

Appendix A2

Ontario Line Project

**Exhibition Station Early Works –
Final Air Quality Early Works Report**

Metrolinx

Air Quality Early Works Report

Ontario Line Exhibition Station Early Works

Prepared by:

AECOM Canada Ltd.
105 Commerce Valley Drive West, 7th Floor
Markham, ON L3T 7W3
Canada

T: 905.886.7022
F: 905.886.9494
www.aecom.com

Date: February 2021

Project #: 60611173

Statement of Qualifications and Limitations

The attached Report (the “Report”) has been prepared by AECOM Canada Ltd. (“AECOM”) for the benefit of the Client (“Client”) in accordance with the agreement between AECOM and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations and conclusions contained in the Report (collectively, the “Information”):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”);
- represents AECOM's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to AECOM which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

AECOM shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. AECOM accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

AECOM agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but AECOM makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

Without in any way limiting the generality of the foregoing, any estimates or opinions regarding probable construction costs or construction schedule provided by AECOM represent AECOM's professional judgement in light of its experience and the knowledge and information available to it at the time of preparation. Since AECOM has no control over market or economic conditions, prices for construction labour, equipment or materials or bidding procedures, AECOM, its directors, officers and employees are not able to, nor do they, make any representations, warranties or guarantees whatsoever, whether express or implied, with respect to such estimates or opinions, or their variance from actual construction costs or schedules, and accept no responsibility for any loss or damage arising therefrom or in any way related thereto. Persons relying on such estimates or opinions do so at their own risk.

Except (1) as agreed to in writing by AECOM and Client; (2) as required by-law; or (3) to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by Client.

AECOM accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information (“improper use of the Report”), except to the extent those parties have obtained the prior written consent of AECOM to use and rely upon the Report and the Information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report and any use of the Report is subject to the terms hereof.

Authors

Report Prepared By:



Jennifer Routhier, P.Eng.
Air Quality Engineer, AECOM

Report Reviewed By:



Danielle Arsenault, P.Eng., TSRP
Air Quality Compliance Lead, AECOM



Madelin Blacha
Environmental Planner, AECOM



Corinne Latimer, MCIP, RPP
Senior Environmental Planner, AECOM

Report Approved By:



Nicole Cooke, MES
Senior Environmental Planner

Executive Summary

ES.1 Ontario Line Exhibition Station Early Works

The Ontario Line Project (the Project) is being assessed in accordance with Ontario Regulation 341/20: Ontario Line Project under the Environmental Assessment Act. Ontario Regulation 341/20: Ontario Line Project outlines a Project-specific environmental assessment process that includes an Environmental Conditions Report, Environmental Impact Assessment Report, and an opportunity for Early Works Report(s) for assessment of works that are ready to proceed in advance of the Environmental Impact Assessment Report. The Environmental Conditions Report documents the local environmental conditions of the Ontario Line Study Area and provides a preliminary description of the potential environmental impacts from the Project. Information outlined in the Environmental Conditions Report is used to inform the Early Works Report(s) and Environmental Impact Assessment Report, which study environmental impacts in further detail and confirm and refine preliminary mitigation measures identified in the Environmental Conditions Report.

Ontario Line early works are components of the Project that are proposed to proceed before the completion of the Ontario Line environmental impact assessment process. An overview of the Project is provided in **Section 1.2**. Early works are defined in Ontario Regulation 341/20: Ontario Line Project under the Environmental Assessment Act as follows:

“any components of the Ontario Line Project that Metrolinx proposes to proceed with before the completion of the Ontario Line assessment process, such as station construction, rail corridor expansion, utility relocation or bridge replacement or expansion.”

Exhibition Station early works are considered to be of strategic importance in enabling the timely implementation of the Project. The early works are being advanced where the Project interfaces with GO Expansion. Advancing early works and supporting environmental and technical studies in this area provides planning and design efficiencies for the Project and GO Expansion, and facilitates the timely implementation of both.

AECOM Canada Limited (AECOM) was retained by Metrolinx and Infrastructure Ontario to complete the Ontario Line Exhibition Station Early Works Report for the Project. This Final Air Quality Early Works Report (this Report) supports the Ontario Line Final Exhibition Station Early Works Report prepared for the Project to document the air quality impact assessment of Exhibition Station early works (**Figure ES-1**).

The Exhibition Station early works will include modifications and improvements to the existing Exhibition GO Station, including extension of the existing passenger tunnel, construction of vertical accesses, construction of a new north platform, shifting of the two northern-most GO tracks, construction of a temporary pedestrian bridge, and relocating utilities.

The Exhibition Station early works components and construction are further described in **Section 1.3**.

The purpose of this Report is to:

- Describe the local environmental conditions related to ambient air quality;
- Assess the potential impacts of early works construction activities on air quality; and,
- Identify mitigation measures and monitoring activities for any negative impacts to air quality as a result of the early works construction activities.

This Report supports the Ontario Line Exhibition Station Early Works Report prepared in accordance with Ontario Regulation 341/20: Ontario Line Project.

Refer to **Section 1** of this Report for more information related to the Project and a detailed early works description.

Figure ES-1: Exhibition Station Early Works Conceptual Design



ES.2 Methodology

This Report documents the assessment of the Exhibition Station early works construction impacts. Impacts associated with Project operations will be addressed as part of the Environmental Impact Assessment Report, under separate cover. Detailed methodology is provided in **Section 2**.

Local Environmental Conditions

Background information and documentation relevant to local ambient air quality conditions within the Exhibition Station Study Area is contained within the Ontario Line Final Environmental Conditions Report (AECOM, 2020)¹, which includes:

- Background air quality concentrations from representative air quality monitoring data;
- Recorded meteorological conditions;
- Existing road traffic emissions from car, trucks, and buses;
- Contributions from identified industrial sources; and,
- Location of identified sensitive and critical receptors.

Impact Assessment

This early works impact assessment and development of mitigation measures and monitoring activities considered the following in accordance with Ontario Regulation 341/20: Ontario Line Project under the Environmental Assessment Act:

- Exhibition Station early works components as described in **Section 1.3.1**;
- The Exhibition Station Early Works Project Footprint and Exhibition Station Study Area as described in **Section 1.3.2**;
- Exhibition Station early works construction activities as described in **Section 1.3.3**; and,
- Local environmental conditions within the Exhibition Station Study Area as described in **Section 3**.

ES.3 Local Environmental Conditions

There are existing exceedances of benzene and benzo(a)pyrene according to the Ambient Air Quality Criteria (Ministry of Environment, 2012) relevant to the Exhibition Station Study Area. Benzene has elevated annual contributions that exceed the

¹ The Ontario Line Final Environmental Conditions Report (AECOM, 2020) was published on November 30, 2020 in accordance with Ontario Regulation 341/20: Ontario Line Project.

threshold guideline from the Ambient Air Quality Criteria. Benzo(a)pyrene, the representative polycyclic aromatic hydrocarbon, shows extremely elevated levels of concentration for both annual and daily provincial air quality thresholds. This is due mainly to high presence of regional air quality contributions, high traffic volumes within the Greater Toronto Area, and industrial contributions from Toronto, the Greater Toronto Area, and Hamilton.

The predominant wind direction, as taken from the Toronto City Centre meteorological station located on Toronto Island, is from the northeast towards the southwest. Impacts from Exhibition Station early works construction activities would therefore potentially be directed towards receptors along Dufferin Street and Springhurst Avenue. These sources are approximately 500 metres west of the Exhibition Station Early Works Project Footprint, and therefore the relative impact of particulate will likely be diluted when compared to receptors adjacent to construction activities. Secondary predominant winds blow from the west, northwest and southwest, which would have an impact on receptors located along Liberty Street and Hanna Avenue. These receptors are located much closer to the Exhibition Station Early Works Project Footprint, and the winds from Lake Ontario may disperse the airborne particulates or vehicular emissions towards the condominium units in east Liberty Village.

Local environmental conditions are further described in **Section 3**.

ES.4 Potential Impacts, Mitigation Measures and Monitoring Activities

Section 4 includes information related to potential impacts, mitigation measures, and monitoring activities for the Exhibition Station early works. Potential impacts may result from early works construction activities, including emissions of dust, fine respirable particulates, and to a lesser extent, combustion emissions from diesel fuelled construction equipment and vehicles, as well as odourous compounds from the same. Mitigation measures and monitoring activities are recommended to minimize the potential impacts during construction.

Refer to **Table ES-1** for a complete list of potential impacts, mitigation measures, and monitoring activities for the Exhibition Station early works.

ES.5 Permits and Approvals

Section 5 notes that no air quality related permits or approvals are anticipated for the Exhibition Station early works at this time. Individual permits and approvals for construction activities are not required specifically for air quality prior to early works construction, with the exception of Environmental Compliance Approval(s) for equipment held by contractors, owners and operators of that equipment, which will be obtained in advance of construction, as necessary.

Table ES-1: Potential Impacts, Mitigation Measures and Monitoring Activities for the Exhibition Station Early Works

Environmental Component	Potential Impacts	Mitigation Measure(s)	Monitoring Activities
<p>Construction Air Quality</p>	<ul style="list-style-type: none"> ▪ Potential air quality impacts could include effects from diesel combustion and particulate emissions. Odour and visible dust may also cause public annoyance. ▪ Exhaust emissions from construction vehicles may contribute to increased levels of nitrogen oxides, and volatiles such as benzene and benzo(a)pyrene, which given their existing background concentrations can contribute to existing levels of provincial criteria exceedance. ▪ Certain construction activities are likely to emit particulates in higher quantities, which include site preparation and earth works activities, demolition activities, unpaved surfaces with heavy equipment travel, and uncovered soil storage piles. ▪ Disruption of contaminated soils may release harmful and/or volatile contaminants. 	<ul style="list-style-type: none"> ▪ On-site construction vehicle activity shall be managed to control emissions of odourous contaminants and diesel exhaust, including benzene and benzo(a)pyrene emissions from exhaust. It is recommended that an Air Quality Management Plan be developed to ensure consistent attention to mitigation of dust and particulates, including silica, from the construction site. The following mitigation measures should be considered in the Air Quality Management Plan: <ul style="list-style-type: none"> – All equipment complies with Canadian engine emissions standards. – All equipment visually inspected prior to use and properly maintained. – Implement a no idling policy on site (unless necessary for equipment operation). – Use of electricity from the grid over diesel generators wherever possible. – Retrofitting of combustion engines with specific exhaust emission control measures such as particulate traps. – Follow guidelines on hot mix asphalt outlined in the Ontario Hot Mix Producers Association’s Environmental Practices Guide: Ontario Hot Mix Asphalt Plants, Fifth Edition (Ontario Hot Mix Producers Association, 2015). ▪ Mitigation measures from Environment Canada’s Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo Services Inc., 2005), the Ministry of Environment, Conservation and Parks’ Technical Bulletin Management Approaches for Industrial Fugitive Dust Sources, shall be followed. The following mitigation measures should be considered in the Air Quality Management Plan: <ul style="list-style-type: none"> – Complete earthwork grading within 10 days of ceased active construction. – Temporary seeding or mulching of bare soil and storage piles. – Compression or clodding of soil surfaces and storage piles to reduce erosion. – Confine storage pile activity to downwind side of piles. – Reduction of activities during high wind conditions. – Full or partial enclosure of demolition activities. – Wind screens or barriers where possible or necessary. – Off-site construction of certain structures or parts of structures to minimize air emission due to interference with the normal flow of traffic. – Scheduling certain construction activities (i.e., site preparation and earth works activities, demolition activities, unpaved surfaces with heavy equipment travel, and uncovered soil storage piles) to periods of time when exposure to dust is expected to be limited (e.g., avoid scheduling activities during dry, windy weather conditions). – Landscaping materials ordered close to time of use to reduce on-site storage. – Application of soil stabilizers or dust control polymers where feasible. – Daily removal of accumulated mud, dirt and debris deposits on-site, and regular truck washing – Paved and unpaved roadway cleaning, watering or application of a dust suppressant. – Minimize drop height of materials on-site. – Covering surface area of hauled bulk material. – Methods and equipment for cleanup of accidental spill of dusty materials. – Limit travel speeds on-site to a maximum of 16-24 kilometres per hour. ▪ If disruption of contaminated soils is anticipated at any time, consult with the construction manager to ensure that harmful and/or volatile contaminants are not released. ▪ Develop a communications protocol which includes timely resolution of complaints. 	<ul style="list-style-type: none"> ▪ On-site meteorological monitoring in conjunction with real-time particulate monitoring representative of receptor impacts. ▪ Place monitors both upwind and downwind of construction activities, where possible. ▪ Application of threshold “Action Level” triggers for implementation of specific and increasing intensity mitigation activities linked to specific construction activities. ▪ Reporting detailing results of ongoing monitoring and mitigation activities. ▪ In addition, relevant construction monitoring activities from the following recommended guidelines will be implemented during construction: <ul style="list-style-type: none"> – Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo Services Inc., 2005); and, – Operations Manual for Air Quality Monitoring in Ontario (Ministry of the Environment, Conservation and Parks, 2018). ▪ Monitoring at locations where there are persistent complaints, as required.

