REimagining Yonge Street from Sheppard to Finch

Municipal Class Environmental Assessment Study

Air Quality Screening Assessment
Final Report – November 2016

Prepared for: City of Toronto

WSP | MMM GROUP

AIR QUALITY

An Air Quality Screening Assessment was completed to assess existing and potential air quality impacts for the REimagining Yonge Street Municipal Class Environmental Assessment (MCEA) Study. The preferred alternative “Transform.” Two Design Options were selected, which include:

- Design Option 4A to be implemented south of Sheppard Avenue. This Design Option includes a six (6) lane cross section, cycle tracks and the inclusion of the landscaped median.
- Design Option 4B which will be implemented from Sheppard Avenue to Finch Avenue. This Design Option includes reducing the existing lane confiuration to traffic to 4-lanes, and incorporates pedestrian clearway and cycle tracks. This Design Option was used to complete this Air Quality Screening Assessment.

1.0 PROJECT BACKGROUND

Yonge Street is the central transportation corridor and pedestrian promenade within North York Centre, one of four centres that have an important role in achieving the provincial growth objectives of the Official Plan where jobs, housing, and services are expected to be concentrated. The Study Area is located within Ward 23 of the City of Toronto.

The City of Toronto is evaluating opportunities to improve the streetscape and public realm for all users (pedestrians, cyclists, transit and vehicles) within the Study Area. A number of opportunities will be considered, including:

- Adding street trees, lighting, paving, and street furniture;
- Enhancing sidewalks and boulevard widths,
- Integrating adjacent parks and public open spaces;
- Enhancing the landscaped median;
- Improving safety for all users;
- Including bike lanes or cycle tracks on Yonge Street;
- Improving pedestrian crossing facilities; and
- Re-configuring right-of-way and traffic lanes.

To accommodate the above-noted noted development opportunities in the Study Area, a Municipal Class Environmental Assessment (EA) Study is undertaken for which Air Quality Impacts are being considered.

2.0 STUDY AREA

The study area located in North York Centre consists of a mix of commercial and residential properties, with the TTC Yonge Street subway line extending underground. North York Centre is transforming based on transit-oriented employment and residential growth, but the implementation of the street vision has not been fully achieved or kept pace with the changing urbanization of the area. Inconsistent urban features, including sidewalks, crossings, and medians, and the lack of dedicated cycling facilities reduce the prominence of the street and present transportation challenges.

As part of the proposed streetscape and public realm improvements, an estimate of the current air quality baseline needs to be established by obtaining relevant air quality data from the City of Toronto, Ontario Ministry of the Environment and Climate Change (MOECC) and Environment Canada and Climate Change (ECCC).

3.0 AIR QUALITY BASICS

Background (ambient) conditions measure contaminant concentrations that are exclusive of emissions from the existing or proposed project infrastructure. These emissions are typically the result of trans-boundary (macro-scale), regional (meso-scale), and local (micro-scale) emission sources and result due to both primary and secondary formation. Primary contaminants are emitted directly by the source and secondary contaminants are formed by complex chemical reactions in the atmosphere. Secondary pollution is generally formed over great distances in the presence of sunlight and heat and most noticeably results in the formation of fine particulate matter ($PM_{2.5}$) and ground-level ozone (O_3), also considered smog.

Air pollution is strongly influenced by weather systems (i.e., meteorology) that typically move out of central Canada into the mid-west of the U.S. then eastward to the Atlantic coast.

The contaminants chosen for this study are based on the regularly assessed contaminants of interest for transportation assessments in Ontario, as determined by the Ministry of Transportation Ontario (MTO) and Ministry of the Environment and Climate Change (MOECC). Motor vehicle emissions have largely been determined by scientists and engineers with United States and Canadian government agencies such as the U.S. Environmental Protection Agency (EPA), the MOECC, Environment Canada (EC), Health Canada (HC), and the MTO.

These contaminants are emitted due to fuel combustion, brake wear, tire wear, the breakdown of dust on the roadway, fuel leaks, evaporation and permeation, and refuelling leaks and spills. Note that emissions related to refuelling leaks and spills are not applicable to motor vehicle emissions from roadway travel. Instead, these emissions contribute to the overall background levels of the applicable contaminants.

