400	24%
R22	17	84	400	21%
R23	21	88	400	22%
R24	15	82	400	20%
R25	23	90	400	22%
R26	15	82	400	21%

Notes: [1] The 90th percentile background concentration is from the years 2003-2007 from MOE Station No. 46089 (Brampton).
[2] The MOE's 1-Hour AAQC for NO_X is $400 \mu g/m^3$.

Table B.6: Maximum Predicted 24-Hour Average NO_2 Concentrations, Including 90th Percentile Background Concentration (μg/m³)

Receptor No.	Predicted Concentration from Dixie Road (μg/m³)	Future Build Predicted Cumulative Concentration (μg/m³) [1]	MOE's 1-Hour AAQC [2]	Percentage of Guideline Limit (%)
R1	7	38	200	19%
R2	5	36	200	18%
R3	5	36	200	18%
R4	12	43	200	21%
R5	6	36	200	18%
R6	6	36	200	18%
R7	11	41	200	21%
R8	6	36	200	18%
R9	7	37	200	18%
R10	6	36	200	18%
R11	10	41	200	20%
R12	4	35	200	17%
R13	7	37	200	19%
R14	6	36	200	18%
R15	5	35	200	18%
R16	8	38	200	19%
R17	4	34	200	17%
R18	5	35	200	18%
R19	9	40	200	20%
R20	3	34	200	17%
R21	7	38	200	19%
R22	3	34	200	17%
R23	4	35	200	17%
R24	2	33	200	16%
R25	5	35	200	18%
R26	3	33	200	17%

Notes: [1] The 90th percentile background concentration is from the years 2001-2005 from NAPS Station No. 46089 (Brampton).
[2] The MOE's 24-Hour AAQC for NO_X is 200 μg/m³.