



Canada-United States-Ontario-Michigan Border Transportation Partnership

Draft Acoustics and Vibration Work Plan

**March 2006
Version 2**

PREFACE

The Canada - U.S. – Ontario - Michigan Border Transportation Partnership (The Partnership) is composed of the Federal Highway Administration and Transport Canada representing the federal levels of government, and the Ontario Ministry of Transportation and the Michigan Department of Transportation representing the provincial/state level. The purpose of the Partnership is to improve the movement of people, goods, and services across the United States and Canadian border within the region of Southeast Michigan and Southwestern Ontario.

This international transportation improvement project will require approvals from governments on both sides of the border. The Partnership has developed a coordinated process that will enable the joint selection of a recommended river crossing location that meets the requirements of *Ontario Environmental Assessment Act* (OEA), *Canadian Environmental Assessment Act* (CEAA), and *National Environmental Policy Act* (NEPA).

The goal of the partnership is to:

- obtain government approval for a new or expanded crossing with connections to the provincial highway system in Ontario and the interstate freeway system in Michigan, including provisions for processing plazas to improve traffic and trade movements at the Windsor-Detroit border;
- completion of comprehensive engineering to support approvals, property acquisition, design and construction; and,
- submit environmental assessment documents to request approval by December 2007.

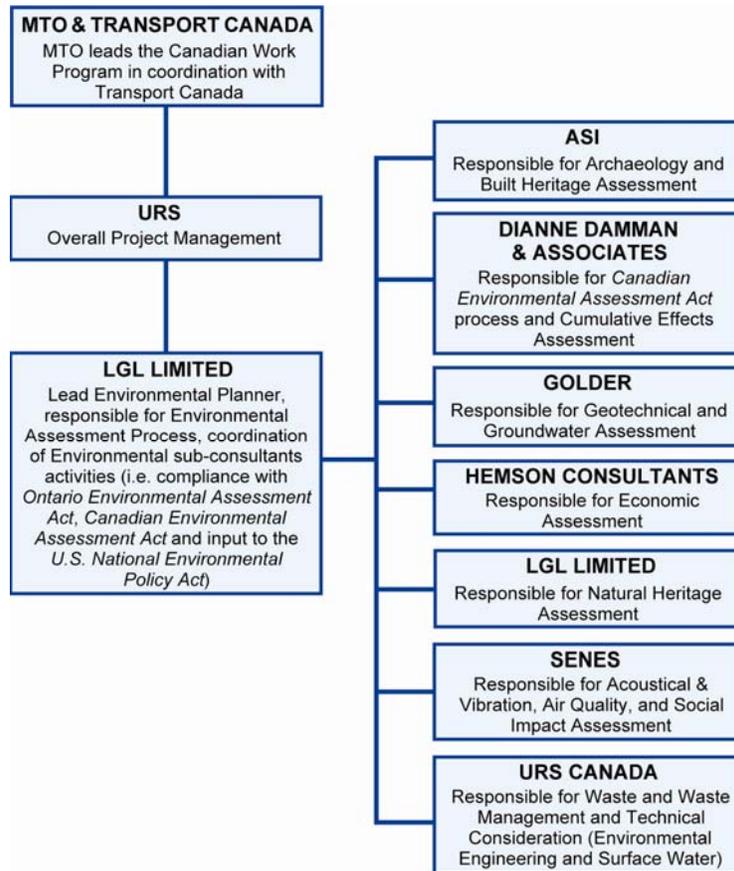
The Partnership completed a *Planning/Need and Feasibility Study* (P/NF) in January 2004 to address cross-border transportation demands for a 30-year planning period. Included in the documentation for that study was an Environmental Overview Report which provided an inventory of the existing condition in a Focused Analysis Area. Subsequently, in accordance with the *Ontario Environmental Assessment Act*, MTO prepared and submitted in May 2004 an environmental assessment Terms of Reference to the Ontario Ministry of the Environment for review and approval. The Terms of Reference was approved by the Ontario Minister of the Environment on September 17, 2004. The Terms of Reference outlines the framework that MTO and Transport Canada will follow in completing the Detroit River International Crossing Environmental Assessment (DRIC EA).

