KEELE FINCH PLUS

NOISE, AIR QUALITY, AND SAFETY STUDY

CITY OF TORONTO

FINAL

PROJECT NO.: 17M-01905-16

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WSP
UNIT 2
126 DON HILLOCK DRIVE
AURORA, ON, CANADA L4G 0G9

T: +1 905 750-3080
F: +1 905 727-0463
WSP.COM

S I G N A T U R E S

PREPARED BY

January 23, 2020

Date

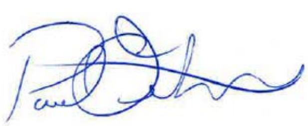
Kana Ganesh, MSc., PhD, P.Eng.
Senior Technical Director, Acoustics and Vibration – Environment

January 23, 2020

David Hofbauer, M.A.Sc., P.Eng.
Senior Technical Lead, Air Quality

Date

APPROVED[1] BY



January 23, 2020

Paul Orchard
Team Lead – Environment

Date

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EXECUTIVE SUMMARY

WSP Canada Inc., (WSP) was retained by the City of Toronto to complete an air, noise, and environmental safety study for the Keele Finch Plus area, an area surrounding the intersection of Keele Street and Finch Avenue West in Toronto, Ontario. WSP understands that the Keele Finch Plus study area is part of a City of Toronto initiative that will result in an updated planning framework to support and leverage current and continuing investment in rapid transit infrastructure. The planning framework would encourage growth and community building around the new subway station and future light rail transit line.

As part of the planning process, the City of Toronto completed an environmental study examining the existing conditions, considered as the Phase 1 Study for the Keele and Finch area. The Phase 1 Study included two technical reports: one considered the Downsview Airport and provided maximum buildable heights, and the other considered land use compatibility by determining minimum separation distance and potential area of influence for each industry based on industry classifications, as per the Ontario Ministry of the Environment, Conservation, and Parks (MECP) D-6 Guideline Compatibility between Industrial Facilities and Sensitive Land Uses. The minimum separation distance and potential area of influence determination from the Phase 1 Study included potential development areas; therefore, as part of the Land Use Planning process the City of Toronto initiated further assessment of air, noise, and environmental safety studies to understand the existing environmental conditions and their impact on potential development. This report addresses the following topics with respect to noise, air quality, and safety impacts on potential sensitive land uses and development proposals:

- The presence of several industrial operations, including large fuel distribution terminals;
- Significant heavy truck activities in the area as a result of industrial operations;
- Potential limitations to approving development proposals within the Mixed-Use Areas; and,
- The presence of the Downsview Airport.

As part of this study WSP reviewed policies, regulations, and guidelines that are applicable to the Keele Finch Plus study area and established criteria from the respective noise, air quality, and safety perspectives based on the results. After establishing the criteria, the baseline and future environmental impacts due to transportation related activities, industrial operations, and operations associated with the Downsview Airport were determined and compared to the criteria to develop appropriate recommendations. The respective findings related to noise, air quality and safety are summarized below and discussed in greater detail within the report.

NOISE

The acoustic environment could potentially be impacted by transportation, industrial operations, and the Downsview Airport activities. The MECP Publication NPC-300 provides sound level criteria for acceptable levels of transportation noise, stationary noise (*i.e.*, industrial and commercial operations), and aircraft noise at sensitive receptors. The descriptions of the noise predictive analysis performed including the software used are as follows:

- Surface transportation using MECP STAMSON (an implementation of MECP developed algorithms for road and rail noise) and commercially available software package CADNA/A (an implementation of the Traffic Noise Model (TNM) by the United States Federal Transit Administration).
- Industrial and commercial operations using commercially available software package CADNA/A (a computerized implementation of the algorithms contained in ISO 9613).
- Aircraft operation at the Downsview Airport using Transport Canada's Noise Exposure Forecast (NEF) software.

The examination of the noise implications of a proposed development within the Keele Finch Plus study area indicates the following:

FOR SURFACE TRANSPORTATION:

1. Considering the significant heavy truck activities in the area due to the presence of industrial operations, it is recommended that the City investigate the possibility of reducing the speed limits on both Keele Street and Finch Avenue West. A speed reduction of 20 km/h can result in a notable change in sound levels.

Development adjacent to Keele Street or Finch Avenue

2. City of Toronto requires a site-specific noise assessment considering the surface transportation sources be included for each of the following stages:
   a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
   b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA).
3. Proposed development should include central air conditioning as an alternative to operable windows despite the outcome of the noise study.
4. The surface transportation noise assessments should determine the acoustical performance requirements for exterior façade elements (i.e., exterior walls, windows, and balcony doors) for the development. For such assessments, STC-50 rated walls and STC-33 rated windows/doors shall be considered the minimum for acoustical performance.
5. Detailed plans should be reviewed by a Professional Engineer or City Building Inspector to confirm that no outdoor living area greater than four metres in depth is provided within the development or that such outdoor areas are assessed from an acoustic perspective.

6. At the site plan approval stage, it is recommended that a Professional Engineer with an acoustics background or an approved professional from the City Building Department certify that the building plan includes the noise controls discussed within this report.
7. It is recommended that the City of Toronto requires a verification/certification by a Professional Engineer as part of the occupancy permit stating based on inspection/testing that the recommendations as part of Item 2 have been correctly interpreted and applied.

<u>Development at least one block away from Keele Street or Finch Avenue</u>

8. Development should include central air conditioning as an alternative to operable windows despite the outcome of the noise study.
9. Minimum STC-50 rated walls and STC-33 rated windows/doors shall be considered the minimum for acoustical performance.
10. Detailed plans should be reviewed by a Professional Engineer or City Building Inspector to confirm that no outdoor living area greater than four metres in depth is provided within the development or that such outdoor areas are assessed from an acoustic perspective.

If the truck on Keele Street and Finch Avenue uses a dedicated truck route that does not traverse through existing residential areas, then recommendations 8 to 10 applies to the entire study area inducing those adjacent to Keele Street and Finch Avenue.

FOR STATIONARY SOURCE OPERATIONS:

The assessment indicated that it is feasible to achieve the MECP and City of Toronto noise objectives within the Keele Finch Plus study area with Class 4 designation for selected areas and suitable mitigation measures as part of the planning process.

<u>For Group 1 Receptors – i.e. Receptors in Mixed Use Areas - to the east of Keele Street</u>

1. It is recommended that the City of Toronto formally confirm the 'mixed-use areas' to the east of Keele Street as a Class 4 acoustic area. For the area or specific site to be Class 4, it should be:
    a. an area intended for development with new noise sensitive land use(s) that are not yet built;
    b. in proximity to existing, lawfully established stationary source(s); and,
    c. formally confirmed from the land use planning authority to proceed with the Class 4 Area Classification, which is determined during the land use planning process.
2. The City of Toronto should require a verification of stationary source impacts including the sources associated with a development on itself (self-impact) corresponding to the year of site plan approval against Class 4 limits. The verification can be done through a modelling approach or a measurements approach conducted onsite to confirm the stationary source sound level.

3. In the event that the land use authority does not classify the area as Class 4, City of Toronto should require a site-specific detailed noise assessment considering the stationary sources including self-impact be included for each of the following stages against Class 1 limit:
    a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
    b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA);

<u>For Group 1 Receptors – i.e. Receptors in Mixed Use Areas - to the west of Keele Street</u>

4. The City of Toronto should require a site-specific detailed noise assessment considering the stationary sources including self-impact be included for each of the following stages against Class 1 limits:
    a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
    b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA);

Impulsive sources:

Since the spur lines of these facilities are well away from current and potential sensitive receptors considered for this study, and also assuming that the facilities comply with the MECP's requirements at the closest existing receptor, it is WSP's opinion that impulsive noise is not a concern.

Based on the assumption that the facilities with stationary sources comply with the MECP's guideline limits for steady and impulsive sources at the nearest existing receptors during a predictable worst-case operation, the study concludes that it is feasible to meet the sound level limits for a Class 4 area for mixed used areas to the east of Keele Street and Class 1 limits at all other receptors. A site-specific study should consider detailed assessment of stationary sources for source or receptor-based control of any residual effects.

DOWNSVIEW AIRPORT OPERATIONS:

1. Warning clauses as required by the MECP should be included in pertinent Offers of Purchase and Sale, Lease, or Rental Agreements to inform future occupants of the existence of the airport in mixed use areas identified in Figure 2 as 'Area 1'.

AIR QUALITY

The air quality environment could potentially be impacted by transportation and industrial operations. Assessment criteria for transportation and industrial operations were established from the MECP Ambient Air Quality Criteria (AAQC) and the Canadian Ambient Air Quality Standards (CAAQS) to examine impacts on future development. Descriptions of the air quality predictive analysis performed, including the software used are as follows:

— Surface transportation using United States Environmental Protection Agency (US EPA) Motor Vehicle Emission Simulator (MOVES) software to predict vehicle emissions and then perform dispersion modelling using the US EPA CAL3QHCR model.

— Stationary sources using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD).

The assessment indicated that it is feasible to achieve AAQC and CAAQS criteria within the Keele Finch Plus study area for transportation sources. No additional studies or recommendations are required for surface transportation related to air quality.

Due to the screening level of assessment conducted for stationary sources, further detailed analysis is recommended for oxides of nitrogen (NO_X) and particulate matter (PM) within locations in the study area (**Figure 30**). Nickel (Ni), manganese (Mn), hexavalent chromium [Cr(VI)], and lead (Pb) should all be included in further detailed analysis when a development is proposed. NO_X and PM are already a known issue within the City of Toronto when compared to AAQC and CAAQS guidelines, so the study area is not an exception. Metals are not monitored in government operated air quality stations; however, within the study area is the presence of a large quantity of small automotive and metal working operations. Development close to these operations should consider air handling units well above grade, inoperable windows, or other mitigation to avoid poor air quality from these facilities emitting at low elevations.

SAFETY

The operations of fuel distribution terminals have the potential to pose a safety concern related to ionizing radiation and release scenarios that could cause a pool fire. Ionizing radiation exists naturally in both the pipelines servicing the fuel distribution terminals and in the flow controllers.

The measured ionizing radiation within the study area did not pose a significant risk when compared to background levels from just outside the study area. No safety concerns exist for ionizing radiation within the study area due to bulk fuel transport, storage, and flow gauges

As per the Environmental Emergency Regulations (E2 Regulations) under the Canadian Environmental Protection Act, 1999 (CEPA), fuel distribution terminals are required to have safety controls to reduce the frequency and consequences of uncontrolled, unplanned, or accidental releases to the environment. Despite the reduced frequency of hazards there still exists a potential for upset conditions resulting in the release of flammable material which may impact offsite receptors.

A total release scenario of gasoline resulting in a pool fire from the largest existing storage tank present at any of the fuel distribution terminals was used to assess safety risks. Response times from Toronto Fire Services were incorporated into the dispersion model. The worst-case assessment indicated that:

— For a development to proceed within the 175 m of a fuel storage tank (AEGL-3 and AEGL-2) a Risk Assessment should be conducted by the developer that examines the frequency of a pool fire occurring, which when combined with the consequence analysis of this study can identify risk. This Risk Assessment should follow the CSChE Risk Assessment Guide. When a development is being proposed, the actual fuel storage tanks in existence at the closest fuel terminal can be used to recalculate the downwind impacts. Impacts to proposed development can also be evaluated in the Risk Assessment process through the use of onsite mitigation measures such as increased building insulation, line of sight obstructions (berms, walls, etc.), or the use of site façade cooling measures such as dedicated sprinklers.

- No restrictions on land use for developments between 175 m to 270 m (AEGL-1 impact area) from the fuel storage tanks. Developing within the AEGL-1 impact area of a fuel distribution terminal will require development proponents to work with the fuel distribution terminal operator to ensure proper evacuation or shelter in place alert systems are provided for.
- No concerns exist for proposed developments further than 270 m from the fuel storage tanks.

ABBREVIATIONS

General

AAR	Acoustic Assessment Report
AAQC	Ontario Ambient Air Quality Criteria
AEGL	Acute Exposure Guideline Levels
AERMOD	The American Meteorological Society/Environmental Protection Agency Regulatory Model (software)
AIHA	American Industrial Hygiene Association
ALOHA®	Area Locations of Hazardous Atmospheres (software)
BLEVE	Boiling Liquid Expanding Vapour Explosion
CAAQS	Canadian Ambient Air Quality Standards
CADNA/A	Computer Aided Noise Abatement (software)
CEPA	Canadian Environmental Protection Act, 1999
CN	Canadian National Railway Company
COC	Contaminant of Concern
CP	Canadian Pacific Railway Limited
CSChE	Canadian Society for Chemical Engineers
ECA	Environmental Compliance Approval (formerly Certificate of Approval)
ECCC	Environment and Climate Change Canada
EPA	Ontario Environmental Protection Act, RSO 1990, c. E. 19
ERPG	Emergency Response Planning Guideline
G	Ground Absorption Coefficient
ISO	International Organization for Standardization
LEL	Lower Explosive Limit
LOC	Levels of Concern
LOF	Limited Operational Flexibility
Leq(16)	Daytime 16-hour (07:00-23:00) Energy Equivalent Sound Level (Leq)
Leq(8)	Nighttime 8-hour (23:00-07:00) Energy Equivalent Sound Level (Leq)

MECP	Ontario Ministry of the Environment, Conservation, ad Parks (formerly the Ministry of the Environment and Climate Change)
MIACC	Major Industrial Accidents Council of Canada
MOVES	Motor Vehicle Emission Simulator (software)
NOAA	National Oceanic and Atmospheric Administration
NPC-300	Noise Pollution Control Guideline - Ontario
NPRI	National Pollutant Release Inventory
ORNAMENT	Ontario Road Noise Analysis Method for Environment and Transportation
Phast	Process Hazard Analysis Software
POI	Point of Impingement
POR	Point of Reception
SLM	Sound Level Meter
STEAM	Sound from Trains Environmental Analysis Method
UEL	Upper Explosive Limit
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator (coordinate system)
ZOI	Zone of Influence

Units of Measurement

%	Percent
µm	Micrometres
C#	Number (#) of carbon atoms in a molecule
Cr(VI)	Hexavalent chromium
dB	Decibel
dBA	Decibel, A-weighted
h	Hour
Hz	Hertz
in.	Inch
kg	Kilogram
kW	Kilowatt
L	Litre
m	Metre
m^2	Square metre (area)
m^3	Cubic metre (volume)

min	Minute
mm	Millimetre
mSv	MilliSievert
Pa	Pascal
ppm	Parts per million
s	Second

Chemicals

CO	Carbon Monoxide
N_2O	Nitrous Oxide
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Oxides of Nitrogen
O_3	Ozone
Mn	Manganese
Ni	Nickel
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter Less than 2.5 µm in diameter
VOC	Volatile Organic Compounds

GLOSSARY

Ambient Sound Level or Ambient Noise	All-encompassing sound that is associated with a given environment, usually a composite of sounds from many sources near and far. Includes noise from sources other than the sources of interest (i.e., sound other than that being measured), such as sound from other industrial sources, transportation sources, animals and nature.
Attenuation	The reduction of sound intensity achieved by various means (e.g., air temperature and humidity, material porosity, etc.).
A-Weighting	The weighting network used to account for changes in level sensitivity as a function of frequency. The A-weighting network de-emphasizes the low (i.e., below 1 kHz) frequencies, and emphasizes the frequencies between 1 kHz and 6.3 kHz, in an effort to simulate the relative response of the human ear. See *Frequency Weighting*.
Background Sound Level or Background Noise	Same as the ambient sound level.
Barrier	An obstacle on the propagation path of sound between a source and a receiver composed of a berm, wall, and/or fence that is free of gaps within or below its extent and of sufficient mass to prevent significant transmission of sound through it.
Calibrator (acoustical)	Device that produces a known sound pressure level on the microphone of a sound level measurement and is used to verify the measurement system accuracy. Calibrators are routinely factory calibrated by a qualified laboratory.
Contaminant of Concern	Contaminants which are likely to pose a risk to health or the environment.
Daytime	Defined as the hours from 07:00 to 23:00 in an urban environment.
Decibel	A logarithmic measure of any measured physical quantity and commonly used in the measurement of sound. The decibel (dB) provides the possibility of representing a large span of signal levels in a simple manner. The difference between the sound pressure for silenced versus a loud sound is a factor of 1:1 000 000 or more and the same in Decibel is 0 – 130 dB, therefore it is less cumbersome to use a small range of equivalent values. A tenfold increase

	in sound power is equal to +10 dB; a tenfold increase in sound amplitude is equal to +20 dB.
Decibel, A-weighted	A-weighted decibels (dBA). Most common units for expressing sound levels since they approximate the response of the human ear, see *A-weighting*.
Energy Equivalent Sound Level (L_{eq})	An energy-equivalent sound level (L_{eq}) over a specified period of time that would have the same sound energy as the actual (*i.e.*, unsteady) time varying sound over the same period of time. It represents the average sound pressure encountered for the period. The period is often added in parenthesis (*i.e.*, L_{eq}(24) for the 24 h equivalent sound level). A L_{eq} value expressed in dBA is a good, single-value descriptor to use as a measure of annoyance due to noise.
Existing Ambient	Existing sounds in a given area (*i.e.*, includes natural sounds as well as anthropogenic sounds).
Frequency	The number of times per second that the sine wave of sound repeats itself.
Frequency Weighting	A method used to account for changes in sensitivity as a function of frequency. Three standard weighting networks, A, B, and C are used to account for different responses to sound pressure levels. Note: The absence of frequency weighting is referred to as "flat" response or linear weighting.
Ground Absorption Coefficient	A parameter defined based on noise reflection characteristics of a surface. It varies between 0.0 (fully reflective) to 1.0 (fully absorptive).
Guidelines	Guidelines are departmental documents that are used to interpret legislation and/or regulation. Although they may be derived from legislation and are often used to advise how one might comply with a regulation, guidelines do not have the force of law.
Hertz (Hz)	The unit of frequency, defined as full wave cycles per second.
Insertion Loss	The sound level at a given receiver before the construction of a barrier minus the sound level at the same receiver after the construction of the barrier. The construction of a noise barrier usually results in a partial loss of soft-ground attenuation. This is due to the barrier forcing the sound to take a higher path relative to the ground plane; therefore, barrier insertion loss is the net effect of barrier diffraction, combined with this partial loss of soft-ground attenuation.

