



Request for Proposal

Document Number: 2018-573P

Document Title: IN-SERVICE ROAD SAFETY AUDITS

Date Issued: Tuesday, November 6, 2018

ELECTRONIC BID SUBMISSIONS ONLY shall be received by the Agency through the Bidding System no later than:

**12:00 noon local time
Monday, December 3, 2018**

It is the Bidder's sole responsibility to ensure that:

- **the submission is received electronically by the Agency through the Bidding System by the date and time specified above**

**Purchasing Representative: Gary Gardener, Senior Purchasing Analyst
Telephone Number: (905) 791-7800, ext. 4448**

For **IN-SERVICE ROAD SAFETY AUDITS**, as required, and as specified within this Document.

1. Cover Sheet
2. Index
3. Instructions to Bidders
4. Supplementary Terms and Conditions
5. Scope of Work
6. Request for Information
7. Appendices:
 - 7.1 Standard Terms and Conditions
 - 7.2 Transportation Safety and Strategic Operational Plan
 - 7.3 Online Bidding System forms

1. **INFORMATION AND COMMUNICATIONS**

- 1.1 Any questions or information required regarding this Document must be submitted through the Bidding System via peelregion.bidsandtenders.ca by clicking the 'Submit a Question' button for the selected bid opportunity at least four working days prior to closing. Do not submit your questions via e-mail. No oral communications will be considered binding.
- 1.2 Any Bidder who requests and/or receives any information, with regards to this Document, by any person(s) other than the Purchasing Representative or designate, may be disqualified from further consideration.
- 1.3 It is recommended that vendors add noreply@bidsandtenders.ca to their "safe senders" lists in their e-mail systems and monitor their spam/ clutter/ junk filters to ensure they do not miss automatically generated messages sent by bidsandtenders.ca that relate to this bid opportunity.

2. **BIDDER SUBMISSIONS**

- 2.1 This Document is available to Bidders at peelregion.bidsandtenders.ca.
- 2.2 Only Bidders that are registered as a Plan Taker for this Document with Bids and Tenders at peelregion.bidsandtenders.ca and have obtained this Document from Bids and Tenders or the Agency, may submit a Bidder Submission.

Should the Agency receive a Bidder Submission that is subsequently found to be from a Bidder that is not a registered Plan Taker with Bids and Tenders at peelregion.bidsandtenders.ca, and the Bidder did not obtain the Document from Bids and Tenders or the Agency, the Agency reserves the right to reject the Bidder Submission as non-compliant and give it no further consideration for contract award.

- 2.3 **Bidders shall not make any changes or alterations to the Document as issued by the Agency on the Region of Peel's website.** The Bidder Submission of any Bidder found prior to award to have made such alterations shall be disqualified by the Agency and shall be given no further consideration.

In the event that following an award an alteration is discovered to have been made by the successful Bidder, the Document as issued by the Agency and made available on the Agency's website shall be deemed to contain the governing terms and conditions between the parties, and any alterations made to it by the Bidder shall be of no force or effect. The Agency shall further have the right, at its sole option, to terminate any Contract with a Bidder who, subsequent to award, is found by the Agency to have altered the Agency's Document. This right is in addition to and without prejudice to all other rights, remedies, actions or alternatives that may be available to the Agency.

- 2.4 Any documents forming part of a Bidder Submission uploaded to peelregion.bidsandtenders.ca by the Bidder in response to the Document must:
- 2.4.1 NOT have a security password.
 - 2.4.2 Not be defective, corrupted or blank.
 - 2.4.3 Be able to be opened and viewed by the Agency.
- 2.5 The Agency shall disqualify a Bidder Submission that contains documents that cannot be opened and verified by the Agency.
- 2.6 For the purposes of interpretation, all capitalized terms used herein shall have the same meanings ascribed thereto in the Document.
3. **DATE AND PLACE FOR RECEIVING BIDDER SUBMISSIONS AND ACCEPTANCE PERIOD**
- 3.1 ELECTRONIC BID SUBMISSIONS ONLY shall be received by the Agency through the Bidding System and must be received **on or before 12:00 noon local time in Brampton, Ontario on Monday, December 3, 2018.**
- 3.2 The closing date and time shall be determined by the Agency's Bidding System.
- 3.3 Bidder Submissions submitted and/or received by any other method will be disqualified by the Agency unless instructed otherwise by published addenda in respect of the Document.
- 3.4 Only documents found on the Region of Peel's website at peelregion.bidsandtenders.ca are to be considered "official" documents. The Region of Peel accepts no responsibility for the accuracy or completeness of information found on other websites. The onus is on the Bidder to check the Region of Peel's website to verify they have received all relevant information. The Bidder risks submitting a non-compliant bid if addenda or other required information is missing, and disqualification could result.
- 3.5 It is the Bidder's sole responsibility to ensure their Bidder Submission is received by the time and date specified within the Document. The receipt of Bidder Submissions can be delayed due to a number of factors including, but not limited to, "internet traffic", file transfer size, and transmission speed. The Bidder should allow sufficient time to upload its Bidder Submission, including any attachments. Late Bidder Submissions will not be accepted by the Agency's Bidding System.
- 3.6 A Bidder Submission will only be considered to be submitted once it has been RECEIVED by the Agency in its Bidding System, regardless of when the Bidder Submission was submitted by the Bidder.

- 3.7 Bidders will be sent a confirmation e-mail by the Agency's Bidding System to the e-mail address provided by the Bidder when it registered as a Plan Taker in the Bidding System for the Document advising that its Bidder Submission was submitted successfully. Bidders should **not** consider its Bidder Submission to have been submitted until it has received the confirmation e-mail.
- 3.8 The Bidder is solely responsible for the delivery of its Bidder Submission in the manner and by the date and time prescribed in the Document. Each Bidder is responsible for the actual delivery of its Bidder Submission prior to the closing time and closing date.
- 3.9 The Agency is not responsible for any incomplete or misdirected Bidder Submissions due to electronic technical problems arising out of the Bidder's use of the Agency's Bidding System.
- 3.10 Bidder Submissions received by the Agency in accordance with the terms and conditions of the Document shall be irrevocable and open for acceptance for a period of 90 days following the date of the Bidder Submission closing.

4. **ADDENDA**

Addenda, if required, issued by the Purchasing Representative and related to this Contract shall hereby form part of the Contract.

Any addenda related to this Contract will be posted through the Bidding System at peelregion.bidsandtenders.ca. Although the Bidding System will attempt to notify registered Bidders of when addenda are posted on the Bidding System, the Agency does not guarantee any receipt of notifications by Bidders and waives any responsibility. **It is the sole responsibility of Bidders to check the Bidding System often to inform themselves of any posted addenda.**

Bidders shall acknowledge receipt of any addenda when submitting their Bidder Submission through the Bidding System. Bidders shall check a box for each addendum and any applicable attachments that have been issued before a Bidder can submit their Bidder Submission online all in accordance with the terms and conditions of the Document and the Bidding System.

The Agency encourages Bidders not to submit their Bid Submission prior to forty-eight hours before the Document closing time and date, in the event that an addendum is issued. If a Bidder submits their Bidder Submission prior to this or at any time prior to the Document closing and an addendum is issued by the Agency, the Bidding System shall WITHDRAW their Bidder Submission and change their Bidder Submission to an INCOMPLETE STATUS (NOT accepted by the Agency) and the withdrawn Bidder Submission can be viewed by the Bidder in the "MY BIDS" section of the Bidding System. The Bidder is solely responsible to:

- i) make any required adjustments to their Bidder Submission;
- ii) acknowledge the addendum/addenda; and

- iii) ensure the re-submitted Bidder Submission is RECEIVED by the Agency through the Bidding System no later than 12:00 noon local time on the Document closing date.

NOTES TO BIDDERS: Additional company contacts are recommended for the reasons outlined below:

- Do not invite any additional contacts that you do not want to have access to view, edit, submit and/or withdraw or who may be in direct competition, for example a company may have two divisions that could compete for the same bid opportunity.
- You are strongly urged, when creating or updating a Bidding System Bidder account, to add additional company contacts to create their own login to the Bidding System. This will permit your invited contacts that have created their own login to manage (register, submit, edit and withdraw) Bids which your company is a Registered Plan Taker for. In the event you are on vacation, or due to illness, etc., these additional contacts may act on your company's behalf and have the authority to receive addendum notifications from the Bidding System and where permitted by the terms and conditions of the Document, to submit Bidder Submissions electronically through the Bidding System and/or withdraw and/or edit and/or acknowledge addendum/addenda, on your behalf.
- If you are an invited company contact, it is imperative that you create your login from the link contained in the e-mail invitation. Do NOT go directly to peelregion.bidsandtenders.ca website and create a separate Bidder account.

5. **CONTRACT AWARD**

The Agency reserves the right to award the Contract in its entirety or in part to one or more Vendors in accordance with its requirements. Prior to award, the Agency reserves the right to perform a site visit at the Bidder's facilities for the purpose of evaluating the Bidder Submission.

Without limiting, and in addition to all other rights to which the Agency is entitled pursuant to this Document, the Agency shall be entitled to fully evaluate the Bidder Submission, which evaluation may include, without limitation, a review of references provided by the Bidder and of those that may be obtained by the Agency independently, past performance history of contracts between the Bidder and the Agency and/or between the Bidder and third parties, past completion history (including completion of full contract term, late or extended completion of contract and late delivery of goods or services), litigation and claims history of the Bidder (including previous, existing or potential litigation with the Agency or others and construction liens filed by the Bidder or subcontractors), delivery of incorrect services, customer service and responsiveness, or history of bidding unrealistic pricing, any of which may result in higher ultimate costs or other difficulties for the Agency, and to reject a Bidder Submission if the same is, in the Agency's sole opinion, unsatisfactory, or would not provide the best value to the Agency.

6. **QUANTITIES**

Quantities shown in the Document are approximate only and the Agency does not guarantee any volume. The Agency reserves the right, at its sole discretion, to procure either more or less.

7. **EMPLOYMENT AND LABOUR LEGISLATION**

In submitting its Bidder Submission, Bidders hereby acknowledge and agree that they have considered the impact of any legislative and regulatory changes implemented or potentially to be implemented by the Province of Ontario in relation to Ontario's *Employment Standards Act, 2000*, *Labour Relations Act, 1995* and *Occupational Health and Safety Act* and any other employment and labour legislation, which include and may include, among other changes, changes to Ontario's minimum wage legislation, and that they have reflected these changes or potential changes in their bid prices. Bidders are advised that the Agency will not entertain requests to change submitted bid prices for this Document based on changes to employment and labour legislation, including to Ontario's minimum wage or other legislative or regulatory amendments made under or pursuant to the *Fair Workplaces, Better Jobs Act, 2017* or the proposed Bill 47, *Making Ontario Open For Business Act, 2018*.

8. **EVALUATION PROCESS**

Each Bidder Submission will be evaluated in three stages, as follows:

8.1 **Stage I: Substantial Completeness Review**

The Agency will unseal each Bidder Submission and each Bidder Submission will be subject to a substantial completeness review to determine that the submission is substantially complete, compliant with the Document's submission requirements and that pricing information is contained only in the sealed pricing submission.

Bidder Submissions which have not fully complied with the submission requirements of this Document may be considered non-compliant, and will not be considered for Stage II evaluation and not given any further consideration for award.

8.2 **Stage II: Evaluation of the Bidder's Technical Proposal**

The evaluation will be based on a cumulative total score of 100 points, comprised of 80 points being allocated to the Technical Proposal and 20 points being allocated to the Financial Proposal. The total available points being allocated to the Technical Proposal are 80 points.

During this stage of the evaluation process, Bidder Submissions will be reviewed and evaluated by an evaluation committee through a consensus method based on the Evaluation Criteria clause set out in the Instructions to Bidders, below.

The disclosure of the allocated weightings for each category/criteria is provided to assist Bidders in preparing a Bidder Submission that best meets the requirements of the Agency.

Only those Bidder Technical Proposals which score a minimum of 50 points/ out of a possible 80 points in Stage II will have met the established threshold and pass to Stage III and will be given further consideration for award.

In the event that no Bidder Technical Proposals meet this minimum score, at the Agency's sole and absolute discretion, the minimum technical score may be adjusted to permit a minimum of three Bidder Technical Proposals pass on to Stage III.

8.3 Stage III: Evaluation of Financial Proposal

Bidder Submissions which have passed Stage I and Stage II will enter into Stage III and where the pricing will be unsealed and their Financial Proposals considered as the final stage of this call.

Pricing information must be entered by Bidders in the pricing tables provided in the Online Bidding System Forms and be included with the Bidder submission in order for the Bidder Submission to be considered for contract award.

The total available points being allocated to the Financial Proposal are 20 points. The Bidder Submission to this Request for Proposal with the lowest price will receive the maximum score (20 points) for the Financial Proposal category.

The remaining proposals will each receive a pro-rated Financial Proposal Score in accordance with the following formula:

$$\text{Financial Proposal Score} = (\text{Lowest Priced Financial Proposal} / \text{Financial Proposal Price}) \times 20 \text{ (assigned weighting for Financial Proposal)}$$

Important: The intent of the phased evaluation process is to ensure that Bidder Submissions are evaluated initially on the basis of the Agency's criteria only, without regard to pricing. If Bidders attempt to indicate pricing outside of the process indicated above, the Bidder shall, at the Agency's sole discretion, be deemed non-compliant and given no further consideration.

9. EVALUATION CRITERIA

Bidder Submissions will be evaluated by an evaluation committee through a consensus method based on the following categories. The disclosure of the allocated weightings for each category/criteria is provided to assist Bidders in preparing a proposal that best meets the requirements of the Agency. The evaluation will be based on a cumulative total score of 100 points, composed of 80 points being allocated to the Technical Proposal and 20 points being allocated to the Financial Proposal.

By responding to this Document, Bidders agree to accept the decision of the evaluation committee as final. Bidders shall complete Online Bidding System Forms as stated in the Document.

Category	Weighting
Understanding of Project	60 points
Clear Understanding of the Project	15 points
Scope of work	20 points
Scope of work Familiarity with conducting In-service Road Safety Audit	10 points
Deliverables	10 points
Miscellaneous Value Added	5 points
Consultant Firm Project Experience	10 points
Experience - Project Manager	5 points
Qualifications - Key Personnel	5 points
Project Schedule, Timelines, and Staff Hours	10 points
Timelines/Implementation Plan	5 points
Quality and Cost Control	5 points
Price	20 points

10. **PRICING – MANDATORY REQUIREMENT**

Pricing information will be entered by Bidders in the pricing tables provided in the Bidding System and included with the Bidder submission in order for the Bidder submission to be considered. Upon completion of the technical evaluation stage, only those Bidder Submissions that are deemed to meet the needs of the Agency will move on to the pricing evaluation stage and have their submitted pricing considered as the final phase of this call.

Bidders who are submitting more than one proposed solution for consideration shall submit an entirely separate Bidder Submission. The option for multiple submissions is provided in the Bidding System.

Important: The intent of the two-phase evaluation process is to ensure that Bidder Submissions are evaluated initially on the basis of the Agency’s criteria only, without regard to pricing. If Bidders attempt to indicate pricing outside of the process indicated above, the Bidder shall, at the Agency’s sole discretion, be deemed non-compliant and given no further consideration.

11. **HARMONIZED SALES TAX (HST) INFORMATION**

The Agency is subject to the payment of provincial and federal taxes imposed by the Provincial and Federal Governments and, if required, the collection of any withholding tax for non-resident Vendors. All prices within this Document shall be quoted exclusive of HST.

12. **ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES**

The Vendor shall comply with the *Accessibility for Ontarians with Disabilities Act* 2005, and its Regulations thereunder with regard to the provision of goods or services to persons with disabilities. The Vendor acknowledges that pursuant to the *Accessibility for Ontarians with Disabilities Act* 2005, the Region of Peel must, in deciding to purchase goods or services through its procurement process, consider accessibility for persons with disabilities to such goods or services. This legislation can be accessed through the following link to the Government of Ontario's website: ontario.ca/laws/statute/05a11. You may also access this link at peelpurchasing.ca and view the accessibility standards.

Upon award of this contract the Vendor will be required to sign and return the Accessibility for Ontarians with Disabilities Acknowledgement available at peelregion.ca/purchasing, "Additional Information for Bidders".

13. **INVOICING AND PAYMENT INSTRUCTIONS**

13.1 **All invoices must be sent to the individual ordering the goods/ services or as directed at the time of the order placement. Failure to do so will result in a delay of payment.**

13.2 The Agency's method of payment is by Electronic Funds Transfer (EFT). The Vendor will be required to provide the Agency with the Application for Vendor Direct Deposit form containing original signatures in ink, by return mail, fax or hand delivered, the following banking information:

13.2.1 Names of two Company Officers, their titles, e-mail addresses, fax numbers, and phone numbers. Note: Both Company Officers must sign off on any subsequent changes to the Vendor's banking information.

13.2.2 Company mailing and remittance addresses.

13.2.3 Banking information including a void cheque.

13.2.4 The Vendor is required to notify the Agency of any changes to this information immediately.

These Supplementary Terms and Conditions are in addition to the Agency's Standard Terms and Conditions.

SC1 INSPECTION/DEMONSTRATION/TESTING

Add the following to Standard Terms and Conditions Clause 3 Agency Rights:

The inspection of all goods or services including, where necessary the conducting of chemical and physical tests to determine whether or not the specifications are being complied with shall be completed in the manner as prescribed by The Ministry of Environment. All payments required for any inspection, demonstration, and/or testing will be at the Vendor's expense and all reports shall be given to the Agency upon completion of said tests.

SC2 WORKPLACE SAFETY AND INSURANCE BOARD COVERAGE

Add the following to Standard Terms and Conditions Clause 6 Compliance with Laws:

The Vendor clearly understands and agrees that it is not, nor is anyone hired by it, covered by the Agency under the *Workplace Safety and Insurance Act* S.O. 1997, c.16, Sch.A., as amended and the Vendor shall be responsible for and shall pay all dues and assessments payable under the *Workplace Safety and Insurance Act, the Employment Insurance Act, S.C. 1996, c.23* or any *Act*, whether Provincial or Federal, in respect of itself, its employees and operations, and shall furnish the Agency, if requested, with such satisfactory evidence that it has complied with the provisions of any such Acts. If the Vendor fails to do so, the Agency shall have the right to withhold payment of such sum or sums of money due to it that would be sufficient to cover its default and the Agency shall have the right to pay same. The Agency is not the employer of the Vendor or its personnel under any circumstances whatsoever.

The Vendor shall, both prior to commencing Work under the Contract and within 90 days of the expiration of the Contract date, submit a Clearance Certificate from the Workplace Safety and Insurance Board to the Agency that all assessments or compensation have been paid, and the Agency may, at any time during the performance, request a further declaration that all such assessments of compensation have been paid.

The successful Bidder must have valid Workplace and Safety Insurance Board Coverage and will be required to submit a current Clearance Certificate within seven days of award of the Contract.

