

## APPENDIX C4 – NOISE & VIBRATION AND AIR QUALITY REPORTS

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**AIR QUALITY ASSESSMENT FOR  
SCARBOROUGH – MALVERN LRT EA**

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**Prepared for:**

**Toronto Transit Commission**

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**Toronto Transit Commission**

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September 2009



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**EXECUTIVE SUMMARY**

The Toronto Transit Commission and the City of Toronto have conducted a Transit Assessment Project to study methods to provide high-quality and reliable transit services between the TTC Kennedy Subway Station and the Scarborough-Malvern community. This study, named the Scarborough-Malvern Light Rail Transit (SMLRT) Assessment Study, recommends that bus service along Eglinton Avenue from Kennedy Station to Kingston Road and Morningside Road be replaced by Light Rail Transit (LRT) – electrically powered “light rail” vehicles operating in a designated centre lane.

SENES Consultants Limited (SENES) is part of the IBI Group project team retained by the Toronto Transit Commission (TTC) to study the Scarborough – Malvern LRT corridor. SENES was retained to prepare an Air Quality Assessment.

Existing Conditions

Analysis of MOE Toronto East monitoring data indicate that the existing air quality within the study area is typical of an urban setting, which is characterized by elevated pollutant concentrations in relation to rural areas, with periods of compromised air quality due to nitrogen oxides and fine particulate based contaminants, which typically occurs during smog events.

Construction Impacts

Impacts from construction activities can be reduced through the use of newer well maintained construction equipment. Dust impacts can be successfully mitigated through the use of proper controls, such as:

- periodic watering of unpaved construction areas;
- periodic watering of stockpiles;
- limiting speed of vehicle travel;
- use of water sprays during the loading, unloading of materials; and
- sweeping and/or water flushing of the entrances to the construction zones.

Pollutant Burden Analysis

The Air Quality Assessment study shows that installation of the Scarborough-Malvern Light Rail Transit (SMLRT) corridor will result in a reduction of particulate based pollutant emissions and will result in small changes to all gaseous pollutants emissions; therefore, no impacts are predicted based on the operation of the SMLRT system. Particulate based pollutants from within the study area corridor will be reduced by approximately 25% and gaseous pollutants will be reduced by approximately 2%. Carbon dioxide equivalent emissions (CO<sub>2</sub>-e), which is the unit of measure for global warming potential, will be reduced within the study area corridor by 1.1 to 1.2 ktonnes/year.

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**1.0 INTRODUCTION**

**1.1 PROJECT DESCRIPTION**

The Toronto Transit Commission and the City of Toronto have conducted a Transit Assessment Project to study ways to provide high-quality and reliable transit services between the TTC Kennedy Subway Station and the Scarborough-Malvern community. This study, named the Scarborough-Malvern Light Rail Transit (SMLRT) Assessment Study, recommends that bus service along Eglinton Avenue from Kennedy Station to Kingston Road and Morningside Road be replaced by Light Rail Transit (LRT) – electrically powered “light rail” vehicles operating in a designated centre lane.

SENES Consultants Limited (SENES) is part of the IBI Group project team retained by the Toronto Transit Commission (TTC) to study the Scarborough – Malvern LRT corridor. SENES was retained to prepare an Air Quality Assessment.

**1.2 STUDY AREA**

The Scarborough-Malvern LRT corridor is a 13 km long corridor that links Kennedy Station, which serves the Bloor-Danforth Subway, the Scarborough RT and the proposed Eglinton Crosstown LRT, with northern Scarborough communities. Benefits of the line include providing a new high quality light rail service along several busy existing transit routes and a direct high quality transit service to the University of Toronto at Scarborough Campus (UTSC) and to Centennial College’s Ellesmere Road Campus.

The study area for the Air Quality Assessment is approximately 200 metres on either side of the following corridors:

- Eglinton Ave. East from Midland Ave. to Kingston Rd.;
- Kingston Rd. from Eglinton Ave. to Morningside Rd.; and,
- Morningside Rd. from Kingston Rd. to Milner Ave.

For air quality studies, however, physical boundaries have no meaning because air flows over and/or around everything. As a result, the air quality boundaries can be set arbitrarily to fit the important aspects of any project. Where possible, the project boundaries are used.

**1.3 AIR QUALITY IMPACTS OF PROJECT ON THE ENVIRONMENT**

Air quality manifests itself in two broad ways – through air pollutant concentrations which people can breathe into their lungs and through deposition of pollutants to various surfaces which leads to a build-up of soiling potential. Air quality is usually assessed through the examination

of the pollutants that are linked with a particular project. In this case, the pollutants of concern are:

- Particulate Matter: PM<sub>10</sub>, which are those particles 10 microns in diameter and smaller; and, PM<sub>2.5</sub>, which are those particles 2.5 microns in diameter and smaller. Particulate Matter is emitted to the air by the action of the wind, by the action of the wheels of a vehicle on road surfaces, through deterioration of vehicle equipment (i.e., brake wear) and directly from the exhaust of engines;
- carbon monoxide (CO): is a gas formed by the incomplete combustion of carbon-based fuels. It is emitted in vehicle exhaust;
- nitrogen dioxides (NO<sub>x</sub>): are gases formed when anything is burned in air. They are emitted in vehicle exhaust;
- Volatile Organic Compounds (VOCs) emitted as vapour from the fuels used in vehicles or as combustion products through the tailpipe; and,
- Greenhouse Gases (GhGs): Carbon Dioxide (CO<sub>2</sub>), Nitrous Oxide (N<sub>2</sub>O) and Methane (CH<sub>4</sub>) emitted when any fuel is burned.

## 2.0 EXISTING ENVIRONMENTAL CONDITIONS

### 2.1 AIR QUALITY STANDARDS

Several measures are used to describe impacts from vehicles travelling on roadways. Those used in this assessment are as follows:

- Fine Particulate Matter less than 10 and 2.5 microns in diameter (PM<sub>10</sub> and PM<sub>2.5</sub>);
- Criteria Air Contaminants (CACs): Carbon Monoxide (CO) and Nitrogen Oxides (NO<sub>x</sub>) with a discussion of NO<sub>2</sub> and NO components;
- VOCs; and,
- GhGs (CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>).

The contaminants listed above and relevant criteria are discussed in some detail in the remainder of this section.

#### 2.1.1 Fine Particulate Matter PM<sub>10</sub> and PM<sub>2.5</sub>

Many studies over the past few years have indicated that fine particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) in the air is associated with various adverse health effects in people who already have compromised respiratory systems and suffer from asthma, chronic pneumonia and cardiovascular problems. However, the available studies have not been able to link the adverse health effects in such people to any one component of the pollution mix. Fine particulate matter is a mixture of chemically and physically diverse dusts and droplets, and some of these components may be important in determining the effects of PM<sub>10</sub> and PM<sub>2.5</sub> on health.