Table of Contents

	page
1. Introduction.....	1
1.1 Purpose of the Ontario Line Early Works.....	1
1.1.1 Purpose of this Report	1
1.2 Ontario Line Project Overview	4
1.3 Early Works Description.....	4
1.3.1 Project Description	4
1.3.1.1 Passenger Access: Tunnels and Vertical Accesses.....	4
1.3.1.2 New North Platform and Track 1 and Track 2 Shift	5
1.3.1.3 Utilities	6
1.3.2 Early Works Project Footprint and Study Area	6
1.3.3 Construction Activities.....	6
2. Methodology	13
2.1 Local Environmental Conditions	13
2.1.1 Background Information Review	13
2.1.2 Assessment of Contaminants	14
2.1.3 Relevant Air Quality Guidelines.....	15
2.1.4 Existing Ambient Air Quality	17
2.1.5 Identification of Representative Receptors.....	20
2.2 Impact Assessment	20
3. Local Environmental Conditions	22
3.1 Existing Ambient Air Quality.....	22
3.2 Meteorological Conditions.....	24
3.3 Traffic Assessment	25
3.4 Representative Receptors	25
4. Potential Impacts, Mitigation Measures and Monitoring Activities.....	29
5. Permits and Approvals.....	32
6. References	33

List of Figures

Figure 1-1:	Exhibition Station Early Works Conceptual Design.....	3
Figure 1-2:	Exhibition Station Early Works Project Footprint and Exhibition Station Study Area	8
Figure 2-1:	Location of Ambient Air Quality National Air Pollution Surveillance Monitoring Stations Related to the Exhibition Station Study Area.....	19
Figure 3-1:	Wind Rose Representative of Meteorological Conditions in the Exhibition Station Study Area	24
Figure 3-2:	Sensitive Receptors Within the Exhibition Station Study Area	28

List of Tables

Table 1-1:	Report Contents in Accordance with Ontario Regulation 341/20: Ontario Line Project	2
Table 1-2:	Anticipated Construction Activities for the Ontario Line Exhibition Station Early Works	9
Table 2-1:	Summary of Applicable Guidelines and Standards.....	15
Table 2-2:	Ambient Air Quality National Air Pollution Surveillance Monitoring Stations Information Related to the Exhibition Station Study Area	18
Table 3-1:	Comparison of Existing Ambient Air Quality Data to Standards.....	23
Table 3-2:	Representative Traffic Data Within the Exhibition Station Study Area	25
Table 3-3:	Sensitive Receptors Within the Exhibition Station Study Area.....	27
Table 4-1:	Potential Impacts, Mitigation Measures and Monitoring Activities for the Exhibition Station Early Works.....	31

Appendices

Appendix A. Background Air Quality Data

Appendix B. Raw Traffic Turning Movement Counts

1. Introduction

1.1 Purpose of the Ontario Line Early Works

The Ontario Line Project (the Project) is being assessed in accordance with Ontario Regulation 341/20: Ontario Line Project under the Environmental Assessment Act. Ontario Regulation 341/20: Ontario Line Project outlines a Project-specific environmental assessment process that includes an Environmental Conditions Report, Environmental Impact Assessment Report, and an opportunity for Early Works Report(s) for assessment of works that are ready to proceed in advance of the Environmental Impact Assessment Report. The Environmental Conditions Report documents the local environmental conditions of the Ontario Line Study Area and provides a preliminary description of the potential environmental impacts from the Project. Information outlined in the Environmental Conditions Report is used to inform the Early Works Report(s) and Environmental Impact Assessment Report, which study environmental impacts in further detail and confirm and refine preliminary mitigation measures identified in the Environmental Conditions Report.

Ontario Line early works are components of the Project that are proposed to proceed before the completion of the Ontario Line environmental impact assessment process. An overview of the Project is provided in **Section 1.2**. Early works are defined in Ontario Regulation: 341/20: Ontario Line Project under the Environmental Assessment Act as follows:

“any components of the Ontario Line Project that Metrolinx proposes to proceed with before the completion of the Ontario Line assessment process, such as station construction, rail corridor expansion, utility relocation or bridge replacement or expansion.”

Exhibition Station early works are considered to be of strategic importance in enabling the timely implementation of the Project. The early works are being advanced where the Project interfaces with GO Expansion. Advancing early works and supporting environmental and technical studies in this area provides planning and design efficiencies for the Project and GO Expansion, and facilitates the timely implementation of both. Exhibition Station early works are described in detail in **Section 1.3**.

1.1.1 Purpose of this Report

AECOM Canada Limited (AECOM) was retained by Metrolinx and Infrastructure Ontario to complete the Ontario Line Exhibition Station Early Works Report for the Project. This Air Quality Early Works Report (this Report) supports the Ontario Line Final Exhibition

Station Early Works Report and has been prepared for the Project to document the air quality impact assessment of Exhibition Station early works (**Figure 1-1**). The early works components and construction activities are described in **Section 1.3**.

The purpose of this Report is to:

- Describe the local environmental conditions related to ambient air quality;
- Assess the potential impacts of early works construction activities on air quality; and,
- Identify mitigation measures and monitoring activities for any negative impacts to air quality as a result of the early works construction activities.

This Report has been prepared in accordance with Ontario Regulation 341/20: Ontario Line Project and contains the information outlined in **Table 1-1**.

Table 1-1: Report Contents in Accordance with Ontario Regulation 341/20: Ontario Line Project

Reg. Section	Requirement	Report Section
Section 8(2)2	The rationale for proceeding with the early works.	Section 1.1
Section 8(2)4	A description of the local environmental conditions at the site of the early works.	Section 3
Section 8(2)6	Metrolinx's assessment and evaluation of the impacts that the preferred method of carrying out the early works and other methods might have on the environment, and Metrolinx's criteria for assessment and evaluation of those impacts.	Section 4
Section 8(2)7	A description of any measures proposed by Metrolinx for mitigating any negative impacts that the preferred method of carrying out the early works might have on the environment.	Section 4
Section 8(2)8	A description of the means Metrolinx proposes to use to monitor or verify the effectiveness of mitigation measures proposed.	Section 4
Section 8(2)9	A description of any municipal, provincial, federal or other approvals or permits that may be required for the early works.	Section 5

Figure 1-1: Exhibition Station Early Works Conceptual Design



1.2 Ontario Line Project Overview

Metrolinx, an agency of the Province of Ontario, is proceeding with the planning and development of the Ontario Line, extending from Exhibition/Ontario Place to the Ontario Science Centre in the City of Toronto.

The Project is a new approximately 16-kilometre subway line with connections to Line 1 (Yonge-University) subway service at Osgoode and Queen Stations, Line 2 (Bloor-Danforth) subway service at Pape Station, and Line 5 (Eglinton Crosstown) light rail transit service at the future Science Centre Station. Fifteen stations are proposed, with additional connections to three GO Transit lines (Lakeshore East, Lakeshore West and Stouffville), and the Queen, King, Bathurst, Spadina, Harbourfront, and Gerrard/Carlton streetcar routes. The Project will reduce crowding on Line 1 and provide connections to new high-order rapid transit neighbourhoods. The Project will be constructed in a dedicated right-of-way with a combination of elevated (i.e., above existing rail corridor/roadway), tunnelled (i.e., underground), and at-grade (i.e., at grade with existing rail corridor) segments at various locations.

1.3 Early Works Description

1.3.1 Project Description

The Exhibition Station early works will include modifications and improvements to the existing Exhibition GO Station, including extension of the existing passenger tunnel, construction of vertical accesses, construction of a new north platform, shifting of the two northern-most GO tracks, construction of a temporary pedestrian bridge, and relocating utilities.

The Exhibition Station early works will support the future Ontario Line terminus station which will create a connection to the GO network. Exhibition Station early works components are shown in **Figure 1-1** and described in **Section 1.3.1.1** to **Section 1.3.1.3** below.

1.3.1.1 Passenger Access: Tunnels and Vertical Accesses

Existing Passenger Tunnel Extension

There is currently an existing and operating passenger tunnel at Exhibition Station that runs below the GO tracks and provides access between the north and south sides of the rail corridor. This existing tunnel was previously extended north of the north platform with a new head house (enclosed building above tunnel entrance) connected to Atlantic Avenue through a covered pathway, though these structures have not been commissioned. These

structures will be commissioned, along with associated infrastructure such as Closed Circuit Television (CCTV), lighting, and communication systems, as part of the Exhibition Station early works. This activated access point will be in service until the new passenger tunnel extension and north entrance (see details below) are completed. At that time, the covered pathway to Atlantic Avenue will be closed, but the tunnel extension and vertical access will continue facilitating passenger access.

The existing passenger tunnel is also proposed to be extended approximately 40 m further to the north from the currently un-commissioned head house, with a new head house constructed at the new terminus. Vertical accesses will be constructed as well. This tunnel extension and new north entrance will provide continuous access to the station throughout Ontario Line construction.

Temporary Pedestrian Bridge

A temporary pedestrian bridge spanning the rail corridor will be installed, providing additional access and egress capacity for the station platforms and augmenting cross-corridor capacity to serve trips to and from Liberty Village. In addition, the bridge will reduce the potential congestion in the existing tunnel during special events at Exhibition Place and/or Ontario Place. The bridge will be aligned with the existing tunnel and its extension (described above). A temporary structure, this bridge will not be accessible, while the existing tunnel will continue to provide barrier-free access to the westbound platform and across the corridor. The bridge will be complete with all required associated infrastructure such as lighting, CCTV and communication system. The temporary pedestrian bridge is anticipated to be in place until Ontario Line is in operation.

1.3.1.2 New North Platform and Track 1 and Track 2 Shift

A new north platform for westbound GO trains will be constructed that will include all required amenities such as platform edge tiles and curbs, lighting, signage, and platform shelters.

Track 1 and Track 2 (northern-most GO tracks) will be relocated approximately 10 metres to the north of their current locations and run south of the new north platform described above. Once the new north platform is constructed and Track 1 and Track 2 are shifted north, the existing north platform, including the existing headhouse, will be removed.

The new north platform will service GO trains temporarily. Once the Ontario Line station is constructed, the western portion of the new north platform will form part of the joint GO-Ontario Line platform, and the eastern portion will be removed. GO trains will continue to run on Track 1, and stop at the new joint GO-Ontario Line platform. The joint

platform will allow people transferring from the Ontario Line to the GO Train to walk straight from one to the other without having to go up or down a level.

1.3.1.3 Utilities

Utilities such as sewers, water, electrical, communications and gas located within the rail corridor as well as other parts of the Exhibition Station Early Works Project Footprint will be relocated to facilitate completion of the work described above, as required.

1.3.2 Early Works Project Footprint and Study Area

The Exhibition Station Early Works Project Footprint, shown in **Figure 1-2**, is defined as the area of direct disturbance associated with the early works construction activities, including anticipated required construction staging and laydown areas². The Exhibition Station Early Works Project Footprint largely overlaps with the existing Lakeshore West rail corridor and Exhibition GO Station from Mowat Avenue in the west to Pirandello Street in the east and extends approximately 150 metres north of the rail corridor between Atlantic Avenue in the west to Hanna Avenue in the east. The Exhibition Station Early Works Project Footprint also overlaps with an existing building and part of a parking lot on the east side of Atlantic Avenue and immediately north of the existing Exhibition GO Station access.

For the purpose of this Report, the Exhibition Station Study Area, also shown in **Figure 1-2**, includes the Exhibition Station Early Works Project Footprint and a 500 metre buffer. The distance of the 500 metre buffer was based on guidance provided in the Ministry of Transportation, Environmental Guide for Assessing and Mitigating the Air Quality Impact and Greenhouse Gases of Provincial Transportation Projects (Ministry of Transportation, 2020) which states that for major roads, a distance of 500 m is expected to capture the maximum pollutant concentrations.

The Exhibition Station Study Area assessed in this Report is specific to the air quality impact assessment. The study areas for other environmental disciplines are outlined in the Ontario Line Final Exhibition Station Early Works Report.

1.3.3 Construction Activities

Table 1-1 provides a description of the anticipated construction activities for the Exhibition Station early works. These typical activities serve as the basis for the assessment of construction-related potential environmental impacts. These activities

² Staging and laydown areas are areas for the temporary storage of construction equipment and materials.

Metrolinx

Ontario Line Exhibition Station Early Works – Air Quality Early Works Report

may be expanded, further refined, or found to be unnecessary as the Project progresses through detailed design and construction.

