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Appendix A3

Ontario Line Project

Exhibition Station Early Works – Final Noise and Vibration Early Works Report

Metrolinx

Noise and Vibration Early Works Report

Ontario Line Exhibition Station Early Works

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Project #: 60611173

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AECOM: 2015-04-13

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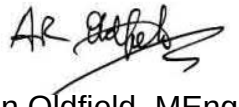

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Executive Summary

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 Early Works Exhibition Station Report for the Project. This Noise and Vibration Early Works Report (this Report) supports the Ontario Line Final Exhibition Early Works Report prepared for the Project to document the noise and vibration 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 activities are further described in **Section 1.3**.

The purpose of this Report is to:

- Assess the temporary construction noise and vibration associated with Exhibition Station early works; and,
- Provide noise and vibration mitigation and monitoring recommendations for future work associated with the Exhibition Station early works temporary construction.

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.

A glossary of terminology is provided in **Appendix A**.

ES.2 Methodology

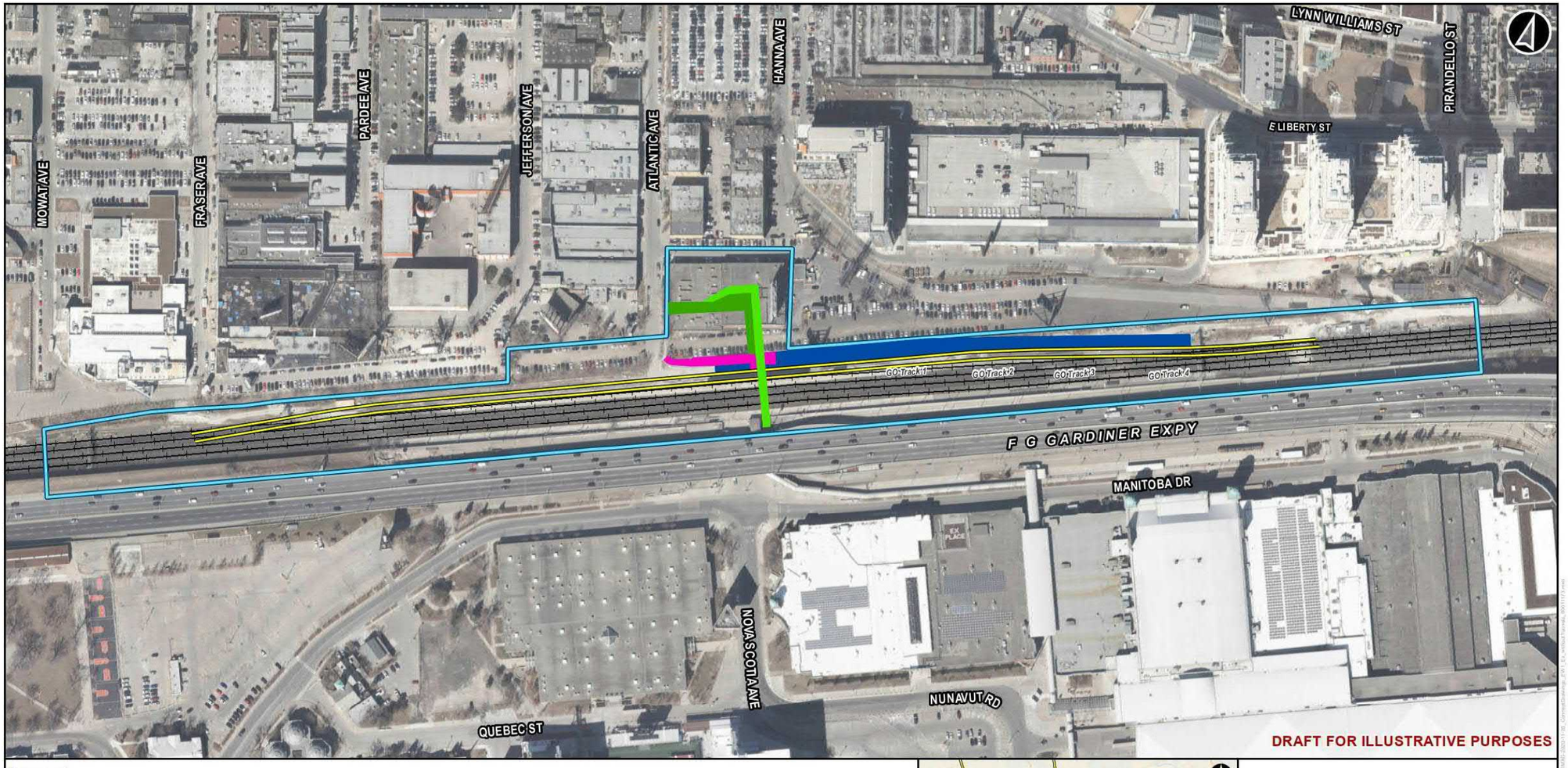
This Report documents the assessment of Exhibition Station early works construction impacts related to noise and vibration. Impacts associated with Project operations will be addressed as part of the Environmental Impact Assessment Report under separate cover. Detailed methodology is provided in **Section 3**.

Local Environmental Conditions

AECOM has conducted baseline measurements as described in the Ontario Line Final Environmental Conditions Report (AECOM, 2020)[1], to characterise the existing noise and vibration levels throughout the proposed Ontario Line Study Area (including areas not associated with the early works). The baseline measurements included collection of continuous noise measurements over several days at locations representative of noise sensitive receivers.

[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.

Figure ES-1: Exhibition Station Early Works Conceptual Design



Baseline vibration measurements were not required, as the construction vibration assessment in this Report uses absolute vibration levels, which are not affected by the existing vibration levels. The majority of the early works area, existing vibration levels are expected to be below human perceptibility, except in close proximity to the existing rail lines.

Impact Assessment

Noise and vibration criteria from various sources were reviewed for applicability to the Project; sources include the City of Toronto, the Ministry of the Environment, Conservation and Parks (MECP), Metrolinx, and the United States Federal Transit Administration (FTA). Criteria from the local sources were applied and supplemented using criteria from the FTA where necessary. Criteria reviewed included:

- MECP Guideline NPC-115;
- MECP Guideline NPC-118;
- City of Toronto By-law 878-2019;
- FTA Transit Noise and Vibration Impact Assessment Manual;
- MECP Guideline NPC-119; and,
- City of Toronto By-law 514-2008.

A screening was conducted to determine areas which required detailed assessment of specific receivers. Noise and vibration sensitive receivers surrounding the early works project sites at Exhibition Station were selected to be representative of the worst-case (located closest to the Exhibition Station Early Works Project Footprint) points of reception and selected in accordance with MECP noise and vibration guidelines. Other possible receiver locations would have lower predicted noise and vibration impacts. Noise and vibration levels were predicted in accordance with methods accepted by the MECP and levels were compared against applicable criteria limits for noise and vibration, respectively. Applicable guidelines and criteria are outlined in **Section 2**.

ES.3 Local Environmental Conditions

Noise

The relevant baseline noise results representing the existing local environmental noise conditions for the areas surrounding Exhibition Station are summarized in **Table ES-1** below.

Table ES-1: Relevant Baseline Noise Measurement Data

Monitoring Location	Daytime (07:00-19:00) Average $L_{eq, 1hr}$ (dBA)	Daytime (07:00-19:00) Min $L_{eq, 1hr}$ (dBA)	Daytime (07:00-19:00) Maximum $L_{eq, 1hr}$ (dBA)	Evening (19:00-23:00) Average $L_{eq, 1hr}$ (dBA)	Evening (19:00-23:00) Minimum $L_{eq, 1hr}$ (dBA)	Evening (19:00-23:00) Maximum $L_{eq, 1hr}$ (dBA)	Night (23:00-07:00) Average $L_{eq, 1hr}$ (dBA)	Night (23:00-07:00) Minimum $L_{eq, 1hr}$ (dBA)	Night (23:00-07:00) Maximum $L_{eq, 1hr}$ (dBA)
MO_03W Hanna Avenue	62	58	67	62	61	63	59	54	64

Vibration

Baseline vibration measurements were not required, as the construction vibration assessment in this Report uses absolute limits that do not change based upon the existing vibration levels. The local environment does not have any normally occurring sources of perceptible vibration; the most significant source of vibration near the Exhibition Station early works is the existing rail lines. Thus, for the majority of the Exhibition Station Study Area, existing vibration levels are expected to be below human perceptibility, except in close proximity to the existing rail lines

ES.4 Potential Impacts, Mitigation Measures and Monitoring Activities

Section 5 and **Section 6** include information related to potential impacts, mitigation measures, and monitoring activities. Potential impacts that may result from early works construction activities include annoyance, disruption of sleep and other activities, and damage to buildings and other structures due to vibration. A number of mitigation measures and monitoring activities are recommended to minimize the potential impacts during construction.

Refer to **Table ES-2** for the complete list of potential impacts, mitigation measures, and monitoring activities for the Exhibition Station early works.

Noise

Section 5 includes relevant assumptions and key inputs into the assessment of construction noise. Construction noise levels were predicted and compared against applicable criteria. Analysis of the results indicated that mitigation measures are required.

Noise screening was conducted to determine if detailed noise predictions would be required. Results showed that there are noise sensitive receivers within the noise screening area, thus detailed noise predictions are required.

Noise predictions were conducted and indicated that noise level criteria could be exceeded at the nearest noise sensitive receivers, with mitigation measures required to meet the noise level criteria.

Mitigation measures to meet criteria are to be further refined and updated in the next phases of design, and may include: restriction on hours of operation, inclusion of upgraded construction hoarding/temporary movable barriers between construction noise sources and sensitive points of reception, enclosures and silencers. Noise monitoring may be required where noise level limits may be exceeded. See **Table ES-2** for further details.

A number of general as well as site-specific noise mitigation recommendations and monitoring strategies have been compiled and are outlined in **Section 6**.

Vibration

Section 5 includes relevant assumptions and key inputs into the assessment of construction vibration. Vibration Zones of Influence were calculated and mapped in accordance with the City of Toronto construction vibration by-law. The mapping was used to determine if any buildings would fall within areas where there is potential for building damage and vibration monitoring is expected to be required.

Analysis of the results indicated that mitigation measures are required. Mitigation measures are to be further refined and updated in the next phases of design and may include operating equipment at lower vibration settings and using alternative construction methods.

A number of general as well as site-specific vibration mitigation recommendations and monitoring strategies have been compiled and are outlined in **Section 6**. Vibration monitoring is required for structures within the Zone of Influence.

ES.5 Permits and Approvals

As noted in **Section 7**, at this time, provincial noise or vibration permits or approvals are not anticipated to be required. This will be confirmed during the next Project phases.

A construction vibration control form is typically required to accompany a building permit as per City of Toronto By-law 514-2008. This will be confirmed during the design and implementation phases of the Exhibition Station early works.

Should a building permit be required, Metrolinx will consult with the City of Toronto.

Metrolinx as a Crown agency of the Province of Ontario is exempt from certain municipal processes and requirements. In these circumstances, Metrolinx will engage with the City of Toronto to incorporate municipal requirements as a best practice, where practical, and may obtain associated permits and approvals.