The Ontario Ministry of Transportation (MTO) is leading the Canadian work program in coordination with Transport Canada. The Michigan, Department of Transportation (MDOT), in coordination with the Federal Highways Administration (FHWA), is leading the U.S. work program.

The partnership is moving forward with technical and environmental work leading to the selection of a new or expanded border crossing, to address cross-border transportation demands for a 30-year planning period.

As an initial step in the DRIC EA process and to build upon the work completed in-depth secondary source data collection has been conducted. This work has been focused within the Preliminary Analysis Area (PAA) identified in the Environmental Overview Report, (as Amended January 2005). The noted data collection effort has been documented in a series of Working Papers. Working Papers have been prepared for the following topics: social impact assessment; economic assessment; archaeological resources; cultural resources; natural heritage; acoustics and vibration; air quality; waste and waste management; and technical considerations. The Working Papers are presented within the Environmental Overview Report (June 2005).

The Canadian Study Team and their tasks are presented below.



The purpose of the Working Papers is to document the secondary source data collection by: describing the data collection/sources used; providing an overview of study area conditions; identifying significance/sensitivity of features in the study area; and, identifying gaps in study area data and developing Work Plans to fill identified data gaps.

In conjunction with the Working Papers, a Work Plan for each discipline has been prepared to structure the filling of identified data gaps. They provide:

- a schedule and order of events for the subject under investigation by phase;
- a rationale for further data collection methodologies;
- data sources;
- methods of assessment, criteria, indicators and measures; and,
- details on the integration of each work plan with the work plans of other disciplines.

The Work Plans have been developed based on current knowledge of existing conditions within the PAA and therefore, should be considered to be living documents which will be subject to agency and public review. The partnership is aware that the assessment and evaluation of alternatives at all phases will require applying the requirements of three pieces of legislation, the OEA, CEAA, and NEPA. Therefore, in preparing the Work Plans, the partnership has sought to integrate the most rigorous requirements from each piece of legislation.

Acoustics and Vibration Work Plan

- 1. Introduction 1
 - 1.1 Planning/Need and Feasibility Study – Existing Environmental Conditions 1
 - 1.2 Detroit River International Crossing – Terms of Reference 2
 - 1.3 Acoustics and Vibration Work Plan..... 2
- 2. Stage 1 – Define Study Area 5
 - 2.1 Task 1 – Define Area of Investigation 5
 - 2.2 Task 2 – Data Collection..... 5
 - 2.3 Task 3 – Data Analysis 6
 - 2.4 Task 4 – Evaluate Alternatives 6
 - 2.5 Task 5 – Conduct Impact Assessment 6
 - 2.6 Task 6 – Recommend Environmental Protection Measures..... 6
 - 2.7 Results..... 6
- 3. Stage 2 – Illustrative Alternatives 7
 - 3.1 Task 1 – Define Area of Investigation 7
 - 3.2 Task 2 – Data Collection..... 7
 - 3.3 Task 3 – Data Analysis 7
 - 3.4 Task 4 – Evaluate Alternatives 7
 - 3.5 Task 5 – Conduct Impact Assessment 8
 - 3.6 Task 6 – Recommend Environmental Protection Measures..... 8
 - 3.7 Results..... 8
- 4. Stage 3 – Practical Alternatives 9
 - 4.1 Task 1 – Define Area of Investigation 9
 - 4.2 Task 2 – Data Collection..... 9
 - 4.3 Task 3 – Data Analysis 10
 - 4.4 Task 4 – Evaluate Alternatives 10
 - 4.5 Task 5 – Conduct Impact Assessment 10
 - 4.6 Task 6 – Recommend Environmental Protection Measures..... 10
 - 4.7 Results..... 10
- 5. Stage 4 – Concept Design Alternatives 11
 - 5.1 Task 1 – Define Area of Investigation 11
 - 5.2 Task 2 – Data Collection..... 11
 - 5.3 Task 3 – Data Analysis 11
 - 5.4 Task 4 – Evaluate Alternatives 11
 - 5.5 Task 5 – Conduct Impact Assessment 11
 - 5.6 Task 6 – Recommend Environmental Protection Measures..... 12
 - 5.7 Results..... 12

