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Appendix I

Air Quality Impact Assessment Report

Appendix I

Sheridan Park Drive Extension Municipal Class Environmental Assessment Air Quality Impact Assessment Report

City of Mississauga

R.J. Burnside & Associates Limited
6990 Creditview Road, Unit 2
Mississauga ON   L5N 8R9 CANADA

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R.J. Burnside & Associates Limited

Report Prepared By:

Kristina Zeromskiene, Ph.D.
Air Emissions & Noise Specialist
KZ:lm

Report Reviewed By:

Harvey Watson, P.Eng.
Manager, Air & Noise
KZ:lm

LICENSED PROFESSIONAL ENGINEER
H.W.W. WATSON
Oct 16/17
PROVINCE OF ONTARIO

Executive Summary

The City of Mississauga (City) has undertaken a Municipal Class Environmental Assessment (EA) to investigate the proposed extension of Sheridan Park Drive between Homelands Drive and Speakman Drive in the southwestern area of Mississauga. This Air Quality Impact Assessment (AQIA) was completed as part of the EA Study in order to understand the impacts of the proposed road extension on local air quality.

Based on the forecasted 2031 traffic volumes, future predicted air quality levels with and without a road extension were compared to the existing air quality levels to understand the impact of a potential road extension on local air quality. Typical contaminants from automobile exhaust were evaluated including Particulate Matter ($PM_{2.5}$ and PM_{10}), Total Suspended Particulates (TSP), Nitrogen Oxides (NO_x), Carbon Monoxide (CO), 1-3 Butadiene, Benzene, Acrolein, Acetylaldehyde, and Formaldehyde.

Air quality modelling was performed for above contaminants for present day, and two future scenarios. The present day results show the current (2017) impact of the local roads. The Future No Build scenario predicts emissions due to traffic in the vicinity of the Study Area for the future (2031) without the proposed road extension. The Future Build scenario predicts future (2031) emissions with the proposed road extension. The impacts were assessed on 0.5 hour, 1 hour, 8 hour, 24 hour and annual basis. Modelled impacts for the local roads were added to the background measurements recorded by the Ministry of Environment and Climate Change (MOECC) for all three scenarios in order to understand the total cumulative effects of the proposed road extension on local air quality.

The future predicted air quality levels at sensitive receptor locations (residential properties and the Homelands Senior Public School) were all below the MOECC criteria with the exception of benzene, which already exceeds the criteria based on background air quality.

The Air Quality Assessment shows that change in concentration of benzene at any location in the Study Area is negligible. The variability in the National Air Pollution Surveillance (NAPS) background measurements (standard deviation of 0.22 $\mu g/m^3$) is much higher than the predicted change in impact (0.0003 $\mu g/m^3$ worst case impact). The background benzene concentration is continuing to fall as shown in Figure 19 of the Air Quality in Ontario 2015 Report. As a result, based on the analysis, there is no expectation that the benzene concentration will increase because of the project.

It should be noted that the elevated benzene levels detected are not isolated to the Sheridan Park area, but observed all over the Province. Improvements to address benzene levels are being dealt with at a national and provincial level that in turn improves air quality at a local level.

Local reductions have a limited effect as a result reducing benzene concentrations requires a provincial solution. According to Air Quality in Ontario 2015 Report published by the MOECC, over the 10 year period from 2005 to 2014, benzene concentrations have decreased 42%. A review of the National Pollutant Release Inventory (NPRI) data did not show any significant industrial / commercial operations emitting benzene in the vicinity of the project area.

Through initiatives to make buildings more green, improvements on vehicle emissions, and as improvements to other fuel burning equipment (such as high efficiency furnaces) continue to be made, it is expected that benzene levels should continue to drop. The City as a whole is encouraging sustainable development and growth. By providing alternative routes, which an extension to Sheridan Park Drive would do, the City is hoping to assist in lessening the environmental impact by minimizing congestion and vehicle idling throughout the city.

A potential Greenhouse Gas emission effect from the proposed road extension was determined to be insignificant on a regional scale. The total annual emissions are expected to be well below 1% of the provincial levels. Similarly, the local impact is negligible.

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Glossary of Terms and Acronyms

AAQC	Ambient Air Quality Criteria
AADT	Annual Average Daily Traffic
AQIA	Air Quality Impact Assessment
AQIA Guidance	City of Mississauga Air Quality Impact Assessment Guidance for Schedule C Road Improvements Class EAs
CAL3QHCR	Air Dispersion Model for Predicting Air Quality Impacts Near Roadways
City	City of Mississauga
BMP	Best Management Practices
Burnside	R.J. Burnside & Associates Limited
CAAQS	Canadian Ambient Air Quality Standards
CAC	Criteria Air Contaminant
City	City of Mississauga
CO	Carbon Monoxide
CO_2e	Carbon Dioxide equivalent
ECCC	Environmental and Climate Change Canada
EA	Environmental Assessment
GHG	Greenhouse Gas
MOECC	Ministry of the Environment and Climate Change
MOP	City of Mississauga Official Plan
MOVES	Motor Vehicle Emission Simulator
MTO	Ministry of Transportation
MTO Guide	Ministry of Transportation “Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects” (2012)
NAAQO	National Ambient Air Quality Objective
NAPS	National Air Pollution Surveillance
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
O_3	Ozone
OTAQ	Office of Transportation and Air Quality
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter < 2.5 µm in diameter
PM_{10}	Particulate Matter < 10 µm in diameter
RAMMET	Meteorological Data Preprocessor
ROW	Right-of-Way
SO_2	Sulphur Dioxide
TTA	Transportation and Traffic Analysis
TSP	Total Suspended Particulate Matter
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

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1.0 Introduction

The City of Mississauga (City) has undertaken a Municipal Class Environmental Assessment (EA) to investigate the proposed extension of Sheridan Park Drive between Homelands Drive and Speakman Drive in the southwestern area of Mississauga. R.J. Burnside & Associates Limited (Burnside) has facilitated the EA on behalf of the City.

The EA Study has followed a comprehensive planning and design process in order to explore the opportunity to connect the east and west sections of Sheridan Park Drive, improve the road network connectivity in the residential neighborhood and business area, create options for alternative routes and improve multi-modal network connectivity. The EA Study has been completed in accordance with the requirements of a Schedule B Undertaking as outlined in the Municipal Engineers Association Municipal Class Environmental Assessment Document (October 2000, as amended 2007, 2011 & 2015), which is an approved process under the *Ontario Environmental Assessment Act*.

As part of the EA Study, Burnside has completed an Air Quality Impact Assessment (AQIA) to identify whether the change in traffic as a result of the Sheridan Park Drive extension will significantly change air quality within the Study Area and vicinity.

1.1 Study Area

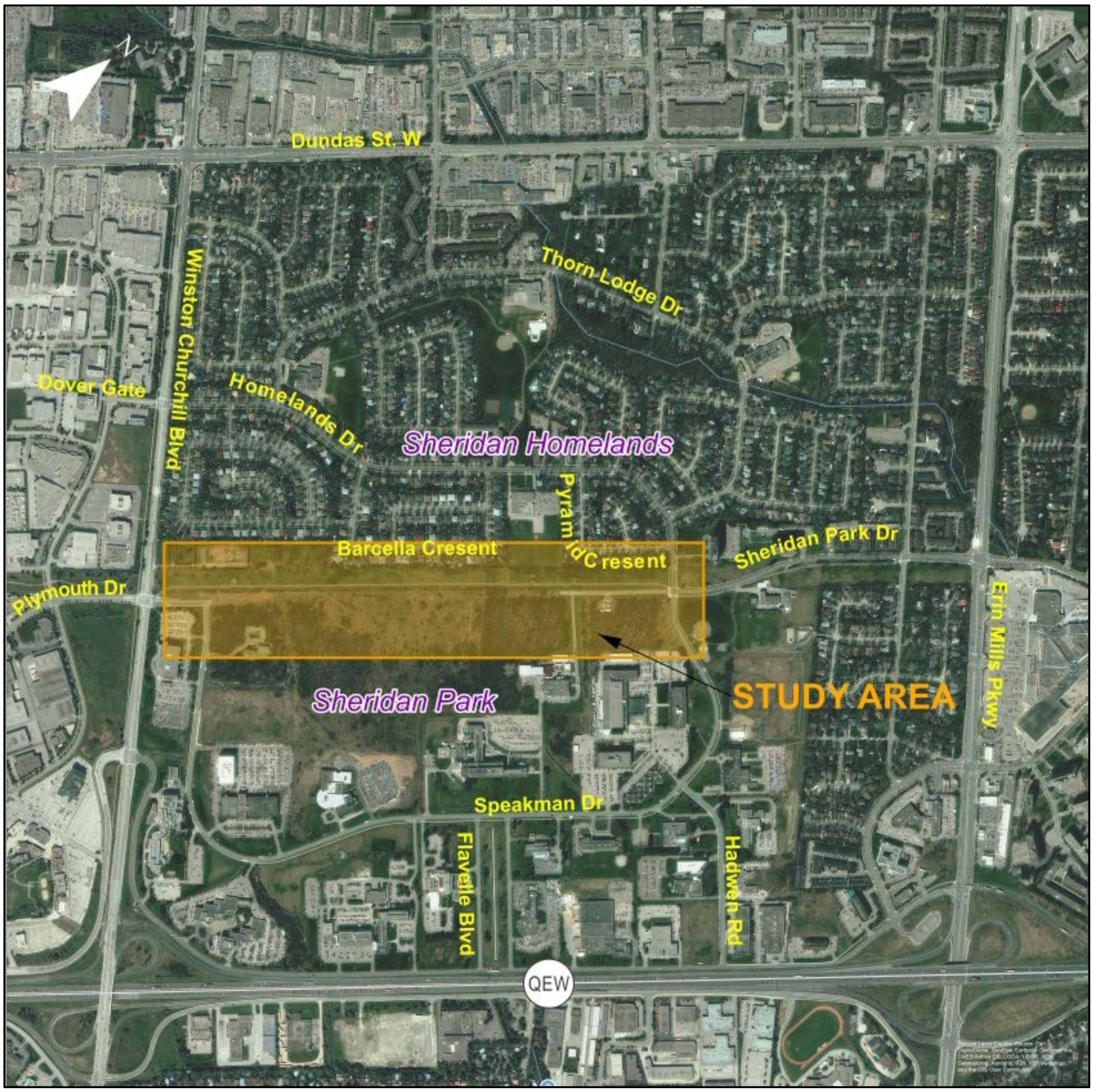
The Study Area is generally bordered by a utility corridor to the north, Winston Churchill Boulevard to the west, Speakman Drive/Homelands Drive to the east and naturalized private lands to the south. The Study Area is illustrated on Figure 1. The proposed extension of Sheridan Park Drive falls within the existing City of Mississauga owned right-of-way (ROW), which runs through the centre part of the Study Area.

The Study Area includes a unique combination of uses including the Sheridan Park Corporate Centre (Sheridan Park), a utility corridor that includes a multi-use trail, and the Sheridan Homelands residential neighbourhood.

Sheridan Park is a 340 acre corporate centre, which is primarily designated Business Employment in the City of Mississauga's Official Plan (MOP). The majority of the Park is occupied by private industries and businesses, which include in their landholdings significant natural areas particularly on the north side of the corporate centre, within the Study Area. These naturalized areas include two wooded areas that are identified as Significant Natural Areas in the City's Natural Areas Survey (2016 Update). Sheridan Park is also identified as one of the City's cultural landscape due to its scenic and distinct visual qualities.