Table ES-2: Potential Noise and Vibration Impacts, Mitigation Measures and Monitoring Activities for the Exhibition Station Early Works

Environmental Component	Potential Impact	Mitigation Measure(s)	Monitoring Activities
Construction Noise	▪ Environmental noise may cause annoyance and disturb sleep and other activities. ▪ The severity of the noise effects resulting from construction projects varies, depending on: – Scale, location and complexity of the Project – Construction methods, processes and equipment deployed – Total duration of construction near sensitive noise receivers – Construction activity periods (days, hours, time period) – Number and proximity of noise-sensitive sites to construction area(s)	Construction noise impact mitigation measures to be considered include but are not limited to the following to meet applicable noise criteria: ▪ Siting construction staging and laydown areas to avoid/reduce adverse impacts to sensitive receptors where possible. ▪ Use construction equipment compliant with noise level specifications in MECP guidelines NPC-115 and NPC-118. ▪ Keep equipment in good working order and operate with effective muffling devices. ▪ Equipment enclosures for equipment such as generators and compressors. ▪ Additional equipment silencers/mufflers. ▪ Use of upgraded construction hoarding (considering requirements from CSA Z107.9 for noise barriers) between construction equipment and noise sensitive receivers. ▪ Use of localized movable noise barriers/screens for specific equipment and operations; including on corridor construction works. ▪ Minimize simultaneous operation of equipment where possible. ▪ Implement a no idling policy on site (unless necessary for equipment operation). ▪ Restrict construction hours where possible: – Perform construction during daytime hours where possible. If night time construction is necessary, the activities with the highest noise levels should be conducted during day time periods where possible. – If construction will occur outside of normal daytime hours, inform local residents before construction of type of construction and expected duration outside of daytime hours. – Consider operational duration limits for construction on the portion of the Exhibition Station Early Works Project Footprint near 5 Hanna Avenue and 6 Pirandello Street (and the attached 65, 75 and 85 East Liberty Street). ▪ Establish and apply project-specific construction noise criteria/exposure limits. ▪ Undertake noise monitoring and regular reporting throughout the construction phase. Where noise level limits are exceeded, additional noise mitigation measures shall be implemented. ▪ Develop a communications protocol which includes timely resolution of complaints. ▪ Additional mitigation measures not listed above may be considered.	▪ Noise levels will be monitored where the impact assessment indicates that noise limits may be exceeded, to identify if any additional mitigation is required. ▪ Noise levels will be monitored to verify mitigation measure(s) effectiveness. ▪ Continuous noise monitoring should be completed at each geographically distinct active construction site associated with the Project with monitor(s) located strategically to capture the worst-case construction related noise levels at receptor locations based on planned construction activities, their locations, and the number, geographic distribution and proximity of noise sensitive receptors. ▪ Monitoring at locations where there are persistent complaints, as required.
Construction Vibration	▪ Exposure to vibration may result in public annoyance and complaints. Vibration may also cause damage to buildings and other structures.	Construction vibration impact mitigation measures to be considered include but are not limited to the following to meet applicable vibration criteria: ▪ Siting construction staging and laydown areas to avoid/reduce adverse impacts to sensitive receptors where possible. ▪ Utilize equipment with low vibration emissions where possible. ▪ Off-site construction of components away from sensitive areas. ▪ Restrict construction hours: – Perform construction during daytime hours where possible. If night time construction is necessary, the activities with the highest vibration levels should be conducted during the daytime periods where possible. ▪ Update ZOI mapping and predictions based upon refined site staging, equipment, construction areas, and building locations prior to the commencement of construction. ▪ Specific to the commercial complex at 15 Atlantic Avenue: Use alternative means of construction within 5.8 metres of structures so that the City of Toronto's prohibited vibration level limits are not exceeded.	▪ Monitoring will be undertaken at locations within the ZOI to ensure compliance with the City of Toronto By-law 514-2008 and to identify the need for additional mitigation if required. ▪ Monitoring will be undertaken to ensure compliance with other applicable vibration level limits identified, as required. ▪ Monitoring will be undertaken to verify mitigation measure(s) effectiveness. ▪ Pre-construction building inspection of the potentially impacted buildings adjacent to the early works construction site are to be undertaken in accordance with City of

Environmental Component	Potential Impact	Mitigation Measure(s)	Monitoring Activities
		▪ Specific to the chimney and accessory building at 1 Atlantic Avenue: Use alternative means of construction within 11.1 metres of structures so that the vibration level limits for susceptible buildings are not exceeded. ▪ Review and refine construction activities in proximity to the Gardiner Expressway and, if required, conduct a more detailed construction vibration analysis with respect to the Gardiner Expressway footings and review other applicable vibration limits that may apply, such as the City of Toronto Specification GN117SS. ▪ Conduct monitoring and pre-construction inspections in accordance with City of Toronto By-law 514-2008. Monitoring and preconstruction requirements can be determined by calculation of ZOI of construction equipment. ▪ Provide smooth surfaces for trucks to travel and route heavily loaded trucks away from vibration sensitive sites where possible. ▪ Operate construction equipment on lower vibration settings where available. ▪ Maximize distance between equipment and sensitive receivers where possible. ▪ Establish and apply project-specific construction vibration criteria. ▪ Do not operate equipment where the City of Toronto By-law 514-2008 prohibited limits are predicted to be exceeded. Alternative construction methods and/or equipment with lower vibration emissions or power settings can be used if they do not exceed the City of Toronto's prohibited vibration limits. ▪ As Project planning and design progress, conduct a review to identify any sensitive structures/operations that require more stringent vibration limits than the limits in City of Toronto By-law 514-2008; assess requirements, review/revise vibration limits for these locations and, if necessary, develop additional mitigation measures. US FTA Report No. 0123, Transit Noise and Vibration Impact Assessment Manual (2018) could be used as a source of additional criteria. ▪ Develop communications protocol which includes timely resolution of complaints; ▪ Additional mitigation measures not listed above may be considered.	Toronto By-law 514-2008. Continuous vibration monitoring along the construction site property lines closest to these structures will be initiated as warranted. ▪ Monitoring at locations where there are persistent complaints, as required.

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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 to 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 Noise and Vibration Early Works Report (this Report) supports the Ontario Line Final Exhibition Station Early Works Report and has been prepared to document the noise and vibration 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:

- Assess the temporary construction noise and vibration impacts due to the Exhibition Station early works; and,
- Provide noise and vibration mitigation and monitoring recommendations for the Exhibition Station early works temporary construction.

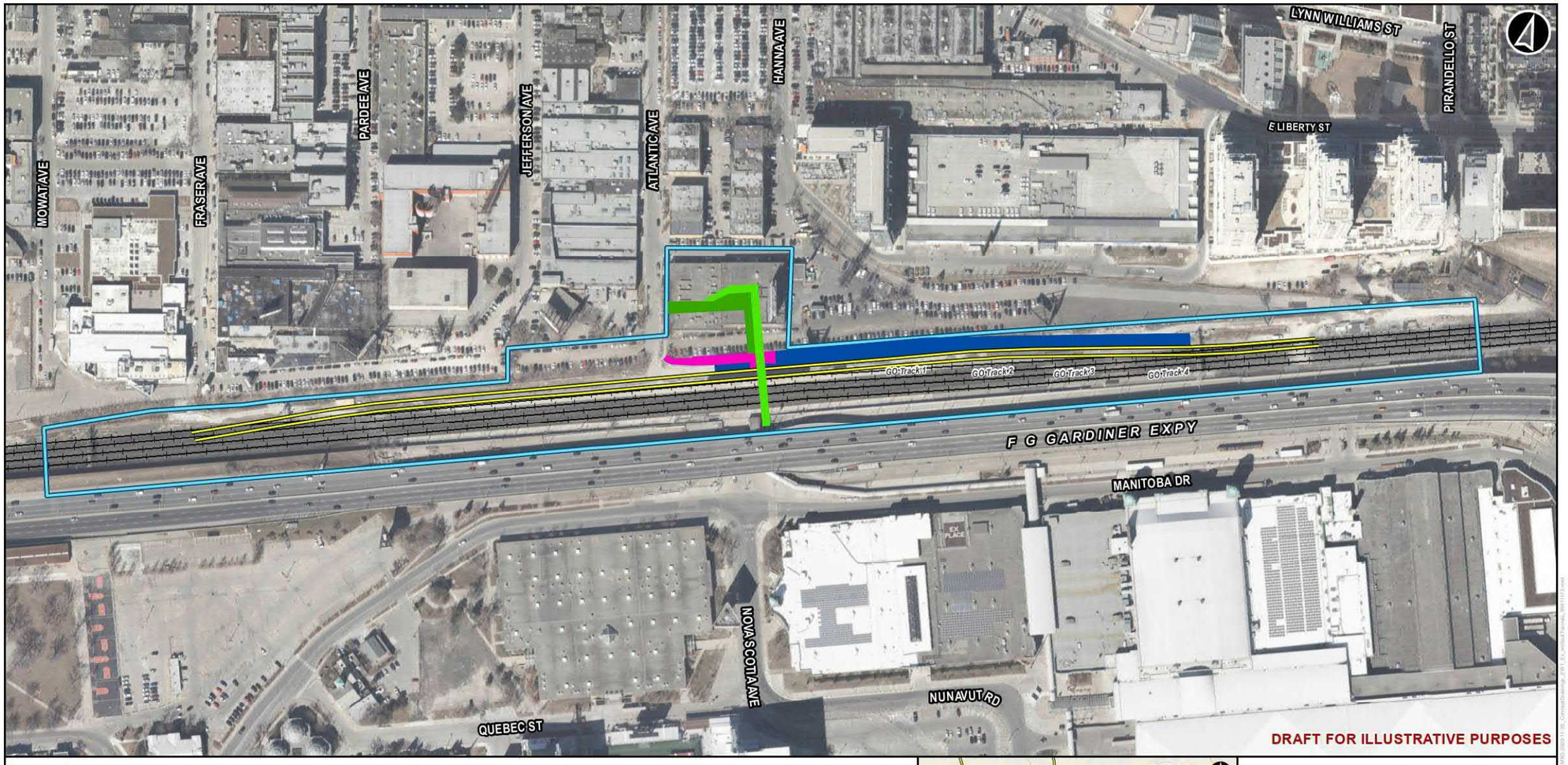
This Report has been prepared in accordance with Ontario Regulation 341/20: Ontario Line Project and contains the information outlined in **Table 1-1**.

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 4**
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 5**
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 6**
Section 8(2)8	A description of the means Metrolinx proposes to use to monitor or verify the effectiveness of mitigation measures proposed.	**Section 6**
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 7**

A glossary of terminology is provided in **Appendix A**.

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 with 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

<u>Existing Passenger Tunnel Extension</u>

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, 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 metres 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, Closed Circuit Television 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 areas[2]. 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 m 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 an approximately 250 metre buffer based upon the night time noise screening distance.

The Exhibition Station Study Area was developed using noise and vibration screening areas which were determined by calculating the distances where the applicable criteria are predicted to be met, using a conservative approach where it was assumed that all construction equipment listed in **Table 3-1** would be active. The approximately 250 metre night time noise screening area was the largest and was thus used to define the Exhibition Station Study Area.

The Exhibition Station Study Area assessed in this Report is specific to the noise and vibration 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 1-2 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.

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

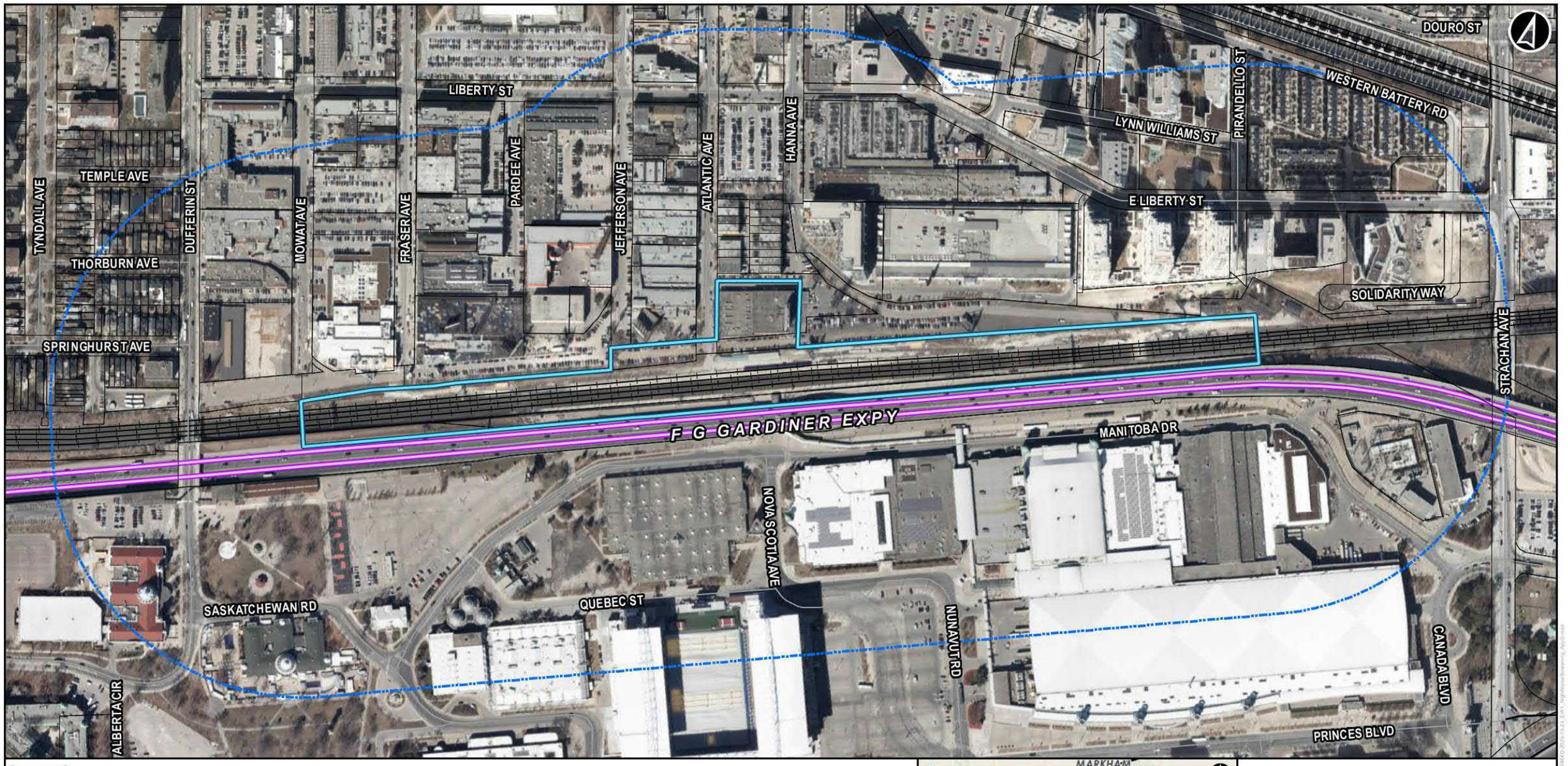


Table 1-2: Anticipated Construction Activities for the Ontario Line Exhibition Station Early Works

Anticipated Construction Activity	Description	Associated Equipment
Site Preparation	▪ 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.	▪ 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	▪ 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. ▪ Demolition and removal of main building at 1 Atlantic Avenue. ▪ Pedestrian tunnel installation. ▪ Removal and reinstatement railway track. ▪ Tree removal.	▪ 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
Excavating and Grading	▪ 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.	▪ 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.
Construction and Rehabilitation/ Upgrade of Structures	▪ 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.).	▪ Foundation placement equipment. ▪ Augured piles or rammed aggregate piers. ▪ Drill rigs. ▪ Mobile cranes and hoists. ▪ Concrete trucks, pumps and vibrators, skid steer.
Construction and/or Alteration of Bridges	▪ Includes grounding and bonding. ▪ Pile installation, foundations, abutments, retaining walls, bridge girders, decking, backfilling, concrete demolition.	▪ Mobile cranes and hoists. ▪ Flatbed trucks, cranes. ▪ Augured piles or rammed aggregate piers. ▪ Drill rigs. ▪ Bulldozer and excavator. ▪ Jackhammer.