List of Tables

- Table 1. Acoustics and Vibration Assessments by Study Stage 4
- Table 2. Acoustics and Vibration Information from Secondary Sources 5

List of Figures

- Figure 1. Key Plan of the Area of Continued Analysis 9

1. INTRODUCTION

1.1 Planning/Need and Feasibility Study – Existing Environmental Conditions

The Partnership jointly commissioned a Planning/Need and Feasibility Study (P/NF) (Canada-US-Ontario-Michigan Border Transportation Partnership 2004), which identified a long-term strategy to address the safe and efficient movement of people and goods between southeast Michigan and southwest Ontario. Although conducted in a manner consistent with the environmental study processes in both countries, the P/NF Study was not completed within the formal environmental study framework. The findings of the P/NF Study, however, serve as an important basis for governments to move forward in the development and improvement of cross border transportation services, including proceeding with the environmental study processes in the U.S. and Canada for major transportation improvements at the Detroit River International Crossing.

A consultation component was incorporated into the P/NF Study process. Canadian and U.S. government departments, ministries and agencies, local municipalities, First Nations groups, private sector stakeholders in border transportation issues, as well as the general public were engaged in the course of the study. Throughout the P/NF Study, the Partnership affirmed that the findings of the P/NF Study may be used to initiate environmental studies in accordance with the requirements of the U.S. *National Environment Policy Act* (NEPA), *Canadian Environmental Assessment Act* (CEAA) and *Ontario Environmental Assessment Act* (OEAA). This step would be followed by completion of the appropriate environmental impact/assessment studies, design of the approved improvements and ultimately, construction.

During preparation of the P/NF Study, background papers were prepared to establish existing conditions within the Preliminary Analysis Area (PAA). The PAA is roughly bounded by 9th Concession Road in the Town of Lakeshore, County Road 18 in the Town of Amherstburg on its southern extent and by the Detroit River on its western and northern extent. An Environmental Overview Working Paper (Canada-US-Ontario-Michigan Border Transportation Partnership 2005) was prepared to document environmental constraints which may preclude or otherwise constrain the generation of feasible transportation alternatives. The information contained in the Environmental Overview Working Paper was gathered from readily available secondary sources. Acoustics and vibration aspects identified in the Environmental Overview Working Paper included: existing land uses, sensitive receptors and existing noise environment.

1.2 Detroit River International Crossing – Terms of Reference

A Terms of Reference was submitted to the Ontario Ministry of the Environment for approval in May 2004. The Terms of Reference identifies the framework that the proponent must follow in completing an individual environmental assessment. The Terms of Reference received approval in September 2004.

The planning process that the Route Planning Study and Environmental Assessment Study will follow is outlined in the Terms of Reference and consists of four stages:

- Stage 1 – Define Study Area;
- Stage 2 – Illustrative Alternatives;
- Stage 3 – Practical Alternatives; and,
- Stage 4 – Concept Design Alternatives.

1.3 Acoustics and Vibration Work Plan

The Acoustics and Vibration Work Plan presents the approach and methodology for conducting the Acoustics and Vibration assessments for the Detroit River International Crossing Route Planning and Environmental Assessment Study. The proposed approach to completing the Acoustics and Vibration Assessments is to increase the level of detail used to assess acoustics and vibration aspects progressively as the geographical area of study is sequentially narrowed down. The proposed level of analysis, resolution, and type of data collection at each stage of the study is designed to maximize efficiency. The Acoustics and Vibration assessments are also designed to complement the work to be performed in the U.S. A summary of the Acoustics and Vibration Assessments in relation to the study stages is presented in Table 1.

At each stage of the study process, similar tasks will occur. These tasks include:

Task 1 – Define Area of Investigation - Identify the study area for the purposes of investigating the potential effects of the project.

Task 2 – Data Collection - Identify the type, source, level of detail and methods to be used to obtain information.

