

Niagara Region

Niagara Escarpment Crossing Comprehensive Environmental Assessment Proposed Terms of Reference

Appendix K Noise and Vibration Work Plan

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Prepared by:



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1 Introduction

This document outlines the proposed work plan that will be carried out during the Niagara Escarpment Crossing Environmental Assessment (EA) to generate a more detailed description and understanding of the environment from a noise and vibration perspective. Further, this document describes how that information will be used to assess the effects of the alternatives and proposed project on the environment through evaluation criteria and indicators. This work plan forms **Appendix K** to the proposed Niagara Escarpment Crossing Comprehensive EA Terms of Reference (ToR) and should be read in conjunction with it.

The ToR presently provides a preliminary description of the environment to gain a general understanding of the potential effects that should be examined in the Niagara Escarpment Crossing EA based on the range of alternatives to the project currently anticipated. This description reflects all components included within the Ontario *Environmental Assessment Act (EA Act*) definition of the environment: natural, social, built, economic, and cultural.

Several investigative studies are proposed as part of the Niagara Escarpment Crossing EA to expand on this preliminary description, including, but not limited to the following:

- Air Quality
- Agricultural
- Archaeology
- Contaminated Property
- Built Heritage and Cultural Heritage Landscapes
- Groundwater
- Land Use
- Natural Heritage
- Noise and Vibration
- Surface Water
- Visual Impact

The details associated with the noise and vibration investigation are provided in this document while details of the other investigative studies are provided as separate work plans. In addition to the investigative studies, the proposed ToR includes three other work plans: Traffic, Operations and Safety, Transportation Planning and Engineering, and Financial all of which are included as separate appendices.

2 Establishment of Noise and Vibration Conditions

2.1 Confirmation of the Preliminary Study Area

The preliminary study area provided in the ToR will be utilized as a starting point for establishing existing and future environmental conditions (**Figure 2-1**). This preliminary study area will be finalized during preparation of the Niagara Escarpment Crossing EA when more detailed information has been obtained, the alternatives to the project have been confirmed, and the potential environmental effects are better understood.



Figure 2-1: Preliminary Study Area

2.2 Review of Available Existing Information Sources

Available existing sources of information will be collected and reviewed to determine existing and future environmental conditions including any data gaps that need to be addressed through subsequent work (e.g., field investigations, modeling, etc.). Presently, the list of existing information sources that will be collected and reviewed as part of the proposed Noise and Vibration Work Plan includes, but may not be limited to, the following:

- Topographic Maps
- Ministry of the Environment, Conservation and Parks (MECP) publications NPC-115, NPC-118, NPC-300, NPC-233, NPC-207, NPC-119
- Ministry of Transportation (MTO) Environmental Guide for Noise 2022
- Niagara Region Official Plan, 2022
- Town of Grimsby Official Plan, 2012
- Town of Grimsby Zoning By-law 14-45
- Town of Lincoln Official Plan, 2014
- Town of Lincoln Zoning By-law No. 2022-50
- Township of West Lincoln Official Plan, 2021
- Township of West Lincoln Zoning By-law No. 2017-70

In addition, documentation prepared during the Niagara Escarpment Crossing EA from the other proposed work plans (e.g., Agricultural, Land Use, etc.) will also be considered, as appropriate, along with the preceding existing information sources.

2.3 Proposed Field Investigations

Field investigations are proposed to supplement and enhance available existing sources of information so that additional data is generated to assess each alternative (i.e., identifying potential environmental effects, developing appropriate impact management measures for addressing potential adverse environmental effects, and describing net effects). The need for field investigations will be based on the level of detail associated with the existing information sources collected and reviewed, accessibility of the

preliminary study area, and comments received from review agencies, Indigenous communities, and the public.

The need for an increased level of detail and collection of field data is expected as the Niagara Escarpment Crossing EA progresses. While the assessment of alternative(s) to the project can be completed based on existing source data, the assessment of alternative methods of carrying out the project will be based on more site-specific information generated through subsequent work (e.g., field investigations, modeling, etc.).

The following field investigation is currently proposed as part of the Noise and Vibration Work Plan:

 Shorter-term measurements of noise from the continuous existing commercial/industrial area(s) will be conducted at residential receptors of concern in the final study area where traffic noise is not expected to be the dominant source of background noise. Twenty-minute measurements are considered representative of 1-hour sound level exposures as per MECP Publication NPC-103. Therefore, these measurements will be representative of the predicted 1-hour noise levels which will be determined at residential receptors of concern. These measurements will establish existing conditions and allow for acoustical model verification or determination if additional baseline monitoring is required for commercial/industrial area(s) close to residential receptors of concern.

2.4 Baseline Conditions Noise Modelling and Assessment

In addition to the proposed field investigation, baseline conditions noise modelling and assessment are proposed as part of the Noise and Vibration Work Plan. Determination of noise sensitive receptors will be undertaken, the results of which will used throughout the Niagara Escarpment Crossing EA. The following sources of information that will be used to determine sensitive receptors includes, but may not be limited to the following:

- Aerial imagery of the final study area and the alternative methods of carrying out the project (i.e., alternative alignments)
- Land zoning geographic information systems (GIS) databases
- Documentation prepared during the Niagara Escarpment Crossing EA from the other proposed work plans (e.g., Agricultural, Land Use, etc.)