The City maintains a paved multi-use trail through the utility corridor from Winston Churchill Boulevard to Homelands Drive/Speakman Drive. The trail then continues east along the south side of Sheridan Park Drive to Erin Mills Parkway. To the west of Winston Churchill Boulevard, the trail continues through the hydro corridor in Oakville. The trail provides recreational opportunities to the local residents and commuter cyclists.

Figure 1: Study Area



1.2 Sensitive Receptors

The air quality effects due to the proposed Sheridan Park Drive extension were predicted at selected sensitive receptors. Sensitive receptors are described by the Ministry of Transportation (MTO) in their Guide "Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects" (MTO Guide) (MTO, 2012) as:

- Residences.
- Hospitals.
- Retirement homes.
- Childcare centres.
- Similar institutional buildings (like schools).

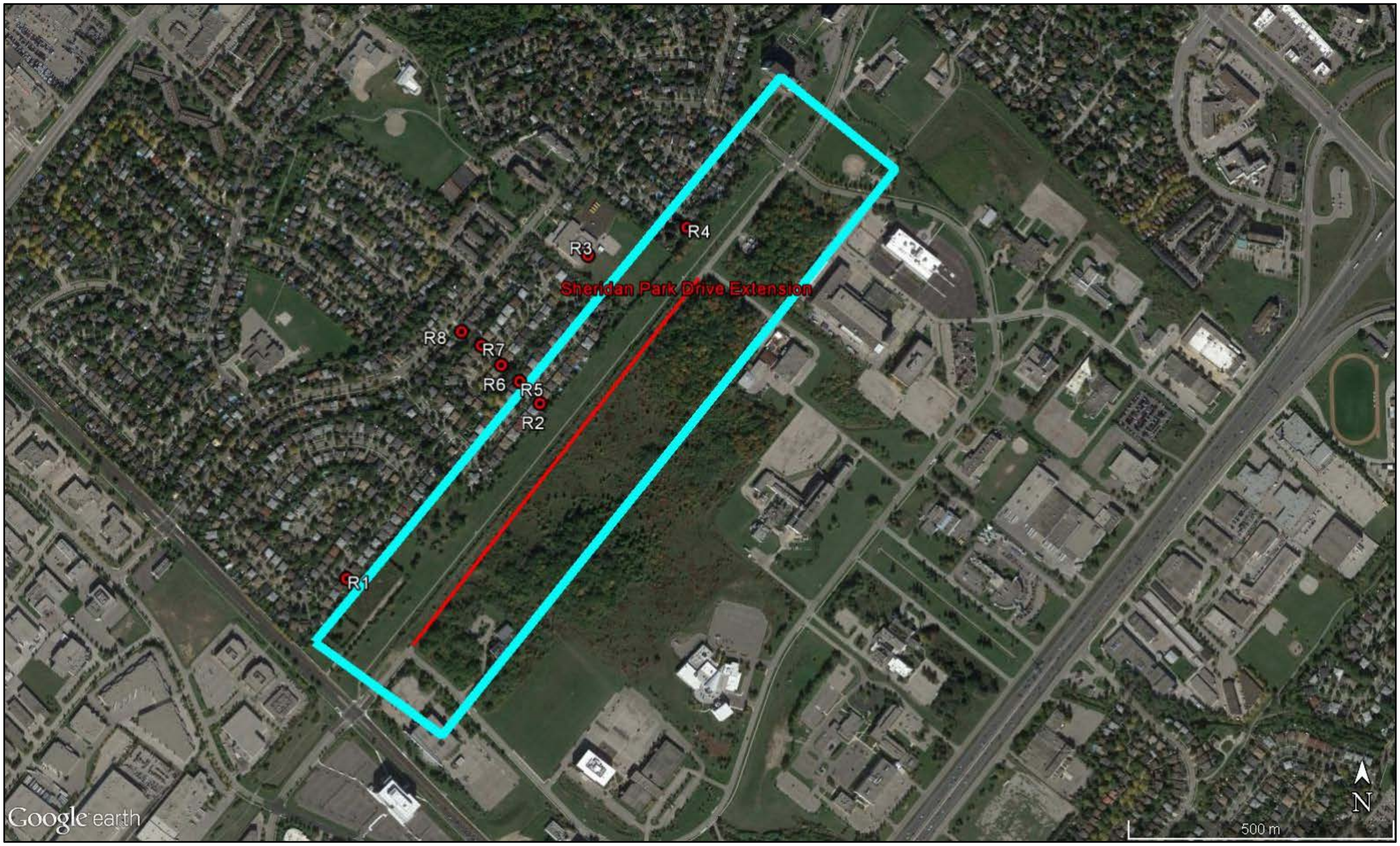
There are residences to the north of the Study Area, which are part of the Sheridan Homelands neighbourhood. In addition, Homelands Sr. Public School is located within this neighbourhood. Three residential properties and the school were selected as representative sensitive receptors within the Study Area. In addition, four residential properties were selected at varying setbacks from the proposed road extension to illustrate the change in ground level air quality concentration at varying distances. All sensitive receptor locations are summarized in Table 1 and shown in Figure 2.

Table 1: Sensitive Receptor Locations

ID	Address	Easting	Northing	Receptor Description
R1	2644 Hollington Crescent	607308	4819204	2 story house
R2	2494 Barcella Crescent	607657	4819529	2 story house
R3	2420 Homelands Drive	607741	4819801	Homelands Sr. Public School
R4	2356 Pyramid Crescent	607922	4819855	2 story house
R5	2493 Barcella Crescent	607619	4819568	2 story house
R6	2498 Glamworth Crescent	607585	4819598	2 story house
R7	2495 Glamworth Crescent	607549	4819633	2 story house
R8	2500 Homelands Drive	607511	4819658	1 story house

Receptors R1, R2, and R4 were selected to represent the closest group of receptors in the Study Area. Receptors R5 through R8 were selected northwest of R2 with increased separation distance from the Study Area in order to show the change in concentration level with the distance. Homeland Senior Public School was selected as a sensitive receptor R3.

Figure 2: Sensitive Receptors



1.3 Potential Pollutants

Transportation related contaminants are emitted due to fuel combustion, brake wear, tire wear, and road dust. According to City of Mississauga publication Air Quality Impact Assessment Guidance for Schedule C Road Improvements Class EAs (AQIA Guidance), the key pollutants released from transportation sources include Criteria Air Contaminants (CACs) and Volatile Organic Compounds (VOCs):

- Carbon Monoxide (CO).
- Nitrogen Oxides (NO_x).
- Total Suspended Particulate Matter (TSP).
- Particulate Matter 10 μm or less in diameter (PM_{10}).
- Particulate Matter 2.5 μm or less in diameter ($PM_{2.5}$).
- Selected VOCs (benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein).

CACs are the common pollutants found in ambient air associated with environmental effects such as smog and acid rain, and cause a variety of health effects. They include particulate matter (PM), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and ozone (O_3). CACs come from a variety of sources and are mainly the products of fossil fuel combustion and industrial processes.

VOCs are compounds that have a high vapour pressure and can easily evaporate into the air. They occur naturally and are also produced by human activities such as cleaning, painting, etc. They are common indoors, where concentrations are typically higher than outdoors.

1.4 Greenhouse Gas

Greenhouse Gases (GHGs) contribute to climate change by trapping heat within the earth's atmosphere. The major gases include carbon dioxide, methane, and nitrous oxide although there are many other gases that behave in a similar way. Burning of fossil fuels is the major source of GHGs.

A GHG impact assessment on a regional scale was completed as part of this AQIA. Total annual emissions were based on the annual vehicle kilometres travelled within the Study Area for the reference year 2031. Annual emissions were compared to the total provincial emissions due to transportation sector to estimate the magnitude of the effect of the Sheridan Park Drive extension. Provincial emissions were taken from the most recent Environment Canada National Inventory Report on Greenhouse Gases (Environment Canada, 2017) for the 2015 calendar year.

2.0 Existing Ambient Air Quality Conditions

2.1 Climate

The ambient air monitoring station in Oakville was used to assess the climate in the vicinity of the Study Area. The Study Area is located within the City of Mississauga close to the border with the Town of Oakville. Both Oakville and Mississauga have a humid continental climate characterized with warm and humid summers and cool winters. Local climate conditions were obtained from Environment and Climate Change Canada's (ECCC) Oakville Southeast Water Pollution Control Plant (WPCP) meteorological station (station ID 615N745, Latitude 43°29'00.000" N, Longitude 79°38'00.000" W). According to the Canadian Climate Normals (calendar years 1981 to 2010) for this station, the mean annual temperature is estimated at 8.1°C. The warmest month of the year is July with an average temperature of 20.9°C and the coldest month is January with an average temperature of -4.7°C. The Oakville Southeast WPCP meteorological station recorded a total average annual precipitation (snow and rain) of 801 mm, 726 mm of which was rain. Precipitation is distributed throughout the year, with most of the rain occurring between April and November. The maximum mean monthly rainfall is 78.3 mm and occurs in August. Climate Normals for the Oakville Southeast WPCP station are summarized in Table 2.

Table 2: Oakville Southeast WPCP Meteorological Station Climate Normals (1981-2010)

Meteorological Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average Temperature (°C)	-4.7	-3.9	0.1	6.4	12.3	17.7	20.9	20.1	15.6	9.3	4	-1.3	8.1
Daily Maximum Temperature (°C)	-0.4	0.6	4.7	11.3	17.9	23.2	26.3	25.2	20.9	14.3	8.3	2.8	12.9
Daily Minimum Temperature (°C)	-8.9	-8.3	-4.5	1.5	6.8	12.1	15.4	15	10.2	4.3	-0.2	-5.5	3.2
Rainfall (mm)	31.5	30.7	37.2	63.1	73.9	71	75.8	78.3	73.5	70	76.8	43.9	726
Snowfall (cm)	28.3	16.1	17.2	2.1	0	0	0	0	0	0	2.5	14.9	81
Precipitation (mm)	59.8	46.7	54.4	65.2	73.9	71	75.8	78.3	73.5	70	79.3	58.8	807