Anticipated Construction Activity	Description	Associated Equipment
Construction of Ancillary Facilities	▪ 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.	▪ Flatbed trucks, cranes, concrete trucks. ▪ Backhoe, pavement excavation equipment. ▪ Mobile cranes and hoists. ▪ Concrete trucks, pumps and vibrators.
Installation of Trackwork	▪ Assembly of track, ties and fastenings.	▪ Thermal welding. ▪ Tie placement (cranes, lifting equipment). ▪ Ballast placement equipment. ▪ Concrete pouring equipment.
Temporary Track Diversion	▪ 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).	▪ 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.
Temporary Road Closures	▪ All road closures will follow standard traffic control management guidelines.	▪ Temporary traffic control devices such as signs, signals, barriers, traffic barrels, plate tampers.
Management of Stormwater	▪ 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.	▪ Site compaction equipment and general grading equipment. ▪ Groundwater pumping.

Anticipated Construction Activity	Description	Associated Equipment
Mechanical Work	▪ 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.	▪ Hoists and cranes, trucks, hand tools, backhoe, small excavator, skid steer, welding units, compaction equipment, vibrators, concrete trucks, tampers.
Electrical Work	▪ 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.	▪ Hoists and cranes, trucks, hand tools, backhoe, small excavator, skid steer, welding units, compaction equipment, vibrators, concrete trucks, tampers.

2. Applicable Guidelines and Criteria

The guidelines, criteria, and municipal by-laws applicable to the early works construction noise and vibration are summarized in the subsections below.

2.1 Noise

2.1.1 Ministry of the Environment, Conservation and Parks

For construction noise, the MECP sets out noise emission standards for various types of construction equipment in their publications NPC-115 (Ministry of the Environment, 1978) and NPC-118 (Ministry of the Environment, 1978). The sound emission standards outlined in NPC-115 and NPC-118, for typical construction equipment and vehicles, are reproduced in the **Table 2-1** to **Table 2-5** below.

Table 2-1: NPC-115 Quiet Zone and Residential Area Sound Emission Standards for Excavation Equipment, Dozers, Loaders, Backhoes or Other Equipment Capable of Being used for Similar Application

Date of Manufacture	Maximum Sound Level (dBA) as determined using Publication NPC-103 – Procedures Section 6 Power Rating Less than 75 kilowatts	Maximum Sound Level (dBA) as determined using Publication NPC-103 – Procedures Section 6 Power Rating 75 kilowatts and Larger
January 1, 1979 to December 31, 1980	85	88
January 1, 1981 and after	83	85

Table 2-2: NPC-115 Sound Emission Standards for Pneumatic Pavement Breakers

Standard	Date of Manufacture	Maximum Sound Level (dBA) as measured using Publication NPC-103
Quiet Zone Sound Emission	January 1, 1979 and after	85
Residential Area Sound Emission	January 1, 1979 to December 31, 1980	90
Residential Area Sound Emission	January 1, 1981 and after	85

Table 2-3: NPC-115 Sound Emission Standards for Portable Air Compressors

Standard	Date of Manufacture	Maximum Sound Level (dBA) as measured using Publication NPC-103
Quiet Zone Sound Emission	January 1, 1979 to December 31, 1980	76
Quiet Zone Sound Emission	January 1, 1981 and after	70
Residential Area Sound Emission	January 1, 1979 and after	76

Table 2-4: NPC-115 Sound Emission Standards for Tracked Drills

Standard	Date of Manufacture	Maximum Sound Level (dBA) as measured using Publication NPC-103, Section 6
Quiet Zone and Residential Area Sound Emission	January 1, 1981 and after	100

Table 2-5: NPC-118 Sound Emission Standards for Heavy Vehicles with Governed Diesel Engines

Date of Manufacture	Maximum Sound Level (dBA) as measured using Publication NPC-103, Section 9
Prior to January 1 ,1979	100
January 1, 1979 and after	95

2.1.2 Municipal Guidelines

Construction noise in the City of Toronto is typically addressed using City of Toronto Noise By-law 878-2019 (City of Toronto, 2019). However, as the Project qualifies as “Government Work” as per By-law 878-2019 (exempt from By-law requirements), the Project is exempt from the City of Toronto’s Noise By-law.

2.1.3 Other Guidance

Receiver based noise level limits provide a basis for the assessment of construction noise impacts to communities from construction over extended periods of time. The United States Federal Transit Administration’s Transit Noise and Vibration Impact Assessment Manual (United States Federal Transit Administration, 2018 – referred to as the FTA Guide) is widely used as a reference for construction noise and vibration

impact assessment and the eight-hour criteria have been used in past Metrolinx noise impact assessments.

The average daytime criterion is defined as a rolling eight-hour (any consecutive eight hours during a time period longer than eight hours) energy average ($L_{eq, 8hr}$) over the course of the daytime, which is defined as 07:00 to 23:00 (Ministry of the Environment, 2013) for noise assessments in Ontario; this daytime noise level limit is 80 dBA. The average night time criterion is defined as the eight-hour energy average ($L_{eq, 8hr}$) during the night time, which is defined as 23:00 to 07:00 (Ministry of the Environment, 2013); this night time noise level limit is 70 dBA. These assessment criteria have been adopted for use in the Exhibition Station early works construction noise impact assessment and are summarized in **Table 2-6.**

Table 2-6: Adopted Construction Noise Assessment Criteria

Time Period	Criteria ($L_{eq, 8hr}$)
Daytime (07:00 – 23:00)	80 dBA
Night time (23:00 – 07:00)	70 dBA

2.2 Vibration

2.2.1 Ministry of the Environment, Conservation and Parks

The MECP regulates vibration from blasting operations using NPC-119 (Ministry of the Environment, 1978), and impulse vibration from stationary facilities such as forging shops using NPC-207 (Ministry of the Environment, 1983). As blasting is not proposed for the Project, and NPC-207 is only applicable to long term operation of a stationary source of vibration, MECP does not have any guidelines applicable to construction vibration associated with the Exhibition Station early works.

2.2.2 Municipal Guidelines

The City of Toronto regulates construction vibration using By-law 514-2008 (City of Toronto, 2008). By-law 514-2008 sets out a screening area (Zone of Influence) where vibration levels are predicted to exceed 5 millimetres per second (mm/s). Should this Zone of Influence (ZOI) extend beyond the boundaries of the construction site, construction vibration monitoring, pre-construction surveys, and pre-construction consultation with property owners and occupants within the ZOI are required. Furthermore, By-law 514-2008 defines vibration limits (prohibited levels) for various frequencies that must not be exceeded, presented in **Table 2-7** below.

Table 2-7: City of Toronto Prohibited Vibration Levels

Frequency of Vibration (Hz)	Vibration Peak Particle Velocity (mm/s)
Less than 4	8
4 to 10	15
More than 10	25

As Project planning and design progress, other criteria/vibration limits that may apply such as the City of Toronto Specification GN117SS which includes limits for trunk sewers and bridge structures may be included and used in the updated vibration assessment that will be undertaken prior to construction commencement.

2.2.3 Other Guidance

Construction vibration can be a concern for felt vibration and annoyance. To review the potential for vibration to be felt, the typical threshold for vibration annoyance (0.14 mm/s root mean square velocity, in accordance with the Ministry of the Environment and Energy and GO Transit, 1994) for operational vibration sources was used as the basis for the review.

Buildings potentially more susceptible to vibration damage, such as structures on heritage designated or listed properties, can be a factor in the analysis of construction vibration. The FTA Guide includes vibration damage criteria for buildings classified as “extremely susceptible to vibration damage”. The limit is 0.12 inches per second (equivalent to 3.0 mm/s). This limit has been adopted for the assessment of the potential construction vibration impacts to known or potential built heritage resources (i.e., buildings/structures with known or potential heritage significance).

3. Methodology

This Report documents the assessment of Exhibition Station early works construction impacts related to noise and vibration. Impacts associated with Project operations will be addressed as part of the Environmental Impact Assessment Report, under separate cover. Noise and vibration impacts due to the construction of the early works are temporary and will cease once construction has been completed.

3.1 Local Environmental Conditions

AECOM has conducted baseline measurements as described in the Ontario Line Final Environmental Conditions Report (AECOM, 2020)[3], to characterise the existing noise and vibration levels within the Ontario Line Study Area.

Data relevant to the Exhibition Station early works construction have been included in **Section 4** below.

Continuous noise measurements were collected over several days at locations representative of noise sensitive receivers. Noise measurements were collected using Quest SoundPro Type 1 and 2 sound level meters. Data collected during inclement weather conditions were discounted from statistical analysis.

Baseline vibration measurements were not required, as the construction vibration assessment in this Report uses absolute limits that do not change based upon the existing vibration levels. The local environment does not have any normally occurring sources of perceptible vibration; the most significant source of vibration near the early works locations are the existing rail lines. Thus, for the majority of the Exhibition Station Study Area, existing vibration levels are expected to be below human perceptibility, except in close proximity to the existing rail lines

3.2 Impact Assessment

The 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**;

[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.

- 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 4**.

Noise and vibration criteria from various sources – City of Toronto, the Ministry of the Environment, Conservation and Parks (MECP), and the United States Federal Transit Administration (FTA) – were reviewed for applicability to the Project. Criteria from the FTA Guide was used to supplement local criteria. Criteria reviewed and adopted for this assessment are summarized in **Section 2**.

Mitigation measures and monitoring activities have been recommended to mitigate the identified potential negative impacts within the Exhibition Station Study Area. The results of the impact assessment are provided in **Section 5**, and recommended mitigation measures and monitoring activities outlined in **Section 6**.

Please note that the impact assessment will be updated prior to the commencement of construction using the most up-to-date information on construction methods and techniques, equipment, and refined construction areas, as required.

3.2.1 Noise

The construction noise assessment evaluated the potential impacts to the nearby noise sensitive receivers. Noise sensitive receivers are defined as properties that accommodate a dwelling unit(s), used for noise sensitive commercial purposes, sleeping facilities, or noise sensitive institutional purposes such as educational facilities.

First, a noise screening was conducted to determine if receptor-specific noise predictions were required. The noise screening was completed by determining the distances where the day or night time criteria are predicted to be met, assuming all construction equipment in **Table 3-2** was active, using a conservative approach to determine the screening distance, which assumed flat ground and no shielding or other noise attenuation effects (see **Appendix B**). The screening distances were then used to create screening areas on maps to determine if any possible sensitive receivers were located within the screening areas (see **Section 5.1**). Assessed representative receptors were selected based upon their location within the noise screening area and their proximity to the Exhibition Station Early Works Project Footprint. The assessed representative noise receptors are further described in **Section 5.1**.

Noise predictions at selected representative receptors included the modelling of various scenarios, using noise calculation algorithms which account for building and geometric noise shielding effects, ground effects, and air attenuation. The receptor-specific noise predictions were conducted for the nearest (to the Exhibition Station Early Works Project Footprint) noise sensitive (closest and with highest noise exposures) receivers.