SC3 INSURANCE

Add the following to Standard Terms and Conditions Clause 14 Insurance:

During the term of this Contract, the Vendor and each and every sub-contractor is required to maintain in full force and effect and at its own expense, the following insurance coverage:

1. Professional Liability / Errors & Omissions Insurance in an amount of not less than \$1,000,000 per claim or occurrence.

All policies of insurance shall be (1) written with an insurer licensed to do business in Ontario (2) in form and content acceptable to the Agency acting reasonably (3) be non-contributing with, and will apply only as primary and not excess to any other insurance available to the Agency and (4) contain an undertaking by the insurers to notify the Agency in writing not less than 30 days before any material change, cancellation, lapse or termination of the policies.

Before the commencement of any operations hereunder, and within seven working days of award of the Contract, the successful Bidder shall provide the Agency a completed Certificate of Insurance on the Agency's form available at peelregion.ca/purchasing, "Additional Information for Bidders" evidencing compliance with the policy requirements as detailed above.

Failure to provide the aforementioned insurance will result in the withholding of payments or at the sole option of the Agency, forfeiture of the Contract.

SC4 ORDER OF PRECEDENCE IN THE EVENT OF CONFLICT

Add the following to Standard Terms and Conditions new Clause 24:

In the event of any inconsistency or conflict in the provisions of the Document, such provisions shall take precedence and govern in the following order, where applicable:

1. Addenda as issued
2. Scope of Work
3. Online Bidding System forms
4. Instructions to Bidders
5. Supplementary Terms and Conditions
6. Standard Terms and Conditions

1. **INTRODUCTION**

The Regional Municipality of Peel is a rapidly growing community with a population of over 1.4 million people and is expected to grow significantly over the next 30 years. Due to the ever-increasing number of drivers and vehicles as well as pedestrians, motorcyclists and cyclists sharing our roadways, the Agency is seeking a consultant to conduct In-service Road Safety Audits at 20 intersections within the Regional Municipality of Peel. The Agency has recently completed a review of its road network to identify intersections where there are potential for safety improvements.

2. **BACKGROUND**

The Agency has recently completed a Road Safety Strategic Plan (RSSP) towards the Vision Zero in order to create thriving, safe, and healthy communities. Through the Road Safety Strategic Plan, the Agency is working towards the elimination of traffic deaths and injuries and making roads safer for all the road users. The Agency also has implemented Safety Performance Functions (SPFs) and Network Screening. Identified locations should receive the Region's priority for future review of In-service Road Safety Audits. The Region have chosen to rank sites based on the Potential for Safety Improvements (PSI) values of fatal and injury collisions in keeping with recently adopted Vision Zero principals.

The overall goals of this project are to review collision history, geometric characteristics and traffic operational efficiencies, and conduct field investigations that may include, but not be limited to traffic conflict observations, a human factors assessment and access management.

3. **OBJECTIVE**

The purpose of this project is to identify economically feasible operational and safety improvement countermeasures for 20 intersections via road safety audits. The road safety audits must be conducted in accordance with the Canadian Guide to In-service Road Safety Reviews published by the Transportation Association of Canada (TAC), aimed at improving road safety and operations for all users.

The successful Vendor is required to conduct In-service Road Safety Audits at the following locations:

Intersections		Municipalities
1	DIXIE RD @ QUEEN ST E/7 HY	BRAMPTON
2	BOVAIRD DR W @ MCLAUGHLIN RD N	BRAMPTON
3	BOVAIRD DR W @ CHINGUACOUSY RD	BRAMPTON
4	BURNHAMTHORPE RD @ CAWTHRA RD	MISSISSAUGA
5	BOVAIRD DR E @ NASMITH RD/GREAT LAKES DR	BRAMPTON
6	KENNEDY RD N @ VODDEN ST E	BRAMPTON
7	AIRPORT RD @ NORTH PARK DR/COTTRELLE BV	BRAMPTON

Intersections		Municipalities
8	LAURELCREST ST/WEST DR @ QUEEN ST E/7 HY	BRAMPTON
9	BOVAIRD DR E @ SUNFOREST DR/YELLOW BRICK RD	BRAMPTON
10	BOVAIRD DR E @ TORBRAM RD	BRAMPTON
11	50 HY @ EBENEZER RD	BRAMPTON
12	50 HY @ LANGSTAFF RD/COTTRELLE BV	BRAMPTON
13	RUTHERFORD RD/FIRST GULF BV @ STEELES AV E	BRAMPTON
14	EBENEZER RD @ THE GORE RD	BRAMPTON
15	MCVEAN DR/CLAIREVILLE CONSERVATION RD @ QUEEN ST E/7 HY	BRAMPTON
16	BOVAIRD DR E @ RICHVALE DR S/LANGSTON DR	BRAMPTON
17	DIXIE RD @ STEELES AV E	BRAMPTON
18	BRITANNIA RD E @ DIXIE RD	MISSISSAUGA
19	50 HY @ HEALEY RD/ ENTRANCE- UNITED LUMBER/ HOME HARDWARE	CALEDON
20	COLERAINE DR @ KING ST W/ HARVEST MOON DRIVE	CALEDON

4. **INFORMATION PROVIDED BY THE AGENCY**

The Agency shall provide background information to the successful Vendor at the project initiation meeting, as listed in Section 5.1, Task I – Review and Analysis of Background Data.

5. **SCOPE OF SERVICE REQUIREMENTS**

The successful Vendor shall complete the following tasks when undertaking this project:

- Data collection from the Agency;
- Office review including collision data and traffic analysis;
- Field investigation;
- Detailed analysis and countermeasure recommendations; and
- Preparation of draft and final reports.

5.1 **Task I – Review and Analysis of Background Data**

At the project initiation meeting, the Agency will provide the following information which will be reviewed by the successful Vendor:

- Details of the recent Capital Projects or Environmental Assessment studies related to the study area, if any;
- Roadway Right of Way;

- Vehicle speed and classification data;
- Recent and historical traffic counts;
- Geometric design drawings (pdf format);
- Traffic signal timing plans;
- Historical raw traffic collision data in Excel format;
- Results of recent network screening and/or over-representation analysis;
- Any public complaints and/or political driven inquiries;
- Applicable Traffic By-laws; and
- Any other information that the Region may deem relevant.

5.2 **Task II– Field Investigation**

The successful Vendor will conduct site investigations as required to identify and capture data necessary to complete the road safety audits. The objective of the field investigation is to gain further insight into the subject intersections and to further verify or identify safety concerns in the area. The review should be conducted in light of the Regional Policy, Regional and Provincial Standards, industry best practices, and traffic bylaws and should consist of the following as a minimum:

- Traffic conflict observations;
- Site geometrics, traffic control devices (signs, signals, pavement markings etc.) and all other roadway features present within the roadway environment for conformance to appropriate Ontario Traffic Manuals (OTM) Book 5, 6, 11, 15, 18 and consistencies, including physical evidence of traffic collisions;
- Road way geometric characteristics including horizontal and vertical alignments (i.e. visibility for all road users including a sight line review as required), cross-section, medians, super-elevations, lane and intersection configuration, lane continuity, channelization, auxiliary lanes, pavement and shoulder condition including pavement edge drop-offs, clear zone, embankment slopes, sight distances, driveway and side street accessibility, access management, corner clearance, and visibility (sight triangles);
- Illumination and delineation devices including roadway illumination, reflective guidance devices, and delineators;
- Impacts of any adjacent land uses, such as schools, commercial plazas, buildings, etc;
- Site operations and road user interactions including traffic speed and classification, traffic patterns and behaviour from the perspective of all road users, length of queuing, any disruptive accesses, the effects of any major traffic generators, conflicts associated with specific user groups such as vehicle/pedestrian and heavy trucks;
- Human factors including positive guidance review, expectancy violations, workload issues, and operational scenarios that may potentially contribute to the occurrence of driver error and collisions;
- Access management including departure sight lines, stopping sight

distances, conflict points, turning restrictions and grading impacts to accesses affected by any widening of the study area roads, impacts of accesses to sidewalks and multiuse path facilities. It also includes reviewing what the operations of accesses are designed for and how they are actually operating in the field;

- Roadside safety, slopes, roadway clear zone, and potential unprotected roadways and/or roadside hazards, safety devices including guiderails, end treatments and crash cushions;
- Pedestrian and cyclists' safety including sidewalks, crosswalks, multiuse paths, bike lanes, pedestrian crossings, and cross-rides for pedestrians and cyclist, based on existing pedestrian/ bicyclists generators within the study area;
- Impact of locations of any transit stops on pedestrian movement; and,
- Accessibility for Ontario with Disabilities (AODA) should be explicitly reviewed.

5.3 **Task III – In-service Road Safety Audits**

5.3.1 Upon review and analysis of the background data and field investigation findings, the successful Vendor shall compile In-service Road Safety Audits for the 20 locations referenced in Scope of Work, Section 5, and the attached Transportation Safety Strategic and Operational Plan that clearly illustrate the following criteria:

- Safety review methodologies;
- Recommended improvement strategies.

5.3.2 Traffic count data will be provided by the Agency and as such, will not be required to be collected for the In-service Road Safety Audits.

5.3.3 The successful Vendor shall incorporate the findings and recommendations of the In-service Road Safety Audits into a Draft Recommendation Report to be approved by the Agency.

6. **DELIVERABLES**

6.1 **Draft and Final Report**

6.1.1 **Draft Recommendation Report**

The successful Vendor is responsible to submit four hardcopies of the Draft Recommendation Report for Agency review. The Draft Recommendation Report shall contain the following:

- An individual Road Safety Audit report for each of the 20 above mentioned locations;
- All required attachments, such as photographs, maps, etc;
- Identification of current deficiencies; and,
- Strategies for development of potential countermeasures.

Agency staff will review the Draft Recommendation Report and provide one set of consolidated comments to the Vendor.

Any comments made by Agency staff on the draft recommendation report must be addressed and incorporated into the Final Report by the successful Vendor.

All draft reports must meet the project-specific format and content expectations for the project and be acceptable to the Agency. The Agency, at its sole discretion, may reject any “draft” report it deems as unsuitable and it is the Vendor’s responsibility to re-submit drafts until the Agency is satisfied, prior to the Agency doing a review of the final report. All costs associated with the rejection and resubmission of drafts will be the Vendor’s responsibility.

6.1.2 **Final Report**

The successful Vendor shall submit **four hardcopies and two electronic copies**, one in Microsoft Word and one in Adobe Acrobat PDF format, of the Final Report within 14 days after receiving Draft Recommendation Report comments from the Agency.

6.2 **Final Presentation**

The successful Vendor will also prepare and conduct a presentation to the Agency on the recommended improvement strategy for each of the 15 locations mentioned in this document. One electronic copy in Microsoft PowerPoint and one electronic copy in PDF format are required.

7. **PROJECT MANAGEMENT**

7.1 **Meetings**

The Agency estimates that the successful Vendor will attend a minimum of five half day meetings with Agency Staff. All meetings will take place at the Agency’s offices located at 10 Peel Centre Drive, Brampton, Ontario and shall be attended by the Project Lead only, unless otherwise requested by the Agency. The minimum number of meetings to be held is as follows:

- One Project Initiation Meeting (half day)
- Three” Working” or “Touch Base” meetings (half day)
- One Final Wrap up and Summary Meeting and Presentation

The Vendor is required to provide the Agency with an agenda one week prior to each meeting and written minutes of these meetings within one week of completion and shall address all issues on the basis of action, information, or when a resolution is required. Additional meetings may be required and the Agency requests provisional pricing for attendance by the Project Lead at additional meetings as requested by the Agency.

7.1.1 **Project Initiation Meeting**

The Agency will schedule a project initiation meeting with the successful Vendor. The objective of the project initiation meeting is to bring together the stakeholders including the Agency and the successful Vendor to set the context of the In-service Road Safety Audit and to discuss the scope of the services and review all available information.

At the Project Initiation Meeting, the Agency will review the milestones that have been proposed by the Vendor. The Agency will also review the scope and objectives of In-service Road Safety Audits, responsibilities, data requirements, timelines and schedule for the completion of the Project and set up lines of communication between all involved parties.

8. **PROJECT TIMELINES**

The project shall be completed within seven months from the date of award of contract. The timeframe for an average In-service Road Safety Audit analysis can vary by location. The Agency anticipates to receive the projects as they are completed.—Some elements of the Road Safety Audits may be conducted concurrently, thus reducing the overall length of the entire project.

9. **BASIS FOR PAYMENT**

The Vendor's pricing shall cover all the Vendor's fees and disbursements to complete all the tasks listed in the terms of reference.

The Vendor's pricing must include the following products: all progress reports; minutes for Project Team Meetings (three); draft and final versions reports. Pricing shall include time for preparation and attendance at all noted meetings and task completion activities. A progress report must be submitted with every invoice identifying the status and expenditure of each individual task.

REQUEST FOR INFORMATION

10. **PROPOSAL SUBMISSION REQUIREMENTS**

Bidders shall submit all required information as stated below, through the Online Bidding System Forms, Appendix 7.3, as indicated.

10.1 **Proposal Format**

The proposal uploaded must be limited to a **maximum of 15 double-sided pages (total of 30 pages of text)** formatted to be printed on 8.5" X 11" paper with a minimum 10 point font. This maximum does not include illustrations, resumes (maximum three pages each), attachments or appendices.

Note that each proposal will be evaluated solely on its content.

References to the Vendor's web page and/or any external communication material will not be considered or evaluated as part of the Proposal Submission.

The Bidder submitted Technical proposal shall be in pdf format and contain the following information in the order in which it appears below

10.1.1 **Clear Understanding of the Project (Upload)**

Describe your firm's approach to the work required. Provide sufficient detail to demonstrate your firm understanding of the scope and objectives of the project. Indicate any major difficulties anticipated in implementing the project requirements.

Propose a Work Plan, which is comprehensive in addressing the Agency's requirements. Incorporate any refinements to the stated requirements, which your firm believes are appropriate. Identify any staff time or information requirements from the Agency, which have not been addressed in this Request for Proposal.

10.1.2 **Compliance with the Scope of Work and Deliverables (Upload)**

Outline in detail your firm's procedures for ensuring the quality, cost control and Agency defined requirements and deliverables are met for this project.

10.1.3 **Experience and Qualifications of Key Personnel and Project Manager (Upload)**

The Vendor must be a firm of professional engineers, which will be responsible for the entire project including, quality control, document production and overall Project Management.

Provide a brief synopsis of your firm's background and areas of expertise. Include the address and telephone number of your main office and any regional/local offices from which the work is to be

directed. Also, identify all sub-Vendors that will be utilized on the project, outline their relevant qualifications and experience, and indicate the scope of work allotted to each sub-Vendor.

Provide an organization chart identifying the Project Manager and Key Technical Personnel to be assigned to the project and show the reporting relationships among these individuals. Where project personnel are drawn from more than one office, indicate how you will ensure timely and accurate communication among team members.

Provide brief curricula vitae for the Principal(s), Project Manager, and Project Engineers who will be responsible for this assignment, describing education, professional qualifications, and experience specifically related to this type of project. For each key individual assigned to this project, indicate the allocation of time to the project within the scheduled period for completion (i.e., per cent dedication). Outline the involvement of each individual in the various phases of the project. Note that once a consultant has been appointed, changes in project personnel will require the prior approval of the Agency's Project Manager.

10.1.4 **Project Schedule/Work Plan (Upload)**

The Agency is expecting that this project be completed within four months from the date of award. It is understood that the timing depends on the quality, completeness and 'turnaround' times to address data provided to the successful consultants.

Submit a GANTT chart schedule showing the start and finish dates for the various tasks incorporated in the Work Plan and the dates of all proposed meetings. The schedule should be broken down into weekly increments. Also, indicate requirements for client-supplied information/decisions that are required to maintain the proposed schedule.

The Project Schedule/Work Plan (11 x 17 sheets) shall include the person-hours for professional and technical staff to complete each task. Hourly rates or dollar amounts must not be included in the Work Plan/Project Schedule attached to the proposal.

Vendors shall submit two separate Work Plan/Project Schedules to the Agency as part of this Request for Proposal.

Both the technical and pricing submission shall include an attached Work Plan and Project Schedule as follows:

- **The Technical Proposal shall include a list of personnel and sub-consultants and the number of hours dedicated to each activity by those personnel and must NOT include hourly rates or dollar amounts in the Work Plan/Project Schedule.**

- **As part of the Online Bidding Forms (Appendix 7.3) Vendors shall list staff members assigned to this project, their Title, Total Hours and Hourly rate.**
- **Upon notification of contract award, the successful Vendor must submit to the Agency a Work Plan and Project Schedule with tasks, person-hours, and hourly rates for professional and technical staff to complete each task including an estimate of any sub-consultant hours required.**

The successful Vendor shall maintain the Project Schedule and submit updated copies to the Agency on a monthly basis. Updates shall include current activities and identification of actual completion/delivery dates for the key activities.

Note: The vendor's monthly invoice must be cross-referenced with the activities identified in the Gantt chart.

As part of the proposal the Vendor shall include a detailed schedule including the anticipated start and completion for each task and all meeting dates. Vendor must note that the Agency has the right to cancel the project at any time and the Vendor will be paid only up to that stage.

10.1.5 Familiarity with performing In-Service Road Safety Audits (Upload)

Describe in detail your firm's familiarity with performing In-Service Road Safety Audits and list any past experience of conducting the audit for other Agencies or Municipalities.

Based on your previous experiences with conducting the In-Service Road Safety Audits for other agencies and municipalities what challenges do you foresee for the Region of Peel and why, and how would you overcome those challenges.

**STANDARD TERMS AND CONDITIONS FOR GOODS AND SERVICES
THE REGIONAL MUNICIPALITY OF PEEL**

These Standard Terms and Conditions govern this purchase and Bidders and/or Vendors agree to be bound by the terms and conditions set forth, except as may be amended by the Agency in writing.

1. Definitions

- (a) "Agency" means The Regional Municipality of Peel, Peel Regional Police, Peel Housing Corporation o/a Peel Living and any other government or agency or board on behalf of which The Regional Municipality of Peel is acting and for the purposes of the performance of the Contract shall mean the municipality or entity awarding the Contract. For purposes of the Contract, "Agency" shall include "Owner".
- (b) "Bidder" means any proponent, respondent or other person or entity who has obtained official procurement documents for the purpose of submitting, or who has submitted a Bidder Submission in response to the Document.
- (c) "Bidder Submission" means the document as completed by the Bidder for the purpose of offering to sell to the Agency the goods and/or services specified in the Document, and includes but is not limited to quotations, tenders and proposals.
- (d) "Bidding System" means the electronic system used by the Agency for its public tenders, bids and request for proposals at the following website: peelregion.bidsandtenders.ca, which is required to be used for all dissemination of information by or on behalf of the Agency and all submissions from Bidders for this Document.
- (e) "Contract" means the agreement in writing governing the performance of the Work and includes, without limitation, the Document (including the Standard Terms and Conditions), Bidder Submission and the written document accepting the Bidder Submission (including any notice of acceptance or award).
- (f) "Document" means the document describing the goods and/or services to be purchased and the terms upon which the goods and/or services are to be purchased and includes, without limitation, those documents referenced on the index of the Document and such addenda as may be issued by the Agency from time to time.
- (g) "Purchasing Representative" means the person named as the Purchasing Representative or designate on the Document.
- (h) "Region of Peel" has the same meaning as the Agency.
- (i) "Vendor" means the successful Bidder and includes the term Contractor who enters into the Contract with the Agency for the provision of the goods and/or services set out in this Document.
- (j) "Work" means the work to be undertaken by the Vendor pursuant to the provisions of the Contract.