Figure 1-2: Exhibition Station Early Works Project Footprint and Exhibition Station Study Area

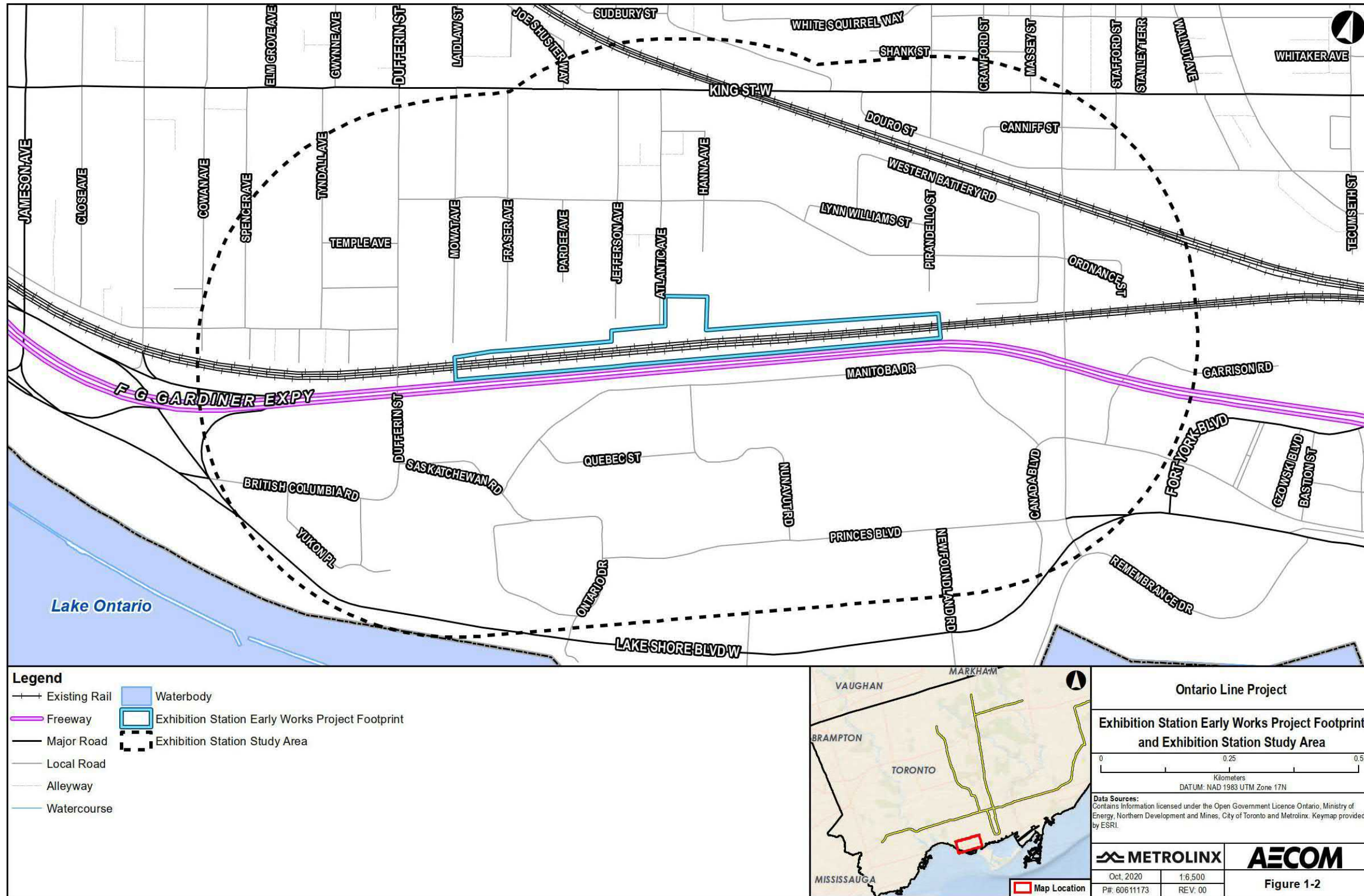


Table 1-2: Anticipated Construction Activities for the Ontario Line Exhibition Station Early Works

Anticipated Construction Activity	Description	Associated Equipment
Site Preparation	<ul style="list-style-type: none"> ▪ Mobilization of equipment and temporary facilities to the site. ▪ Clearing and grubbing of vegetation, tree removal and protection. ▪ Erection of temporary and permanent fences. ▪ Installation of environmental management features (e.g., erosion and sediment controls). ▪ Dewatering works. ▪ Demobilization. ▪ Temporary railway crossing. ▪ Temporary signs. ▪ Locates and surveys. ▪ Notices. ▪ Site specific documents (safety, approvals, permit etc.). ▪ Mobilization of construction materials currently located on site north of train tracks. 	<ul style="list-style-type: none"> ▪ Site compaction equipment and grading equipment. ▪ Vegetation removal equipment. ▪ Excavation equipment. ▪ Haulage/dump trucks. ▪ Dewatering equipment (pumps etc.). ▪ Hand tools. ▪ Surveying equipment. ▪ Flatbed truck. ▪ Forklift.
Site Servicing/ Removals/ Demolition	<ul style="list-style-type: none"> ▪ Relocation and/or extension of services and utilities on the site, which may include both underground and aerial services and utilities (e.g., sewers, water, electrical, communications, gas). This may also involve installation of utilities within the site. Includes utilities on the rail corridor and off the rail corridor. ▪ Includes utilities on the rail corridor and off the rail corridor. ▪ Demolition and removal of main building at 1 Atlantic Avenue. ▪ Pedestrian tunnel installation. 	<ul style="list-style-type: none"> ▪ Excavation equipment including backhoe, dump trucks, spoils removal equipment, jackhammers. ▪ Hand tools. ▪ Mobile crane. ▪ Flatbed trucks. ▪ Track stabilizer. ▪ Boom truck. ▪ Spreader for track work.

Anticipated Construction Activity	Description	Associated Equipment
	<ul style="list-style-type: none"> ▪ Removal and reinstatement railway track. ▪ Tree removal. 	
<p>Excavating and Grading</p>	<ul style="list-style-type: none"> ▪ Excavation and grading activities may involve earth-moving activities and stockpiling, as applicable. Excavated material will be accommodated on-site on the degree practicable; however, where necessary, surplus material will be disposed of off-site to an approved facility. ▪ Any off-site disposal shall be done in compliance with applicable regulations, including as it relates to contaminated material that may be encountered. ▪ Implement support of the existing infrastructure by way of caissons and other temporary supporting structure. ▪ Any groundwater encountered will be managed and disposed of in accordance with applicable regulations. 	<ul style="list-style-type: none"> ▪ Site compaction equipment and general grading equipment, dump trucks, soil removal equipment. ▪ Groundwater pumping equipment. ▪ Excavation equipment including backhoe, dump trucks, soil removal equipment, and jack hammers.
<p>Construction and Rehabilitation/ Upgrade of Structures</p>	<ul style="list-style-type: none"> ▪ All structures will be constructed using standard civil construction techniques. ▪ Rehabilitation and upgrade of GO platforms (Exhibition GO), including mini-platform, platform curbs, etc. ▪ Construction of Ontario Line-GO pedestrian tunnel and vertical access to GO platforms (including elevators and stairwells). ▪ Relocate existing platform amenities (i.e., lighting poles, fencing, Closed Circuit Television, etc.). 	<ul style="list-style-type: none"> ▪ Foundation placement equipment. ▪ Augured piles or rammed aggregate piers. ▪ Drill rigs. ▪ Mobile cranes and hoists. ▪ Concrete trucks, pumps and vibrators, skid steer.
<p>Construction and/or Alteration of Bridges</p>	<ul style="list-style-type: none"> ▪ Includes grounding and bonding. ▪ Pile installation, foundations, abutments, retaining walls, bridge girders, decking, backfilling, concrete demolition. 	<ul style="list-style-type: none"> ▪ Mobile cranes and hoists. ▪ Flatbed trucks, cranes. ▪ Augured piles or rammed aggregate piers. ▪ Drill rigs.

Anticipated Construction Activity	Description	Associated Equipment
		<ul style="list-style-type: none"> ▪ Bulldozer and excavator. ▪ Jackhammer.
<p>Construction of Ancillary Facilities</p>	<ul style="list-style-type: none"> ▪ Ancillary facilities may include electrical transformer /supply equipment, parking areas, exterior yard facilities including lighting, electrification enabling facilities, platform shelters, platform canopies, utility buildings, entrance plazas/ head houses. 	<ul style="list-style-type: none"> ▪ Flatbed trucks, cranes, concrete trucks. ▪ Backhoe, pavement excavation equipment. ▪ Mobile cranes and hoists. ▪ Concrete trucks, pumps and vibrators.
<p>Installation of Trackwork</p>	<ul style="list-style-type: none"> ▪ Assembly of track, ties and fastenings. 	<ul style="list-style-type: none"> ▪ Thermal welding. ▪ Tie placement (cranes, lifting equipment). ▪ Ballast placement equipment. ▪ Concrete pouring equipment.
<p>Temporary Track Diversion</p>	<ul style="list-style-type: none"> ▪ Grading. ▪ Temporary drainage. ▪ Relocation/Installation of tracks. ▪ Temporary relocation of signals, if any. ▪ Clear delineation and protection between active rail service and construction work zones. ▪ Provision of GO signal overhead bridge support/protection and temporary GO ballast track protection (i.e., sheet piling). 	<ul style="list-style-type: none"> ▪ Site compaction equipment and general grading equipment, dump trucks, spoil removal equipment. ▪ Thermal welding. ▪ Tie placement (cranes, lifting equipment). ▪ Ballast placement equipment. ▪ Temporary concrete barriers.
<p>Temporary Road Closures</p>	<ul style="list-style-type: none"> ▪ All road closures will follow standard traffic control management guidelines. 	<ul style="list-style-type: none"> ▪ Temporary traffic control devices such as signs, signals, barriers, traffic barrels, plate tampers.
<p>Management of Stormwater</p>	<ul style="list-style-type: none"> ▪ All precipitation falling within the site will be managed as stormwater within a designed system of collection, conveyance, retention and discharge features. The system will be designed and operated in compliance with applicable standards and regulatory requirements. Surface flows within the site will be managed within the site to ensure discharge to off-site receivers (i.e., municipal storm sewers) is appropriate in terms of water quantity and quality. 	<ul style="list-style-type: none"> ▪ Site compaction equipment and general grading equipment. ▪ Groundwater pumping.

Anticipated Construction Activity	Description	Associated Equipment
Mechanical Work	<ul style="list-style-type: none"> ▪ Installation of snow melt systems, heating and ventilation systems, plumbing work, gas lines, elevators and associated machinery, fire sprinklers and associated infrastructure, and other components associated with the early works Project structures. 	<ul style="list-style-type: none"> ▪ Hoists and cranes, trucks, hand tools, backhoe, small excavator, skid steer, welding units, compaction equipment, vibrators, concrete trucks, tampers.
Electrical Work	<ul style="list-style-type: none"> ▪ Installation of electrical upgrades, fare equipment, Closed Circuit Television, communication system, lighting poles and fixtures, and other electrical components associated with the Exhibition Station early works. 	<ul style="list-style-type: none"> ▪ Hoists and cranes, trucks, hand tools, backhoe, small excavator, skid steer, welding units, compaction equipment, vibrators, concrete trucks, tampers.

2. Methodology

This Report documents the assessment of Exhibition Station early works construction impacts related to air quality. Impacts associated with Project operations will be addressed as part of the Environmental Impact Assessment Report, under separate cover.

2.1 Local Environmental Conditions

Local environmental conditions within the Exhibition Station Study Area were established through a review of relevant background information, a definition of appropriate air quality contaminants, and determining existing concentrations of the air quality contaminants from local monitoring stations. Existing air quality is also defined by volume of traffic within the Exhibition Station Study Area. Higher levels of traffic result in higher local air quality concentrations. The existing levels of air quality contaminant concentrations were compared to federal and provincial standards to determine which contaminants exceed standard thresholds within the Exhibition Station Study Area. Detailed methodology related to local environmental conditions is provided in the sub-sections below.

2.1.1 Background Information Review

Background information and documentation relevant to the Exhibition Station Study Area is contained within the Ontario Line Final Environmental Conditions Report (AECOM, 2020)³, which includes:

- Identification of air quality representative receptors within the Exhibition Station Study Area;
- Determination of representative background air quality monitoring stations within the National Air Pollution Surveillance network for the Exhibition Station Study Area. Appropriate representation was based on proximity to the Exhibition Station Study Area, availability of contaminant monitoring data, and proximity to similar nearby air quality sources as those existing within the Exhibition Station Study Area;

³ The Ontario Line Final Environmental Conditions Report (AECOM, 2020) was published on November 30, 2020 in accordance with Ontario Regulation 341/20: Ontario Line Project.

- Traffic peak levels and/or annual average daily traffic volumes along primary routes of travel within the Exhibition Station Study Area were reviewed, where available; and,
- Review of existing meteorological data representative of the Exhibition Station Study Area.

2.1.2 Assessment of Contaminants

The primary air emission sources within the Exhibition Station Study Area are expected to be the vehicular emissions from the road network, in addition to the additional construction emissions from the identified activities for early works.

Emissions from diesel trains traversing the Exhibition Station Study Area were not assessed due to the relatively low contribution of air contaminants. For example, the Air Quality Assessment Report prepared for the Union Station Rail Corridor East Enhancements Transit Project Assessment Process (AECOM, 2018) included a quantitative assessment of downtown Toronto air quality sources and project source impacts where it was shown that hourly road air contaminant contributions were exponentially higher than those of both GO Train emission contributions and VIA/Canadian National contributions (e.g., 23.9 g/hour of CO from roads, compared with 2.0 g/hour from GO rail and 0.05 g/hr from VIA/Canadian National rail). Certain contaminants had a higher contribution from the Metrolinx GO network within the Union Station Rail Corridor East Enhancements study area, such as NO_x and fine particulate matter (PM_{2.5}). These emissions were not specifically quantified in this assessment, however it should be noted that diesel rail traffic can present as a minor source of air quality contamination for these two specific contaminants.

Based on recommendations within the Ministry of Transportation's Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (Ministry of Transportation, 2020), this air quality early works assessment includes the following criteria air contaminants from vehicle emissions:

1. Nitrogen dioxide, NO₂ (assessed over 1-hour, 24-hour, and annual averaging periods);
2. Carbon monoxide, CO (assessed over 1-hour and 8-hour averaging periods);
3. Sulphur Dioxide, SO₂ (assessed over 1-hour, 24-hour, and annual averaging period);
4. Particulate matter (<10 microns), PM₁₀ (assessed over 24-hour and annual averaging periods);

5. Particulate matter (<2.5 microns), PM_{2.5} (assessed over 24-hour and annual averaging periods);
6. Acetaldehyde (assessed over 30-minute and 24-hour averaging period);
7. Acrolein (assessed over 1-hour and 24-hour averaging periods);
8. Benzene (assessed over 24-hour and annual averaging periods);
9. Benzo(a)pyrene, B(a)P (assessed over 24-hour and annual averaging periods);
10. Formaldehyde (assessed over 24-hour averaging period); and,
11. 1,3-butadiene (assessed over 24-hour and annual averaging periods).