International Organization for Standardization (ISO)	An international body that provides scientific standards and guidelines related to various technical subjects and disciplines.
Legislation	Legislation refers to written laws, often referred to as Acts or statutes, which are enacted by Parliament, the legislative arm of government.
Line Source	Multiple point sources moving in one direction (*e.g.*, a continuous stream of roadway traffic, radiating sound cylindrically). Sound levels from a line source decrease at an ideal rate of 3 dB per doubling of distance.
Mitigation	Measures taken at the source or the receptor to reduce, eliminate, or control impacts to health or the environment. Mitigation can occur at the receptor or at the source:
Receptor Mitigation	Receptor mitigation are steps taken at the receiver to reduce adverse effects. Mitigative measures generally are landscaping, orientation, or on building measures such as non-operable windows, air conditioning, insulation, and noise reducing windows.
Source Mitigation	Source mitigation is, in general, the most effective form of mitigation and involves controlling a source before it is able to emit pollutants or potentially offensive noise levels.
Nighttime	Defined as the hours from 23:00 to 07:00 in Ontario.
Noise	Any unwanted sound. "Noise" and "sound" are used interchangeably in this document. See *Sound*.
Noise Barrier	See *Barrier*.
Octave	The interval between two frequencies having a ratio of two to one. For acoustic measurements, the octave bands start at 1 000 Hz centre frequency and go up or down from that point, at a 2:1 ratio. From 1 000 Hz, the next centre frequencies are 2 000 Hz, 4 000 Hz, and so one. The centre frequencies also move downward to 500 Hz, 250 Hz, and so one.
Point of Reception	A representative point considered for the purpose of assessment within noise-sensitive receptor such as a residence, campground, daycare, school, church, or hospital.
Point Source	Source that radiates sound spherically (*i.e.*, equally in all directions). Sound levels from a point source decrease at a theoretical rate of 6 dB per doubling of distance.

Predictable Worst-Case Operation	A planned and predictable mode of operation for stationary source(s), during the hour when the noise emissions from the stationary source(s) have the greatest impact at a point of reception, relative to the applicable limit.
Regulations	Regulations are a form of law, sometimes referred to as subordinate legislation, which define the application and enforcement of legislation. Regulations are made under the authority of an Act, called an Enabling Act.
Sound	A wave motion in air, water, or other media. It is the rapid oscillatory compression changes in a medium that propagate to distant points. It is characterized by changes in density, pressure, motion, and temperature as well as other physical properties.
Sound Level	Generally, sound level refers to the weighted sound pressure level obtained by frequency weighting, usually A- or C-weighted, and expressed in decibels.
Sound Level Meter	An instrument consisting of a microphone, amplifier, output meter and frequency-weighting networks that is used to measure noise and sound levels.
Sound Power Level	The total sound energy radiated by a source per unit time (*i.e.*, rate of acoustical energy radiation). The unit of measurement is the Watt (W). The acoustic power radiated from a given sound source as related to a reference power level, typically 1E-12 W (1 pW) and expressed as decibels. A sound power level of 1 W = 120 decibels relative to a reference level of 1 pW.
Sound Pressure	The root-mean-square of the instantaneous sound pressures during a specified time interval for a stated frequency band.
Sound Pressure Level	Logarithmic ratio of the root means square sound pressure to the sound pressure at the threshold of human hearing (20 µPa).
Spectrum (Frequency Spectrum)	The frequency dependent characteristic of sound often expressed as amplitude versus octave band frequency (See O*ctave Band*).
Weighting	Adjustment of sound level data to reflect receptor sensitivities. A weighting is used to refer to average human hearing as a function of frequency.
Windscreen	A porous screen used to cover the microphone of a sound level measurement system. Windscreens are designed to minimize the effects of wind disturbance on the sound

levels being measured while minimizing the attenuation (< 0.5 dB) of the signal.

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

WSP Canada Inc., (WSP) was retained by the City of Toronto to complete a noise, air quality, and safety assessment for the Keele Finch Plus area, an area surrounding the intersection of Keele Street and Finch Avenue West in Toronto, Ontario. A site location plan is shown in **Figure 1**, with specific areas of interest for proposed developments identified in **Figure 2**.

WSP understands that the Keele Finch Plus area is part of a City of Toronto initiative that will result in an updated planning framework to support and leverage investment in rapid transit infrastructure within the area. The planning framework would encourage growth and community building around the new subway station and future light rail transit line.

The City of Toronto, Metrolinx, and the Toronto Transit Commission (TTC) are working to improve the current and future transportation framework within the Keele Finch area. In this process, the Toronto-York Spadina Subway Extension (TYSSE) was undertaken by the TTC and began operation in December of 2017. Similarly, Metrolinx's Light Rail Transit (LRT) line within the study area is expected to become operational by 2023. The transportation infrastructure investment has provided the impetus for the City of Toronto to prepare an updated planning framework for the Keele Finch Plus area.

The City of Toronto completed an existing environmental conditions study (Phase 1 Study) for the Keele and Finch area. As part of the Phase 1 Study, the Ontario Ministry of the Environment, Conservation, and Parks (MECP) D-6 Guideline publication for 'Compatibility between Industrial Facilities and Sensitive Land Uses' (MECP, Guideline D-6) was used to identify potential compatibility issues between the existing industrial operations and potential new development within the study area. The results of the Phase 1 Study indicated that further assessment of noise, air quality, and safety should be completed to understand the existing environmental conditions and their potential impact(s) on proposed developments.

1.2 PREVIOUS STUDIES

In 2015, a City of Toronto staff report (City of Toronto, October 2015) identified and recommended a planning study along the Finch Avenue West corridor, focusing on the area identified within this report as the Keele Finch Plus study area. Subsequently, the City of Toronto, October 2016 report presented the results of the Phase 1 Study for the Keele Finch Plus study area. The Phase 1 Study report included three technical reports:

1. Downsview Airport Needs Assessment (ARUP, November 2016);
2. Existing Environmental Conditions (GHD, September 2016); and,

3. Transportation: Overview of Existing Conditions (City of Toronto, 2016).

The November 2016 report completed by ARUP identified that ‘Runway 15’ of the Downsview Airport requires take-off, approach, and transitional surfaces outside of the Downsview Airport boundary. The extent of those transitional surfaces will impact the land use planning within the Keele Finch Plus study area. The report specifically focused on building height limitations that would be imposed from requirements such as air traffic safety. The ARUP report provided indicative building heights that are considered the maximum acceptable heights to allow for the flight path of Runway 15 in the surrounding area. Maximum building heights reproduced directly from the ARUP report are presented in **Figure 3**.

The September 2016 report completed by GHD presented existing environmental conditions, in conjunction with the MECP D-6 Guideline. The objective of the MECP D-6 Guideline is to prevent or minimize the encroachment of sensitive land uses upon industrial land uses and vice-versa. The GHD study identified and categorized industrial facilities based on the D-6 Guideline classifications and suggested a minimum separation distance requirement or a potential area of influence, reproduced in **Figure 4.** The GHD report discussed common mitigation measures that site developers could potentially implement to reduce typical impacts and included the recommendation that the City of Toronto consider requiring potential developments to conduct studies for air emissions, odour, dust, and noise to assess the cumulative impact of existing industrial and commercial facilities on the Keele Finch Plus study area.

1.3 OBJECTIVES

To further understand the limitations related to the Keele Finch Plus study area in general and within the specific areas of interest identified in **Figure 2**, the City of Toronto initiated a detailed noise, air, and safety study to carry out the recommendations of the Phase 1 Study. The purpose of the detailed study is to focus on noise, air, and safety with the following concerns:

— The presence of several industrial operations in the area, including fuel distribution terminals which may pose a safety risk due to upset conditions;

— The existence of significant heavy truck activities in the area as a result of industrial operations, estimated to be in the range of 700 to 800 trucks a day according to the Canadian Fuels Association;

— Some of the lands located within the minimum separation distances suggested by the D-6 Guidelines are currently designated Mixed-Use Areas in the City's Official Plan, which allows for a variety of uses. Not all lands designated Mixed-Use Areas are expected to include specified uses that the designation contemplates; therefore, it is important to understand limitations related to aspects such as noise, air quality and safety prior to approving development proposals; and,

— The presence of the Downsview Airport will limit the height of most structures in the study area. The ARUP study identified potential building heights that could be permitted. As a second step, the City of Toronto wishes to investigate the noise impact on sensitive land uses at the height limits previously identified in the ARUP report.

To investigate the above noted concerns within the Keele Finch Plus study area, a detailed assessment was conducted including:

— Baseline and future noise impacts from stationary and transportation sources;
— Baseline and future air quality impacts from transportation sources;
— Future air quality concerns from stationary sources;
— Potential noise impacts to future sensitive land uses due to the operations at the Downsview Airport; and,
— Potential safety impacts from the operation of the fuel distribution terminals.

1.4 REGULATIONS, GUIDELINES, AND POLICY FRAMEWORK

Noise and air quality contaminants (*e.g.*, chemicals, dust, odour, etc.) are recognized as pollutants in Ontario. Uncontrolled noise or air quality contaminants can cause adverse effects which could impact human health, human activities, and/or the natural environment. WSP reviewed regulations, guidelines, and policies at the federal, provincial, and municipal level that are applicable to the Keele Finch Plus study area; the results of this review are summarized and commented on below.

1.4.1 CANADIAN ENVIRONMENTAL PROTECTION ACT

The Canadian Environmental Protection Act, S.C. 1999, c. 33 (the ‘CEPA’) forms part of Canada's federal environmental legislation aimed at preventing pollution and protecting the environment and human health. The goal of the CEPA is to contribute to sustainable development, which is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. The CEPA came into force on March 31, 2000 following an extensive Parliamentary review. The CEPA makes pollution prevention the cornerstone of national efforts to reduce toxic substances in the environment and sets out processes to assess the risks to the environment and human health posed by substances. The CEPA imposes timeframes and provides a wide range of tools to manage toxic substances and other pollutants. The authority of the CEPA allows for harmful substances to be phased out completely from use within the country, or otherwise prevent their release into the environment in any measurable quantity. On-Road and Off-Road vehicle emissions are regulated through the CEPA.

1.4.1.1 ENVIRONMENTAL EMERGENCY REGULATIONS

The Environmental Emergency (E2) Regulations (SOR/2003-307) are enabled under the CEPA. The E2 Regulations require individuals who own, possess, manage, or control regulated substances at or above threshold quantities at on-shore fixed facilities, to provide information on the substance(s) and their stored quantities. If certain volumes of a substance are in use, the E2 Regulations may require preparation of an E2 Plan. Section 4 of the E2 Regulations specifies the required E2 plan contents, but the form of the E2 Plan is not detailed. The primary goal of preparing and implementing an E2 Plan is to reduce the probability of emergencies occurring and to reduce their impact; such planning is critical for preparedness, response, and recovery activities in the event of an environmental emergency. An inventory of all facilities with a registered E2 Plan is maintained in the Government of Canada CEPA S.200 database, published online.

1.4.2 ONTARIO ENVIRONMENTAL PROTECTION ACT

The Ontario Environmental Protection Act, RSO 1990, c. E. 19 (the 'EPA'), is the legislation that provides for the protection and conservation of the natural environment within the province. Under Section 9 of the EPA, all facilities that discharge contaminants to the atmosphere are required to obtain an Environmental Compliance Approval (ECA, formerly referred to as a Certificate of Approval), Environmental and Activity Sector Registry (EASR), or demonstrate exemption to regulatory approval requirements. For the purposes of this report, an ECA and EASR are collectively referred to as 'regulatory approvals. A contaminant includes an emission of noise or discharges to the air. As per the EPA a facility must have a regulatory approval in place prior to the construction or alteration of any source that emits to the environment.

1.4.2.1 ONTARIO REGULATIONS (ECA/EASR)

Ontario Regulation (O. Reg.) 419/05, O. Reg. 1/17, and O. Reg. 524/98 are enabled under the EPA. Equipment for which an ECA is required must meet O. Reg. 419/05 to document compliance with Section 9 of the EPA. Equipment for which an EASR is required must meet O. Reg. 1/17 to document compliance with Section 9 of the EPA. Exemptions to regulatory approvals are listed in O. Reg. 524/98. In general terms, the requirements for a facility to obtain an ECA or EASR are identical in terms of technical assessments required. O. Reg. 1/17 (EASR) facilities gain instant approval of their application once submitted electronically to the MECP, with an opportunity for the MECP to perform an audit of the technical documents. O. Reg. 419/05 (ECA) facilities require MECP engineering review of their application package before approval is granted and can take up to a year for a review to be completed.

A noise technical report, if required by a screening process, is an Acoustic Assessment Report (AAR). The AAR is required to demonstrate compliance with MECP Publication NPC-300 guideline limits. The air quality assessment is known as an Emission Summary and Dispersion Modelling (ESDM) report. Compliance is demonstrated through the creation of an ESDM report prepared in accordance with s.26 of O. Reg. 419/05. In both noise and air quality assessments there is no determination of cumulative effects with other facilities that may be operating in the vicinity, as facilities are assessed independently of each other. An inventory of all facilities registered is maintained by the MECP on Access Environment, publicly available online.

1.4.3 FEDERAL GUIDELINES – CANADIAN AMBIENT AIR QUALITY STANDARDS (CAAQS)

The Canadian Ambient Air Quality Standards (CAAQS) are health-based air quality objectives for pollutant concentrations in outdoor air. Under the Air Quality Management System, Environment and Climate Change Canada (ECCC) and Health Canada established air quality objectives for fine particulate matter. These objectives are more comprehensive than the previous Canada Wide Standards that the CAAQS replaced in 2013. The CAAQS include a long-term (annual) target for particulate matter less than 2.5 µm ($PM_{2.5}$) as well as a proposed target for the year 2020. Additional CAAQS were released in November 2017 for Sulphur dioxide (SO_2) and nitrogen dioxide (NO_2), with varying objectives proposed to take effect in 2020 and 2025.

1.4.4 ONTARIO GUIDELINES

1.4.4.1 GUIDELINE D-1: LAND USE COMPATIBILITY

The MECP Guideline D-1: Land Use Compatibility (D-1 Guideline) outlines recommended separation distances when a new sensitive land use is proposed near an existing facility or vice-versa. The D-1 Guideline does not apply to situations where incompatible land uses already exist or when zoning to allow for incompatible land uses already exists. When planning a new sensitive land use near an existing facility, depending on the type of facility or potential influence, the adverse effects could be:

- noise and vibration;
- aesthetic (visual) impacts;
- air emissions, including odour and dust; and/or,
- other emitted contaminants.

The D-1 Guideline encourages providing a separation distance between incompatible land uses based on a potential influence area or actual influence area.

1.4.4.2 GUIDELINE D-6: COMPATIBILITY BETWEEN INDUSTRIAL FACILITIES AND SENSITIVE LAND USES

The MECP Guideline D-6: Compatibility between Industrial Facilities and Sensitive Land Uses (D-6 Guideline) applies the requirements of the D-1 Guideline specifically for industrial facilities and sensitive land use compatibility. The purpose of the D-6 Guideline is to prevent or minimize the encroachment of sensitive land use upon industrial land use and vice-versa. Industrial and sensitive land uses are incompatible due to possible adverse effects from industrial operations.

The D-6 Guideline provides minimum separation distances and potential influence areas for three different classifications of industrial facilities ranging from Class I: operations having the least impact on the surrounding environment, to Class III: operations having the greatest impact. The minimum separation distance is the distance between two incompatible land uses that would facilitate minimal or no adverse effects.

The potential influence area refers to the distance from a facility where adverse effects are generally expected to occur for varying durations and frequencies. **Table 1.1** outlines the industrial class minimum separation distances and potential influence areas as published within the D-6 Guideline.

Table 1.1 Guideline D-6 Separation Distance and Potential Influence Area

Class	Minimum Separation Distance (m)	Potential Influence Area (m)
I	20	70
II	70	300
III	300	1 000

The classes of industrial facilities are defined within the D-6 Guideline with example operations. The D-6 Guideline permits a reduction in the potential influence area if evidence can be provided through detailed assessment or mitigation that adverse effects can be mitigated or deemed minimal.

1.4.4.3 ENVIRONMENTAL NOISE GUIDELINE (PUBLICATION NPC-300)

The MECP noise guideline 'Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning Publication NPC-300', August 2013 (Publication NPC-300) provides guidelines on impact assessment. Publication NPC-300 consists of the following three sections:

- Part A Background;
- Part B Stationary Sources; and,
- Part C Land Use Planning.

Part C of Publication NPC-300 provides advice, sound level limits, and guidance for land use planning purposes. It is intended to provide a common framework to address noise in land use planning and to minimize the potential conflict between proposed noise sensitive land uses and sources of noise emissions.

The MECP distinguishes between three different types of noise emitting sources to evaluate impacts:

- Stationary Sources (includes both steady and impulsive sources);
- Transportation Sources (surface transportation only, includes both road and rail); and,
- Aircraft Operation.

The guidance relates primarily to transportation and stationary sources of noise in the land use planning process. The primary role of the MECP is to issue approvals required by the Environmental Protection Act, as previously discussed. The MECP has no authority under the Planning Act with respect to the land use planning approval process; therefore, Publication NPC-300 is intended to provide a common framework for land use planning authorities, developers, and consultants to address environmental noise in the land use planning process. Guidance on supplementary sound level limits for new developments that are not formally considered noise sensitive land uses in the land use planning approval process is also presented within the document. Publication NPC-300 identifies four area classes from Class 1 to Class 4, the definition of each class is as follows:

- Class 1 area: an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, including road traffic, often referred to as "urban hum."
- Class 2 area: an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas:
  - sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00); and,
  - low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 (19:00 or 23:00 to 07:00).
- Class 3 area: a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as:
  - a small community;
  - agricultural area;
  - a rural recreational area such as a cottage or a resort area; or,
  - a wilderness area.
- Class 4 area: an area or specific site that would otherwise be defined as Class 1 or 2 and which:
  - is an area intended for development with new noise sensitive land use(s) that are not yet built;
  - is in proximity to existing, lawfully established stationary source(s); and,
  - has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process.

Within the City of Toronto, Class 2 and Class 3 areas are rare to non-existent. The City of Toronto is predominantly Class 1 areas with new proposed developments meeting the Class 4 area designation. The Class 4 designation is discussed below as the Keele Finch study area is a candidate for classification as a Class 4 area.

Any area with existing noise sensitive land use(s) cannot be classified as a Class 4 area according to Publication NPC-300. The Class 4 area designation recognizes that any newly developed sensitive land uses would be impinging on existing industrial or commercial operations, and so the limits for sound levels are elevated. The assumption made is that any Class 4 area development would occur so as to not impact lawfully operating stationary source(s).

The Class 4 area designation is based on formal confirmation by the land use planning authority, in this case the City of Toronto. Any confirmation would be issued at the discretion of the land use planning authority and in the exercise of its responsibility and authority under the Planning Act. The following criteria from Publication NPC-300 outlines considerations for applying the Class 4 area designation:

- An appropriate noise impact assessment should be conducted for the land use planning authority as early as possible in the land use planning process that verifies that the applicable sound level limits will be met.
- Noise control measures may be required to ensure stationary sources comply with the applicable sound level limits at the new noise sensitive land use.
- Noise control measures may include receptor-based noise control measures and/or source-based noise control measures.
- Source based noise control measures may require MECP approval.
- Receptor based noise control measures may require agreements for noise mitigation, as described in Part A of Publication NPC-300.
- Prospective purchasers should be informed that a dwelling is in a Class 4 area through appropriate means and informed of all agreements for noise mitigation. Registration on title of the agreements for noise mitigation is recommended. Additionally, registration on title of an appropriate warning clause to notify purchasers that the applicable Class 4 area sound level limits for a dwelling are protective of indoor areas and assume closed windows. Examples of warning clauses are provided in Publication NPC-300.
- Any final agreements for noise mitigation as described in Part A of Publication NPC-300 and all other relevant documentation are to be submitted to the MECP by a stationary source owner when applying for an ECA/EASR approval. These agreements will be assessed during the review of the application for the MECP approvals. The stationary source owner must include a copy of the formal confirmation of the Class 4 area classification from the land use planning authority in the application for an MECP approval.