2. Bidder Submission

- (a) The Bidder Submission must be submitted electronically using the Bidding System.
- (b) A person or persons with authority to bind the Bidder must electronically declare on the online Bidding System that their Bidder Submission has been made entirely in accordance with the Document.
- (c) All pricing in the Bidder Submission must be expressed in figures, and must be in Canadian Dollars.

- (d) Prices in the Bidder Submission must include all costs necessary to complete the Work in accordance with the Document including customs and duties.
- (e) The Bidder represents, warrants and confirms that no oral or written alterations or variations in the Document and/or Contract have been made by the Bidder and none shall be valid or binding upon the Agency unless authorized by the Agency in writing.
- (f) Bidder Submissions which are qualified or subject to any conditions, limitations or restrictions shall be rejected by the Agency.
- (g) The Bidder acknowledges that it is solely responsible for obtaining and reviewing all Contract documents and all addenda issued by the Agency pertaining to the Document.

3. Agency Rights

The Agency reserves the right, in its sole and absolute discretion to:

- (a) deem a Bidder Submission to be unbalanced and may reject any and all Bidder Submissions, which it so deems, and for this purpose, "unbalanced" shall include, without limitation, a Bidder Submission which does not reflect a realistic breakdown of the costs of each or any portion of the Work;
- (b) adjust the totals in a Bidder Submission where there are errors in extensions, additions or computations. In such cases, the unit prices shown shall govern;
- (c) reject any or all Bidder Submissions, accept a Bidder Submission which is not the lowest price, reject a Bidder Submission even if it is the only one received by the Agency; and cancel this request for Bidder Submissions at any time either before or after the receipt of Bidder Submissions, following which the Agency may proceed as it determines in its sole discretion, including without limitation, negotiating with any one or more of the Bidders or any other person or entity for the performance of the Work under such terms and conditions as the Agency may decide in its sole discretion, or issuing a new request for Bidder Submissions on the same or modified terms, all without liability to itself;
- (d) award the Contract in its entirety or in part, to one or more Vendors, if in doing so the best interests of the Agency will be served;
- (e) inspect and have a demonstration of the goods and/or services offered prior to award of a Contract and request evidence of experience, ability or financial standing;
- (f) waive formalities, technical defects, irregularities and omissions in a Bidder Submission, and may accept a Bidder Submission which does not comply with the formal requirements of the Document, if in doing so the best interests of the Agency will be served;
- (g) remove from the Agency's list of vendors the name of any vendor and/or Bidder for failure to accept a contract or for unsatisfactory performance or non-performance of a contract;
- (h) fully evaluate the Bidder Submission, which evaluation may include, without limitation, a review of references provided by the Bidder and of those that may be obtained by the Agency independently, past performance history of contracts between the Bidder and the Agency and/or between the Bidder and third parties, past completion history (including completion of full contract term, late or extended completion of contract and late delivery of goods or services), litigation and claims history of the Bidder (including previous, existing or potential litigation with the Agency or others and construction liens filed by the Bidder or subcontractors), delivery of incorrect services, customer service and responsiveness, or history of bidding unrealistic pricing, any of which may result in higher ultimate costs or other difficulties for the Agency, and to reject a Bidder

Submission if the same is, in the Agency's sole opinion, unsatisfactory, or would not provide the best value to the Agency;

- (i) reject and disqualify any or all Bidder Submissions based on a Bidder's Vendor Performance Rating, status and standing as per the Agency's Vendor Performance Evaluations procedures, as amended from time to time; and
- (j) seek further information and/or clarification, including without limitation a detailed price breakdown, from any Bidder after the closing time, for the purposes of assisting the Agency in interpreting and evaluating any Bidder Submission and in interpreting any inconsistencies which may appear in any Bidder Submission, and the Agency shall have the right to consider and rely on such further information and clarifications in evaluating the Bidder Submissions and awarding the Contract.

4. Collusion and Conflict of Interest

- (a) By submitting a Bidder Submission, each Bidder represents and warrants that no member, officer or employee of the Agency or Council has or will have an interest, directly or indirectly, in the performance of the Contract, or in the supplies, work or business in connection with the said Contract, or in any portion of the profits thereof, or in any monies to be derived therefrom; the Bidder Submission is not made in collusion with any other Bidder making a Bidder Submission for the same goods and services and is, in all respects, fair and without fraud; and that neither it nor any of its subcontractors nor any of their respective representatives has any actual, apparent or potential conflict of interest or existing business or other relationship with the Agency or any or any other party or person providing advice or services to the Agency with respect to the Document or the Work or any of their respective representatives that gives rise or might give rise to an unfair advantage (a "Conflict of Interest"). Each Bidder acknowledges that it is within the Agency's discretion to determine whether a Conflict of Interest exists.
- (b) Should the Bidder give or offer any gratuity to or attempt to bribe any member of the Agency, or to commit collusion or fraud, the Agency shall be at liberty to reject the Bidder Submission or, if a Contract has been awarded, terminate the Contract forthwith, without liability to itself, and to rely upon the sureties as provided for.
- (c) By submitting a Bidder Submission for this Document, each Bidder thereby releases and forever discharges the Agency from any and all liability related to any determination the Agency may make regarding Conflicts of Interest, including any disqualification, prohibition, rejection or contract termination which may result therefrom.
- (d) In addition to all other rights in this Document or otherwise available at law or in equity, the Agency may, in its discretion, immediately disqualify a Bidder Submission or may terminate any contract entered into in connection with or resulting from the Document, without liability, penalty or cost, upon giving notice to the Bidder if the Bidder or any of their respective representatives fails to disclose or has failed to disclose any Conflict of Interest.

5. Taxes

The Agency is subject to the payment of provincial sales and federal taxes imposed by the Provincial and Federal Governments and, if required, the collection of any withholding tax for non-resident vendors.

6. Compliance with Laws

The Vendor shall comply with all applicable laws and by-laws including without limitation, the *Workplace Safety Insurance Act*, the *Occupational Health and Safety Act*, and the *Human Rights Code*, as amended from time to time. Any breach or breaches of any applicable laws or by-laws, whether by the Vendor or any of its subcontractors, may result in the immediate termination of the Contract and the forfeiture of all sums owing to the Vendor by the Agency.

7. Inconsistency, Conflicts and Omissions

- (a) In the event of any inconsistency or conflict in the Document, the Bidder shall notify the Agency prior to the closing time.
- (b) The Bidder shall not take advantage of any apparent error or omission in the Document. Any work not specified which is necessary for the proper performance and completion of any part of the Work contemplated, which may be implied as included in the Work, shall be done by the Vendor as if it had been specified and shall not be construed as a variation in the Work to be done, and shall not be subject to any claim by the Vendor for additional compensation.

8. Acceptance/Rejection of Goods and Services

The Agency shall be entitled, in its sole and absolute discretion, to accept or reject goods or services which are substandard, defective, of inferior quality, or are otherwise not in accordance with the Contract, as the best interests of the Agency may require.

9. Force Majeure

In the event that performance of the Contract in the reasonable opinion of either party is made impossible by an occurrence beyond the control of the party affected, then either party shall notify the other in writing. The Agency shall either terminate the Contract forthwith and without any further payments being made, or authorize the Vendor to continue the performance of the Contract with such adjustments as may be required by the occurrence in question and agreed upon by both parties. In the event that the parties cannot agree upon the aforementioned adjustments, it is agreed by the parties that the Contract shall be terminated. Delays in or failure of performance by either party under the Contract shall not constitute default hereunder or give rise to any claim for damages if caused by occurrences beyond the control of the party affected, including but not limited to, decrees of Governments, acts of God, fires, floods, riots, war, rebellion, sabotage, and atomic or nuclear incidents. Lack of finances, strikes, lockouts or other concerted acts by workers shall not be deemed to be a cause beyond a party's control.

10. Assignment

The Vendor shall keep the Contract under its control and shall not assign, transfer, convey or sublet any portion of the Contract without first obtaining the written consent of the Agency.

11. Covenants and Indemnities

- (a) The Vendor agrees:
 - (i) to perform the Contract in accordance with the documents under which the award is made;
 - (ii) to indemnify and hold harmless the Agency, its officers, directors, agents, employees, Councillors, Chair and Board Members from and against all claims, costs, expenses, demands, losses, damages, actions, suits or proceedings, including all legal fees and disbursements, that arise out of, or are attributable to the acts or omissions of the Vendor, its subcontractors, suppliers, agents, employees, officers, directors, and all other persons and other entities for whose acts the Vendor may be liable

or for whom it is responsible in law and their respective officers, directors, agents and employees.

- (iii) to indemnify and to save the Agency, its officers, directors, agents, employees, Councillors, Chair and Board members harmless from liability of any kind for the use of any composition, secret process, invention, copyright, patent, intellectual property, article or appliance, furnished or used in the performance of the Contract of which the Vendor is not the owner, patentee, assignee, or licensee;
 - (iv) to guarantee against defective goods and/or services and to replace any damaged or defective goods and/or services to the satisfaction of the Agency;
 - (v) to furnish adequate protection from damage for all work and to repair damage of any kind, for which it and its employees are responsible; and
 - (vi) to pay for all permits, licenses, approvals, and inspections, and to give all notices and comply with all by-laws and regulations of the Agency.
- (b) For greater certainty, and without limiting the intent of any other terms of the Contract, the obligations of the Vendor in this paragraph 11 shall survive the expiry or other termination of the Contract.

12. Guarantees and Warranties

All Work shall be done in a good and workmanship like manner. All materials, goods and services must meet the specifications. The Vendor warrants and guarantees that all materials, goods; services and workmanship will be free from defects and fit for the purpose intended by the Agency. All goods delivered by the Vendor must be new, in good working order and of the latest model possessing all the accessories standard to the manufacturer's stock model. The goods and/or services must be covered by written guarantees and warranties acceptable to the Agency. The warranties set out herein and any other warranties provided to the Agency by the Vendor as part of the Contract are and shall be in addition to all other warranties to which the Agency may be entitled in law and in equity.

13. Damage Claims

The Vendor shall be liable for the costs of all damages caused by it, its subcontractors, suppliers, agents, employees, workers, persons employed by it, officers, directors and all other persons and other entities for whose acts the Vendor may be liable or for whom it is responsible in law, arising from the execution of the Work, by reasons including, without limitation, the existence, location, condition of work, or any materials, plant or machinery used thereon or therein, or which may happen by reason of its failure or the failure for those for whom it is responsible, to do or perform any or all of the several acts or things required to be done by them under the Contract, and shall indemnify and save the Agency, its officers, directors, agents, employees, Councillors, Chair and Board members harmless from any claims arising thereby, including but not limited to costs of rectification incurred by the Agency and any legal costs in connection therewith on a solicitor and client basis.

14. Insurance

The Vendor shall maintain insurance as required by all applicable laws and regulations and shall maintain such further insurance as may be required by the Agency pursuant to the terms of the Contract. The Vendor shall furnish satisfactory proof of insurance when required by the Agency.

15. Liquidated Damages

If the Vendor fails, neglects or refuses at any time to supply all goods or services to the Agency as specified within the Contract, or fails, neglects or refuses to replace goods or services rejected by the Agency, then the Agency shall be and is hereby empowered forthwith to procure such material elsewhere and to charge all costs for goods or services thereby incurred by it to the Vendor as liquidated damages and to deduct the same from the monies due, or to become due to the Vendor on any other contract, or to collect such costs from the Vendor by any other method permitted by law.

16. Right to Retain Monies

The Agency shall have the right to retain, out of monies payable to the Vendor under the Contract the total amount outstanding from time to time of all claims arising out of the default of the vendor in any of its obligations to the Agency, whether pursuant to this or any other contract between the Vendor and the Agency which has not been settled by the Vendor or its insurers. For the purposes of this paragraph, a claim by the Vendor has been settled if payment has been made to and accepted by the claimant and a complete release obtained from it, or the claim has been fully investigated and a complete denial of liability has been made to and accepted by the claimant.

17. Termination

- (a) This Contract may be terminated without notice by the Agency should the Vendor fail to comply with one or more of the Contract terms. In addition to cancelling the Contract, the Agency shall be entitled to pursue any remedies to which it is entitled in law or equity for damages suffered as a result of the Vendor's breach.
- (b) Where there is a question of non-performance, payment in whole or in part may be withheld at the discretion of the Agency.

18. Notice

- (a) Any notice, direction, request or document required or permitted to be given by either party to the other shall be deemed to have been sufficiently and effectually given if delivered or mailed by prepaid registered post, or equivalent, or sent by facsimile transmission to the address and number shown in the Bidder Submission or to such other address or number of which either party hereto may from time to time notify the other in the manner set out in this paragraph.
- (b) If any such notice, direction, request, document or payment is so given, it shall be conclusively deemed to have been given and received on the date of delivery if delivered, on the next business day if transmitted by telefax, and on the fifth calendar day following the mailing thereof, if sent by mail as aforesaid.

19. Confidential Information/Ownership and Disclosure of Bidder Submissions
- (a) The Vendor agrees to protect and maintain the confidentiality of all personal or other information, including all personal health information, that the Vendor accesses or of which the Vendor acquires knowledge of as a result of the services in this Contract, and agrees to use, collect, disclose, retain, protect and dispose of the personal (health) information only in accordance with all privacy legislation applicable to the Agency where it is acting on behalf of the Agency. Disclosure of any information shall be done only with the Agency's prior written consent. The provisions of the indemnity clause in this Contract apply to any breach of privacy or confidentiality in this clause. The Vendor shall ensure that its directors, officers, employees, agents, subcontractors and anyone else for whom it is responsible in law all adhere to the requirements of this section regarding privacy and confidentiality.
 - (b) The Agency, and the Agency's responsibilities under this Contract, are subject to all applicable privacy legislation including the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990 c.M.56, as amended ("MFIPPA") and/or the *Personal Health Information Protection Act*, 2004 ("PHIPA") with respect to the collection, use, disclosure, retention and protection of confidential, sensitive or personal (health) information under the Agency's custody and control. Under an MFIPPA request, all documents provided to the Agency by the Vendor pursuant to the procurement process which led to this Contract, and the Contract itself and associated documents, may be required by law to be made available to a requesting member of the public, with the possible exception that the party submitting certain information requests that it be treated as confidential and that there is an appropriate exemption to disclosure in MFIPPA, or a non-disclosure requirement in either MFIPPA or PHIPA.
 - (c) The Bidder Submissions, along with all correspondence, documentation and information provided to the Agency by any Bidder in connection with or arising out of the Bidder Submission, once received by the Agency, shall become the property of the Agency and may be appended to any agreement and/or purchase order with the successful Bidder. Bidders must identify in their Bidder Submissions any scientific, technical, proprietary, commercial or other confidential information, the disclosure of which could cause them injury.
 - (d) In public bids, the name of each Bidder and the lump sum price contained in their Bidder Submission shall be published on the Bidding System.
 - (e) Where award is to be made by Regional Council, the Peel Police Services Board or the Board of Directors of Peel Housing Corporation, information regarding all Bidder Submissions, including names of each Bidder, lump sum prices and the annual or overall value of the Contract and/or Bidder Submissions shall be included in public reports to Regional Council or the relevant Boards such that the information is released publicly. The Bidder acknowledges that the Agency cannot guarantee it can honour requests to keep Bidder information confidential in light of applicable law requirements, and also in light of the need for transparency and public disclosure where release of Bidder information in public Council reports related to a specific project or procurement process is necessary.
20. Remedies
- (a) The rights and remedies of the Agency as set forth in any provision of the Contract shall not be exclusive and are in addition to any other rights or remedies provided by law or in equity.
 - (b) The exercise of any remedy provided by the Contract does not relieve the Vendor or its sureties from any liability under the Contract.

- (c) The Agency may take such steps as it considers necessary to remedy any breach of the Contract and any damages or expenditures thereby incurred by the Agency plus a reasonable allowance for overhead may be collected in any manner provided for in the Contract or otherwise available in law.
- (d) The failure of either the Agency or the Vendor to insist upon strict performance of any provisions of the Contract shall not be construed as a waiver or relinquishment of the right to insist upon strict performance of such provisions on any future occasion.

21. Severability

In the event that any provision of the Contract is held invalid, illegal or unenforceable, the remaining provisions of the Contract will not be affected and shall continue in full force and effect.

22. Governing Law

This Document, the Bidder Submission and the Contract shall be governed and construed in accordance with the laws of the Province of Ontario. In conducting its procurements, the Agency is subject to and intends to comply with all applicable trade agreements, including but not limited to the Comprehensive Economic Trade Agreement, Agreement on Internal Trade and the Ontario-Quebec Trade and Cooperation Agreement.

23. Time is of the Essence

Time shall be in all respects of the essence of this Contract.

Region of Peel

Operational Plan Review –
In-Service Road Safety
Reviews

Transportation Safety Strategic and Operational Plan

August 2017

B000597 CIMA+



Operational Plan Review – In-
Service Road Safety Reviews
**Transportation
Safety Strategic and
Operational Plan**

August 2017

B000597 CIMA+



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Table of Contents

1. Purpose	1
2. Organization of the Paper.....	2
3. Overview of In-service RSA.....	2
3.1 What are In-service RSAs?.....	2
3.2 In-service RSAs Process	3
3.2.1 Office Review.....	4
3.2.2 Field Review (s)	4
3.2.3 Detailed Analysis and Countermeasure Recommendation.....	4
4. Recommendations for Conducting In-service RSAs for Peel Region	5
4.1 Justification and Criteria for Selecting Locations for In-service RSA.....	5
4.2 Procedure for Conducting an In-service RSA.....	6
Task 1 – Project Management and Meetings.....	6
Task 2 – Data collection.....	6
Task 3 – Office Review	7
Task 4 – Field investigation.....	11
Task 5 – Detailed Analysis and Countermeasure Recommendations.....	12
Task 6 – Report and Documentation	16
4.3 Consideration of Vulnerable Road Users in In-service RSA.....	16
5. Corridor Access Management in In-service RSA.....	17
5.1 Environmental Scan.....	18
5.1.1 Review of Guidelines and Papers.....	18
5.1.2 Review of the Peel Region Road Characterization Study.....	19
5.2 Recommendations for Peel Region for CAM in In-service RSA.....	20
5.2.1 Recommendations on Factors for CAM in In-service RSA	20
5.2.2 Common Measures for Corridor Access Management.....	23
6. Proactive Countermeasures for CAM Enhancements.....	26



7. Access Management Safety Check List.....	34
8. Closing Remarks	42

Table of Figures

Figure 1: Intersection Physical and Functional Areas	27
Figure 2: Right-turn and Left-turn Bay	28
Figure 3: Favorable Access Improvement Measures near Intersections	29
Figure 4: Changing Location of adjacent driveways relative to each other	30
Figure 5: Bicycle path marking in conflict zone.....	34
Figure 6: In-service RSA Process	43

Table of Tables

Table 1: TTC and ROC Scoring Guidelines.....	10
Table 2: Recommended factors related to CAM to be considered in RSAs.....	21
Table 3: Common corridor access measures	23
Table 4: CMF for reducing Access Point Density on Urban and Suburban Arterials.....	32
Table 5: Access Management Safety Check List.....	35



1. Purpose

The Region of Peel (the “Region”) has requested a comprehensive review of eighteen existing operational programs, which have been contributing to improving road safety in the Region.