The current 24-hour suggested regulatory limits for fine particulate matter are presented in Table 2.1 as follows:

**TABLE 2.1  
AIR QUALITY CRITERIA FOR PM<sub>10</sub> AND PM<sub>2.5</sub>**

Provincial: Ontario Ministry of the Environment			
Pollutant	Averaging Period	Guideline Level	Ambient Air Quality Criteria
PM <sub>10</sub>	24 hours	Ontario Interim	50 µg/m <sup>3</sup>
PM <sub>2.5</sub>	24 hours	Proposed CWS (by 2010)	30 µg/m <sup>3</sup> *

NOTE: CWS = Canada Wide Standard

\* Compliance is measured as the 98<sup>th</sup> percentile over three years.

### 2.1.2 Criteria Air Contaminants (CO, NO<sub>x</sub>)

Criteria Air Contaminants (CACs), including carbon monoxide and nitrogen oxides are common air pollutants that are typically released into the air by activities such as the combustion of fossil fuels.

Carbon monoxide (CO) is a colorless, odourless gas that is produced as a result of incomplete oxidation of carbon during combustion. According to the MOE, in Ontario, over 60% of the CO produced is from the transportation sector [MOE 1999]. The remainder is the result of other sources of fossil fuel combustion such as heating buildings, commercial and industrial operations, etc.

Nitrogen oxides (NO<sub>x</sub>) is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying ratios. Nitrogen dioxide (NO<sub>2</sub>) is the primary component of concern in NO<sub>x</sub>. NO<sub>2</sub> is a reddish brown gas with a pungent odour, which, upon reaction with other atmospheric compounds, becomes a major contributor to smog, acid rain, inhalable particulates and reduced visibility. NO<sub>2</sub> also plays a major role in atmospheric reactions that produce ground level ozone. Man-made sources of NO<sub>x</sub> include all fossil fuel combustion such as heating buildings, commercial and industrial operations, etc. While, motor vehicle exhaust is a significant source of NO<sub>x</sub> only a small percentage is emitted as NO<sub>2</sub> directly from the tailpipe [X. Yao et al, 2005]. The main component of NO<sub>x</sub> from tailpipes is NO which reacts in the atmosphere over time and distance to form NO<sub>2</sub>. The rate of reaction is influenced by many factors including initial concentration, sunlight, ozone concentrations and others.

The MOE AAQCs for CO and NO<sub>x</sub> are shown in Table 2.2

**TABLE 2.2**  
**MOE AMBIENT AIR QUALITY CRITERIA FOR CRITERIA AIR CONTAMINANTS**

Compound	CAS No	Ambient Air Quality Criteria (AAQC)			
		Annual (µg/m <sup>3</sup> )	24-hour (µg/m <sup>3</sup> )	8-hour (µg/m <sup>3</sup> )	1-hour (µg/m <sup>3</sup> )
Carbon Monoxide	630-08-0	NS	NS	15,700	36,200
Nitrogen Oxides	10102-44-0	NS	200	NS	400

NS – No Standard.

### 2.1.3 Volatile Organic Compounds

Volatile Organic Compounds (VOCs) are defined technically as organic compounds having a saturation vapour pressure greater than 0.1 mm of mercury at 25°C and standard atmospheric pressure. Certain VOCs warrant special concern because they are capable of being transported

very long distances in the atmosphere and play an important role in the formation of ground-level ozone and fine particles. Almost all VOCs contribute to ground-level ozone, and most do not break down in the troposphere during photochemical reactions.

VOCs are emitted into the atmosphere from a variety of sources, including vehicles, fossil fuel combustion, steel-making, petroleum refining, fuel refilling, industrial and residential solvent use, paint application, manufacturing of synthetic materials (e.g. plastics, carpets), food processing, agricultural activities and wood processing and burning. The primary VOC constituents of tail-pipe emissions from vehicles are benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene.

Many VOCs are odorous compounds at higher concentrations. Odours from vehicular exhaust are generally acknowledged to be associated with the presence of aldehyde constituents, other minor volatile organic compounds and nitrogen oxides in the exhaust. The aldehydes are largely comprised of formaldehyde, acrolein and acetaldehyde.

### 2.1.4 Greenhouse Gases

Green House Gases (GhGs) absorb and emit radiation within the thermal infrared range, which is the process regarded as the fundamental cause of the non-natural part of the “greenhouse effect.” Greenhouse gases include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), ozone and chlorofluorocarbons. Fossil fuel combustion is the main source of GhG emissions related to this Project, which results in emissions of methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O).

For a given mixture of different GhGs and their amount, carbon dioxide equivalents (CO<sub>2</sub>-e) is the unit of measure used to describe the amount of CO<sub>2</sub> that would have the same global warming potential as CO<sub>2</sub> when measured over a time period (typically a 100 year period). The carbon dioxide equivalency for a gas is calculated by multiplying the mass (of the gas) by its global warming potential. For example, the global warming potential for CH<sub>4</sub> over 100 years is 25 and for N<sub>2</sub>O is 298 [IPPC, 2007]. This means that the emission of 1 tonne of CH<sub>4</sub> is equivalent to the emission of 25 tonnes of CO<sub>2</sub>, and the emission of 1 tonne of N<sub>2</sub>O is equivalent to the emission of 298 tonnes of CO<sub>2</sub>.

## 2.2 EXISTING AIR QUALITY

### 2.2.1 Historical Ambient Monitoring Data

The Ontario Ministry of the Environment (MOE) measures air contaminants at various locations throughout Ontario, and reports on the state of Ontario’s air quality on an annual basis. To

assess the current air quality in the study area, historical air quality monitoring data from a nearby MOE monitoring station was considered. Tables 2.3 and 2.4 outline existing (year 2007) NO<sub>x</sub> and PM<sub>2.5</sub> measurements at the Toronto East (MOE Ref #33003) monitoring location, and presents a summary of the data in terms of mean, 90<sup>th</sup> percentile, 1-hr maximum and 24-hr maximum values. CO was not measured at the Toronto East monitoring location, therefore, data from the Toronto Downtown location is provided in Table 2.5.

The tables indicate that historically NO<sub>x</sub> and PM<sub>2.5</sub> have exceeded the standard from time to time by as much as double the allowable concentration (usually during smog events which are regional in nature). PM<sub>10</sub>, VOCs and GhGs have not been measured at these locations during the past five years. In summary, the historical data outlines a typical urban/suburban airshed with occasional smog periods during which air quality is compromised. In Ontario, the smog season occurs from May through September, with most events of compromised air quality occurring due to transboundary pollution from polluted air masses that flow northward from the Ohio Valley in the United States.

