NIAGARA REGION

Guidelines for Transportation Impact Studies

May 2012

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1 Introduction

Niagara Region recognizes the importance of all modes of transportation to its citizens and businesses and to their ability to move around and through the Region. The Niagara Region Policy Plan includes a number of objectives and policies that demonstrate this. Section 9 of the Policy Plan outlines the Region's desire for a safe, convenient, efficient, aesthetic and economical transportation system for its residents and businesses, the desire for an efficient arterial road system; and for efficient transit services. It is important to ensure that new developments and redevelopments are planned with these objectives in mind as well. As a result, the Region has moved away from requiring more traditional Traffic Impact Statements which are generally focused on the impacts of car and truck traffic. With the adoption of this Guideline Document, the Region now requires that benefits and impacts for all modes of transportation generated by, or attracted to, a new development or redevelopment be assessed in a Transportation Impact Study (TIS).

Rather than focusing on the travelled lanes between the curbs, the TIS shall look at all means and modes of transportation. "Traffic" shall be interpreted as all modes of transportation that moves through the right-of-way.

It should be noted that it is not the intention of this guideline to be a "barrier" to development within the Region; rather it is meant to assist all parties in identifying what is required upfront to achieve a complete TIS document that will best serve the needs of all involved.

1.1 Purpose of a Transportation Impact Study

The main purposes of a TIS is:

- To identify the benefits and impacts of a proposed development or redevelopment;
- To identify how the proposed development can benefit the existing transportation network and vice versa; and
- To identify how any transportation impacts associated with the proposed development can be mitigated and addressed in a manner that is consistent with the objectives of Niagara Region and the local Municipalities.

The TIS also serves as the basis for the identification of existing or proposed safety concerns and evaluation of transportation related improvements or measures to be included as a condition of access approval for the development or redevelopment. The TIS addresses connectivity between the development and the existing transportation networks, for all modes (cars, trucks, transit, cyclists and pedestrians) expected to access or leave the development.

1.2 Purpose of These Guidelines

Niagara Region has prepared this document to provide guidance to developers and consultants in the preparation of TIS and the details required in a TIS that would be considered acceptable to the Region. Following these guidelines and contacting appropriate Regional (and Muncipal, as required) staff in the preliminary stages of the development planning process will provide a more consistent and efficient review process. The Region will also use these guidelines for Class Environmental Assessment Studies for Capital Works Projects and for transportation analysis associated with Secondary Planning.

1.3 Need for a TIS

In general, a TIS will be required when any one of the following criteria is met:

- More than 100 new peak hour auto trips are generated as a result of the project/development/redevelopment; and/or
- Localized safety or capacity issues already exist; and/or
- Localized safety or capacity issues are anticipated as a result of the proposed project/development/redevelopment; and/or
- There are site-specific or project-specific characteristics that warrant more detailed transportation analysis.

NOTE: Niagara Region reserves the right to require the submission of a TIS notwithstanding the criteria listed above where a Regional road is expected to be impacted.

2 General Transportation Impact Study Requirements

2.1 Qualifications to Conduct a TIS

Where a TIS is required or requested by the Region, it will be the responsibility of the proponent to retain a qualified transportation consultant experienced in transportation planning and traffic engineering. The consultant must be a registered Professional Engineer licenced and in good standing in the Province of Ontario and the TIS report shall be signed and stamped by the Professional Engineer prior to final approval.

2.2 Pre-Study Conference

The evaluation of the impacts of a proposed development on the transportation network depends upon a number of assumptions about the type, amount, mode and patterns of traffic expected to be produced from and attracted to the site. Region staff is available for pre-submission communication to

ensure that the consultant/applicant is familiar with the Region's TIS process and relevant policies, procedures and approvals, to confirm key assumptions and parameters through the Development Services Division, and to facilitate discussions between the consultant/applicant and other relevant reviewing agencies (i.e. area municipalities, the Ministry of Transportation, etc.). Depending upon the complexity of the proposed development, this may reduce or negate the need for study revisions following submission of the completed study. All questions regarding Transportation Impact Studies shall be directed to the Development Services Division.