This paper discusses the road safety audit (RSA) process and how it applies to Peel Region. The prevailing guidance for conducting RSAs in Canada is the Canadian Road Safety Audit Guide prepared by Transportation Association of Canada (TAC). A road safety audit is defined in this guide as “*a formal and independent safety performance review of a road transportation project by an experienced team of safety specialists, addressing the safety of all road users. An RSA can be conducted at any stage of a road transportation project including planning, design, construction, pre-opening, post-construction (shortly after opening), and in-service.*”¹ RSAs aim to introduce corrective actions that minimize collision risks before they are introduced to the road system. RSAs are often more proactive and preventive.

The Region is specifically interested in conducting RSAs of in-service roads (the last stage in the sequence of various RSA stages as noted above), which are also known as in-service road safety reviews and are conducted according to the guidelines provided in the Canadian Guide to In-service Road Safety Reviews prepared by TAC. Both documents, Canadian Guide to In-service Road Safety Reviews and Canadian Road Safety Audit Guide, are complementary to each other. An in-service road safety review is defined in this guide as “*in-depth engineering study of an existing road using road safety principles with the purpose of identifying cost-effective countermeasures that would improve road safety and operations for all road users.*”² The in-service road safety reviews are most effective when conducted at locations where a high collision risk has been identified. The in-service road safety reviews typically aim to provide recommendations to reduce an already existing collision risk and are more reactive.

For in-service roads, various jurisdictions use the terms in-service road safety review or in-service road safety audits interchangeably. The Region of Peel uses the term in-service road safety audits. Therefore, from here onwards, the term in-service road safety audit will be used in this paper.

This paper discusses practices and guidelines to undertake in-service road safety audits to enhance road safety. In addition, it also discusses the proactive and preventive measures related to corridor access management enhancements.

This paper discusses the following specific items:

- In-service road safety audit methodology including justifications, criteria and procedures for commissioning, conducting and completing the reviews with consideration for vulnerable road users.
- Inclusion of corridor access management in RSA methodology including factors to be reviewed and mitigation measures for collision reduction.

¹ The Canadian Road Safety Audit Guide, Transportation Association of Canada, 2001

² The Canadian Guide to In-service Road Safety Reviews, 2004



- Proactive implementation of corridor access management enhancements.
- Access management safety checklist for new access designs.

2. Organization of the Paper

The rest of the paper is organized as follows:

Section 3 presents an overview of the in-service RSA process. The section begins with a discussion of the definition of in-service RSAs. The section continues by discussing the process involved in conducting in-service RSAs.

Section 4 presents the recommendations for conducting in-service RSAs specific to Peel Region. It includes justification and criteria for selecting locations and procedures for conducting an in-service RSA for Peel Region.

Section 5 reviews the RSA guidelines of some Canadian and international jurisdictions to identify factors involved in in-service RSAs specific to corridor access management and provides factors to be considered for inclusion of corridor access management in in-service RSA. The Section continues to discuss common measures for corridor access management.

Section 6 presents recommendations for proactive implementation of corridor access management techniques.

Section 7 presents an access management safety check list for new designs undertaken during the development and redevelopment applications.

Section 8 presents a summary of the paper with some additional recommendations for the Region of Peel.

3. Overview of In-service RSA

3.1 What are In-service RSAs?

The prevailing guidance for conducting in-service RSA in Canada is the TAC Canadian Guide to In-service Road Safety Reviews, which is a complimentary document to the TAC Canadian Guide to Road Safety Audits. As noted above, an in-service RSA is an in-depth study of an existing road, using road safety principles with the purpose of identifying cost-effective countermeasures that improve road safety and operations for all road users including vulnerable road users. An in-service RSA can be conducted on any road section, intersection, or interchange in any environment (urban/rural) irrespective of a site's physical characteristics. However, in order to optimize use of available resources and increase the likelihood of success in improving safety, in-service RSA are most effective when conducted at sites where a high potential for safety improvement has been identified.

The TAC Canadian Guide to In-service Road Safety Reviews identifies the role of in-service RSA as follows:

“Improving the physical and operational characteristics of existing roads is a proven and effective method to improve road safety. The geometric and operational characteristics of many existing roads



(particularly old roads) are incompatible with the current demands that are placed on them. Traffic volumes, surrounding land use, road user behaviour, population demographics, vehicle characteristics, traffic operations technology, and road safety engineering knowledge change over time. By upgrading the operational and physical characteristics of existing roads to be more compatible with current traffic conditions and safety knowledge, significant gains in safety can be achieved.

Collisions are caused when a failure occurs in the interaction between the road user, the vehicle, and the road environment. Incompatibility between a road's intended function and the current demands placed upon them can contribute to this failure. Many of the collisions that are attributed to road user error can be prevented or made less severe by improving the road environment. Traffic specialists with an understanding of human behaviour can improve roads to prevent common road user errors from resulting in a collision. As well, the road environment can be made more forgiving so that a collision may be less severe.

To be effective, road safety improvements need to be carefully selected and targeted at specific deficiencies and driver behaviours. The proper selection of safety and operational improvements for existing roads is made possible through an in-service road safety audit.”³

3.2 In-service RSAs Process

An in-service RSA will normally begin with a site chosen from a prioritized list of sites produced by the annual screening of the road network. The listed sites are not necessarily those with the highest number of collisions: they are those where the potential for safety improvement is highest. When selecting the sites from the prioritized list, geographical representation can be incorporated at the outset of the network screening by ranking sites within pre-defined sub-areas, and selecting a minimum number of sites per sub-area.

In addition to network screening, in-service RSAs may also be triggered by other means such as public complaints or stakeholder requests. A location where geometric or operational improvements are already planned for implementation could be good candidate for an in-service RSA, even if the location is not among the highest in terms of potential for safety improvement. This is because, additional safety countermeasures can be considered at a relatively small incremental cost. An in-service RSA can also be triggered as a result of high profile collision and media attention at a particular location (the purpose is not to investigate the collision).

The in-service RSA process has three stages. The first stage is the office review in which various procedures are used to develop an understanding of the nature of a site's problems. The office review produces a list of operational concerns of a studied site. The second stage is the field review in which findings of the office review are confirmed and any potential hazards at a site are identified. The third stage is the detailed analysis and recommendation of countermeasures that will address a site's problems/deficiencies. In summary, an in-service RSA can be divided in the following three tasks:

- + Office review;

³ The Canadian Road Safety Audit Guide, Transportation Association of Canada, 2001



- + Field review; and
- + Detailed analysis and recommendation of countermeasures.

The three tasks do not necessarily take place sequentially. There will often be a need to iterate between tasks in order to gather additional information to complete the review.

The level of investigation and types of analysis undertaken in an in-service RSA will vary depending on the size, physical characteristics, and operational and safety issues within the study area. For example, the following study area types will result in in-service RSA with similar structure, but different content:

- + Urban roadway segment with multiple accesses on both sides;
- + Urban intersection;
- + Rural highway segment with or without accesses; and
- + Freeway interchange.

3.2.1 Office Review

The office review includes informed and systematic examination of all available data including a review and analysis of operational characteristics, collision characteristics, geometric and roadside characteristics, recent and planned improvements, maintenance history, and stakeholders consultation if required. The office review uses collision summaries, police reports, collision diagrams, traffic and highway geometric data, adjacent land use information, existing drawings and maps, and photographs. The information is analyzed to identify potential operational and safety deficiencies in the study area. The findings from the office review are also used to highlight issues that need closer examination during the field review.

If there are insufficient data to undertake some of the evaluation, the analysis may be deferred until additional data are collected during the field review.

3.2.2 Field Review (s)

The field reviews are conducted to verify the deficiencies identified during the office review and to identify those hazards that have not yet become causal factors for any collisions. The field investigations include an equally thorough examination of road user tasks and information requirements, traffic operations, and road and roadside design. They may be supported by drive-throughs, walk-throughs and a video record. These investigations identify the circumstances, the information available to the driver, and any difficulties that highway users might encounter at the subject site. Additional data may be collected during the field review in order to complete all required analyses. The output of a field review is a list of safety and operational deficiencies.

3.2.3 Detailed Analysis and Countermeasure Recommendation

The development of recommendations involves the identification and selection of suitable countermeasures (an action that if implemented will likely reduce the frequency or severity of one or



more types of collisions) to address the site's safety and operational performance concerns. The first step under this task is to summarize the needs based on identified deficiencies and then develop alternative countermeasures. These alternatives are then subjected to economic analysis to determine the applicable and most cost-effective countermeasures. Non-economic factors (e.g. design consistency, environmental impacts, mobility and connectivity, etc.) should also be considered for the countermeasures that may not be cost-effective otherwise. The findings of the detailed analysis are used to determine appropriate countermeasures which will reduce the frequency and/or severity of collisions. The output of this task is a set of countermeasures that would mitigate the site's safety and operational performance deficiencies and provide an estimate of the economic viability of countermeasures.

4. Recommendations for Conducting In-service RSAs for Peel Region

This section provides our recommendations for commissioning, conducting and completing RSAs with consideration for all road users including vulnerable road users.

4.1 Justification and Criteria for Selecting Locations for In-service RSA

Sites for conducting in-service RSAs can be selected as follows:

- + The sites can be selected based on the priority list of sites produced by the screening of the road network. The Region has developed Safety Performance Functions (SPFs) and conducts network screening annually using the Traffic Engineering Software (TES) Safety Module. The network screening analysis provides a potential for safety improvement (PSI) index for each site. The sites are then ranked based upon the PSI value. The PSI index can be estimated by considering various collision types including: fatal and injury collisions, total collisions, and collisions by specific impact types (e.g. rear-end, angle, head-on, single motor vehicle, etc.). The outcome of the network screening process identifies road sections and intersections prone to high collision risks based on the PSI value. These identified locations should receive the Region's priority for conducting in-service RSAs based on available resources. The Region may choose to rank sites based on the PSI values of only fatal and injury collisions in keeping with vision zero principles or other collision types as identified above.
- + The locations for in-service RSAs can also be selected based on public complaints and stakeholder requests. The Regional Traffic Safety Team will assess the need of conducting such an audit based on the issue.
- + The locations for in-service RSAs can also be selected proactively by considering vulnerable road users, or target groups, such as children, youth, seniors, and heavy trucks.
- + The locations for RSAs can also be identified proactively by staff when they are travelling the Regional roadways.
- + All locations already planned for geometric or operational improvements should be subjected to in-service RSAs. This can help identify additional safety measures at a small additional cost.



These RSAs can be conducted by consultants as part of the Environmental Assessment studies and at detailed design stage. The Region may also hire an experienced consultant for conducting audits through a public bidding process for an independent safety review during detailed design.

Further information on selection of sites for conducting in-service RSAs is provided in the white paper documenting recommended safety programs for the Region.

4.2 Procedure for Conducting an In-service RSA

The Region may choose to conduct in-service RSAs using its in-house team or hire external consultants with specific experience. Although the steps for each assignment may be slightly different based on the scope of work (for example, some assignments may not require operational analysis or conflict analysis). In-service RSAs, when conducted by external consultants, will be generally undertaken in following steps:

Task 1 – Project Management and Meetings

- + The consultant hired to conduct an in-service RSA will be expected to attend two - three meetings (based on the project scope and decided by the Project Manager) with the Region Staff. The minimum number of meetings to be held is as follows:
 - One project initiation meeting;
 - One progress meeting; and
 - One final wrap up and summary meeting and presentation (if necessary).

The objective of the project initiation meeting will be to bring together the stakeholders including the Region and the consultant to set the context of the in-service RSA and to discuss the scope of the services and review all information available.

At the project initiation meeting, the Region will review the milestones that have been proposed by the consultant. The Region will also review the scope and objectives of in-service RSA, responsibilities, data requirements, timelines, and schedule for the completion of the Project and set up lines of communication between all involved parties.

The objective of the progress meeting will be to obtain feedback/update on the project progress and/or to seek/provide any project related clarifications. Ideally the progress meeting should be conducted before the report is drafted.

The objective of the final wrap up meeting will be to bring together all stakeholders and to make them aware of the final findings of the project. The consultant will make a final presentation on the study findings. This meeting is usually required for larger projects or as per the discretion of the Region's Project Manager.

Task 2 – Data collection

The consultant will generally be provided with available data, which may include, but not be limited to, the following:



- + Historical Raw Traffic Collision Data from the Region, in Microsoft Excel Format and/or Motor Vehicle Accident (MVA) Reports;
- + Results of any network screening and/or over-representation analysis conducted;
- + Safety Performance Functions (SPFs);
- + Recent and historical traffic counts;
- + Vehicle speed and classification data;
- + Pedestrian and cyclist counts;
- + Roadway right of way;
- + Geometric design drawings;
- + Intersection signal timing plans;
- + Intersection design drawings and/or legal drawings, if available;
- + Aerial Photography and/or CAD base plans of each location, if available;
- + Maintenance / construction history and future plans for the study sites and for adjacent sites which may have an influence on the study sites;
- + Details of the recent Capital Projects or Environmental Assessment studies related to the study area, if any;
- + Any public complaints and/or political driven inquiries;
- + Applicable traffic bylaws; and
- + Any other information that the Region may deem relevant.

Task 3 – Office Review

As part of the office review, the data collected in the previous step will be reviewed for completeness and accuracy. Any gaps within the data will be addressed in consultation with the Region's Project Manager. The following tasks will be completed.

Task 3.1 – Operational Characteristics

A review of operational characteristics may include the following:

- + Speed Studies – This task will require recording and analyzing actual vehicle travel speeds to identify or verify concerns related to speed zoning or excessive speeding through the study area.
- + Existing and Forecasted Vehicle Volume – Traffic volume counts represent the demands at the study site. Typically, the morning and afternoon peak periods should be analyzed at a minimum. Seasonal variations in traffic volumes and classifications should also be accounted for, particularly for sites that are significantly affected by different seasons. Annual changes in traffic volumes should be analyzed to determine whether or not traffic volume patterns have been subject to fluctuation or significant growth in recent years. At sites with an identified or perceived safety or operational deficiency with respect to heavy trucks, it is useful to survey and analyze



the vehicle classification characteristics. The Region has deployed permanent count stations (PCS) at some locations to identify travel patterns. The Region also has a vast Automatic Traffic Recorder (ATR) program. It is suggested that the Region expands its PCS program and derive factors to estimate AADTs accurately on Regional roads.

- + Operational Efficiency - The operational efficiency at the study site should be analyzed, as required. The operational efficiency can have a direct bearing on the collision risk. The capacity performance of study intersections should be quantified for each peak hour of interest, using measures such as delay (possibly represented by a level of service), volume/capacity ratios, and queuing for each turning movement and for the intersection as a whole. This analysis is typically conducted according to the procedures of Highway Capacity Manual (HCM) or Canadian Capacity Guide (CCG) for Signalized Intersections.

At signalized intersections, a review of signal timings should be conducted to determine if the signal operations can be optimized to minimize overall delays, taking into account the surrounding network and corridor requirements.

At un-signalized intersections where long delays are being encountered, the need to modify the traffic control (for example, to a roundabout or signal) should be reviewed.

At sites other than intersections, such as along highway and freeway segments, the level of service, delays, queuing and weaving can be quantified using the procedures of the HCM.

The traffic operational efficiency at signalized intersections should be conducted by using Synchro / Sim Traffic software package. The traffic operational efficiency at un-signalized intersections and at sites other than intersections should be conducted using Highway Capacity Software.

Operational efficiency also applies to pedestrian traffic. Long delays between “Walk” phases or acceptable crossing gaps may cause pedestrians to become impatient and take risks, for example by crossing when vehicles have the right-of-way or by accepting an inadequate gap. “Do Not Walk” phases that are accompanied by very low levels of traffic volumes are likely to be ignored. Long crossing distances with inadequate crossing intervals may result in elderly pedestrians and people with disabilities being stranded in the intersection. These situations result in an increased risk of collisions that involve vulnerable road users.

There may be situations where it is obvious that the collision problem of a location is not related to an operational deficiency and therefore, the analysis of traffic operational efficiency may not be necessary. An example of such a situation is a low volume rural roadway segment with repeated collisions due to the lack of adequate sight distance.

Task 3.2 – Road User Collision Analysis

The analysis of the historical collision data forms the core of an in-service RSA and provides an in-depth understanding of potential safety deficiencies of the study site. A minimum of five years of historical collision data should be analyzed. The following types of collision analysis are recommended:



- + Review of Collision History – The collision data within the study period should be reviewed for a general understanding of the collision characteristics of the site such as: location, year, month, day of week, time of day, season, severity, impact type, lighting condition, environmental condition, road surface condition, apparent driver action, sequence of events, driver/pedestrian condition, driver age, and any other significant attribute. Collision distribution patterns of the collision data should be identified by summarizing the collision data in an organized format, such as presenting the collisions type and collision characteristics in readily understandable charts. The collision summary should include number and proportions of different collision attributes. In this way, an unusual collision trend can be identified that may require further investigation.
- + Collision diagrams - Collision diagrams should be reviewed to have an understanding of spatial distribution of collisions with respect to vehicle movements. The collision diagrams should be reviewed for its accuracy before making an inference.
- + Overall Collision Rates – Overall collision rates should be reviewed to assess the collision risk for the individual road user. Collision rates allow comparisons of collision risk along roads of a similar class that could have a range of traffic volumes. However, this measure should be used very carefully, since low volume sites can be identified as high risk collision locations.
- + Statistical Collision Analysis - The Region annually conducts network screening using TES with which Potential for Safety Improvement (PSI) and collision over-representation for each site are calculated. The results of these analyses should be reviewed to identify the extent of the safety problem and collision attributes that have occurred more than expected within the study area.
- + Cross Tabulation - Values that are high or statistically over-represented should be more closely examined by cross-tabulation to gain a more detailed understanding of the collision risk. For example, if run-off road collisions and slippery conditions are over-represented, they should be cross-examined to see if there is a correlation between the two.
- + Summarizing Collision Analysis Results - The results of the collision analysis should be summarized based on the findings of the collision analysis. The intent of this section is to identify patterns in collisions which will assist the project team to identify the issues or deficiencies during the field review that are contributing to the collisions.