**TABLE 2.3  
TORONTO EAST (33003) 2007 AMBIENT AIR QUALITY MONITORING FOR PM<sub>2.5</sub>**

Averaging Time	AAQC	Concentration (µg/m <sup>3</sup> )
24-hr Mean	-	7.8
24-hr 90 <sup>th</sup> Percentile	-	15.9
24-hr Maximum	30*	41
No. of Times above proposed CSW	-	7

\* Compliance is measured as the 98<sup>th</sup> percentile over three years, therefore 22 exceedances (2% of 365x3) of the 24-hr criteria is within compliance for three years or nominally 7 exceedances per year on average.

Note: All values are as calculated from hourly data available from the <http://www.airqualityontario.ca/> website.

**TABLE 2.4  
TORONTO EAST (33003) 2007 AMBIENT AIR QUALITY MONITORING FOR NITROGEN OXIDES**

Averaging Time	AAQC	Concentration (µg/m <sup>3</sup> )
1-hr Mean	-	53
24-hr Mean	-	53
1-hr 90 <sup>th</sup> Percentile	-	103
24-hr 90 <sup>th</sup> Percentile	-	92
1-hr Maximum	400	858
24-hr Maximum	200	246
No. of Times above 1-hr AAQC	-	32
No. of Times above 24-hr AAQC	-	1

Note: All values are as calculated from hourly data available from the <http://www.airqualityontario.ca/> website.

**TABLE 2.5  
TORONTO DOWNTOWN (31103) 2007 AMBIENT AIR QUALITY MONITORING FOR CARBON MONOXIDE**

Averaging Time	AAQC	Concentration (µg/m <sup>3</sup> )
1-hr Mean	-	231
8-hr Mean	-	231
1-hr 90 <sup>th</sup> Percentile	-	412
8-hr 90 <sup>th</sup> Percentile	-	406
1-hr Maximum	36,200	1,947
8-hr Maximum	15,700	1,222
No. of Times above 1-hr AAQC	-	0
No. of Times above 8-hr AAQC	-	0

Note: All values are as calculated from hourly data available from the <http://www.airqualityontario.ca/> website.

Figure 2.1 presents the location of the MOE air quality monitoring (33003) location relative to the study area.

**FIGURE 2.1**  
**MOE MONITORING STATION TORONTO EAST (33003)**



### 2.3 SENSITIVE RECEPTOR LOCATIONS WITHIN STUDY AREA

Sensitive receptors (i.e., hospitals, old age homes, schools, residential communities, etc) within the study area were identified through internet searches and internet based satellite images. Only sensitive receptors within 100 metres of the corridor were considered. Search results indicated numerous residential communities and other sensitive receptors throughout the study area corridor. It should be noted that because this air quality assessment is based on overall contaminant loadings within the study area and is not based on dispersion modelling, specific sensitive receptor locations were not considered.

Residential communities are located:

- Along most of Eglinton Ave. approximately 100 m north and south of the roadway immediately behind commercial properties;
- Along most of Kingston Road immediately adjacent to the roadway; and,
- Along Morningside Ave. close to the roadway from Kingston Road up to the University of Toronto campus.

Basically, since air does not respect any type of boundary, it can be said that anywhere that a person is found living, working or playing near this study area corridor is a sensitive location.

## 3.0 ATMOSPHERIC EMISSIONS

### 3.1 VEHICLE EMISSIONS ESTIMATION

#### 3.1.1 Traffic Volumes

The rate of contaminant emissions from a section of road is proportional to the number and type of vehicles travelling along that road as well as vehicle speed. The IBI Group provided annual average daily traffic (AADT) volumes for all major roadways within the study area for the following scenarios (see Appendix B):

- Existing Conditions – 2007;
- Future with LRT – 2021;
- Future without LRT – 2021;
- Future with LRT – 2031; and,
- Future without LRT – 2031.

The traffic data provided by the IBI Group indicate that the roads within the study area are currently (year 2007) at capacity during peak hours. The traffic data is based on the anticipation that the peak hour volumes will decrease due to the capacity, however the overall AADT will increase due to the growth of the City of Toronto. The data assumes that the peak hours will extend from 3 hours to 5 hours to accommodate the spilled over traffic. The data assumes a 1% growth per annum for all the roads. For existing conditions and future without LRT scenarios, public transit is provided by buses mixed in with other traffic.

The future with LRT traffic data is based on removing one lane in each direction and installing the LRT system. This will reduce the number of lanes available to cars down to two lanes in each direction, however the traffic data reflects approximately the same number of vehicles on the road, which as stated above is based on an increase in the number of peak hours per day where the roads operate at capacity. It should be noted that the number of people travelling through the corridor will increase with the LRT system due to the anticipated increase in ridership with the new public transit system.

The “leakage” of vehicles from the study area corridor based on the installation of the SMLRT system has not been considered. Leakage is defined as those emissions that leave the study area but still contribute to overall pollutant emissions. As stated above reducing the number of lanes available to cars from three down to two lanes in each direction will result in a significantly greater number of hours where the roads operate at capacity. Some cars will find alternate travel routes, whereas some drivers will use the SMLRT system. In addition, the electricity required to

power the LRT system trains will result in pollutant emissions, but not within the study area corridor.

### 3.1.2 Vehicle Emissions

All pollutants considered in this study are emitted in vehicle exhaust. Additionally, particulate (PM<sub>10</sub> and PM<sub>2.5</sub>) is emitted from the roadway surface as a result of tire/break wear, and re-suspension of surface dust by (1) the action of the tires on the surface and (2) the wake created by the passing of the vehicle. Both tailpipe and mechanically generated fractions of particulate were included in this study. Tailpipe emissions from vehicles are a function of many variables. Some of the more important parameters are listed below.

- age of the vehicle (newer vehicles emit less);
- number of kilometres which the vehicle has driven;
- emission control equipment that may have been tampered with;
- type of fuel (gasoline, diesel);
- Reid Vapour Pressure (RVP) of gasoline used (adjusted seasonally);
- ambient air temperature;
- vehicle speed;
- rate of acceleration;
- time spent idling;
- type of vehicle (automobile, light truck, heavy truck, bus, etc.); and
- cold or hot start mode.

Vehicular emissions are generally estimated by using emission factors in units of mass of contaminant emitted per vehicle, per distance travelled. To obtain a mass emission rate for a particular road section, the length of the road section is multiplied by the number of vehicles using that section to obtain the total number of vehicle kilometres travelled (VKT). The VKT are then multiplied by the appropriate emission factors.