Identification of sensitive receptors will remain consistent between the noise and air quality investigative studies. Sensitive receptors will comprise of various classifications including the following:

- Residential
- Commercial
- Industrial
- Places of worship
- Educational institutions
- Medical facilities
- Passive and active recreation

Prevailing ambient noise levels within the final study area will be quantified by preparing an industry standard road traffic noise model using the US Federal Highway Administration (FHWA) software Traffic Noise Model (TNM 3.2), using road traffic volume data sourced from Travel Demand Analysis Report (see the Traffic, Operations and Safety Work Plan) prepared as part of the Niagara Escarpment Crossing EA, supplement with data provided by the review authorities where required. Vehicular road traffic generates noise that consists of mechanical noise from the engine and brakes, friction noise created from the wheels in contact with the road surface, and aerodynamic wind noise.

Traffic volume, speed, road composition, gradient and surface type will affect the overall traffic noise that can be generated. Proximity and line-of-sight to transportation facilities like roads and highways are more consequential for quantifying the off-site noise exposure conditions. Road traffic volume data would be sourced from the Travel Demand Analysis Report and would include all relevant roads within the final study area, vehicle type composition, and consideration for 'build' and 'no-build' or 'do nothing' scenarios.

The acoustical model calculates the predicted equivalent sound level (L_{Aeq}) respective of the defined daytime (7 a.m. to 11 p.m.) and nighttime (11 p.m. to 7 a.m.) periods. Figures will be prepared showing prevailing road traffic noise level contours within the final study area for the daytime and nighttime periods.

Documentation

The results of reviewing available existing information sources and from the proposed field investigations and modeling will be documented in a Noise and Vibration Baseline Conditions Report.

3 Assessment of the Alternatives

3.1 Alternatives To the Project

Following confirmation of the preliminary list of alternatives to the project, they will be assessed and comparatively evaluated leading to a recommended alternative(s) to the project. The recommended alternative(s) will be presented to review agencies, Indigenous Communities, and the public for a defined period to receive comments, following which a preferred alternative(s) will be identified. The assessment of the alternatives to the project (through the application of evaluation criteria) will be based on available existing information sources contained in the Baseline Conditions Reports.

3.1.1 **Preliminary Criteria and Indicators**

The preliminary evaluation criteria and indicators that will be used for assessing the alternatives to the project from a noise and vibration perspective include, but may not be limited to, those set out in **Table 3-1**. The preliminary evaluation criteria and indicators will be finalized based on comments received during the Niagara Escarpment Crossing EA and documented in the EA Report.

Table 3-1: Preliminary Criteria and Indicators for Assessing the Alternatives To				
the Project				

Category	Criterion	Indicator
Built Environment	 Effect of vibration during construction on existing buildings 	 Approximate number of standard and vibration sensitive structures potentially affected
Social Environment	 Effect on Noise Sensitive Areas (NSAs) during construction (e.g., noise, vibration, etc.) 	 Approximate number of NSAs potentially affected
Social Environment	 Effect of increased noise levels on sensitive receptors from road traffic noise 	 Approximate number of sensitive receptors potentially affected

3.2 Alternative Methods of Carrying Out the Project

Following the identification of the preferred alternative(s) to the project, alternative methods of carrying out the project will be generated, possibly screened, assessed, and comparatively evaluated leading to a recommended method(s). The recommended method(s) will be presented to review agencies, Indigenous Communities, and the public for a defined period to receive comments, following which a preferred method(s) will be identified.

The generation and possible screening of the alternative methods will be based on available existing information sources contained in the Baseline Conditions Reports. The assessment of the alternative methods of carrying out the project (through the application of evaluation criteria) will be based more on the information provided through subsequent work (e.g., field investigations, modelling, etc.) contained in the Baseline Conditions Reports, as appropriate.

3.2.1 Preliminary Criteria and Indicators

The preliminary evaluation criteria and indicators that will be used for assessing the alternative methods of carrying out the project from a Noise and Vibration perspective include, but may not be limited to, those set out in **Table 3-2**. The preliminary evaluation criteria and indicators will be finalized based on comments received during the Niagara Escarpment Crossing EA and documented in the EA Report.

Category	Criterion	Indicator
Built Environment	 Effect of vibration on existing buildings 	 Number of standard and vibration sensitive structures affected and extent and duration of vibration impacts
Social Environment	 Effect on Noise Sensitive Areas (NSAs) during construction (e.g. noise, vibration, etc.) 	 Number of NSAs affected, extend and duration of noise and vibration impacts, predicted through noise modelling
Social Environment	 Effect of increased noise levels on sensitive receptors from road traffic noise 	 Number of sensitive receptors affected, extent and duration of road traffic noise impacts, predicted through noise modelling

Table 3-2: Preliminary Criteria and Indicators for Assessing the Alternative Methods of Carrying Out the Project

4 Impact Assessment of the Proposed Project

Once selected, the preferred method(s) of carrying out the project (i.e., proposed project) will be further developed at a preliminary design level of detail so that the potential environmental effects can be identified with more certainty, more site specific impact management measures (i.e., avoidance, mitigation, and compensation measures) can be developed for application, net environmental effects can be identified with more certainty, appropriate monitoring requirements can be clearly defined, and specific approval/permitting requirements for constructing the proposed project can be identified.