Construction of early works is expected to contribute emissions of primarily suspended particulate matter, suspended silica (represented as suspended particulate), and diesel and gasoline combustion emissions from specific construction equipment. Coarse fraction of particulates (PM₁₀) are emitted from vehicular tire wear, brake wear, and road dust fugitives, whereas the fine fraction (PM_{2.5}) is mostly attributed to vehicle emission exhausts.

2.1.3 Relevant Air Quality Guidelines

The applicable standards for the criteria air contaminants are regulated by the Ministry of the Environment, Conservation and Parks and Canadian Council of Ministers of the Environment as the Ambient Air Quality Criteria (Ministry of the Environment, Conservations and Parks, 2020) and Canadian Ambient Air Quality Standards (Canadian Council of Ministers of the Environment, 2012), respectively, as shown in **Table 2-1**.

Table 2-1: Summary of Applicable Guidelines and Standards

Criteria Air Contaminant	Source of Standard	Averaging Period	Air Quality Threshold Value (µg/m ³)
NO ₂	Ambient Air Quality Criteria	One hour	400
NO ₂	Ambient Air Quality Criteria	24 hours	200
NO ₂ ⁽¹⁾	Canadian Ambient Air Quality Standards	One hour (2020)	113
NO ₂ ⁽¹⁾	Canadian Ambient Air Quality Standards	Annual (2020)	32
NO ₂ ⁽¹⁾	Canadian Ambient Air Quality Standards	One hour (2025)	78
NO ₂ ⁽¹⁾	Canadian Ambient Air Quality Standards	Annual (2025)	22
CO	Ambient Air Quality Criteria	One hour	36,200

Criteria Air Contaminant	Source of Standard	Averaging Period	Air Quality Threshold Value ($\mu\text{g}/\text{m}^3$)
CO	Ambient Air Quality Criteria	Eight hours	15,700
SO₂ ⁽²⁾	Ambient Air Quality Criteria	10-minute	180
SO₂ ⁽²⁾	Ambient Air Quality Criteria	One hour	100
SO₂ ⁽²⁾	Ambient Air Quality Criteria	Annual	10
SO₂ ⁽³⁾	Canadian Ambient Air Quality Standards	One hour (2020)	183
SO₂ ⁽³⁾	Canadian Ambient Air Quality Standards	Annual (2020)	13
SO₂ ⁽³⁾	Canadian Ambient Air Quality Standards	One hour (2025)	170
SO₂ ⁽³⁾	Canadian Ambient Air Quality Standards	Annual (2025)	10
PM₁₀ ⁽⁴⁾	Ambient Air Quality Criteria	24 hours	50
PM_{2.5} ⁽⁵⁾	Canadian Ambient Air Quality Standards	24 hours (2020)	27
PM_{2.5} ⁽⁵⁾	Canadian Ambient Air Quality Standards	Annual	8.8
Acetaldehyde	Ambient Air Quality Criteria	30-minute	500
Acetaldehyde	Ambient Air Quality Criteria	24 hours	500
Acrolein	Ambient Air Quality Criteria	One hour	4.5
Acrolein	Ambient Air Quality Criteria	24 hours	0.4
Benzene	Ambient Air Quality Criteria	24 hours	2.3
Benzene	Ambient Air Quality Criteria	Annual	0.45
Benzo(a)pyrene	Ambient Air Quality Criteria	24 hours	0.00005
Benzo(a)pyrene	Ambient Air Quality Criteria	Annual	0.00001
1,3-Butadiene	Ambient Air Quality Criteria	24 hours	10
1,3-Butadiene	Ambient Air Quality Criteria	Annual	2
Formaldehyde	Ambient Air Quality Criteria	24 hours	65

Notes: (1) The Canadian Ambient Air Quality Standards air quality threshold for nitrogen dioxide is based on the three-year average of the annual 98th percentile of the daily maximum one-hour average concentrations.

(2) The Ambient Air Quality Standards for SO₂ was updated by the Ministry of the Environment and Climate Change in March 2018 in the document Ontario Air Standards for Sulphur Dioxide (SO₂) published by the Technical Assessment and Standards Development Branch (Ministry of the Environment and Climate Change, 2018).

(3) The Canadian Ambient Air Quality Standards Air Quality threshold for sulphur dioxide is based on the three-year average of the annual 99th percentile of the daily maximum one-hour average concentrations.

(4) The value of 50 $\mu\text{g}/\text{m}^3$ (24 hr) is an interim Ambient Air Quality Criteria and is provided as a guide for decision making.

(5) The Air Quality threshold for fine particulate (PM_{2.5}) is based on the 98th percentile ambient measurement (24-hour), annually averaged over three years.

The Canadian Council of Ministers of the Environment has developed Canada-wide standards for a variety of contaminants. These standards are developed jointly by various provincial jurisdictions based on a scientific and risk-based approach. Standards are presented to the Ministers along with a timetable for implementation and monitoring and public reporting programs. Ministers are responsible for implementing the standards within their own jurisdictions and promoting consistency across the country.

Recently, the Canadian Council of Ministers of the Environment has developed new standards for fine particulate matter PM_{2.5}, NO₂ and SO₂, under the Canadian Ambient Air Quality Standards. The Canadian Ambient Air Quality Standards are established as voluntary objectives under the Canadian Environmental Protection Act, 1999 and are typically used as a benchmark for appropriate air quality levels in Ontario.

The Ambient Air Quality Criteria values listed above are acceptable effects-based levels in ambient air. Limits are set based on the “limiting effect” and are the lowest concentrations at which an adverse effect may be experienced. Effects considered may include health, odour, vegetation, soiling, visibility, corrosion or others and limits have variable averaging times appropriate for the effect that they are intended to protect against. The Ambient Air Quality Criteria are used for assessing general air quality and the potential for causing an adverse effect. Adverse environmental effects are not expected where concentrations below the air quality threshold presented in **Table 2-1**. If a contaminant has more than one Ambient Air Quality Criterion, all must be used for assessment purposes as each represents a different type of effect linked to a particular averaging period.

2.1.4 Existing Ambient Air Quality

The existing ambient air quality levels were quantified using publicly available historical data from ambient air quality monitoring stations from the National Air Pollution Survey network within Toronto. Data utilized were the most recent and complete data available at the time of the preparation of this Report⁴. It was assumed that the existing ambient air quality would be representative of the current conditions present in the Exhibition Station Study Area. The following National Air Pollution Survey air quality monitoring stations were selected as representative of the ambient air quality of the Exhibition Station Study Area:

- Toronto West (National Air Pollution Survey Identification 60430);
- Toronto Downtown (National Air Pollution Survey Identification 60433);

4. National Air Pollution Survey data used was from 2017. Traffic data used to estimate existing conditions was determined from traffic counts from 2017, 2018, and 2019. An annual growth rate of 1% was applied to 2017 and 2018 data to produce comparable 2019 annual averaged daily traffic.

- Gage Institute Station (National Air Pollution Survey Identification 60427); and,
- Roadside Wallberg (University of Toronto) Station (National Air Pollution Survey Identification 60439).

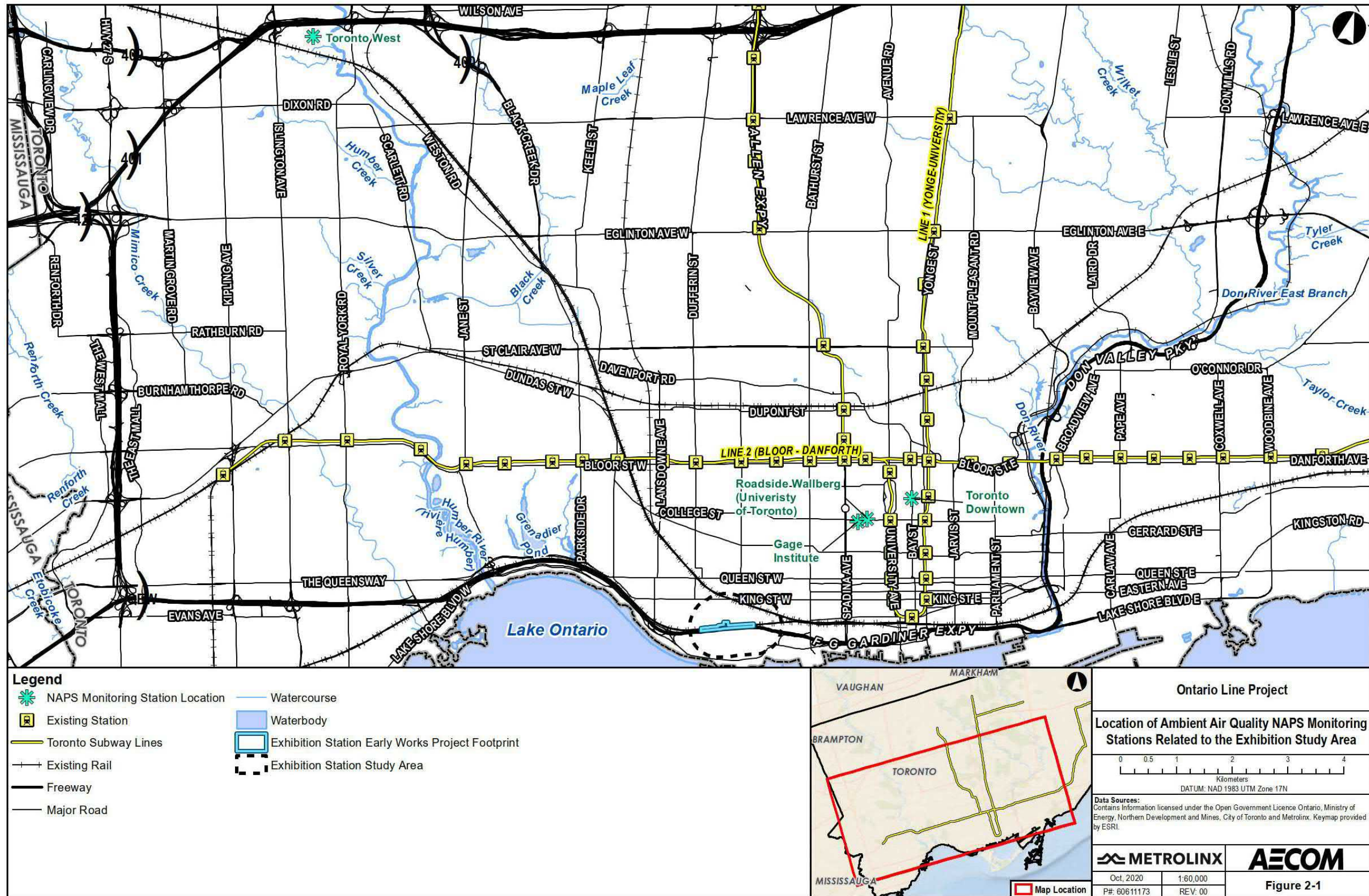
These stations are located nearest to the Exhibition Station Study Area and monitored (in combination) all relevant contaminants for the assessment, since a single station is unable to monitor all contaminants. Where multiple stations were found to monitor a common contaminant, the closest representative station was selected for the assessment. Details of the air quality monitoring stations closest to the Exhibition Station Study Area are provided in **Table 2-2**. **Figure 2-1** presents the locations of the four air quality monitoring stations relative to the Exhibition Station Study Area. Air quality measurement data from these stations are provided in **Appendix A**.

Table 2-2: Ambient Air Quality National Air Pollution Surveillance Monitoring Stations Information Related to the Exhibition Station Study Area

Station Information	Toronto West	Toronto Downtown	Gage Institute	Roadside Wallberg (University of Toronto)
NAPS No.	60430	60433	60427	60439
Address	125 Resources Road, Toronto	Bay and Wellesley Street, Toronto	223 College Street, Toronto	200 College Street, Toronto
Year of Data Available	2011 - 2017	2011 - 2017	2011 - 2014	2014 - 2017
Latitude	43.7094	43.66417	43.6582	43.6590
Longitude	-79.5435	-79.38722	-79.3972	-79.3954
Station Type	Urban	Urban	Urban	Urban
Pollutants Measured	CO, SO ₂	NO ₂ , PM _{2.5}	1,3-Butadiene, Benzene, Benzo(a)pyrene -2011 – 2014, 2016 -2017	Formaldehyde, Acetaldehyde, Acrolein, Benzo(a)pyrene - 2015 only

One-hour, eight-hour, and 24-hour ambient concentrations for the contaminants were obtained from the 90th percentile of hourly measurements from the representative air quality monitoring stations (the average value was calculated from the available years). The 90th percentile of available background data was used following the methodology outlined in the Ministry of Transportation’s Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (Ministry of Transportation, 2020).

Figure 2-1: Location of Ambient Air Quality National Air Pollution Surveillance Monitoring Stations Related to the Exhibition Station Study Area



Annual ambient concentrations for the contaminants were obtained from the mean measurements from the representative air quality monitoring station (the average value was calculated from the available years).

2.1.5 Identification of Representative Receptors

Land use within the Exhibition Station Study Area was reviewed to identify existing and planned future developments that are considered sensitive or critical receptors. The Ministry of Transportation’s Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects defines a sensitive receptor as a “residential dwelling” and a critical receptor as a “retirement home, hospital, childcare centre, school, or similar institutional building” (Ministry of Transportation, 2020).

Representative receptors within the Exhibition Station Study Area were selected based on proximity to emission sources (i.e., the Exhibition Station Early Works Project Footprint) and distribution surrounding emission sources to account for variability in wind directions based on guidance from the Ministry of Transportation’s Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (Ministry of Transportation, 2020). The representative receptors identified within the Exhibition Station Study Area are shown in **Figure 3-2**.