The vehicular emission rates were estimated for existing conditions (2007), and for the future years 2021 and 2031. Emission factors were obtained by running the MOBILE6C model (the ‘C’ denotes that the model has been adjusted for the average Canadian fleet by Environment Canada). Nitrous oxide (N<sub>2</sub>O) emission factors are from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The MOBILE6C model was run for SENES by Air Improvement Resources (AIR), one of the original developers of the MOBILE model. The model outputs emission factors in grams per vehicle kilometre travelled (g/VKT) for all contaminants of concern. All expected technological and regulatory changes affecting future emissions up to 2021 and 2031 are built into the MOBILE6C model run, in order to generate the most representative emission factors possible. Table 3.1a, 3.1b and 3.1c summarize the emission

factors used in the existing conditions and future years for speeds of 60 km/hr and 100 km/h, which are the posted speed limits within the study area (note that only Hwy 401 has a posted speed limit of 100 km/hr).

**Table 3.1a – MOBILE6C Tailpipe Emission Factors for 2007**

<b>Cars</b>				
<b>Speed (km/h)</b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>CO</b>	<b>NO<sub>x</sub></b>
60	0.026	0.016	13	1.3
100	0.026	0.016	13	1.4
<b>Speed (km/h)</b>	<b>VOCs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O*</b>
60	0.53	340	0.031	0.008
100	0.52	340	0.030	0.008
<b>Medium Trucks</b>				
<b>Speed (km/h)</b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>CO</b>	<b>NO<sub>x</sub></b>
60	0.089	0.074	0.55	2.6
100	0.089	0.074	0.58	3.1
<b>Speed (km/h)</b>	<b>VOCs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O*</b>
60	0.11	490	0.006	0.001
100	0.11	490	0.006	0.001
<b>Heavy Trucks (and Buses)</b>				
<b>Speed (km/h)</b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>CO</b>	<b>NO<sub>x</sub></b>
60	0.15	0.13	0.84	5.0
100	0.15	0.13	0.89	5.9
<b>Speed (km/h)</b>	<b>VOCs</b>	<b>CO<sub>2</sub></b>	<b>CH<sub>4</sub></b>	<b>N<sub>2</sub>O*</b>
60	0.21	730	0.010	0.003
100	0.20	730	0.009	0.003

Emission factors are in g/VKT for all indicated speeds.

\* Emission factors from 2006 IPCC Guidelines for National Greenhouse Gas Inventories





#### 4.0 POLLUTANT BURDEN ANALYSIS

To assess the potential changes in pollutant burden within the study area based on installation of the Scarborough-Malvern LRT, contaminant emissions of CO, NO<sub>x</sub>, VOCs, GhGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and CO<sub>2</sub>-e) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) were calculated for the following five scenarios:

- Existing conditions – 2007;
- Future without LRT – 2021;
- Future with LRT – 2021;
- Future without LRT – 2031; and
- Future with LRT – 2031.

The results of the pollutant burden analysis are presented below for the primary contaminants of concern CO<sub>2</sub>-e, NO<sub>x</sub> and PM<sub>10</sub>. Complete results for all contaminants are presented in Appendix A. It should be noted that as described in Section 3.1.1 above, “leakage” has not been considered in the pollutant burden analysis. Therefore, pollutant reduction values provided are only within the study area.

#### 4.1 CARBON DIOXIDE EQUIVALENTS (CO<sub>2</sub>-e)

As outlined in Table 4.1 below the CO<sub>2</sub>-e pollutant burden within the study area corridor is estimated to be reduced by 1.1 ktonnes per year based on the installation of the LRT system (or a reduction of approximately 2%). This reduction is based on approximately the same number of vehicles on the road but with buses replaced by the LRT system (see also Section 3.1.1 above).

**Table 4.1 Corridor Specific CO<sub>2</sub>-e Pollutant Burden**

Scenario	CO <sub>2</sub> -e Pollutant Burden in ktonnes/year	Reduction Based on LRT in ktonnes/year
Existing Conditions	51.2	n/a
2021 without LRT	59.4	1.1 (2%)
2021 with LRT	58.3	
2031 without LRT	64.2	1.2 (2%)
2031 with LRT	63.0	

These results in Table 4.1 do not include the pollutant burden from Highway 401. As a comparison annual CO<sub>2</sub>-e emissions from Highway 401 for a 400 metre section under Morningside Ave. (200 metres on either side of Morningside Ave.) were calculated to be 19.4 ktonnes CO<sub>2</sub>-e for the year 2021 and 26.1 ktonnes CO<sub>2</sub>-e for the year 2031.

As outlined in Section 2.1.4 above, CO<sub>2</sub>-e is a combination of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions, and as outlined in Appendix A, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O all exhibit similar reductions based on the installation of the LRT system.

#### 4.2 NITROGEN OXIDES (NO<sub>x</sub>)

As outlined in Table 4.2 below the NO<sub>x</sub> pollutant burden within the study area corridor is estimated to be reduced by 0.9 tonnes NO<sub>x</sub> in 2021 and 0.2 tonnes NO<sub>x</sub> in 2031 based on installation of the LRT system. The table also illustrates a significant decrease of NO<sub>x</sub> emissions from existing conditions to the future scenarios, which is also due to reduced emissions per vehicle based on expected emission reductions from more sophisticated engine technologies and fuels. In recent years there have been significant advancements in the ability of automakers to reduce NO<sub>x</sub> tailpipe emissions.

**Table 4.2 Corridor Specific NO<sub>x</sub> Pollutant Burden**

Scenario	NO <sub>x</sub> Pollutant Burden in tonnes/year	Reduction Based on LRT in tonnes/year
Existing Conditions	212	n/a
2021 without LRT	44.2	0.9 (2.1%)
2021 with LRT	43.3	
2031 without LRT	35.4	0.2 (0.5%)
2031 with LRT	35.2	

As with Table 4.1 above, the results in Table 4.2 do not include the pollutant burden from Highway 401 or from surrounding roads. As a comparison annual NO<sub>x</sub> emissions from Highway 401 for a 400 metre section under Morningside Ave. (200 metres on either side of Morningside Ave.) were calculated to be 15.4 tonnes NO<sub>x</sub> for the year 2021 and 15.7 tonnes NO<sub>x</sub> for the year 2031.

As outlined in Appendix A, CO and VOC emissions increase slightly (approximately 1% to 2%), which is due to a greater number of gasoline powered vehicles on the road (essentially gasoline powered cars and the LRT system replacing diesel buses). As illustrated in Figures 3.1a to 3.1c above, gasoline powered vehicles emit greater CO and VOC concentrations than diesel powered buses.

### 4.3 PARTICULATE MATTER – 10 MICRONS (PM<sub>10</sub>)

As outlined in Table 4.3 below the PM<sub>10</sub> pollutant burden within the study area corridor is estimated to be reduced by approximately 5.1 tonnes PM<sub>10</sub> in 2021 and 5.4 tonnes in 2031 based on installation of the LRT corridor (or a reduction of approximately 25%). The table also illustrates a decrease of PM<sub>10</sub> emissions from existing conditions to the future scenarios, which is also due to reduced emissions per vehicle based on expected emission reductions from more sophisticated engine technologies and fuels. It should be noted that the significant decrease in particulate based compounds when compared to gaseous compounds is due to a lower fleet average vehicle weight with the removal of buses from the roadway.