An acoustic model using the ISO 9613 (International Organization for Standardization, 1996) prediction algorithms was prepared. As the construction equipment cannot all operate in the same physical position, the equipment was modelled as operating over an area closest to the assessed representative receiver.

For the purpose of this study, a conservative approach was used where it was assumed that equipment could operate anytime.

Other assumptions include:

- Adjacent residential properties were assumed to be occupied by residents over the course of construction; and,
- Ground absorption would have a negligible effect and has been set to zero.

The predicted construction noise levels are estimates based on conservative assumptions, reference equipment noise levels and the Exhibition Station early works information (Exhibition Station Early Works Project Footprint and construction activities) available to date. Results were compared to guideline limits and mitigation recommendations were made to reduce the noise impacts. The impact assessment will be updated prior to the commencement of construction using the most up-to-date information on construction methods and techniques, equipment, and refined construction areas, as required. If noise levels limits are exceeded during construction, the noise prediction model can be used to determine which noise sources are causing the greatest impacts, and mitigation can be investigated for those specific noise sources.

3.2.2 Vibration

Vibration receptors are defined as any structures where applicable vibration criteria could be exceeded. The assessment of construction vibration was based on the City of Toronto’s definition of ZOI - the area (zone) in which vibration levels are predicted to be at or above the screening threshold. ZOI mapping determines which locations may be above the applicable vibration criteria and where vibration controls may need to be implemented.

The Exhibition Station early works vibration ZOI was calculated using the FTA Guide's construction vibration propagation equations to calculate the distances where the screening threshold is met. These distances define the ZOI.

A conservative approach was used, where construction equipment operations within the construction areas were assumed to be unrestricted to specific areas, and the equipment with the maximum vibration levels was used as the basis of assessment. As a result, Exhibition Station early works vibration ZOI is based upon the equipment with the highest vibration levels operating at the edge of the Exhibition Station Early Works Project Footprint.

Screening distances for the other applicable vibration criteria (City of Toronto By-law prohibited limit, FTA Guide limit for buildings extremely susceptible to building damage, and human perceptibility – discussed in **Section 2.2**) were also mapped.

Structures within the Exhibition Station Early Works Project Footprint were assumed to be the responsibility of Metrolinx and have not been included as receivers in this analysis.

The predicted construction vibration ZOIs are based on conservative assumptions, reference equipment vibration levels and the Exhibition Station early works information available to date (**Section 1.3**). Representative vibration receptors were identified using the ZOI as described above and are further described in **Section 5.2**. Assessment results were compared to vibration criteria and mitigation recommendations are made to avoid or reduce the vibration impacts based on the calculated ZOI. The impact assessment will be updated prior to the commencement of construction using the most up-to-date information on construction methods and techniques, equipment, and refined construction areas, as required.

3.3 Construction Activities and Equipment

Preliminary construction activities associated with Exhibition Station are provided in **Table 1-2**. Construction activities were consolidated into assessment scenarios based upon the following:

- Activities that do not have associated construction noise or vibration equipment, such as temporary road closures, have not been included in this assessment;
- Activities that occur simultaneously with other activities, such as stormwater management, have been included in the assessment of the other assessed construction activities; and,

- Activities that are similar to other activities which have similar noise and vibration impacts, such as temporary track diversion and installation of trackwork near station, have been assessed in the same scenario.

The construction equipment listed in **Table 1-2** has also been supplemented based on past project experience with similar construction activities.

The consolidated construction site activity scenarios include:

- Site Preparation;
- Site Services (Utility Relocation);
- Demolition;
- Excavation/Grading;
- Structure Construction;
- Bridge Span Installation; and,
- Trackwork.

Construction equipment and reference construction equipment noise and vibration source data are presented in **Table 3-1** and **Table 3-2** respectively. Exact construction equipment quantities, types, and staging will be determined in advance of construction and may vary from the tables below. Updates will be addressed in the next phases of design. Reference data were sourced from the FTA Guide and the United States Federal Highway Administration's Roadway Construction Noise Model (United States Federal Highway Administration, 2006 – referred to as the RCNM).

Table 3-1: Assumed Construction Equipment by Activity

Equipment	Site Preparation	Site Services (Utility Relocation)	Demolition	Excavation/ Grading	Structure Construction	Bridge Span Installation	Track-Work
Auger Piling Equipment	-	-	-	-	X	-	-
Rammed Aggregate Piers	-	-	-	-	X	-	-
Backhoe	-	X	X	X	X	-	X
Chainsaw	X	-	-	-	-	-	-
Compactor (ground)	X	-	-	X	-	-	X
Compressor (air)	-	X	X	-	X	X	-
Concrete Mixer Truck	-	-	-	-	X	-	-
Concrete Pump Truck	-	-	-	-	X	-	-
Concrete Saw	-	X	X	-	-	-	-
Crane (mobile)	-	-	X	-	X	X	X
Dozer	X	-	X	X	-	-	-
Dump/Flatbed/ Concrete Truck Movements	6 per hour	6 per hour	6 per hour	6 per hour	6 per hour	6 per hour	6 per hour
Excavator	X	X	X	X	-	-	-
Front End Loader	X	X	-	X	-	-	-
Generator	-	-	X	-	X	-	-
Grader	X	-	-	X	-	-	-
Hoe Ram	-	-	X	-	-	-	-
Jack Hammer	-	X	X	X	-	-	-
Man Lift	-	-	X	-	X	X	-
Pavement Scarifier	-	-	X	-	-	-	-
Pumps	X	-	-	X	-	-	-
Rail Saw	-	-	-	-	-	-	X
Roller	X	-	-	X	-	-	-
Vibratory Concrete Mixer	-	-	-	-	X	-	-
Vacuum Excavator	-	X	-	-	-	-	-
Ballast Equalizer	-	-	-	-	-	-	X
Ballast Tamper	-	-	-	-	-	-	X
Spike Driver	-	-	-	-	-	-	X
Tie Cutter	-	-	-	-	-	-	X
Tie Handler	-	-	-	-	-	-	X
Tie Inserter	-	-	-	-	-	-	X

Table 3-2: Reference Construction Equipment Data

Equipment	Reference Noise Data Sound Level at 15.24 m / 50 ft (dBA)	Reference Noise Data Acoustical Usage Factor (%)	Reference Vibration Data PPV at 7.62 m / 25 ft (mm/s)	Reference Vibration Data RMSV at 7.62 m / 25 ft (VdB ref 1 micro-inch/s)
Auger Piling Equipment	85	20	2.261	87
Rammed Aggregate Pier[1]	90	20	2.261	87
Backhoe[2]	80	40	0.076	58
Chain Saw	85	20	Negligible	Negligible
Compactor (ground)[3]	80	20	0.889	79
Compressor (air)	80	40	Negligible	Negligible
Concrete Mixer Truck	85	40	1.930	86
Concrete Pump Truck	82	20	1.930	86
Concrete Saw	90	20	Negligible	Negligible
Crane (mobile)	85	16	Negligible	Negligible
Dozer	85	40	2.261	87
Dump/Flatbed Truck	84	40	1.930	86
Excavator[2]	80	40	0.076	58
Front End Loader[2]	80	40	0.076	58
Generator	82	50	Negligible	Negligible
Grader[2]	85	40	0.076	58
Hoe Ram	90	20	2.261	87
Jack Hammer	89	20	0.889	79
Man Lift	85	20	Negligible	Negligible
Pavement Scarifier[4]	85	20	0.076	58
Pumps	77	50	Negligible	Negligible
Rail Saw[5]	90	20	Negligible	Negligible
Roller	85	20	5.334	94
Vibratory Concrete Mixer[3]	80	20	0.889	79
Vacuum Excavator	85	40	Negligible	Negligible
Ballast Equalizer[6]	82	40	0.076	58
Ballast Tamper[1]	83	40	0.076	58
Spike Driver[7]	77	20	0.889	79
Tie Cutter[8]	84	20	Negligible	Negligible
Tie Handler[9]	80	40	Negligible	Negligible
Tie Inserter[9]	85	40	Negligible	Negligible

Notes: (1) Assumed similar to hoe ram in FTA Guide and RCNM
(2) Assumed similar to small dozer in FTA Guide (vibration)
(3) Assumed similar to jack hammer in the FTA Guide (vibration)
(4) Assumed similar to grader/small dozer in the FTA Guide (vibration)
(5) Assumed similar to concrete saw
(6) Assumed similar acoustical usage factor as a grader/loader and vibration as a grader/small dozer
(7) Assumed similar acoustical usage factor and vibration impact as a jack hammer
(8) Assumed similar acoustical usage factor as a concrete saw
(9) Assumed similar acoustical usage factor as a loader

4. Local Environmental Conditions

4.1 Noise

As discussed in **Section 3.1**, relevant monitoring locations data are presented in **Table 4-1** with monitoring locations shown on **Table 4-1**.

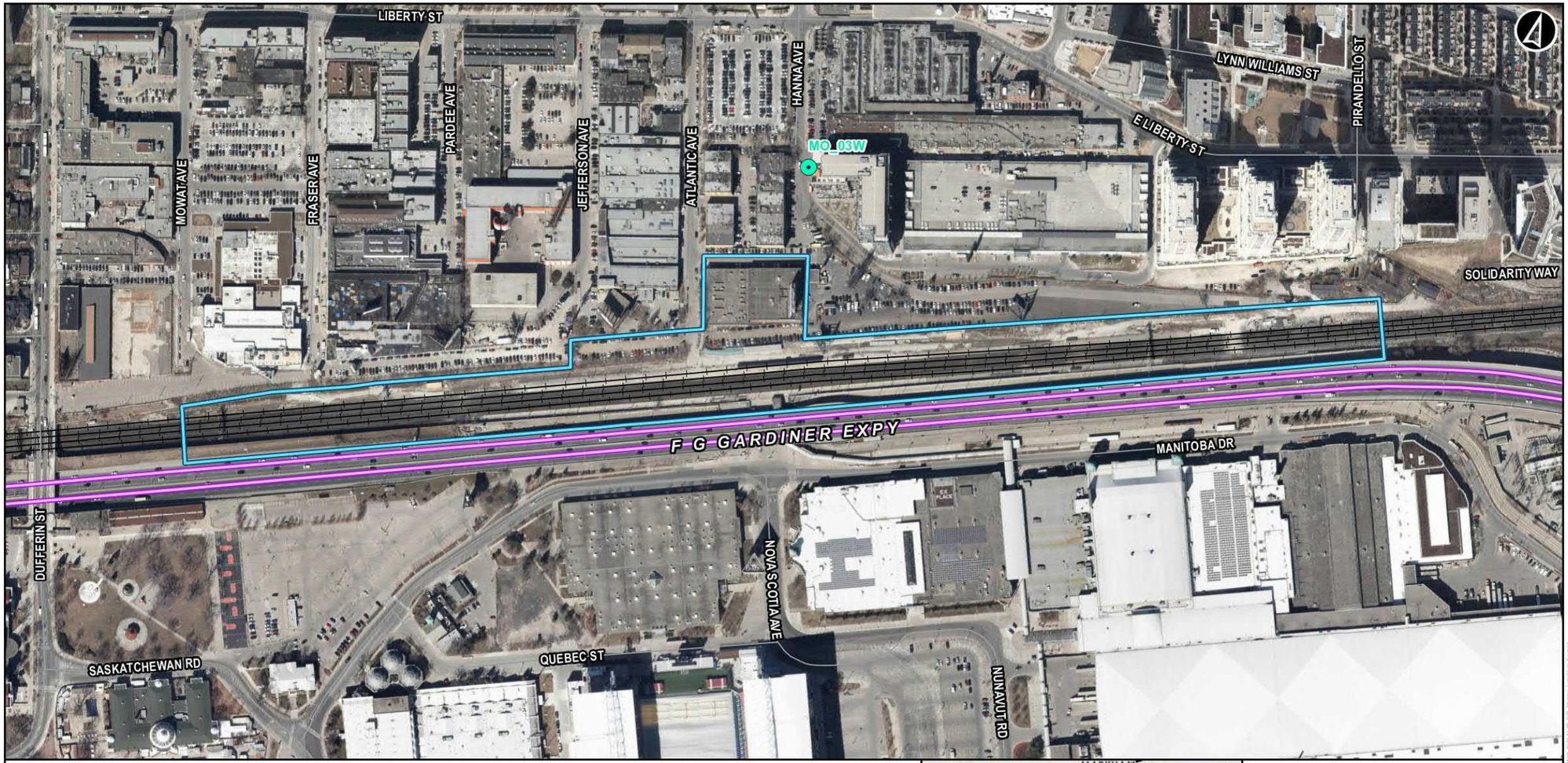
4.2 Vibration

As discussed in **Section 3.1**, baseline vibration measurements were not required as the construction vibration assessment in this Report uses absolute limits that do not change based upon the existing vibration levels.