Task 3.3 – Traffic Conflict Analysis

A traffic conflict analysis may be required for the following conditions: collision data are missing or incomplete; the analysis of collision data fails to reveal identifiable patterns or contributing factors; and particular obvious collision risks are not part of collision data. The detailed information on traffic conflict analysis is provided in TAC In Service Road Safety Review Guide and Traffic Conflicts Procedure Manual⁴ and is briefed in subsequent paragraphs.

Traffic conflict analysis is limited to intersections. Wherever required, traffic conflict data should be collected for eight hours for each approach of an intersection. For a four-legged intersection, 32

⁴ Traffic Conflict Procedure Manual, Second Edition, Insurance Corporation of British Columbia, 1996



person-hours of observation will be required. The collected conflict data should include the conflict type, location, severity, time, travel directions of the involved road users, and other related characteristics.

The severity rating of conflicts is measured by combining two scores – time to collision (TTC) and risk of collision (ROC). The TTC is an objective measure of the time remaining prior to the collision at the instant the preventive action was taken. Each conflict is assigned a TTC score from 1 to 3. The ROC is a subjective measure of the perceived control that the conflict participants had over the conflict events. Each conflict is also assigned a ROC score from 1 to 3. TTC and ROC for each conflict are combined to determine the overall severity rating of a conflict. Each conflict can have a minimum rating of 2 and maximum rating of 6. The TTC and ROC score can be assigned by using the following Table 1⁵.

Table 1: TTC and ROC Scoring Guidelines

TTC and ROC Score	TTC (sec)	ROC
1 (Potential)	$1.5 < \text{TTC} \leq 2.0$	Low Risk
2 (Slight)	$1.0 < \text{TTC} \leq 1.5$	Moderate Risk
3 (Serious)	< 1.0 second	High Risk

The ROC score is assigned based on the judgement of the observer based on the seriousness of the observed conflict.

Once the traffic conflict data is collected, the analysis consists of the following:

- + Conflict Diagram – A conflict diagram, similar to a collision diagram, showing spatial distribution of observed conflicts is created. The diagram includes conflict types, direction of travel, time of occurrence and severity.
- + Conflict Frequency - The frequency of conflict occurrence per hour is determined for each observation period (morning, mid-day, and afternoon).
- + Conflict Rate – The rate of conflicts with respect to traffic volume is determined.
- + Conflict Distribution - It includes a distribution of conflicts based on observation period, severity rating, conflict type, and time. The distribution can determine the conflict types that created the highest risk and the times of the day when conflicts are more likely to occur.

The results of the traffic conflict analysis should be compared with the collision analysis results to identify contributing factors to certain collision types and other safety concerns that are not apparent from the collision data.

⁵ Development of a Conflict Analysis Methodology Using SSAM, IOWA State University, August 2012



Task 4 – Field investigation

A detailed field investigation of all intersections and roadway segments within the study area should be undertaken to identify the factors contributing to collisions. The review should be conducted during peak and off-peak traffic periods and may be required for both day and night conditions. The review should be conducted in light of Regional Policy, Regional and Provincial Standards, industry best practices, and traffic bylaws and should consist of the following as a minimum:

- + Site geometrics, traffic control devices (signs, signals, pavement markings etc.), and all other roadway features present within the roadway environment for conformance and consistency, including physical evidence of traffic collisions.
- + Road way geometric characteristics including horizontal and vertical alignments (i.e. visibility for all road users including a sight line review as required), cross-section, medians, super-elevations, lane and intersection configuration, lane continuity, channelization, auxiliary lanes, pavement and shoulder condition including pavement edge drop-offs, clear zone, embankment slopes, sight distances, driveway and side street accessibility, access management, corner clearance and visibility (sight triangles).
- + Traffic control devices including signs, traffic signals, pavement markings, and other related devices for conformance to appropriate Ontario Traffic Manuals (OTM) Book 5, OTM Book 6, and OTM Book 11.
- + Illumination and delineation devices including roadway illumination, reflective guidance devices, and delineators.
- + Impacts of any adjacent land uses, such as schools, commercial plazas, buildings, etc.
- + Site operations and road user interactions including traffic speed and classification, traffic patterns and behaviour from the perspective of all road users, length of queuing, any disruptive accesses, the effects of any major traffic generators, conflicts associated with specific movement types such as weaving, merging, and accesses; and conflicts associated with specific user groups such as vehicle/pedestrian and heavy trucks.
- + Human factors including positive guidance review, expectancy violations, workload issues, and operational scenarios that may potentially contribute to the occurrence of driver error and collisions. The review of positive guidance and expectancy violation should be conducted by following the procedures provided in OTM Book 1, Appendix C – Positive Guidance Tool Kit. The procedure provides a step-by-step assessment of a driver's task negotiating a problem location leading to identification of driver-related problems caused by deficiencies in the site's information system. OTM Book 1 provides checklists to facilitate the required tasks including hazard identification, hazard visibility assessment, expectancy violation determination, information load analysis, and current information system evaluation.
- + Access management including departure sight lines, stopping sight distance, conflict points, turning restrictions and grading impacts to accesses affected by any widening of the study area roads, impacts of accesses to sidewalks and multiuse path facilities, etc. It also includes reviewing what the operations of accesses are designed for and how they are actually operating in the field.



There are some scenarios where accesses are actually designed to operate as right-in/right-out, however, left-turn movements are also being made as a result of an existing median opening or any other geometric deficiency. The approved design of accesses can be determined by review of the respective titles.

- + Roadside safety, slopes, roadway clear zone, and potential unprotected roadways and/or roadside hazards, safety devices including guiderails, end treatments, and crash cushions.
- + Pedestrian and cyclists' safety including sidewalks, crosswalks, multi-use paths, bike lanes, pedestrian crossings, and cross-rides, for pedestrians and cyclists, based on existing pedestrian / bicyclists generators within the study area.
- + Impact of locations of any transit stops on pedestrian movement (location of the transit stop could prompt mid-block crossing).
- + Accessibility for Ontarians with Disabilities (AODA) should be explicitly reviewed.

Task 5 – Detailed Analysis and Countermeasure Recommendations

The results of the previous analyses are combined for determining any potential safety issues of the study area. These safety issues form the basis of the development and evaluation of solutions. Based on the identified safety issues, a list of potential countermeasure alternatives is generated that could assist in reducing or eliminating the safety issues. These potential countermeasures are further evaluated as follows:

- + Identification of deficiencies and confirmation of needs;
- + Identification and selection of suitable countermeasures to address the needs;
- + Economic evaluation of countermeasures; and
- + Development of Action Plan

Task 5.1 – Identifying Deficiencies and Confirming Needs

Under this task, the deficiencies identified in the previous tasks are summarized as needs. The summary statements should identify the causes of collision patterns identified. The summary statements should also include the hazards that are not yet involved in collisions. These summary statements serve as a foundation for identifying suitable countermeasures.

Task 5.2 – Identification and Selection of Suitable Countermeasures

Once the safety needs of a study site have been identified, the most suitable countermeasures are considered based upon the site's characteristics and deficiencies. The basic principles involved in selecting countermeasures are as follows:

- + Determine the range of countermeasures likely to influence the identified safety needs; for example, starting from measures such as improved signs and markings all the way to twinning of the highway or grade separation of an intersection;



- + Determine whether an improvement at another location could affect the collision frequency at the study site (e.g. a median closure can prompt U-turns at an adjacent intersection creating potential of collisions involving U-turning vehicles) ;
- + Select countermeasures that can be expected to reduce the frequency and/or severity of collisions caused by the identified deficiency. This requires a combination of research, knowledge, experience, and judgement;
- + Consider the consequences of the selected countermeasures, including collision risk migration to other locations;
- + Consider the feasibility of the countermeasure from both a technical and community perspective. The countermeasure should be suitable for the site context and should fit within the framework of other safety initiatives. The countermeasure should also be acceptable to the community and the affected stakeholders; and
- + Conduct an evaluation to quantify the costs and benefits of implementing the selected countermeasures.

Each selected countermeasure should address one or more specific deficiencies that were identified in the analysis of collisions, geometry, operations, conflicts, and human factors.

Some references for countermeasures are listed below:

- + American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual;
- + Federal Highway Administration (FHWA)'s Clearinghouse (<http://www.cmfclearinghouse.org/>);
- + FHWA Safety Website (<http://safety.fhwa.dot.gov/>);
- + National Highway Traffic Safety Administration (NHTSA) "Countermeasures That Work";
- + NCHRP Report 600 – Human Factors Guidelines;
- + TAC In Service Road Safety Review Guide;
- + Geometric Design Guides (e.g. TAC Geometric Design Guide for OTM Roads);
- + OTM Books;
- + NACTO Urban Street Design Guide;
- + The Science of Highway Safety, Ontario Ministry of Transportation; and
- + Experience from other municipalities,
(<http://www.regionofwaterloo.ca/en/safehealthycommunity/trafficsafety.asp>).

Task 5.3 – Economic Evaluation of Countermeasures

The economic evaluation of countermeasures is conducted in following three steps:

- + Estimation of expected benefits,
- + Estimation of the cost, and



- + Economic analysis using an appropriate method.

Task 5.3.1 - Estimation of Expected Benefits

To estimate the expected benefits of a countermeasure it is necessary to estimate the expected reduction in the number and/or severity of collisions for the site in question. This is best done using the Empirical Bayes method to compare the safety of the site with and without the proposed countermeasure.

Empirical Bayes is a statistical method to account for the regression to the mean in collision data. The observed collision frequencies are blended with the average collision frequencies for sections of highway with similar characteristics to create a “smoothed” collision frequency that is more likely to represent the true long-term collision mean. The average collision frequencies for similar sections of highway are represented by Safety Performance Functions (SPF). Safety Performance Functions (SPF) are equations that use the Empirical Bayes method to estimate the expected number of collisions (by severity level) on a highway facility based on its traffic volume, length, and classification. The Region has developed its own SPFs.

The next step is to estimate the reduction in collision frequencies as a result of the countermeasure by applying Collision Modification Factors (CMF). The CMF of any given measure is simply a ratio of “the expected collision frequency with the measure” to “the expected collision frequency without the measure”. CMFs selected to estimate safety benefits are generally expressed by collision severity (i.e. fatal, injury, PDO) and should be based on the latest available studies. Some major sources of CMFs include CMF Clearinghouse⁶ and the Highway Safety Manual⁷. When a CMF of countermeasure is not available, a sensitivity analysis can be helpful to understand the extremes of the benefits of the countermeasure (i.e., cost-effectiveness of a countermeasure on assumption of eliminating 100% collisions, or a very slight reduction in collisions). Sometimes, even a 100% reduction of collisions may not be cost-effective or, conversely a very slight reduction may be highly cost-effective.

The third step is to estimate the dollar value of collisions saved based on the societal cost of collisions by severity. The dollar value of the collision reduction is obtained by multiplying the cost per collision by the collision reduction. Each collision severity level is considered separately, and the savings is summed to obtain the overall benefit. The societal cost of collisions adopted by the Region are as follows:

Fatal collision - \$831,429 per collision,

Injury collision - \$20,084 per collision, and

PDO collision - \$6,136 per collision.

These costs are based on 1990 dollars and should be converted into present values using the Bank of Canada average annual inflation rate (http://www.bankofcanada.ca/en/rates/inflation_calc.html) by using the following equation:

⁶ <http://www.cmfclearinghouse.org/>

⁷ Highway Safety Manual, AASHTO, 2010



Future Value = Present Value * (1+ annual inflation rate)^{number of years}.

Task 5.3.2 - Estimation of Costs

Estimates of the construction costs must be completed for each countermeasure. These costs should consider both the capital and operations and maintenance costs.

The capital costs for a countermeasure represent only the initial costs required to construct, which includes; contract administration, construction, design, environmental mitigation, loss-of-business, property acquisition, traffic staging, etc.

The costs incurred over the life of the improvement, such as maintenance costs or any decrease in operational performance resulting from the measure should also be estimated. These future costs should be discounted to present dollars by using present worth factor (PWF) based on Bank of Canada discount rate. The PWF can be calculated by using the following equation:

$$PWF = \frac{1}{(1+i)^N}, \text{ where } i = \text{Discount Rate and } N \text{ is Number of Years}$$

For example, the PWF for a discount rate of 5% for 4 years will be 0.82270. Therefore the present value of a maintenance of \$1,000, conducted on an improvement after 4 years of its implementation will be \$822.70.

Task 5.3.3 - Economic Analysis

The benefit to cost ratio is a common economic evaluation technique that compares the value of the expected benefits with the cost of implementing the countermeasure. The benefit to cost ratio is found by dividing the net present value of the benefits of the countermeasure by the costs of the initiative. A benefit to cost ratio greater than 1.0 over effective project life represents a viable project. However, to ensure adequate value will be obtained by the countermeasure investment, it is preferable to carry forward countermeasures with benefit to cost ratios in excess of 2.0.

Task 5.4 – Development of Action Plan

The purpose of this task is to outline the action plan to implement the recommendations. It will include grouping of the countermeasures into workable strategies for the consideration of the Region. The grouping should be based on the urgency of implementation and may include: immediate action, short-term action, medium term action, and long-term action. Immediate actions include countermeasures that should be implemented soon after they are identified (e.g. trimming over-hanging branches obstructing visibility of a signal head). Short-term action include countermeasures that are relatively inexpensive and could be funded from the maintenance budget (e.g. upgrading signs). Medium-term actions include relatively expensive countermeasures that may require design work and possibly the acquisition of right-of-way (e.g. provision of a left-turn lane). Long-term measures are those measures that require long-term planning, design, and public consultation (e.g. re-aligning a roadway).



Task 6 – Report and Documentation

Upon completion of the previous tasks, an In-Service RSA Report must be produced. The report should include a description of the subject location's existing conditions, the findings from the office review, the findings from the field review, and all other analyses undertaken. It should include all recommended countermeasures with appropriate economic analysis. Any non-conformities to standards or industry best practices, even though not directly related to collision history, must also be included (e.g. fixed objects within clear zone). The identification of these non-conformities is important to ensure that the Region's road network conforms to standards. If for any countermeasure, an economic analysis cannot be conducted, a cost estimate should be provided.

The report should be done in two steps. A draft report should be prepared for comments by the Region's project team. Then, the comments received on the draft report must be addressed and incorporated into the final report.

4.3 Consideration of Vulnerable Road Users in In-service RSA

An in-service RSA is conducted taking into consideration all road users. A review that does not include vulnerable road users (i.e. pedestrians, disabled, children, seniors, and cyclists) cannot be considered complete. Therefore, it is essential that the teams conducting in-service RSAs must have particular knowledge of issues related to vulnerable road users.

Some key elements for consideration of vulnerable road users within in-service RSAs are as follows:

- + Accommodation of pedestrians including children, seniors, and the disabled by:
 - Providing pedestrian facilities that address the needs of all types of pedestrians throughout a pedestrian route (e.g. sidewalks of adequate widths, sidewalk/street boundaries discernable to people with visual impairments, adequate curb ramps for accessibility, etc.);
 - Providing safe, continuous, and convenient paths along all pedestrian routes for all (e.g. provide a path clear of any temporary and permanent obstructions, a path adequate for persons in wheelchairs, pedestrian friendly gradients, providing safe crossing points, adequate walking surface, etc.);
 - Providing traffic conditions conducive to pedestrian safety (e.g. minimizing vehicular pedestrian conflicts, providing adequate pedestrian walk time, turning radii at intersections that do not encourage high speed right turns, creating gaps in traffic to allow pedestrians to cross the road, providing separation between travel lanes and pedestrian, etc.);
 - Providing a roadway environment where pedestrians or motorists do not ignore pedestrian facilities (e.g. locating the pedestrian crossing points where they are required);
 - Providing means for considering the safety of children in school zones (e.g. engage qualified crossing guard);
 - Providing appropriate illumination and visibility from the perspective of all road users (e.g. improved pedestrian visibility at night, appropriate sight lines for all road users);



- Providing appropriate traffic control devices (e.g. signs, pavement markings, signals, school crossing guards, pedestrian crossovers); and
 - Meeting AODA requirements
- + Accommodation of cyclists by:
- Providing design features that do not adversely impact the use of bicycle facilities (e.g. cyclist friendly gradient, design to reduce conflicting movements at intersections, minimizing conflicts at transit stops, minimizing conflict points with on street parking where a parked vehicle may open their car door and allow for a cyclist to drive into it, etc.);
 - Providing provisions for cyclists according to traffic operations (e.g. discouraging vehicle left-turns into accesses along heavy bicycle routes, discouraging shared roadways for high volume and high speed roadways, etc.);
 - Providing a smooth and stable riding surface (e.g. manhole covers properly designed and placed);
 - Providing obstructions away from the pedestrian facility (e.g. maintain appropriate horizontal and vertical clearance, install guide rail, etc.);
 - Providing a cyclist friendly roadside design (e.g. provide appropriate clear zone, provide appropriate heights of bridge parapet walls and guiderails);
 - Providing appropriate illumination and visibility from the perspective of all road users (e.g. provide adequately lit riding surface, appropriate sight lines for all road users); and
 - Providing appropriate traffic control devices (e.g. signs, pavement markings, signals, crossrides, etc.).

For a comprehensive check lists of pedestrian and cyclist considerations during an In Service RSA, readers are referred to the following documents:

- + Pedestrian Road Safety Audit Guidelines and Prompt Lists prepared by Federal Highway Administration (FHWA-SA-07-007); and
- + Bicycle Road Safety Audit Guidelines and Prompt Lists prepared by Federal Highway Administration (FHWA-SA-12-018).

5. Corridor Access Management in In-service RSA

Corridor Access Management (CAM) is a systematic process through which jurisdictions manage the provision of access to the public road system for new development or redevelopment. It is essentially a strategy that balances the safety and mobility of a roadway facility with the access needs of adjacent land uses. Managing access points along major roadways helps improve safety, mobility, and accessibility along the roadway because it favourably impacts all properties along the corridor. CAM strategies use a combination of measures, such as, closing, consolidating, or improving driveways, median openings, and intersections to maintain the flow of people and freight while enabling safe access to businesses and neighborhoods.



CAM is not a separate component of any roadway network system. An in-service RSA of a roadway facility should consider all access points within the study area and provide recommendations to improve or modify access management strategies as required.