Task 3 – Data Analysis - Identify how the information will be interpreted to determine the significance acoustics and vibration to sensitive receptors.

Task 4 – Evaluate Alternatives - Identify the acoustics and vibration criteria and indicators that will be used to compare alternatives.

Task 5 – Conduct Impact Assessment - Identify the range of potential environmental effects to be assessed.

Task 6 – Recommend Environmental Protection Measures - Identify the range of potential environmental protection measures to be assessed. Environmental protection measures typically include avoidance, minimization, mitigation, compensation and monitoring.

These tasks are summarized for each stage of the study process in Table 1.

TABLE 1. ACOUSTICS AND VIBRATION ASSESSMENTS BY STUDY STAGE

Study Stage ¹	Level of Analysis	Task 1 Define Area of Investigation	Task 2 Data Collection	Task 3 Data Analysis	Task 4 Evaluate Alternatives	Task 5 Impact Assessment	Task 6 Environmental Protection Measures
Stage 1 – Define Study Area	1:250,000 scale	Preliminary Analysis Area	<ul style="list-style-type: none"> • Secondary source • Air photo interpretation 	Identify potential noise sensitive areas within the PAA	<ul style="list-style-type: none"> • Avoid, where feasible, noise sensitive areas within the PAA 	Opportunities/ Constraints Analysis	<ul style="list-style-type: none"> • Avoidance
Stage 2 – illustrative Alternatives	1:50,000 scale	Illustrative routes, plazas, plaza extensions and crossings rights-of-way, footprints and adjacent zones of influence	<ul style="list-style-type: none"> • Secondary source • Air photo interpretation • Windshield/ aerial surveys • GIS and CAD data • Municipal land use and zoning information 	Identify areas of existing and proposed urban and rural development, in order to generate route alternatives that give consideration to operational noise, construction noise and vibration impacts	<ul style="list-style-type: none"> • Compare number of sensitive receptors within a 500 m radius of the ROW (i.e. 250 m on either side of the ROW) 	Estimation of separation distance	<ul style="list-style-type: none"> • Maximization of separation distance
Stage 3 – Practical Alternatives	1:10,000 scale	Practical routes, plazas, plaza extensions and crossings rights-of-way, footprints and adjacent zones of influence	<ul style="list-style-type: none"> • Secondary source • Air photo interpretation • GIS and CAD data • Municipal land use and zoning information • Traffic data provided by traffic consultant • Estimation of vibration levels from engineering data and monitoring, as required 	<p>Model existing and future daytime (16 hours) and nighttime (8 hours) noise levels at receptors closest to each practical alternative to determine the potential noise impact of each alternative.</p> <p>Predict vibration levels at selected receptor locations using monitoring and engineering data</p>	<ul style="list-style-type: none"> • Compare potential increase in daytime and nighttime noise levels at closest receptor locations (outdoor living area) during the construction and operation of the crossing. • Compare vibration levels at receptor locations with MOE/MTO protocols and guidelines 	<p>Future noise level exceedance above existing/ background levels</p> <p>Vibration levels above levels stipulated in protocols and guidelines</p>	<ul style="list-style-type: none"> • Avoidance • Minimization
Stage 4 – Concept Design Alternatives	1:1,000 scale	Concept design routes, plazas, plaza extensions and crossings rights-of-way, footprints and adjacent zones of influence	<ul style="list-style-type: none"> • Secondary source • Air photo interpretation • Traffic data to conduct noise modeling • Engineering data and/or monitoring to obtain vibration levels. 	Identify receptors that are most likely to be impacted by noise and vibration.	<ul style="list-style-type: none"> • Compare worst-case project-related noise and vibration levels with appropriate criteria. 	Conceptual Site-Specific Impacts	<ul style="list-style-type: none"> • Avoidance • Minimization • Conceptual site-specific mitigation, and monitoring

¹ Detail Design is not currently included in the Detroit River International Crossing Route Planning and Environmental Assessment Study

2. STAGE 1 – DEFINE STUDY AREA

A study area will be established to encompass the stated problems, opportunities and range of feasible alternatives. The study area will be generated based on a review of significant physical and environmental constraints that may preclude the development of feasible alternatives and the ability to provide continuous corridors of sufficient area to generate a range of linear transportation facility alternatives.