Table 4-1: Relevant Baseline Noise Measurement Data

Monitoring Location	Daytime (07:00-19:00) Average $L_{eq, 1hr}$ (dBA)	Daytime (07:00-19:00) Minimum $L_{eq, 1hr}$ (dBA)	Daytime (07:00-19:00) Maximum $L_{eq, 1hr}$ (dBA)	Evening (19:00-23:00) Average $L_{eq, 1hr}$ (dBA)	Evening (19:00-23:00) Minimum $L_{eq, 1hr}$ (dBA)	Evening (19:00-23:00) Maximum $L_{eq, 1hr}$ (dBA)	Night (23:00-07:00) Average $L_{eq, 1hr}$ (dBA)	Night (23:00-07:00) Minimum $L_{eq, 1hr}$ (dBA)	Night (23:00-07:00) Maximum $L_{eq, 1hr}$ (dBA)
MO_03W Hanna Avenue	62	58	67	62	61	63	59	54	64

Figure 4-1: Noise Monitoring Location near the Exhibition Station Early Works Project Footprint



5. Impact Assessment Results

Potential impacts of the noise and vibration associated with the construction of Exhibition Station early works have been assessed and are described in the following subsections.

Recommended mitigation measures and monitoring activities are presented in **Section 6**.

5.1 Noise

As discussed in **Section 3.2.1** a noise screening was conducted based upon conservative assumptions to determine if receptor-specific noise predictions are required. Noise screening mapping for Exhibition Station is presented in **Figure 5-1**. Results of the noise screening show that there are a number of noise sensitive receivers located within the screening distance, necessitating receptor-specific noise predictions.

The nearest noise sensitive receivers are located at 5 Hanna Avenue and 6 Pirandello Street. Note that 6 Pirandello Street shares structural footings with 65, 75 and 85 East Liberty Street and all three are at approximately the same setback from the Exhibition Station Early Works Project Footprint. Thus the predicted noise levels at 65, 75 and 85 East Liberty Street are the same as those at 6 Pirandello Street.

Exhibition Station Early Works Project Footprint is otherwise surrounded by commercial, and transportation land uses. Lands to the south of the Gardiner Expressway are the buildings associated with Exhibition Place, which are considered not noise sensitive. The predicted noise levels from the construction of the Exhibition Station early works are presented in **Table 5-1**.

Table 5-1: Construction Noise Prediction Results

Representative Receiver	Assessment Criteria (day $L_{eq,8hr}$/ night $L_{eq,8ih}$)	Site Preparation Predicted $L_{eq, 8hr}$ [dBA]	Site Services (Utility Relocation) Predicted $L_{eq, 8hr}$ [dBA]	Demolition Predicted $L_{eq, 8hr}$ [dBA]	Excavation/ Grading Predicted $L_{eq, 8hr}$ [dBA]	Structure Construction Predicted $L_{eq, 8hr}$ [dBA]	Bridge Span Installation Predicted $L_{eq, 8hr}$ [dBA]	Trackwork Predicted $L_{eq, 8hr}$ [dBA]
5 Hanna Avenue (residential)	80/70	77	77	78	77	77	75	79
6 Pirandello Street (residential)	80/70	80	80	81	80	80	78	82

Results in the above table indicate that, without mitigation, the noise levels are predicted to exceed the adopted night time noise criteria in all scenarios. Recommendations to reduce the noise impacts are presented in **Section 6**.

5.2 Vibration

The construction equipment with the greatest potential impact for this project is the vibratory roller, and thus the screening distances calculated were based on the vibratory roller. The screening distances are:

- For perceptible vibration (annoyance) 0.14 mm/s (RMSV) – 33 metres;
- For buildings extremely susceptible to vibration damage 3.0 mm/s – 11.1 metres;
- City of Toronto Screening 5.0 mm/s – 7.9 metres; and,
- City of Toronto Prohibited Limit 8.0 mm/s – 5.8 metres.

Mapping of the vibration screening distances in **Figure 5-2** shows that vibration levels may be perceptible at the following commercial buildings within the Exhibition Station Early Works Project Footprint:

- 15 Atlantic Avenue;
- 2-20 Atlantic Avenue/28 Atlantic Avenue[4];
- 1 Fraser Avenue;
- 3 Mowat Avenue/2 Fraser Avenue[5]; and,
- Chimney and accessory building at 1 Atlantic Avenue.

There are no structures on properties that are known or potential built heritage resources located within the screening distance, with the exception of 1 Atlantic Avenue main building, accessory building and chimney which are located within the screening distances for building damage. **Table 1-2** notes that the main building at 1 Atlantic Avenue will be demolished and removed as part of the Exhibition Station early works; however, the chimney and accessory building on the property will be retained.

Without mitigation measures, the City of Toronto vibration limits may be exceeded at the Gardiner Expressway. A detailed review of expected vibration levels (with finalized construction areas and equipment) with respect to the Gardiner Expressway footings is required in the next stage of design.

4. 2-20 Atlantic Avenue and 28 Atlantic Avenue are located within the same building.
5. 3 Mowat Avenue and 2 Fraser Avenue are located within the same building.

15 Atlantic Avenue is at the limit of the ZOI (City of Toronto Screening and Prohibited Limit – see **Figure 5-2**). A further review of the expected levels (with finalized construction areas and equipment) with respect to 15 Atlantic Avenue is required in the next stage of design.

Figure 5-1: Noise Screening for the Exhibition Station Early Works Project Footprint

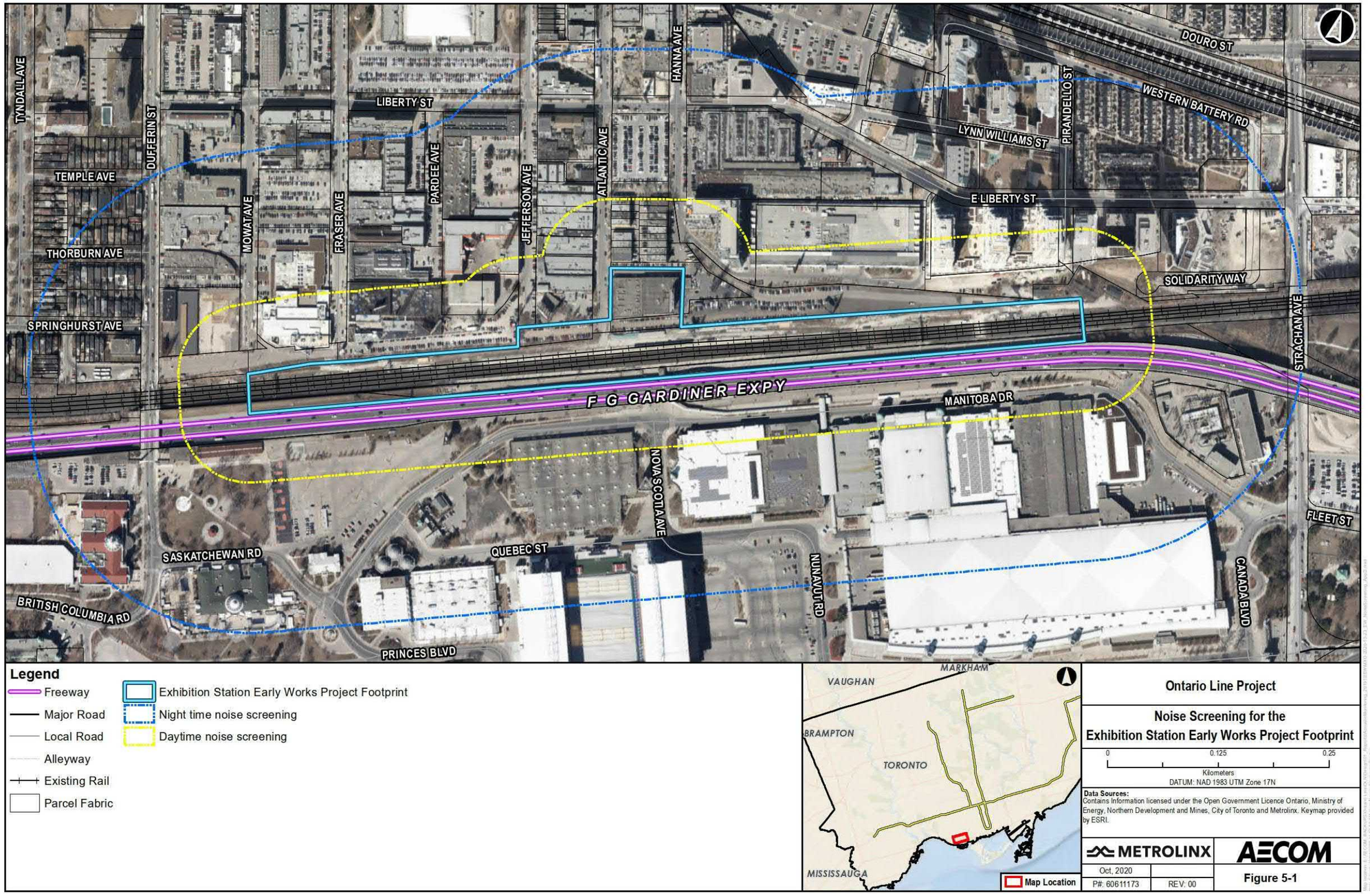
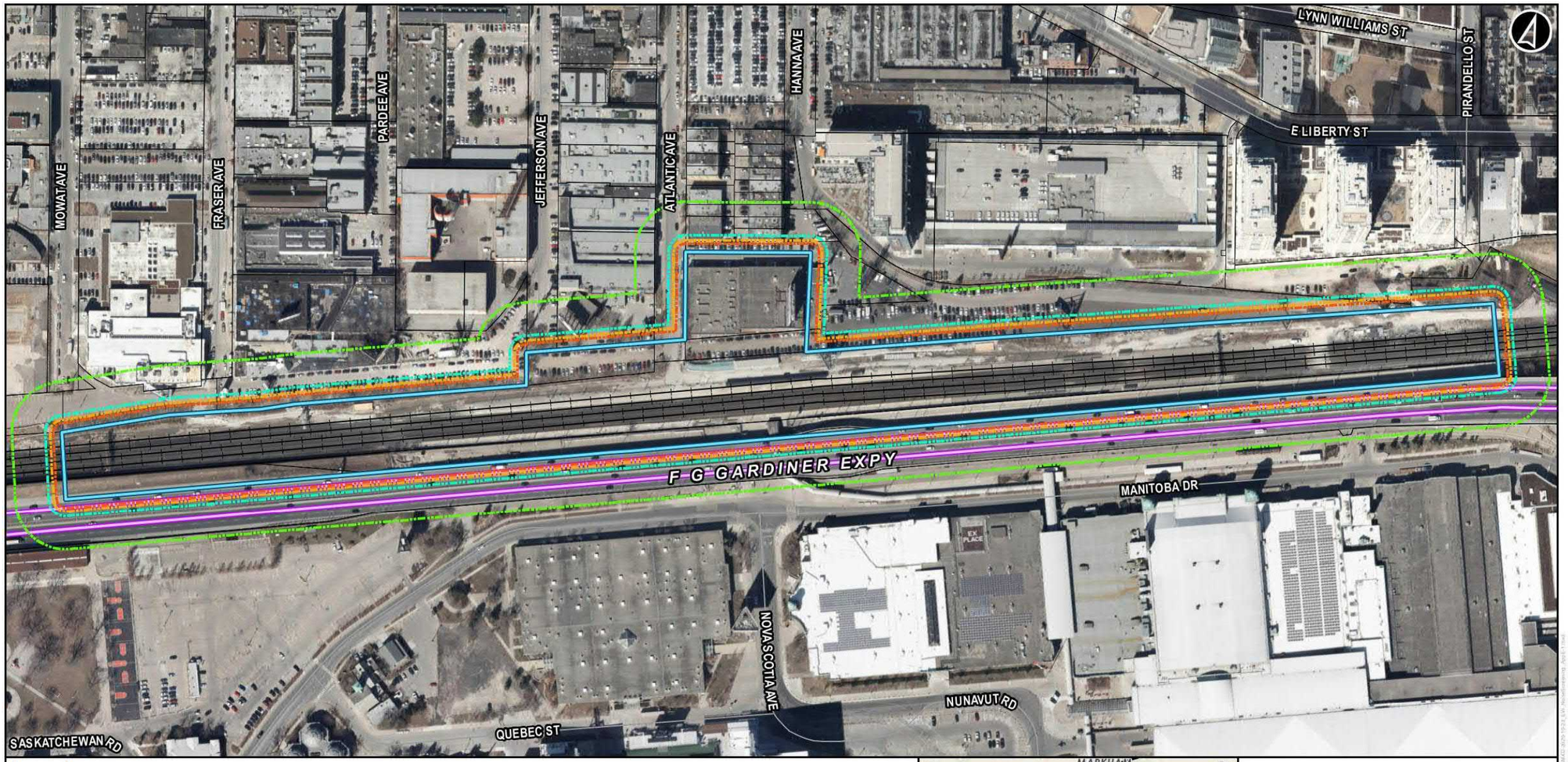


Figure 5-2: Vibration Screening for the Exhibition Station Early Works Project Footprint



6. 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.