The use of the Class 4 area designation requires clear communication to new property owners, as well as re-designation of existing stationary source operators within the area. Detailed noise studies are used to support any proposed development and the potential for an adverse effect from incompatible land use is either mitigated or deemed minimal.

1.4.4.4 AMBIENT AIR QUALITY CRITERIA (AAQC)

The Ontario Ambient Air Quality Criteria (AAQC) were developed by the MECP; it lists desirable concentrations of contaminants in the air. The AAQC desirable concentrations are based on protection against adverse effects such as health, odour, vegetation, soiling, visibility, corrosion, or other effects. The AAQC are most commonly used in environmental assessments, special studies using ambient air monitoring data, assessment of general air quality in a community, and annual reporting on air quality across the province. AAQC are set with different averaging times (*e.g.*, annual, 24-hour, one hour, and 10 minute) appropriate for the effect that they are intended to protect against. The AAQC are updated based on the state-of-the-science for each contaminant.

1.4.5 PROVINCIAL POLICY STATEMENT

The Ontario Ministry of Municipal Affairs and Housing issued an updated Provincial Policy Statement (April 2014), related to land use planning with the objective of building healthy communities. The Provincial Policy Statement outlines that the long-term prosperity and social well-being of Ontario depends upon planning for strong, sustainable, and resilient communities for people of all ages, a clean and healthy environment, and a strong and competitive economy. The Provincial Policy Statement requires that major facilities and sensitive land uses should be planned to ensure that they are appropriately designed, buffered, and/or separated from each other to prevent or mitigate adverse effects from odour, noise, and other contaminants; the objective is to minimize risk to public health and safety, and to ensure the long-term viability of existing facilities. The Provincial Policy Statement requires appropriate planning to be considered when sensitive land uses are contemplated near non-sensitive land uses.

1.4.6 ONTARIO'S GROWTH PLAN

Ontario's growth plan: A Place to Grow - Growth Plan for the Greater Golden Horseshoe (GGH), updated in May 2019 (2019 Growth Plan) outlines a land use planning framework for the GGH. The 2019 Growth Plan highlights the Policies for 'Where and How to Grow', the following are considered relevant for this study:

- Managing growth;
- Creating delineated built-up areas;
- Planning urban growth centres;
- Planning and prioritizing transit corridors and station areas;
- Planning for employment; and
- Planning for housing.

The update to the growth plan was designed with the intent of aiding sustainable growth through utilizing land, resources, and infrastructure to reduce urban sprawl, without impacting the ability to promote job creation. This study is considered part of the City of Toronto's initiative towards planning, creating, and managing sustainable growth.

1.4.7 CITY OF TORONTO BY-LAWS

1.4.7.1 NOISE BY-LAW, TORONTO MUNICIPAL CODE CHAPTER 591

The City of Toronto Noise By-Law, Toronto Municipal Code Chapter 591 – Noise (By-Law) provides:

a. Prohibitions;
b. Limitations on sound levels for some noise sources/activities; and,
c. Procedures for obtaining an exemption.

The By-Laws are generally applicable to construction related noise. For the sound level limits related to stationary sources, the By-Law references the use of MECP Publication NPC-205 Sound Level Limits for Stationary Sources in Class 1 and 2 Areas (Urban) (Publication NPC-205). The MECP replaced Publication NPC-205 with Publication NPC-300 in 2013. Sound level limits from Publication NPC-300 are considered in this report.

1.4.7.2 *IDLING CONTROL BY-LAW, TORONTO MUNICIPAL CODE CHAPTER 517*

The City of Toronto Anti-Idling By-Law No. 775-2010, Toronto Municipal Code 517 requires that no vehicle idle for longer than one minute in a one-hour period. Vehicle emissions are a contributing factor in climate change, and the purpose of the Idling Control By-Law is to reduce unnecessary emissions to assist in improving ambient air quality within the City of Toronto.

1.4.8 CITY OF TORONTO OFFICIAL PLAN

The City of Toronto Official Plan is intended to ensure that Toronto evolves, improves, and realizes its full potential in areas such as transit, land use development, and the environment. The most recent Official Plan consolidation of policies went into effect in June 2015, but an Official Plan Review has been underway in thematic stages since 2011. The thematic stages include a review of: transportation, urban design, employment, environment, heritage, housing, and neighbourhoods and apartment neighbourhoods land use designations. The purpose of the Official Plan is to develop the detailed framework for long-term growth planning. The Official Plan is required to be consistent with Provincial Plans, as previously discussed. The Official Plan outlines an efficient and comprehensive transit system as a crucial component and calls for reducing automobile dependency by fostering transit-oriented growth and increasing density by building new transit lines to support a more reliable and affordable transit system. Areas within the City of Toronto are identified for growth and densification as well as the preservation of employment lands to ensure the population growth does not outpace economic viability (i.e., sustainable growth per the Ontario Growth Plan).

Official Plan Amendment (OPA) 231 was adopted by the City of Toronto in December 2013 and approved by the Province in July 2014. OPA 231 contains new economic policies and designations for land use designated ‘Employment Areas’ as follows:

- preserve the City’s Employment Areas for business and economic activities;
- limit sensitive uses that could affect the function of businesses within Employment Areas;
- promote office space on rapid transit corridors; and,
- accommodate the growth of the retail and institutional sectors to serve the growing population of the City and region.
- Compatibility or Mitigation studies may be required for complete applications for sensitive use developments in the vicinity of industrial operations.

2 STUDY AREA

This section describes the extent of the area around the intersection of Keele Street and Finch Avenue West considered to be the study area and the land uses within that area.

2.1 PROJECT LOCATION AND SPATIAL BOUNDARIES

2.1.1 PROJECT LOCATION

The Keele Finch Plus study area contains a mix of land uses including employment areas, institutional, mixed use areas, apartment neighbourhoods, neighbourhoods, and open space areas. Keele Street and Finch Avenue West are both classified as major arterial roads by the City of Toronto. Both roadways have four lanes of traffic and a sidewalk on both sides. The roads have a posted speed limit of 60 km/h throughout the area. A rail corridor intersects Finch Avenue West to the east of Keele Street. A utility corridor runs just to the north of Finch Avenue West.

The study area to the west of Keele Street includes land use designations for neighbourhoods, apartment neighbourhoods, institutional, and mixed-use areas. The study area to the east of Keele Street includes land use designations for employment areas and mixed-use areas; however, the zoning east of Keele Street only allows for industrial and commercial uses currently. A land use designation map from the City of Toronto around the Keele Finch study area is provided in **Figure 2**.

Major contributors to noise and air emissions within the study area include traffic from road and rail as well as industrial and commercial operations. The acoustical environment is expected to vary, being louder near industry, road, or rail sources compared to more distant locations; the air quality impacts from roads will follow the same trend. Air quality impacts from stationary sources (industrial, commercial, and institutional) are expected to be dependent on dispersion characteristics such as the release height of contaminants and local meteorological conditions.

2.1.2 SPATIAL BOUNDARY

The study area encompasses the space where there is potential for noise, air quality, and safety impacts on existing and proposed developments. Based on the surrounding land use, topography, propagation properties of sound, and dispersion of air quality contaminants, a study area was selected with a 1.5 km radius from the intersection of Keele Street and Finch Avenue West. The 1.5 km radius is considered the study area for this report. Since noise and air quality impacts can occur at heights above ground level, the height of impact was also delineated. The proposed maximum buildable heights based on flight paths from Downsview Airport from the ARUP, November 2016 report were utilized to spatially define noise and air quality impact with respect to height of potential future developments. The heights identified in the ARUP report may not necessarily reflect the heights used in the preferred concept or the heights put forward by developers, but they represent current maximum allowable heights due to flight path restrictions; therefore, they are considered as plausible worst-case building heights in this study. The study area captures existing residential uses, industrial uses, other stationary uses, areas of specific concern for development, and major road and rail corridors.

The City of Toronto provided a conceptual Full-Build scenario for the year 2045 for the study area. The Full-Build scenario includes buildings at a variety of heights ranging from 7 to 19 storeys, based on the height limitations associated with the Downsview Airport.

The built form generated by the City of Toronto planning division is designed to assess impacts and for planning decision-making purposes. The provided built form does not represent the preferred concept for the Keele Finch Plus Study; it is used as a conceptual framework to allow for assessment of structures to the maximum buildable height based on Downsview Airport flight paths. Consequently, the built form shall not be interpreted to represent Toronto City Planning opinion with respect to permitted building heights in the Keele Finch Plus Study, or submission of any development applications under the Planning Act, which will be subject to the City's normal comprehensive review process.

2.2 VARIATIONS WITH TIME

The study of the acoustical and air quality environment must consider time-based variations with respect to emissions from stationary, road, and rail traffic. The time-based considerations allow for the following:

— In consultation with the City of Toronto, the year for the ‘Current’ condition is 2018 and the ‘Future’ Full-Build condition year is 2045; at which time it is anticipated the study area will attain mature development stage, fully utilizing the new transportation infrastructure.
— Variation of noise and air emissions over daytime and nighttime.
— Traffic variation over a single day.
— Traffic variation from Current to Future conditions when the transportation infrastructure is operational.
— Improvements to fleet vehicle air emissions between the Current and Future conditions.

2.2.1 CURRENT AND FUTURE CONDITIONS

The study considers and compares the Current (2018) and Future (2045) noise and air quality effects. The following are considered and discussed within this study:

— current and future noise impacts due to surface transportation;

- current and future air quality impacts due to surface transportation;
- current and future noise impacts due to commercial and industrial operations;
- future air quality impacts due to commercial and industrial operations;
- current and future noise impacts due to Downsview Airport operation; and,
- future safety concerns around the operation of fuel distribution terminals.

2.2.1.1 NOISE

The NPC-300 guideline requires consideration of both daytime (07:00 to 23:00) and nighttime (23:00 to 07:00) sound levels. Traffic volumes for road and rail are expected to vary throughout the week, during the daytime and nighttime hours, and between the Current and Future conditions. In order to account for these variations, the MECP recommends using Annual Average Daily Traffic (AADT) volume for calculations. For stationary sources, the MECP recommends the use of the worst-case one-hour equivalent sound level. As required by the MECP, stationary sources are assessed based on the one-hour equivalent sound level while transportation related sound level impacts are assessed based on the 16-hour daytime and eight-hour nighttime equivalent sound levels.

2.2.1.2 AIR QUALITY

For air quality impacts, the contaminants are assessed on variable averaging times based on the impact to health or the environment, as previously described for AAQC averaging times. Traffic data from AADT is evenly divided into one-hour increments over peak and off-peak periods for modelling. For stationary sources, all existing facilities are assumed to exist in the future condition, to ensure their viability within the project area. Class I, Class II, and Class III facilities were examined for cumulative impacts.

2.2.1.3 SAFETY

For environmental safety there are five Class III facilities within the Keele-Finch area, they were identified as:

- Imperial Oil Limited, 1150 Finch Avenue West (Finch Distribution Terminal);
- Suncor Energy, 1138 Finch Avenue West (Metro Depot Terminal);
- Shell Canada, 3975 Keele Street (Keele Terminal) and 3985 Keele Street (contiguous facility with Keele Terminal);
- Vitafoam Products Canada Limited, 150 Toro Road; and,
- Apollo Health and Beauty Care Corporation, 1 Apollo Place.

From a public safety perspective, only the three fuel distribution terminals were examined. The three fuel distribution terminals, due to their storage of bulk fuels, have a larger potential to cause a safety risk versus the other two facilities, which have a high nuisance potential as per Guideline D-6. The environmental safety assessment is specific to tank storage and chemicals, which produce areas of impact. These impact areas can be overlain on land use designations to examine how the fuel distribution terminals may impact development. The pipelines that service these fuel distribution terminals also have a safety risk with respect to exposure to radiation from naturally occurring cesium within oil deposits remaining in the refined materials transported and stored at these facilities, as well as the use of cesium in flow measurement equipment used on these pipelines.

The other two Class III facilities, Vitafoam and Apollo Health and Beauty Care, have operations which make them a concern for noise and air quality, but there are no additional community safety concerns associated with them.

2.3 RECEPTORS

A sensitive receptor for air quality and noise is defined by the MECP in O. Reg. 419/05, Section 30(8) and NPC-300, respectively as a:

- place of residence;
- child care facility;
- health care facility;
- senior citizen's residence;
- long-term care facility; or,
- school including learning institutions such as universities and colleges.

Land uses that currently have sensitive receptors, are zoned to have sensitive receptors, or that are designated by the City of Toronto as having a potential for redevelopment with sensitive receptors are considered in this assessment. The location where a sensitive receptor could exist is termed the Point of Reception (POR). For the purposes of this assessment, PORs within the study area were identified both through desktop analysis and through field observations.

When assessing stationary sources for air quality and for safety concerns from upset conditions the study area was examined with impacts identified via areas of concern, or areas requiring detailed assessment. Specific receptor types (sensitive, non-sensitive) were not examined for these studies as they were utilized to determine locations within the study area where impacts were observed.

The PORs in close proximity to transportation or stationary sources within the study area were selected and considered as representative, as impacts tend to decrease with distance, with the noted exception of air quality impacts from stationary sources. The PORs were organized into three groups:

- Group 1 – PORs identified as being an area of specific concern on **Figure 2**; these receptors are highlighted within this study as they have the potential for immediate redevelopment. These receptors represent future potential multi-storey developments.
- Group 2 – Future mid/high density receptors along Keele Street and Finch Avenue West that are currently used for low rise residential purposes.

— Group 3 – Existing receptors that are not within the Keele Street and Finch Avenue West corridors but are at least one block away and will remain unaffected by redevelopment plans.

The PORs were identified by their group number (G#) followed by a unique three-digit number. The PORs were not considered in a sequential numbering system as all receptors or potential receptors were identified, and then some receptors were removed due to their non-sensitive nature. The identification system considered:

— POR identification between G1-001 and G1-021 represent Group 1 receptors;
— POR identification between G2-030 and G2-072 represent Group 2 receptors; and,
— POR identification between G3-100 and G3-120 represent selected Group 3 receptors.

A total of 82 receptors were considered as sensitive in this study; in addition, the stationary air quality modelling used a defined receptor grid to measure air quality at a spacing of every 50 m to examine the dispersion characteristics of sources. The details of the PORs are provided in **Appendix A**. The project PORs are shown in **Figure 5**.

2.4 EXISTING ENVIRONMENT

The study area includes several commercial, industrial, and institutional facilities as well as road, rail, and aircraft transport networks. These stationary facilities and transportation networks have the potential to emit noise and air contaminants into the local environment. The presence of the fuel distribution terminals has the potential to cause upset conditions and hence is considered a potential safety concern for proposed developments.

2.4.1 ACOUSTIC ENVIRONMENT

The existing acoustical environment is dominated by: vehicular activities along the major arterial roadways of Finch Avenue West and Keele Street, rail traffic along the corridor to the east, aircraft from the Downsview Airport, and industrial/commercial operations including shipping and receiving traffic. Site investigations conducted by WSP staff indicate that both the daytime and nighttime acoustical environment is dominated by anthropogenic (human) activities typical of urban residential areas.

2.4.2 AMBIENT AIR QUALITY

Concentrations of specific air quality contaminants in the local environment resulting from sources were estimated by analysing historical monitoring data from the ECCC National Air Pollution Surveillance (NAPS) stations as well as MECP air monitoring stations within the City of Toronto. Data was collected from these stations for the most recent available years. The time period for the background data varies for each contaminant based on the availability of quality assured data from ECCC and the

MECP. The station information, chemicals monitored, and period of analysis are listed in **Table 2.1**.

Table 2.1 Air Monitoring Stations for Air Quality Contaminants

CONTAMINANT	STATION ID	STATION NAME (LOCATION)	AVAILABILITY OF DATA
Particulate Matter ($PM_{2.5}$ and PM_{10})	MECP – 31103 MECP – 33003 MECP – 34020	Toronto Downtown Toronto East Toronto North (Hendon/Yonge Street)	2011-2015
Nitrogen Dioxide (NO_2)	MECP – 31103 MECP – 33003 MECP – 34020	Toronto Downtown Toronto East Toronto North (Hendon/Yonge Street)	2011-2015
Carbon Monoxide (CO)	MECP – 35125	Toronto West (Resources Road)	2011-2015
Acrolein	NAPS – 60418	Toronto (Ruskin/Perth Street)	2002-2006
Benzene, 1,3-Butadiene	NAPS – 60427	Toronto (223 College Street)	2011-2015
Acetaldehyde, Formaldehyde	NAPS - 64401	Egbert (RR56/10th Side Road)	2006-2010
Benzo(a)pyrene	NAPS - 60427	Toronto (223 College Street)	2010-2014

The 90th percentile background concentration for each Contaminant of Concern (COC) was determined from the stations listed in **Table 2.1**. The average concentrations recorded above the 90th percentile was considered outliers and were removed from calculations to avoid extreme, rare, and transient events. The 90th percentile over the five-year data set is representative of ambient background conditions for averaging periods of 30 minutes, one hour, eight hours, and 24 hours. For contaminants with an annual averaging period, the highest recorded annual mean over the five years of data was used. **Table 2.2** summarizes the background concentrations representative of the study area, and the associated air quality objectives from the AAQC or CAAQS, with applicable year in parenthesis.

Table 2.2 Ambient Background Concentrations

COC	Averaging Period	Background Value (µg/m³)	Objective Value (µg/m³)	Source
NO_2	1 h	51.9	113 79 400	CAAQS (2020) CAAQS (2025) AAQC
	24 h	**72.2**	200 **23**	AAQC **CAAQS (2025)**
	Annual	**28.0**	**32** **22.6**	**CAAQS (2020)** **CAAQS (2025)**
CO	1 h	412	36 200	AAQC
	8 h	412	15 700	AAQC
PM_{10}	24 h	31.1	50	AAQC
$PM_{2.5}$	24 h	16.8	28 27	CAAQS (2015) CAAQS (2020)
	Annual	**9.40**	10 **8.8**	CAAQS (2015) **CAAQS (2020)**
Acetaldehyde	30 min	1.58	4.5	AAQC
	24 h	1.58	0.4	AAQC
Acrolein	1 h	0.290	2.3	AAQC
	24 h	0.290	0.45	AAQC
Benzene	24 h	0.980	10	AAQC
	Annual	**0.770**	**2**	**AAQC**
1,3-Butadiene	24 h	0.100	500	AAQC
	Annual	0.0700	500	AAQC
Benzo(a)pyrene	**24 h**	**0.000150**	**0.00005**	**AAQC**
	Annual	**0.000130**	**0.00001**	**AAQC**
Formaldehyde	24 h	4.40	65	AAQC

Notes: **Bold values** exceed the applicable criteria

The air quality objectives listed in **Table 2.2** represent desirable levels of contaminants in ambient air, and are not enforceable within any jurisdiction; they represent a 'road map' for ambient air quality provincially (AAQC) and nationally (CAAQS). **Table 2.2** has different objective values from the AAQC and CAAQS. In the case of nitrogen dioxide (NO_2) both the AAQC and CAAQS have a one-hour limit value, of which the CAAQS values are more stringent because they represent planned limits for the years 2020 and 2025.