**Table 4.3 Corridor Specific PM<sub>10</sub> Pollutant Burden**

Scenario	PM <sub>10</sub> Pollutant Burden in tonnes/year	Reduction Based on LRT in tonnes/year
Existing Conditions	22.1	n/a
2021 without LRT	20.4	5.1 (25%)
2021 with LRT	15.2	
2031 without LRT	21.3	5.4 (25%)
2031 with LRT	15.9	

As with Tables 4.1 and 4.2 above, the results in Table 4.3 do not include the pollutant burden from Highway 401 or any of the surrounding roads. As a comparison annual PM<sub>10</sub> emissions from Highway 401 for a 400 metre section under Morningside Ave. (200 metres on either side of Morningside Ave.) were calculated to be 14 tonnes PM<sub>10</sub> for the year 2021 and 18 tonnes PM<sub>10</sub> for the year 2031.

As outlined in Appendix A, PM<sub>2.5</sub> exhibits similar reductions to those described above for PM<sub>10</sub>.

## 5.0 CONCLUSIONS

### 5.1 CONCLUSIONS

#### Existing Conditions

Analysis of MOE Toronto East monitoring data indicate that the existing air quality within the study area is typical of an urban setting, which is characterized by elevated pollutant concentrations in relation to rural areas, with periods of compromised air quality due to nitrogen oxides and fine particulate based contaminants, which typically occurs during smog events.

#### Construction Impacts

Impacts from construction activities can be reduced through the use of newer well maintained construction equipment. Dust impacts can be successfully mitigated through the use of proper controls, such as:

- periodic watering of unpaved construction areas;
- periodic watering of stockpiles;
- limiting speed of vehicle travel;
- use of water sprays during the loading, unloading of materials; and
- sweeping and/or water flushing of the entrances to the construction zones.

#### Pollutant Burden Analysis

The Air Quality Assessment study shows that installation of the Scarborough-Malvern Light Rail Transit (SMLRT) corridor will result in a reduction of particulate based pollutant emissions and will result in small changes to all gaseous pollutants emissions; therefore, no impacts are predicted based on the operation of the SMLRT system. Particulate based pollutants from within the study area corridor will be reduced by approximately 25% and gaseous pollutants will be reduced by approximately 2%. Carbon dioxide equivalent emissions (CO<sub>2</sub>-e), which is the unit of measure for global warming potential, will be reduced within the study area corridor by 1.1 to 1.2 ktonnes/year.

### 5.2 RECOMMENDATIONS

Installation of the SMLRT system will reduce pollutant emissions. Further measures recommended to reduce current and future particulate based air quality impacts from all transportation sources along the SMLRT corridor include the following:

- increased tree planting adjacent to the roadway; and,
- increased road vacuum sweeping and flushing.

Trees located along the roadway, will act as screens and can reduce (by up to 90%) the particulate matter flowing horizontally from the roadway (Watson and Chow, 2000). Road flushing and sweeping can reduce silt loading on the roadways, often significantly.

The construction of the proposed SMLRT corridor has the potential to affect the air quality in the vicinity of the site during the construction phase. As with any construction site, these emissions will be of relatively short duration and are unlikely to have any long-lasting effect on the surrounding area. Impacts from construction activities can be reduced through the use of newer well maintained construction equipment.

Night time construction activities should also be considered in order to reduce the higher emissions from vehicles that are slowed down by the reduced existing road capacity during the day.

## **6.0 REFERENCES**

- United States Environmental Protection Agency (U.S. EPA) 2003. *Compilation of Air Pollutant Emission Factors*. AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 13.2.1 Paved Roads.
- Ontario Ministry of the Environment. [www.airqualityontario.ca](http://www.airqualityontario.ca). Toronto East Monitoring Station.
- X. Yao, N. T. Lau, C. K. Chan, and M. Fang, 2005 *The Use Of Tunnel Concentration Profile Data To Determine The Ratio Of NO<sub>2</sub>/NO<sub>x</sub> Directly Emitted From Vehicles* Atmos. Chem. Phys. Discuss., 5, 12723–12740
- IPPC, 2007, Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, J. Lean, D.C. Lowe, G. Myhre, J. Nganga, R. Prinn, G. Raga, M. Schulz and R. Van Dorland, 2007: Changes in Atmospheric Constituents and in Radiative Forcing. *In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- John G. Watson and Judith Chow, Desert Research Institute (DRI). *Reconciling Urban Fugitive Dust Emissions Inventory and Ambient Source Contribution Estimates: Summary of Current Knowledge and Needed Research* (May 2000). Page 4-6 and Page 4-7, Figure 4-5.

**APPENDIX A**

**COMPLETE TABLES OF RESULTS**

**Table A.1 Corridor Specific CO<sub>2</sub>-e Pollutant Burden**

Scenario	CO <sub>2</sub> -e Pollutant Burden (ktonnes/year)	Reduction Based on LRT (ktonnes/year)
Existing Conditions	51.2	n/a
2021 without LRT	59.4	1.1
2021 with LRT	58.3	
2031 without LRT	64.2	1.2
2031 with LRT	63.0	

**Table A.2 Corridor Specific NO<sub>x</sub> Pollutant Burden**

Scenario	NO <sub>x</sub> Pollutant Burden (tonnes/year)	Reduction Based on LRT (tonnes/year)
Existing Conditions	212	n/a
2021 without LRT	44.2	0.9
2021 with LRT	43.3	
2031 without LRT	35.4	0.2
2031 with LRT	35.2	

**Table A.3 Corridor Specific PM<sub>10</sub> Pollutant Burden**

Scenario	PM <sub>10</sub> Pollutant Burden (tonnes/year)	Reduction Based on LRT (tonnes/year)
Existing Conditions	22.1	n/a
2021 without LRT	20.4	5.1
2021 with LRT	15.2	
2031 without LRT	21.3	5.4
2031 with LRT	15.9	

**Table A.4 Corridor Specific CO Pollutant Burden**

Scenario	CO Pollutant Burden (tonnes/year)	Increase Based on LRT (tonnes/year)
Existing Conditions	1708	n/a
2021 without LRT	1159	23
2021 with LRT	1182	
2031 without LRT	1225	25
2031 with LRT	1250	

**Table A.5 Corridor Specific VOCs Pollutant Burden**

Scenario	VOCs Pollutant Burden (tonnes/year)	Increase Based on LRT (tonnes/year)
Existing Conditions	72.8	n/a
2021 without LRT	34.4	0.3
2021 with LRT	34.7	
2031 without LRT	34.8	0.4
2031 with LRT	35.2	