2.2 Impact Assessment

This early works impact assessment and development of mitigation measures and monitoring activities considered the following:

- Exhibition Station early works components as described in **Section 1.3.1**;
- The Exhibition Station Early Works Project Footprint and Exhibition Station Study Area as described in **Section 1.3.2**;
- Exhibition Station construction activities as described in **Section 1.3.3**; and,
- Local environmental conditions within the Exhibition Station Study Area as described in **Section 3**.

Mitigation measures and monitoring activities have been recommended to mitigate the identified potential negative impacts. The following federal and provincial guidelines for construction mitigation were utilized in the development of mitigation measures:

- Environment Canada’s Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo Services Inc., 2005);

- Ministry of the Environment, Conservation and Parks' Management Approaches for Industrial Fugitive Dust Sources Technical Bulletin (Ministry of the Environment, Conservation and Parks, 2017);
- Ontario Hot Mix Producers Association's Environmental Practices Guide: Ontario Hot Mix Asphalt Plants, Fifth Edition (Ontario Hot Mix Producers Association, 2015); and,
- Operations Manual for Air Quality Monitoring in Ontario (Ministry of the Environment, Conservation and Parks, 2018).

The results of the impact assessment are provided in **Section 4**.

3. Local Environmental Conditions

3.1 Existing Ambient Air Quality

Relevant ambient air quality data collected at the four National Air Pollution Surveillance air quality monitoring stations (Environment and Climate Change Canada, 2019) are summarized in **Appendix A**. Representative data for all criteria air contaminants were identified as follows for the averaging period combinations listed in **Table 3-1**:

- 1-hour, 8-hour, and 24-hour ambient concentrations for the contaminants were obtained from the 90th percentile of hourly measurements from the representative air quality monitoring stations (the average value was calculated from the available years). The 90th percentile of available background data was used following the methodology outlined in the Ministry of Transportation’s Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (Ministry of Transportation, 2020).
- Annual ambient concentrations for the contaminants were obtained from the mean measurements from the representative air quality monitoring station (the average value was calculated from the available years).

The averaged background concentrations for each contaminant were compared to the applicable federal and provincial standards for all of the applicable time averaging periods and percentile concentrations. The approach to calculating the overall 90th percentile for the data set was to calculate the individual year’s 90th percentile data, provided in a 1-year format from the National Air Pollution Survey Monitoring online data portal, then to determine the average of a selection of the most recent and complete five years’ 90th percentile data.

As shown in **Table 3-1**, there are several recorded levels of air quality threshold exceedance within the monitored existing ambient air quality data. Benzene has elevated annual contributions which exceed the threshold guideline from the Ambient Air Quality Criteria. Benzo(a)pyrene, the representative polycyclic aromatic hydrocarbon, shows extremely elevated levels of concentration for both annual and daily provincial air quality thresholds. This is due mainly to high presence of regional air quality contributions, high traffic volumes within the Greater Toronto Area, and industrial contributions from Toronto, the Greater Toronto Area, and Hamilton.

Table 3-1: Comparison of Existing Ambient Air Quality Data to Standards

Criteria Air Contaminant	Station Identification	Averaging Period	Years	Average of Background Data ($\mu\text{g}/\text{m}^3$)	Statistical Measure	Standard Threshold ($\mu\text{g}/\text{m}^3$)	Standard Source	% of Standard Threshold
NO ₂	60433	One hour	2013-2017	49.50	90 th Percentile	400	Ambient Air Quality Criteria	12%
NO ₂	60433	One hour	2013-2017	49.50	90 th Percentile	113	Canadian Ambient Air Quality Standards	44%
NO ₂	60433	24 hours	2013-2017	41.75	90 th Percentile	200	Ambient Air Quality Criteria	21%
NO ₂	60433	Annual	2013-2017	26.68	Mean	32	Canadian Ambient Air Quality Standards	83%
CO	60430	One hour	2013-2017	446	90 th Percentile	36,200	Ambient Air Quality Criteria	1%
CO	60430	8 hours	2013-2017	419	90 th Percentile	15,700	Ambient Air Quality Criteria	3%
SO ₂ ⁽²⁾	60430	30-min.	2013-2017	6.70	90 th Percentile	180	Ambient Air Quality Criteria	4%
SO ₂	60430	One hour	2013-2017	5.51	90 th Percentile	100	Ambient Air Quality Criteria	6%
SO ₂	60430	Annual	2013-2017	1.84	Mean	10	Canadian Ambient Air Quality Standards	18%
PM ₁₀ ⁽³⁾	60433	24 hours	2013-2017	25.78	90 th Percentile	50	Ambient Air Quality Criteria	51%
PM _{2.5}	60433	24 hours	2013-2017	13.89	90 th Percentile	27	Canadian Ambient Air Quality Standards	51%
PM _{2.5}	60433	Annual	2013-2017	7.94	Mean	8.8	Canadian Ambient Air Quality Standards	90%
Acetaldehyde ⁽⁴⁾	60439	30-min.	2014-2017	5.00	90 th Percentile	500	Ambient Air Quality Criteria	1%
Acetaldehyde	60439	24 hours	2014-2017	1.69	90 th Percentile	500	Ambient Air Quality Criteria	0%
Acrolein ⁽⁵⁾	60439	One hour	2014-2017	0.17	90 th Percentile	4.5	Ambient Air Quality Criteria	4%
Acrolein	60439	24 hours	2014-2017	0.07	90 th Percentile	0.4	Ambient Air Quality Criteria	17%
Benzene	60435	24 hours	2011-2014	0.92	90 th Percentile	2.3	Ambient Air Quality Criteria	40%
Benzene	60435	Annual	2011-2014	0.61	90th Percentile	0.45	Ambient Air Quality Criteria	134%
Benzo(a)-pyrene	60427 60439	24 hours	2011-2015	1.21E-04	90th Percentile	0.00005	Ambient Air Quality Criteria	242%
Benzo(a)-pyrene	60427 60439	Annual	2011-2015	6.72E-05	90th Percentile	0.00001	Ambient Air Quality Criteria	672%
1,3-Butadiene	60435	24 hours	2011-2014	0.10	90 th Percentile	10	Ambient Air Quality Criteria	1%
1,3-Butadiene	60435	Annual	2011-2014	0.06	90 th Percentile	2	Ambient Air Quality Criteria	3%
Formaldehyde	60439	24 hours	2014-2017	3.16	90 th Percentile	65	Ambient Air Quality Criteria	5%

Notes: (1) Exceedances of the Ambient Air Quality Criteria and Canadian Ambient Air Quality Standards are shown in red.

(2) Concentrations of sulphur dioxide (SO₂) are measured on an hourly basis, background concentrations for the 30-minute averaging period have been converted using the Ministry of the Environment, Conservation and Parks' conversion factor where $C_{0.5\text{hr}} = C_{1\text{hr}} \times (1\text{hr}/0.5\text{hr})^{0.28}$.

(3) PM₁₀ was not included in National Air Pollution Surveillance air quality monitoring station measurements, and therefore was estimated using PM_{2.5} measurements, assuming a ratio of 1 $\mu\text{g}/\text{m}^3$ PM₁₀ per 0.54 $\mu\text{g}/\text{m}^3$ of PM_{2.5} as per Lall et al. publication in Atmospheric Environment, Estimation of historical annual PM_{2.5} exposures for health effects assessment (Lall et al., 2004).

(4) Concentrations of acetaldehyde are measured on a 24 hour basis, background concentrations for the 30-minute averaging period have been converted using the Ministry of the Environment, Conservation and Parks' conversion factor where $C_{0.5\text{hr}} = C_{24\text{hr}} \times (24\text{hr}/0.5\text{hr})^{0.28}$.

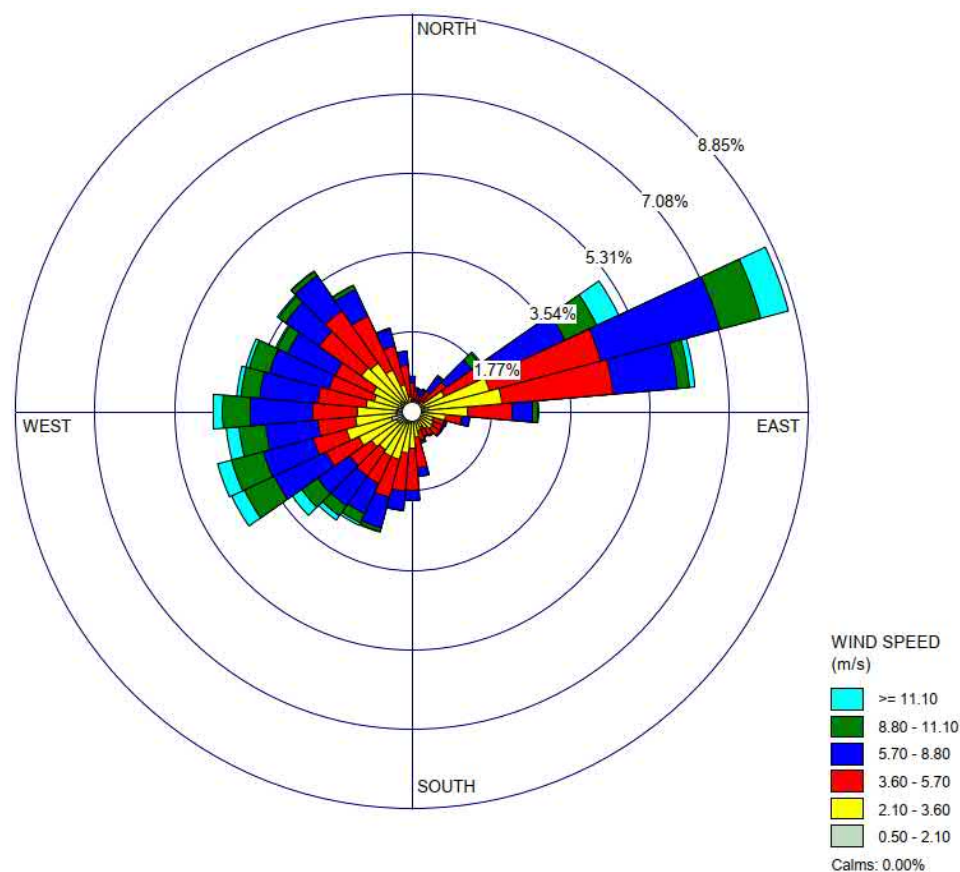
(5) Concentrations of acrolein are measured on a 24 hour basis, background concentrations for the hourly averaging period have been converted using the Ministry of the Environment, Conservation and Parks' conversion factor where $C_{1\text{hr}} = C_{24\text{hr}} \times (1\text{hr}/24\text{hr})^{0.28}$.

3.2 Meteorological Conditions

The local air quality from both ambient conditions and contributions from traffic and construction activities are affected by the local and regional meteorological conditions. Predominant wind speeds and wind directions within the Exhibition Station Study Area will determine the likely areas of most common impacts, and the potential areas of greatest impact. High impact conditions from construction and traffic emissions are created from low speed surface air movement towards a nearby receptor. Additionally, high impact conditions may also form by high-speed surface air movement due to an increase in fugitive dust emissions from unpaved surfaces, stockpiles, and material handling. Local surface station meteorological data was used to anticipate areas of high probability impact.

The closest representative meteorological station for the Exhibition Station Study Area was identified as the Toronto City Centre station located on Toronto Island (Station Identification 71265). This station captures the meteorological effects from Lake Ontario which impact the air quality conditions of the Exhibition Station Study Area. The wind rose for the five-year meteorological period (2015-2019) showing the wind direction and wind speed is presented in **Figure 3-1**. The wind rose shows that the predominant wind direction is from the northeast.

Figure 3-1: Wind Rose Representative of Meteorological Conditions in the Exhibition Station Study Area



3.3 Traffic Assessment

Major traffic sources within the Exhibition Station Study Area include the Gardiner Expressway, as well as King Street West, Dufferin Street, and the local traffic within Liberty Village. **Table 3-2** shows the summary of annual average daily traffic data for cars, trucks and buses (where available) along the major roads within the Exhibition Station Study Area. Raw turning movement counts of traffic representative of the Exhibition Station Study Area are included in **Appendix B**. The purpose of providing representative annual averaged daily traffic data is to demonstrate the relative contribution from each major roadway within the Exhibition Station Study Area. This data presented in **Table 3-2** indicates that the Gardiner Expressway is likely to have the greatest impact on the existing local air quality.

Table 3-2: Representative Traffic Data Within the Exhibition Station Study Area

Road Segment	2019 Annual Averaged Daily Traffic: Cars	2019 Annual Averaged Daily Traffic: Trucks	2019 Annual Averaged Daily Traffic: Bus
King Street West	5,952	60	184
Dufferin Street, north of Liberty Street West	6,322	166	303
Dufferin Street, south of Liberty Street West	7,244	166	287
Liberty Street West	2,775	24	168
Gardiner Expressway	78,457	5,008	--

3.4 Representative Receptors

There is a diverse range of land uses within the Exhibition Station Study Area. Residential apartment complexes, commercial buildings, and mixed-use land uses are located north of the Gardiner Expressway. A mix of commercial and industrial land uses are located to the south of the Gardiner Expressway. There is one hotel south of the Gardiner Expressway (i.e., Hotel X), however this was not included as a representative receptor within this assessment as several sensitive receptors were identified.⁵

5. Hotels are not defined as sensitive or critical receptors in the Ministry of Transportation's Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (Ministry of Transportation, 2020). Although hotels may see prolonged residential capacity, most visitors are short-term and transient. Hotels may be used as representative receptors if there is a lack of sensitive receptors.