From **Table 2.2** when looking at the existing ambient stations within the City of Toronto there are currently elevated levels above the guidelines for:

- 24 h and annual NO_2 (CAAQS);
- annual $PM_{2.5}$ (CAAQS);
- annual benzene (AAQC); and,
- 24 hour and annual benzo(a)pyrene (AAQC).

These parameters are generally elevated throughout urban southern Ontario, which is why they have ambient objectives that have been reduced over the previous five years as an attempt to flag the concern over elevated levels.

2.4.3 SAFETY

There are three fuel distribution terminals within the Keele Finch Plus study area included in the safety assessment due to the storage of bulk quantities of fuels. The facility at 3985 Keele Street identified in the Phase 1 study was a former Petro-Canada facility which is incorporated into Suncor operations with Shell leasing terminal space. Based on the publicly available information from the National Pollutant Release Inventory (NPRI), ECA permitting, and the City of Toronto ChemTRAC program, all the fuel distribution terminals store bulk quantities of gasoline, kerosene/jet fuel, diesel, ethanol, petroleum distillate, and furnace oil. The Canadian Society for Chemical Engineers (CSChE) publishes a Risk Assessment – Recommended Practices for Municipalities and Industry (CSChE, 2004) which outlines risk management in land-use planning and siting decisions. The CSChE Risk Assessment outlines recommended land uses as well as detailed Federal Environmental Emergency Regulations (E2 Regulation) modelling for facilities that store bulk quantities of chemicals that could have a potential to harm the public. E2 Regulation assessments are not publicly available; however, facilities completing these assessments are publicly listed. All fuel distribution terminals within the study area are listed as having a registered E2 Plan. For this study assumptions based on public information were made to assess the fuel distribution terminals.

3 SURFACE TRANSPORTATION

3.1 INTRODUCTION

Surface transportation includes both road and rail traffic for noise, and road traffic only for air quality. The environmental impact of transportation sources is considered significant for both noise and air quality because transportation sources are a major consumer of fossil fuels. The engines in transportation fleets and tire/rail interactions create noise pollution while the combustion of fossil fuels and resuspension of roadway dust create air pollution. Roadway sources of noise and air pollution have detailed guidelines to control vehicular emissions as well as controlling noise at the receiver through roadway design (e.g., noise barriers, buffer zones, etc.). This section examines how increasing traffic as well as constructing receptors closer to the major arterial roadways impacts the study area.

Major impacts on the local environment within the study area include traffic from major arterial roads. Through a review of the available data it was noted that the following roads have City of Toronto traffic data associated with them and can be used to assess impact from a noise and air quality perspective:

- Alexdon Road;
- Broadoaks Drive;
- Finch Avenue;
- Four Winds Drive;
- Keele Street;
- Murray Ross Parkway;
- Romfield Lane;
- Sentinel Road;
- Tangiers Road;
- The Pond Road; and,
- Toro Road.

The rail corridor that crosses Finch Avenue West, east of Keele Street, is a source of noise for receptors within the area. The rail corridor currently services sporadic CN rail activity as well as the Barrie GO Corridor for Metrolinx. The Barrie GO Corridor has undergone a Transit Project Assessment Process (TPAP) to twin the line and increase rail traffic during peak hours up to 15-minute service between trains. Part of the TPAP was to electrify the corridor by 2025, eliminating GO locomotives as a concern to air quality within the study area.

Impacts from surface transportation sources are expected to be greatest near road and rail corridors and decrease the further a receptor is from the road or rail corridor. A study area map showing major surface transportation sources is provided in **Figure 6.**

3.2 DATA COLLECTION

The City of Toronto provided traffic volumes for current conditions and the Synchro Studio model output which includes traffic light information for the Keele Finch Plus study area. WSP processed the detailed traffic movements for the study area based on the traffic data provided. The traffic data consisted of eight-hour average daily traffic and peak traffic volumes for the study area and are presented in **Appendix B**. The annual average daily traffic was estimated from eight-hour traffic. To estimate the 2045 traffic volume, a conservative traffic growth rate of 1.5 % per annum was used based on previous studies conducted in the region. A traffic growth rate of 1.5 % per annum is considered a conservative representation for an area such as the study area, where the current traffic conditions are expected to be at its capacity (i.e. little or no room for further growth). Since the study results will be utilized in a planning capacity it is typical to use a higher traffic growth rate to establish feasibility so that the impacts from the actual traffic growth rate will be equal to or less than predicted. The existing traffic data was processed to provide the following information:

- annual average daily traffic (AADT);
- hourly distribution of traffic;
- fraction of trucks and buses;
- speed limit; and,
- peak hour traffic volume.

Rail data was obtained from the Barrie Rail Corridor Expansion Project, Transit Project Assessment Process Appendix H: Noise and Vibration Impact Assessment of the Environmental Project Report, August 8, 2017 (EPR Report), prepared by Hatch Limited in association with RWDI and R.J. Burnside & Associates Limited. The EPR Report is a publicly available document available from Metrolinx.

3.3 IMPACT ON ACOUSTIC ENVIRONMENT

This section of the report considers current and future noise impacts from surface transportation at the identified points of reception. The Finch West Light Rail Transit system was not included in the assessment; services are designed to be electrified and a separate study is expected to be completed under the TPAP by Metrolinx.

3.3.1 REFERENCE PROTOCOLS AND GUIDELINES

In land use planning, although elimination or control of the source of pollution is usually a primary objective, there are general limits as to what is practically and technically feasible. The MECP Publication NPC-300 provides sound level criteria for acceptable levels of transportation noise impacting on sensitive developments. These limits are discussed in “Part C – Land Use Planning” of Publication NPC-300.

Publication NPC-300 provides sound level limits in terms of energy equivalent (average) sound levels (Leq) in units of A-weighted decibels (dBA) at a specific location. Both outdoor and indoor locations are specified, with the focus of outdoor areas being amenity spaces. Publication NPC-300 provides further guidance to select appropriate controls for achieving indoor sound level limits.

Sound Levels in an Outdoor Living Area (OLA) – If the daytime (07:00 – 23:00) sound level in an OLA is below 55 dBA then controls are not required by Publication NPC-300. An exceedance of the daytime sound level of up to 5 dBA to 60 dBA is often acceptable without requiring any noise mitigation; however, such exceedances should be identified to the occupants with a warning clause on the purchase of sale agreement and on the title of property. Examples of warning clauses are provided in Publication NPC-300. If sound levels exceed 60 dBA then the mitigation of noise in terms of economic, technical, and administrative feasibility should be investigated; where possible controls may also be included in the design, as well as potential warning clauses in the purchase of sale agreement and on the title of property. A summary of the Publication NPC-300 requirements is shown in **Table 3.1**.

Table 3.1 Publication NPC-300 Requirements for Outdoor Living Areas

AREA	TIME PERIOD	Leq (dba)	Controls and Warning Clause Requirements [1]
Outdoor Living Area (OLA)	Daytime (07:00 – 23:00)	< 55	None
		55 – 60	Warning Clause (Type A)
		> 60	Noise Control Feasibility and Warning Clause

Notes: [1] Warning clause are defined in MECP Publication NPC-300

Sound Levels in an Indoor Space – To achieve desired indoor sound levels, Publication NPC-300 provides guidelines based on predicted sound level at the façade/plane of window. If the predicted sound level at the plane of window exceeds the limit then additional considerations such as the type of ventilation, type of windows, exterior wall materials, and door materials must be selected to mitigate and provide appropriate indoor sound levels. In addition, warning clauses to inform the occupants are also required.

Table 3.2 summarizes requirements for ventilation, type of building façade construction, and the requirement for warning clauses (defined in Publication NPC-300) to inform the future occupants of the exceedances.

Table 3.2 Publication NPC-300 Requirements for Façade/Plane of Window

AREA	TIME PERIOD	Leq (dba)	Ventilation Requirements	Building Component Requirements	Warning Clause Requirements [1]

Plane of Window [2]	Daytime (07:00 – 23:00)	< 55	None	Building components compliant with the OBC[3]	None
		55 – 65	Forced Air Heating with provision for central air condition	Building components compliant with the OBC[3]	Type C
		> 65	Central air conditioning is required	Building components designed/selected to meet Indoor Requirements	Type D
	Night time (23:00 – 07:00)	≤ 50	None	Building components compliant with the OBC[3]	None
		51 – 60	Forced Air Heating with the provision to add central air conditioning	Building components compliant with the OBC[3]	Type C
		> 60	Central air conditioning is required	Building components designed/selected to meet Indoor Requirements	Type D

Notes: [1] Warning clauses are defined in MECP Publication NPC-300
[2] Plane of Window of a bedroom, living area, or dining room
[3] OBC = Ontario Building Code

3.3.1.1 RAIL REQUIREMENTS

CN, GO, and other rail operators have published their own noise criteria, generally in the form of minimum setback distances, warning clauses, and limits similar to the MECP plane of window limits from Publication NPC-300. For noise control and safety reasons, CN and GO stipulate that the minimum required setback between a residence and a principal main line is 30 m. For such developments where a residence is at or near the 30 m mark from the main line, CN typically recommends a minimum 5.5 m berm/barrier (2.5 m berm with a 3.0 m acoustic barrier). The sensitive land uses within the study area are more than 100 m from the rail corridor right-of-way; therefore, these requirements are satisfied and not applicable to this study. The rail traffic information was included within the noise propagation modelling.

City of Toronto approved a land use study ‘Development in Proximity to Rail Operations, March 2019’, (March 2019 Study), which allows reduced setbacks (e.g. 20 m) under certain circumstances. When development occurs near a rail corridor this study guideline shall also be consulted.

3.3.2 ASSESSMENT METHODS

Publication NPC-300 states that the sound level descriptors for both road and rail noise are based on the 16-hour daytime [Leq(16)] and the eight hour nighttime [Leq(8)] equivalent sound levels. Daytime corresponds to the period between 07:00 to 23:00 while nighttime corresponds to the period between 23:00 to 07:00.

Calculation and measurement methods discussed in MECP Publications NPC-206, NPC-300, and NPC-103 are suited for establishing the Current (baseline) acoustical environment at discrete locations. According to the MECP, the assessment of road traffic impacts and rail traffic impacts are most commonly evaluated by predictions using ORNAMENT and STEAM, respectively. The MECP allows that other traffic noise prediction models are acceptable as well where complex studies require.

The MECP prediction software STAMSON is an implementation of the ORNAMENT and STEAM calculation methods. STAMSON is not sufficiently robust enough to handle large study areas and acoustical dynamics with the efficiency required for the study area. The interface does not provide sufficient flexibility to handle complex road and rail systems which includes topographic variations, curved road and rail configurations, varying ground conditions in terms of acoustical absorption, and gradual road or rail elevation changes. Similarly, measurement methods are not always sufficient in terms of choice of measurement locations, due to issues related to accessibility, security, and interference.

To establish the Current sound levels within the Keele Finch Plus study area, an alternate modelling method utilizing the CADNA/A noise propagation model was used. The purpose of using CADNA/A software was to allow for greater flexibility in modelling the complex road and rail geometry present within the study area, as well as to overcome the limitations identified with the traditional calculation and measurement methodology.

The following steps were taken to create a predictive model for the study area in CADNA/A that met the MECP objectives and allowed for quantitatively determining the sound levels due to road and rail traffic:

- Five reference points were selected within the Study Area (**Figure 6**);
- Field measurements were conducted at the identified reference points (Baseline in **Appendix C)**;
- The sound levels at the five reference points were estimated using the STAMSON software;

- The sound level at the five reference points were estimated using CADNA/A software;
- Results were compared between the field measurements and both models, resulting in the prediction confidence of the CADNA/A method being determined; and,
- Once the prediction confidence was established, the CADNA/A model was used to calculate the Current and Future condition sound levels within the study area.

The following factors were considered in the analysis:

- vehicle/locomotive speeds;
- road and rail traffic volumes;
- percentage of heavy trucks (from GHD report);
- horizontal and vertical road/rail receiver geometry;
- ground absorption; and,
- screening provided by terrain, houses, or existing barriers.

3.3.3 CURRENT CONDITION (2018)

The assessment of road and rail transportation noise impacts is based on traffic counts provided by the City of Toronto. The breakdown of cars, medium trucks, and heavy trucks has been included in this assessment.

Predicted surface transportation sound level contours for existing conditions are shown in **Figure 7** and **Figure 8** for daytime and nighttime respectively, at a typical height of 4.5 m to represent sound levels at a second storey window. Most of the existing receptor buildings are impacted on the second storey, so additional heights were not investigated for the Current condition. Predicted sound levels at selected existing receptors are provided in the results and discussion section.

3.3.4 FUTURE CONDITION (2045)

A sketch-up model representing a concept of a future built form was received from the City of Toronto planning division. The model was used as a starting point to investigate the Future condition. To assess the Future condition two scenarios were examined:

- No-Build scenario: no development in the study area, but traffic growth is included; and,
- Full-Build: development and traffic growth were investigated.

In order to provide an indication of sound level variation in low-rise (one to three storey), mid-rise (three to eight storey) and high-rise (nine storeys and above) buildings, representative heights of 4.5 metres (second storey), 16.5 metres (sixth storey) and 31.5 metres (11^{th} storey) were used in the sound level predictions.

3.3.4.1 NO-BUILD SCENARIO

This scenario assumes that there is no mid/high-rise development in the study area, but traffic growth occurs per the conservative growth rate of 1.5 % from 2018 to 2045. This scenario provides an indication to the planning team at the City of Toronto of how the noise propagation will impact the future without any development.

Predicted surface transportation sound level contours for the 2045 No-Build scenarios are shown in **Figure 9** and **Figure 10** for daytime and nighttime, respectively at a typical height of 4.5 m representing a second storey window. Most of the existing receptor buildings are impacted on the second storey, so additional heights were not investigated for the No-Build scenario. Predicted sound levels at selected existing receptors are provided in the results and discussion section**.**

3.3.4.2 FULL-BUILD SCENARIO

The conceptual future built form was used to investigate how noise could impact a conceptual future development within the study area. The Full-Build scenario includes buildings at a variety of heights ranging from 25 m to 55 m and located in the areas adjacent to Keele Street and Finch Avenue West. Predicted surface transportation noise level contours for the 2045 Full-Build scenario are shown in:

— **Figure 11** and **Figure 12** for the daytime and nighttime noise contours, respectively for a typical height of 4.5 m representing the height of a second storey window;

— **Figure 13** and **Figure 14** for the daytime and nighttime noise contours, respectively for a typical height of 16.5 m representing the height of a sixth storey window;

— **Figure 15** and **Figure 16** for the daytime and nighttime noise contours, respectively for a typical height of 31.5 m representing the height of an 11th storey window.

— **Figure 17** shows daytime and nighttime maximum sound levels for future buildings.

Predicted sound levels at selected existing receptors are provided in the Results section.

3.3.5 NOISE RESULTS

Table 3.3 compares the predicted sound levels at selected receptors from the transportation portion of this assessment. The results for all receptors are provided in **Appendix A.**

The results indicate that:

- Group 1 receptors - ventilation requirements to be selected and building façade to be selected;
- Group 2 receptors - ventilation requirements to be selected and building façade to be selected; and
- Group 3 receptors - changes are less than 5 dB in the future without considering the shielding provided by the future buildings along Keele Street and Finch Avenue. In a fully built case the changes are expected to be lower.

Table 3.3 Summary of Sound Level Results for Surface Transportation

Results									**Analysis**			
POR ID	Existing Conditions		Future Conditions		Future Conditions		Future Conditions		Future [2045] Maximum Sound Level [dBA] Day/Night	Sound Level Criteria [dBA] Day/Night	Type of Mitigation	Remarks
G1-001	n/a_18	n/a_18	57	52	62	56	64	58	64 / 58	Ref Table 3.2	Force Air Ventilation, Building meeting OBC,	To be addressed at SPA
G1-018	n/a_18	n/a_18	67	60	70	64	70	64	70 / 64	Ref Table 3.2	Central AC, Selected Building Component	To be addressed at SPA**
G1-019	n/a_18	n/a_18	66	60	69	63	69	63	69 / 63	Ref Table 3.2	Central AC, Selected Building Component	To be addressed at SPA**
G2_034	n/a_18	n/a_18	63	57	67	61	68	61	68 / 61	Ref Table 3.2	Central AC, Selected Building Component	To be addressed at SPA**
G2_035	n/a_18	n/a_18	70	63	72	65	71	64	72 / 65	Ref Table 3.2	Central AC, Selected Building component	To be addressed at SPA**
G2_036	n/a_18	n/a_18	68	62	70	63	69	63	70 / 63	Ref Table 3.2	Central AC, Selected Building component	To be addressed at SPA**

G3_115	48	44	50	45	n/a	n/a	n/a	n/a	n/a	n/a	Changes are less than 5dB without shielding provided by buildings along Keele or Finch	n/a
G3_116	47	45	50	45	n/a	n/a	n/a	n/a	n/a	n/a		
G3_117	45	42	48	43	n/a	n/a	n/a	n/a	n/a	n/a		

Notes:

n/a_18 represents that it is currently not a receptor, but a future receptor

n/a - represent it is not a receptor either currently or in the future (in G3 group 16.5 m and 31.5 m receptors are not applicable to two storey buildings and therefore an "n/a" is provided

* these exceedances are due to trucking activities and can be addressed with a barrier

** there are minor to major exceedances noted; both of these can be addressed during SPA with a refined site-specific study; major exceedances appear to be related to trucking activities, which can in most cases be addressed with a barrier or appropriate site plan.

3.3.6 RECOMMENDATIONS

The receptors of Group 1 and Group 2 represent future development within the study area specifically in areas designated as mixed use; there are no plans to develop employment areas into sensitive land uses. Group 1 represents mid/high rise developments being proposed in areas of specific interest from **Figure 2**. Group 2 represents future sensitive receptors on Keele Street and on Finch Avenue West, west of Keele Street. The assessment indicated that it is feasible to achieve the noise objectives within the study area provided some additional site-specific work and mitigation steps are evaluated. The following recommendations are provided to implement detailed noise control to achieve the objectives:

1. Considering the significant heavy truck activities in the area due to the presence of industrial operations, it is recommended that the City investigate the possibility of reducing the speed limits on both Keele Street and Finch Avenue West. A speed reduction of 20 km/h can result in a notable change in sound levels.

Development adjacent to Keele Street or Finch Avenue

2. City of Toronto requires a site-specific noise assessment considering the surface transportation sources be included for each of the following stages:
    a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
    b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA).
3. Proposed development should include central air conditioning as an alternative to operable windows despite the outcome of the noise study.
4. The surface transportation noise assessments should determine the acoustical performance requirements for exterior façade elements (*i.e.*, exterior walls, windows, and balcony doors) for the development. For such assessments, STC-50 rated walls and STC-33 rated windows/doors shall be considered the minimum for acoustical performance.
5. Detailed plans should be reviewed by a Professional Engineer or City Building Inspector to confirm that no outdoor living area greater than four metres in depth is provided within the development or that such outdoor areas are assessed from an acoustic perspective.
6. At the site plan approval stage, it is recommended that a Professional Engineer with an acoustics background or an approved professional from the City Building Department certify that the building plan includes the noise controls discussed within this report.
7. It is recommended that the City of Toronto requires a verification/certification by a Professional Engineer as part of the occupancy permit stating based on inspection/testing that the recommendations as part of Item 2 have been correctly interpreted and applied.

