A SCOPE

The Transportation Planning and Research Standing Committee (TPRSC) of TAC is undertaking a project about traffic congestion in urban areas. The goal is to produce a guideline that will assist practitioners with measuring traffic congestion.

B BACKGROUND

A key rationale for investing in transportation infrastructure is to avoid, reduce and manage traffic congestion, whose impacts on quality of life and economic activity are well established. The rapid growth of GPS-based traffic measurements has allowed travellers to get real-time information on traffic conditions. In turn, some private-sector providers of this information have started to compare urban traffic congestion nationally and internationally. The resultant congestion rankings receive widespread public and media attention. However, their basis is unclear, and the treatment of well-documented limitations in the use of GPS is not known (e.g., representativeness of subscriber base, appropriateness of application, geographic coverage, etc.).

A key result is that the rankings, while informative, are often inconsistent with more statistically reliable congestion measurements made by urban authorities. This has led to some public and political questioning of the efficacy of often substantial infrastructure investments. In the meantime, authorities have used different methods and different data sources to measure congestion: standards do not exist. Moreover, public acceptability of congestion (and its very definition) varies from place to place. Finally, the availability of GPS travel data provides unique opportunities for enhancing transportation planning; however, in Canada these opportunities are only just beginning to be understood. Putting all this together, some urban authorities have identified the need to develop practical guidelines and standards for measuring and monitoring congestion. The proposed project would address this need. It also will talk to defining congestion at the front end, data sources and their uses, and applications of the results at the back end (e.g., to monitor changes in congestion or to evaluate proposed transportation investments).

C PROJECT OBJECTIVE

The objective is to provide a guideline to measure and monitor urban traffic congestion, in order to promote methodological consistency among Canada’s urban areas, provide guidance on how to quantify traffic congestion, how available traffic congestion data sources should be used, and inform the institutional, public and political discourse on transportation issues and solutions. It would inform and guide, but would not prescribe or recommend methods, data, etc. It could incorporate the state of the practice / state of the research review.
D METHODOLOGY

The consultant is expected to present the approach and methodology on how to best achieve the project objective and deliverables. The consultant should also demonstrate their understanding of the project goal and objective, and the soundness of the approach/methodology to be followed to satisfy the project objectives. The consultant should provide details of tasks to be undertaken to achieve the project objectives and deliverables as well as present a detailed work plan for various tasks and a milestone for each task. The consultant should describe the work/activities to be undertaken and the level of effort invested in each task.

It is expected that key tasks will include, but not be limited to:

- Conducting a comprehensive review of English and French literature in the field of traffic congestion, including major guidance documents currently being used in North America and Europe, any relevant guidance currently available from Canadian provinces or municipalities and references from scientific and engineering journals and conferences.

- The outcome of the literature review may reveal a need to interview Canadian or US municipalities concerning their current practices. As required, three (3) to eight (8) municipalities should be contacted.

- Developing an inventory and comparison of existing public and private sector sources (e.g. HERE, TomTom, INRIX, ATRI) of data and their approaches. The comparison should include the geographical coverage relevant to Canada as well as the vehicles in scope (i.e. passenger vehicles, commercial vehicles) for each data source.

- Synthesizing the findings from the literature review, jurisdictional survey (if required), and inventory of data sources towards the development of a national guideline for defining and measuring traffic congestion.

As a minimum, topics expected to be covered in the guide include the following but are not limited to:

- **Introduction**
  
  a) Purpose of project
    
    i. Defining the problem
    
    ii. Desired outcome
b) Intended audience and users

c) Caveats / disclaimers

d) Method / approach

e) Sources

• Defining Congestion and Indices Used to Measure Congestion

a) What do the literature and interviews with municipalities indicate about definitions and associated measures for congestion?
   i. What are the key attributes and why is it important for transportation planning, operational and investment decisions?
   ii. What are the various levels and kinds of needs/users of congestion measures?

b) Define the indices that can be used to measure congestions, including but not limited to:
   i. Travel Time Index (TTI)
   ii. Delay Index (DI)
   iii. Buffer Time Index (BTI)
   iv. Planning Time Index (PTI)
   v. Total Vehicle Delay
   vi. Delay Cost

c) Identify and define the benchmarks required for each index (e.g. speed)

d) Define the scalability of each index from the corridor level to network-wide.

e) Define how to identify and measure bottlenecks in the system (e.g. top 10 congestion hot spots, worst 100km road sections…).

• Data Sources to Measure Congestion

a) Location based data sets, such as GPS or cellular tracking data, can be used to develop congestion indices. These data sets can be “raw” in nature and may require additional processing to prepare the data in a way that it can be used to produce congestion indices. Or, the companies collecting the data may offer the service of processed data (i.e. map-matching, generating free flow speed and average speed...
Guidelines for Defining and Measuring Urban Congestion

Deadline: Thursday, January 21st, 2016 at 13:00 E.T.