Discussions may include, but are not limited to:

- TIS process, assumptions and reporting requirements;
- Regional policies, procedures and approvals;
- Provincial policies, such as Niagara Escarpment Plan or Greenbelt Plan, as applicable;
- Road, sidewalk, transit and trail jurisdictions and responsibilities where more than one authority is involved;
- Extent of study area, including specific interchanges, intersections, transit connections and trail connections to include in analysis;
- Source and/or methodology for data collection;
- Appropriate study horizon years to consider for multi-staged development;
- Appropriate analysis periods for proposed development (for example AM peak, PM peak, Saturday peak, summer weekday, etc.);
- Suitability of rates for forecasting background traffic growth (all modes);
- Developments that need to be included in background traffic forecasts;
- Site plan considerations such as access locations and design;
- Active transportation initiatives, the need for (or enhancement of) pedestrian, cyclist or transit amenities if they have been identified in another plan;
- Trip generation data source and estimation method (for example ITE Trip Generation rate vs. ITE Trip Generation equation vs. locally observed rate) for less typical uses;
- Trip distribution and route assignment (all modes) prediction methods and assumptions for more complex developments or road networks;
- Sources and assumptions for trip pass-by or interaction rates where the complexity of the development requires these;
- Methodology for predicting signal/roundabout justification for forecast traffic volumes;

- Software to use for capacity analysis, and assumptions and parameters to apply for the agreed upon software tool;
- Methodology and/or software to use for evaluating storage lane length requirements;
- Methodology and/or software to use for evaluating stacking length requirements for drive-thrus expected at peak periods;
- Access management best practices; and
- Any other information that may be relevant to the proposed development.

2.3 Data Collection

The consultant/applicant is responsible for collecting, assembling, analysing and presenting all types of data required for the study.

The assembly of available data should be accompanied by a detailed investigation of the project site, area streets and the surrounding vicinity. This process should include recording all relevant characteristics needed for the analysis (e.g. land use type, intensity, lane configurations, bicycle and pedestrian facilities, transit stops/routes, etc.) plus observations of the existing transportation operational conditions.

Current traffic and collision data (data collected within at least three years of the study) shall be used. Turning movement count (TMC), historical and recent AADT volume information for Regional Roads, and collision data is available from Niagara Region for a fee (see Region's website [www.niagararegion.ca] and search for "Consolidated Fees and Charges Bylaw"). An email, formally requesting data, shall be sent to the Development Services Division who will coordinate with the Transportation Services Division.

Additional current volume data (including transit, pedestrian and cyclist) should be collected to supplement the available data, as necessary. Such data should be collected through surveys consistent with procedures described in the current edition of the Manual of Traffic Engineering Studies published by the Institute of Transportation Engineers (ITE). The Region reserves the right to require more comprehensive data collection be undertaken by the proponent, if required (e.g. on a Saturday for retail development).

For the purposes of determining future background traffic volumes generated by other planned developments, approved proposed development traffic should be used in consultation with the Region.

Any factors utilized in the TIS that are not in concurrence with the recognized standards must be agreed upon by Regional staff prior to submission of the final report.

2.4 Submission Requirements

A minimum of four (4) hard copies of the TIS, as well as one (1) .pdf copy, shall be submitted to the Region for review. All supporting information such as the traffic analysis outputs, trip generation / distribution data source, etc. shall be submitted for review with the TIS. All Synchro files shall be submitted in digital form for review.

These Guidelines recognize that the cycling, pedestrian and transit networks and amenities are different across the Region, and that the impact of a small infill development, a Regional Capital Works Project, and a large Secondary Plan area can vary greatly. It is expected that the level of analysis required will also vary depending on the exact location, size and type of the proposed development/redevelopment. For this reason, consultants are strongly urged to confirm TIS requirements with the Development Services Division in advance for each development/redevelopment.