At this planning stage, if truck traffic can be eliminated from Finch Avenue and Keele Street, the above noted requirements can be relaxed and the requirements below for development that are at least one black away from Finch Avenue and Keele Street can be applied.

Development at least one block away from Keele Street or Finch Avenue

Group 3 receptors are existing receptors that are at least one block away from the road and in the Full-Build scenario will be physically shielded from roadway noise by future development. The acoustical environment as it relates to transportation noise for the Group 3 receptors is expected to improve within the Full-Build scenario as new developments will act as quasi-noise barriers. Therefore, for development at least one block away from Keele Street or Finch Avenue, the following are recommended:

1. Development should include central air conditioning as an alternative to operable windows despite the outcome of the noise study.
2. Minimum STC-50 rated walls and STC-33 rated windows/doors shall be considered the minimum for acoustical performance.
3. Detailed plans should be reviewed by a Professional Engineer or City Building Inspector to confirm that no outdoor living area greater than four metres in depth is provided within the development or that such outdoor areas are assessed from an acoustic perspective.

3.4 IMPACTS ON AIR QUALITY

3.4.1 ASSESSMENT METHOD

Local air quality impacts from transportation sources were assessed by estimating contaminant concentrations resulting from the roadway traffic volumes in the Current and Future conditions. The rail corridor along the east side of the study and the under-construction Finch West Light Rail Transit were not included in the assessment as both rail services are designed to be electrified. The methodology for this air quality impact assessment is outlined in the Ontario Ministry of Transportation (MTO) Environmental Guide for Assessing and Mitigating Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (the ‘MTO Guideline’, MTO 2012). The assessment relies on atmospheric dispersion modelling of contaminants. Guidance pertaining to the technical aspects of the modelling are from the MECP Guideline A-11: Air Dispersion Modelling Guideline for Ontario, version 3 (ADMGO, MECP 2017).

3.4.2 APPROACH

The roadway volume in the Current and Future condition have been utilized to determine the local impacts of traffic related air contaminants on sensitive receptors within the study area. The impacts have been compared to applicable air quality objectives. Operations considered in the study area for the Current condition include traffic movement on roads including passenger cars, trucks, and buses. Operations considered in the study area for the Future condition include passenger cars, trucks, and buses with an assumed traffic volume in 2045, conservatively projected from existing traffic volumes as previously discussed.

The assessment was conducted using an emission rate calculation model. The US EPA MOVES model was used to determine vehicle emission rates for passenger cars, trucks, and buses. The local impacts of all emissions were predicted using an air dispersion model. The US EPA CAL3QHCR model was used to determine the dispersion of the emissions associated with the conditions.

3.4.2.1 CONTAMINANTS OF CONCERN

COCs assessed in transportation modelling included:

— Particulate matter less than 2.5 micrometres (µm) ($PM_{2.5}$);

— Particulate matter less than 10 micrometres (µm) (PM_{10});

— Volatile organic compounds (VOCs): acetaldehyde, acrolein, benzene, 1,3-butadiene, and formaldehyde;

— Polycyclic aromatic hydrocarbons (PAHs): benzo(a)pyrene as a surrogate;

— Nitrogen dioxide (NO_2); and,

— Carbon monoxide (CO).

3.4.2.2 EMISSION RATE CALCULATION

The most significant and user-controlled data input into the dispersion modelling are the emission rates and associated source parameters. An accurate collection of emission rates and source parameters results in a more accurate prediction of concentrations at receptors. The MOVES model, developed for this purpose by the US EPA, was used to generate emission factors (*i.e.*, emission rate in mass per time for each kilometer of travel by vehicles). The emission factors were generated for travelling and idling activities. Vehicles were assumed to stop and go on roadways without turning the ignition off (*i.e.*, no cold start emissions).

Emission factors were calculated for the Current and Future conditions. All emission factors were developed for January, which is the month with the coldest temperatures, and July, the month with the hottest temperatures. The maximum generated emission rate was selected for this assessment to account for the worst-case scenario. Associated hourly meteorological data for temperature and relative humidity for January and July were collected from the Toronto Pearson International Airport station from 2008 to 2012. The vehicle speed was determined based on relative activity (*i.e.* idling or travelling). The MOVES model can provide emission factors for multiple speed ranges, applied to modelling following the posted speed limits.

Vehicle exhaust emissions vary widely by type of vehicle, and the MOVES model generates emission factors for several different classes, following the 13 identified classifications of the United Stated Federal Highway Administration: motorcycles, passenger cars, light trucks, buses, heavy trucks, etc. To generate a composite emission factor for each pollutant that represents the average vehicle fleet, the individual emission factors were grouped using vehicular fleet composition for each roadway segment within the study area. The information of vehicle composition (*i.e.*, the percentage of trucks and buses in the traffic mix) was provided by the City of Toronto.

DUST RESUSPENSION

The $PM_{2.5}$ and PM_{10} emission factors estimated by MOVES only includes the exhaust emissions, brake wear, and tire wear emissions. The MOVES model is not capable of estimating the emission due to the resuspension of particulates from vehicles travelling over a silt laden paved surface. The particulate resuspension emissions have been estimated using US EPA recommended methodology and added to the calculated MOVES emissions. The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicles travelling were calculated using the empirical equation suggested in US EPA AP-42 (AP-42, 2011):

$$\mathrm{E} = \mathrm{K} \times (\mathrm{SL})^{0.9} \times (\mathrm{w})^{1.02}$$

where:

SL = road surface silt loading = 0.2 g/m2 (from US EPA, AP-42, section 13.2.1.3, Table 13.2.1-2.)

w = average weight (tonnes) of the vehicles traveling the road;
Passenger car = 1.5 tonnes
Truck = 20 tonnes
Bus = 13.5 tonnes
K = 0.25 g/VMT (PM2.5); 1 g/VMT (PM10)

3.4.2.3 DISPERSION MODELLING

Dispersion models use mathematical formulations to represent the atmospheric processes that transport and disperse air contaminants. This assessment involves the CAL3QHCR dispersion model. The CAL3QHCR model was developed by the US EPA specifically to predict air contaminant levels from roadways. The CAL3QHCR model uses emission factors and combines them with hourly meteorological data, traffic data, and the configuration of the roadway to predict roadway contributions to air quality levels at selected receptors.

The CAL3QHCR model can process up to a year of hourly meteorological data. The CAL3QHCR model can accept hourly inputs for specified vehicular emissions, traffic volume, and signalization (ETS) data on a weekly cycle. The model predicts air contaminants from both travelling and idling vehicles. CAL3QHCR has input methods for estimating queue lengths and contribution of emissions from idling vehicles at signal-controlled intersections. The CAL3QHCR dispersion model estimates air pollutant concentrations near a roadway by allocating the vehicle emissions to linear segments of the roadway, termed links. A new link must be defined whenever the road width, traffic volume, speed, alignment, or type of traffic movement (free flow or queue) changes. Free Flow links are allocated for moving traffic versus Queue links assigned where vehicle idling takes place such as at signalized intersections. The model calculates the contribution from all the relevant links to each individual receptor so that the modelled impact can be determined.

The CAL3QHCR model generates impacts for different averaging periods over one year of simulation. The model calculates hourly concentrations at receptors over the year of simulation and presents the maximum and 90th percentile hour. The 24-hour average value is calculated using the emission rates and daily variation of emissions which is determined by traffic data. The model calculates one value for each day over the year and presents the maximum daily concentration.

3.4.2.4 METEOROLOGICAL DATA

The MTO Guideline prescribes a single worst-case set of meteorological conditions for use in a credible worst-case analysis (MTO, 2012). For this air quality impact assessment, a more refined approach was adopted, in which the most recent annual meteorological dataset was used for dispersion modelling. Predicted worst-case concentrations for 30 minutes, one hour, eight hours, 24 hours, and annual averaging times were extracted from the results of the one-year simulation. The most recent data from 2013 surface data, hourly measurements recorded at surface-based weather stations located 10 m above grade, from the Toronto Airport Station (Pearson Airport) was utilized in this study.

3.4.3 AIR QUALITY RESULTS

The impact of roadway traffic at receptors within the study area is negligible. Overall, the predicted concentrations for the Future condition are lower than the Current condition at the most impacted receptor for each contaminant within the study area. This is an indication of an improvement to local air quality. The key to this improvement is not due to the development, but instead is owed to the advancements in vehicle technology, fuel efficiency, and exhaust control efficiency predicted to occur by 2045 within the MOVES model. A summary of the model results at the most impacted receptor within the study area for each contaminant is presented in **Table 3.4**.

Table 3.4 Air Quality Impacts from Roadway Traffic (most impacted receptor)

Contaminant	AverAging Period	Background (µg/m³)	Current Impact - 2018 (µg/m³)	Future Impact - 2045 (µg/m³)	Percent of Limit [1] (2018)	Percent of Limit [1] (2045)
NO_2	1 h	51.9	39.5	7.56	9.9 %	9.6 %
	24 h	72.2	10.9	2.45	5.4 %	1.2 %
	Annual	28.0	3.00	0.690	13 %	3.1 %
CO	1 h	412	143	34.2	0.39%	0.09 %
	8 h	412	91.2	22.8	0.58%	0.15 %
PM_{10}	24 h	31.1	10.7	13.5	21 %	27 %

$PM_{2.5}$	24 h	16.8	2.86	3.36	11 %	12 %
	Annual	9.40	1.00	1.06	11 %	12 %
Acetaldehyde	30 min	1.58	0.213	0.0399	0.04 %	0.01 %
	24 h	1.58	0.0483	0.00856	0.01 %	0.00 %
Acrolein	1 h	0.290	0.0235	0.00481	0.52 %	0.11 %
	24 h	0.290	0.00615	0.00123	1.5 %	0.31 %
Benzene	24 h	0.980	0.0298	0.00335	1.3 %	0.15 %
	Annual	0.770	0.00865	0.00101	1.9 %	0.22 %
1,3-Butadiene	24 h	0.100	0.00443	0.0000960	0.04 %	0.00 %
	Annual	0.0700	0.00120	0.0000300	0.06 %	0.00 %
Benzo (a)pyrene	24 h	0.000150	0.0000930	0.0000150	185 %	30 %
	Annual	0.000130	0.0000280	0.00000400	285 %	44 %
Formaldehyde	24 h	4.40	0.174	0.0266	0.27 %	0.04 %

Notes: [1] 'Limits' are air quality objectives (AAQC and CAAQS) listed **Table 2.2**.

The Future condition has a minor increase in $PM_{2.5}$ and PM_{10}, which is due to the increased vehicular traffic. An increase in vehicles increases resuspended particulate from the roadway, brake wear, and tire wear emissions. These emissions would have no reductions in future technology as engines will become more efficient, but brakes and tires still degrade at a representative rate.

Figure 18 to **Figure 23** show contours for contaminants with predicted concentrations above 10 % of the air quality objectives from **Table 3.4**. Any contaminant with concentrations below 10 % of the air quality objectives are not presented as they have negligible air quality impacts.

3.4.4 RECOMMENDATIONS

The impact of roadway traffic at receptors within the study area is negligible; therefore, no additional studies or recommendations are required for surface transportation related air quality.

4 STATIONARY OPERATIONS

4.1 INTRODUCTION

The stationary (industrial, commercial, and institutional) operations assessment includes facilities that have regulatory approvals (ECA or EASR) as well as those that do not require one or do not have one. The environmental impact of stationary operations is considered significant for both air and noise. There is the potential for facilities that do not have regulatory approvals to report emissions to either the federal NPRI program or the City of Toronto ChemTRAC program. Additionally, facilities may not have a regulatory approval, but can be subject to the City of Toronto's Noise By-Law without any release of a contaminant to the air. There also exists the potential for facilities within the area to not have a regulatory approval simply because they are not aware of the process. Not having a regulatory approval due to lack of knowledge of the requirements does not exempt a facility from section 9 of the EPA.

Copies of regulatory approvals that are publicly available on the MECP Access Environment, and previously obtained by City of Toronto for the Phase 1 Study were reviewed and summarized in **Appendix D**. For facilities that are identified as potentially significant sources of air and noise emissions, the air contaminants were identified. For acoustic emissions, the facility contributions were determined from their compliance status and used as a cumulative source from the acoustic centre of each facility; it was assumed that each facility would exactly meet compliance at the nearest existing receptor as a conservative assumption. The major contributions within the study area are fuel distribution terminals and their associated trucking activities that occur on site.

This section discusses the existing identified facilities impact on Current and potential Future condition receptors within the study area. The acoustic environment is expected to vary from locations nearest to the industry compared to locations further away, while the air quality impacts are driven by meteorological dispersion and not by proximity. A study area map showing major industrial facilities and commercial buildings is provided in **Figure 24**.

4.2 DATA COLLECTION

4.2.1 NOISE

A noise monitoring program was conducted at four locations within the study area and measurements were used to calibrate the stationary source model. The calibration details are provided in **Appendix C**. Monitoring locations are shown in **Figure 6**.

4.2.2 AIR QUALITY

Publicly available information about the existing commercial and industrial facilities located within the study area was compiled. This information included regulatory approvals, NPRI data submitted by the facilities and available online, and ChemTRAC data submitted by the facilities and available online. From the publicly available documentation 114 facilities were identified to be potential sources of air emissions within the study area. Of the identified facilities, 59 had regulatory approvals, 18 had NPRI emission data available online, and 19 had ChemTRAC emission data available online. For facilities without publicly available emission data conservative assumptions were applied. Emission estimates are summarized in **Appendix E**.

The emission assessment assumes facilities that require or currently have a regulatory approval operate in compliance with all regulatory requirements; therefore, it was assumed that the facility's emissions do not exceed the maximum allowable Point of Impingement (POI) concentrations off-property per O. Reg. 419/05.

As a means of verifying compliance, WSP conducted five days of field odour measurements at various locations; these locations were selected to be downwind from any facility that was identified as having VOCs or was involved in the production of food, organics, or chemicals within the study area.

4.3 IMPACTS ON ACOUSTIC ENVIRONMENT

This section of the report considers the effects of the commercial and industrial operations on the Current and Future condition receptors.

4.3.1 REFERENCE PROTOCOLS AND GUIDELINES

Stationary sources are defined in the MECP Publication NPC-300 as a source of sound or a combination of sources of sound that are included and normally operated within the property lines of a facility. Publication NPC-300 provides criteria for stationary sources based on one-hour equivalent sound levels. A stationary source is required to show compliance by calculating predicted sound levels below the noise guidelines.

Publication NPC-300 provides sound level limits for sensitive receptors based on the acoustical environment in which the receptor is located. Publication NPC-300 categorizes all acoustical environments into four classes: Class 1 (urban), Class 2 (suburban), Class 3 (rural), and Class 4 (special case). This classification depends on the local land use and the existing ambient sound levels. **Table 4.1** summarizes the MECP exclusionary limits for Class 1, Class 2, Class 3, and Class 4 areas.

Table 4.1 MECP One Hour Exclusion Limits (dBA)

PERIOD	CLASS 1		Class 2		CLASS 3		CLASS 4	
	PLANE OF	OUTDOOR POR [2]	PLANE OF	OUTDOOR POR [2]	PLANE OF	OUTDOOR POR [2]	PLANE OF	OUTDOOR POR [2]

	WINDOW [1]		WINDOW [1]		WINDOW [1]		WINDOW [1]	
Daytime (07:00 – 19:00)	50	50	50	50	45	45	60	55
Evening (19:00 – 23:00)	50	50	50	45	40	40	60	55
Night-time (23:00 – 07:00)	45	N/A	45	N/A	40	N/A	55	N/A

Notes: [1] Plane of window means a point in space corresponding with the location of the centre of a window of a noise sensitive space.
[2] POR means point of reception; representing a point at a receptor location.
N/A = Outdoor PORs do not assess against the nighttime exclusion limits

The MECP defines a Class 4 area as an area or specific site that would otherwise be defined as Class 1 or Class 2 areas and which meets the following criteria:

— is an area intended for development with new noise sensitive land use(s) that are not yet built;
— is in proximity to existing, lawfully established stationary source(s); and,
— has formal confirmation from the land use planning authority to proceed with the Class 4 Area Classification, which is determined during the land use planning process.

Publication NPC-300 further states that areas with existing noise sensitive land use(s) cannot be classified as Class 4 areas. The MECP provides the following additional considerations to new noise sensitive land uses proposed in a Class 4 area:

— An appropriate noise impact assessment should be conducted for the land use planning authority as early as possible in the land use planning process that verifies that the applicable sound level limits will be met.
— Noise control measures may be required to ensure the stationary source comply with the applicable sound level limits at the new noise sensitive land use. Source mitigation is at the expense of the development proponent and that source mitigation is preferred.
— Noise control measures may include receptor-based noise control measures and/or source-based noise control measures.
— Source-based noise control measures may require an MECP approval.
— Receptor-based noise control measures may require agreements for noise mitigation.

- Purchasers should be informed that the dwelling is located in a Class 4 area through appropriate means and informed of the agreements for noise mitigation. Registration on title of the agreements for noise mitigation is recommended. Additionally, it is recommended to include registration on title of an appropriate warning clause to notify purchasers that the applicable Class 4 area sound level limits for this dwelling are protective of indoor areas and assume closed windows.
- Any final agreements for noise mitigation as described in Part A of Publication NPC-300 and all other relevant documentation are to be submitted to the MECP by the stationary source owner(s) when applying for MECP approval. These agreements will be assessed during the review of the application for MECP approvals. Additionally, the stationary source owner(s) are to include a copy of the formal confirmation of the Class 4 area classification from the land use planning authority in the application for an MECP approval.

In addition, Publication NPC-300 provides limits for impulsive noises. Potential for banging of rail cars during shunting at the fuel distribution terminals would be considered impulsive noise and should be assessed separate to facility noise. Since the spur lines of these facilities are well away from current and potential sensitive receptors considered for this study, and also assuming that the facilities comply with the MECP's requirements at the closest existing receptor, it is WSP's opinion that impulsive noise is not a concern and therefore was not considered in this study.

4.3.2 ASSESSMENT METHODS

Per MECP Publication NPC-300, the sound level descriptors for stationary sources of noise are based on the one hour, Leq(1) daytime, and Leq(1) nighttime equivalent sound levels. The daytime corresponds to any one-hour period between 07:00 and 23:00 and nighttime corresponds to any one-hour period between 23:00 and 07:00. Since the study area is not considered Class 2 or Class 3 there is no separate evening period applicable in the guideline from 19:00 – 23:00.

A predictive analysis was performed using the commercially available software package CADNA/A, a computerized implementation of the algorithms contained in ISO 9613-1 and ISO 9613-2. This model includes geometrical divergence (distance attenuation), barrier effects due to intervening structures, ground effects, atmospheric absorption, and topography. The model considers a downwind condition, where the wind direction is always worst-case and oriented from each source location towards each POR.