All of the selected contaminants are emitted during fuel combustion, and the contaminants emitted from brake wear, tire wear, and breakdown of road dust are emitted as particulates. A list of these Contaminants of Concern (COC) is provided below:

- Nitrogen Dioxide (NO_2)
- Carbon Monoxide (CO)
- Fine Particulate Matter (<2.5 microns in diameter) ($PM_{2.5}$)
- Coarse Particulate Matter
- (<10 microns in diameter) (PM_{10})
- Total Suspended Particulate Matter
- Acetaldehyde (HCHO)
- Acrolein (C_3H_4O)
- Benzene (C_6H_6)
- 1,3-Butadiene (C_4H_6)
- Formaldehyde (CCHO)

4.0 METHODOLOGY

The movement of air and therefore above-noted COCs in air are not restricted by jurisdictional boundaries and are typically transported long distances away from their sources. These have potential air quality effects both near the local source and on a regional level, away from the source.

For this reason, this air quality screening assessment evaluates the existing conditions of COC levels in the study area airshed and as a result of emissions contributed by various sources including vehicular traffic, comfort heating sources for residential and commercial buildings and finally, industrial establishments. Further, effects due to anticipated construction activities and overall project operations of air quality are also evaluated.

5.0 APPLICABLE GUIDELINES

Air quality in Ontario is protected by Ambient Air Quality Criteria (AAQCs) developed by the MOECC for use in general air quality assessments. In addition, Ontario Regulation 419/05: Air Pollution – Local Air Quality (O. Reg 419) under the *Environmental Protection Act*. O. Reg. 419 contains standards for which emitters of contaminants must meet. Both sets of standards are effect-based concentration levels in air with variable averaging times depending on the effect. Effects may be health, odour, vegetation, soiling, visibility and corrosion, among others.

6.0 Air Quality – Existing Conditions

The following sub-sections provide an overview of the existing air quality condition within the study area. Information presented in this sub-sections was developed based on secondary source information, correspondence with regulatory agencies and readily available public data provided by the regulatory agencies.

6.1.1 City of Toronto

Previous studies completed for the City of Toronto were used to characterize the background emissions. In 2008, Toronto Public Health established a list of 25 substances that are priority concern for the City. The list of 25 priorities were combined with a complete Criteria Air Contaminant (CAC) list to generate a set of “Priority Air Contaminants” for the City as a whole, to be used in cumulative air studies.

In 2011, the City initiated a series of local air quality studies to evaluate the presence of pollutants and the potential cumulative health impacts of these pollutants on local communities. The studies are conducted by City's Environment & Energy Division and Toronto Public Health, in partnership with the Ministry of the Environment and Climate Change (MOECC). The City commissioned the development of the Toronto Airshed Model “An All Sources Cumulative Air Quality Impact Study of South Riverdale - Leslieville – Beaches” (Golder, 2011), which addressed the transport and dispersion of long-range, regional and local emissions on the Toronto airshed including industrial, commercial, residential, transportation-related, agricultural, and natural. The purpose of the airshed modelling project was to determine the contribution of various local and transboundary sources to the geographical distribution of ambient air quality concentrations for the City of Toronto. This model used 2006 data, but it is still considered to be representative of current background emissions within the City. Air dispersion modelling using CALPUFF/CALMET Modelling System was used to calculate and map the concentrations of the 30 air pollutants in specific areas of Toronto. To date, two studies were completed for Wards 30 and 32 (i.e.

South Riverdale, Leslieville and Beaches Area) and Wards 5 and 6 (South Etobicoke Area). From these two studies, the City identified key sources of emissions affecting local air quality were identified as on-road vehicles and equipment that use fossil fuels for comfort heating homes and businesses. The report also concluded that local emissions in Toronto (in percentage terms) are mainly dominated by transportation sources, contributing approximately 76% of the total emissions by weight released to the air in Toronto. On the contrary, “off-road” transportation sources including rail, marine and airports, contribute a further 10% - in total 86% of total emissions by weight. Other off-road emissions are contributed by industries located within the City, approximately at 6% while residential and commercial buildings contribute a further 8% combined.