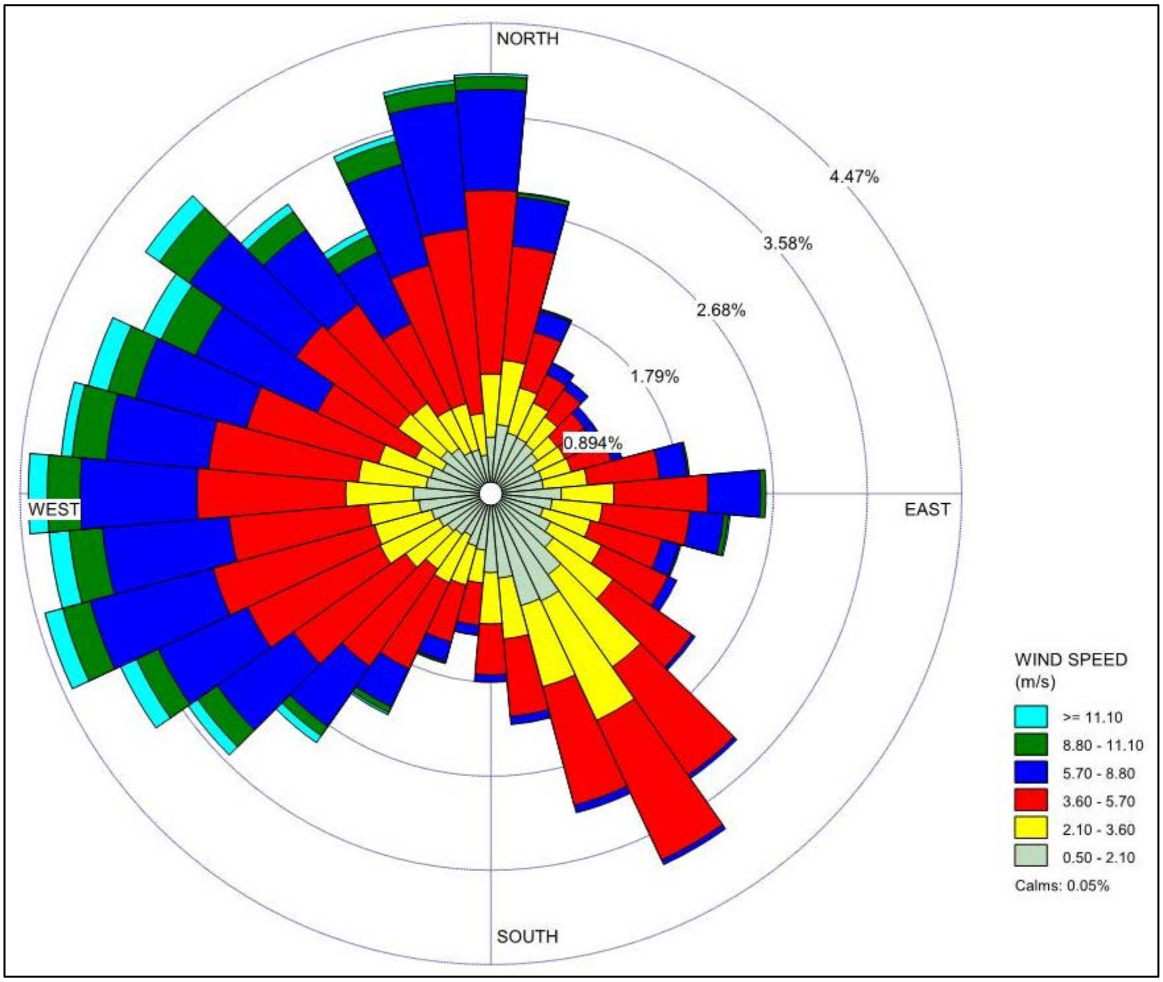
Station Climate ID: 615N745; Latitude: 43°29'00.000" N, Longitude: 79°38'00.000" W.
Elevation: 86.9 m

Source:http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=OAKVILLE+SOUTHEAST+WPCP&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=4846&dispBack=1

The MOECC provided the meteorological data set (station ID 61587) used in this AQIA. This data set covers the 2012 to 2016 calendar years. Based on the provided data, the average wind speed at the station is 4.45 m/s. The dominant wind directions are west and north. A wind rose depicting the relative frequency of wind directions including wind speeds is provided in Figure 3. The meteorological data set was used in the dispersion model (CAL3QHCR) to predict the concentration levels at various places.

The dispersion model starts with the emissions based on traffic and then predicts how those contaminants will be moved by the wind.

Figure 3: Wind Rose



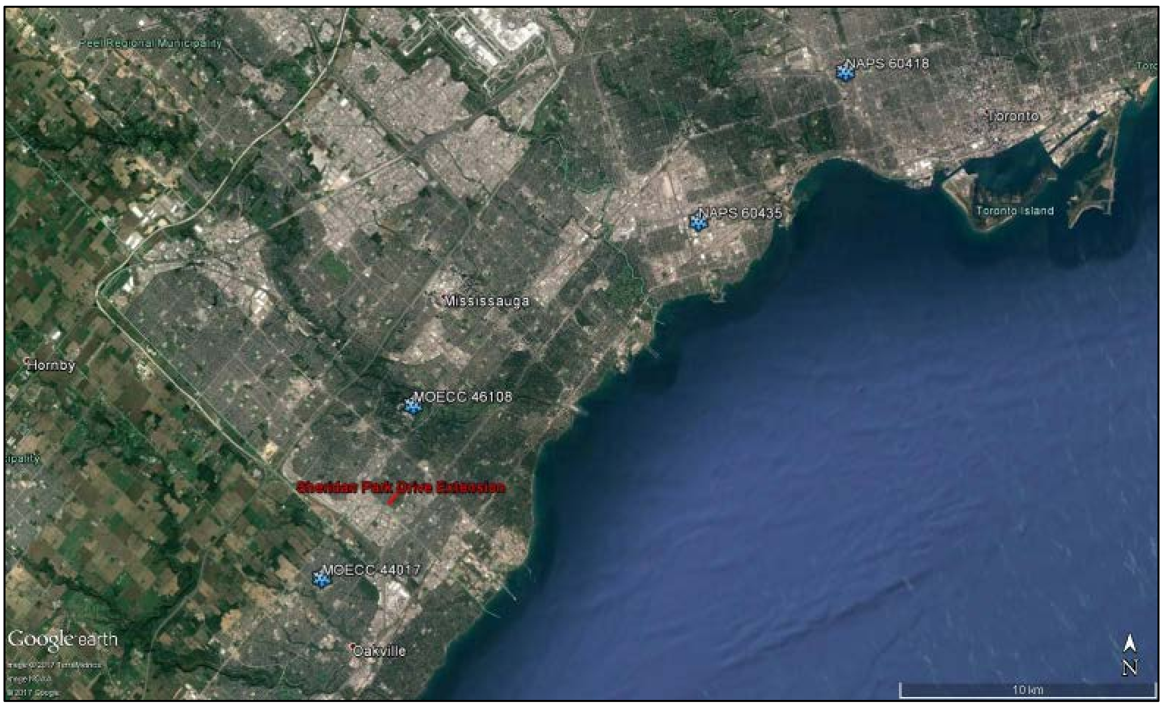
2.2 Air Quality

The MOECC and National Air Pollution Surveillance (NAPS) stations in close proximity to the Study Area were reviewed to ensure the most representative background concentration would be selected. Not all contaminant concentrations are available at every station; therefore, a total of three stations were selected to fully characterize the background concentrations in the vicinity of the Study Area. One MOECC station was selected to represent $PM_{2.5}$, NO_x, and CO. Two NAPS stations were selected to represent background concentrations for 1,3-butadiene, benzene, acetaldehyde, acrolein, and formaldehyde. The stations and the most recent five available data years are summarized in Table 3. The locations of the selected stations are shown in Figure 4.

Table 3: Ambient Monitoring Stations Summary

Contaminant	Station ID	Station Location	Year
$PM_{2.5}$	MOECC 46108	3359 Mississauga Rd. N., U of T Mississauga	2011-2015
NO_x	MOECC 46108	3359 Mississauga Rd. N., U of T Mississauga	2011-2015
CO	MOECC 44017	Eighth Line/Glenashton Drive, Halton Res	2001-2004
1,3-Butadiene	NAPS 60435	Toronto 461 Kipling Avenue	2011-2015
Benzene	NAPS 60435	Toronto 461 Kipling Avenue	2011-2015
Acetaldehyde	NAPS 60418	Toronto Perth/Ruskin (Junction Triangle)	2001-2005
Acrolein	NAPS 60418	Toronto Perth/Ruskin (Junction Triangle)	2001-2005
Formaldehyde	NAPS 60418	Toronto Perth/Ruskin (Junction Triangle)	2001-2005

Figure 4: MOECC and NAPS Air Quality Stations



The Study Area is in close proximity to two MOECC ambient monitoring stations – Oakville (4.2 km) and Mississauga (2.4 km). $PM_{2.5}$ and NO_x background concentrations were taken from the nearest Mississauga station. CO concentrations were available at Oakville station only and were limited to 2001-2004 calendar years. Summary of background concentrations 90th percentile[1], maximum and average values for all contaminants is provided in Table 4.

[1] 90th percentile of monitoring data is typically considered a conservative estimate of background air quality. 90th percentile is the level below which 90% of all the observed values occur.

Table 4: Background Data Summary

Contaminant	CAS#	Averaging period	90th Percentile	Max	Average
$PM_{2.5}$	-	24hr	14.17	39.50	7.43
		Annual	n/a	8.64	7.42
PM_{10}	-	24hr	26.33	73.15	13.76
TSP	-	24hr	47.22	131.67	24.76
		Annual	n/a	28.82	24.74
NO_x	11104-93-1	1hr	47.25	477.75	22.73
		24hr	40.91	175.51	22.71
		Annual	n/a	25.65	22.72
CO	630-08-0	1hr	935	3,865	611
		8hr	908	1,459	611
1,3-Butadiene	106-99-0	24hr	0.07	0.21	0.04
		Annual	n/a	0.049	0.045
Benzene	71-43-2	24hr	0.80	1.40	0.51
		Annual	n/a	0.57	0.52
Acetaldehyde	75-07-0	0.5hr	n/a	n/a	n/a
		24hr	3.30	5.58	1.95
Acrolein	107-02-8	1hr	n/a	n/a	n/a
		24hr	0.20	1.17	0.12
Formaldehyde	50-00-0	24hr	6.48	11.24	3.66

Notes:
- Acrolein concentrations are provided on a daily basis so hourly values cannot be determined.
- 5 annual values are insufficient to calculate an annual 90th percentile value so the maximum value was used.
- PM_{10} concentrations based on $PM_{2.5}/PM_{10}$ ratio of 0.54 (Lall, 2004).
- TSP concentrations based on $PM_{2.5}$/TSP ratio of 0.30 (Lall, 2004).

Fine particulate matter is associated with major health effects compared to larger particles. Due to their small size, they can penetrate deep into lungs. MOECC monitoring stations record only background concentrations of $PM_{2.5}$. Since PM_{10} and TSP background concentrations were not available, values were calculated based on monitored $PM_{2.5}$ concentrations. Mean ratios of $PM_{2.5}/PM_{10}=0.54\pm0.14$, and $PM_{2.5}/TSP=0.30\pm0.11$ derived by Lall, et al (2004) were used to calculate 90^{th} percentile, maximum and average concentrations of PM_{10} and TSP. This method is used throughout the province to predict PM_{10} and TSP concentrations when the only measured values are for $PM_{2.5}$. The MOECC considers this method to be acceptably accurate.

2.3 Air Quality Assessment Criteria

Ontario regulates contaminants released into the environment in order to limit and even reduce concentrations of harmful substances in the atmosphere and to protect the environment and human health. As a part of this regulation, the MOECC has developed a number of sources of criteria as described below.

Ambient air criteria for contaminants associated with road traffic emissions were taken from Ontario's Ambient Air Quality Criteria (AAQC) developed by the MOECC and is summarized in Table 5. According to the MOECC "an AAQC is a desirable concentration of a contaminant in air, based on protection against adverse effects on health or the environment". The Canadian Ambient Air Quality Standards (CAAQS) coming into effect in 2020 were used for $PM_{2.5}$. The Canadian National Ambient Air Quality Objectives (NAAQO) for maximum desired level was used as an annual nitrogen dioxides criterion.

Table 5: Representative Contaminants and Air Quality Criteria

Contaminant	CAS#	Averaging Period	AAQC[1] ($\mu g/m^3$)	CAAQS[2] ($\mu g/m^3$)	NAAQO[3] ($\mu g/m^3$)	Limiting Effect
CO	630-08-0	1hr	36,200			Heath
		8hr	15,700			Heath
NO_x	10102-44-0	1hr	400			Heath
		24hr	200			Heath
		Annual			60	Heath
$PM_{2.5}$	-	24hr	30	27		
		Annual		8.8		
PM_{10}	-	24hr	50			
TSP	-	24hr	120			Visibility
		Annual	60			Visibility
1-3 Butadiene	106-99-0	24hr	10			Health
		Annual	2			Health
Acetaldehyde	75-07-0	0.5hr	500			Health
		24hr	500			Health
Acrolein	107-02-8	1hr	4.5			Health
		24hr	0.4			Heath
Benzene	71-43-2	24hr	2.3			Heath
		Annual	0.45			Heath
Formaldehyde	50-00-0	24hr	65			Heath

Notes:

[1] Ontario's Ambient Air Quality Criteria

[2] Canadian Ambient Air Quality Standards

[3] Canadian National Ambient Air Quality Objective

NO_x is the sum of nitrogen dioxide (NO_2) and nitric oxide (NO). Emissions of NO_x consist mainly of NO; however, NO is converted to NO_2 in the ambient air. NO_2 has an adverse effect at much lower concentrations than NO according to Ontario's Ambient Air Quality Criteria publication. Therefore, the AAQC is based on the NO_2 concentration. As a conservative assumption for this assessment, it was assumed that all NO is converted to NO_2.