2.1 Task 1 – Define Area of Investigation

The area of investigation is the Preliminary Analysis Area identified in the amended Environmental Overview Document. In general, this includes the City of Windsor and the Towns of LaSalle, Tecumseh and Amherstburg.

2.2 Task 2 – Data Collection

An effort will be made to collect existing acoustics and vibration data from readily available secondary sources. A list of the secondary source information to be collected and its source is presented in Table 2.

TABLE 2. ACOUSTICS AND VIBRATION INFORMATION FROM SECONDARY SOURCES

Secondary Source Information	Information Source
Baseline noise data from CEAA Screening Studies	Responsible Authority for several CEAA Screening Environmental Assessment Reports in the Essex-Windsor area
Baseline noise data from CEAA Screening Studies	National Energy Board – Responsible Authority for a CEAA Screening Environmental Assessment Report for a project in the City of Windsor
Baseline noise data from CEAA Screening Studies	Canadian Transportation Agency - Responsible Authority for a CEAA Screening Environmental Assessment Report for a project in the City of Windsor
Baseline noise and vibration data	Canadian Environmental Assessment Agency (CEAA) <ul style="list-style-type: none"> • Federal Environmental Assessment (FEAI) for EAs completed in Windsor up until October 2003; • Canadian Environmental Assessment Registry (CEAR) for EAs completed or underway in Windsor since October 2003; • Communications with CEAA's staff at its Ontario Region Office (in Toronto) and Ottawa Head Office.
Baseline noise and vibration data	The province of Ontario Environmental Bill of Rights (EBR) and EA Project Updates
Baseline noise and vibration data	City of Windsor
Zoning and land use information	City of Windsor
background noise monitoring results for areas within the City of Windsor.	In-house information
Receptor locations	Project Information – Environmental Overview Working Paper, GIS mapping

Recent aerial photography will be obtained from the County of Essex and reviewed in order to identify existing rural and urban land uses and transportation corridors.

2.3 Task 3 – Data Analysis

The location of areas of urban and rural development and key existing transportation corridors will be determined.

2.4 Task 4 – Evaluate Alternatives

No evaluation of alternatives will be performed at this stage.

2.5 Task 5 – Conduct Impact Assessment

No impact assessment will be carried out at this stage for acoustics and vibration other than to identify potential areas for conflict in land use due to increased traffic noise and vibration. At this stage, mapping of the features most important to noise and vibration at a scale of 1:250,000 will be reviewed.

2.6 Task 6 – Recommend Environmental Protection Measures

Avoidance of areas that are likely to result in conflict due to noise and vibration from a new transportation corridor is the only practical environmental protection measure to be considered at this stage.

2.7 Results

The Preliminary Analysis Area will be refined based on a review of noise and vibration aspects and constraints to the development of a linear transportation facility. Illustrative alternatives will be generated and carried forward for further evaluation.

3. STAGE 2 – ILLUSTRATIVE ALTERNATIVES

Illustrative alternatives represent the full set of alternative highway alignments/crossing locations to be considered. Illustrative alternatives will be generated by identifying routes, plazas, plaza extensions and crossings extending from Highway 401 to the Canada/U.S. border.

3.1 Task 1 – Define Area of Investigation

The area of investigation is illustrative routes, plazas, plaza extensions and crossings within the Preliminary Analysis Area. In general, this includes the City of Windsor and the Towns of LaSalle, Tecumseh and Amherstburg.

3.2 Task 2 – Data Collection

At this stage, the determination of noise sensitive areas shall be accomplished using existing information sources mainly obtained from other study disciplines. Topographic maps, at scales of 1:50,000 or 1:25,000, and Ontario Base Maps, at scale of 1:10,000, GIS, CAD data, aerial photographs, traffic data, regional and municipal land use plans and public consultation, will generally form the basis for evaluation.