In consultation with the City of Toronto, there are on-going studies at Ward 8, 9 and 10, which is located immediately west of the Study Area in Ward 23. Since, the studies are still on-going, the City only has preliminary data on a worst-case 24-hour and Annual averaged concentration basis for only three pollutants - Benzene, NOx, PM2.5 for this area. The preliminary analysis maps produced for these pollutants indicate that the worst-case conditions occur along the most travelled routes, such as Highway 401 and arterial major roadways.

On the basis of the study information collected from the nearby and comparable Wards to the Study Area, these data can be used to extrapolate the overall air quality the study area, especially the portion of the Study Area that is in close proximity to the Highway 401. The Highway 401 is expected to have greatly influenced by vehicular emissions i.e. emissions pertaining to NOx, 1,3 butadiene, benzene, polyaromatic hydrocarbons, carbon monoxides and particulate matters.

Residential and commercial sources such as condominium developments and high-rise office buildings along Yonge Street utilize natural gas for comfort heating. Combustion emissions from these sources are expected to contribute significantly to the existing air quality conditions, especially for NOx, PM, CO and SO2.

Finally, large industrial sources which are also major contributors to air quality conditions in the City, are not located within 5 km radius of the Study Area. On this basis, the local air quality conditions in and adjacent to the Study Area are not expected to have been much impacted by the industrial facilities that are located beyond the 5-km radius of the Study Area.

6.1.2 The Ministry of the Environment and Climate Change (MOECC)

The Province of Ontario operates a network of 39 ambient (outside) air monitoring stations across the province that collects real-time air pollution data. This information is communicated to the public through Ontario's new Air Quality Health Index (AQHI) and as hourly concentrations of six common air pollutants which can have an adverse effect on humans and the environment at high levels, such as, Ozone (03), Fine Particulate Matter with 2.5 microns (PM 2.5), Nitrogen Dioxide (NOx), Sulphur Dioxide (S02), Carbon Monoxide (CO) and Total Reduced Sulphur Compounds (TRSC).

Information from the AQI monitoring stations is used by MOECC:

- to monitor the existing air quality conditions around these operating monitoring stations and inform the general public about Ontario's ambient air quality;
- assess Ontario's air quality and evaluate long-term trends;

- identify areas where criteria and standards are exceeded; provide the basis for air quality policy/program development;
- determine the impact from U.S. and Canadian sources on Ontario's air quality;
- provide scientists with air quality data to link environmental and human health effects to pollution levels; and
- finally, provide smog advisories for public health protection, if and when applicable.

MOECC's air quality monitoring is carried out continuously and can be viewed on a real time basis (hourly summaries) as published on Air Quality Ontario website (http://www.airqualityontario.com/). Each year, the Ministry also prepares an Air Quality Report to assess the state of air quality in Ontario based on the provincial Air Quality Health Index network.

Among the 39 stations, the closest monitoring station to the Study Area is “Toronto North Ambient Air Monitoring Site” located to the northwest of the intersection of Hedron Avenue and Yonge Street. This station closest in proximity to the Study Area is as shown on **Error! Reference source not found.** below and Station information summarized in Table 1 below.

Station Type: *Urban*

Height of Air Intake: *5 metres*

Elevation Above Sea Level (ASL): *325 metres*

Pollutants Measured: *O_3, $PM_{2.5}$, NO_2*

Table 1 MOECC Toronto North Monitoring Station Parameters

Station Name	Toronto North
ID	34020
Address	Hendon Avenue/Yonge Street
Type	Urban
Latitude	43.781611
Longitude	-79.417722
Air Intake Height	5 metres
Elevation Above Sea Level	190 metres
Pollutants Monitored	NO_x, O_3, $PM_{2.5}$

The location of the station relative to the Study Area is shown below in **Figure 1.**