3.0 Local Air Quality Assessment

Transportation is one of the largest sources of air pollution in Canada according to Environment and Climate Change Canada (ECCC).

The exhaust from the vehicles due to fuel combustion contains a number of pollutants that might be harmful to human health and the environment. The main contaminants include particulate matter, nitrogen oxides, and carbon monoxide. However, there are many more contaminants associated with transportation. The magnitude of the emissions and the predicted change of those emission ns due to proposed road extension were also evaluated in this AQIA.

3.1 Methodology

Following the MTO Guide, two scenarios were assessed for Sheridan Park Drive extension, namely the Future No Build and Future Build scenarios. Those scenarios assess the future impact without the extension and future impact with the extension. The AQIA Guidance requires the assessment of the Current and Future Build scenarios. These three scenarios are referred to as “Current”, “Future Build” and “Future No Build”. The future date used in the assessment is 2031. The scenarios use the following information:

- Current (2017) Scenario:
  - Existing traffic volumes
  - Existing roads
- Future No Build (2031) Scenario:
  - Projected 2031 traffic volumes on all roads around the Study Area if the extension is not built
  - Existing roads
- Future Build (2031) Scenario:
  - Projected 2031 traffic volumes on all roads around the Study Area if the extension is built
  - Existing roads
  - Sheridan Park Drive extension

Ground level contaminant concentrations were predicted for all contaminants of interest for the three scenarios. Predicted values were added to the existing background ambient concentrations. The resulting cumulative concentrations were compared to the applicable criteria and the magnitude of the impact of the proposed road extension was determined.

For the future 2031 scenarios, background concentrations were assumed to remain the same. Based on data collected at the MOECC ambient monitoring stations, concentrations of the key pollutants such as NO_x, CO, $PM_{2.5}$, and some VOCs such as benzene decreased over the last 10 years between 11% and 62% (MOECC, 2017). Assuming this trend will continue in the future, using current background values for the future scenario is a conservative approach.

3.2 Emission Factors

Transportation related emissions are associated with fuel combustion, brake wear, tire wear, as well as re-suspended road dust.

Emission factors for fuel combustion, brake wear and tire wear were estimated using Motor Vehicle Emission Simulator (MOVES) developed by the United States Environmental Protection Agency (US EPA) Office of Transportation and Air Quality (OTAQ). This emission modeling system estimates emissions for mobile sources covering a broad range of pollutants and conditions including the variety of vehicles (cars vs. trucks), ambient temperature, and vehicle speed. The summary of emission factors is provided in Appendix A. Weighted emission factors were derived based on the speed limit and vehicle type distribution for each road segment.

MOVES does not provide an emission factor for TSP. An exhaust emission factor for PM_{10} was used for TSP as, according to the US EPA, based on emissions test results, more than 97% of tailpipe particulate matter is PM_{10} or less.

Particulate emissions due to re-suspended road dust were estimated using the latest US EPA methodology for paved roads (US EPA, 2011). As a result, the total emission factors for particulate matter were a sum of tail pipe and road dust emission factors.

3.3 Traffic

Traffic volumes were provided for the morning (AM) and evening (PM) rush hours as well as annual average daily traffic (AADT). Based on the change between existing and future forecasted traffic volumes on the roads closest to the proposed extension, it was determined that AM rush hour traffic was expected to increase more than PM rush hour traffic. Due to the higher expected traffic volume increase, the AM rush hour represents the worst case scenario and was selected as a basis for this assessment.

The percentage of heavy vehicles was derived from the hourly vehicle counts on all surrounding roads. It was assumed that this percentage will remain the same in the future scenarios.

There are two intersections controlled by traffic lights within the Study Area – Winston Churchill Blvd. / Homelands Dr. and Winston Churchill Blvd. / Sheridan Park Dr. Existing signal timings for both intersections were utilized.

3.4 Air Dispersion Modelling

Dispersion modelling to determine maximum pollutant concentration was completed in accordance with the MTO Guide. The modelled impacts of contaminant emissions are assessed as 1-hour, 8-hour, 24-hour, and annual concentrations to match the appropriate criteria.

The appropriate model to assess the maximum impact is the US EPA CAL3QHCR model. The CAL3QHCR model estimates ground level air pollutant concentrations near roads from both moving and idling vehicles.

A site-specific meteorological data set was provided by the MOECC for use with this AQIA. The CAL3QHCR ready meteorological data set covers the dates from January 1, 2012 to December 31, 2016.

The hourly data includes many factors, which affect the dispersion of air contaminants including wind speed, wind direction, temperature, mixing height and stability category.

As explained in Section 1.2, eight sensitive receptors were selected for this assessment. The first four sensitive receptors (R1-R4) where selected into order to assess the impact to air quality along the length of the Study Area while the last four sensitive receptors (R5-R8) were selected in order show the change in air quality impact as the distance to the proposed road extension increases.

The model is developed to incorporate the area road network and associated characteristics such as road width, traffic volume, travel speed, etc. In addition, the model assumes idling during the red phase of the signal cycle.

3.5 Modelling Results

The impact of the proposed Sheridan Park Drive extension was assessed based on the predicted ground level concentrations at the selected sensitive receptors within the Study Area as shown in Figure 2 and existing background concentrations as monitored at MOECC and NAPS stations.

Predicted future ground level concentrations at the most impacted receptors are summarized for each contaminant and averaging period in Table 6 through Table 8. Detailed results are provided in Appendix C. The most impacted receptor is the receptor with the highest predicted ground level concentration. This appears to be either R1 or R8 depending on the contaminant. Both receptors are the ones nearest to the existing roads. R1 is the closest receptor to Winston Churchill Boulevard and is the most impacted by Winston Churchill Boulevard. R8 is the nearest receptor to Homelands Drive and the major impact on air quality at this receptor is due to proximity to Homelands Drive.

The results are presented by contaminant and include background concentration (90^{th} percentile), predicted concentration at the most impacted receptor and cumulative concentrations (background plus predicted concentration). The predicted and cumulative concentrations are compared against applicable criteria.

Table 6: Maximum Predicted Concentrations – Current Scenario

Contaminant	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Most Impacted Receptor	Current Predicted Concentration (µg/m³)	Current Predicted % of Criteria	Current Cumulative Concentration (µg/m³)	Current Cumulative % of criteria
CO	1hr	36,200	934.80	R1	36.98	0.10%	971.78	2.7%
	8hr	15,700	907.73	R1	28.61	0.18%	936.34	6.0%
NO_x	1hr	400	47.25	R8	9.04	2.26%	56.29	14.1%
	24hr	200	40.91	R1	3.74	1.87%	44.65	22.3%
	Annual	60	25.65	R1	1.32	2.19%	26.96	44.9%
$PM_{2.5}$	24hr	27	14.17	R8	0.76	2.80%	14.92	55.3%
	Annual	8.8	8.64	R8	0.30	3.40%	8.94	101.6%
PM_{10}	24hr	50	26.23	R8	2.74	5.48%	28.97	57.9%
TSP	24hr	120	47.22	R8	13.90	11.58%	61.12	50.9%
	Annual	60	28.82	R8	5.38	8.96%	34.19	57.0%
1,3-Butadiene	24hr	10	0.07	R1	0.0018	0.02%	0.08	0.8%
	Annual	2	0.05	R8	0.0008	0.04%	0.05	2.5%
Acetaldehyde	0.5hr	500	3.30	R8	0.028	0.01%	3.32	0.7%
	24hr	500	3.30	R1	0.011	0.00%	3.31	0.7%
Acrolein	1hr	4.5	0.20	R8	0.0038	0.08%	0.21	4.6%
	24hr	0.4	0.20	R8	0.0012	0.30%	0.21	51.4%
Benzene	24hr	2.3	0.80	R1	0.014	0.62%	0.81	35.4%
	Annual	0.45	0.57	R1	0.005	1.09%	0.58	128.1%
Formaldehyde	24hr	65	6.48	R1	0.018	0.03%	6.50	10.0%

Notes:
- 90^{th} percentile used as background concentrations for 1-hr, 8-hr, and 24-hr averaging periods.
- Maximum annual values use as background concentrations for annual averaging periods.
- 24-hour 90^{th} percentile used as background concentrations for acrolein 1-hour and acetaldehyde 0.5-hr averaging periods because measured data is only reported for the 24 hour period.

Table 7: Maximum Predicted Concentrations – Future No Build Scenario

Contaminant	Averaging Period	Criteria (µg/m^3)	Background Concentration (µg/m^3)	Most Impacted Receptor	Build Predicted Concentration (µg/m^3)	Future No Build Predicted % of Criteria	Future No Build Cumulative Concentration (µg/m^3)	Future No Build Cumulative % of criteria
CO	1hr	36,200	934.80	R1	51.63	0.14%	986.43	2.7%
	8hr	15,700	907.73	R1	37.96	0.24%	945.69	6.0%
NO_x	1hr	400	47.25	R8	11.82	2.95%	59.07	14.8%
	24hr	200	40.91	R1	4.91	2.46%	45.82	22.9%
	Annual	60	25.65	R1	1.71	2.84%	27.35	45.6%
$PM_{2.5}$	24hr	27	14.17	R8	1.01	3.74%	15.18	56.2%
	Annual	8.8	8.64	R8	0.40	4.52%	9.04	102.8%
PM_{10}	24hr	50	26.23	R8	3.67	7.33%	29.90	59.8%
TSP	24hr	120	47.22	R8	18.61	15.51%	65.83	54.9%
	Annual	60	28.82	R8	7.16	11.94%	35.98	60.0%
1,3-Butadiene	24hr	10	0.07	R1	0.0024	0.02%	0.08	0.8%
	Annual	2	0.05	R8	0.0010	0.05%	0.05	2.5%
Acetaldehyde	0.5hr	500	3.30	R8	0.036	0.01%	3.33	0.7%
	24hr	500	3.30	R1	0.014	0.00%	3.31	0.7%
Acrolein	1hr	4.5	0.20	R8	0.0050	0.11%	0.21	4.6%
	24hr	0.4	0.20	R8	0.0016	0.40%	0.21	51.5%
Benzene	24hr	2.3	0.80	R1	0.019	0.82%	0.82	35.6%
	Annual	0.45	0.57	R1	0.006	1.42%	0.58	128.4%
Formaldehyde	24hr	65	6.48	R1	0.024	0.04%	6.51	10.0%

Notes:
- 90th percentile used as background concentrations for 1-hr, 8-hr, and 24-hr averaging periods.
- Maximum annual values use as background concentrations for annual averaging periods.
- 24-hour 90th percentile used as background concentrations for acrolein 1-hour and acetaldehyde 0.5-hr averaging periods because measured data is only reported for the 24 hour period.