(iii) Statistics. Sources for such data will be identified and compared. For each data set, the following will be discussed:

i. How the data is collected
ii. Quality assurance of the data
iii. Data collection rate
iv. Approximate sample size
v. Geographical coverage of the data
vi. Level of processing/analytics required to produce congestion indices if provided in “raw” form (in general terms)
vii. Methods employed by data provider to process data
viii. The congestion indices that the data can be used for

b) There are more conventional technologies that can be used by jurisdictions to collect data that can in turn be used to produce congestion indices. Examples of these include traffic sensors (e.g. in-road, Bluetooth detectors, etc.). These technologies will be identified to indicate how they may be used to collect data for the purpose of developing specific congestion indices.

c) Comment on potential and emerging sources of data that can be used to measure congestion. Some examples include mandatory on-board GPS tracking, connected vehicles, and autonomous vehicles and how it could affect congestion measurement.

• Assessing Different Approaches to Measuring Congestion

a) Review academic / research / public sector practices in measuring congestion.

b) Review private sector applications (e.g. TomTom, HERE Traffic, INRIX, etc.) that report on congestion to examine their congestion indices and how they are developed.

i. Indicate those academic/research/public sectors that make use of a private sector application, either in the form of “raw” data or as processed data.

c) Assess the definitions and methodologies for various congestion indices that are developed by all sectors.

i. What are similar/comparable methodologies being used?
ii. What are similar indices being used to monitor and measure urban congestion?

iii. Consider the implications of using private sector applications. Will using one private sector application under-report certain congestion indices while using another over-report them?

• Presenting Road Congestion Information
  a) Describe and compare the various tools and methods used to disseminate and/or present congestion indices, based on literature review and interviews.
  b) Review potential visualization tools that can be used to present congestion indices, either graphically for a specific location, or on a map.

E PROJECT DELIVERABLES

The major deliverable of this project will be a national guideline for defining and measuring urban traffic congestion, suitable for publication by the Transportation Association of Canada.

Additional project deliverables will be:

• Status reports and presentations regarding work in progress to the project steering committee. It is expected that the Consultant’s lead team member will attend in person all project meetings scheduled in conjunction with TAC’s spring and fall technical meetings. Attendance at all other project meetings will be by teleconference.

• Presentation of project results and an overview of the final draft guide to Transportation Planning and Research Standing Committee (TPRSC) and to the Urban Transportation Council (UTC) when the project is completed. It is expected that the Consultant’s lead team member will attend in person to provide those presentations.

• A final PowerPoint presentation describing the project work and the contents of a guide.

• A five page primer that describes the topic of traffic congestion from a broad perspective. This brief will be used as a reference document for the publication and will be made available through TAC.

• Learning materials to support training on the defining and measuring congestion guideline that would be suitable for two hour sessions delivered through webinars.

The final project deliverable, the guideline for defining and measuring urban congestion, will include an executive summary, table of contents, detailed results of the project work, and references.
The project deliverables will be provided as follows:

- Electronic files of all text, tables and figures and all other supporting material shall be delivered to TAC as part of the contract.
- Electronic version of all deliverables in Microsoft Word.
- Electronic version of the complete final draft report (text, graphics, appendices, etc.) in Adobe PDF.
- Electronic version of the document in Adobe InDesign is requested.
- Electronic files for all graphics and images (e.g. tables, figures, charts, road signs, photos, etc.) used in the report must be provided to TAC with the final document. Text within a graphic or figure must be able to be accessed by TAC, to facilitate translation.
  - Acceptable graphic formats are Adobe Illustrator or Adobe Photoshop. Embedded graphics in Word documents are not acceptable.
  - Spreadsheets must be created using Microsoft Excel.
- Three or four colour photographs in TIF, JPG or EPS format, and with a resolution no less than 300 dpi, must be submitted for possible use on the publication cover. Credits should be included with each photo. Rights for use of the photos, if required, must be obtained in advance of submission by the Consultant.

Furthermore, deliverables must adhere to the guidelines outlined in the TAC Project Handbook. The Handbook contains an electronic template, pre-set with TAC standards for fonts, headers and footers, reference format, etc. Consultants are asked to maintain integrity with the standards provided in the template. Requests for variations from these standards must be discussed with the TAC project manager. The Handbook can be found online at:


F PROJECT SCHEDULE

The consultant should propose a project schedule that will deliver a high-quality, comprehensive practices guide in a reasonable timeframe. It is expected that a contract will be signed and work will begin in February 2016 and that final draft deliverables will be submitted to the project steering committee no later than early March 2017. A presentation of the project results would then be scheduled for TAC’s Transportation and Planning Research Standing Committee and the Urban Transportation Council as part of the TAC Spring Technical Meetings in 2017.
It is expected that a consultant’s lead team member will be present in person for the project meetings to discuss the work in progress.