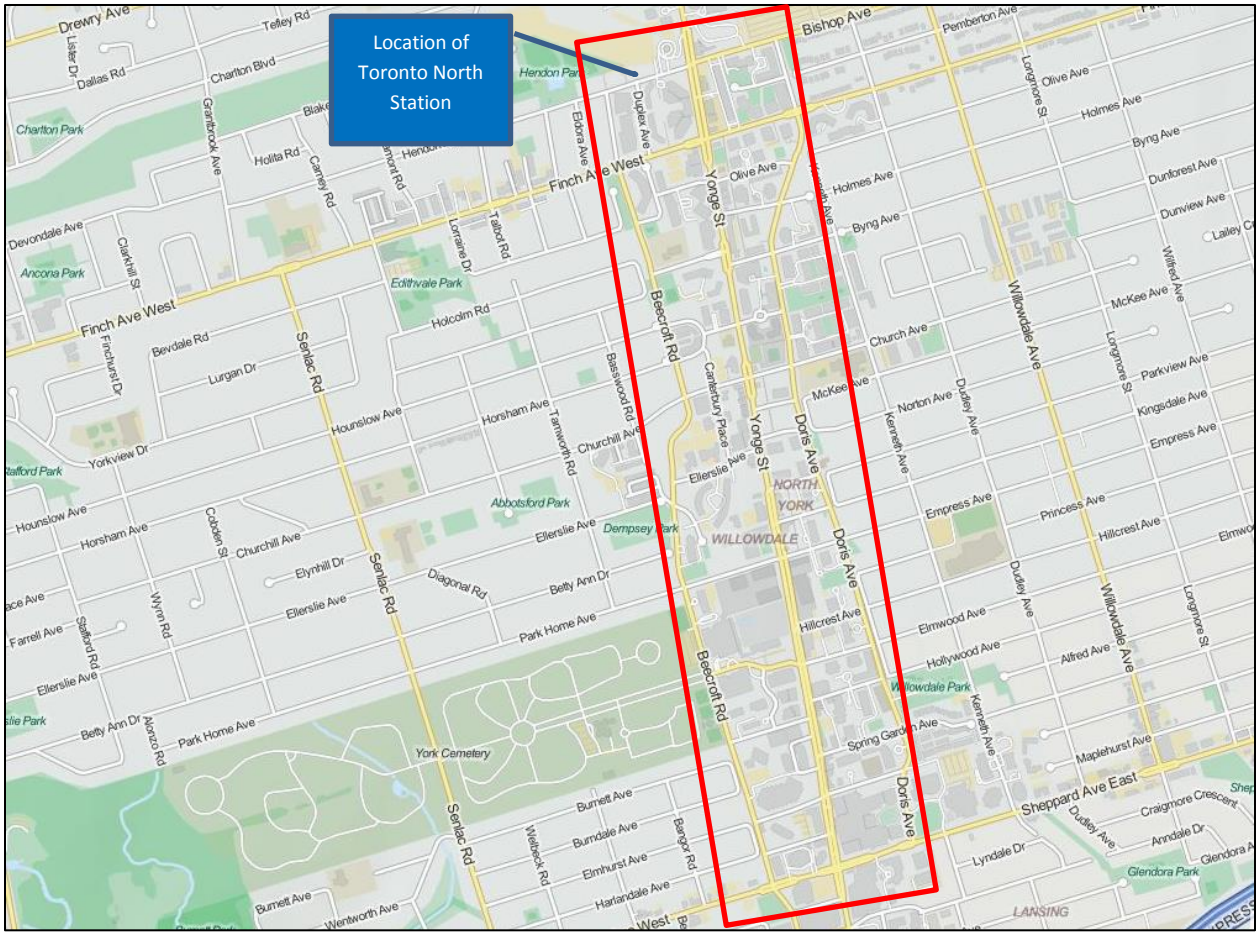

Figure 1 – Location of Toronto North Station relative to the Study Area.

While the hourly updated data are available until now, the maximum hourly data in any given year are available through MOECC's Annual Publication which summarizes the state of ambient air quality in Ontario and examines 10-year trends. The latest Provincial report was issued in 2016 for the year 2014 and is entitled "Air Quality in Ontario - Report for 2014".