For stationary sources within the study area it was assumed that they were compliant with the MECP one-hour exclusion limits for a Class 1 area; therefore, sound levels from each facility were derived by reverse-calculating compliance levels at the closest POR. The trucking activities related to fuel distribution terminals were modelled as additional line sources within the model.

The only shielding and obstacles contained in the model were those associated with the facilities themselves and any existing buildings. The facility and surrounding ground surfaces were modeled as a combination of reflective and absorptive ground.

The following steps were taken to create a predictive model for the study area in CADNA/A that met the MECP's objectives and allowed for quantitatively determining the sound levels within the study area:

- Four reference points were selected within the study area.
- The sound level at the reference points was estimated using CADNA/A software.
- Field measurements were conducted at the identified reference points.
- Results were compared between CADNA/A and the field measurements; the prediction confidence of the CADNA/A model was established.
- The prediction confidence of the site specific CADNA/A model was used to calculate the Current and Future condition sound levels within the study area.

4.3.3 CURRENT CONDITION

The assessment of stationary source operation noise impacts assumes that each of these facilities meets the regulatory requirements. Predicted sound level contours for existing conditions due to stationary sources are shown in **Figure 25** and **Figure 26** for daytime and nighttime respectively, for a typical height of 4.5 m representing the height of the second storey windows. Most of the existing receptor buildings are impacted on the second storey, so additional heights were not investigated for the Current condition.

4.3.4 FUTURE CONDITION

The City of Toronto's conceptual built form model was used in this assessment, which is a maximum extents assumption for building heights. Both the No-Build scenario, representing no development within the study area as well as the Full-Build scenario, representing the conceptual built form model were investigated in this assessment.

4.3.4.1 NO-BUILD SCENARIO

As discussed, this scenario assumes that there is no mid/high-rise development in the area, but only the industrial and commercial development growth by 50 % between 2018 to 2045. Since the stationary sources are expected to meet MECP sound level limits at the nearest receptors in all directions, the changes in the acoustic environment are not considered significant to the Current Condition.

4.3.4.2 FULL-BUILD SCENARIO

The City of Toronto conceptual built form was assessed to investigate how noise would impact proposed new receptors. Predicted stationary source sound level contours for the 2045 Full-Build scenario are shown in the figures listed below:

- **Figure 25** and **Figure 26** show the daytime and nighttime noise contours for 2018 and 2045 respectively at a typical height of 4.5 m, representing the height of a second storey window;

— **Figure 27** shows the daytime noise contours for a height of 16.5 m representing the height of a fifth storey window and 31.5 m representing the height of a tenth storey window.
— **Figure 28** shows the nighttime noise contours for a height of 16.5 m representing the height of a fifth storey window and 31.5 m representing the height of a tenth storey window.

4.3.5 RESULTS

The predicted results, based on the assumption that each individual facility is currently in compliance with Class 1 limits, are provided in **Appendix A**. The compliance of each stationary source is dependent on future operational scenarios.

The results indicate the following:

- Group 1 receptors – some exceedances of Class 1 limits are noted; considering the fact that these receptors are located near the fuel distribution terminals, and there exists an increasing demand for fuel, the future noise impact from these facilities could exceed the limits significantly. For these receptors Class 4 designation should be considered an option.
- Group 2 receptors - exceedances are not anticipated provided all facilities operate in compliance with the requirements.
- Group 3 receptors - exceedances are not noted provided all facilities operate in compliance with the requirements.

4.3.6 RECOMMENDATIONS

As discussed previously Group 1 receptors represent future receptors within the study area. The assessment of stationary sources indicates that it is feasible to achieve the MECP and City of Toronto noise objectives. Compliance assumes that the industrial facilities currently can demonstrate compliance with Publication NPC-300 exclusion limits. Where new development is considered adjacent to an existing and operational industrial facility, it is assumed that the industry, City of Toronto, and the developer will work together to implement noise controls to achieve compliance at PORs. For Group 1 receptors a site-specific noise assessment should be conducted when development extents and plans such as details of windows and balconies (outdoor living areas) are known to verify the industrial operations.

For Group 1 Receptors – i.e. Receptors in Mixed Use Areas - to the east of Keele Street

1. It is recommended that the City of Toronto initiate formally confirm the ‘mixed-use areas’ to the east of Keele Street as a Class 4 acoustic area. For the area or specific site to be Class 4, it should be:

  a. an area intended for development with new noise sensitive land use(s) that are not yet built;
  b. in proximity to existing, lawfully established stationary source(s); and,
  c. formally confirmed from the land use planning authority to proceed with the Class 4 Area Classification, which is determined during the land use planning process.
2. The City of Toronto should require a verification of stationary source impacts including the sources associated with a development on itself (self-impact) corresponding to the year of site plan approval against Class 4 limits. The verification can be done through a modelling approach or a measurements approach conducted onsite to confirm the stationary source sound level.
3. In the event that the land use authority does not classify the area as Class 4, City of Toronto should require a site-specific detailed noise assessment considering the stationary sources including self-impact be included for each of the following stages against Class 1 limit:
   a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
   b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA);

For Group 1 Receptors – i.e. Receptors in Mixed Use Areas - to the west of Keele Street

4. The City of Toronto should require a site-specific detailed noise assessment considering the stationary sources including self-impact be included for each of the following stages against Class 1 limits:
   a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
   b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA);

4.4 IMPACTS ON AIR QUALITY

4.4.1 REFERENCE PROTOCOLS AND GUIDELINES

The purpose of this section of the assessment is to demonstrate the impact of stationary sources on local air quality within the study area. Air quality impact results were prepared and then compared to existing AAQC and CAAQS, collectively referred to as air quality objectives. The assessment of the commercial and industrial operations on air quality was prepared in accordance with:

— O. Reg. 419/05 (emission estimates and dispersion modelling);
— MECP Guideline A10 (emission estimates);
— MECP Guideline A11 (dispersion modelling); and,
— AAQC and CAAQS (Point of Impingement (POI) concentrations)

4.4.2 ASSESSMENT METHODS

4.4.2.1 DISPERSION MODELLING

To quantify the air quality impact of stationary sources within the study area the AERMOD dispersion model software was utilized. AERMOD uses local meteorological and terrain data, along with building locations and geometry, in conjunction with emission source parameters (*i.e.*, source height, flow rate, temperature, and direction) to calculate the expected air dispersion effect of specified contaminants over a designated area.

For this assessment the existing buildings within the study area that would have building downwash affects were entered into the model and assigned corresponding building heights; where existing facility building height information was unavailable, a building height of 3.5 m was applied to represent a one-storey structure for determining release heights. Building base elevations were assigned by the AERMOD terrain processor. The current preprocessed urban Meteorological Data for Central Region (Toronto) made available online by the MECP was also used. Future building heights were not incorporated into the dispersion model as the MECP handles tall buildings through the urban dispersion factor. The urban dispersion factor is only allowed by the MECP in highly intensified areas, such as the core of downtown Toronto, otherwise the urban meteorological dataset and the rural dispersion factor are mandated.

Contaminants being assessed in this study have ambient threshold values with varying averaging periods; therefore, the model was set to run the one hour, 24 h, 30 days, and annual averaging periods. The modelling was used to calculate ambient air quality from all sources, so does not account for existing AAQC monitored data; the study is trying to replicate this data and identify sources. The modelling results were compared to the ambient threshold values (AAQC and CAAQS) since the cumulative impact of all stationary sources is being assessed. Each individual facility is required to meet the O. Reg. 419/05 limits; however cumulative impacts from multiple facilities are not assessed through the regulations. Cumulative effects are assessed via the ambient threshold values which are not enforceable but present an idea of an areas ambient air quality.

4.4.2.2 SOURCES

Since detailed information about the exact location of all potential sources of emissions and their source parameters is not publicly available, each facility was assigned a volume source appropriately sized to the building or property geometry. Volume sources were used to conservatively represent one sole source of all emissions from the site. The volume sources were placed in the center of each building or property and assigned a release height equal to the corresponding building height; in circumstances where a property had multiple building tier heights, the release height was set to the average height of the tiers. Where building height information was unavailable, a release height of 3.5 m was applied to represent a one-storey structure. Three facilities identified within the Phase 1 Study no longer exist or operate; therefore, these sources were excluded from the model. The model includes a total of 103 volume sources. Volume sources were assumed to be operating 24 h/day, 365 days/year.

For facilities with regulatory approvals, specifically ECAs, individual stack data was available. Those stacks with a height of 10 m or more were assigned individual point sources within the model. The point sources were placed in the general location of the source of emissions based on aerial imagery where possible. Point source parameters (*i.e.*, release height, flow rate, and diameter) were taken from the ECA for the corresponding sites. The model includes a total of nine-point sources. Specific contaminant emissions were estimated for the individual point sources, all other contaminant emissions from the corresponding facilities were attributed to their respective volume sources. Two of the point sources within the model (P1 and P2), identified as part of the City of Toronto Dufferin Organics Processing Facility are expected to have emissions 24 h/day, 365 days/year. The remaining point sources (P3 – P9) were set to operate from Monday to Friday, 08:00 – 17:00, 52 weeks/year within the model. All point sources were assigned a base elevation by the terrain processor.

Figure 29 summarizes the source locations and types included in this study.

4.4.2.3 RECEPTORS

Air quality modelling for stationary sources does not normally look at sensitive receptors, only at a grid of receptors. Stationary sources are required to meet O. Reg. 419/05 limits at all off site locations, regardless of land use. For this study the sensitive receptors were included to examine cumulative impacts of all stationary sources.

The individual receptors were placed in the model at the center of each proposed building for Group 1 and Group 2 receptors, and on the existing buildings for Group 3 receptors, following the Group 1, 2, and 3 organization discussed previously. Additional receptors were included in the model; they were placed in a stacked manner at varying heights above each original receptor to show impacts above the ground level for proposed mid/high rise buildings. The list of receptors in **Appendix A** includes deviations in the elevated receptor heights which are denoted with an additional letter from ‘a’ to ‘e’ where: ‘a’ is 1.5 m off the ground and each corresponding letter is 3.0 m higher to ‘d’ which is 10.5 m above the ground, and ‘e’ is half way between the 10.5 m receptor and the proposed building height. A receptor ID ending in the letter ‘r’ represents a receptor set at the roof height of the proposed building. The roof level receptor represents the location of potential roof top mechanical equipment, amenity areas, or fresh air intakes on the proposed building.

In addition to the individual receptor list, a general receptor grid as is common for air quality impacts was used in the model to represent the concentration of air emissions over the entire study area. A grid spacing of 50 m was used with 110 points on each axis (X and Y). A grid of receptors was used to determine if there were any areas of concern within the study area not identified by the individually defined receptors, since air quality from stationary sources is impacted by dispersion and not proximity to source as was the case for previous sections.

4.4.2.4 SCREENING MODEL

All sources of emissions were conservatively assigned an emission rate of 1 g/s to create a screening model. The resulting dispersion factors for each source were then used in conjunction with their estimated individual contaminant emission rates to determine the maximum POI concentration within the study area. The maximum result for each contaminant from each source was then summed and compared to the corresponding AAQC or CAAQS value.

The screening model methodology is a conservative estimate; the aggregate maximum POI concentration would be greater than the POI concentration from modelling each contaminant individually with its corresponding emission rate from the individual sources. This approach was used to demonstrate the overall dispersion within the study area. Source groups were used in the model to represent a group of sources that emit similar contaminants. The concentration contours for each source group could then be viewed for each source of emission or for each individual contaminant from all sources. The maximum concentration at each of the individual receptors can also be viewed for each source or for each contaminant source group.

There are no changes in emissions from the Current to the Future condition, as all employment land uses are desired to remain in place as the area develops around the transit hub. As such, the air quality stationary assessment does not have a comparison of existing conditions to proposed conditions, but instead shows contaminant levels at existing and planned receptors alike assuming no change to existing stationary sources. Any new stationary sources within the study area would be required to comply with Guideline D-6 and section 9 of the Ontario Environmental Protection Act, RSO 1990, c.E. 19 (discharges to the environment).

4.4.3 RESULTS

The 24-hour dispersion results for the screening model are included in **Figure 30**. **Table 4.2** summarizes the modelling results for each contaminant at the maximum point of impingement calculated in the model for either elevated or ground level receptors.

Table 4.2 Dispersion Modelling Results (Stationary Sources)

Contaminant	Averaging Period (h)	AAQC Limit (µg/m³)	Maximum Ground Level Concentration (µg/m³)	% of Limit	Maximum Elevated Concentration (µg/m³)	% of Limit
Nitrogen Oxides	24	200	[3]	Requires Further Assessment	[3]	Requires Further Assessment
	24	23 [2] (2025)	[3]		[3]	
	1	400 113[2] (2020)	[3]		[3]	
	1	79 [2] (2025)	[3]		[3]	

Lead	30 Day	0.2	[3]		[3]	
	24	0.5	[3]		[3]	
Iron	24	4	0.96	24 %	1.4	34 %
Cobalt	24	0.1	0.00018	0.2 %	0.00026	0.3 %
Nickel	24	0.2	[3]	Requires Further Assessment	[3]	Requires Further Assessment
	Annual	0.04	[3]		[3]	
Manganese	24	0.4	[3]		[3]	
Chromium	24	0.5	0.00018	0.04 %	0.00026	0.1%
Hexavalent Chromium	24	0.0007	[3]	Requires Further Assessment	[3]	Requires Further Assessment
	Annual	0.00014	[3]		[3]	
Particulate Matter (compared to $PM_{2.5}$ and PM_{10} AAQC)	24	50 [2]	[3]		[3]	
	24	28 [2] (2020) 27 [2] (2025)	[3]		[3]	
	Annual	8.8 [2]	[3]		[3]	
Toluene	24	2000	255	13 %	335	17 %
Formaldehyde	24	65	0.22	0.3 %	0.41	1 %
Benzene	24	2.3	0.0028	0.1 %	0.0052	0.2 %
	Annual	0.45	0.00053	0.1 %	0.00049	0.1 %
Dichloromethane	24	220	3.3	2 %	5.3	2 %
	Annual	44	0.83	2 %	0.82	2 %
Chloroform	24	1	0.055	5 %	0.10	10 %
	Annual	0.2	0.010	5 %	0.0094	5 %
Vinyl Chloride	24	1	0.000079	0.01%	0.00023	0.02 %
	Annual	0.2	0.000020	0.01 %	0.000019	0.01 %
Trichlorofluoroethane	24	800,000	0.0066	0.000001 %	0.018	0.000002 %
Petroleum	24	2600 [1]	0.037	0.001 %	0.10	0.004 %
Perchloroethylene	24	360	0.0075	0.002 %	0.0071	0.002 %

Notes: [1] Petroleum emissions were compared to the mineral spirits AAQC
[2] CAAQS value
[3] This contaminant requires detailed analysis to determine impacts at a proposed receptor

The dispersion modelling has generated areas of specific concern within the study area for NO_X, PM, and four metals (lead, nickel, manganese, and hexavalent chromium). Both NO_X and PM are identified as contaminants that already exceed AAQC guidelines within the City of Toronto based on data presented in **Table 2.2**. There are no metals included in any of the ambient monitoring stations reporting within the City of Toronto. **Figure 30** outlines specific areas of concern within the study area where dispersion modelling predicts elevated concentrations of NO_X and PM exist. For lead, nickel, manganese, and hexavalent chromium, all are elevated throughout the entire study area. Dispersion contours for nitrogen oxides and particulate matter are in **Figure 31** to **Figure 34**. If proposed development occurs within a specific isopleth on **Figure 30** then there is a requirement to perform a detailed air quality analysis. Although the concentration contours in the dispersion model identify high concentrations of contaminants within the study area, they are a screening level assessment and require developers to recognize the potential issue and perform a detailed monitoring, modelling, or mitigative analysis.

The elevated ambient concentrations for metals is due to the large number of small metal shops and automotive repair facilities within the study area. These facilities generally emit contaminants at low elevations resulting in poor dispersion. A detailed air quality assessment should examine the height of potential exceedances for metals and develop mitigation to allow for a proposed development to proceed.

The following summarizes the contaminants based on their potential level of impact:

— ***No Impacts***: toluene, formaldehyde, benzene, dichloromethane, chloroform, vinyl chloride, trichlorofluoroethane, petroleum (as mineral spirits), and perchloroethylene are not expected to be present in significant amounts at the specific receptors. These contaminants are predominantly VOCs and are typically characterized by having strong odours.

— ***Potential Impacts***: NO_X, lead (Pb), nickel (Ni), hexavalent chromium [Cr(VI)], manganese (Mn), and particulate matter (PM) may be present in significant concentrations at the specific receptors:

  — the impacts of NO_X and PM are expected at varying heights throughout the study area;

  — impacts from metals are expected closer to ground level throughout the study area;

  — the impacts are expected to occur for multiple averaging times, as they are not exclusive to one averaging period;

4.4.4 RECOMMENDATIONS

The following recommendations are provided for air quality:

  — The City of Toronto request developers create a detailed air quality impact assessment at mechanical equipment height (air intakes) and ground level to determine impacts due to NO_X, lead (Pb), nickel (Ni), hexavalent chromium [Cr(VI)], manganese (Mn), and particulate matter (PM) at each of the following stages:

    — Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and

    — Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA).

  — Detailed assessments for NO_X and PM should be triggered based on the isopleths in **Figure 30** and all identified metals should also be included, forming part of the developer’s submission. A detailed assessment would entail a detailed statistical summary of local ambient monitoring station data, onsite ambient monitoring at the proposed location for the development and at heights indicative of air handling equipment, and/or a detailed examination of neighbouring industrial facilities to determine actual impacts.

— Mitigation options that would address ambient air quality, if a detailed assessment determined an issue would be inoperable windows (air conditioning provisions) to prevent poor air quality from entering, air handling outdoor air grills located at elevations to be above ambient air quality issues, potential air purification equipment for PM and/or metals, etc.

5 OTHER ENVIRONMENTAL IMPACTS

5.1 INTRODUCTION

As discussed previously, the study area includes an airport and several fuel distribution terminals. The Downsview Airport is located just outside the study area to the southeast of Keele Street and Finch Avenue West. This airport has exclusively been used as a testing facility by Bombardier Aerospace since 1994. Runway 15 points to the intersection of Keele Street and Finch Avenue West; therefore, in addition to the building height limitations, sound from aircraft using the airport during take off and landing could be a concern.

It is noted that the Downsview Airport and associated Bombardier Aerospace lands have been sold at the time of publishing of this report. The current plan is that Bombardier operations, including the airport, will remain until at least 2021 and may remain until as late as 2023. Since development within the study area could occur within this time frame, the current airport and its operations must be considered during any development planning. The airport may cease to exist or expand into a full commercial facility, impacts for which would have to be assessed once the new purchasers have a development plan. This section of the report reviews the noise issues related to the current airport usage.

There are three fuel distribution terminals in the area. The fuel distribution terminals have the potential to represent a risk to public safety from naturally occurring radiation within the buried pipelines as well as upset (fire and explosion) conditions within the tank storage areas. As per the E2 Regulations under CEPA, fuel distribution terminals are required to have safety controls to reduce the frequency and consequences of uncontrolled, unplanned, or accidental releases to the environment. Despite the introduction of the E2 Regulations, there still exists a potential for upset conditions resulting in the release of hazardous or flammable materials which can impact offsite receptors. Considering publicly available information, this section also reviews the safety issues associated with the fuel distribution terminals.