The results of the above assessment indicate that mitigation and monitoring will be required. Recommended mitigation measures and monitoring activities to be carried forward and refined in the next phases of design are summarized below. Additional mitigation measures can be considered in the subsequent phases of design. Note that noise and vibration impacts due to the construction of the Exhibition Station early works are temporary and will cease once construction has been completed. A summary of potential impacts, mitigation measures, commitments, and monitoring activities to verify mitigation measure effectiveness for this Project is provided in **Table 6-1**.

6.1 Mitigation Measures – General Recommendations

General mitigation recommendations are typical measures applicable to most construction projects and include best practices to decrease potential impacts. Preliminary recommendations to be further refined and updated in the next phases of design are described in the subsections below.

6.1.1 Noise

Mitigation measures to be investigated during the next phases of design for construction noise levels to meet the applicable criteria include but are not limited to the following:

- Comply with applicable noise guidelines from the MECP including NPC-115 and NPC-118;
- Operate construction equipment during daytime hours and avoid night time operations where feasible, in an effort to minimize the potential for complaints;
- If construction will occur outside of normal daytime hours, inform local residents of the type of construction and expected duration outside of daytime hours prior to commencing work;
- Use of upgraded construction hoarding (considering requirements from CSA Z107.9, Standard for Certification of Noise Barriers) between construction equipment and noise sensitive receivers;

- Evaluate acoustic enclosures for equipment such as generators and compressors;
- Use of localized noise barriers for specific equipment and operations;
- Minimize simultaneous operation of equipment where possible;
- Implement a no idling policy on site (unless necessary for equipment operation);
- Use of broadband back up signals instead of tonal backup signals; and,
- Arrange site to avoid vehicle traveling in reverse if possible.

Re-evaluation of mitigation requirements should be completed in the next phases of design to account for design and construction methodology updates.

6.1.2 Vibration

Mitigation measures to be investigated during the next phases of design for construction vibration levels to meet applicable criteria include but are not limited to the following:

- Update ZOI mapping and predictions based upon finalized site staging, construction operational areas, and building locations; location and number of structures within the ZOI may change. As ZOI mapping was based upon a vibratory roller, the associated ZOI setback distances could decrease if equipment with lower vibration emissions are used;
- Update ZOI assessment for sensitive infrastructure such as the Gardiner Expressway footings and utilities in vicinity of Exhibition Station Early Works Project Footprint;
- Conduct monitoring and preconstruction inspections in accordance with City of Toronto By-law 514-2008. Monitoring and preconstruction requirements can be determined by the distance between the construction equipment operation area and sensitive receivers;
- Provide smooth surfaces for trucks to travel;
- Operate during daytime where possible;
- Route heavily loaded trucks away from vibration sensitive sites where possible;
- Manage the sequence of construction phases such as demolition, earth-moving, and ground-impacting operations to not occur in the same period, to the extent possible;
- Operate construction equipment on lower vibration settings where available;
- Maximize distance between equipment and sensitive receivers where possible; and,

- Do not operate equipment at setback distances less than the prohibited ZOI. Use alternative means of construction within these distances that result in vibration levels below the City of Toronto's prohibited vibration limits. Note that ZOI was calculated based upon generic equipment. Equipment with lower vibration emissions, or power settings, can be used provided that vibration levels do not exceed the City of Toronto's prohibited vibration limits.

Re-evaluation of mitigation requirements should be completed in the next phases of design to account for design and construction methodology updates.

6.2 Mitigation Measures – Site-Specific Recommendations

Mitigation recommendations specific to the Exhibition Station early works, to be further refined and updated in the next phases of design, are described in **Section 6.2.1** and **Section 6.2.2** below.

6.2.1 Noise

Mitigation measures will be investigated and updated during the next phases of design for construction noise levels to be below applicable criteria limits. The following noise mitigation measures should be considered to decrease construction noise impacts:

- Consider construction work shift duration limits for the portion of the Exhibition Station Early Works Project Footprint near 5 Hanna Avenue and 6 Pirandello Street (and associated 65, 75 and 85 East Liberty Street); and,
- Use temporary movable noise screens for the loudest construction activities.

6.2.2 Vibration

Mitigation measures to be further refined and updated during the next phases of design, for construction vibration levels to be below applicable criteria limits, include:

- Use alternative means of construction within 5.8 metres of structures that result in vibration levels below the City of Toronto's prohibited vibration limits. This is specific to the commercial complex at 15 Atlantic Avenue;
- Use alternative means of construction within 11.1 metres of structures that result in vibration levels below the limit for buildings extremely susceptible for vibration damage. This is specific to the chimney and accessory building at 1 Atlantic Avenue; and,

- Update construction vibration analysis with respect to the Gardiner Expressway footings and, as stated in the **Section 2**, review other applicable vibration limits that may apply such as City of Toronto Specification GN117SS which includes limits for trunk sewers and bridge structures.

6.3 Potential Impacts, Mitigation Measures and Monitoring Activities Summary

Table 6-1 below presents a summary of potential impacts, mitigation measures and monitoring activities to verify mitigation measure effectiveness.

Table 6-1: Potential Noise and Vibration Impacts, Mitigation Measures and Monitoring Activities for the Exhibition Station Early Works

Environmental Component	Potential Impact	Mitigation Measure(s)	Monitoring Activities
Construction Noise	▪ Environmental noise may cause annoyance and disturb sleep and other activities. ▪ The severity of the noise effects resulting from construction projects varies, depending on: – Scale, location and complexity of the Project – Construction methods, processes and equipment deployed – Total duration of construction near sensitive noise receivers – Construction activity periods (days, hours, time period) – Number and proximity of noise-sensitive sites to construction area(s)	Construction noise impact mitigation measures to be considered include but are not limited to the following to meet applicable noise criteria: ▪ Siting construction staging and laydown areas to avoid/reduce adverse impacts to sensitive receptors where possible. ▪ Use construction equipment compliant with noise level specifications in MECP guidelines NPC-115 and NPC-118. ▪ Keep equipment in good working order and operate with effective muffling devices. ▪ Equipment enclosures for equipment such as generators and compressors. ▪ Additional equipment silencers/mufflers. ▪ Use of upgraded construction hoarding (considering requirements from CSA Z107.9 for noise barriers) between construction equipment and noise sensitive receivers. ▪ Use of localized movable noise barriers/screens for specific equipment and operations; including on corridor construction works. ▪ Minimize simultaneous operation of equipment where possible. ▪ Implement a no idling policy on site (unless necessary for equipment operation). ▪ Restrict construction hours where possible: – Perform construction during daytime hours where possible. If night time construction is necessary, the activities with the highest noise levels should be conducted during day time periods where possible. – If construction will occur outside of normal daytime hours, inform local residents before construction of type of construction and expected duration outside of daytime hours. – Consider operational duration limits for construction on the portion of the Exhibition Station Early Works Project Footprint near 5 Hanna Avenue and 6 Pirandello Street (and the attached 65, 75 and 85 East Liberty Street). ▪ Establish and apply project-specific construction noise criteria/exposure limits. ▪ Undertake noise monitoring and regular reporting throughout the construction phase. Where noise level limits are exceeded, additional noise mitigation measures shall be implemented. ▪ Develop a communications protocol which includes timely resolution of complaints. ▪ Additional mitigation measures not listed above may be considered.	▪ Noise levels will be monitored where the impact assessment indicates that noise limits may be exceeded, to identify if any additional mitigation is required. ▪ Noise levels will be monitored to verify mitigation measure(s) effectiveness. ▪ Continuous noise monitoring should be completed at each geographically distinct active construction site associated with the Project with monitor(s) located strategically to capture the worst-case construction related noise levels at receptor locations based on planned construction activities, their locations, and the number, geographic distribution and proximity of noise sensitive receptors. ▪ Monitoring at locations where there are persistent complaints, as required.
Construction Vibration	▪ Exposure to vibration may result in public annoyance and complaints. Vibration may also cause damage to buildings and other structures.	Construction vibration impact mitigation measures to be considered include but are not limited to the following to meet applicable vibration criteria: ▪ Siting construction staging and laydown areas to avoid/reduce adverse impacts to sensitive receptors where possible. ▪ Utilize equipment with low vibration emissions where possible. ▪ Off-site construction of components away from sensitive areas. ▪ Restrict construction hours: – Perform construction during daytime hours where possible. If night time construction is necessary, the activities with the highest vibration levels should be conducted during the daytime periods where possible. ▪ Update ZOI mapping and predictions based upon refined site staging, equipment, construction areas, and building locations prior to the commencement of construction. ▪ Specific to the commercial complex at 15 Atlantic Avenue: Use alternative means of construction within 5.8 metres of structures so that the City of Toronto's prohibited vibration level limits are not exceeded.	▪ Monitoring will be undertaken at locations within the ZOI to ensure compliance with the City of Toronto By-law 514-2008 and to identify the need for additional mitigation if required. ▪ Monitoring will be undertaken to ensure compliance with other applicable vibration level limits identified, as required. ▪ Monitoring will be undertaken to verify mitigation measure(s) effectiveness. ▪ Pre-construction building inspection of the potentially impacted buildings adjacent to the early works construction site are to be undertaken in accordance with City of Toronto By-law 514-2008. Continuous

Environmental Component	Potential Impact	Mitigation Measure(s)	Monitoring Activities
		▪ Specific to the chimney and accessory building at 1 Atlantic Avenue: Use alternative means of construction within 11.1 metres of structures so that the vibration level limits for susceptible buildings are not exceeded. ▪ Review and refine construction activities in proximity to the Gardiner Expressway and, if required, conduct a more detailed construction vibration analysis with respect to the Gardiner Expressway footings and review other applicable vibration limits that may apply, such as the City of Toronto Specification GN117SS. ▪ Conduct monitoring and pre-construction inspections in accordance with City of Toronto By-law 514-2008. Monitoring and preconstruction requirements can be determined by calculation of ZOI of construction equipment. ▪ Provide smooth surfaces for trucks to travel and route heavily loaded trucks away from vibration sensitive sites where possible. ▪ Operate construction equipment on lower vibration settings where available. ▪ Maximize distance between equipment and sensitive receivers where possible. ▪ Establish and apply project-specific construction noise criteria/exposure limits. ▪ Do not operate equipment where the City of Toronto By-law 514-2008 prohibited limits are predicted to be exceeded. Alternative construction methods and/or equipment with lower vibration emissions or power settings can be used if they do not exceed the City of Toronto's prohibited vibration limits. ▪ As Project planning and design progress, conduct a review to identify any sensitive structures/operations that require more stringent vibration limits than the limits in City of Toronto By-law 514-2008; assess requirements, review/revise vibration limits for these locations and, if necessary, develop additional mitigation measures. US FTA Report No. 0123, Transit Noise and Vibration Impact Assessment Manual (2018) could be used as a source of additional criteria. ▪ Develop communications protocol which includes timely resolution of complaints; ▪ Additional mitigation measures not listed above may be considered.	vibration monitoring along the construction site property lines closest to these structures will be initiated as warranted. ▪ Monitoring at locations where there are persistent complaints, as required.

7. Permits and Approvals

At this time, provincial noise or vibration permits or approvals are not anticipated to be required. This will be confirmed during the next Project phases.

A construction vibration control form is typically required to accompany a building permit as per City of Toronto By-law 514-2008. This will be confirmed during the design and implementation phases of the Exhibition Station early works.

Should a building permit be required, Metrolinx will consult with the City of Toronto.

Metrolinx as a Crown agency of the Province of Ontario is exempt from certain municipal processes and requirements. In these circumstances, Metrolinx will engage with the City of Toronto to incorporate municipal requirements as a best practice, where practical, and may obtain associated permits and approvals.

8. References

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Ontario Line Final Environmental Conditions Report. Prepared for Metrolinx.

City of Toronto, 2019:
By-law 878-2019 (Noise) – Municipal Code 591, June 2019.

City of Toronto, 2008:
By-law 514-2008 (Construction Vibration) – Municipal Code 363.

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ISO 9613-2: Acoustics - Attenuation of Sound during Propagation Outdoors Part 2: General Method of Calculation

Ministry of the Environment and Energy (MOEE) and GO Transit, 1994:
MOEE/Go Transit Noise and Vibration Protocol.

Ontario Ministry of the Environment, 1978:
Publication NPC-115: Construction Equipment.