Windshield surveys will also be conducted, where necessary, to verify and augment information collected during aerial photography reviews.

3.3 Task 3 – Data Analysis

The separation distance between the closest receptors and the ROW. Also, the number of receptors within 250 m on either side of the ROW.

3.4 Task 4 – Evaluate Alternatives

The construction of a new transportation corridor can potentially result in significant noise/vibration impacts on surrounding areas. In order to reduce the potential for these impacts, a key objective should be to increase the separation distance between the alternatives and surrounding sensitive receptor land uses. Sensitive receptors will include outdoor living area of residences, including seniors' residences, hospitals, schools, day-cares, sites that are socially significant for First Nations cultural and religious ceremonies and campgrounds.

Alternatives will be evaluated using comparative criteria. In general, the greater the separation distance between the Right-of-Way (ROW) of the proposed transportation corridor and sensitive receptors, the lower the impacts on sensitive receptors. Thus, the route location, which provides the greatest separation distance, will show the lowest impacts from a noise/vibration perspective.

3.5 Task 5 – Conduct Impact Assessment

Impact assessment will be carried out using a geographical information system (GIS) and aerial photography. For mapping and analysis purposes, the receptor information relevant to noise and vibration will need to be at the 1:50,000 scale.

3.6 Task 6 – Recommend Environmental Protection Measures

Maximize the separation distance between the receptors and the ROW.

3.7 Results

The illustrative alternatives will be evaluated to select a technically preferred illustrative alternative(s). Practical alternatives will be generated and carried forward for further evaluation.

4. STAGE 3 – PRACTICAL ALTERNATIVES

Practical alternatives represent the set of illustrative alternatives that, upon evaluation of impacts and benefits, are carried forward for further consideration. Practical alternatives are generated through more detailed design (although still at a preliminary level) to better identify property requirements, infrastructural implications, construction staging impacts and mitigation measures.

4.1 Task 1 – Define Area of Investigation

The area of investigation is practical routes, plazas, plaza extensions and crossings within the technically preferred illustrative alternative(s). This area is known as the Area of Continued Analysis (ACA) and is illustrated in Figure 1.