5.2 ASSESSMENT OF DOWNSVIEW AIRPORT ON ACOUSTIC ENVIRONMENT

This section reviews regulatory acoustic requirements related to airport operations and investigates the potential acoustical impacts of the Downsview Airport on the study area.

5.2.1 REFERENCE PROTOCOLS AND GUIDELINES

The MECP Publication NPC-300 contains a chapter specifically related to Air Traffic Noise and outlines the method of assessment for conducting a noise impact assessment of air traffic noise, indoor and outdoor sound level limits, and recommended noise controls.

Publication NPC-300 utilizes the Noise Exposure Forecast or Noise Exposure Prediction (NEF/NEP) contour system for establishing applicable limits for air traffic noise in the province of Ontario, and further highlights applicable development criteria. Generally, the NEF-30 contour is used as a threshold for prohibiting new residential development and other sensitive land uses. Where a predicted noise impact is expected or shown to exceed the applicable limits, warning clauses and mitigation measures for indoor spaces including architectural design, special building components, and/or central air conditioning, may all be required.

The applicable outdoor limit prescribed by NPC-300 is presented in **Table 5.1**.

Table 5.1 Outdoor Aircraft Noise Limit

Time Period	NEF/NEP
24 h	30

The aircraft noise limit is applicable to any outdoor area, such as an outdoor living area of a residence. The location of the noise sensitive land use with respect to the NEF-30 contour is the primary measure controlling the outdoor noise impacts (MECP, 2013). This is an indication that the MECP's outdoor limits cannot be achieved in areas located within any NEF/NEP contour greater than 30.

The applicable indoor air traffic noise limits are presented in **Table 5.2** for general types of spaces, and supplementary limits for additional indoor living spaces are provided in **Table 5.3**.

Table 5.2 Indoor Aircraft Noise Limits (Applicable over 24-hour period) (MECP, 2013)

Type of Space	Indoor NEF/NEP[1]
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, daycare centres, etc.	5
Sleeping quarters	0

Notes: [1] Indoor NEF/NEP shall not be confused with NEF/NEP contour maps. The values are representative of the indoor sound levels and are used as assessment criteria for the evaluation of building performance requirements.

Table 5.3 Supplementary Indoor Aircraft Noise Limits (Applicable over 24-hour period) (MECP, 2013)

Type of Space	Indoor NEF/NEP[1]
General offices, reception areas, retail stores, etc.	15
Individual or semi-private offices, conference rooms, etc.	10
Living/dining areas of residences, sleeping quarters of hotels/motels, theatres, libraries, schools, daycare centres, places of worship, etc.	5
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	0

Notes: [1] Indoor NEF/NEP shall not be confused with NEF/NEP contour maps. The values are representative of the indoor sound levels and are used as assessment criteria for the evaluation of building performance requirements.

These limits are applicable to the identified indoor space with the windows and doors of the living space closed for an entire 24 h period. The indoor NEF/NEP values presented in **Table 5.2** and **Table 5.3** are used in determining the appropriate acoustic insulation requirements for developments within the NEF/NEP outdoor contours.

In general, if the outdoor NEF/NEP value is shown to be less than NEF-25 for a proposed development, the MECP indicates that further assessment is not required. If a new development is to be located between the outdoor contours NEF-25 and NEF-30, the MECP recommends the dwelling be designed with a provision for central air conditioning and that building components including windows, doors, walls, ceilings, and roofs should be designed to achieve the indoor sound level limits in **Table 5.2** and **Table 5.3**. Furthermore, the MECP recommends the use of a warning clause for prospective owners or tenants; sample warning clauses are provided in Publication NPC-300.

5.2.2 DATA COLLECTION

For major airports, an airport operating area (AOA) is generally identified within the Official Plans; however, no such plans are identified for the Downsview Airport. The AOA is intended to define those areas near the Airport within which noise sensitive land uses could be impacted by airport operations, primarily by way of, but not limited to, overhead flights. The AOA is based on outputs which forecast flight traffic demand and are drawn to approximate the NEF-30 contour of the airport. The NEF-30 contour itself is considered a boundary, within which it is considered undesirable to locate noise sensitive land uses.

Since the Downsview Airport has exclusively been used as a testing facility by Bombardier Aerospace since 1994, there is no such AOA available; however, building heights are controlled through the City of Toronto’s zoning by-law. There are approximately four to five test flights per day that use Runway 15. There exists a possibility that the airport could cease to exist or be expanded into a commercial airport (similar to Billy Bishop Toronto City Airport), as previously indicated. If it ceases to exist, the acoustic effects become reversible and no impacts should be considered in the future development proposals; however, if it continues to exist and is expanded into a commercial airport the flight numbers per day in **Table 5.4** were assumed.

Table 5.4 Current (2018) and assumed future scenario (2045)

Description	Number of flights / days
2018 – Approaching from or departing towards north	Up to 10
2018 – Approaching from or departing towards south	Up to 10
2045 – Approaching from or departing towards north	Up to 60
2045 – Approaching from or departing towards south	Up to 60

The City of Toronto is focused on sustainable development; therefore, for planning purposes, the hypothetical commercial airport scenario presented above is considered a conservative approach.

5.2.3 ASSESSMENT METHODS

NEF contours for the Downsview Airport were estimated using the data presented in **Table 5.4**. Transport Canada's Noise Exposure Forecast (NEF) system was used to estimate the forecasted aircraft noise within the study area from Downsview Airport. This forecast system factors in the subjective reactions of the human ear to specific aircraft noise stimulus: loudness, frequency, duration, time of occurrence, tone, etc.

Using this method, if the NEF level is greater than 35, complaints are likely to be frequent. Transport Canada outlines that a NEF above 25 is likely to produce some level of annoyance; therefore, prediction from NEF – 20 to NEF-35 was carried out for the Future condition. The City of Toronto can use this system to verify that land use planning is compatible with Downsview Airport operations.

Transport Canada recommends that where the NEF exceeds 30, new residential development should not proceed. If it does, regardless of this caution, a detailed noise analysis should be conducted, and noise reduction practices should be implemented. Transport Canada further states that it is the developer's duty to inform all prospective residents of possible nuisance from aircraft noise, generally through warning clauses as previously discussed.

5.2.4 CURRENT CONDITION

The NEF-30 contours were based on four to five test flights per day for current operations at the airport and do not extend beyond the Downsview Airport property. Based on current operations of four to five test flights per day, noise from Downsview Airport is not considered an issue within the Study Area.

5.2.5 FUTURE CONDITION

As discussed, the Future condition was estimated, and the predicted NEF contours are shown in **Figure 35.** **Figure** 35 indicates that the increase in air traffic to a large commercial airport produces a NEF-30 contour that is outside the study area; therefore, poses no noise concerns.

5.2.6 RECOMMENDATIONS

The predictive analysis indicated that it is feasible to achieve MECP's limits at the areas of interests. The following is recommended:

1. Warning clauses as required by the MECP should be included in pertinent Offers of Purchase and Sale, Lease, or Rental Agreements to inform future occupants of the existence of the airport in mixed use areas identified in Figure 2 as 'Area 1'.

5.3 INDUSTRIAL SAFETY

Safety concerns surrounding the operation of fuel distribution terminals include radiation and upset conditions at the facilities. These are summarized in the following section.

5.3.1 IONIZING RADIATION

Cesium (Cs) is a silvery-white metal that is a liquid at 28 °C. Non-radioactive cesium is found naturally in many metals and used extensively in accurate clocks and cell phones. The most common radioactive form of cesium has an atomic mass of 137 atomic mass units (Cs^{137}). Cs^{137} is produced by nuclear fusion for use in medical devices and gauges. Small amounts of Cs^{137} are present in the environment across North America, meaning exposure to Cs^{137} occurs naturally. The beta particle (neutron/proton shift) radioactive decay of Cs^{137} has a half-life of 30.17 years and about 94.6 % decays to barium-137 (Ba^{137m}). Ba^{137m} has a half-life of 2.63 minutes and emits gamma particles (photons) during radioactive decay.

Health effects resulting from exposure to ionizing radiation depend on the exposure route. Radioactive materials that emit alpha and beta particles when they decay (i.e., Cs^{137}) are most harmful when exposure is internal, such as through ingestion, inhalation, absorption, or injection. Radioactive materials emitting gamma particles (i.e., Ba^{137m}) can penetrate through the human body and so are a concern as exposure can be external, not requiring direct contact. The Canadian Nuclear Safety Commission has set the exposure limit for the general population at 1 milliSievert (mSv) above background radiation levels. According to the Canadian Nuclear Safety Commission, the average effective dose from natural background radiation measured in the City of Toronto is 1.6 mSv/year, of which 0.6 mSv/year is from artificial sources.

5.3.1.1 RADIATION SURVEYS

The sources of radiation within the study area are believed to be within the fuel storage terminals. Radiation surveys around the subject facilities were conducted on April 2, 2018 and repeated on April 11, 2018 with a Ludlum 44-9 Geiger-Mueller detector capable of identifying gamma particle radiation. The survey was designed to reflect exposure to the public; therefore, the surveys were conducted in publicly accessible areas along the property boundaries of the fuel storage terminals. Surveys were also conducted up to Steeles Avenue at a distance from the fuel terminal facilities to measure the background radiation levels relevant to the area.

5.3.1.2 SURVEY RESULTS

The background radiation levels measured were identical at all locations for both dates of the survey. The background levels of the survey produced results of 2.62 mSv/year. The highest levels measured within the study area were 3.5 mSv/year to the northwest of the fuel distribution terminals. The difference between the background and measured levels is 0.88 mSv/year, which conforms to the Canadian Nuclear Safety Commission maximum permissible exposure rate of 1 mSv/year above background levels.

5.3.2 FUEL DISTRIBUTION TERMINAL OPERATIONS

To assess the potential impacts associated with tank leaks, pool fires, and associated vapours, the Canadian Society for Chemical Engineering (CSChE) publication Risk Assessment – Recommended Practices for Municipalities and Industry (CSChE, 2004) was followed. The CSChE Risk Assessment Guide was originally tasked to the Major Industrial Accidents Council of Canada (MIACC) to complete; however, the MIACC was dissolved in 1999, at which time the document was transferred to the CSChE for completion.

The CSChE document identifies risk control measures that may be implemented which are broadly classified into:

— Safety management of the hazardous facility (best practices);
— Incident management (emergency response, communication with the public); and,
— Land-use restrictions.

Safety management for a facility can only be conducted by the operator of the facility and is the most important component with respect to facility safety; how a facility operates daily has the greatest impact on incident avoidance. Incident management can be conducted by staff at a facility (i.e., onsite fire response), but can also utilize offsite resources and may even include the participation of local residents. Responding quickly, with the right equipment, and to the right location can limit offsite impacts, and communicating upset conditions to nearby residents and employment land uses can limit short-term exposure. The final measure, land-use restrictions, is conducted through cooperation between the operator and municipal planners. The importance of stakeholder participation and risk communication is the key to all measures working effectively; this is generally accomplished through community action groups and communication programs.

To assess the level of risk, the CSChE Risk Assessment Guide recommends a three-step process:

Step One – Identify the hazardous substances (and their location)

Step Two – Gather hazardous substance information

Step Three – Identify specific events which can lead to hazardous substance releases

5.3.2.1 STEP ONE – IDENTIFY THE HAZARDOUS SUBSTANCES

There are three fuel distribution terminals within the Keele Finch Plus study area. Based on the publicly available information from the Federal NPRI, the provincial ECA permitting, and the City of Toronto ChemTRAC program, all of the fuel distribution terminals store bulk quantities of gasoline, kerosene/jet fuel, diesel, ethanol, petroleum distillate, and furnace oil.

Shell Canada Products Limited (Shell) operates one facility, located at 3975 Keele Street. Based on aerial imagery and the facility ECA dated September 2005, the facility contains 12 above ground storage tanks for various fuel storage. There is no information from the public sources with respect to any underground storage tanks. The ECA identifies that the Shell facility has a total storage capacity of 152 000 m^3 of petroleum products with a maximum annual throughput of 8 000 000 m^3.

Suncor Energy Inc. (Suncor) operates one facility located at 1138 Finch Avenue West. Based on aerial imagery and the facility ECA dated April 2017, the facility contains 11 above ground storage tanks for various fuel storage. There is no information available from the publicly available sources with respect to any underground storage tanks on the site. The ECA identifies that the Suncor facility has a production limit of up to 5 800 000 m^3 per year.

Imperial Oil Limited (Imperial Oil) operates one facility located at 1150 Finch Avenue West. Based on aerial imagery and the information in the facility ECAs, dated January 2009 and January 2012, the facility contains 18 above ground storage tanks and six underground storage tanks. Quantities of fuels stored are contained within the ECAs and are presented in **Table 5.5**.

Table 5.5 Imperial Oil (1150 Finch Avenue West) Fuel Storage Quantities

Fuel Type	Total Volume (m^3)	No. of Storage Tanks	Estimated Volume per tank (m^3)
Gasoline (including commingle)	99 125	9	17 017
Kerosene/Jet fuel	31 170	2	15 585
Diesel	6 893	1	6 893

Ethanol	6 893	1	6 893
Petroleum Distillate	34 813	4	8 703
Furnace Oil	6.8	2	3.4
TOTAL	**178 000**	**19**	**-**

The volume of fuel stored at the Imperial Oil facility are greater than the other fuel distribution terminals within the study area based on size of onsite storage tanks and volumes listed in **Table 5.5**. The Shell and Suncor facilities do not have publicly available individual tank fuel quantities, so they were assumed to be scaled versions of the Imperial Oil facility.

The fuel types stored at the fuel distribution terminals vary in their physical parameters. From the chemicals and quantities listed in **Table 5.5**, gasoline and petroleum distillate (naphtha) are both MIACC List 1 substances, making them Priority One risks (CSChE, 2004).

5.3.2.2 STEP TWO – GATHER HAZARDOUS SUBSTANCE INFORMATION

Following the CSChE Risk Assessment Guide, the next step is to identify the relevant information for the materials, systems, processes, and facility characteristics. The following sections deal with the hazardous substances identified in Step One: gasoline and petroleum distillate.

MATERIAL PROPERTIES

Gasoline contains a mixture of hydrocarbons, generally between four carbon (C4) and 12 carbon (C12) atoms per molecule. It is a mixture of alkanes, naphthenes, and olefins. Gasoline is a known carcinogen. The Lower Explosive Limit (LEL) is 1.2 % in air and the Upper Explosive Limit (UEL) is 7.1 % in air.

Petroleum distillates (naphtha) are a complex blend of hydrocarbons that can be used as fuel. Light naphtha has
five to six carbon atoms (C5 – C6) per molecule while heavy naphtha has seven to nine carbon atoms (C7 – C9) per molecule. Petroleum naphtha is a major constituent in the distillate of crude oil and can be used as a surrogate for modelling purposes. The LEL of petroleum naphtha is 1.2 % in air and the UEL is 6.9 % in air.

The concentration of vapour in air must be between the LEL and UEL for combustion to occur, otherwise an air/vapour mixture will be too lean (below the LEL) or too rich (above the UEL) to ignite/explode. Based on the conservative nature of the properties of gasoline, only gasoline has been carried through as the worst-case scenario.

QUANTITIES

Based on **Table 5.5**, the average size of storage tanks at Imperial Oil is 17 017 m^3 for gasoline. The volume of tanks at the Suncor and Shell facilities is unknown; however, they contain smaller throughputs and generally smaller tanks than the Imperial Oil facility. The largest tank on site at the facilities is 23 856 m^3, based on aerial imagery and observations made from offsite. The largest observed tank size was used to determine upset condition scenarios as a worst-case approach. The tank is considered at 90 % capacity to account for a vapour head space.

OPERATING CONDITIONS

Gasoline is stored in a liquid state at ambient temperature and pressure at the fuel distribution terminals, as is standard operating practice for these fuel types. The types of tanks that are in use are unknown (e.g. fixed roof, floating roof, etc.), but are not relevant to the study. Any pressurization within the tanks would be due to the vapour pressure of the stored material but would be low enough to consider the tanks unpressurized. Since gasoline is stored as a liquid then the immediate concern from a safety analysis perspective is the heat release due to a pool fire from leaking material.

OPERATING, TESTING, AND MAINTENANCE INSTRUCTIONS AND PROCEDURES

Press releases from the fuel distribution terminal operators indicate strategic investment into these terminals is recent and part of their core business plans. A public letter from the Canadian Fuels Association (CFA) dated July 3, 2018 (the 'CFA Letter') in response to the "July 4, 2018 North York Community Council meeting, item NY32.19, Keele-Finch Plus – Encouraging Growth and Community Building – Interim Report", indicates that the fuel distribution terminals provide approximately "…95 % of the liquid transport fuels, heating and other fuels used by businesses, governments, public transit and private motorists, serving approximately 8 million people within the GTA [Greater Toronto Area] and beyond."

The importance of these facilities, proximity to existing residences, and recent public transit projects in the area implies that equipment should generally be in a state of good repair with strict maintenance schedules and emergency procedures in place. These facilities are a major dependence for the GTA, as well as public "flagship" operations for all operators, indicating a duty of care by the operators to ensure safe and continued operations. All three operators of the fuel terminals are known for their cultures of safety and operational management, which generally reflect upon excellent procedures in operating, testing, and maintenance. The economic loss of operations at these fuel terminals due to upset conditions would be catastrophic due to the dependence of the GTA on these facilities, per the quote from the CFA Letter above. The exact details of the operating, testing, and maintenance instructions and procedures are unknown within the context of this report, but it is assumed that the facilities are operated and maintained with due diligence.

5.3.2.3 STEP THREE – IDENTIFY SPECIFIC EVENTS WHICH CAN LEAD TO HAZARDOUS SUBSTANCE RELEASES

The identification of events which can lead to hazardous substance releases is a site-specific activity. The following techniques conducted by owners of fuel terminals are the most common:

— Safety Reviews;

— Checklist Analysis;

- What-if Analysis;
- Failure Modes and Effects Analysis (FMEA); and/or,
- Hazard and Operability Analysis (HAZOP).

Identifying what could go wrong is the key step to determining release and risk scenarios for modelling. Risk scenarios can be used to communicate land use restrictions to municipal planners, and inform the public of various expected scenarios, and their associated probability. It is unknown what techniques have been applied at the fuel distribution terminals.