**Table A.6 Corridor Specific CO<sub>2</sub> Pollutant Burden**

Scenario	CO <sub>2</sub> Pollutant Burden (ktonnes/year)	Reduction Based on LRT (ktonnes/year)
Existing Conditions	50.8	n/a
2021 without LRT	59.0	1.1
2021 with LRT	57.9	
2031 without LRT	63.7	1.2
2031 with LRT	62.5	

**Table A.7 Corridor Specific CH<sub>4</sub> Pollutant Burden**

Scenario	CH <sub>4</sub> Pollutant Burden (tonnes/year)	Increase Based on LRT (tonnes/year)
Existing Conditions	4.2	n/a
2021 without LRT	2.4	0.0
2021 with LRT	2.4	
2031 without LRT	2.5	0.0
2031 with LRT	2.5	

**Table A.8 Corridor Specific N<sub>2</sub>O Pollutant Burden**

Scenario	N <sub>2</sub> O Pollutant Burden (tonnes/year)	Reduction Based on LRT (tonnes/year)
Existing Conditions	1.09	n/a
2021 without LRT	1.2	0.0
2021 with LRT	1.2	
2031 without LRT	1.3	0.0
2031 with LRT	1.3	

**Table A.9 Corridor Specific PM<sub>2.5</sub> Pollutant Burden**

Scenario	PM <sub>2.5</sub> Pollutant Burden (tonnes/year)	Reduction Based on LRT (tonnes/year)
Existing Conditions	3.11	n/a
2021 without LRT	1.06	0.06
2021 with LRT	1.00	
2031 without LRT	1.00	0.05
2031 with LRT	0.95	

**APPENDIX B  
TRAFFIC VOLUME DATA**

Existing AADT (2007)													
LOCATION	SECTION FROM TO		Posted Speed Limit	24 Hour AADT									
				Total (cars- bus-trucks)		Cars		Bus		Medium Trucks		Heavy Trucks	
				NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
<b>North South Roads</b>													
Morningside Ave	Kingston Rd	Warmsworth St	60	9,532	8,798	9,209	8,239	162	132	92	322	69	106
	Warmsworth St	Fairwood Cres	60	11,866	10,954	11,166	10,136	202	285	285	401	214	131
	Fairwood Cres	Ellesmere Rd	60	10,930	11,840	10,193	10,957	186	308	315	433	236	142
	Ellesmere Rd	Military Trail	60	11,357	12,303	10,687	11,485	193	320	273	375	204	123
	Military Trail	Milner Ave	60	14,928	16,172	14,173	15,228	254	420	287	395	215	129
Military Trail	Ellesmere Rd	60	4,176	5,314	3,859	4,875	71	138	140	227	105	74	
<b>East West Roads</b>													
Eglinton Ave E	Midland Ave	Failmouth Ave	60	15,401	13,119	14,161	11,311	616	485	470	756	154	567
	Failmouth Ave	Brimley Rd	60	12,965	15,846	11,920	13,710	415	539	475	913	156	685
	Brimley Rd	Oswego Rd	60	14,924	13,776	13,842	11,688	478	468	455	926	149	694
	Oswego Rd	McCowan Rd	60	15,455	13,165	14,647	11,143	433	474	283	885	93	664
	McCowan Rd	Torrence Rd	60	14,700	13,570	13,693	11,599	412	489	448	847	147	635
	Torrence Rd	Cedar Brae Blvd (Bellamy)	60	13,047	12,043	12,153	10,497	365	434	398	636	130	477
	Cedar Brae Blvd (Bellamy)	Mason Rd	60	11,268	10,402	10,281	9,126	439	489	412	449	135	337
	Mason Rd	Markham Rd	60	11,248	10,382	10,353	8,848	439	488	343	598	112	449
	Markham Rd	Cedar Drive	60	9,277	8,563	8,464	7,298	362	402	340	493	111	370
	Cedar Drive	Kingston Rd	60	8,703	7,717	8,001	6,762	278	178	319	445	104	333
Ellesmere Rd	Morningside Rd	Military Trail	60	7,610	5,741	7,020	4,933	282	132	232	386	76	289
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	60	26,426	23,434	24,713	22,633	396	211	893	337	423	253
	Scarborough Golf Club Rd	Cornwell Rd	60	24,152	21,418	23,348	20,758	217	300	442	206	145	154
	Cornwell Rd	Dale Ave	60	21,391	18,969	20,678	18,385	193	266	391	182	128	137
	Dale Ave	Celeste Dr	60	18,225	22,275	17,618	21,589	164	312	334	214	109	160
	Celeste Dr	Overature Rd	60	19,580	20,380	18,611	19,752	176	285	597	196	196	147
	Overature Rd	Galloway Rd	60	18,836	19,604	17,598	18,836	170	274	804	282	264	212
	Galloway Rd	Poplar Rd	60	16,631	17,309	15,202	16,631	216	242	913	249	299	187
	Poplar Rd	Lawrence Rd	60	16,572	17,248	15,283	16,572	215	241	809	248	265	186
	Lawrence Rd	Morningside Rd	60	16,283	16,947	15,148	16,283	212	237	695	244	228	183
	Morningside Rd	Amiens Rd	60	16,405	17,075	15,196	16,405	279	239	701	246	230	184
Amiens Rd	Fairwood Cres	60	16,871	17,559	15,627	16,871	287	246	720	253	236	190	

Note:  
1. Bus/Truck volumes, directional split were estimated based on the City of Toronto turning movement counts