Ontario Ministry of the Environment, 1978:
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Ontario Ministry of the Environment, 1978:
Publication NPC-119: Blasting.

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Publication NPC-207: Impulse Vibration in Residential Buildings.

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United States Federal Highway Administration, 2006:
Roadway Construction Noise Model.

United States Federal Transit Administration, 2018:
Transit Noise and Vibration Impact Assessment Manual, September

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Appendix A

Terminology

Appendix A. Terminology

Term	Definition
Sound	Pressure wave travelling through a medium, such as air.
Noise	Unwanted sound.
Acoustics	The science of sound propagation and transmission.
Vibration	Oscillation of a parameter that defines the motion of a mechanical system.
Decibel, dB	A logarithmic ratio, not strictly a unit, used to describe sound levels. For sound pressure, the reference level is 20 micro pascals (threshold of hearing).
Frequency	The rate at which an event is repeated. Measured in Hertz (Hz), where 1 Hz = 1 oscillation/sec. Normal human hearing extends over a range of frequencies from about 20 Hz to about 20 kHz.
Octave Band	A band of frequencies where the upper limiting frequency is twice the lower limiting frequency. Octave bands are identified by their centre-frequencies. The octave bands standardized for acoustic measurements include those centred at 31.5, 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hz.
A-Weighting Network, dBA	A frequency weighting network intended to represent the variation in the ear's ability to hear different frequencies. Overall sound levels calculated or measured using the A-weighting network are indicated by dBA rather than dB.
Sound Pressure Level (SPL, L_p)	A measurement of instantaneous sound pressure and equal to 10 times the logarithm (base 10) of the ratio of the instantaneous sound pressure of a sound divided by the reference sound pressure of 20 µPa (0 dB). Reported and measured in decibels (dB or dBA).
L_{eq} - "Equivalent sound level"	Value of a constant sound pressure level which would result in the same total sound energy as would the measured time-varying sound pressure level over equivalent time duration. The $L_{eq, 1hr,}$ for example, describes the equivalent continuous sound level over a 1-hour period.
Peak Particle Velocity (PPV)	The peak signal value of an oscillating vibration velocity waveform. Can be expressed in mm/s.
Root Mean Square Velocity (RMSV)	The square root of the mean-square value of an oscillating vibration velocity waveform, where the mean-square value is obtained by squaring the value of amplitudes at each instant in time and then averaging these values over the sample time.
Vibration Decibel, VdB	A logarithmic ratio, not strictly a unit, used to describe felt vibration.

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Appendix B

Example Calculation

Job Name:	Ontario Line Early Works
Job Number:	60611173
Date:	17-Jul-20
Title:	Noise Screening
Description:	Noise Screening Calcs - Assuming Augured piling

ref dist (m) 15.24

Equipment	reference (dBA)	usage factor	Calc to PWL	Incorp - Usage factor
Auger Piling Equipm	85	20	116.6	109.7
Rammed Aggregate	90	20	121.6	114.7
Backhoe2	80	40	111.6	107.7
Chain Saw	85	20	116.6	109.7
Compactor (ground)	80	20	111.6	104.7
Compressor (air)	80	40	111.6	107.7
Concrete mixer truc	85	40	116.6	112.7
Concrete pump truc	82	20	113.6	106.7
Concrete saw	90	20	121.6	114.7
Crane (mobile)	85	16	116.6	108.7
Dozer	85	40	116.6	112.7
Dump/flatbed truck	84	40	115.6	111.7
Excavator2	80	40	111.6	107.7
Front end loader2	80	40	111.6	107.7
Generator	82	50	113.6	110.6
Grader2	85	40	116.6	112.7
Hoe Ram	90	20	121.6	114.7
Jack Hammer	89	20	120.6	113.7
Man Lift	85	20	116.6	109.7
Pavement Scarifier4	85	20	116.6	109.7
Pumps	77	50	108.6	105.6
Rail Saw5	90	20	121.6	114.7
Roller	85	20	116.6	109.7
Vibratory Concrete I	80	20	111.6	104.7
Vacuum Excavator	85	40	116.6	112.7
Ballast Equalizer6	82	40	113.6	109.7
Ballast Tamper1	83	40	114.6	110.7
Spike Driver7	77	20	108.6	101.7
Tie Cutter8	84	20	115.6	108.7
Tie Handler9	80	40	111.6	107.7
Tie Inserter9	85	40	116.6	112.7
			Total (dBA)	125.9
			Dist for 80 dBA (m)	78.3
			Dist for 70 dBA (m)	247.5

Job Name:	Ontario Line Early Works
Job Number:	60611173
Date:	17-Jul-20
Title:	Vibration Zone of Influence
Description:	Vibration Zone of Influence Inputs and Parameters

$$PPV = PPV_{ref} * \left(\frac{D_{ref}}{D}\right)^{1.5}$$

$$D = D_{ref} * \left(\frac{PPV_{ref}}{PPV}\right)^{2/3}$$

$$L_v = L_{v,ref} - 30 \log\left(\frac{D}{D_{ref}}\right)$$

$$D = D_{ref} * 10^{\frac{L_{v,ref} - L_v}{30}}$$

$$L_v = 20 \log\left(\frac{v_{rms}}{v_{ref}}\right)$$

Reference Vibration Levels

	Reference PPV				Lv,ref				
	Dref		PPV		Dref			Vref	
Equipment	ft	m	in/sec	mm/s	ft	m	Lv,ref	in	mm
Vibratory Roller	25	7.62	0.210	5.334	25	7.62	94	0.000001	0.0000254
HoeRam	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
Large dozer	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
Small dozer	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
Caisson Drilling	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
Trucks	25	7.62	0.076	1.930	25	7.62	86	0.000001	0.0000254
Jackhammers	25	7.62	0.035	0.889	25	7.62	79	0.000001	0.0000254
Auger Pile	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
Backhoe	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
Ground compactor	25	7.62	0.035	0.889	25	7.62	79	0.000001	0.0000254
concrete mix truck	25	7.62	0.076	1.930	25	7.62	86	0.000001	0.0000254
Concrete pump truck	25	7.62	0.076	1.930	25	7.62	86	0.000001	0.0000254
Dozer	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
Dump/flatbed truck	25	7.62	0.076	1.930	25	7.62	86	0.000001	0.0000254
excavator	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
front end loader	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
grader	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
hoe ram	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
jack hammer	25	7.62	0.035	0.889	25	7.62	79	0.000001	0.0000254
pavement scarifier	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
roller	25	7.62	0.210	5.334	25	7.62	94	0.000001	0.0000254
vibratory concrete mixer	25	7.62	0.035	0.889	25	7.62	79	0.000001	0.0000254
Ballast equalizer	25	7.62	0.003	0.076	25	7.62	58	0.000001	0.0000254
ballast tamper	25	7.62	0.089	2.261	25	7.62	87	0.000001	0.0000254
spike driver	25	7.62	0.035	0.889	25	7.62	79	0.000001	0.0000254

Job Name:	Ontario Line Early Works
Job Number:	60611173
Date:	17-Jul-20
Title:	Vibration Zone of Influence
Description:	Bylaw 514

Zone of Influence - Bylaw 514

Equipment	8.0 mm/s m	5.0 mm/s m
Auger Pile	3.3	4.5
Backhoe	0.3	0.5
Ground compactor	1.8	2.4
concrete mix truck	3.0	4.0
Concrete pump truck	3.0	4.0
Dozer	3.3	4.5
Dump/flatbed truck	3.0	4.0
excavator	0.3	0.5
front end loader	0.3	0.5
grader	0.3	0.5
hoe ram	3.3	4.5
jack hammer	1.8	2.4
pavement scarifier	0.3	0.5
roller	5.8	7.9
vibratory concrete mixer	1.8	2.4
Ballast equalizer	0.3	0.5
ballast tamper	3.3	4.5
spike driver	1.8	2.4

Job Name:	Ontario Line Early Works
Job Number:	60611173
Date:	17-Jul-20
Title:	Vibration Zone of Influence
Description:	Vibration Zone of Influence Calculation - 0.14 mm/s

Zone of Influence - 0.14 mm/s

Equipment	Lv,criteria for calc	Zone of influence	
		m	ft
Auger Pile	74.8258864	19	64
Backhoe	74.8258864	2	7
Ground compactor	74.8258864	10	34
Dump/flatbed truck	74.8258864	18	59
excavator	74.8258864	2	7
front end loader	74.8258864	2	7
grader	74.8258864	2	7
hoe ram	74.8258864	19	64
jack hammer	74.8258864	10	34
pavement scarifier	74.8258864	2	7
roller	74.8258864	33	109
vibratory concrete mixer	74.8258864	10	34
Ballast equalizer	74.8258864	2	7
ballast tamper	74.8258864	19	64
spike driver	74.8258864	10	34

Receiver
Name: R04
ID: 5 Hanna Avenue
X: 311404.90 m
Y: 4833019.40 m
Z: 111.58 m

Area Source, ISO 9613, Name: "", ID: "Prep_trk_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
1	311433.36	4832962.13	86.96	0	DEN	1000	91.8	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	65.3
2	311419.29	4832957.63	87.18	0	DEN	1000	91.8	18.5	0.0	0.0	0.0	47.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	65.4
3	311441.34	4832960.22	86.71	0	DEN	1000	91.8	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	67.6
4	311412.71	4832948.71	86.76	0	DEN	1000	91.8	21.8	0.0	0.0	0.0	48.5	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	67.7
5	311419.92	4832953.33	86.93	0	DEN	1000	91.8	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	65.1
6	311434.94	4832953.67	86.58	0	DEN	1000	91.8	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	64.6

Area Source, ISO 9613, Name: "", ID: "Prep_dozer_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7	311433.36	4832962.13	86.96	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	58.5
8	311419.29	4832957.63	87.18	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	47.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.6
9	311441.34	4832960.22	86.71	0	DEN	1000	85.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	60.9
19	311412.71	4832948.71	86.76	0	DEN	1000	85.0	21.8	0.0	0.0	0.0	48.5	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	61.0
20	311419.92	4832953.33	86.93	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	58.3
21	311434.94	4832953.67	86.58	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	57.8

Area Source, ISO 9613, Name: "", ID: "Prep_grader_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
10	311433.36	4832962.13	86.96	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	58.5
11	311419.29	4832957.63	87.18	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	47.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.6
12	311441.34	4832960.22	86.71	0	DEN	1000	85.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	60.9
16	311412.71	4832948.71	86.76	0	DEN	1000	85.0	21.8	0.0	0.0	0.0	48.5	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	61.0
17	311419.92	4832953.33	86.93	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	58.3
18	311434.94	4832953.67	86.58	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	57.8

Area Source, ISO 9613, Name: "", ID: "Prep_roller_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
23	311433.36	4832962.13	86.96	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.5
25	311419.29	4832957.63	87.18	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	47.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	55.6
27	311441.34	4832960.22	86.71	0	DEN	1000	82.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	57.9
31	311412.71	4832948.71	86.76	0	DEN	1000	82.0	21.8	0.0	0.0	0.0	48.5	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	58.0
33	311419.92	4832953.33	86.93	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.3
35	311434.94	4832953.67	86.58	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	54.8

Area Source, ISO 9613, Name: "", ID: "Prep_chainsaw_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
28	311433.36	4832962.13	85.56	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	47.8	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.4
29	311419.29	4832957.63	85.78	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.5
30	311441.34	4832960.22	85.31	0	DEN	1000	82.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	57.8
37	311412.71	4832948.71	85.36	0	DEN	1000	82.0	21.8	0.0	0.0	0.0	48.6	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	57.9
38	311419.92	4832953.33	85.53	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.3
39	311434.94	4832953.67	85.18	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	54.8

Area Source, ISO 9613, Name: "", ID: "Prep_loader_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
40	311433.36	4832962.13	86.96	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	53.5
41	311419.29	4832957.63	87.18	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	47.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	53.6
42	311441.34	4832960.22	86.71	0	DEN	1000	80.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.9
53	311412.71	4832948.71	86.76	0	DEN	1000	80.0	21.8	0.0	0.0	0.0	48.5	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	56.0

Area Source, ISO 9613, Name: "", ID: "Prep_loader_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
55	311419.92	4832953.33	86.93	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	53.3
56	311434.94	4832953.67	86.58	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	52.8

Area Source, ISO 9613, Name: "", ID: "Prep_exca_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
44	311433.36	4832962.13	86.96	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	53.5
46	311419.29	4832957.63	87.18	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	47.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	53.6
48	311441.34	4832960.22	86.71	0	DEN	1000	80.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.9
49	311412.71	4832948.71	86.76	0	DEN	1000	80.0	21.8	0.0	0.0	0.0	48.5	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	56.0
50	311419.92	4832953.33	86.93	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	53.3
51	311434.94	4832953.67	86.58	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	52.8