There are future residential developments (i.e., planned or under construction) within the Exhibition Station Study Area (e.g., the residential building under construction at Strachan Avenue and Ordnance Street). These future developments were not identified as representative receptors based on their proximity to emission sources (i.e., the Exhibition Station Early Works Project Footprint). While future developments are located within the Exhibition Station Study Area, other receptors were determined to be more representative than these future developments. Representative receptors are listed in **Table 3-3**.

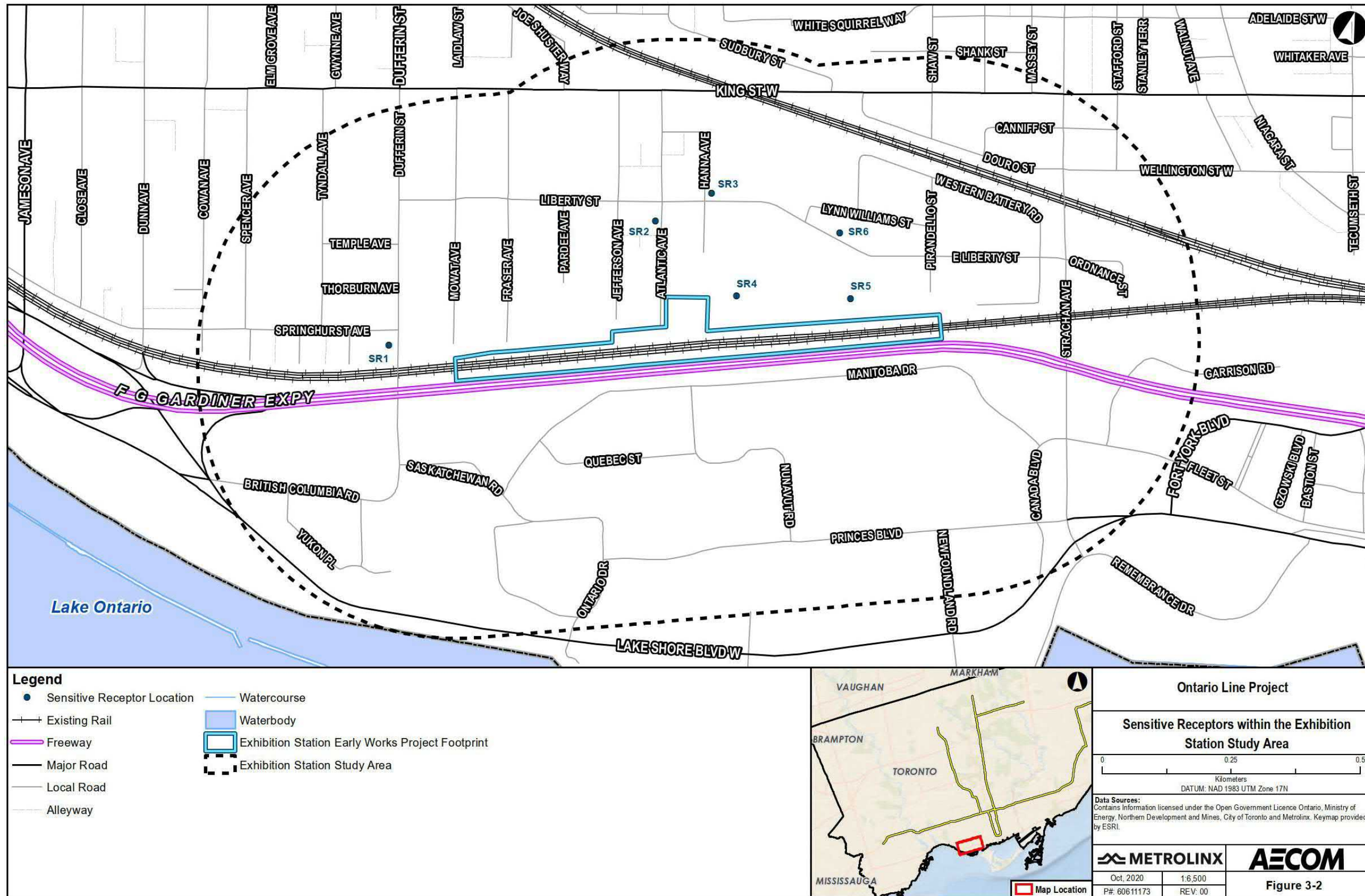
All representative receptors identified in this assessment are sensitive. There were no identified critical receptors within the Exhibition Station Study Area. Sensitive and critical receptors are defined in **Section 2.1.5**.

A list of sensitive receptors within the Exhibition Station Study Area is provided in **Table 3-3** and shown in **Figure 3-2**.

Table 3-3: Sensitive Receptors Within the Exhibition Station Study Area

Receptor Identification	Receptor Type	Address	Description	UTM Easting (m)	UTM Northing (m)
SR1	Sensitive	1 Springhurst Avenue	Apartment / condo building, window / balcony second floor	626974.05	4832491.73
SR2	Sensitive	25 Liberty Street	Live/work apartment, window second floor	627398.19	4832873.87
SR3	Sensitive	43 Hanna Avenue	Live/work apartment, window/balcony second floor	627486.54	4832956.28
SR4	Sensitive	5 Hanna Avenue	Apartment / condo building, window / balcony second floor	627591.66	4832780.74
SR5	Sensitive	85 East Liberty Street	Apartment / condo building, window / balcony second floor	627804.34	4832840.45
SR6	Sensitive	150 East Liberty Street	Apartment / condo building, window / balcony second floor	627747.29	4832956.56

Figure 3-2: Sensitive Receptors Within the Exhibition Station Study Area



4. Potential Impacts, Mitigation Measures and Monitoring Activities

In accordance with Sections 8(2)6, 8(2)7 and 8(2)8 of Ontario Regulation 341/20: Ontario Line Project, this section describes the potential impacts, mitigation measures, and monitoring activities to verify the effectiveness of mitigation measures associated with the Exhibition Station early works.

Potential impacts to air quality as a result of disturbances associated with the Exhibition Station early works have been assessed and are presented in **Table 4-1**, in addition to mitigation measures and monitoring activities.

When considering the existing background air quality levels within the Exhibition Station Study Area and local meteorological data, predicted areas of impact can be determined. The predominant wind direction, as taken from the Toronto City Centre meteorological station located on Toronto Island, is from the northeast towards the southwest. Impacts from Exhibition Station early works construction activities would therefore potentially be directed towards receptors along Dufferin Street and Springhurst Avenue. These sources are approximately 150 metres west of the Exhibition Station Early Works Project Footprint, and are likely to be impacted from activities during the project construction. Secondary predominant winds blow from the west, northwest and southwest, which would have an impact on receptors located along Liberty Street and Hanna Avenue, some located within 100 metres of the Exhibition Station Early Works Project Footprint, which would also likely be most impacted from activities during the project construction.

There are no exceedances in the existing ambient level of particulates (PM₁₀ and PM_{2.5}) within the Exhibition Station Study Area when comparing to the 90th percentile of National Air Pollution Survey monitoring station data. However, given that the annual averaging period for ambient levels of PM_{2.5} is 90% of its respective Canadian Ambient Air Quality Standards threshold, it would be prudent to minimize additional impact from all construction activities for the duration of Exhibition Station early works construction. Construction activities which may contribute to local particulate and dust settling within the Exhibition Station Study Area include demolition, crushing and earth works activities, concrete cutting, etc.

Ambient Air Quality Criteria levels for nitrogen dioxide are currently 12% and 21% of the limits for the 1-hour and 24-hour averaging periods, while the annual average is currently at 83%. When comparing nitrogen dioxide to the Canadian Ambient Air Quality

Standards, the current concentration is 44% of the threshold limit. Benzene and benzo(a)pyrene both currently exceed their recommended limits, while most other contaminants are well below recommended standards. The contributions of benzene and benzo(a)pyrene from the Exhibition Station early works are expected to be relatively minimal, being restricted to release from diesel construction equipment operation only. When compared to local traffic and diesel rail contributions, the relative impacts are negligible. However, considering the current existing exceedances of the two contaminants, any additional contributions from diesel construction equipment exhaust may contribute to an increased impact on local air quality.

Table 4-1 provides mitigation measures and monitoring activities to be implemented for potential impacts that may result from the Exhibition Station early works.

Table 4-1: Potential Impacts, Mitigation Measures and Monitoring Activities for the Exhibition Station Early Works

Environmental Component	Potential Impacts	Mitigation Measure(s)	Monitoring Activities
<p>Construction Air Quality</p>	<ul style="list-style-type: none"> ▪ Potential air quality impacts could include effects from diesel combustion and particulate emissions. Odour and visible dust may also cause public annoyance. ▪ Exhaust emissions from construction vehicles may contribute to increased levels of nitrogen oxides, and volatiles such as benzene and benzo(a)pyrene, which given their existing background concentrations can contribute to existing levels of provincial criteria exceedance. ▪ Certain construction activities are likely to emit particulates in higher quantities, which include site preparation and earth works activities, demolition activities, unpaved surfaces with heavy equipment travel, and uncovered soil storage piles. ▪ Disruption of contaminated soils may release harmful and/or volatile contaminants. 	<ul style="list-style-type: none"> ▪ On-site construction vehicle activity shall be managed to control emissions of odourous contaminants and diesel exhaust, including benzene and benzo(a)pyrene emissions from exhaust. It is recommended that an Air Quality Management Plan be developed to ensure consistent attention to mitigation of dust and particulates, including silica, from the construction site. The following mitigation measures should be considered in the Air Quality Management Plan: <ul style="list-style-type: none"> – All equipment complies with Canadian engine emissions standards. – All equipment visually inspected prior to use and properly maintained. – Implement a no idling policy on site (unless necessary for equipment operation). – Use of electricity from the grid over diesel generators wherever possible. – Retrofitting of combustion engines with specific exhaust emission control measures such as particulate traps. – Follow guidelines on hot mix asphalt outlined in the Ontario Hot Mix Producers Association’s Environmental Practices Guide: Ontario Hot Mix Asphalt Plants, Fifth Edition (Ontario Hot Mix Producers Association, 2015). ▪ Mitigation measures from Environment Canada’s Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo Services Inc., 2005), the Ministry of Environment, Conservation and Parks’ Technical Bulletin Management Approaches for Industrial Fugitive Dust Sources, shall be followed. The following mitigation measures should be considered in the Air Quality Management Plan: <ul style="list-style-type: none"> – Complete earthwork grading within 10 days of ceased active construction. – Temporary seeding or mulching of bare soil and storage piles. – Compression or clodding of soil surfaces and storage piles to reduce erosion. – Confine storage pile activity to downwind side of piles. – Reduction of activities during high wind conditions. – Full or partial enclosure of demolition activities. – Wind screens or barriers where possible or necessary. – Off-site construction of certain structures or parts of structures to minimize air emission due to interference with the normal flow of traffic. – Scheduling certain construction activities (i.e., site preparation and earth works activities, demolition activities, unpaved surfaces with heavy equipment travel, and uncovered soil storage piles) to periods of time when exposure to dust is expected to be limited (e.g., avoid scheduling activities during dry, windy weather conditions). – Landscaping materials ordered close to time of use to reduce on-site storage. – Application of soil stabilizers or dust control polymers where feasible. – Daily removal of accumulated mud, dirt and debris deposits on-site, and regular truck washing – Paved and unpaved roadway cleaning, watering or application of a dust suppressant. – Minimize drop height of materials on-site. – Covering surface area of hauled bulk material. – Methods and equipment for cleanup of accidental spill of dusty materials. – Limit travel speeds on-site to a maximum of 16-24 kilometres per hour. ▪ If disruption of contaminated soils is anticipated at any time, consult with the construction manager to ensure that harmful and/or volatile contaminants are not released. ▪ Develop a communications protocol which includes timely resolution of complaints. 	<ul style="list-style-type: none"> ▪ On-site meteorological monitoring in conjunction with real-time particulate monitoring representative of receptor impacts. ▪ Place monitors both upwind and downwind of construction activities, where possible. ▪ Application of threshold “Action Level” triggers for implementation of specific and increasing intensity mitigation activities linked to specific construction activities. ▪ Reporting detailing results of ongoing monitoring and mitigation activities. ▪ In addition, relevant construction monitoring activities from the following recommended guidelines will be implemented during construction: <ul style="list-style-type: none"> – Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (Cheminfo Services Inc., 2005); and, – Operations Manual for Air Quality Monitoring in Ontario (Ministry of the Environment, Conservation and Parks, 2018). ▪ Monitoring at locations where there are persistent complaints, as required.

5. Permits and Approvals

No air quality related permits or approvals are anticipated for the Exhibition Station early works at this time. Individual permits and approvals for construction activities are not required specifically for air quality prior to early works construction, with the exception of Environmental Compliance Approval(s) for equipment held by contractors, owners and operators of that equipment, which will be obtained in advance of construction, as necessary.

6. References

AECOM, 2018:

Union Station Rail Corridor East Enhancements Transit Project Assessment Process – Air Quality Assessment Report. Prepared for Metrolinx.

AECOM, 2020:

Ontario Line Final Environmental Conditions Report. Prepared for Metrolinx.