Table 8: Maximum Predicted Concentrations – Future Build Scenario

Contaminant	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Most Impacted Receptor	Future Build Predicted Concentration (mg/m3)	Future Build Predicted % of Criteria	Future Build Cumulative Concentration (mg/m3)	Future Build Cumulative % of criteria
CO	1hr	36,200	934.80	R1	53.94	0.15%	988.74	2.7%
	8hr	15,700	907.73	R1	39.33	0.25%	947.06	6.0%
NO_x	1hr	400	47.25	R1	10.70	2.68%	57.95	14.5%
	24hr	200	40.91	R1	5.15	2.57%	46.05	23.0%
	Annual	60	25.65	R1	1.75	2.91%	27.40	45.7%
$PM_{2.5}$	24hr	27	14.17	R8	0.81	2.99%	14.97	55.5%
	Annual	8.8	8.64	R8	0.33	3.76%	8.98	102.0%
PM_{10}	24hr	50	26.23	R8	2.92	5.84%	29.15	58.3%
TSP	24hr	120	47.22	R8	14.81	12.34%	62.03	51.7%
	Annual	60	28.82	R8	5.93	9.88%	34.74	57.9%
1,3-Butadiene	24hr	10	0.07	R1	0.0026	0.03%	0.08	0.8%
	Annual	2	0.05	R1	0.0008	0.04%	0.05	2.5%
Acetaldehyde	0.5hr	500	3.30	R8	0.031	0.01%	3.33	0.7%
	24hr	500	3.30	R1	0.015	0.00%	3.31	0.7%
Acrolein	1hr	4.5	0.20	R8	0.0041	0.09%	0.21	4.6%
	24hr	0.4	0.20	R1	0.0013	0.33%	0.21	51.4%
Benzene	24hr	2.3	0.80	R1	0.020	0.86%	0.82	35.6%
	Annual	0.45	0.57	R1	0.007	1.47%	0.58	128.5%
Formaldehyde	24hr	65	6.48	R1	0.025	0.04%	6.51	10.0%

Notes:
- 90th percentile used as background concentrations for 1-hr, 8-hr, and 24-hr averaging periods.
- Maximum annual values use as background concentrations for annual averaging periods.
- 24-hour 90th percentile used as background concentrations for acrolein 1-hour and acetaldehyde 0.5-hr averaging periods because measured data is only reported for the 24 hour period.

Table 6 shows the maximum impact of the current traffic on the various receptors including the amount contributed by the roads and background levels. Table 7 shows the same information for the future scenario assuming that the extension is not built (Future No Build). Table 8 shows the same information for the future scenario assuming that the extension is built (Future Build).

Table 6 through Table 8 show that the contribution from all the roads in the area including the proposed extension is relatively small compared to the background values.

The cumulative concentrations predicted within the Study Area for all contaminants are well below their applicable criteria with two exceptions as shown in Table 6 ($PM_{2.5}$, annual and benzene, annual).

The annual $PM_{2.5}$ concentration is predicted to be slightly above the criteria. However, the annual concentration of $PM_{2.5}$ in the ambient air quality is at 98% of the criterion. Since the prediction of annual $PM_{2.5}$ concentration is a result of adding the maximum background value to the maximum modelled value, the contribution of $PM_{2.5}$

contaminants due the current traffic and the traffic based on the Future No Build and Future Build Scenario is a much smaller portion of the cumulative concentration. The $PM_{2.5}$ annual concentration is slightly above the criterion for the Current[2], Future No Build[3], and Future Build[4] scenarios at R7 and R8. The exceedance is the highest for the Future No Build scenario at R7 and R8. The concentrations for this contaminant are predicted to be below criteria for all other receptors for all scenarios as shown in Table C 7, Table C 8, and Table C 9 in Appendix C.

According to Air Quality in Ontario 2015 Report (MOECC, 2017), fine particulate matter decreased 25% from 2006 to 2015. Considering the general trend in Ontario, average annual background concentrations and the very small contribution due to the roads within the Study Area it is reasonable to expect that cumulative $PM_{2.5}$ concentrations will be below their annual criteria within the Study Area in the future.

Similar to $PM_{2.5}$, annual benzene concentrations exceed the annual criteria. However, in this case the annual concentration of benzene in the ambient air quality exceeds the criterion. The contribution of benzene concentrations due to the current traffic and the traffic based on the Future No Build and Future Build Scenarios is a much smaller portion of the cumulative concentration and the difference between the Future No Build and Future Build Scenarios is negligible.

The elevated background benzene concentration is not isolated to the Sheridan Park area, but observed across the Province of Ontario. Improvements to address benzene levels are being dealt with at a national and provincial level that in turn improves air quality at a local level. Local reductions have a limited effect as a result reducing benzene concentrations requires a provincial solution. According to Air Quality in Ontario 2015 Report (MOECC, 2015), over the 10-year period from 2005 to 2014, benzene concentrations have decreased by 42%. A review of the National Pollutant Release Inventory (NPRI) data did not show any significant industrial/commercial operations emitting benzene in the vicinity of the Study Area.

Through initiatives to make buildings more green, improvements on vehicle emissions, and as improvements to other fuel burning equipment (such as high efficiency furnaces) continue to be made, it is expected that benzene levels should continue to drop. The City as a whole is encouraging sustainable development and growth. By providing alternative routes, which an extension to Sheridan Park Drive would do, the City is hoping to assist in lessening the environmental impact by minimizing congestion and vehicle idling throughout the City.

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[2] Appendix C, Table C 7 R1=100.0 %, R7 = 100.0 %, and R8 = 101.6 %,
[3] Appendix C, Table C 8 R1=100.6 %, R7 = 100.5 %, and R8 = 102.8 %,
[4] Appendix C, Table C 9 R1=100.6 %, R7 = 100.3 %, and R8 = 102.0 %,

3.6 Air Quality during Construction Phase

Road construction generally consists of excavation of soil, import and compaction of materials, and paving. Therefore, air emissions associated with the construction of road infrastructure are typically limited to the following:

- Fugitive dust emissions due to soil excavation and filling activities.
- Fugitive dust emissions due to the stockpiling of soil and other friable construction materials.
- Fugitive dust emissions due to the transport of friable fill materials via dump trucks.
- Emissions resulting from the combustion engines of construction equipment.

The Best Management Practices (BMP) would help to mitigate potential air quality effects associated with the construction of this road extension, including but not limited to the following:

- Dust suppression measures (e.g., application of water wherever appropriate, or the use of approved non-chloride chemical dust suppressants, where the application of water is not suitable) as needed to control fugitive dust emissions in accordance with the Cheminfo Services Inc. March 2005 publication "Best Practices for the Reduction of Air Emissions From Construction and Demolition Activities".
- Stockpiling of soil and other friable materials in locations that are less exposed to wind (e.g., protected from the wind by suitable barriers or wind fences/screens).
- Use of dump trucks with retractable covers for the transport of friable fill materials.
- Washing of equipment and use of mud mats where practical at construction site exits to limit the migration of soil and dust off-site.
- Use of erosion and sedimentation control measures such as silt fence and erosion control blankets to address areas with temporary unstabilized soil.
- Ensuring that all construction vehicles, machinery, and equipment are equipped with current emission controls, and in a state of good repair.

The potential air quality effects associated with the construction stage of Sheridan Park Drive extension are expected to be temporary and localized to the areas adjacent the corridor. Effects are to be reduced to the extent possible through implementation of construction Best Management Practices.

4.0 Regional Air Quality Assessment

The assessment of emission impacts associated with the proposed extension of Sheridan Park Drive on a regional scale was based on the annual GHG emissions. Annual emissions were calculated using emission factors summarized in Table 9.

Table 9: Emission Factors for Energy Mobile Combustion Sources

Vehicles	Emission Factors (g/L fuel)		
	CO_2	CH_4	N_2O
Gasoline	2,316	0.33	0.28
Diesel	2,690	0.10	0.15

Source:
National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada. Part 2 Table A6-12: Emission Factors for Energy Mobile Combustion Sources.

Typical vehicle fuel consumption was taken from the Summary Report of Canadian Vehicle Survey (Natural Resources Canada, 2009). Auto manufacturers are continuously looking for ways to improve their vehicle fuel efficiency; therefore, the actual emissions for both current and future scenarios are expected to be even lower than the calculated 2009 fuel consumption. An average light vehicle (gasoline) was assumed to consume 10.7 L/100 km. An average truck (diesel) was assumed to consume 28.9 L/100 km. Based on AADT and length of segment of each road within the Study Area; total kilometers travelled were estimated to calculate GHG emissions. Annual expected GHG emissions for existing and future conditions are summarized in Table 10. Annual concentrations for all GHGs including total CO_2 equivalent, are estimated to be well below 0.1% of the provincial GHG levels associated with road transportation sector. Therefore, the impact of the proposed road extension on GHG emissions is negligible.

Table 10: Annual GHG Emissions within the Study Area

Contaminant	CO_2	CH_4	N_2O	Total CO_2e
Current Scenario (t/yr)	4,559	0.6	0.5	4,728
Future Scenario No Build (t/yr)	5,672	0.8	0.6	5,883
Increase from Current to Future No Build (t/yr)	1,114	0.2	0.1	1,156
Future Scenario Build (t/yr)	5,226	0.7	0.6	5,420
Increase from Current to Future Build (t/yr)	668	0.1	0.1	693
Increase from No Build to Build2 (t/yr)	(446)	-0.1	-0.1	(463)
Total Provincial1 (t/yr)	47,300,000	3000.0	3000.0	48,300,000
Current Scenario (%)	0.010%	0.020%	0.017%	<0.01%
Future No Build Scenario (%)	0.012%	0.025%	0.021%	0.012%
Future Build Scenario (%)	0.011%	0.023%	0.020%	0.011%

[1] National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada. Part 3, Table A11-13: 2015 GHG Emissions Summary for Ontario.
2 Negative values indicate that the Build Scenario produces fewer emissions than the No Build Scenario.

Detailed GHG calculations for both scenarios are provided in Appendix D.

5.0 Conclusions

The results of the dispersion modelling show that the future predicted air quality levels at sensitive receptor locations (residential properties and the Homelands Senior Public School) were all below the MOECC criteria with the exception of benzene, which already exceeds the criteria based on background air quality.

The Air Quality Impact Assessment shows that change in concentration of benzene at any location in the Study Area is negligible.

The results also show that there is a negligible difference in future predicted air quality levels at sensitive receptor locations with or without the Sheridan Park Drive road extension.

The selected sensitive receptors were chosen to represent all the receptors in the vicinity of the Study Area. All other receptors are expected to experience the same or smaller impact due to the proposed road extension.

Potential air quality effects associated with the construction stage is expected to be temporary and localized to the surrounding area. Emissions associated with construction are typically limited to fugitive dust emissions and emissions associated with mobile equipment. During the construction period, people living next to the construction sites might experience elevated dust concentrations.

It is recommended to monitor dust levels during construction stage and apply mitigation measures, such as water application, if needed to reduce the effect on surrounding residences.