In respect to Toronto North station, the 2014 Provincial Report indicates that the station monitored three pollutants: Ozone (O3), Fine Particulate Matter (PM2.5) and Nitrogen Dioxide (NOx). The other pollutants in the Provincial Program (sulphur dioxide, carbon monoxide and total reduced sulphur compounds) have reached background levels and are no longer required to be monitored at the Toronto North station.

Reportedly, a total of 8,696 hours monitored O3, of which the mean concentration was measured at 25.3 ppb with one event being above the reportable criteria for 1-hour.

Similarly, a total of 8,609 hours monitored PM2.5, of which, the average concentration was measured at 9.2 ug/m3, with two (2) events above the 24-hour reportable criteria.

Finally, a total of 8,709 hours monitored NOx, of which, the mean concentration was measured at 4.3 ppb, with no events reported above the reportable criteria.

The following data obtained from the report shows a general trend over a period of 10 years for these three (3) monitored contaminants –

Contaminant	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	% change
Ozone	24.5	23.3	24.5	22.7	22.1	24.8	23.6	25.7	25.3	25.3	3.27%
Fine Particulate Matter	9.4	7.6	7.8	7.3	5.9	6.2	7.7	7.3	8.3	9.2	-2.13%
NOx	30.4	27.5	25	24.3	22.8	20	21.5	18.5	17	17.7	-41.78%

In addition to monitoring ambient contaminant concentrations, the MOECC maintains a province-wide Air Quality Health Index (AQHI) for the purpose of relaying a general assessment of air quality to the public on an hourly basis.

As per the MOECC, the Air Quality Office of the Environmental Monitoring and Reporting Branch and Environment Canada and Climate Change continuously collects near real-time data for criteria pollutants from these AQI sites. The AQHI is based on pollutants that have adverse effects on human health and the environment; ozone, fine particulate matter, nitrogen dioxide, carbon monoxide, sulphur dioxide, and total reduced sulphur compounds.

At the end of each hour, the concentration of each pollutant measured at each site is converted into a number ranging from zero upwards using a common scale or index. The calculated number for each pollutant is a sub-index value. At a given air monitoring site, the highest sub-index value for any given hour becomes the reporting AQI for that hour. The index is a relative scale, in that the lower the index, the better the air quality. Index values between 1 and 3 are low risk, 4 - 6 are moderate risk, 7 - 10 high risk, 10+ is very risk. The MOECC web site, www.airqualityontario.com, provides index values, corresponding categories, and potential health and environmental effects. The AQHI values recorded at the Toronto North station in 2015 are shown in **Error! Reference source not found.** below.

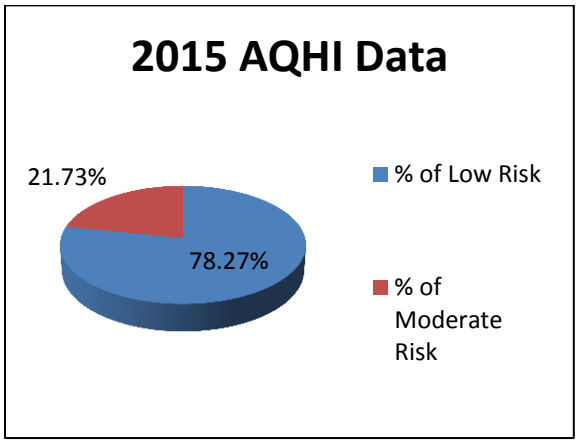

Figure 2 – Percentage breakdown of Air Quality Health Index reported for 2015.

6.1.3 Environment Canada and Climate Change (ECCC)

An analysis of Environment Canada's National Pollutant Release Inventory (NPRI) Database revealed a number of industrial facilities within a five (5) kilometer radius of the centre of the study area as shown on **Error! Reference source not found.** below. Most of these industries are located in far west of the Study Area which includes facilities in the general manufacturing, electricity and wood product sectors as well as one wastewater treatment plant. None of these facilities reported above-noted contaminants of interest.