5.1 Environmental Scan

5.1.1 Review of Guidelines and Papers

In order to identify any specific processes and factors involved in RSAs specific to CAM in available literature, RSA guidelines for some Canadian and international jurisdictions were reviewed. A summary of this review follows:

FHWA Road Safety Audit Guidelines, Federal Highway Administration, 2006

- + The guideline does not provide any specific methodology for including Corridor Access Management as part of RSA. However, it considers the review of accesses as one of the major topic area that should be reviewed for various issues.
- + The guideline suggests that accesses (driveways, intersections, interchanges) should be reviewed for upstream/downstream effects, potential conflicting movements, and sight distances. Consolidation of access points should be considered.
- + The detailed prompt list is provided that includes various factors related to accesses that should be reviewed. These factors include: degree of access control with respect to the road's function, sight distance, design speed compatibility with number and type of accesses, possibility of linking multiple accesses into one service road, traffic queues as a result of accesses, distance of busy accesses from the intersections, number and level of accesses, and safety of pedestrians.

The Canadian Road Safety Audit Guide, 2001

- + The guideline does not provide any specific methodology for including Corridor Access Management as part of an in-service RSA. However, it considers the review of access management as part of the RSAs.

Road Safety Audit Guidelines, New Brunswick, 1999

- + This guideline specifically considers access and adjacent development at all stages of RSAs.
- + A checklist is provided which specifically gives guidance for the review of accesses and adjacent developments. The factors include: right-of-way, location of accesses, visual clutter (be it excessive commercial signing or lighting), traffic patterns, interaction between driveway and roadway, driveway spacing, location of accesses with respect to curves, sight distances, etc.

Road Safety Audit Guidelines for Safety Checks of New Road Projects, PIARC, 2011

- + This guideline provides check lists for conducting RSAs at interurban main roads crossing built-up areas of towns and villages and urban main roads with guidance related to accesses. The factors include: right-of-way, sight distance, degree of access control, speed compatibility, distance from traffic generators, potential of combining accesses, access for emergency vehicles, and adequacy of turning radii.



Road Safety Audit Austroads, 2002

- + This guideline provides additional considerations to be made for RSA of development proposals. The factors include: visibility at accesses, stopping sight distance, gradients, parking provisions, turning characteristics, signs and markings, impact of landscaping, traffic management, etc.

Guidelines for Operational Performance Reviews, Ontario Ministry of Transportation, 2015

- + This guideline provides prompt lists for reviews of access points. The factors listed include: driveway spacing, location with respect to horizontal and vertical curves, distance from intersections, signing and marking consistency, ease of turning, queuing, sight distance availability, advance signing, conflict points, and speed compatibility.

Intersection Proven Safety Countermeasure – Technical Summary: Corridor Management, US Department of Transportation Federal Highway Administration, 2015

- + This document provides countermeasures related to CAM. It highlights that one of the main ways corridor access management strategies improve safety is by reducing or separating conflict points. It indicates that reducing conflict points increases the available response time for all road users including pedestrians and bicyclists. The document also points out that CAM strategies more often lead to safety benefits driven by improved traffic flow associated with consistency in driver behavior and reduced aggressive actions such as speeding and red light running.

Access Management in the Vicinity of Intersections, U.S. Department of Transportation, Federal Highway Administration, 2010

- + This document discusses in detail potential access management techniques to improve the safety and efficiency of roadway. Some of the techniques discussed include: limiting driveways within the functional area of an intersection, eliminating left-turn movements at driveways, median treatments, and reducing driveway density.

National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan Volume 5: A Guide for Addressing Unsignalized Intersection Collisions, 2003

- + This document discusses in detail the objectives and strategies for improving safety at unsignalized intersections.

5.1.2 Review of the Peel Region Road Characterization Study

The Region published the Road Characterization Study (RCS) in 2013 with the key objective of ensuring that the Regional arterial transportation network considers all road users and transportation modes with an eye toward growth and intensification. Section 3 of the RCS outlines the Region's approach towards access control. The main goal of this approach is to support the existing and the future right-of-way users (goods movement, transit, automobiles, cyclists, and pedestrians) while maintaining road safety and operational efficiency. The Region seeks the following three outcomes from implementing access control measures:

- + Maintaining efficient access to properties.



- + Accommodating non-motorized (pedestrian and bicycle) road users along and across Regional arterials.
- + Preserving the character and appearance of arterial roads.

To achieve these objectives the RCS highlights four areas of access management measures that should be considered on the Regional roadways:

- + Controlling the number and location of access points along arterial roadways. The main premise of this measure is that minimizing the number of accesses reduces interruptions to the traffic flow on the arterial roadways. This measure also improves safety by reducing the number of points of vehicular conflict.
- + Considering access design measures, which essentially controls the number of turning movements at an access. Access points range from permitting all turning movements between the arterial and an access to permitting partial access (for example left-in, right-in/out or right turns in and out only).
- + Providing auxiliary lanes, these lanes improve capacity and safety on the arterial by removing slow moving vehicles from high speed through lanes.
- + Forming networks of local connections; the main objective here is to support access to arterial roadways through a grid of connected local streets and private service roads. While this measure has implications on improving vehicular capacity and travel speeds, it also contributes to higher pedestrian convenience and the safety of all modes of travel on the arterial roadway.

5.2 Recommendations for Peel Region for CAM in In-service RSA

Based on the review of the road safety audit guidelines of Canadian and International jurisdictions, it was identified that all the jurisdictions explicitly consider the review of access management as part of any safety audit. It is recommended that Peel Region follow the same approach. Since there is a direct interaction between a corridor's traffic and the traffic from accesses, the in-service RSA of the corridor should be conducted in conjunction with the review of access points. In this way, every in-service RSA should explicitly include the accesses along the corridor.

5.2.1 Recommendations on Factors for CAM in In-service RSA

Based on the review of RSA guidelines of Canadian and International jurisdictions, and other documents as listed in Section 5.1.1, the factors involved in the review are general and include adequacy of right-of-way, degree of access control, sight distance, speed compatibility, potential for conflicting movements, the potential for combining accesses, the safety of vulnerable road users, access spacing, traffic queues as a result of accesses, and the location of accesses with respect to curves. These factors are consistent with the CAM strategies provided in the Region's RCS 2013.



Table 2 summarizes the recommended factors/impacts related to CAM to be considered in in-service RSAs⁸.

Table 2: Recommended factors related to CAM to be considered in RSAs.

Factor Related to CAM	Description
Design of corridor access management	Roadway safety is related to improved access design and fewer conflict locations. A consistent design will promote drivers' expectancy minimizing the chances of driver error. Therefore, it is suggested that the provision of accesses should be in strict compliance with the Region's access management guidelines provided in Region's RCS.
Management of accesses within functional areas of intersections. Information on the functional area of intersections is provided in Section 5.2.3.	Driveways near intersections may confuse drivers and create vehicle-vehicle conflicts. Therefore, consideration should be given to close, relocate, or restrict accesses near intersections.
Sight distance at accesses	Sight distances for vehicles approaching and exiting the access should be adequate. Some sharp horizontal curves, and vertical crest curves may obstruct the visibility. Clear sight triangles should be available.
Availability/judgement of gaps in main street traffic	Collisions may occur when drivers waiting at accesses are not able to find an appropriate gap or are not able to judge appropriate gaps within the main street traffic. Consideration should be given to resolve this issue. Examples include, a change to the traffic control, relocating the accesses, etc.

⁸ National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan Volume 5: A Guide for Addressing Unsignalized Intersection Collisions, 2003



Factor Related to CAM	Description
Improve main street driver awareness of the accesses	Some access related collisions, especially in rural areas, may occur due to the unawareness of the accesses by drivers on the main street. By improving signing, pavement markings, and illumination, the awareness of accesses can often be improved.
Reduce frequency and severity of conflicts	By reducing the number and severity of conflicts at accesses, the number and severity of collisions can be reduced. This can be done through geometric improvements, such as the introduction of auxiliary lanes, medians, restricting movements, or by closing or relocating accesses.
Provide appropriate traffic control	The traffic control should accommodate the traffic volume and configuration of the access. Some existing accesses may require signalization.
Violation of traffic control devices and rules	Collisions may occur due to non-compliance with traffic regulations. Consideration should be given to avoid the inappropriate placement of traffic control devices in locations that may violate driver expectancies and therefore increase the potential for driver non-compliance.
Speed incompatibility	Higher operating speeds on corridors may cause speed differentials between the turning traffic and the through traffic, which may cause angle and rear-end collisions.
Vulnerable road users	Pedestrian and cyclists may be at risk at accesses. For example, on sidewalks and cycle tracks not directly adjacent to the travel lane, turning drivers may not notice the pedestrians and cyclists. Likewise, drivers of left turning vehicles into the accesses may not notice pedestrians or cyclists given their attention on oncoming traffic while looking for a safe gap.
Location of transit stops in the vicinity of accesses	Stopped buses may obstruct the visibility for the motorists exiting the accesses.



5.2.2 Common Measures for Corridor Access Management

Table 3 provides some industry measures that are used to mitigate the impacts identified in Section 5.2.1⁹. Collision Modification Factors (CMF), if available, are provided with the standard error (SE) of estimate representing the measure of accuracy.

Table 3: Common corridor access measures

Factor / Impact	Measure	CMF (if available)
Improve Management of Accesses within Functional Areas of Intersections	Implement access closures / relocations	CMF for reducing access density ¹⁰ : $CMF = \frac{0.322 + DD \times [0.05 - 0.005 \times \ln AADT]}{0.322 + 5 \times [0.05 - 0.005 \times \ln AADT]}$ <ul style="list-style-type: none"> • AADT = average annual daily traffic volume of the roadway being evaluated • DD = access point density measured in accesses per mile
	Implement access turning restrictions by limiting to right-in / right-out only	CMF not available
Sight Distance Restrictions	Clear sight triangles for all types of movements	CMF not available
	Modify horizontal and/or vertical alignments to increase the sight distance available	CMF not available
	Eliminate parking obstructing the sight lines	CMF=0.58, SE=0.08
Availability and judgement of	Adjust adjacent signals to create gaps at accesses	CMF not available

⁹ National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan Volume 5: A Guide for Addressing Unsignalized Intersection Collisions, 2003

¹⁰ The Highway Safety Manual (HSM) (Chapter 13, Section 13.14.2, page 13-50)



Factor / Impact	Measure	CMF (if available)
gaps in main street traffic	Provide roadside markers or pavement markings in the field of view of the driver observing the approaching traffic stream in conjunction with signing and public education campaign. The roadside markers or pavement markings can be placed at fixed travel time distances from an intersection, which can assist drivers in deciding when it safe to accept a gap. However, this will require educating the drivers through a public education campaign.	CMF=0.81, SE= 0.07 (rural)
	Use of intelligent transportation systems to inform drivers of the available gaps for making turning and crossing movements.	CMF not available
Improve driver awareness of accesses	Improve visibility of accesses by providing signing and delineation	CMF not available
	Improve illumination at accesses	CMF=0.62, SE=0.13
	Provide splitter islands on the access approach	CMF not available
	Provide transverse rumble strips in advance of major accesses, especially in rural areas with isolated accesses	CMF not available
Reduce frequency and severity of conflicts	Provide exclusive left-turn lanes at busy accesses	CMF=0.748, SE=0.095
Reduce frequency and severity of conflicts	Implement turning restrictions by providing median island and/or directional median	CMF=0.49, SE=0.16
	Implement bypass lanes at busy accesses	CMF not available
	Implement turning restrictions by signing	CMF not available
	Provide exclusive right-turn lanes	CMF=0.993, SE =unknown



Factor / Impact	Measure	CMF (if available)
	Provide wide paved shoulders in access areas	CMF not available
	Close or relocate high risk accesses	CMF not available
	Consolidate accesses	CMF for reducing access density: $CMF = \frac{0.322 + DD \times [0.05 - 0.005 \times \ln AADT]}{0.322 + 5 \times [0.05 - 0.005 \times \ln AADT]}$ <ul style="list-style-type: none"> • AADT = average annual daily traffic volume of the roadway being evaluated DD = access point density measured in accesses per mile
	Add continuous two-way left turn lane (TWLTL)	CMF=0.64, SE=0.04 (for two lane rural roads)
	Add non-traversable median	CMF=0.49, SE=0.16
	Add a left-turn bay at a median opening	CMF not available
	Provide continuous auxiliary lane	CMF not available
	Convert offset driveways to four-legged intersections and vice-versa	CMF not available
Provide appropriate traffic control	Confirm the appropriateness of traffic control such as yield control, two-way stop control, all-way stop control, roundabout, and signalization	CMF not available
Violation of traffic control devices and rules	Improve the geometry and placement to enhance road user's perception of the traffic control	CMF not available
	Implement enforcement to reduce violation regulator signs and signals	CMF not available
	Initiate public campaign on safety issues of a particular location	CMF not available
Speed compatibility	Explore and implement traffic calming strategies	CMF not available



Factor / Impact	Measure	CMF (if available)
	Reduce the posted speed to reduce the speed differential at driveways	CMF=0.74, SE= 0.03 (Lowering posted speed from 50 km/h to 40 km/h in urban residential areas)
	Reduce the right-turn radius to reduce the turning speed	CMF not available
Vulnerable road users	Review pedestrians and cyclists issues and improve pedestrian and bicycle facilities	CMF not available

6. Proactive Countermeasures for CAM Enhancements

There are many safety issues which frequently arise around access points along a corridor. These safety issues typically occur due to the unexpected slowing of vehicles, and/or the ingress and egress of turning vehicles. However, there are countermeasures that can be introduced along the corridor to improve the safety of these accesses. Most of these countermeasures must be considered during the (re)design stage of a corridor, but if considered proactively, can often help to avoid safety issues from occurring in the first place. This further avoids the need to have to retroactively address these safety issues during an in-service road safety review.

a) Avoid Driveways within the Functional Area of an Intersection

FHWA published a report¹¹ that discussed potential access management techniques to improve the safety and efficiency of roadways. One of the key measures discussed is related to restricting accesses within the functional area of an intersection. This helps to reduce the number of decisions that drivers must make while navigating an intersection and improves safety in the vicinity of an intersection.

Intersections are defined by both its physical areas and its functional areas, Figure 1 illustrates both areas of an intersection.

¹¹ Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration



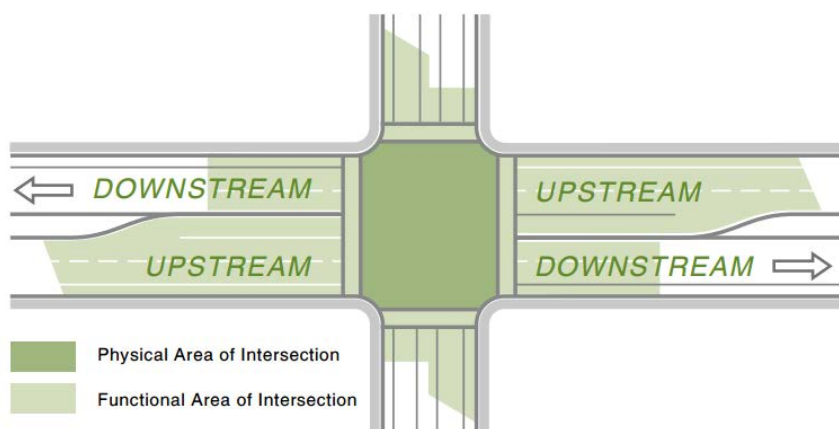


Figure 1: Intersection Physical and Functional Areas¹²

The physical area of an intersection is defined by the confined space within the corners of the intersection. The functional area, on the other hand, is variable and extends both upstream and downstream from the physical intersection area. According to AASHTO's - A Policy on Geometric Design of Highways and Streets - The Green Book (Section 9, pp. 9-2, 2011) the upstream functional area is defined by the following factors:

- + Distance traveled during perception-reaction time;
- + Deceleration distance while the driver maneuvers to a stop;
- + The amount of queuing at the intersection.

The AASHTO policy does not provide any criteria to determine downstream functional area, however the stopping sight distance is recommended.

b) Reduce the Number of permitted Movements through an Access

The number of conflict points at the intersection of an access and a roadway influences the safety at this location. Generally, minimizing this number will reduce the potential for collisions. One way to do this is to limit the permitted movements through an access. The number of conflict points associated with a full-movement access is considerably higher than those associated with a right-in/right-out accesses, or right-in only, or right-out only.

In this respect, it is most beneficial from a safety perspective to prohibit left-turning movements at the accesses. According to a research published by the USDOT¹³ it is estimated that nearly 72 percent of collisions at an access involve a left-turning vehicle. This suggests that reducing or eliminating left turns to or from accesses enhances safety.

¹² Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration

¹³ Analysis of Crossing Path Collisions, 2001, National Highway Traffic Safety Administration, US Department of Transportation



c) Install Turn Lanes at High Volume Accesses

The Access management Guidelines for City of Edmonton indicates that right-turn and left-turn lanes at accesses separate the turning traffic from the through traffic and prevent turning traffic from blocking and impeding through traffic. Usually the turning lanes are introduced with a taper that allows drivers to smoothly change the lane into the turn lane. Left-turn lane is usually for one access. However, the right-turn lane can be for several accesses. When used for several accesses, a right-turn lane is referred to as an auxiliary lane. Justification for right turn lanes involve several criteria including sufficient volume to create a hazard, availability of land, surrounding land use, design speed of the road and geometric alignment. A designer will be required to balance these factors against the cost of introducing a new turn lane on a case by case basis.

Turn bays are usually provided when traffic flow is important as shown in Figure 2. Local roadways and collector roadways rarely require right-turn or left-turn lanes for accesses.

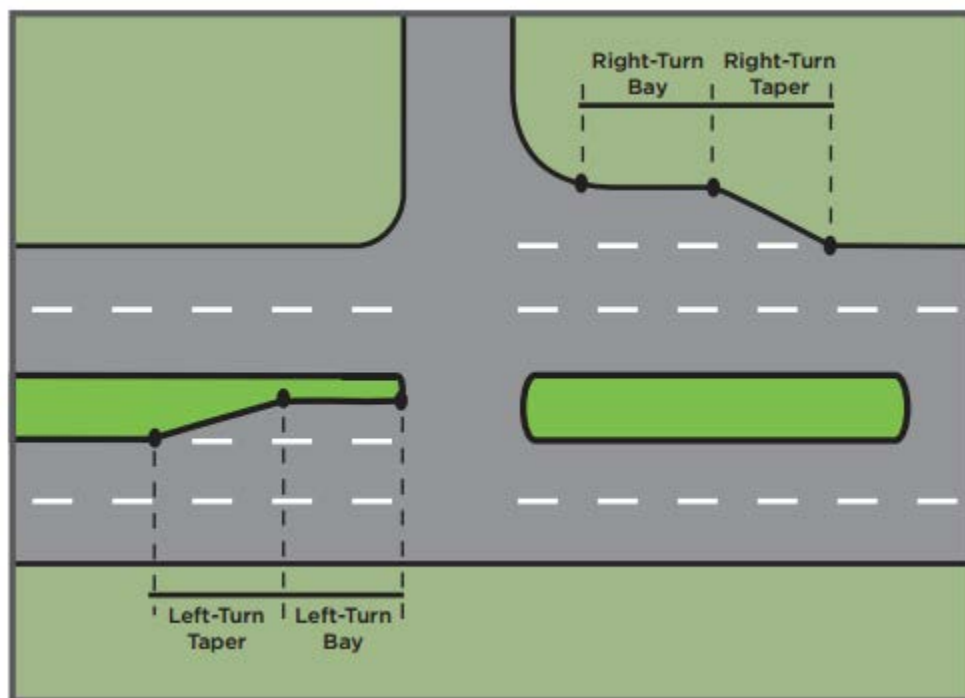


Figure 2: Right-turn and Left-turn Bay¹⁴

¹⁴ Access Management Guidelines, 2013, City of Edmonton



d) Relocate Accesses From Major Roads to Minor Roads

This measure discussed in the FHWA study¹⁵ calls for managing accesses, to the extent possible, so that access is provided to and from the lower functional classification roads. In this way accesses will be located on roads with lower traffic volumes and lower speed limits. This helps to reduce the frequency of conflicts and minimizes both the opportunity of collision occurrence and the severity of those collisions should they occur. For example in Figure 3 below, Access “C” was relocated to the minor road. The figure also illustrates other measures implemented to manage accesses near intersections. This measure is likely to require consultation with various stakeholders and project specific safety study.