6.0 References

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Appendix A

BURNSIDE

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Appendix A

Traffic Volumes

Table A 1: Current and Future Traffic Volumes

Road Description				Current Scenario			Future No Build Scenario			Future Build Scenario		
Road	Posted Speed (km/h)	Percent Cars (%)	Percent Large Vehicles (%)	AM Peak Hour (vph)	PM Peak Hour (vph)	Daily Traffic (vpd)	AM Peak Hour (vph)	PM Peak Hour (vph)	Daily Traffic (vpd)	AM Peak Hour (vph)	PM Peak Hour (vph)	Daily Traffic (vpd)
Winston Churchill Blvd. N of Homelands Dr.	60	97	3	2,623	2,575	24,000	3,250	3,200	32,250	3,300	3,240	32,700
Winston Churchill Blvd.	60	97	3	2,831	2,949	28,900	3,570	3,700	36,350	3,640	3,760	37,000
Winston Churchill Blvd. S of Sheridan Park Dr.	60	97	3	2,604	3,366	29,850	3,750	4,230	39,900	3,800	4,290	40,450
Homelands Dr. W.	50	94	6	454	605	5,300	530	690	6,100	460	580	5,200
Homelands Dr.	40	94	6	454	605	5,300	530	690	6,100	460	580	5,200
Homelands Dr. E	50	94	6	335	294	3,100	450	340	3,950	350	260	3,050
Sheridan Park Dr. W	50	99	1	785	562	6,700	1,050	730	8,900	1,200	880	2,200
Sheridan Park Dr. Extension	50	99	1	0	0	0	0	0	0	209	208	2,050
Sheridan Park Dr. EW	50	99	1	47	53	500	59	64	600	0[1]	0[1]	0[1]
Sheridan Park Dr. EE	50	96	4	785	639	7,100	950	780	8,650	1,040	860	9,500
Speakman Dr. W	50	99	1	785	562	6,700	1,050	730	8,900	1,050	880	2,200
Speakman Dr. E	50	99	1	590	441	4,650	700	530	6,150	650	490	5,700

[1] *Sheridan Park Dr. EW is considered part of Sheridan Park Dr. Extension in this scenario*

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Appendix B

Emission Factors

Table B 1: Emission Factors for Free Flow Links

Road	Weighted Emission Factors (g/VMT)									
	CO	NOx	PM2.5	PM10	TSP	1-3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde
Winston Churchill Blvd. N of Homelands Dr.	1.95	0.41	0.017	0.019	0.019	0.00024	0.0011	0.00013	0.0015	0.0019
Winston Churchill Blvd.	1.95	0.41	0.017	0.019	0.019	0.00024	0.0011	0.00013	0.0015	0.0019
Winston Churchill Blvd. S of Sheridan Park Dr.	1.95	0.41	0.017	0.019	0.019	0.00024	0.0011	0.00013	0.0015	0.0019
Homelands Dr. W.	2.13	0.58	0.023	0.026	0.026	0.00030	0.0018	0.00025	0.0018	0.0035
Homelands Dr.	2.27	0.63	0.025	0.027	0.027	0.00035	0.0021	0.00029	0.0020	0.0040
Homelands Dr. E	2.13	0.58	0.023	0.026	0.026	0.00030	0.0018	0.00025	0.0018	0.0032
Sheridan Park Dr. W	2.15	0.34	0.015	0.017	0.017	0.00024	0.0008	0.00007	0.0016	0.0013
Sheridan Park Dr. extension	2.15	0.34	0.015	0.017	0.017	0.00024	0.00081	0.00007	0.0016	0.0013
Sheridan Park Dr. EW	2.15	0.34	0.015	0.017	0.017	0.00024	0.0008	0.00007	0.0016	0.0013
Sheridan Park Dr. EE	2.14	0.49	0.020	0.022	0.022	0.00028	0.0014	0.00018	0.0017	0.0029
Speakman Dr. W	2.15	0.34	0.015	0.017	0.017	0.00024	0.0008	0.00007	0.0016	0.0013
Speakman Dr. E	2.15	0.34	0.015	0.017	0.017	0.00024	0.0008	0.00007	0.0016	0.0013

Table B 2: Emission Factors for Queue Links

Road	Weighted Emission Factors (g/VMT)									
	CO	NOx	PM2.5	PM10	TSP	1-3 Butadiene	Acetaldehyde	Acrolein	Benzene	Formaldehyde
Winston Churchill Blvd. N of Homelands Dr.	8.253	1.636	0.083	0.092	0.092	0.002	0.009	0.001	0.010	0.016
Winston Churchill Blvd. S of Homelands Dr.	8.253	1.636	0.083	0.092	0.092	0.002	0.009	0.001	0.010	0.016
Winston Churchill Blvd. N of Sheridan Park Dr.	8.253	1.636	0.083	0.092	0.092	0.002	0.009	0.001	0.010	0.016
Winston Churchill Blvd. S of Sheridan Park Dr.	8.253	1.636	0.083	0.092	0.092	0.002	0.009	0.001	0.010	0.016
Homelands Dr. W.	8.360	2.698	0.121	0.133	0.133	0.002	0.014	0.002	0.011	0.029
Sheridan Park Dr. W	8.182	0.928	0.058	0.065	0.065	0.002	0.006	0.001	0.009	0.008

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Appendix C

Modelling Results

Appendix C

Table C 1: Predicted CO Ground Level Concentrations - Current Scenario

Receptor ID	1-hr					8-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	934.8	37.0	971.8	36,200	2.7%	907.7	28.6	936.3	15,700	6.0%
R2	934.8	20.3	955.1	36,200	2.6%	907.7	16.8	924.5	15,700	5.9%
R3	934.8	22.5	957.3	36,200	2.6%	907.7	12.8	920.5	15,700	5.9%
R4	934.8	17.6	952.4	36,200	2.6%	907.7	8.3	916.0	15,700	5.8%
R5	934.8	20.5	955.3	36,200	2.6%	907.7	17.4	925.2	15,700	5.9%
R6	934.8	21.9	956.7	36,200	2.6%	907.7	18.2	926.0	15,700	5.9%
R7	934.8	26.6	961.4	36,200	2.7%	907.7	19.7	927.4	15,700	5.9%
R8	934.8	36.3	971.1	36,200	2.7%	907.7	24.7	932.5	15,700	5.9%

Table C 2: Predicted CO Ground Level Concentrations - Future No Build Scenario

Receptor ID	1-hr					8-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	934.8	51.6	986.4	36,200	2.7%	907.7	38.0	945.7	15,700	6.0%
R2	934.8	28.2	963.0	36,200	2.7%	907.7	22.1	929.8	15,700	5.9%
R3	934.8	28.7	963.5	36,200	2.7%	907.7	16.6	924.4	15,700	5.9%
R4	934.8	22.6	957.4	36,200	2.6%	907.7	10.4	918.1	15,700	5.8%
R5	934.8	28.4	963.2	36,200	2.7%	907.7	23.0	930.8	15,700	5.9%
R6	934.8	28.6	963.4	36,200	2.7%	907.7	24.1	931.8	15,700	5.9%
R7	934.8	34.2	969.0	36,200	2.7%	907.7	25.9	933.6	15,700	5.9%
R8	934.8	47.3	982.1	36,200	2.7%	907.7	32.6	940.3	15,700	6.0%

Table C 3: Predicted CO Ground Level Concentrations - Future Build Scenario

Receptor ID	1-hr					8-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	934.8	53.9	988.7	36,200	2.7%	907.7	39.3	947.1	15,700	6.0%
R2	934.8	32.4	967.2	36,200	2.7%	907.7	24.1	931.8	15,700	5.9%
R3	934.8	27.5	962.3	36,200	2.7%	907.7	17.3	925.1	15,700	5.9%
R4	934.8	27.3	962.1	36,200	2.7%	907.7	13.0	920.7	15,700	5.9%
R5	934.8	31.5	966.3	36,200	2.7%	907.7	24.1	931.8	15,700	5.9%
R6	934.8	31.1	965.9	36,200	2.7%	907.7	24.5	932.2	15,700	5.9%
R7	934.8	31.0	965.8	36,200	2.7%	907.7	25.5	933.3	15,700	5.9%
R8	934.8	41.2	976.0	36,200	2.7%	907.7	29.8	937.5	15,700	6.0%

Table C 4: Predicted NOx Ground Level Concentrations - Current Scenario

Receptor ID	1-hr					24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	47.3	7.5	54.7	400	13.7%	40.9	3.7	44.6	200	22.3%	25.6	1.3	27.0	60	44.9%
R2	47.3	4.2	51.5	400	12.9%	40.9	1.4	42.3	200	21.2%	25.6	0.4	26.1	60	43.5%
R3	47.3	5.3	52.5	400	13.1%	40.9	1.4	42.3	200	21.2%	25.6	0.6	26.2	60	43.7%
R4	47.3	4.0	51.3	400	12.8%	40.9	1.1	42.1	200	21.0%	25.6	0.4	26.1	60	43.4%
R5	47.3	4.5	51.8	400	12.9%	40.9	1.5	42.4	200	21.2%	25.6	0.5	26.1	60	43.6%
R6	47.3	5.1	52.3	400	13.1%	40.9	1.6	42.6	200	21.3%	25.6	0.6	26.2	60	43.7%
R7	47.3	6.4	53.6	400	13.4%	40.9	1.9	42.8	200	21.4%	25.6	0.7	26.3	60	43.9%
R8	47.3	9.0	56.3	400	14.1%	40.9	2.6	43.5	200	21.8%	25.6	1.1	26.8	60	44.6%

Table C 5: Predicted NOx Ground Level Concentrations - Future No Build Scenario

Receptor ID	1-hr					24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	47.3	10.3	57.6	400	14.4%	40.9	4.9	45.8	200	22.9%	25.6	1.7	27.4	60	45.6%
R2	47.3	5.5	52.8	400	13.2%	40.9	1.8	42.8	200	21.4%	25.6	0.6	26.2	60	43.7%
R3	47.3	6.8	54.0	400	13.5%	40.9	1.8	42.7	200	21.3%	25.6	0.7	26.3	60	43.9%
R4	47.3	5.1	52.4	400	13.1%	40.9	1.4	42.3	200	21.2%	25.6	0.5	26.1	60	43.6%
R5	47.3	5.7	53.0	400	13.2%	40.9	2.0	42.9	200	21.4%	25.6	0.6	26.3	60	43.8%
R6	47.3	6.5	53.8	400	13.4%	40.9	2.1	43.1	200	21.5%	25.6	0.7	26.4	60	43.9%
R7	47.3	8.2	55.5	400	13.9%	40.9	2.5	43.4	200	21.7%	25.6	0.9	26.5	60	44.2%
R8	47.3	11.8	59.1	400	14.8%	40.9	3.5	44.4	200	22.2%	25.6	1.5	27.1	60	45.2%

Table C 6: Predicted NOx Ground Level Concentrations - Future Build Scenario

Receptor ID	1-hr					24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	47.3	10.6	57.9	400	14.5%	40.9	4.9	45.8	200	22.9%	25.6	1.7	27.3	60	45.5%
R2	47.3	5.6	52.9	400	13.2%	40.9	1.9	42.8	200	21.4%	25.6	0.6	26.2	60	43.7%
R3	47.3	6.2	53.4	400	13.4%	40.9	1.7	42.6	200	21.3%	25.6	0.6	26.3	60	43.8%
R4	47.3	4.8	52.1	400	13.0%	40.9	1.5	42.4	200	21.2%	25.6	0.5	26.2	60	43.6%
R5	47.3	5.5	52.8	400	13.2%	40.9	1.9	42.8	200	21.4%	25.6	0.6	26.3	60	43.8%
R6	47.3	6.0	53.2	400	13.3%	40.9	2.0	42.9	200	21.5%	25.6	0.7	26.3	60	43.8%
R7	47.3	7.3	54.6	400	13.6%	40.9	2.3	43.2	200	21.6%	25.6	0.8	26.4	60	44.1%
R8	47.3	10.1	57.4	400	14.3%	40.9	3.0	43.9	200	22.0%	25.6	1.2	26.9	60	44.8%

Table C 7: Predicted PM2.5 Ground Level Concentrations - Current Scenario

Receptor ID	1-hr					Annual				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	14.2	0.4	14.6	27	54.1%	8.6	0.2	8.8	8.8	100.0%
R2	14.2	0.2	14.4	27	53.3%	8.6	0.1	8.7	8.8	99.1%
R3	14.2	0.2	14.4	27	53.3%	8.6	0.1	8.7	8.8	99.2%
R4	14.2	0.2	14.3	27	53.1%	8.6	0.1	8.7	8.8	99.0%
R5	14.2	0.2	14.4	27	53.4%	8.6	0.1	8.7	8.8	99.2%
R6	14.2	0.3	14.5	27	53.6%	8.6	0.1	8.8	8.8	99.4%
R7	14.2	0.4	14.6	27	54.0%	8.6	0.2	8.8	8.8	100.0%
R8	14.2	0.8	14.9	27	55.3%	8.6	0.3	8.9	8.8	101.6%