In concert with preparing the preliminary design level of detail, it may be necessary to undertake additional work (e.g., field investigations, modelling, etc.) at the impact assessment stage of the Niagara Escarpment Crossing EA. The additional work proposed as part of the Noise and Vibration Work Plan could include the following subject to preparation of the EA:

- Operational road traffic noise assessment
- Construction noise and vibration assessment

4.1 Operational Road Traffic Noise Assessment

An operational road traffic noise assessment is proposed for assessing the potential noise impacts of the proposed project. The assessment will be based on the requirements of the following documentation:

- Ministry of Transportation of Ontario (MTO) Environmental Noise Guide (The Guide), 2022
- Niagara Region Regional Road Traffic Noise Control, 2006

Road traffic noise level predictions will be made at identified NSAs by preparing an industry standard road traffic noise model using the US FHWA software Traffic Noise Model (TNM 3.2). The noise impacts in the final study area will be modelled and evaluated for the baseline existing (no build) conditions and the proposed project (future). Figures will be prepared showing the cumulative impacts of noise on the final study area including sound level contour plots for the proposed project. The figures will highlight the origin of the noise and identify environmental noise impacts in the final study area. The existing versus the proposed project model predictions will be compared to the limits established in NPC-300, MTO's Environmental Guide for Noise

and the Niagara Region Road Traffic Noise Control to determine if mitigation will be necessary and technically justified.

Existing (no build) and future (proposed project) noise impacts for the final study area and recommend mitigation measures, if technically justified for the proposed project based on MTO's Environmental Noise Guide will be documented. The feasibility of alternate barrier arrangements will also be investigated where required and preliminary detailed design objectives would be provided, if necessary. A list of all documents procured and reviewed will be provided with details of the meaning of each and how the data was used for modelling inputs, control feasibility and technical justification and ultimately to stated opinion(s) detailed therein.

4.2 Construction Noise and Vibration Assessment

The ambient noise impacts in the final study area will be modelled or measured to determine baseline existing conditions to gauge the impact of the proposed project relative to existing conditions. The noise assessment will consist of a review of available topographical maps, land use plans, and the preliminary design to identify the worst-case noise sensitive areas; determining construction noise levels under a worst-case scenario for worst-case noise sensitive receptors; and a summary of potential noise impacts from construction using the provided construction activities and the corresponding equipment for each activity.

Distance propagation calculations will be completed for construction equipment sound levels only based on preliminary staging plans which will detail a general graph or predicted level at closest receptors. This would be conduct using appropriate industry standard environmental noise modelling software, or a suitable alternative method.

The worst-case cumulative site-wide sound levels estimated at the receptor(s) include attenuation effects due to geometric divergence, atmospheric attenuation, barriers/berms, ground absorption and directivity, as applicable significant noise sources at off-site buildings were input into the model as intervening structures.

Best Practices for construction mitigation will be detailed per the technical requirements outlined in "Best Practices for construction mitigation will be detailed per the technical requirements outlined in "MTO Environmental Guide for Noise, October 2022" and "Section 3.4 of the Environmental Reference for Highway Design, June 2013". Figures showing the cumulative impacts of noise on the Study Area including sound level contour plots will be included. The figures will highlight the origin of the noise and identify the most critical environmental impacts in the Study Area to determine if a noise

control plan is required and technically justified. If technically justified, then recommendations to reduce the noise to sensitive areas will be provided.

A Construction Vibration Zone of Influence Study (Study) will be undertaken, detailing the following:

- Modelled vibration impacts to adjacent sensitive structures.
- Comparison of estimated vibration impacts to the benchmark City of Toronto Vibration Limits and documentation of Zone of Influence.
- Recommended vibration mitigation best practices.

Where warranted, the Study will include recommendations for pre-condition surveys and construction vibration monitoring locations.

Documentation

The results of the impact assessment including any additional investigations will be documented in a Noise and Vibration Impact Assessment Report.

5 Documentation

The results of implementing this work plan will be documented in two reports during the Niagara Escarpment Crossing EA:

- Noise and Vibration Baseline Conditions Report will document the results of collecting and reviewing available existing sources of information, the field investigation, and the baseline noise modelling.
- Noise and Vibration Impact Assessment Report will document the results of the impact assessment of the proposed project including any additional investigations.

Upon completion, the report will be made available during the Niagara Escarpment Crossing EA to review agencies, Indigenous Communities, and the public for their information via the project website and upon request and will become either a reference or supporting document to the submitted EA Report. The EA Report will be based on and reflect the information contained in the two reports.