Canadian Council of Ministers of the Environment, 2012:

Canadian Ambient Air Quality Standards. Available:

<https://www.alberta.ca/canadian-ambient-air-quality-standards.aspx>

Cheminfo Services Inc., 2005:

Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities. Prepared for Environment Canada. Available:

<http://www.bv.transports.gouv.qc.ca/mono/1173259.pdf>

Environment and Climate Change Canada, 2019:

National Air Pollution Surveillance Program. Available:

<https://www.canada.ca/en/environment-climate-change/services/air-pollution/monitoring-networks-data/national-air-pollution-program.html>

Ontario Hot Mix Producers Association, 2015:

Environmental Practices Guide: Ontario Hot Mix Asphalt Plants, Fifth Edition.

Available:

<http://www.onasphalt.org/files/Publications/OHMPA%20EPG%20Document%20Single%20Pages%20-%20Website.pdf>

Lall, R., M. Kendall, K. Ito, and G. D. Thurston, 2004:

Estimation of historical annual PM_{2.5} exposures for health effects assessment.

Atmospheric Environment 38. Available:

https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.files/fileID/13226

Ontario Ministry of the Environment, Conservation and Parks, 2018:

Operations Manual for Air Quality Monitoring in Ontario. Available:

<https://dr6j45jk9xcmk.cloudfront.net/documents/1466/3-7-32-manual-for-air-quality-monitoring-en.pdf>

Ontario Ministry of the Environment, Conservation and Parks, 2020:

Ontario's Ambient Air Quality Criteria. Available: <https://files.ontario.ca/mecp-ambient-air-quality-criteria-list-en-2020-05-01.pdf>

Ontario Ministry of the Environment and Climate Change, 2017:

Technical Bulletin: Management Approaches for Industrial Fugitive Dust Sources. Available: <https://files.ontario.ca/management-approaches-for-industrial-fugitive-dust-sources.pdf>

Ontario Ministry of the Environment and Climate Change, 2018:

Ontario Air Standards for Sulphur Dioxide (SO₂). Available: [https://prod-environmental-registry.s3.amazonaws.com/2018-](https://prod-environmental-registry.s3.amazonaws.com/2018-03/SO2%20Decision%20Document%20%28March%202018%29_0.pdf)

[03/SO2%20Decision%20Document%20%28March%202018%29_0.pdf](https://prod-environmental-registry.s3.amazonaws.com/2018-03/SO2%20Decision%20Document%20%28March%202018%29_0.pdf)

Ontario Ministry of Transportation, 2020:

Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects. Available:

[https://prod-environmental-registry.s3.amazonaws.com/2020-](https://prod-environmental-registry.s3.amazonaws.com/2020-07/AQGHG%20Guide%20%28May%202020%29.pdf)

[07/AQGHG%20Guide%20%28May%202020%29.pdf](https://prod-environmental-registry.s3.amazonaws.com/2020-07/AQGHG%20Guide%20%28May%202020%29.pdf)

Appendix A

Background Air Quality Data

Metrolinx – Ontario Line Early Works

Air Quality Early Works Memorandum Report - Attachment 2

Contaminant	NAPS Station ID	Units	1-hour 90th percentile							8-hour 90th percentile							
			2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017	
Acrolein	60439	µg/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Acetaldehyde	60439	µg/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Formaldehyde	60439	µg/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzene	60427	µg/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	60435		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1,3-Butadiene	60427	µg/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	60435		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo(a)pyrene	60427	ng/m3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	60435		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	60439		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	60430		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen Dioxide	60410	ppb	30.00	27.00	26.00	27.00	28.00	25.00	23.00	26.95	24.75	23.45	24.63	25.71	23.04	21.00	
	60421		30.00	27.40	25.00	26.00	26.00	25.00	ND	27.75	25.08	22.88	24.10	24.20	23.75	ND	
	60428		25.00	25.00	20.00	24.00	23.00	23.00	ND	23.21	22.93	18.78	22.55	20.45	21.08	ND	
	60430		34.00	31.00	30.00	31.00	31.00	31.00	28.00	31.01	27.88	27.25	28.88	28.56	27.50	25.74	
	60433		27.00	25.00	24.00	25.00	25.00	25.00	24.00	25.26	22.88	22.58	23.25	22.63	22.25	22.45	
	60434		21.00	20.00	19.00	19.00	19.00	19.00	17.00	19.25	18.25	17.50	17.25	17.51	16.95	15.50	
	60435		33.00	32.00	32.00	32.00	33.00	30.00	30.00	30.75	29.81	29.39	28.92	29.63	27.00	27.38	
	60450		ND	ND	ND	ND	ND	6.00	20.00	ND	ND	ND	ND	ND	ND	4.45	17.94
	60438		ND	ND	ND	ND	ND	ND	31.00	ND	ND	ND	ND	ND	ND	ND	28.75
	60440		ND	ND	ND	ND	ND	ND	22.00	ND	ND	ND	ND	ND	ND	ND	20.35
Carbon monoxide	60430	ppm	0.30	0.40	0.36	0.37	0.36	0.36	0.35	0.31	0.36	0.35	0.36	0.35	0.34	0.34	
	60438		ND	ND	ND	ND	ND	ND	0.54	ND	ND	ND	ND	ND	ND	0.49	
	60440		ND	ND	ND	ND	ND	ND	0.33	ND	ND	ND	ND	ND	ND	0.31	
	60430		3.00	2.00	1.00	1.00	2.00	1.00	1.00	2.75	1.75	1.38	1.50	1.87	1.25	1.00	
Sulphur dioxide	60434	ppb	2.00	2.00	2.00	3.00	3.00	2.00	ND	2.50	1.63	1.63	2.50	2.50	1.79	ND	
	60450		ND	ND	ND	ND	ND	32.00	ND	ND	ND	ND	ND	ND	31.41	ND	
	60438		ND	ND	ND	ND	ND	ND	1.00	ND	ND	ND	ND	ND	ND	0.75	
	60440		ND	ND	ND	ND	ND	ND	0.00	ND	ND	ND	ND	ND	ND	0.38	
	60430		14.00	14.00	16.00	17.00	17.00	13.00	14.00	13.20	13.19	15.50	16.64	17.00	12.88	13.25	
Fine particulate (PM _{2.5})	60421	µg/m3	17.00	16.00	16.00	17.00	18.00	14.00	ND	16.60	14.88	15.50	16.63	18.00	14.25	ND	
	60428		13.00	13.00	17.00	18.00	18.00	14.00	ND	12.25	12.14	16.09	16.88	17.24	13.13	ND	
	60430		15.00	15.00	18.00	17.00	17.00	13.00	14.00	13.75	13.63	16.63	16.25	17.00	12.84	13.59	
	60433		14.00	14.00	16.00	17.00	17.00	13.00	14.00	12.75	13.38	15.66	16.00	16.08	12.99	13.88	
	60434		13.00	13.00	16.00	16.00	17.00	14.00	14.00	12.63	12.38	15.00	15.63	16.63	13.75	13.24	
	60435		15.00	15.00	18.00	19.00	19.00	15.00	16.00	13.75	13.86	17.38	17.95	18.36	14.25	15.00	
	60438		ND	ND	ND	ND	ND	ND	17.00	ND	ND	ND	ND	ND	ND	ND	15.80
	60440		ND	ND	ND	ND	ND	ND	15.00	ND	ND	ND	ND	ND	ND	ND	13.63
	60450		ND	ND	ND	ND	ND	ND	13.00	ND	ND	ND	ND	ND	ND	ND	12.94
	60429		ND	12.70	ND	ND	ND	ND	ND	ND	9.20	ND	ND	ND	ND	ND	ND

Note: "ND" represents stations and years where there was not enough data to calculate a completed data set

Metrolinx – Ontario Line Early Works
Air Quality Early Works Memorandum Report - Attachment 2

Contaminant	NAPS Station ID	Units	24-hour 90th percentile							Annual Average							
			2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017	
Acrolein	60439	µg/m3	ND	ND	ND	0.07	0.07	0.07	0.04	ND	ND	ND	0.04	0.05	0.03	0.02	
Acetaldehyde	60439	µg/m3	ND	ND	ND	1.53	1.99	1.65	0.84	ND	ND	ND	0.88	1.15	0.91	0.68	
Formaldehyde	60439	µg/m3	ND	ND	ND	2.80	3.80	2.60	1.14	ND	ND	ND	1.68	2.25	1.42	0.91	
Benzene	60427	µg/m3	0.90	0.98	0.92	0.80	ND	ND	ND	0.59	0.62	0.61	0.59	ND	ND	ND	
	60435		0.71	0.87	0.86	0.77	0.66	0.76	0.72	0.57	0.51	0.51	0.48	0.52	0.45	0.47	
1,3-Butadiene	60427	µg/m3	0.10	0.11	0.09	0.07	ND	ND	ND	0.06	0.06	0.05	0.04	ND	ND	ND	
	60435		0.07	0.08	0.07	0.06	0.07	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03	
Benzo(a)pyrene	60427	ng/m3	0.15	0.13	0.10	0.07	ND	ND	ND	0.09	0.08	0.06	0.04	ND	ND	ND	
	60435		0.21	ND	ND	ND	ND	ND	ND	0.09	ND	ND	ND	ND	ND	ND	
	60439		ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND	0.07	ND	
	60430		ND	ND	ND	ND	ND	0.09	ND	ND	ND	ND	ND	ND	ND	0.05	
Nitrogen Dioxide	60410	ppb	23.36	21.90	21.09	22.98	22.86	20.09	18.85	15.21	14.04	13.61	14.24	13.89	12.12	11.46	
	60421		25.81	23.75	21.41	21.33	22.39	21.98	ND	15.40	13.44	12.90	13.43	12.94	11.97	ND	
	60428		20.53	20.37	17.21	20.28	20.53	20.04	ND	11.26	10.38	9.03	10.60	9.91	9.70	ND	
	60430		27.97	25.13	23.43	25.94	25.69	23.88	23.14	19.10	16.29	16.13	17.07	16.57	15.74	14.96	
	60433		23.31	20.63	20.00	20.83	21.13	20.75	20.19	14.92	13.36	13.45	14.00	13.35	13.35	12.99	
	60434		17.14	15.95	15.87	15.44	16.17	14.65	13.88	10.56	9.63	9.49	9.22	9.15	8.62	7.98	
	60435		26.83	25.54	25.42	25.06	26.44	24.56	23.43	18.40	16.52	16.96	16.81	16.72	14.69	15.47	
	60450		ND	ND	ND	ND	ND	4.36	16.64	ND	ND	ND	ND	ND	ND	4.36	8.19
	60438		ND	ND	ND	ND	ND	ND	26.86	ND	ND	ND	ND	ND	ND	ND	17.91
	60440		ND	ND	ND	ND	ND	ND	18.28	ND	ND	ND	ND	ND	ND	ND	10.49
	60429		ND	14.67	ND	ND	ND	ND	ND	ND	14.67	ND	ND	ND	ND	ND	ND
Carbon monoxide	60430	ppm	0.30	0.34	0.33	0.33	0.33	0.32	0.34	0.20	0.26	0.25	0.26	0.25	0.25	0.25	
	60438		ND	ND	ND	ND	ND	ND	0.45	ND	ND	ND	ND	ND	ND	0.33	
	60440		ND	ND	ND	ND	ND	ND	0.30	ND	ND	ND	ND	ND	ND	0.22	
Sulphur dioxide	60430	ppb	2.53	1.65	1.25	1.46	1.86	1.21	1.00	1.54	0.58	0.48	0.74	1.02	0.64	0.46	
	60434		2.25	1.44	1.71	2.28	2.39	1.78	ND	1.29	0.58	0.70	1.28	1.06	1.04	ND	
	60450		ND	ND	ND	ND	ND	29.82	ND	ND	ND	ND	ND	ND	29.82	ND	
	60438		ND	ND	ND	ND	ND	ND	0.63	ND	ND	ND	ND	ND	ND	0.22	
	60440		ND	ND	ND	ND	ND	ND	0.42	ND	ND	ND	ND	ND	ND	0.13	
Fine particulate (PM _{2.5})	60410	µg/m3	12.01	12.23	15.75	15.56	15.43	12.25	12.38	6.16	6.25	8.16	8.92	8.45	7.03	7.41	
	60421		15.54	14.46	14.90	15.40	16.95	12.92	ND	7.72	7.26	8.29	9.22	9.36	7.35	ND	
	60428		12.11	11.83	15.08	15.76	16.17	11.86	ND	5.97	5.69	8.50	8.91	8.42	6.83	ND	
	60430		12.60	13.13	15.71	14.57	16.18	12.02	12.03	6.92	7.05	8.76	9.06	8.52	6.99	7.41	
	60433		11.99	13.02	15.56	14.83	15.20	11.67	12.88	6.24	6.41	8.25	8.67	8.38	6.98	7.38	
	60434		11.64	11.86	15.00	14.58	16.02	12.79	12.58	6.03	5.98	7.87	8.65	8.51	7.22	6.85	
	60435		12.65	13.23	16.99	16.07	17.56	13.27	13.97	6.73	6.65	9.36	9.81	9.44	8.06	8.17	
	60438		ND	ND	ND	ND	ND	ND	14.53	ND	ND	ND	ND	ND	ND	ND	9.22
	60440		ND	ND	ND	ND	ND	ND	12.54	ND	ND	ND	ND	ND	ND	ND	7.36
	60450		ND	ND	ND	ND	ND	ND	11.62	ND	ND	ND	ND	ND	ND	ND	6.98
	60429		ND	7.92	ND	ND	ND	ND	ND	ND	7.92	ND	ND	ND	ND	ND	ND

Note: "ND" represents stations and years where there was not enough data to calculate a completed data set

Metrolinx – Ontario Line Early Works
 Air Quality Early Works Memorandum Report - Attachment 2