Table C 8: Predicted PM2.5 Ground Level Concentrations - Future No Build Scenario

Receptor ID	1-hr					Annual				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	14.2	0.6	14.7	27	54.6%	8.6	0.2	8.8	8.8	100.6%
R2	14.2	0.3	14.4	27	53.5%	8.6	0.1	8.7	8.8	99.3%
R3	14.2	0.3	14.4	27	53.5%	8.6	0.1	8.7	8.8	99.4%
R4	14.2	0.2	14.4	27	53.3%	8.6	0.1	8.7	8.8	99.1%
R5	14.2	0.3	14.5	27	53.7%	8.6	0.1	8.8	8.8	99.5%
R6	14.2	0.4	14.6	27	53.9%	8.6	0.1	8.8	8.8	99.8%
R7	14.2	0.6	14.7	27	54.5%	8.6	0.2	8.8	8.8	100.5%
R8	14.2	1.0	15.2	27	56.2%	8.6	0.4	9.0	8.8	102.8%

Table C 9: Predicted PM2.5 Ground Level Concentrations - Future Build Scenario

Receptor ID	1-hr					Annual				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	14.2	0.6	14.7	27	54.6%	8.6	0.2	8.9	8.8	100.6%
R2	14.2	0.4	14.5	27	53.8%	8.6	0.1	8.8	8.8	99.6%
R3	14.2	0.3	14.5	27	53.7%	8.6	0.1	8.8	8.8	99.5%
R4	14.2	0.3	14.5	27	53.7%	8.6	0.1	8.8	8.8	99.5%
R5	14.2	0.3	14.5	27	53.7%	8.6	0.1	8.8	8.8	99.6%
R6	14.2	0.4	14.5	27	53.8%	8.6	0.1	8.8	8.8	99.8%
R7	14.2	0.5	14.6	27	54.2%	8.6	0.2	8.8	8.8	100.3%
R8	14.2	0.8	15.0	27	55.5%	8.6	0.3	9.0	8.8	102.0%

Table C 10: Predicted PM10 Ground Level Concentrations - Current Scenario

Receptor ID	24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	26.2	1.3	27.5	50	55.0%
R2	26.2	0.7	26.9	50	53.9%
R3	26.2	0.7	27.0	50	53.9%
R4	26.2	0.7	26.9	50	53.8%
R5	26.2	0.8	27.1	50	54.2%
R6	26.2	1.1	27.3	50	54.6%
R7	26.2	1.5	27.7	50	55.4%
R8	26.2	2.7	29.0	50	57.9%

Table C 11: Predicted PM10 Ground Level Concentrations - Future No Build Scenario

Receptor ID	24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	26.2	1.7	27.9	50	55.8%
R2	26.2	0.9	27.1	50	54.3%
R3	26.2	0.9	27.2	50	54.3%
R4	26.2	0.8	27.0	50	54.0%
R5	26.2	1.1	27.3	50	54.7%
R6	26.2	1.4	27.6	50	55.3%
R7	26.2	1.9	28.2	50	56.3%
R8	26.2	3.7	29.9	50	59.8%

Table C 12: Predicted PM10 Ground Level Concentrations - Future Build Scenario

Receptor ID	24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	26.2	1.7	27.9	50	55.9%
R2	26.2	1.2	27.4	50	54.8%
R3	26.2	1.1	27.3	50	54.6%
R4	26.2	1.2	27.4	50	54.8%
R5	26.2	1.1	27.3	50	54.7%
R6	26.2	1.2	27.4	50	54.9%
R7	26.2	1.6	27.8	50	55.7%
R8	26.2	2.9	29.2	50	58.3%

Table C 13: Predicted TSP Ground Level Concentrations - Current Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	47.2	5.9	53.1	120	44.2%	28.8	2.2	31.0	60	51.7%
R2	47.2	3.4	50.6	120	42.2%	28.8	1.2	30.0	60	50.0%
R3	47.2	3.6	50.8	120	42.3%	28.8	1.3	30.1	60	50.2%
R4	47.2	3.0	50.3	120	41.9%	28.8	1.0	29.8	60	49.7%
R5	47.2	4.2	51.4	120	42.9%	28.8	1.4	30.2	60	50.4%
R6	47.2	5.3	52.5	120	43.8%	28.8	1.8	30.6	60	51.0%
R7	47.2	7.3	54.5	120	45.4%	28.8	2.6	31.5	60	52.4%
R8	47.2	13.9	61.1	120	50.9%	28.8	5.4	34.2	60	57.0%

Table C 14: Predicted TSP Ground Level Concentrations - Future No Build Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	47.2	7.8	55.0	120	45.8%	28.8	2.9	31.7	60	52.8%
R2	47.2	4.4	51.6	120	43.0%	28.8	1.5	30.3	60	50.5%
R3	47.2	4.6	51.8	120	43.2%	28.8	1.6	30.4	60	50.7%
R4	47.2	3.8	51.0	120	42.5%	28.8	1.3	30.1	60	50.1%
R5	47.2	5.6	52.8	120	44.0%	28.8	1.8	30.7	60	51.1%
R6	47.2	7.1	54.3	120	45.2%	28.8	2.3	31.1	60	51.9%
R7	47.2	9.8	57.0	120	47.5%	28.8	3.5	32.3	60	53.8%
R8	47.2	18.6	65.8	120	54.9%	28.8	7.2	36.0	60	60.0%

Table C 15: Predicted TSP Ground Level Concentrations - Future Build Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	47.2	7.9	55.1	120	45.9%	28.8	3.0	31.8	60	53.0%
R2	47.2	5.7	52.9	120	44.1%	28.8	1.9	30.8	60	51.3%
R3	47.2	5.3	52.5	120	43.8%	28.8	1.7	30.6	60	50.9%
R4	47.2	5.9	53.1	120	44.2%	28.8	1.8	30.6	60	51.0%
R5	47.2	5.4	52.7	120	43.9%	28.8	2.0	30.8	60	51.3%
R6	47.2	5.9	53.1	120	44.2%	28.8	2.3	31.1	60	51.8%
R7	47.2	8.0	55.2	120	46.0%	28.8	3.1	31.9	60	53.2%
R8	47.2	14.8	62.0	120	51.7%	28.8	5.9	34.7	60	57.9%

Table C 16: Predicted 1,3-Butadiene Ground Level Concentrations - Current Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	0.074	0.002	0.076	10	0.8%	0.049	0.001	0.049	2	2.5%
R2	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.4%
R3	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R4	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.4%
R5	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.4%
R6	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R7	0.074	0.001	0.075	10	0.8%	0.049	0.000	0.049	2	2.5%
R8	0.074	0.002	0.076	10	0.8%	0.049	0.001	0.050	2	2.5%

Table C 17: Predicted 1,3-Butadiene Ground Level Concentrations - Future No Build Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	0.074	0.002	0.076	10	0.8%	0.049	0.001	0.050	2	2.5%
R2	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R3	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R4	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.4%
R5	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R6	0.074	0.001	0.075	10	0.8%	0.049	0.000	0.049	2	2.5%
R7	0.074	0.001	0.075	10	0.8%	0.049	0.001	0.049	2	2.5%
R8	0.074	0.002	0.076	10	0.8%	0.049	0.001	0.050	2	2.5%

Table C 18: Predicted 1,3-Butadiene Ground Level Concentrations - Future Build Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	0.074	0.003	0.077	10	0.8%	0.049	0.001	0.050	2	2.5%
R2	0.074	0.001	0.075	10	0.8%	0.049	0.000	0.049	2	2.5%
R3	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R4	0.074	0.001	0.075	10	0.7%	0.049	0.000	0.049	2	2.5%
R5	0.074	0.001	0.075	10	0.8%	0.049	0.000	0.049	2	2.5%
R6	0.074	0.001	0.075	10	0.8%	0.049	0.000	0.049	2	2.5%
R7	0.074	0.001	0.075	10	0.8%	0.049	0.000	0.049	2	2.5%
R8	0.074	0.002	0.076	10	0.8%	0.049	0.001	0.050	2	2.5%

Table C 19: Predicted Acetaldehyde Ground Level Concentrations - Current Scenario

Receptor ID	0.5-hr					24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	3.30	0.02	3.32	500	0.7%	3.30	0.01	3.31	500	0.7%
R2	3.30	0.01	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R3	3.30	0.02	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R4	3.30	0.01	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R5	3.30	0.01	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R6	3.30	0.02	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R7	3.30	0.02	3.32	500	0.7%	3.30	0.01	3.30	500	0.7%
R8	3.30	0.03	3.32	500	0.7%	3.30	0.01	3.30	500	0.7%

Table C 20: Predicted Acetaldehyde Ground Level Concentrations - Future No Build Scenario

Receptor ID	0.5-hr					24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	3.30	0.03	3.33	500	0.7%	3.30	0.01	3.31	500	0.7%
R2	3.30	0.02	3.31	500	0.7%	3.30	0.01	3.30	500	0.7%
R3	3.30	0.02	3.32	500	0.7%	3.30	0.01	3.30	500	0.7%
R4	3.30	0.02	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R5	3.30	0.02	3.31	500	0.7%	3.30	0.01	3.30	500	0.7%
R6	3.30	0.02	3.32	500	0.7%	3.30	0.01	3.30	500	0.7%
R7	3.30	0.03	3.32	500	0.7%	3.30	0.01	3.30	500	0.7%
R8	3.30	0.04	3.33	500	0.7%	3.30	0.01	3.31	500	0.7%

Table C 21: Predicted Acetaldehyde Ground Level Concentrations - Future Build Scenario

Receptor ID	0.5-hr					24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	3.30	0.03	3.33	500	0.7%	3.30	0.01	3.31	500	0.7%
R2	3.30	0.02	3.31	500	0.7%	3.30	0.01	3.30	500	0.7%
R3	3.30	0.02	3.31	500	0.7%	3.30	0.01	3.30	500	0.7%
R4	3.30	0.01	3.31	500	0.7%	3.30	0.00	3.30	500	0.7%
R5	3.30	0.02	3.31	500	0.7%	3.30	0.01	3.30	500	0.7%
R6	3.30	0.02	3.31	500	0.7%	3.30	0.01	3.30	500	0.7%
R7	3.30	0.02	3.32	500	0.7%	3.30	0.01	3.30	500	0.7%
R8	3.30	0.03	3.33	500	0.7%	3.30	0.01	3.31	500	0.7%

Table C 22: Predicted Acrolein Ground Level Concentrations - Current Scenario

Receptor ID	1-hr					24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.3%
R2	0.204	0.001	0.205	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R3	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R4	0.204	0.001	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R5	0.204	0.001	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R6	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R7	0.204	0.002	0.207	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R8	0.204	0.004	0.208	4.50	4.6%	0.204	0.001	0.205	0.40	51.4%

Table C 23: Predicted Acrolein Ground Level Concentrations - Future No Build Scenario

Receptor ID	1-hr					24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	0.204	0.003	0.207	4.50	4.6%	0.204	0.001	0.206	0.40	51.4%
R2	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R3	0.204	0.002	0.207	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R4	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R5	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R6	0.204	0.002	0.207	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R7	0.204	0.003	0.207	4.50	4.6%	0.204	0.001	0.205	0.40	51.3%
R8	0.204	0.005	0.209	4.50	4.6%	0.204	0.002	0.206	0.40	51.5%