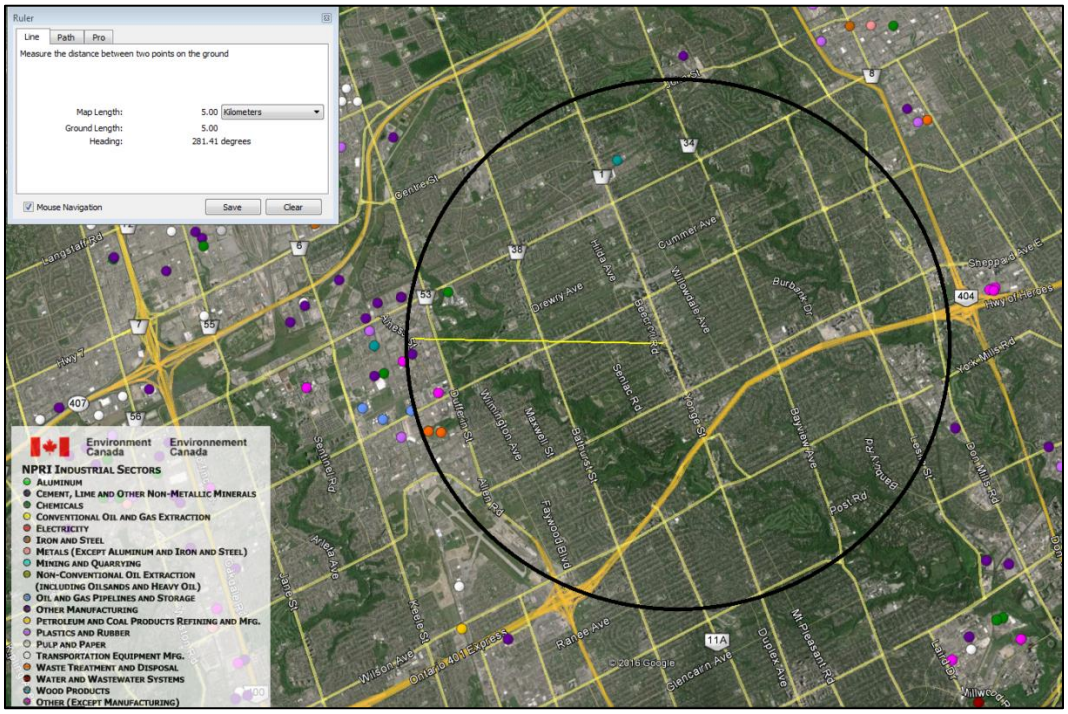

Figure 3 – Location of Industrial Facilities reported under the Environment Canada and Climate Change's NPRI Program in 2014.

7.0 FINDINGS OF ASSESSMENT AND MITIGATION MEASURES

As per the overall findings, the air quality at a regional level has been improving as the levels of concentrations of COCs are generally in declining trend. Similarly, the air quality trend within the Study Area and the vicinity has exhibited similar characteristics. On this basis, it is expected that due to the proposed changes of the Study Area, utilization of existing rapid transit systems and fuel efficient passenger cars and buses, the general air quality in the Study Area is to remain or get better with time, resulting into reduction of overall emissions.

7.1.1 Effects of Construction on Air Quality and Mitigation Measures

Construction activities potentially generate considerable amount of air pollution. Construction activities may involve heavy equipment that generates air pollutants and dust; however, these impacts are generally considered "temporary". The emissions are typically highly variable and prediction is difficult, depending on the specific activities that are taking place and the effectiveness of the mitigation measures.

The most common construction activities that may generate emissions include site preparation, earthmoving, roadway surfacing, construction of structures and facilities, and demolition of existing structures.

In addition, fuel combustion from mobile heavy-duty diesel- and gasoline powered equipment, portable auxiliary equipments, and worker commute trips; and fugitive dust from soil disturbance are the major sources of air pollution during construction phase.

The best possible manner to deal with these construction related emissions is through diligent implementation of Construction Code of Practice, operating procedures such as application of dust suppressants, efficient staging of construction activities and minimization of haul distances, covering up stockpiles, etc. It is recommended that to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an emissions management plan within the umbrella of the Environmental Management Plan. Such a plan would help establish best management practices for dust and other emissions.