Contaminant	Units	NAPS Station ID	CCME 98th percentile of 1-hour Daily Max							CCME 1-hour (3-year average)
			2011	2012	2013	2014	2015	2016	2017	
Acrolein	µg/m3	60439	-	-	-	-	-	-	-	-
Acetaldehyde	µg/m3	60439	-	-	-	-	-	-	-	-
Formaldehyde	µg/m3	60439	-	-	-	-	-	-	-	-
Benzene	µg/m3	60427	-	-	-	-	-	-	-	-
		60435	-	-	-	-	-	-	-	-
1,3-Butadiene	µg/m3	60427	-	-	-	-	-	-	-	-
		60435	-	-	-	-	-	-	-	-
Benzo(a)pyrene	ng/m3	60427	-	-	-	-	-	-	-	-
		60435	-	-	-	-	-	-	-	-
		60439	-	-	-	-	-	-	-	-
		60430	-	-	-	-	-	-	-	-
Nitrogen Dioxide	ppb	60410	50.72	45.76	47.72	57.00	54.72	52.74	44.72	54.82
		60421	51.00	49.00	48.72	53.72	49.72	47.70	ND	51.48
		60428	51.72	47.76	44.48	53.00	49.72	47.00	ND	51.48
		60430	56.00	51.70	56.72	59.76	55.76	52.70	50.00	57.49
		60433	48.74	44.74	47.16	50.78	48.00	47.00	43.00	49.17
		60434	46.00	38.56	42.48	48.72	47.74	42.00	36.00	47.49
		60435	59.74	61.00	62.72	66.74	64.76	56.00	50.00	64.74
		60450	ND	ND	ND	ND	ND	6.00	41.78	Not Enough Data
		60438	ND	ND	ND	ND	ND	ND	50.56	Not Enough Data
		60440	ND	ND	ND	ND	ND	ND	44.44	Not Enough Data
Carbon monoxide	ppm	60430	0.90	1.07	0.91	1.01	0.92	0.99	0.93	1.02
		60438	ND	ND	ND	ND	ND	ND	1.13	Not Enough Data
		60440	ND	ND	ND	ND	ND	ND	0.68	Not Enough Data
		60429	ND	28.00	ND	ND	ND	ND	ND	Not Enough Data
Sulphur dioxide	ppb	60430	12.00	10.36	10.72	9.00	12.00	8.00	7.00	11.57
		60434	17.82	13.00	21.00	15.00	14.53	17.48	ND	18.77
		60450	ND	ND	ND	ND	ND	32.00	ND	Not Enough Data
		60438	ND	ND	ND	ND	ND	ND	7.00	Not Enough Data
		60440	ND	ND	ND	ND	ND	ND	6.00	Not Enough Data
Fine particulate (PM _{2.5})	µg/m3	60410	30.72	31.70	42.48	42.00	42.44	29.74	29.72	42.31
		60421	37.00	32.00	40.00	42.96	39.72	31.00	ND	40.89
		60428	30.00	31.20	46.00	48.72	47.00	33.72	ND	47.24
		60430	35.74	35.00	44.86	43.72	39.76	29.70	36.72	42.78
		60433	32.72	31.70	42.76	37.72	38.72	28.70	32.00	39.73
		60434	30.00	28.78	40.60	41.44	38.74	32.00	32.72	40.26
		60435	38.00	34.76	46.34	49.48	47.60	35.00	35.84	47.81
		60438	ND	ND	ND	ND	ND	ND	44.56	Not Enough Data
		60440	ND	ND	ND	ND	ND	ND	35.72	Not Enough Data
		60450	ND	ND	ND	ND	ND	ND	33.34	Not Enough Data
60429	ND	13.00	ND	ND	ND	ND	ND	Not Enough Data		

Note: "ND" represents stations and years where there was not enough data to calculate a completed data set

Appendix B

Raw Traffic Turning Movement Counts

TMC: KING ST AT QUEEN ST & RONCESVALLES AVE

		2019															
Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			SUM NORTH	SUM EAST	SUM SOUTH	SUM WEST
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	ID: OLW1	ID: OLW2	ID: OLW3	ID: OLW4
AM PEAK (8:15 - 9:15)	CAR	176	92	16	1	458	717	33	58	57	2	311	71	222	818	869	1002
	TRK	2	3	0	0	18	10	2	2	4	0	5	4	9	25	15	29
	BUS	1	12	0	0	16	0	0	16	0	0	10	1	29	26	28	27
PM PEAK (16:45 - 17:45)	CAR	387	187	14	0	374	345	53	85	109	2	520	65	337	961	619	1390
	TRK	5	0	0	0	0	0	0	0	3	0	15	1	1	15	0	23
	BUS	2	9	0	0	13	0	0	9	0	0	13	0	18	26	18	28
8 HOUR SUMMARY (7:30 - 18:00)	CAR	1746	928	115	19	2553	2587	326	545	704	19	2380	576	2068	5374	4079	7383
	TRK	31	28	1	1	67	33	9	6	24	1	68	23	58	145	68	190
	BUS	9	81	0	0	100	5	0	84	1	0	105	1	166	205	170	215
AHV (Average Hourly Vol.)	CAR	140.75	69.75	7.5	0.25	208	265.5	21.5	35.75	41.5	1	207.75	34	139.75	444.75	372	598
	TRK	1.75	0.75	0	0	4.5	2.5	0.5	0.5	1.75	0	5	1.25	2.5	10	3.75	13
	BUS	0.75	5.25	0	0	7.25	0	0	6.25	0	0	5.75	0.25	11.75	13	11.5	13.75
AADT (An. Avg. Daily Traffic)	CAR	2252	1116	120	4	3328	4248	344	572	664	16	3324	544	2236	7116	5952	9568
	TRK	28	12	0	0	72	40	8	8	28	0	80	20	40	160	60	208
	BUS	12	84	0	0	116	0	0	100	0	0	92	4	188	208	184	220

TMC: DUFFERIN ST AT LIBERTY ST

		2018															
Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			SUM NORTH	SUM EAST	SUM SOUTH	SUM WEST
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	ID: OLW1	ID: OLW2	ID: OLW3	ID: OLW4
AM PEAK (8:30 - 9:30)	CAR	1	206	398	4	0	5	77	369	0	171	0	52	631	475	751	1
	TRK	0	10	4	0	0	0	0	18	0	1	0	2	30	4	29	0
	BUS	0	19	0	0	0	0	0	23	0	0	0	0	42	0	42	0
PM PEAK (16:30 - 17:30)	CAR	0	354	153	4	3	1	56	321	0	366	0	146	825	212	1042	3
	TRK	0	4	2	0	0	0	0	6	0	2	0	2	12	2	12	0
	BUS	0	13	0	0	0	0	0	16	0	0	0	0	29	0	29	0
8 HOUR SUMMARY (7:30 - 18:00)	CAR	1	2141	1736	23	6	18	505	2590	0	1905	0	622	5376	2247	6654	7
	TRK	0	94	33	1	0	0	6	124	0	42	0	26	245	39	260	0
	BUS	0	150	0	0	0	0	0	152	0	1	0	0	302	0	303	0
AHV (Average Hourly Vol.)	CAR	0.25	140	137.75	2	0.75	1.5	33.25	172.5	0	134.25	0	49.5	364	171.75	448.25	1
	TRK	0	3.5	1.5	0	0	0	0	6	0	0.75	0	1	10.5	1.5	10.25	0
	BUS	0	8	0	0	0	0	0	9.75	0	0	0	0	17.75	0	17.75	0
AADT (An. Avg. Daily Traffic)	CAR	4	2240	2204	32	12	24	532	2760	0	2148	0	792	5824	2748	7172	16
	TRK	0	56	24	0	0	0	0	96	0	12	0	16	168	24	164	0
	BUS	0	128	0	0	0	0	0	156	0	0	0	0	284	0	284	0
		2019 (annual increase factor of 1%)															
AADT (An. Avg. Daily Traffic)	CAR	4	2262	2226	32	12	24	537	2788	0	2169	0	800	5882	2775	7244	16
	TRK	0	57	24	0	0	0	0	97	0	12	0	16	170	24	166	0
	BUS	0	129	0	0	0	0	0	158	0	0	0	0	287	0	287	0

TMC: DUFFERIN ST AT MELBOURNE AVE

Time Period	Vehicle Type	2017															
		NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND			SUM NORTH	SUM EAST	SUM SOUTH	SUM WEST
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	ID: OLW1	ID: OLW2	ID: OLW3	ID: OLW4
AM PEAK (8:15 - 9:15)	CAR	14	223	19	20	1	43	15	479	8	21	1	14	736	36	766	24
	TRK	0	12	1	2	0	1	0	15	1	0	0	1	30	1	28	1
	BUS	0	18	0	0	0	0	0	18	0	0	0	0	36	0	36	0
PM PEAK (16:00 - 17:00)	CAR	2	503	19	10	0	15	19	350	15	23	1	24	887	39	891	18
	TRK	0	4	0	0	0	0	0	8	0	0	0	0	12	0	12	0
	BUS	0	22	0	0	0	0	0	20	0	0	0	0	42	0	42	0
8 HOUR SUMMARY (7:30 - 18:00)	CAR	70	2347	91	100	3	154	70	2617	82	102	7	95	5159	171	5220	162
	TRK	0	100	1	5	1	6	0	122	3	1	0	2	229	2	229	4
	BUS	0	156	0	1	0	0	0	159	0	0	0	0	316	0	315	0
AHV (Average Hourly Vol.)	CAR	4	181.5	9.5	7.5	0.25	14.5	8.5	207.25	5.75	11	0.5	9.5	405.75	18.75	414.25	10.5
	TRK	0	4	0.25	0.5	0	0.25	0	5.75	0.25	0	0	0.25	10.5	0.25	10	0.25
	BUS	0	10	0	0	0	0	0	9.5	0	0	0	0	19.5	0	19.5	0
AADT (An. Avg. Daily Traffic)	CAR	64	2904	152	120	4	232	136	3316	92	176	8	152	6492	300	6628	168
	TRK	0	64	4	8	0	4	0	92	4	0	0	4	168	4	160	4
	BUS	0	160	0	0	0	0	0	152	0	0	0	0	312	0	312	0
2019 (annual increase factor of 1%)																	
AADT (An. Avg. Daily Traffic)	CAR	65	2962	155	122	4	237	139	3383	94	180	8	155	6622	306	6761	171
	TRK	0	65	4	8	0	4	0	94	4	0	0	4	171	4	163	4
	BUS	0	163	0	0	0	0	0	155	0	0	0	0	318	0	318	0

Average TMC: Dufferin St. from Melbourne-King-Liberty

Time Period	Vehicle Type	2017-2018	2019
		NORTH-SOUTH	
AADT (An. Avg. Daily Traffic)	CAR	6226	6322
	TRK	164	166
	BUS	298	303

***Average AADT: Gardiner Expressway, Midblock, between Cherry St. and DVP**

Time Period	Vehicle Type	2017	2019
		WEST-EAST	
AADT (An. Avg. Daily Traffic)	CAR	105394	107512
	TRK	6727	6862
	BUS	---	---

***Average AADT: Gardiner Expressway, Spadina Interchange-Kingsway Interchange**

Time Period	Vehicle Type	2017	2019
		WEST-EAST	
AADT (An. Avg. Daily Traffic)	CAR	77680	78457
	TRK	4958	5008
	BUS	---	---

***Average AADT: Don Valley Parkway, North of Gardiner Interchange**

Time Period	Vehicle Type	2017	2019
		NORTH-SOUTH	
AADT (An. Avg. Daily Traffic)	CAR	87182	88935
	TRK	5565	5677
	BUS	---	---

*Source: Metrolinx Union Station Rail Corridor (USRC) East Enhancements Transit Project Assessment Process (TPAP Air Quality Assessment, Table 15, 2017)

TTC Service Summary - Route 121AD Fort-York Esplanade

		2019	
Time Period	Vehicle Type	No. of Vehicles	Service Interval (min'sec")
AM Peak	BUS	7	13'00"
PM Peak		7	18'00"
AHV		3.5	-
AADT		56	-

*Source: TTC Service Summary_2019-05-12

TTC Service Summary - Route 72 Pape

		2019	
Time Period	Vehicle Type	No. of Vehicles	Service Interval (min'sec")
AM Peak	BUS	9	5'59"
PM Peak		9	6'41"
AHV		4.5	-
AADT		72	-

*Source: TTC Service Summary_2019-05-12

TTC Service Summary - Route 504B Broadview Stn - Dufferin Gate

		2019	
Time Period	Vehicle Type	No. of Vehicles	Service Interval (min'sec")
AM Peak	BUS	22	5'15"
PM Peak		20	6'00"
AHV		10.5	-
AADT		168	-

*Source: TTC Service Summary_2019-05-12

TTC Service Summary - Route 506 Carlton

		2019	
Time Period	Vehicle Type	No. of Vehicles	Service Interval (min'sec")
AM Peak	BUS	36	5'10"
PM Peak		27	5'40"
AHV		15.75	-
AADT		252	-

*Source: TTC Service Summary_2019-05-12

TTC Service Summary - Route 72B Pape Stn - Union Stn via Queens Quay

		2019	
Time Period	Vehicle Type	No. of Vehicles	Service Interval (min'sec")
AM Peak	BUS	4	19'00"
PM Peak		4	21'15"
AHV		2	-
AADT		32	-

*Source: TTC Service Summary_2019-05-12

TTC Service Summary - Express Route 143 Downtown/Beach Express

		2019	
Time Period	Vehicle Type	No. of Vehicles	Service Interval (min'sec")
AM Peak	BUS	4	15'00"
PM Peak		3	25'00"
AHV		1.75	-
AADT		28	-

*Source: TTC Service Summary_2019-05-12