Consultants are reminded that there may be local and/or Ministry of Transportation (MTO) and/or St. Lawrence Seaway Management Corporation and/or Niagara Escarpment Commission, etc., requirements related to transportation that need to be addressed for the proposed development/redevelopment. Consultants shall contact the appropriate authority to confirm their requirements and standards.

Consultants are also reminded that approval of the TIS does not constitute approval of the development application. Conditions imposed by other reviewers must be resolved as well.

2.5 Study Updates

A TIS will have a functional life of three years from the date of the study. Consideration may be given to extending the functional life of the TIS should build-out not take place as expected and other major changes within the study area have not occurred (i.e. for infill developments in a mature area). Major changes within the study area may reduce the applicability of the study if they were not considered in the original impact assessment and may require an update to the assessment if the development has not already begun or completed build-out.

2.6 References

The following references are recommended but not limited to:

- ITE Trip Generation Manual and Handbook (most recent edition);
- Geometric Design Standards for Ontario Highways (GDSOH) manual (most recent edition);
- Highway Capacity Manual (2010, or most recent edition);
- Roadside Safety Manual (most recent edition);
- All Ontario Traffic Manual (OTM) Books;

- ITE Manual of Traffic Engineering Studies (most recent edition); and
- ITE Traffic Access and Impact Studies for Site Development: A Recommended Practice.

3 TIS Report Format & Contents

The following section outlines the typical content for the TIS. In general, the content and extent of the TIS will depend on the location, nature and size of the proposed development and the prevailing transportation network and conditions in the surrounding area. **Appendix A** illustrates a typical impact study process. **Appendix B** provides examples of the recommended format for critical summary tables within the TIS report.

1. **Title Page**
2. **Executive Summary**

- Contains key findings, conclusions and recommendations of the TIS and should be located at the front of the TIS.

3. **Table of Contents**

- List of Exhibits
- List of Appendices

4. **Introduction**

- Includes the name of the applicant, nature of the application and purpose for submitting the TIS;
- Contains a brief description of the project;
- Includes a summary of the pre-consultation meeting with Niagara Region staff; and
- Contains a description of the components of the TIS.

5. **Study Area**

- Contains a description and a map of the study area including, but not limited to, the site location, land use type(s) of the surrounding and subject development lands;
- The study area map should extend far enough to contain all roadways and highways (local, regional and Provincial), major driveways, intersections, interchanges, trails, bikeways/paths, sidewalks, and transit services that will be affected by the traffic generated by the proposed development, up to 1 km from the proposed development/redevelopment in all directions. It is not necessary to extend the study area map beyond the Canada/US border, or into Lake Ontario or Lake Erie to meet the "up to 1 km from the proposed development/redevelopment"

requirement. The study area limits should be confirmed with the Development Services Division prior to initiating the TIS.

6. Existing Conditions

- Describes the transportation infrastructure jurisdictions, road classifications, existing land use type, speed limits, lane configurations, street names, signalized and/or unsignalized intersections, sidewalks, bike paths/lanes, trails, transit routes and/or stops and their locations. This information should be provided on detailed maps and diagrams.

7. **Proposed Development & Site Plan**

- Contains a drawing and a written description of the type of land uses proposed and a detailed site plan showing structures, parking, access, site circulation for all modes of transportation;
- Identifies existing road edges, other entrances/accesses, pavement markings and traffic control for roads adjacent to the proposed development, shown to scale, for both sides of existing roads.
- Describes the size of the proposed development, such as, property size (area), number of residential units, industrial gross floor area, number of employees, number of hotel rooms, commercial gross leasable floor area, parking spaces, active transportation facilities, transit stops, etc.
- Identifies the phasing scheme of the development;
- Identifies the expected dates of full and partial completion/occupancy, estimated length of construction and opening dates, if available, for each phase;
- Identifies how phasing of the development (if proposed) will impact the transportation circulation and infrastructure requirements internal and external to the site.

8. Other Area Development & Planned Transportation Network Improvements

- Identifies other developments in the study area that are under construction, approved or in the approval process that will impact the transportation network or proposed access;
- Identifies any road, transit, pedestrian and/or cycling improvements that are planned or currently under construction within the defined study area.