Area Source, ISO 9613, Name: "", ID: "Prep_pump_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
58	311433.36	4832962.13	85.56	0	DEN	1000	78.0	18.5	0.0	0.0	0.0	47.8	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	51.4
59	311419.29	4832957.63	85.78	0	DEN	1000	78.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	51.5
60	311441.34	4832960.22	85.31	0	DEN	1000	78.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	53.8
61	311412.71	4832948.71	85.36	0	DEN	1000	78.0	21.8	0.0	0.0	0.0	48.6	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	53.9
62	311419.92	4832953.33	85.53	0	DEN	1000	78.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	51.3
64	311434.94	4832953.67	85.18	0	DEN	1000	78.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	50.7

Area Source, ISO 9613, Name: "", ID: "Prep_trk_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
66	311749.55	4833072.00	85.41	0	DEN	1000	91.8	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	56.4
68	311763.31	4833080.95	85.41	0	DEN	1000	91.8	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	55.7

Area Source, ISO 9613, Name: "", ID: "Prep_compact_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
72	311433.36	4832962.13	85.56	0	DEN	1000	77.0	18.5	0.0	0.0	0.0	47.8	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	50.4
73	311419.29	4832957.63	85.78	0	DEN	1000	77.0	18.5	0.0	0.0	0.0	47.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	50.5
74	311441.34	4832960.22	85.31	0	DEN	1000	77.0	21.5	0.0	0.0	0.0	48.4	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	52.8
77	311412.71	4832948.71	85.36	0	DEN	1000	77.0	21.8	0.0	0.0	0.0	48.6	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	52.9
79	311419.92	4832953.33	85.53	0	DEN	1000	77.0	18.8	0.0	0.0	0.0	48.2	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	50.3
80	311434.94	4832953.67	85.18	0	DEN	1000	77.0	18.8	0.0	0.0	0.0	48.7	0.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.7

Area Source, ISO 9613, Name: "", ID: "Prep_dozer_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
81	311749.55	4833072.00	85.41	0	DEN	1000	85.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.6
86	311763.31	4833080.95	85.41	0	DEN	1000	85.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	48.9

Area Source, ISO 9613, Name: "", ID: "Prep_grader_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
84	311749.55	4833072.00	85.41	0	DEN	1000	85.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.6
90	311763.31	4833080.95	85.41	0	DEN	1000	85.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	48.9

Area Source, ISO 9613, Name: "", ID: "Prep_chainsaw_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
94	311749.55	4833072.00	84.01	0	DEN	1000	82.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	46.6
99	311763.31	4833080.95	84.01	0	DEN	1000	82.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	45.9

Area Source, ISO 9613, Name: "", ID: "Prep_roller_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
98	311749.55	4833072.00	85.41	0	DEN	1000	82.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	46.6
103	311763.31	4833080.95	85.41	0	DEN	1000	82.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	45.9

Area Source, ISO 9613, Name: "", ID: "Prep_loader_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
107	311749.55	4833072.00	85.41	0	DEN	1000	80.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	44.6
115	311763.31	4833080.95	85.41	0	DEN	1000	80.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	43.9

Area Source, ISO 9613, Name: "", ID: "Prep_exca_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
111	311749.55	4833072.00	85.41	0	DEN	1000	80.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	44.6
119	311763.31	4833080.95	85.41	0	DEN	1000	80.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	43.9

Area Source, ISO 9613, Name: "", ID: "Prep_pump_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
124	311749.55	4833072.00	84.01	0	DEN	1000	78.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	42.6
125	311763.31	4833080.95	84.01	0	DEN	1000	78.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	41.9

Area Source, ISO 9613, Name: "", ID: "Prep_compact_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
127	311749.55	4833072.00	84.01	0	DEN	1000	77.0	24.8	0.0	0.0	0.0	61.9	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	41.6
129	311763.31	4833080.95	84.01	0	DEN	1000	77.0	24.5	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	40.9

Receiver
Name: 6 Pirandello Street
ID: 6 Pirandello Street
X: 311739.54 m
Y: 4833118.46 m
Z: 108.79 m

Area Source, ISO 9613, Name: "", ID: "Prep_trk_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
13	311762.84	4833083.02	85.41	0	DEN	1000	91.8	18.5	0.0	0.0	0.0	44.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	68.4
14	311748.77	4833078.53	85.43	0	DEN	1000	91.8	18.5	0.0	0.0	0.0	44.5	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	68.6
15	311770.82	4833081.11	85.41	0	DEN	1000	91.8	21.5	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	70.4
22	311742.19	4833069.61	85.41	0	DEN	1000	91.8	21.8	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	70.7
24	311749.40	4833074.22	85.42	0	DEN	1000	91.8	18.8	0.0	0.0	0.0	45.2	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	68.2
26	311764.42	4833074.56	85.41	0	DEN	1000	91.8	18.8	0.0	0.0	0.0	45.9	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	67.4

Area Source, ISO 9613, Name: "", ID: "Prep_dozer_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
32	311762.84	4833083.02	85.41	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	44.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	61.6
34	311748.77	4833078.53	85.43	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	44.5	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	61.8
36	311770.82	4833081.11	85.41	0	DEN	1000	85.0	21.5	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	63.7
52	311742.19	4833069.61	85.41	0	DEN	1000	85.0	21.8	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	63.9
54	311749.40	4833074.22	85.42	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	45.2	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	61.4
57	311764.42	4833074.56	85.41	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	45.9	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	60.7

Area Source, ISO 9613, Name: "", ID: "Prep_grader_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
43	311762.84	4833083.02	85.41	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	44.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	61.6
45	311748.77	4833078.53	85.43	0	DEN	1000	85.0	18.5	0.0	0.0	0.0	44.5	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	61.8
47	311770.82	4833081.11	85.41	0	DEN	1000	85.0	21.5	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	63.7
63	311742.19	4833069.61	85.41	0	DEN	1000	85.0	21.8	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	63.9
65	311749.40	4833074.22	85.42	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	45.2	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	61.4
67	311764.42	4833074.56	85.41	0	DEN	1000	85.0	18.8	0.0	0.0	0.0	45.9	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	60.7

Area Source, ISO 9613, Name: "", ID: "Prep_chainsaw_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
69	311762.84	4833083.02	84.01	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	44.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.5
70	311748.77	4833078.53	84.03	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	44.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.7
71	311770.82	4833081.11	84.01	0	DEN	1000	82.0	21.5	0.0	0.0	0.0	45.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	60.5
87	311742.19	4833069.61	84.01	0	DEN	1000	82.0	21.8	0.0	0.0	0.0	45.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	60.8
88	311749.40	4833074.22	84.02	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	45.3	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.3
89	311764.42	4833074.56	84.01	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	46.0	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	57.6

Area Source, ISO 9613, Name: "", ID: "Prep_roller_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
75	311762.84	4833083.02	85.41	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	44.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.6
76	311748.77	4833078.53	85.43	0	DEN	1000	82.0	18.5	0.0	0.0	0.0	44.5	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.8
78	311770.82	4833081.11	85.41	0	DEN	1000	82.0	21.5	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	60.6
82	311742.19	4833069.61	85.41	0	DEN	1000	82.0	21.8	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	60.9
83	311749.40	4833074.22	85.42	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	45.2	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.4
85	311764.42	4833074.56	85.41	0	DEN	1000	82.0	18.8	0.0	0.0	0.0	45.9	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	57.6

Area Source, ISO 9613, Name: "", ID: "Prep_exca_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
91	311762.84	4833083.02	85.41	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	44.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.6
92	311748.77	4833078.53	85.43	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	44.5	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.8
93	311770.82	4833081.11	85.41	0	DEN	1000	80.0	21.5	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.7
104	311742.19	4833069.61	85.41	0	DEN	1000	80.0	21.8	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.9

Area Source, ISO 9613, Name: "", ID: "Prep_exca_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
105	311749.40	4833074.22	85.42	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	45.2	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.4
106	311764.42	4833074.56	85.41	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	45.9	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	55.7

Area Source, ISO 9613, Name: "", ID: "Prep_loader_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
95	311762.84	4833083.02	85.41	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	44.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.6
96	311748.77	4833078.53	85.43	0	DEN	1000	80.0	18.5	0.0	0.0	0.0	44.5	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.8
97	311770.82	4833081.11	85.41	0	DEN	1000	80.0	21.5	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.7
100	311742.19	4833069.61	85.41	0	DEN	1000	80.0	21.8	0.0	0.0	0.0	45.7	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	58.9
101	311749.40	4833074.22	85.42	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	45.2	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.4
102	311764.42	4833074.56	85.41	0	DEN	1000	80.0	18.8	0.0	0.0	0.0	45.9	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	55.7

Area Source, ISO 9613, Name: "", ID: "Prep_pump_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
108	311762.84	4833083.02	84.01	0	DEN	1000	78.0	18.5	0.0	0.0	0.0	44.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	54.5
109	311748.77	4833078.53	84.03	0	DEN	1000	78.0	18.5	0.0	0.0	0.0	44.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	54.7
110	311770.82	4833081.11	84.01	0	DEN	1000	78.0	21.5	0.0	0.0	0.0	45.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.5
112	311742.19	4833069.61	84.01	0	DEN	1000	78.0	21.8	0.0	0.0	0.0	45.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	56.8
113	311749.40	4833074.22	84.02	0	DEN	1000	78.0	18.8	0.0	0.0	0.0	45.3	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	54.3
114	311764.42	4833074.56	84.01	0	DEN	1000	78.0	18.8	0.0	0.0	0.0	46.0	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	53.5

Area Source, ISO 9613, Name: "", ID: "Prep_compact_2"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
116	311762.84	4833083.02	84.01	0	DEN	1000	77.0	18.5	0.0	0.0	0.0	44.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	53.5
117	311748.77	4833078.53	84.03	0	DEN	1000	77.0	18.5	0.0	0.0	0.0	44.6	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	53.7
118	311770.82	4833081.11	84.01	0	DEN	1000	77.0	21.5	0.0	0.0	0.0	45.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	55.5
120	311742.19	4833069.61	84.01	0	DEN	1000	77.0	21.8	0.0	0.0	0.0	45.8	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	55.8
121	311749.40	4833074.22	84.02	0	DEN	1000	77.0	18.8	0.0	0.0	0.0	45.3	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	53.3
122	311764.42	4833074.56	84.01	0	DEN	1000	77.0	18.8	0.0	0.0	0.0	46.0	0.2	-3.0	0.0	0.0	0.0	0.0	0.0	52.5

Area Source, ISO 9613, Name: "", ID: "Prep_trk_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
123	311420.07	4832951.11	86.76	0	DEN	1000	91.8	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	56.1
126	311433.83	4832960.05	86.89	0	DEN	1000	91.8	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	56.3

Area Source, ISO 9613, Name: "", ID: "Prep_grader_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
128	311420.07	4832951.11	86.76	0	DEN	1000	85.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.3
132	311433.83	4832960.05	86.89	0	DEN	1000	85.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.5

Area Source, ISO 9613, Name: "", ID: "Prep_dozer_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
130	311420.07	4832951.11	86.76	0	DEN	1000	85.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.3
131	311433.83	4832960.05	86.89	0	DEN	1000	85.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	49.5

Area Source, ISO 9613, Name: "", ID: "Prep_chainsaw_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
133	311420.07	4832951.11	85.36	0	DEN	1000	82.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	46.3
135	311433.83	4832960.05	85.49	0	DEN	1000	82.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	46.5

Area Source, ISO 9613, Name: "", ID: "Prep_roller_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
134	311420.07	4832951.11	86.76	0	DEN	1000	82.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	46.3
136	311433.83	4832960.05	86.89	0	DEN	1000	82.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	46.5

Area Source, ISO 9613, Name: "", ID: "Prep_loader_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
137	311420.07	4832951.11	86.76	0	DEN	1000	80.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	44.3
140	311433.83	4832960.05	86.89	0	DEN	1000	80.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	44.5

Area Source, ISO 9613, Name: "", ID: "Prep_exca_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
138	311420.07	4832951.11	86.76	0	DEN	1000	80.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	44.3
139	311433.83	4832960.05	86.89	0	DEN	1000	80.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	44.5

Area Source, ISO 9613, Name: "", ID: "Prep_pump_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
141	311420.07	4832951.11	85.36	0	DEN	1000	78.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	42.3
142	311433.83	4832960.05	85.49	0	DEN	1000	78.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	42.5

Area Source, ISO 9613, Name: "", ID: "Prep_compact_1"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
143	311420.07	4832951.11	85.36	0	DEN	1000	77.0	24.8	0.0	0.0	0.0	62.2	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	41.3
144	311433.83	4832960.05	85.49	0	DEN	1000	77.0	24.5	0.0	0.0	0.0	61.8	1.3	-3.0	0.0	0.0	0.0	0.0	0.0	41.5