Future Without LRT (2021)													
LOCATION	SECTION		Posted Speed Limit	24 Hour AADT									
				Total (cars-bus-trucks)		Cars		Bus		Medium Trucks		Heavy Trucks	
				NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
FROM		TO											
<b>North South Roads</b>													
Morningside Ave	Kingston Rd	Warmsworth St	60	10,863	10,027	10,496	9,389	185	150	104	367	78	120
	Warmsworth St	Fairwood Cres	60	13,528	12,487	12,730	11,556	230	325	325	457	243	150
	Fairwood Cres	Ellesmere Rd	60	12,460	13,498	11,620	12,491	212	351	359	494	269	162
	Ellesmere Rd	Military Trail	60	12,947	14,026	12,183	13,093	220	365	311	428	233	140
	Military Trail	Milner Ave	60	17,018	18,436	16,157	17,359	289	479	327	450	245	147
Military Trail	Ellesmere Rd	Morningside Rd	60	4,760	6,058	4,399	5,557	81	158	160	259	120	85
<b>East West Roads</b>													
Eglinton Ave E	Midland Ave	Failmouth Ave	60	17,557	14,956	16,144	12,895	702	553	535	861	176	646
	Failmouth Ave	Brimley Rd	60	14,780	18,064	13,588	15,629	473	614	541	1,040	177	780
	Brimley Rd	Oswego Rd	60	17,013	15,705	15,780	13,324	544	534	519	1,055	170	792
	Oswego Rd	McCowan Rd	60	17,618	15,008	16,697	12,703	493	540	322	1,009	106	756
	McCowan Rd	Torrance Rd	60	16,758	15,469	15,611	13,223	469	557	511	965	168	724
	Torrance Rd	Cedar Brae Blvd (Bellamy)	60	14,873	13,729	13,855	11,966	416	494	454	725	149	544
	Cedar Brae Blvd (Bellamy)	Mason Rd	60	12,846	11,858	11,721	10,404	501	557	470	512	154	384
	Mason Rd	Markham Rd	60	12,822	11,836	11,803	10,087	500	556	391	682	128	511
	Markham Rd	Cedar Drive	60	10,576	9,762	9,649	8,319	412	459	387	562	127	422
	Cedar Drive	Kingston Rd	60	9,921	8,798	9,121	7,709	317	202	363	507	119	380
Ellesmere Rd	Morningside Rd	Military Trail	60	8,675	6,544	8,003	5,624	321	151	265	440	87	330
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	60	30,125	26,715	28,173	25,801	452	240	1,018	385	482	289
	Scarborough Golf Club Rd	Cormwell Rd	60	27,533	24,416	26,617	23,664	248	342	504	234	165	176
	Cormwell Rd	Dale Ave	60	24,386	21,625	23,573	20,959	219	303	446	208	146	156
	Dale Ave	Celeste Dr	60	20,777	25,394	20,085	24,611	187	356	380	244	125	183
	Celeste Dr	Overature Rd	60	22,322	23,233	21,217	22,517	201	325	681	223	223	167
	Overature Rd	Galloway Rd	60	21,473	22,349	20,062	21,473	193	313	917	322	301	241
	Galloway Rd	Poplar Rd	60	18,959	19,733	17,330	18,959	246	276	1,041	284	341	213
	Poplar Rd	Lawrence Rd	60	18,892	19,663	17,422	18,892	246	275	922	283	302	212
	Lawrence Rd	Morningside Rd	60	18,562	19,320	17,268	18,563	241	270	793	278	260	209
	Morningside Rd	Amiens Rd	60	18,702	19,465	17,324	18,702	318	273	799	280	262	210
	Amiens Rd	Fairwood Cres	60	19,233	20,018	17,815	19,233	327	280	821	288	269	216

Note:  
1. Bus/Truck volumes, directional split were estimated based on the City of Toronto turning movement counts

Future With LRT (2021)													
LOCATION	SECTION		Posted Speed Limit	24 Hour AADT									
				Total (cars-bus-trucks)		Cars		LRT		Medium Trucks		Heavy Trucks	
				NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
FROM		TO											
<b>North South Roads</b>													
Morningside Ave	Kingston Rd	Warmsworth St	60	10,866	10,030	10,683	9,543	236	236	104	367	78	120
	Warmsworth St	Fairwood Cres	60	13,528	12,487	12,960	11,880	236	236	325	457	243	150
	Fairwood Cres	Ellesmere Rd	60	12,460	13,498	11,832	12,842	236	236	359	494	269	162
	Ellesmere Rd	Military Trail	60	12,947	14,026	12,403	13,458	236	236	311	428	233	140
	Military Trail	Milner Ave	60	17,018	18,436	16,446	17,839	236	236	327	450	245	147
Military Trail	Ellesmere Rd	Morningside Rd	60	4,760	6,058	4,480	5,715	236	236	160	259	120	85
<b>East West Roads</b>													
Eglinton Ave E	Midland Ave	Failmouth Ave	60	17,557	14,956	16,846	13,448	236	236	535	861	176	646
	Failmouth Ave	Brimley Rd	60	14,780	18,064	14,061	16,243	236	236	541	1,040	177	780
	Brimley Rd	Oswego Rd	60	17,013	15,705	16,324	13,858	236	236	519	1,055	170	792
	Oswego Rd	McCowan Rd	60	17,618	15,008	17,190	13,243	236	236	322	1,009	106	756
	McCowan Rd	Torrance Rd	60	16,758	15,469	16,080	13,780	236	236	511	965	168	724
	Torrance Rd	Cedar Brae Blvd (Bellamy)	60	14,873	13,729	14,271	12,461	236	236	454	725	149	544
	Cedar Brae Blvd (Bellamy)	Mason Rd	60	12,846	11,858	12,222	10,961	236	236	470	512	154	384
	Mason Rd	Markham Rd	60	12,822	11,836	12,303	10,643	236	236	391	682	128	511
	Markham Rd	Cedar Drive	60	10,576	9,762	10,062	8,778	236	236	387	562	127	422
	Cedar Drive	Kingston Rd	60	9,921	8,798	9,439	7,911	236	236	363	507	119	380
Ellesmere Rd	Morningside Rd	Military Trail	60	8,675	6,544	8,323	5,775	236	236	265	440	87	330
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	60	30,125	26,715	28,101	26,066	236	236	1,157	489	868	160
	Scarborough Golf Club Rd	Cormwell Rd	60	27,533	24,416	26,840	24,021	236	236	396	298	297	98
	Cormwell Rd	Dale Ave	60	24,386	21,625	23,771	21,275	236	236	351	264	263	86
	Dale Ave	Celeste Dr	60	20,777	25,394	20,253	24,982	236	236	299	310	224	102
	Celeste Dr	Overature Rd	60	22,322	23,233	21,384	22,856	236	236	536	283	402	93
	Overature Rd	Galloway Rd	60	21,473	22,349	20,210	21,806	236	236	721	409	541	134
	Galloway Rd	Poplar Rd	60	18,959	19,733	17,526	19,253	236	236	819	361	614	118
	Poplar Rd	Lawrence Rd	60	18,892	19,663	17,622	19,185	236	236	725	360	544	118
	Lawrence Rd	Morningside Rd	60	18,562	19,320	17,471	18,850	236	236	624	354	468	116
	Morningside Rd	Amiens Rd	60	18,702	19,465	17,602	18,992	236	236	628	356	471	117
	Amiens Rd	Fairwood Cres	60	19,233	20,018	18,102	19,531	236	236	646	366	485	120

Note:  
1. Bus/Truck volumes, directional split were estimated based on the City of Toronto turning movement counts