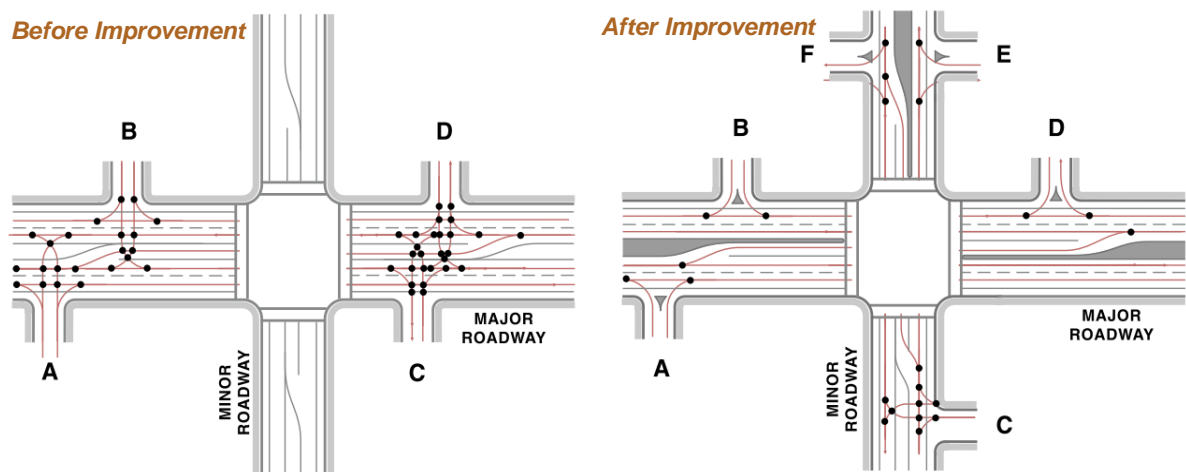


Figure 3: Favorable Access Improvement Measures near Intersections¹⁶

The figure highlights several improvements undertaken to manage accesses along the major road as discussed below:

- + Access to driveways A, B, and D is changed to right-in/right-out movements only to reduce conflict points;
- + Raised median is introduced to the major roadway to help prevent left-turn movements at the vicinity of the driveways;
- + Driveway C is relocated to the minor road in order to preserve mobility on the major road and to reduce the number of conflict points on the major road;
- + Driveways E & F are newly introduced on the minor road to maintain access to the properties. .

¹⁵ Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration

¹⁶ Modified from: Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration



e) Change the Location of the Access Relative to other Accesses in the Vicinity

In cases where there is a traversable median (e.g., TWLTL), consideration should be given to locate accesses so that they have a positive offset relative to each other¹⁷ as illustrated in Figure 4. This will eliminate the conflict between left-turning vehicles from opposite directions. If it was not possible to align accesses with a positive offset, then consideration should be given to position the accesses directly across the street from one another as illustrated in Option 2 in Figure 4.

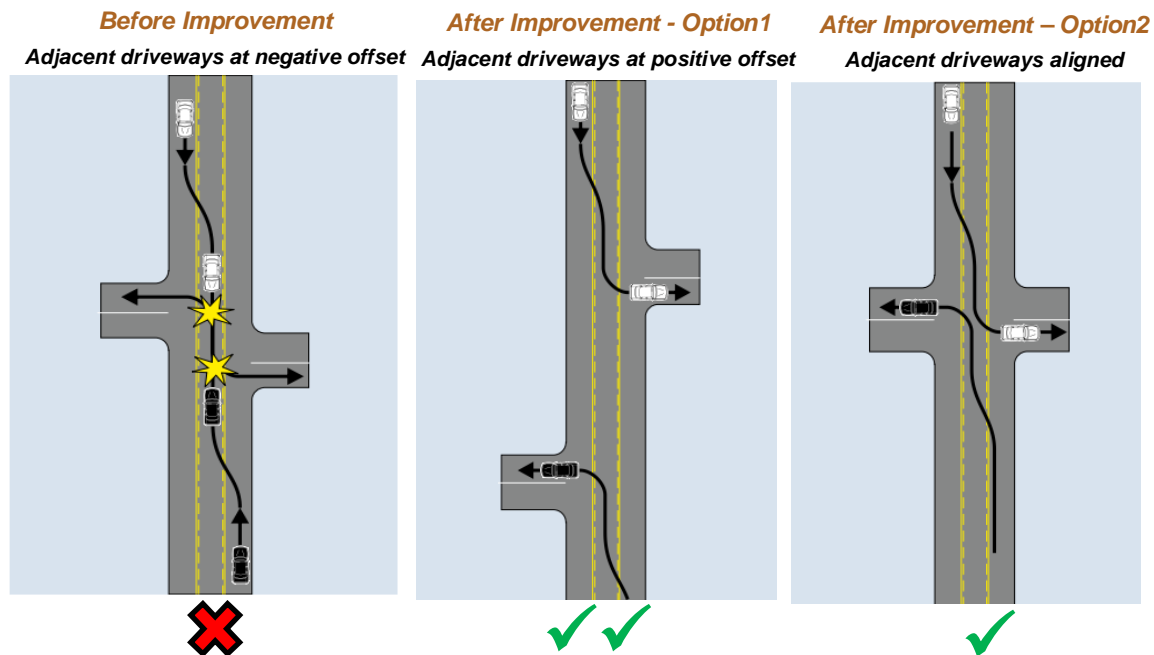


Figure 4: Changing Location of adjacent driveways relative to each other¹⁸

f) Consider Median Treatments

An undivided roadway provides no separation between opposing traffic, does not restrict turning movements into and out of access points, and offers no refuge for pedestrians. Median treatments can improve road safety significantly. Two median treatments are typically discussed^{19,20} the installation of non-traversable medians and the implementation of two-way left-turn lanes (TWLTL).

¹⁷ Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration

¹⁸ Modified from: Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration

¹⁹ Report 420, Impacts of Access Management Techniques, Transportation Research Board. Washington, D.C. 1999

²⁰ Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration (pp 5)



Non-traversable medians separate opposing directions of travel and therefore eliminate collisions related to left-turn crossing movements. When a non-traversable median of sufficient width is constructed, it can also provide refuge for pedestrians crossing the roadway. While no particular CMF could be found for this treatment in the HSM, according to a study²⁰ published by the USDOT, non-traversable medians generally result in an overall collision reduction of approximately 35 percent as compared to undivided roadways.

According to the same study, installing TWLTLs will generally result in an overall collision reduction of approximately 33 percent as compared to undivided roadways. A TWLTL provides lateral separation between opposing traffic, however, it offers no refuge for crossing pedestrians, and it loses its safety effectiveness as the number of through lanes increases along the roadway (e.g., from one through lane in each direction to two through lanes in each direction). Another report by the FHWA²¹ provides the following statistics regarding the expected safety benefits of both treatments:

- + Installing a TWLTL on an undivided roadway reduces collisions by 13 to 70 percent (Hallmark et al. 2008).²²
- + Converting a TWLTL to a non-traversable median reduces total collisions by 15 to 57 percent and reduces injury collisions by 33 to 48 percent.²³
- + Installing a non-traversable median on an undivided roadway reduces collisions by 21 to 53 percent.²⁴
- + Raised medians are associated with a 45 percent reduction in pedestrian collisions and 78 percent reduction in pedestrian fatalities.²⁵

g) Reduce Driveways Density

A study that looked at nearly 40,000 collisions in the United States in the late 1990s found that an increase from 10 to 20 access points per mile (1.6 kilometer) on major arterial roads increases the collision rate by about 30 percent and this rate continues to rise as more access is permitted²⁶.

The Canadian Guide to In-Service Road Safety Reviews²⁷ (Table 6.4, page 123) identifies access point reduction as a countermeasure that generally results in lower collision frequencies with an

²¹ Intersection Proven Safety Countermeasure Technical Summary: Corridor Access Management, 2015, U.S. Department of Transportation, Federal Highway Administration (pp 8)

²² Hallmark, S., et al. (http://www.intrans.iastate.edu/reports/safety_ops_air.pdf)

²³ FHWA, Safe Access is Good for Business.

(http://ops.fhwa.dot.gov/publications/amprimer/access_mgmt_primer.htm)

²⁴ Eisele, W.L., and W.E. Frawley. Estimating the Safety and Operational Impact of Raised Medians and Driveway Density: Experiences from Texas and Oklahoma Case Studies, Transportation Research Record 1931, 2005. (<http://ntl.bts.gov/lib/10000/10600/10603/3904-3.pdf>)

²⁵ Hallmark, S., et al. (http://www.intrans.iastate.edu/reports/safety_ops_air.pdf)

²⁶ Intersection Proven Safety Countermeasure-Technical Summary: Corridor Access Management, 2015, US Department of Transportation Federal Highway Administration.

²⁷ The Canadian Guide to In-Service Road Safety Reviews, 2004, Transportation Association of Canada



expected collision reduction range of 50% to 60% of all access-related collisions as well as 10% to 30% of lane changing collisions. The Guide, however, does not provide any specific details of intended access control measures.

The Highway Safety Manual (HSM)²⁸ (Chapter 13, Section 13.14.2, page 13-50) reports Collision Modification Factors (CMFs) for reducing the number of access points per mile (1.6 kilometer) known as access point density. The CMFs are reported for two classes of roads, rural two-lane roads and Urban and Suburban Arterials.

Rural two-lane roads

The collision effects of decreasing access point density on rural two-lane roads are presented in Equation 13-7. The base condition (i.e., the condition in which the CMF = 1.00) for access point density is five access points per mile.

$$CMF = \frac{0.322 + DD \times [0.05 - 0.005 \times \ln AADT]}{0.322 + 5 \times [0.05 - 0.005 \times \ln AADT]}$$

Where:

- + AADT = average annual daily traffic volume of the roadway being evaluated
- + DD = access point density measured in driveways per mile.
- + The standard error of the CMF is unknown.

Urban and Suburban Arterials

The collision effects of decreasing access point density on urban and suburban arterials are shown in Table 4

Table 4: CMF for reducing Access Point Density on Urban and Suburban Arterials²⁹

Treatment	Setting (Road Type)	Traffic Volume	Crash Type (Severity)	CMF	Std. Error
Reduce driveways from 48 to 26–48 per mile				0.71	0.04
Reduce driveways from 26–48 to 10–24 per mile	Urban and suburban (Arterial)	Unspecified	All types (Injury)	0.69	0.02
Reduce driveways from 10–24 to less than 10 per mile				0.75	0.03
Base Condition: Initial driveway density per mile based on values in this table (48, 26–48, and 10–24 per mile).					

The base condition of the CMFs (i.e., the condition in which the CMF = 1.00) is the initial driveway density prior to the implementation of the treatment as presented in the table.

²⁸ Highway Safety Manual, 2010, American Association of State Highway and Transportation Officials

²⁹ Highway Safety Manual, 2010, American Association of State Highway and Transportation Officials- Table 13-58 pp. 13-51



h) Other Potential Access Management Treatments to Improve Safety for Pedestrians and Bicyclists

In addition to the access management treatments identified above, FHWA access management study³⁰ suggests designing the driveway accesses with smaller radii in order to restrict inbound vehicle speeds. The main objective is to improve pedestrian and bicyclist safety at access points. Smaller driveway radii of (7.5 - 10.5 m) requires motorists to slow down to complete the turn.

Furthermore the OTM Book 18 - Cycling Facilities – suggests certain measures at conflict zones where travel paths of different road users may cross each other, such as where a cyclist is making a through movement and a motorist is turning. This is a situation that could generally occur at access points and therefore the risk of collisions is higher.

The OTM Book 18 (pp. 140) suggests the following measures to be considered for markings to increase driver awareness of the bicycle facility through a conflict zone:

- Bike stencils or chevrons at 1.5 m to 10 m spacing (with optional directional arrows to clarify cyclist trajectories);
- Sharrows at 1.5 m to 15 m spacing;
- Dashed guide lines (with optional bike stencils or chevrons);
- Green surface treatment; or
- Dashed guide lines (with optional bike stencils or chevrons) and green surface treatment.

³⁰ Access Management in the Vicinity of Intersections, 2010, U.S. Department of Transportation, Federal Highway Administration (pp 12)



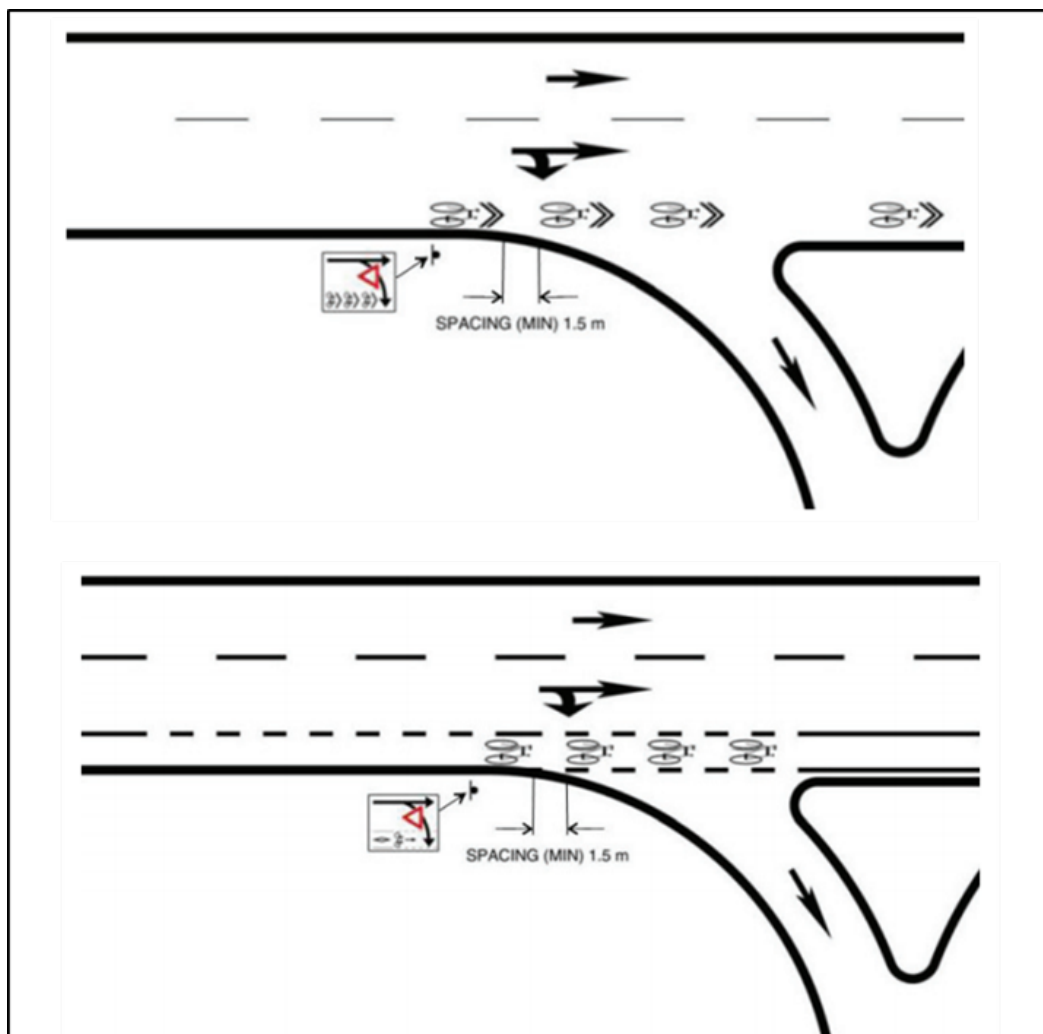


Figure 5: Bicycle path marking in conflict zone³¹

7. Access Management Safety Check List

Table 5 provides an access management safety check list for access designs undertaken during the development and redevelopment applications. The check list was developed by using the various references discussed within this document.

³¹ The OTM Book 18 – Cycling Facilities (pp. 140-141)



Table 5: Access Management Safety Check List

Factor	Issues to be Considered	Yes/No/NA	Comments
Corridor Access Management Design	In case of a traversable median such as TWLTL, is it possible to align accesses to have positive offset?		Aligning accesses to have positive offsets minimize conflicts between left-turning vehicles
	If in the previous case it was not possible to have positive offset, is it possible to align accesses opposite to each other?		It avoids drivers overlapping in the median.
	Is it possible to provide an auxiliary right-turn lane to serve vehicles turning in/out of the access?		Allows slower traffic to be separated from faster moving, through traffic.
	Consider locating accesses on the side streets.		Refer to section 6-e of this paper
	Consider placing accesses that serve left-turning vehicles near the center of the block.		To minimize interaction with upstream and downstream intersection queues
Management of Accesses near Intersections	Is there a reasonable gap between the location of the access and the vehicle queues at the intersection?		Refer to section 6-a of this paper
	Consider positioning accesses away from the functional areas of intersections		Refer to section 6-a of this paper
	Are auxiliary turning lanes of appropriate length?		
Sight Distance at Accesses	Consider placing loading and bus bays on the far side of the access to maximize sight distance for motorists exiting an access.		
	Is sight distance for entering/leaving vehicles adequate?		



Factor	Issues to be Considered	Yes/No/ NA	Comments
Sight Distance at Accesses (contd.)	Are all sight distances adequate for all movements and road users?		
	Are sight lines obstructed by signs, bridge abutments, buildings, landscaping, etc.?		
	Could sight lines be temporarily obstructed by parked vehicles, snow storage, seasonal foliage, etc.?		
	Do grades at intersecting roadways allow desirable sight distance?		
Availability / judgement of gaps in main street traffic	Are there sufficient gaps within the main stream for all permitted movements?		Depending on the peak traffic volumes and vehicular speeds, inadequate gaps for turning vehicles may cause drivers to take unnecessary risks
Improve main street driver awareness of the accesses	Are all necessary regulatory, warning and guide signs in place and visible?		
	Check visibility and readability of signs to approaching users		
	Check for any missing / redundant / broken signs		
	Are stop / yield signs used where appropriate?		
	Are pavement markings clearly visible in day and night time conditions?		
	Check retro-reflectivity of markings.		