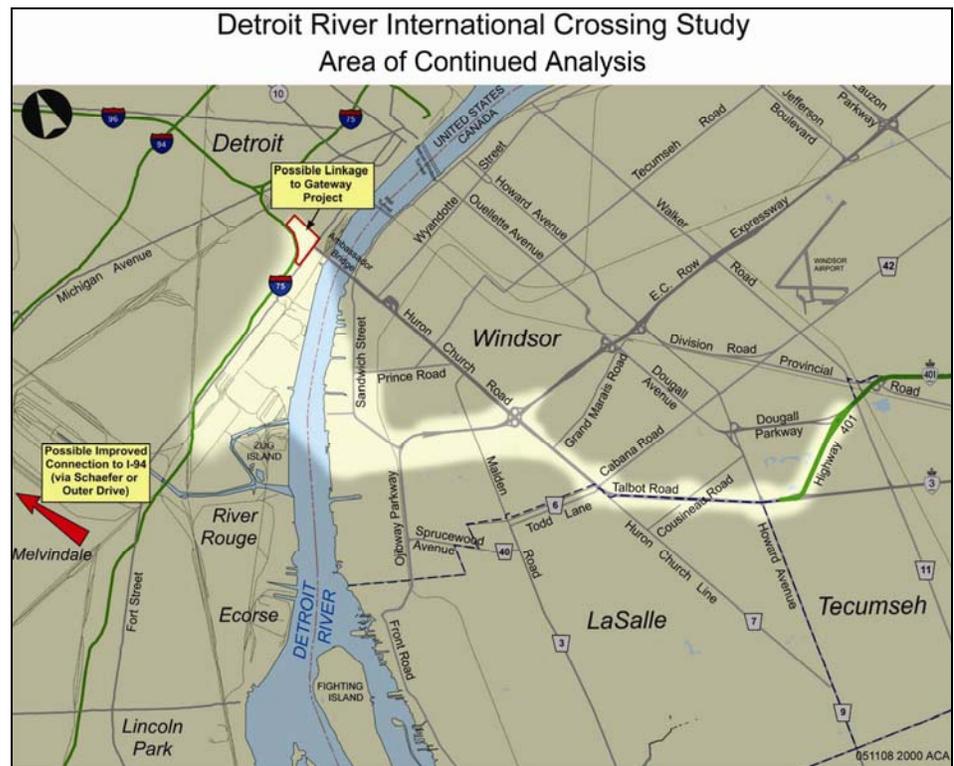


FIGURE 1. KEY PLAN OF THE AREA OF CONTINUED ANALYSIS.

4.2 Task 2 – Data Collection

Data pertinent to noise and vibration, collected previously from secondary sources, review of aerial photographs and windshield surveys will be supplemented with traffic data for existing and future scenarios, engineering data and monitoring, as required. The traffic

data will be used to estimate existing and future noise levels at receptors along practical route alternatives.

4.3 Task 3 – Data Analysis

Data will be analyzed at the closest receptor based on vibration velocity and outdoor noise criteria.

4.4 Task 4 – Evaluate Alternatives

Alternatives will be evaluated using comparative criteria. The evaluation of practical alternatives will be based on the increase in existing noise levels at the closest receptor locations. Vibration levels of the alternatives will be compared to MOE/MTO protocols and guidelines.

4.5 Task 5 – Conduct Impact Assessment

Impact assessment will be based on the exceedance of receptor background noise levels and compliance with MOE/MTO vibration protocols and guidelines.

4.6 Task 6 – Recommend Environmental Protection Measures

Environmental protection measures to be incorporated at this stage include avoidance of route alternatives with the likelihood to cause the highest noise and vibration impacts.

4.7 Results

The practical alternatives will be evaluated to select a technically preferred practical alternative(s). Concept design alternatives will be generated and carried forward for further evaluation.

5. STAGE 4 – CONCEPT DESIGN ALTERNATIVES

Concept design alternatives represent the set of practical alternatives that, upon evaluation of impacts and benefits, are carried forward for further consideration. Concept design includes the consideration and development of specific engineering and environmental issues to further understand very particular implications of the recommended alternative. The level of engineering detail is sufficient to develop environmental protection measures in consultation with the appropriate agencies and to secure environmental assessment approvals.

5.1 Task 1 – Define Area of Investigation

The area of investigation is concept design routes, plazas, plaza extensions and crossings within the technically preferred practical alternative(s) of the ACA (Figure 1).

5.2 Task 2 – Data Collection

Data pertinent to noise and vibration, collected previously from secondary sources, review of aerial photographs and windshield surveys will be supplemented with traffic data for existing and future scenarios, design engineering data, and noise and vibration monitoring, as required.

5.3 Task 3 – Data Analysis

Data will be analyzed at the route segment level for the different design options.

5.4 Task 4 – Evaluate Alternatives

Alternatives will be evaluated using comparative criteria. The evaluation of concept design alternatives will be based on the potential increase in noise levels and vibration at the closest receptor locations, as well as a noise and vibration criteria specified in MOE/MTO protocols and guidelines.

5.5 Task 5 – Conduct Impact Assessment

Impact assessment will be based on conceptual site-specific and route segment impacts resulting from the proposed project. For analysis purposes, the boundaries/locations of receptors will be accurate to at least 1:1,000 scale. Conceptual site-specific impacts and route segment impacts to be conducted in accordance with MOE/MTO protocol.

5.6 Task 6 – Recommend Environmental Protection Measures

Environmental protection measures to be considered at this stage include maximizing separation distances between the ROW and closest receptors. Noise and vibration monitoring needs will also be identified to ensure compliance with environmental legislation and regulations, and to determine the accuracy of impact predictions. As necessary, generic mitigation measures typically incorporated into the design of linear transportation facilities would be recommended.

5.7 Results

The concept design alternatives will be evaluated to select a technically preferred concept design alternative(s). Detail design is not included in the current scope of work for the Detroit River International Crossing Route Planning and Environmental Assessment Study.