9. Study Horizons

- Established based on development size;
  - <500 peak hour peak direction trips = 5 years from the date of TIS;
  - 500 to 1,000 peak hour peak direction trips = 5 years after full occupancy; and

- >1000 peak hour peak direction trips = 5 years after full occupancy or Transportation Plan Horizon for large-scale projects

- Where applicable, the opening date of each major phase in a multi-phased development should be assessed separately utilizing the 5 year horizon criteria noted above.

- The Region may request, at its sole discretion, that a 10-year horizon also be examined for any size development in addition to the 5 year. A 10-year horizon may also be requested if the need to examine the feasibility of a roundabout is required.

10. Transportation Analysis

- Impacts on the transportation network should be evaluated for A.M. and P.M. peak hours and the site peak generation hour. Depending upon the study area and proposed land or building uses, there may be a need to consider specific seasons, days of week, or non-typical peak periods. Tourist areas are one example where summer weekend volumes may be higher than weekday volumes. The Region can provide additional information regarding travel demand and/or unique study areas through reference to the Region's TransCAD model.

- The peak hour analysis should be undertaken for existing, background and full development (as well as for interim stages if applicable) with and without the relevant transportation improvements

- Heavy/Commercial vehicles, transit and pedestrian/cyclists should be accounted for in the traffic analysis.

- The background traffic growth factor generally used is 2%, although the consultant should be aware that a higher or lower factor may be required depending on site-specific circumstances.

- Traffic analysis software must be configured using Niagara Region Standards as noted below;

  - Lane Settings:

    - Ideal Saturated Flow: 1,750 vphpl

    - Total Lost Time: 4 seconds (if applicable)

  - Volume Settings:

    - Peak Hour Factor: 0.92

  - Timing Settings:

    - Existing timing as per timing plan

    - Control Type: As per signal timing plan unless new signal then fully actuated

    - Leading Protected/Permissive advance greens only

- Lead/Lag Optimization: No
- Recall Mode: Minimum recall to main street through phases

11. Background Traffic Forecasts (non-site traffic) and Analysis

- Describes the method and assumptions for determining non-site future transportation, including growth rates plus size and expected build out years for approved developments in the study area.

12. Trip Generation

- Describes source and details of trip generation rates or equations used for all modes of transportation;
- Local data collection may be acceptable provided that conditions are similar to those for the proposed development or that differences are accounted for. A minimum of three comparable studies should be provided.
- The report should also include a description of any initiatives proposed to provide alternatives to single occupancy vehicle use and any steps that will be taken to support transit use, walking, cycling or other forms of Transportation Demand Management.

13. Trip Distribution/Assignment

- Describes methods and assumptions for distribution and route assignment of all modes of traffic;
- Assumptions for trip distribution should be supported by one or more of the following:
  - Transportation Tomorrow Survey (TTS) data;
  - Origin-destination Surveys;
  - Comprehensive Travel Surveys;
  - Planning models;
  - Market studies; or
  - Other recognized trip distribution methodology.
- Assumptions for route assignment should be supported by:
  - Existing travel patterns;
  - Expected future travel patterns.

14. Trip Pass-by/Interaction Rates (on-site Synergy)

- Describes source, method and assumptions for adjusting gross trip generation for pass-by trips or site interaction rates.
- Obvious or unrealistic trip rate discounting will result in the report being returned to the Consultant for revision, which could result in a longer than expected approval timeline.

15. Sustainable Forms of Transportation / Transportation Demand Management (TDM)

- If TDM reductions are being applied to trip generation, a TDM plan should be prepared that identifies existing and future (proposed) sustainable forms of transportation, routes and infrastructure within the study area
- Plan should describe and evaluate the potential impacts and changes to pedestrian, cycling and transit modal split associated with the development / redevelopment.