Factor	Issues to be Considered	Yes/No/ NA	Comments
Reduce frequency and severity of conflicts	Consider replacing gated parking entries with alternate ticketing options.		The objective is to decrease the driver's entrance time into the access and off the main roadway, thus reducing the likelihood of conflict on the main roadway.
	Consider placing accesses that serve left-turning vehicles near the center of the block to minimize interaction with upstream and downstream intersection queues		
	Is there adequate throat depth in accesses for vehicles to easily exit off of a major roadway?		The objective is to minimize speed differential between through vehicles and vehicles slowing to turn into an access.
	Would prohibiting left-turn movements to / from the access improve the situation? Is it feasible to do so, is there practical alternative route?		
Provide appropriate traffic control	Is the traffic control adequate based on traffic volume and configuration of the access?		Check if existing conditions warrant signalization.
Violation of traffic control devices and rules	Check location and number of signal heads. Are signals visible?		
	Are primary and secondary signal heads properly positioned?		
	Are auxiliary heads necessary?		
	Are minimal green and clearance phases provided?		
	Check visibility and readability of signs to approaching users		



Factor	Issues to be Considered	Yes/No/ NA	Comments
Violation of traffic control devices and rules (cont.)	Check for any missing / redundant / broken signs.		
	Are stop / yield signs used where appropriate?		
	Are pavement markings clearly visible in day and night time conditions?		
	Check retro-reflectivity of markings.		
	Are all necessary regulatory, warning and guide signs in place and visible?		
Speed incompatibility	Is it possible to provide auxiliary right-turn lane to serve vehicles turning in / out of the access?		The objective is to minimize speed differential between through vehicles and vehicles slowing to turn into an access
	Is there adequate throat depth in the access for vehicles to easily exit from a major roadway?		The objective is to minimize speed differential between through vehicles and vehicles slowing to turn into an access.
Vulnerable Road users	Is it possible to provide raised medians?		This improves pedestrian safety by providing refuge, and reduce the number of potential pedestrian-vehicle conflicts from vehicles turning left into accesses.
	Is it possible to construct a channelized island between the in/out movements at right-turn-only driveways?		To provide a pedestrian refuge across the access.
	Consider minimizing the width of the access in order to reduce pedestrian crossing distances?		



Factor	Issues to be Considered	Yes/No/ NA	Comments
	Are pedestrians on the sidewalk and on the access crossing visible to drivers and are vehicles visible to the pedestrians?		Consideration should be given to not block pedestrian-driver sightlines with landscaping or signage.
Vulnerable Road users (cont.)	Is cycling signage adequate and appropriate?		Are there sufficient signs to alert cyclists that vehicles may be entering or exiting an access and to alert vehicles that cyclists may be crossing the access? (e.g. 'Slow Watch for Turning Vehicles' sign to warn cyclists approaching the intersection and a 'Bicycle Crossing on Side Street' sign may be installed to warn motorists approaching the intersection).
	Does parking adversely affect cycling safety?		<ul style="list-style-type: none"> • On-street parking may effect a cyclist's position on the road as cyclists attempt to avoid "dooring." • Pull-in/angle parking may lead to conflicts with cyclists when vehicles back up because awareness and visibility of approaching cyclists on the roadway may be restricted or obstructed by other parked vehicles. • Back-in/head-out angle parking provides improved visibility of approaching cyclists on the roadway, as a driver has much better visibility when exiting.



Factor	Issues to be Considered	Yes/No/ NA	Comments
			<ul style="list-style-type: none"> Encroachments, double parking, and illegal parking can contribute to cyclist conflicts with other users.
	Is vegetation narrowing the rideable width or affecting the surface quality?		
Vulnerable Road users (cont.)	Does debris accumulate in the area used (or intended for use) by cyclists?		
	Are there potholes or other surface defects?		
	Are drainage grates or manholes located in the cyclists' path of travel?		
	Are there longitudinal joints or cracks that could trap a wheel?		
	Does ponding of water occur in the cyclists' path of travel?		
	Are clear zones along paths adequate?		
	Are there frequent changes in the geometrics or accommodations provided for cyclists?		Frequent or sudden changes in geometrics or accommodations for cyclists can cause conflicts with other users
Is access provided to primary destinations?		Consideration should be given to primary destinations for cyclists (e.g., work, school, church, parks, restaurants, etc.). Lack of appropriate access	



Factor	Issues to be Considered	Yes/No/ NA	Comments
			and accommodations for cyclists affects their safety within the roadway or pathway environment and may contribute to fewer riders due to safety concerns.
Vulnerable Road users (cont.)	Is sight distance an issue?		Consider the following features that may limit sight distance: Trees, shrubs, and landscaping; Sharp horizontal curves; Crests on steep hills; Fences and walls; Structures and buildings.
	Are there longitudinal or transverse joints that may cause cyclists problems?		Longitudinal joints (parallel to the direction of travel) may trap a front bicycle tire and result in loss of control. Transverse joints (perpendicular to the direction of travel) may have wide gaps that can trap bicycle wheels, causing loss of control and sudden falls.
	Are there difficulties for cyclists caused by intersection geometry or lane use assignments?		When peak traffic volumes and high speeds are present, intersection design features can make it difficult for cyclists to cross. The following conditions may be a safety concern for cyclists: Free flow right-turn lanes; Acceleration/deceleration lanes; Lane drops; Through lanes that become turn lanes; Shoulder drops to accommodate a turn lane;



Factor	Issues to be Considered	Yes/No/NA	Comments
			Roundabouts; and Bus stops near intersections. Cyclists are challenged where multi-use trails meet intersections at right-turn channels where it is quite difficult and awkward for cyclists to do a shoulder check at a severe angle to check for oncoming vehicles and then sharply turn to make the perpendicular crossing onto the island.
	Are there conflicting traffic movements during bicycle crossing phases?		
Vulnerable Road users (cont.)	Do traffic signal clearance intervals safely accommodate cyclists?		
	Are transit stop locations appropriate for cyclists?		
Location of transit stops in the vicinity of accesses	Consider placing loading and bus bays on the far side of the access to maximize sight distance for motorists exiting an access.		

8. Closing Remarks

This paper discussed in detail a step-by-step methodology for conducting RSAs of in-service roads for Region of Peel with a particular focus on corridor access management (CAM). It provides a discussion of factors to be considered for inclusion of CAM in RSAs with commonly used measures. The paper also provides some recommendations for proactive implementation of CAM techniques.

An in-service RSA process can be divided in three parts including office review, field review and detailed analysis and recommendation of countermeasures. The process is summarized in the flow chart provided in Figure 6.



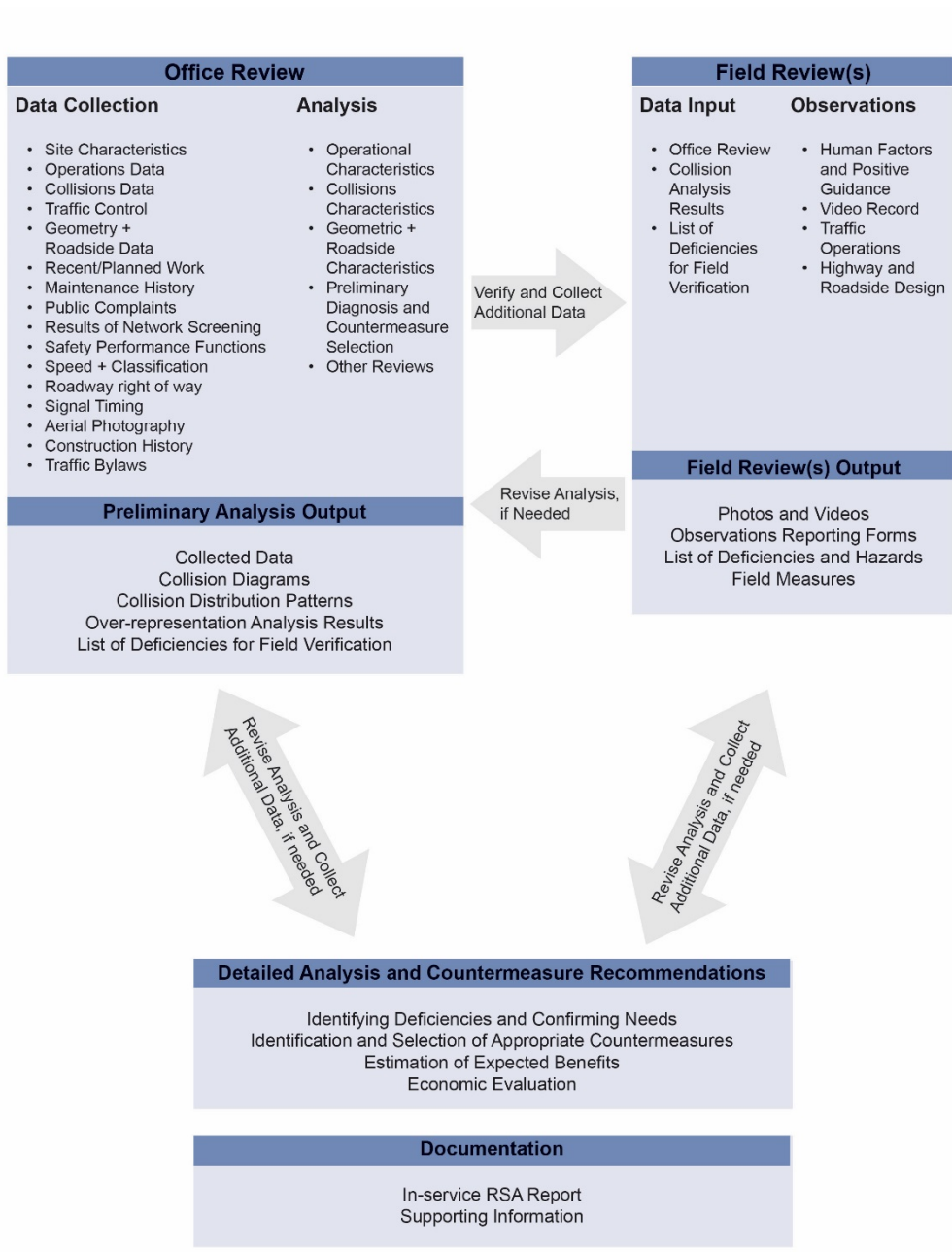


Figure 6: In-service RSA Process

Some additional recommendations that should be considered in conjunction with Region’s safety programs are as follows:



- + It is recommended that the Region deploys permanent count stations to identify travel patterns and derive factors to estimate AADT of Regional Roads. Permanent Count Stations can be installed to count traffic volumes for 365 days a year at specific geographical locations in such a way that each location will represent a geographical area with similar traffic patterns. These locations then become representative of the seasonal fluctuations in traffic demand experience on regional highways within their respective geographical area. AADT factors, such as Seasonal Factors, Half-Monthly, and Monthly Factors can then be calculated for each PCS, All roads within each geographical area then can be counted using ATR counts and their AADT can be estimated by using the AADT factors of the PCS of that geographical area.
- + It is recommended that the Region updates its SPFs periodically. This will help with the accurate prediction of collisions.
- + The Region explicitly considers in-service RSAs for its Environmental Assessment (EA) assignments. Various recommendations provided during EAs should be evaluated from a safety perspective.
- + It is recommended that in-service RSAs should also be considered as part of detailed designs. This can help in consideration of additional safety measures at a relatively low additional cost.





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2018-573P - IN SERVICE ROAD SAFTY AUDITS

Date Issued: November 6, 2018 12:00 PM

Schedule of Prices

*Denotes a "MANDATORY" field

Do not enter \$0.00 dollars unless you are providing the line item at zero dollars to the Owner.

If the line item and/or table is "NON-MANDATORY" and you are not bidding on it, leave the table and/or line item blank. Do not enter a \$0.00 dollar value.

TABLE 1 IN-SERVICE ROAD SAFETEY AUDITS SUMMARY OF FEES

Item	Intersections	Municipalities	Unit	Quantity	Unit Price *	Total
1	DIXIE RD @ QUEEN ST E/7 HY	BRAMPTON	L.S	1		
2	BOVAIRD DR W @ MCLAUGHLIN RD N	BRAMPTON	L.S	1		
3	BOVAIRD DR W @ CHINGUACOUSY RD	BRAMPTON	L.S	1		
4	BURNHAMTHORPE RD @ CAWTHRA RD	MISSISSAUGA	L.S	1		
5	BOVAIRD DR E @ NASMITH RD/GREAT LAKES DR	BRAMPTON	L.S	1		
6	KENNEDY RD N @ VODDEN ST E	BRAMPTON	L.S	1		
7	AIRPORT RD @ NORTH PARK DR/COTTRELLE BV	BRAMPTON	L.S	1		
8	LAURELCREST ST/WEST DR @ QUEEN ST E/7 HY	BRAMPTON	L.S	1		
9	BOVAIRD DR E @ SUNFOREST DR/YELLOW BRICK RD	BRAMPTON	L.S	1		
10	BOVAIRD DR E @ TORBRAM RD	BRAMPTON	L.S	1		
11	50 HY @ EBENEZER RD	BRAMPTON	L.S	1		
12	50 HY @ LANGSTAFF RD/COTTRELLE BV	BRAMPTON	L.S	1		
13	RUTHERFORD RD/FIRST GULF BV @ STEELES AV E	BRAMPTON	L.S	1		
14	EBENEZER RD @ THE GORE RD	BRAMPTON	L.S	1		
15	MCVEAN DR/CLAIREVILLE CONSERVATION RD @ QUEEN ST E/7 HY	BRAMPTON	L.S	1		
16	BOVAIRD DR E @ RICHVALE DR S/LANGSTON DR	BRAMPTON	L.S	1		
17	DIXIE RD @ STEELES AV E	BRAMPTON	L.S	1		

18	BRITANNIA RD E @ DIXIE RD	MISSISSAUGA	L.S	1		
19	50 HY @ HEALEY RD/ ENTRANCE-UNITED LUMBER/ HOME HARDWARE	CALEDON	L.S	1		
20	COLERAINE DR @ KING ST W/ HARVEST MOON DRIVE	CALEDON	L.S	1		
Subtotal:						

TABLE 2 - HALF DAY MEETINGS

Item	Description	Unit	Quantity	Unit Price *	Total
1	Half Day Meetings	Each	5		
Subtotal:					

TABLE 3 - ADDITIONAL PROVISIONAL ITEMS

Item	Description	Unit	Unit Price *
1	Additional Meetings	Per Hour	

TABLE 4 - STAFF HOURS AND HOURLY RATES

Line Item	Staff Member Name	Title	Total Hours	Hourly Rate
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Summary Table

Bid Form	Amount
TABLE 1 IN-SERVICE ROAD SAFETAY AUDITS SUMMARY OF FEES	
TABLE 2 - HALF DAY MEETINGS	
Grand Total (exclusive of taxes):	

Bid Questions

Please provide in the space below your GST/HST Registration Number. Please note that all invoices provided to the Agency must show the GST/HST Registration Number and show this tax on a separate line.

Specifications

STATEMENT OF EXPERIENCE

The Bidder agrees that the following is a statement of the Bidder's experience in carrying out comparable Work. The Agency may contact those named below to verify the Bidder's statement and to assess the Bidder's ability to carry out the Work.

Line Item	Description of Contract *	For Whom Work Performed *	\$ Value *	Year *
1				
2				
3				
4				

CONTACT INFORMATION

In the space provided please list the contact names and numbers during the times indicated below.

Line Item	Description	Regular Hours Service (7:00 a.m. - 5:00 p.m.) *	After Hours Service (5:00 p.m. - 7:00 a.m.) *	Saturdays, Sundays and Holidays *
1	Name			
2	Phone Number			
3	Cell Number			
4	Email Address			

BREAKDOWN OF TOTAL PROJECT HOURS

Please provide a list of personnel and sub-consultants hours dedicated to each task listed below including the total number of person hours dedicated to the project.

Task	Professional and Technical Staff Hours *	Sub-Consultant Hours *	Total *
In Service Road Safety Audits			

REFERENCES

Please give the **names** of three clients, other than the Agency, who have similar projects and for whom you are performing or have performed similar Work.

Line Item	Company *	Phone *	Contact Person *	Estimated Contract Amount *	Year *	Project/Contract Number *
1						
2						
3						

Documents

It is your responsibility to make sure the uploaded file(s) is/are not defective or corrupted and are able to be opened and viewed by the Owner. If the attached file(s) cannot be opened or viewed, your Bid Call Document may be rejected.

- Understanding of the Project * (mandatory)
- Compliance with Scope of Work and Deliverables * (mandatory)
- Experience and Qualifications of Key Personnel and Project Manager * (mandatory)
- Project Schedule and Work Plan * (mandatory)
- Familiarity with Performing In-Service Road Safety Audits * (mandatory)
- Appendices (Additional Information such as charts, resumes, etc) * (mandatory)

Declarations & Addenda

This Bidder Submission is made entirely in accordance with the Document. By completing the information below and by submitting an online response to the Document, it is deemed that the Bidder has read and agreed to abide by all of the terms and conditions contained in the Document. and that you have the authority to bind the Bidder and submit this Bidder Submission on behalf of the Bidder.

I acknowledge in my acceptance of the terms and conditions below the following requirements for Accessibility for Ontarians with Disabilities, [Health & Safety Compliance Certificate & Appendix A](#) and [Code of Conduct](#):

Contracted employees, third party employees, agents and others who deal with members of the public on behalf of the Region of Peel or participate in the development of policies, practices and procedures governing the provision of goods or services to members of the public must meet the requirements of the Accessibility for Ontarians with Disabilities Act 2005 and its Regulations with regard to training and the provision of goods or services to persons with disabilities. A document describing the training policy, a summary of the contents of the training and details of training dates and attendees must be submitted to the Region of Peel upon request. If a training policy is not yet in place, complete the training module at the following website: accessforward.ca.



I/WE agree to be bound by the terms and conditions in the Document and have authority to bind the Bidder and submit this Bidder Submission on behalf of the Bidder.

The bidder shall declare any potential conflict of interest as defined in the Standard Terms and Conditions that could arise from submitting a bidder submission for this document. Do you have a potential conflict of interest?

Yes **No**

The Bidder acknowledges and agrees that the addendum/addenda below form part of the Bid Document

Please check the box in the column "**I have reviewed this addendum**" below to acknowledge each of the addenda.

File Name	I have reviewed the below addendum and attachments (if applicable)	Pages
There have not been any addenda issued for this bid.		