An example of a risk identification process is a nodes analysis where fault can occur at a fuel distribution terminal following a HAZOP system approach as follows:

System 1: Storage of Products
- Sub-system 1.1: Filling tanks
  - Node 1.1.1: Opening tank valves
  - Node 1.1.2: Filling tank
  - Node 1.1.3: Closing tank valve
- Sub-system 1.2: Product storage
  - Node 1.2.1: Product storage

System 2: Loading product
- Sub-system 2.1: Arrival at loading station
  - Node 2.1.1: Positioning of truck
  - Node 2.1.2: Hose connection to tank truck
- Sub-system 2.2: Transfer from tanks
  - Node 2.2.1: Opening tank truck valves
  - Node 2.2.2: Transfer and filling tank truck
  - Node 2.2.3: Valve closure

The nodes outlined in the example HAZOP process flow above are all points of potential failure due to human-error or mechanical-malfunction. A HAZOP would then perform an analysis of each node; for example, Node 1.1.1: Opening tank valves could result in a fire due to discharge from the build-up of static electricity. A corrective measure would then be introduced such as properly ensuring all valves are adequately grounded and/or limiting flow to slow a build-up of static electricity. The HAZOP technique is a useful means of producing fault trees to remove the potential for accidents and malfunctions. The above example limits mechanical failure, but standard operating procedures (step-by-step instructions) would be developed by the facilities to limit human-error via similar analysis means.

In general, an upset condition such as a leak or spill from the nodes outlined above (storage/transfer of product) are the major concern at a fuel distribution terminal, and any associated pool fires from those spills. To determine consequences of an upset condition, dispersion modelling was conducted.

5.3.2.4 UPSET CONDITION MODELLING

As per the E2 Regulations under CEPA, fuel distribution terminals are required to have safety controls to reduce the frequency and consequences of uncontrolled, unplanned, or accidental releases to the environment. All three of the fuel distribution terminals are registered as participants within the publicly accessible E2 database at the time of this report being generated, meaning they have E2 Plans. Despite the introduction of the E2 Regulations, there still exists a potential for upset conditions resulting in the release of flammable material which could impact offsite receptors. The offsite consequence assessment consists of two distinct release scenarios, defined by MIACC:

- total release: the failure of a storage tank; and,
- slow release: the release of 10 % of the tank quantity in 30 minutes.

Both release scenarios would result in a quantity of gasoline accumulating, which could result in a pool fire. The total release scenario is the release of the largest quantity of a substance from a storage tank or process line failure that can result in a pool of material which could create a pool fire within the emergency containment area (e.g. berm) of a tank. Only a pool fire from a total release scenario was examined as a worst-case assumption.

Toronto Fire Services identified a response time between 6 minutes 24 seconds to 10 minutes 24 seconds to an emergency call from the fuel distribution terminals. The total release scenario was created to recognize a leak occurring over 10 minutes before responders arrived, representing the worst-case response time. It should be noted that the fire response may come from another station in the area if the local station is currently dispatched; however, this is included in the range of response times identified.

Quantities of gasoline stored at all fuel distribution terminals were estimated based on the available information outlined previously. Dispersion of released material due to accidental release is modelled to predict the distance that a flammable vapour cloud would exist at dangerous levels before dissipating to the point that serious injuries from a fire no longer occur.

ASSESSMENT METHODS

The total release assessment utilized the Process hazard analysis software (Phast) to predict the dispersion of gasoline. Phast was developed by Det Norske Veritas Germanischer Lloyd (DNV GL). Phast allows for modifications to the upset scenario, such as Toronto Fire Services response time and control techniques. Phast is used to model chemical releases for emergency response and planning. Phast models the key hazards such as toxic vapour clouds, flammable vapour clouds, boiling liquid expanding vapour explosions (BLEVE), jet fires, and pool fires related to specific chemical storage and potential release mechanisms. The Emergency Response Planning Guideline (ERPG) includes toxic Levels of Concern (LOCs) that are used to predict the impact zones harmful to receptors. The ERPGs were developed by the ERPG committee of the American Industrial Hygiene Association (AIHA). The ERPG values represent different circumstances with specific effects, with the corresponding concentration and the distances at which those effects are likely to occur. The ERPG is a three-tiered guideline. The effects are referred to as Acute Exposure Guideline Levels (AEGLs) to anticipate adverse human health effects caused by exposure to chemicals. The three tiers of AEGLs under the ERPG are as follows, where AEGL-1 is the least severe and AEGL-3 is the most severe:

— AEGL-1 is the airborne concentration of a substance, or energy release in the event of a fire, above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling, and are temporary and reversible upon cessation of exposure;
— AEGL-2 is the airborne concentration of a substance, or energy release in the event of a fire, above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects as well as an impaired ability to remove themselves from exposure; and,
— AEGL-3 is the airborne concentration of a substance, or energy release in the event of a fire, above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or immediate death.

5.3.2.5 MODELLING PARAMETERS

There are different volumes of storage tanks identified at each facility; however, to be conservative, one tank with the largest size is considered for modelling purpose. It is unknown if gasoline is stored in the largest tank or not, but this is a conservative assumption. Since gasoline is the worst-case parameter from a volatile and LEL perspective only it was assessed. The modelling parameters used in this study are listed in **Table 5.6**.

Table 5.6 Dispersion Modelling Parameters

Parameter	Input
Tank Dimension	One Vertical Tank, diameter = 45 m and height = 15 m.
Tank capacity	23 856 m^3
Ground Roughness	Urban or forest
Cloud Cover	Partly Cloudy
Humidity	Medium, 50 %
Temperature	10 °C
Stability Class	D – Relatively strong wind speeds and moderate solar radiation are associated with neutral stability (moderate turbulence)
Wind Speed	5 m/s
Leak Rate	380 L/s

5.3.2.6 RELEVANT RECEPTORS

The three fuel distribution terminals are located on the northeast quadrant of the Study Area. The fuel distribution terminals are designated Employment Areas in the City's Official Plan. Land uses at the northeast corner of the Keele Street and Finch Avenue West intersection and northeast corner of the Tangiers Road and Finch Avenue West intersection are designated Mixed Used Areas. **Figure 1** is a scaled aerial image illustrating the existing study area, with the location of the fuel distribution terminals identified by the large white storage tanks. The land use designation for the study area is illustrated in **Figure 2**, identifying specific areas of concern for imminent development.

The area surrounding the fuel distribution terminals can be impacted by upset conditions related to fuel storage and distribution activities. All receptors around the fuel distribution terminals are examined in this assessment, regardless of end use. For this study it is assumed that the fuel distribution terminals and all existing receptors continue to exist long-term, into the year 2045. The purpose of this assessment is to determine potential land use compatibility for future development while identifying and mitigating any challenges to local businesses, including the fuel distribution terminals.

ACCIDENTAL RELEASE SCENARIOS

For this assessment one release scenario was examined for gasoline. The following sections describe the release scenario.

The above ground storage tanks at each fuel distribution terminal have significant separation distances between each other. The separation distance is assumed to be large enough to represent on-site safety controls; therefore, the spread of a fire from one tank to another in the form of a chain reaction is considered unlikely.

The total release scenario is assumed to occur from one large tank located within the fuel tank farms and existing containment structures. It is also assumed that fuels are stored at ambient temperature and pressure, with any slight pressurization caused by the stored liquids vapour pressure controlled through tank breathing losses. The total release scenario normally examines a tank volume spill within 30 minutes, as per MIACC, which represents a critical failure such as a rupture or line break. In consultation with Toronto Fire Services it was determined that the local fire station is involved in the facilities E2 Plan for upset conditions. In the event of a total release scenario the following information was provided from Toronto Fire Services:

- Toronto Fire Services response time is 6 minutes 24 seconds to 10 minutes 24 seconds regardless of dispatch location.
- Toronto Fire Services has a limited quantity of a foaming agent it applies to pool fires/exposed pools. This foam acts as a fire suppressant in the event of fire as well as to block oxygen from getting to a pool of liquid, in turn also blocking vapours from leaving the pool (i.e., stopping the emissions from a spill).
- A Community Awareness and Emergency Response (CAER) group exists, between the fuel distribution terminals there is a collective foam supply which Toronto Fire

Services accesses on arrival (i.e., limited quantities of foam brought onto site are to start the response while larger supplies of foam onsite are accessed).

RESULTS OF RELEASE SCENARIOS

The dispersion modelling exercise categorizes the concern level by the previously discussed AEGL's. The models calculate the downwind impact of a pool fire, assumed to be the worst-case scenario from liquid fuels, by calculating the fire intensity in kilowatts per square metre (kW/m^2). The downwind impact is measured from the tank location. Within the AEGL-3 impact area there should be "No other land uses", as defined by MIACC that are not a part of the fuel distribution terminal operations. Any existing development within the AEGL-3 limit would already be considered within the fuel distribution terminal E2 Plans, but no further burden should be placed on the operators by continuing development within this impacts area. The AEGL-2 impact area could be developed following a risk assessment to determine the annual individual risk of a development by considering land use and exact location. The annual individual risk could then be compared to MIACC's Risk Acceptability Criteria to determine compatibility. The annual individual risk would be the responsibility of the developer. All land uses are permitted within the AEGL-1 impact area. Within the AEGL-2 and AEGL-1 impact areas the E2 Plan for each fuel distribution terminal would require an update by the operator outlining evacuation procedures from these areas to minimize impact.

Table 5.7 outlines the impact zones for the gasoline storage tanks for the pool fire associated with the total release scenario.

Table 5.7 Gasoline Impact Zones for a Pool Fire

Level of Concern	Intensity Level	Downwind Impact (m)
AEGL-3 (Immediately Dangerous)	3 (37.5 kW/m^2)	115
AEGL-2 (Irreversible Impacts)	2 (12.5 kW/m^2)	175
AEGL-1 (Reversible Impacts)	1 (4 kW/m^2)	270

5.3.2.7 RECOMMENDATIONS

The pool fire dispersion modelling results of the gasoline storage tank total release scenario downwind impacts are summarized in **Figure 36.** The levels of concern indicate that:

- For a development to proceed within the 175 m of a fuel storage tank (AEGL-3 and AEGL-2) a Risk Assessment should be conducted by the developer that examines the frequency of a pool fire occurring, which when combined with the consequence analysis of this study can identify risk. This Risk Assessment should follow the CSChE Risk Assessment Guide. When a development is being proposed, the actual fuel storage tanks in existence at the closest fuel terminal can be used to recalculate the downwind impacts. Impacts to proposed development can also be evaluated in the Risk Assessment process through the use of onsite mitigation measures such as increased building insulation, line of sight obstructions (berms, walls, etc.), or the use of site façade cooling measures such as dedicated sprinklers.

- No restrictions on land use for developments between 175 m to 270 m (AEGL-1 impact area) from the fuel storage tanks. Developing within the AEGL-1 impact area of a fuel distribution terminal will require development proponents to work with the fuel distribution terminal operator to ensure proper evacuation or shelter in place alert systems are provided for.
- No concerns exist for proposed developments further than 270 m from the fuel storage tanks.

6 SUMMARY OF RECOMMENDATIONS

6.1 NOISE

6.1.1 SURFACE TRANSPORTATION

1. Considering the significant heavy truck activities in the area due to the presence of industrial operations, it is recommended that the City investigate the possibility of reducing the speed limits on both Keele Street and Finch Avenue West. A speed reduction of 20 km/h can result in a notable change in sound levels.

Development adjacent to Keele Street or Finch Avenue

2. City of Toronto requires a site-specific noise assessment considering the surface transportation sources be included for each of the following stages:
    a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
    b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA).
3. Proposed development should include central air conditioning as an alternative to operable windows despite the outcome of the noise study.
4. The surface transportation noise assessments should determine the acoustical performance requirements for exterior façade elements (*i.e.*, exterior walls, windows, and balcony doors) for the development. For such assessments, STC-50 rated walls and STC-33 rated windows/doors shall be considered the minimum for acoustical performance.
5. Detailed plans should be reviewed by a Professional Engineer or City Building Inspector to confirm that no outdoor living area greater than four metres in depth is provided within the development or that such outdoor areas are assessed from an acoustic perspective.
6. At the site plan approval stage, it is recommended that a Professional Engineer with an acoustics background or an approved professional from the City Building Department certify that the building plan includes the noise controls discussed within this report.
7. It is recommended that the City of Toronto requires a verification/certification by a Professional Engineer as part of the occupancy permit stating based on inspection/testing that the recommendations as part of Item 2 have been correctly interpreted and applied.

Development at least one block away from Keele Street or Finch Avenue

8. Development should include central air conditioning as an alternative to operable windows despite the outcome of the noise study.

9. Minimum STC-50 rated walls and STC-33 rated windows/doors shall be considered the minimum for acoustical performance.
10. Detailed plans should be reviewed by a Professional Engineer or City Building Inspector to confirm that no outdoor living area greater than four metres in depth is provided within the development or that such outdoor areas are assessed from an acoustic perspective.

Note: if the truck on Keele Street and Finch Avenue uses a dedicated truck route that does not traverse through existing residential areas, then recommendations 8 to 10 applies to the entire study area including those adjacent to Keele Street and Finch Avenue.

6.1.2 STATIONARY OPERATIONS

For Group 1 Receptors – i.e. Receptors in Mixed Use Areas - to the east of Keele Street

1. It is recommended that the City of Toronto formally confirm the 'mixed-use areas' to the east of Keele Street as a Class 4 acoustic area. For the area or specific site to be Class 4, it should be:
    a. an area intended for development with new noise sensitive land use(s) that are not yet built;
    b. in proximity to existing, lawfully established stationary source(s); and,
    c. formally confirmed from the land use planning authority to proceed with the Class 4 Area Classification, which is determined during the land use planning process.
2. The City of Toronto should require a verification of stationary source impacts including the sources associated with a development on itself (self-impact) corresponding to the year of site plan approval against Class 4 limits. The verification can be done through a modelling approach or a measurements approach conducted onsite to confirm the stationary source sound level.
3. In the event that the land use authority does not classify the area as Class 4, City of Toronto should require a site-specific detailed noise assessment considering the stationary sources including self-impact be included for each of the following stages against Class 1 limit:
    a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,
    b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA);

For Group 1 Receptors – i.e. Receptors in Mixed Use Areas - to the west of Keele Street

4. The City of Toronto should require a site-specific detailed noise assessment considering the stationary sources including self-impact be included for each of the following stages against Class 1 limits:

a. Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and,

b. Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA);

6.1.3 DOWNSVIEW AIRPORT OPERATIONS

- Warning clauses as required by the MECP should be included in pertinent Offers of Purchase and Sale, Lease, or Rental Agreements to inform future occupants of the existence of the airport in mixed use areas identified in Figure 2 as 'Area 1'.

6.2 AIR QUALITY

6.2.1 SURFACE TRANSPORTATION

The assessment indicated that it is feasible to achieve AAQC and CAAQS criteria within the Keele Finch Plus study area for transportation sources. No additional studies or recommendations are required for surface transportation related air quality.

6.2.2 STATIONARY SOURCES

The following recommendations and discussions are provided for the stationary sources impacts on air quality:

- The City of Toronto request developers create a detailed air quality impact assessment at mechanical equipment height (air intakes) and ground level to determine impacts due to NO_X, lead (Pb), nickel (Ni), hexavalent chromium [Cr(VI)], manganese (Mn), and particulate matter (PM) at each of the following stages:
  - Official Plan Amendment (OPA) or Zoning By-law Amendment (ZBA); and
  - Draft Plan of Subdivision (SUB) or Site Plan Approval (SPA).
- Detailed assessments for NO_X and PM should be triggered based on the isopleths in **Figure 30** and all identified metals should also be included, forming part of the developer's submission. A detailed assessment would entail a detailed statistical summary of local ambient monitoring station data, onsite ambient monitoring at the proposed location for the development and at heights indicative of air handling equipment, and/or a detailed examination of neighbouring industrial facilities to determine actual impacts.
  - Mitigation options that would address ambient air quality, if a detailed assessment determined an issue would be inoperable windows (air conditioning provisions) to prevent poor air quality from entering, air handling outdoor air grills located at elevations to be above ambient air quality issues, potential air purification equipment for PM and/or metals, etc.

6.3 SAFETY

The following recommendations and discussions are provided for safety:

- Ionizing Radiation – There were no issues identified with ionizing radiation due to cesium content of fuels or flow gauges within the study area; therefore, there are no further studies recommended.
- Fuel Distribution Terminal Safety:
  - For a development to proceed within the 175 m of a fuel storage tank (AEGL-3 and AEGL-2) a Risk Assessment should be conducted by the developer that examines the frequency of a pool fire occurring, which when combined with the consequence analysis of this study can identify risk. This Risk Assessment should follow the CSChE Risk Assessment Guide. When a development is being proposed, the actual fuel storage tanks in existence at the closest fuel terminal can be used to recalculate the downwind impacts. Impacts to proposed development can also be evaluated in the Risk Assessment process through the use of onsite mitigation measures such as increased building insulation, line of sight obstructions (berms, walls, etc.), or the use of site façade cooling measures such as dedicated sprinklers.
  - No restrictions on land use for developments between 175 m to 270 m (AEGL-1 impact area) from the fuel storage tanks. Developing within the AEGL-1 impact area of a fuel distribution terminal will require development proponents to work with the fuel distribution terminal operator to ensure proper evacuation or shelter in place alert systems are provided for.
  - No concerns exist for proposed developments further than 270 m from the fuel storage tanks.

7 CONCLUSIONS

This report described the air, noise, and environmental safety effects of the Keele Finch Plus study area. The report also investigated the effects of air, noise, and environmental safety on future planned development (2045 build form scenario). The following scenarios were considered:

- baseline and future noise impacts from stationary and transportation sources;
- baseline and future air quality impacts from transportation sources;
- future air quality concerns from stationary sources;
- potential noise impacts to future sensitive uses due to the operations at Downsview Airport; and,
- potential safety impacts from the fuel distribution terminals.

The report discussed the regulatory framework; considered the study area air and noise impact assessment due to surface transportation and stationary sources, noise effects due to Downsview airport operation and environmental safety due to gas terminal operation in the area. The results of the assessment indicated that:

- Acoustic analysis of conditions resulting from transportation activities concluded that it is feasible to develop in compliance with established criteria, following recommendations presented by WSP.
- Acoustic analysis of conditions resulting from stationary sources concluded that it is feasible to develop in compliance with established criteria, following recommendations presented by WSP.
- Acoustic analysis of conditions resulting from operations at the Downsview Airport concluded that it is feasible to develop in compliance with established criteria, following recommendations presented by WSP.
- Air quality analysis of conditions resulting from transportation activities concluded that it is feasible to develop in compliance with established criteria.
- Air quality analysis of conditions resulting from industrial and commercial activities concluded that further detailed analysis (e.g. monitoring at air handling heights, facility specific modelling, etc.) is required for NO_X, PM, Ni, Cr(VI), Mn, and Pb to meet the established criteria, areas of concern are outlined in **Figure 30**.
  - The exceedances for metals are due to the large number of metal shops and automotive repair facilities within the Study Area. Development close to these operations should consider air handling units well above grade, inoperable windows, or other mitigation to avoid these sources emitting at low elevations.
- No safety concerns exist for ionizing radiation within the study area due to bulk fuel transport, storage, and flow gauges.
- Safety concerns arise from the fuel distribution terminals in the case of a pool fire due to an upset condition:

- As measured from onsite fuel storage tanks, risk assessments should be conducted on new developments located within 175 m;
- No restrictions on land use for developments between 175 m to 270 m (AEGL-1 impact area) from a fuel storage tank. Developing within the AEGL-1 impact area of a fuel distribution terminal will require development proponents to work with the fuel distribution terminal operator to ensure proper evacuation or shelter in place alert systems are provided for.

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