Potential construction mitigation measures can be typically dealt with standard mitigation measures which include: the use of dust suppressants to ensure dust is effectively managed and kept to a minimum as praticably possible; the use of reformulated fuels, emulsified fuels, exhaust catalyst and filtration technologies, cleaner engine repowers, and new alternative-fuelled trucks to reduce emissions from construction equipment; regular cleaning of construction sites and access roads to remove construction-caused debris and dust; covered loads when hauling fine-grained materials; compliance with posted speed limits and, as appropriate, further reductions in speeds when travelling sites on unpaved surfaces; the restrictions on the idling of construction equipment unnecessarily should be kept to a minimum and finally, Environmental Compliance Approvals (ECAs) from the MOECC and appropriate dust controls/suppression for any portable crushers, asphalt plants or concrete batching plants.

It is recommended that construction-related emissions be handled by development and implementation of a management plan and implementation of best management practices, in order to minimize the emissions to the best extent that can reasonably be achieved. With the implementation of air quality control measures as part of the Plan, no net negative effects are anticipated from construction.

7.1.2 Effects of Proposed Changes on Air Quality and Mitigation Measures

The City of Toronto's Environment and Energy Division (EED) conducted "The Urban Venitilation Study" in an effort to address fundamental changes to local air quality due to the impacts of recent urban development that is causing intensification in combination with the impacts of the existing urban layout. The City indicated that "vertical intensification" which refers to core areas in the City with building profiles are becoming taller and taller but at ground level, the roads are becoming narrower. The emissions due to traffic volumes in such narrow corridors within these high rise neighborhoods can potentially cause emission entrapment, eventually, adverse effects on local air quality at a ground level. This issue related to pollution entrapment at ground level by buildings is related more to the dimensions of the current buildings and existing road network. The report summarized that the longer the street, the less impact one tall building volume has within the equation. The shallow canyons are unlikely to have adverse air quality due to canyon entrapment of pollution, by contrast, a long and deep canyon would be problematic.

While the project may cause a slight increase in local emissions and air quality in areas that receive diverted traffic, overall it is expected to cause a decrease in regional and local emissions. Widening roadways with more inclusion to pedestrian modes of travel and bicycle paths will further improve not only the air quality but the overall quality of the existing road network. In addition, proposed green spaces and extensive landscaping can act as buffer areas that may further enhance the overall quality of the road network throughout the section. In addition, a number of provincial and federal initiatives with the phase-in of new vehicles/engines having more stringent emission standards over the near future will help further reduce significant vehicular emissions contributing to air pollution in the area.

8.0 CONCLUSION

From the overall screening assessment, vehicular emissions and comfort heating sources from residential and high-rise commercial buildings are considered to be two most significant contributors to air pollution within the Study Area and the vicinity. The Highway 401 which is located in close proximity to the south of the Study Area is expected to have greatly influenced emissions pertaining to NOx, 1,3 butadiene, benzene, polyaromatic hydrocarbons, carbon monoxides and particulate matters.

Large industrial sources which are also major contributors to air quality conditions in the City of Toronto, are not located within a 5 km radius of the Study Area. On this basis, the local air quality conditions in and adjacent to the Study Area are not expected to have much impact by the industrial facilities

Overall, from the assessment of regional air quality and GHG emissions there is an improving air quality trend from the data analyzed in the past 10 years and as a result of the project, it is expected that the project will further aid in improvement of both regional and local emissions. A temporary spike in emissions associated with construction related activities is expected; however, it should be noted that the emissions are of unpredictable nature. The types of anticipated activities were reviewed and best management practices for minimizing emissions during construction were considered as part of the evaluation. It is recommended that construction-related emissions be handled by development of a management plan and implementation of best management practices, in order to minimize the emissions to the best extent that can reasonably be achieved.

Based on the idenfitication of contaminations, findings, and conclusions an Air Quality Impact Assessment (AQIA) is not required for the REimagining Yonge MCEA Study.

References:

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