Future Without LRT (2031)												
LOCATION	SECTION		24 Hour AADT									
			Total (cars and trucks only)		Cars		Bus		Medium Trucks		Heavy Trucks	
			NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
FROM	TO	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	
<b>North South Roads</b>												
Morningside Ave	Kingston Rd	Warmworth St	11,819	10,910	11,420	10,216	201	164	113	399	85	131
	Warmworth St	Fairwood Cres	14,714	13,582	13,846	12,569	250	353	353	497	265	163
	Fairwood Cres	Ellesmere Rd	13,553	14,682	12,639	13,587	230	382	390	537	293	176
	Ellesmere Rd	Military Trail	14,082	15,256	13,252	14,241	239	397	338	465	253	153
	Military Trail	Milner Ave	18,511	20,053	17,574	18,882	315	521	355	489	267	160
Military Trail	Ellesmere Rd	5,178	6,590	4,785	6,045	88	171	174	281	130	92	
<b>East West Roads</b>												
Eglinton Ave E	Midland Ave	Failmouth Ave	19,097	16,268	17,560	14,026	764	602	582	937	191	703
	Failmouth Ave	Brimley Rd	16,076	19,648	14,780	17,000	514	668	588	1,132	193	849
	Brimley Rd	Oswego Rd	18,506	17,082	17,164	14,493	592	581	564	1,148	185	861
	Oswego Rd	McCowan Rd	19,164	16,325	18,162	13,817	537	588	351	1,097	115	823
	McCowan Rd	Torrance Rd	18,228	16,826	16,980	14,383	510	606	556	1,050	182	787
	Torrance Rd	Cedar Brae Blvd (Bellamy)	16,178	14,934	15,070	13,016	453	538	493	788	162	591
	Cedar Brae Blvd (Bellamy)	Mason Rd	13,973	12,898	12,749	11,317	545	606	511	557	168	418
	Mason Rd	Markham Rd	13,947	12,874	12,838	10,971	544	605	425	742	139	556
	Markham Rd	Cedar Drive	11,503	10,618	10,496	9,049	449	499	421	612	138	459
	Cedar Drive	Kingston Rd	10,791	9,570	9,921	8,385	345	220	395	551	129	413
Ellesmere Rd	Morningside Rd	9,436	7,118	8,705	6,117	349	164	288	478	94	359	
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	32,768	29,058	30,645	28,065	492	262	1,108	418	524	314
	Scarborough Golf Club Rd	Cornwell Rd	29,949	26,558	28,951	25,740	270	372	548	255	180	191
	Cornwell Rd	Dale Ave	26,525	23,522	25,641	22,797	239	329	485	226	159	169
	Dale Ave	Celeste Dr	22,599	27,621	21,846	26,770	203	387	414	265	136	199
	Celeste Dr	Overature Rd	24,280	25,271	23,078	24,492	219	354	741	243	243	182
	Overature Rd	Galloway Rd	23,356	24,309	21,822	23,357	210	340	997	350	327	263
	Galloway Rd	Poplar Rd	20,622	21,464	18,851	20,622	268	300	1,132	309	371	232
	Poplar Rd	Lawrence Rd	20,549	21,388	18,950	20,549	267	299	1,003	308	329	231
	Lawrence Rd	Morningside Rd	20,191	21,015	18,783	20,191	262	294	862	303	283	227
	Morningside Rd	Amiens Rd	20,342	21,173	18,843	20,343	346	296	869	305	285	229
	Amiens Rd	Fairwood Cres	20,920	21,774	19,378	20,920	356	305	893	314	293	235

Future With LRT (2031)												
LOCATION	SECTION		24 Hour AADT									
			Total (cars and trucks only)		Cars		LRT		Medium Trucks		Heavy Trucks	
			NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
FROM	TO	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	
<b>North South Roads</b>												
Morningside Ave	Kingston Rd	Warmworth St	11,819	10,910	11,621	10,380	236	236	113	399	85	131
	Warmworth St	Fairwood Cres	14,714	13,582	14,096	12,922	236	236	353	497	265	163
	Fairwood Cres	Ellesmere Rd	13,553	14,682	12,870	13,969	236	236	390	537	293	176
	Ellesmere Rd	Military Trail	14,082	15,256	13,491	14,638	236	236	338	465	253	153
	Military Trail	Milner Ave	18,511	20,053	17,889	19,404	236	236	355	489	267	160
Military Trail	Ellesmere Rd	5,178	6,590	4,873	6,216	236	236	174	281	130	92	
<b>East West Roads</b>												
Eglinton Ave E	Midland Ave	Failmouth Ave	19,097	16,268	18,324	14,628	236	236	582	937	191	703
	Failmouth Ave	Brimley Rd	16,076	19,648	15,295	17,668	236	236	588	1,132	193	849
	Brimley Rd	Oswego Rd	18,506	17,082	17,756	15,073	236	236	564	1,148	185	861
	Oswego Rd	McCowan Rd	19,164	16,325	18,698	14,405	236	236	351	1,097	115	823
	McCowan Rd	Torrance Rd	18,228	16,826	17,490	14,989	236	236	556	1,050	182	787
	Torrance Rd	Cedar Brae Blvd (Bellamy)	16,178	14,934	15,523	13,554	236	236	493	788	162	591
	Cedar Brae Blvd (Bellamy)	Mason Rd	13,973	12,898	13,294	11,923	236	236	511	557	168	418
	Mason Rd	Markham Rd	13,947	12,874	13,382	11,576	236	236	425	742	139	556
	Markham Rd	Cedar Drive	11,503	10,618	10,944	9,548	236	236	421	612	138	459
	Cedar Drive	Kingston Rd	10,791	9,570	10,267	8,605	236	236	395	551	129	413
Ellesmere Rd	Morningside Rd	9,436	7,118	9,054	6,281	236	236	288	478	94	359	
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	32,768	29,058	30,566	28,352	236	236	1,258	532	944	174
	Scarborough Golf Club Rd	Cornwell Rd	29,949	26,558	29,194	26,128	236	236	431	324	323	106
	Cornwell Rd	Dale Ave	26,525	23,522	25,856	23,141	236	236	382	287	286	94
	Dale Ave	Celeste Dr	22,599	27,621	22,030	27,174	236	236	325	337	244	110
	Celeste Dr	Overature Rd	24,280	25,271	23,260	24,861	236	236	583	308	437	101
	Overature Rd	Galloway Rd	23,356	24,309	21,983	23,719	236	236	785	445	589	146
	Galloway Rd	Poplar Rd	20,622	21,464	19,063	20,942	236	236	891	393	668	129
	Poplar Rd	Lawrence Rd	20,549	21,388	19,168	20,868	236	236	789	391	592	128
	Lawrence Rd	Morningside Rd	20,191	21,015	19,003	20,504	236	236	678	385	509	126
	Morningside Rd	Amiens Rd	20,342	21,173	19,146	20,658	236	236	684	387	513	127
	Amiens Rd	Fairwood Cres	20,920	21,774	19,690	21,244	236	236	703	398	527	131