Table C 24: Predicted Acrolein Ground Level Concentrations - Future Build Scenario

Receptor ID	1-hr					24-hr				
	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria	Background 90th percentile, μg/m^3	Maximum Concentration, μg/m^3	Maximum Concentration plus Background, μg/m^3	Criteria, μg/m^3	% of Criteria
R1	0.204	0.003	0.207	4.50	4.6%	0.204	0.001	0.206	0.40	51.4%
R2	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R3	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R4	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R5	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R6	0.204	0.002	0.206	4.50	4.6%	0.204	0.001	0.205	0.40	51.2%
R7	0.204	0.003	0.207	4.50	4.6%	0.204	0.001	0.205	0.40	51.3%
R8	0.204	0.004	0.208	4.50	4.6%	0.204	0.001	0.206	0.40	51.4%

Table C 25: Predicted Benzene Ground Level Concentrations - Current Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	0.799	0.014	0.814	2.3	35.4%	0.572	0.005	0.577	0.45	128.1%
R2	0.799	0.005	0.804	2.3	35.0%	0.572	0.002	0.573	0.45	127.4%
R3	0.799	0.005	0.804	2.3	35.0%	0.572	0.002	0.573	0.45	127.4%
R4	0.799	0.004	0.803	2.3	34.9%	0.572	0.001	0.573	0.45	127.3%
R5	0.799	0.005	0.805	2.3	35.0%	0.572	0.002	0.573	0.45	127.4%
R6	0.799	0.006	0.805	2.3	35.0%	0.572	0.002	0.574	0.45	127.4%
R7	0.799	0.007	0.806	2.3	35.0%	0.572	0.002	0.574	0.45	127.5%
R8	0.799	0.009	0.808	2.3	35.1%	0.572	0.004	0.575	0.45	127.8%

Table C 26: Predicted Benzene Ground Level Concentrations - Future No Build Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	0.799	0.019	0.818	2.3	35.6%	0.572	0.006	0.578	0.45	128.4%
R2	0.799	0.007	0.806	2.3	35.0%	0.572	0.002	0.574	0.45	127.5%
R3	0.799	0.006	0.805	2.3	35.0%	0.572	0.002	0.574	0.45	127.5%
R4	0.799	0.005	0.804	2.3	35.0%	0.572	0.002	0.573	0.45	127.4%
R5	0.799	0.007	0.806	2.3	35.1%	0.572	0.002	0.574	0.45	127.5%
R6	0.799	0.008	0.807	2.3	35.1%	0.572	0.002	0.574	0.45	127.6%
R7	0.799	0.009	0.808	2.3	35.1%	0.572	0.003	0.575	0.45	127.7%
R8	0.799	0.012	0.811	2.3	35.3%	0.572	0.005	0.576	0.45	128.1%

Table C 27: Predicted Benzene Ground Level Concentrations - Future Build Scenario

Receptor ID	24-hr					Annual				
	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria	Background 90th percentile, μg/m³	Maximum Concentration, μg/m³	Maximum Concentration plus Background, μg/m³	Criteria, μg/m³	% of Criteria
R1	0.799	0.020	0.819	2.3	35.6%	0.572	0.007	0.578	0.45	128.5%
R2	0.799	0.008	0.807	2.3	35.1%	0.572	0.002	0.574	0.45	127.5%
R3	0.799	0.007	0.806	2.3	35.0%	0.572	0.002	0.574	0.45	127.5%
R4	0.799	0.006	0.805	2.3	35.0%	0.572	0.002	0.574	0.45	127.5%
R5	0.799	0.008	0.807	2.3	35.1%	0.572	0.002	0.574	0.45	127.5%
R6	0.799	0.008	0.807	2.3	35.1%	0.572	0.003	0.574	0.45	127.6%
R7	0.799	0.009	0.808	2.3	35.1%	0.572	0.003	0.575	0.45	127.7%
R8	0.799	0.011	0.810	2.3	35.2%	0.572	0.004	0.576	0.45	128.0%

Table C 28: Predicted Formaldehyde Ground Level Concentrations - Current Scenario

Receptor ID	24-hr				
	Background 90th percentile, $\mu g/m^3$	Maximum Concentration, $\mu g/m^3$	Maximum Concentration plus Background, $\mu g/m^3$	Criteria, $\mu g/m^3$	% of Criteria
R1	6.48	0.02	6.50	65	10.0%
R2	6.48	0.01	6.49	65	10.0%
R3	6.48	0.01	6.49	65	10.0%
R4	6.48	0.01	6.49	65	10.0%
R5	6.48	0.01	6.49	65	10.0%
R6	6.48	0.01	6.49	65	10.0%
R7	6.48	0.01	6.49	65	10.0%
R8	6.48	0.01	6.50	65	10.0%

Table C 29: Predicted Formaldehyde Ground Level Concentrations - Future No Build Scenario

Receptor ID	24-hr				
	Background 90th percentile, $\mu g/m^3$	Maximum Concentration, $\mu g/m^3$	Maximum Concentration plus Background, $\mu g/m^3$	Criteria, $\mu g/m^3$	% of Criteria
R1	6.48	0.02	6.51	65	10.0%
R2	6.48	0.01	6.49	65	10.0%
R3	6.48	0.01	6.49	65	10.0%
R4	6.48	0.01	6.49	65	10.0%
R5	6.48	0.01	6.49	65	10.0%
R6	6.48	0.01	6.49	65	10.0%
R7	6.48	0.01	6.49	65	10.0%
R8	6.48	0.02	6.50	65	10.0%

Table C 30: Predicted Formaldehyde Ground Level Concentrations - Future Build Scenario

Receptor ID	24-hr				
	Background 90th percentile, $\mu g/m^3$	Maximum Concentration, $\mu g/m^3$	Maximum Concentration plus Background, $\mu g/m^3$	Criteria, $\mu g/m^3$	% of Criteria
R1	6.48	0.02	6.51	65	10.0%
R2	6.48	0.01	6.49	65	10.0%
R3	6.48	0.01	6.49	65	10.0%
R4	6.48	0.01	6.49	65	10.0%
R5	6.48	0.01	6.49	65	10.0%
R6	6.48	0.01	6.49	65	10.0%
R7	6.48	0.01	6.49	65	10.0%
R8	6.48	0.02	6.50	65	10.0%

Table C 31: Project Impact Due to Predicted Ground Level Concentrations (Future No Build vs Future Build Scenarios)

Contaminant	CO		NOx			PM2.5		PM10	TSP	
Receptor ID	1hr	8hr	1hr	24hr	Annual	24hr	Annual	24hr	24hr	Annual
R1	0.2%	0.1%	0.5%	-0.1%	-0.1%	0.1%	0.1%	0.1%	0.2%	0.3%
R2	0.4%	0.2%	0.2%	0.1%	0.1%	0.5%	0.3%	0.9%	2.5%	1.4%
R3	-0.1%	0.1%	-1.1%	-0.1%	-0.1%	0.3%	0.1%	0.5%	1.3%	0.4%
R4	0.5%	0.3%	-0.6%	0.2%	0.1%	0.8%	0.3%	1.5%	4.1%	1.8%
R5	0.3%	0.1%	-0.4%	-0.1%	-0.1%	0.1%	0.1%	0.0%	-0.2%	0.5%
R6	0.3%	0.0%	-1.0%	-0.3%	-0.2%	-0.2%	0.0%	-0.7%	-2.2%	-0.2%
R7	-0.3%	0.0%	-1.6%	-0.6%	-0.4%	-0.6%	-0.2%	-1.2%	-3.1%	-1.2%
R8	-0.6%	-0.3%	-2.9%	-1.0%	-0.9%	-1.3%	-0.7%	-2.5%	-5.8%	-3.4%

(continued)

Contaminant	1,3-Butadiene		Acetaldehyde		Acrolein		Benzene		Formaldehyde
Receptor ID	24hr	Annual	0.5hr	24hr	1hr	24hr	24hr	Annual	24hr
R1	0.26%	0.00%	0.03%	0.02%	0.05%	0.00%	0.12%	0.03%	0.02%
R2	0.27%	0.00%	0.03%	0.01%	-0.03%	0.00%	0.14%	0.05%	0.01%
R3	0.00%	0.00%	-0.06%	0.00%	-0.15%	0.00%	0.04%	0.00%	0.00%
R4	0.00%	0.41%	-0.03%	0.01%	0.03%	0.00%	0.14%	0.05%	0.01%
R5	0.27%	0.00%	-0.02%	0.00%	-0.11%	0.00%	0.05%	0.02%	0.00%
R6	0.00%	0.00%	-0.05%	-0.01%	-0.15%	0.00%	0.02%	0.02%	0.00%
R7	0.00%	-0.41%	-0.08%	-0.01%	-0.24%	-0.05%	-0.02%	-0.02%	-0.01%
R8	-0.53%	-0.40%	-0.16%	-0.03%	-0.42%	-0.15%	-0.11%	-0.10%	-0.03%

BURNSIDE

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Appendix D

GHG Impact

Table D 1: Annual GHG Emissions - Current Scenario

Road Segment	Daily Traffic (vpd)	Percent Cars (%)	Percent Large Vehicles (%)	Segment Length, m	CO_2, tonnes/yr	CH_4, tonnes/yr	N_2O, tonnes/yr
Winston Churchill Blvd. N of Homelands Dr.	24,000	97	3	370	855	0.12	0.10
Winston Churchill Blvd.	28,900	97	3	480	1,335	0.18	0.15
Winston Churchill Blvd. S of Sheridan Park Dr.	29,850	97	3	330	948	0.13	0.11
Homelands Dr. W.	5,300	94	6	445	241	0.03	0.03
Homelands Dr.	5,300	94	6	300	162	0.02	0.02
Homelands Dr. E	3,100	94	6	750	237	0.03	0.03
Sheridan Park Dr. W	6,700	99	1	150	93	0.01	0.01
Sheridan Park Dr. extension							
Sheridan Park Dr. EW	500	99	1	245	11	0.00	0.00
Sheridan Park Dr. EE	7,100	96	4	390	272	0.04	0.03
Speakman Dr. W	6,700	99	1	445	275	0.04	0.03
Speakman Dr. E	4,650	99	1	300	129	0.02	0.02
				Total	**4,559**	**0.6**	**0.5**

Table D 2: Annual GHG Emissions - Future Build (2031) Scenario

Road	Daily Traffic (vpd)	Percent Cars (%)	Percent Large Vehicles (%)	Segment Length, m	CO_2, tonnes/yr	CH_4, tonnes/yr	N_2O, tonnes/yr
Winston Churchill Blvd. N of Homelands Dr.	32,700	97	3	370	1,165	0.16	0.13
Winston Churchill Blvd.	37,000	97	3	371	1,321	0.18	0.15
Winston Churchill Blvd. S of Sheridan Park Dr.	40,450	97	3	372	1,448	0.20	0.16
Homelands Dr. W.	5,200	94	6	373	198	0.03	0.02
Homelands Dr.	5,200	94	6	374	198	0.03	0.02
Homelands Dr. E	3,050	94	6	375	117	0.01	0.01
Sheridan Park Dr. W	2,200	99	1	376	76	0.01	0.01
Sheridan Park Dr. extension	2,050	99	1	377	71	0.01	0.01
Sheridan Park Dr. EW							
Sheridan Park Dr. EE	9,500	96	4	379	354	0.05	0.04
Speakman Dr. W	2,200	99	1	380	77	0.01	0.01
Speakman Dr. E	5,700	99	1	381	201	0.03	0.02
				Total	**5,226**	**0.7**	**0.6**