The Project Steering Committee may require several reviews as the document is being drafted. Teleconferences will be scheduled at the direction of the PSC throughout the duration of the project. A minimum of three (3) weeks should be allocated for the review of interim drafts prior to any meeting or teleconference. A minimum of four (4) up to a maximum of six (6) week review period must be allocated for members of the PSC, TPRSC, and UTC to review and to provide comments on the final draft of the document. Proponents should give allowance for this time when planning their study completion schedule. The Project Steering Committee wishes to be an active participant in the project development, and therefore, will be interested in the Project Steering Committee/consultant interaction proposed.

The Project Steering Committee will review each draft document, and the consultant is expected to address all comments.

### G  LEVEL OF EFFORT

A maximum budget of $107,000 plus applicable taxes is available for this project. Invoices will be permitted on completed and approved items. An amount equal to 10% of each invoice will be retained until the final deliverables have been completed and accepted by the Project Steering Committee and approved by the Urban Transportation Council.
H PROPOSALS

To be considered for this project, proponents must submit a proposal to be received no later than Thursday, January 21st, 2016 One (1) hard copy of the proposal as well as an electronic version in Microsoft Word or Adobe Acrobat format shall be delivered to the undersigned with the below bulleted information following the Evaluation Criteria specified in Appendix A. A hard copy version of the proposal can be received by mail after the deadline, as long as the electronic version is received by the deadline.

- **Scope and objectives** – The proponent is to demonstrate a clear understanding of the project’s objective/scope and is to describe the challenges that might be encountered in its execution.
- **Methodology** – The proponent is to describe the approach to be used to accomplish all components of the project and all the deliverables (content of progress reports and final report). The proponent is to identify major tasks to be undertaken, all resources to be used, including sources of information and data, analyses and testing that are planned, and means to be used to make recommendations.
- **Work plan** – The proponent is to show the time budgeted for the various components of the project; is to include deadlines for approvals through the various stages, and is to show that adequate time and resources are devoted to all aspects of the project.
- **Project team** – The proponent is to identify the project leader and team members (including subconsultants) and is to include resumes with examples of similar projects that have been worked on.
- **References** – The proponent is to name three organizations for which they have completed substantial similar projects. The proponent is to include the organization’s address and the name and telephone number of an individual familiar with the project.
- **Fees breakdown** – The proponent is to include a total project cost, a detailed fees breakdown of the various components of the job, an itemized professional fees list for each member of the team, and administrative, travel and other expenses and disbursements per stage. Professional fees per team member should be matched for each component of the job to show hours assigned by each team member per component.
- **Conflict of Interest Declaration** – The proponent is to include in the proposal a disclosure, including information on possible sources of significant financial or organizational conflict of interest in conducting the research. For example, under certain conditions, ownership of the proposing agency, other organizational relationships, or proprietary rights and interests could be perceived as jeopardizing an objective approach to the research effort, and proponents are asked to disclose any such circumstances and to explain how they will be accounted for in the study.
Request for Proposal

Date: Monday, December 21\textsuperscript{st}, 2015

Guidelines for Defining and Measuring Urban Congestion
Deadline: Thursday, January 21\textsuperscript{st}, 2016 at 13:00 E.T.

Proposals will be evaluated based on the methodology described and presented by candidates (evaluation criteria are presented in Appendix A). Team qualities, the expertise that will be brought to the project, and the time that will be invested will also be considered in the evaluation.

The main body of the proposal should be no more than ten (10) pages (single sided). The cover letter, detailed pricing form, project schedule chart, organizational diagram and résumés should not be included in the page count.

Proposals should make use of a twelve (12) point font, single spaced, with one (1) inch margins for the ten (10) pages of the main body of the proposal.

The Project Steering Committee reserves the right to interview selected candidates prior to selecting a consultant team.

I PROJECT ADMINISTRATION

Transportation Association of Canada
A project manager will act as liaison between the Project Steering Committee and the Consultant for this project. All administrative and technical inquiries should be addressed to the undersigned.

The Project Steering Committee will be responsible for reviewing project deliverables and ensuring that the work of the Consultant successfully accomplishes the objectives set out herein.

A contract for consulting services must be established with the Consultant before work can begin.

TAC will administer a SharePoint site for collaboration and documentation transfer for this project.

Although the working language for this project is English, the consultant is expected to review French literature as part of the study.

For more information, contact:

Luay Mustafa, Project Manager
Transportation Association of Canada
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Fax: (613) 736-1395
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Appendix A: Evaluation Criteria for Project Proposals

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of project’s scope and end-product requirements</td>
<td>20</td>
</tr>
<tr>
<td>Approach and methodology toward development of a guide</td>
<td>25</td>
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<tr>
<td>Adequacy of work plan to meet required timeframes</td>
<td>20</td>
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<tr>
<td>Qualifications and experience of Consultant team and project coordinator and their proven competence in relevant related work</td>
<td>25</td>
</tr>
<tr>
<td>Experience with TAC projects and/or processes</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
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