16. Evaluation of Impacts

- Should indicate existing traffic, transit, pedestrian/cyclist traffic volumes for roadways and intersections, heavy truck movements;
- Must be based on recent data as noted in Data Collection section of these guidelines;
- Describes methodologies and parameters used in evaluation;
- Transportation analysis must be undertaken for:
  - Existing conditions;
  - Future background conditions;
  - Total future conditions which includes traffic (including transit, cyclist and pedestrians) for the opening day of the development and 5 years (and 10 years, if required) based on the criteria noted under Study Horizons);
- Operational analysis must be undertaken for:
  - Street segments and/or intersections located in an area exhibiting congestion and/or high rate of growth and/or if as part of the new development a new traffic control signal or roundabout is proposed to be constructed on a Regional road.
  - All signalized and major unsignalized intersections in the study area network shall be evaluated.
    - At signalized intersections, through and/or through-right and/or right-turn movements with a v/c ratio greater than 0.85 are deemed to be “critical” in terms of operations. Dedicated left-turn movements with a v/c ratio greater than 0.90 are deemed to be “critical” in terms of operations. Movements that experience a v/c ratio noted as

"critical" or greater would be considered for geometric and/or other improvement(s).[1] Access should be evaluated related to the level of service at all driveways.

- At unsignalized intersections analysis must highlight where movements are expected to operate at LOS "D" or worse and/or where the estimated 95th percentile queue length for an individual movement exceeds the available queuing space.

- The following shall be included as part of the reporting for operational analysis:
  - v/c ratios;
  - Delay;
  - Level of Service (LOS); and
  - 95th percentile queue lengths;
- The results of the operational analysis and/or MTO warrants shall be used to determine the need for left-turn and right-turn auxiliary lanes.
- All volumes should be shown in exhibits.

17. Traffic Signal Justification / Roundabouts

- The need for traffic and pedestrian signals and/or underground provisions (conduits) should be reviewed at all locations affected by the proposed development and for each proposed development stage(s). Refer to OTM Book 12 to determine when traffic signals or provisions for signals are warranted. Utilize OTM Book 12 Traffic Signal Justifications and/or Niagara Region IPS Warrant (for pedestrian signals);
- All proposed new traffic and pedestrian signals should be evaluated for conformance to Region Standards, proximity to other adjacent traffic signals, traffic signal progression and any impacts on the corridor;
- If a traffic signal is justified, then a screening to determine the suitability of a roundabout may be required by the Region. Consultation with the Region regarding the need for a roundabout screening should have taken place during the pre-study conference, however, if this did not occur, the Region shall be contacted regarding the potential need. Details on the requirements of the screening are included in **Appendix C**.
  - If a roundabout is deemed to be feasible based on the screening then a functional design of the roundabout would be required.
  - The functional design of the roundabout should be adequately sized to provide the required capacity to accommodate the 10-year horizon traffic volume and design vehicles, should

[1] Other improvements coul d include pedestrian and cycling facilities, HOV, transit, TDM, etc.

include adequate deflection to achieve the required speed reduction, should consider nearby accesses, property and utility impacts and should include necessary facilities for transit, pedestrians and cyclists;

18. **Geometric Improvements (Intersection / Road Section)**

- The need for geometric improvements should be reviewed at all locations in the study area and for each proposed development stage(s). The TIS should clearly identify transportation impacts by movement (left, through, right, merge, other)
- The transportation system improvements that are needed to mitigate these impacts and the timing of these improvements must be specifically noted;
- All geometric improvements should be shown on a functional plan identifying lane arrangements and intersection improvements for each horizon year;
- All geometric improvements must be in accordance with the Niagara Region Roadway Design Standards and the Road Cross Section Policy. These documents can be found in **Appendix D** and **Appendix E**.

19. **Safety Review**

Niagara Region recommends following the principles of the Road Safety Committee of Ontario (ROSCO) Safety Impact Study (SIS) Guidelines when completing the safety review portion of the TIS. A copy of the ROSCO SIS Guidelines is included in **Appendix F**.

A SIS is, "An examination of traffic and infrastructure data associated with a development to identify: the effects of the development on the collision risk of the site and the adjacent road system, recommended modifications to the site plan and the street system to deliver the maximum level of safety within the constraints of design."

In this case, the SIS should complement the TIS. It is intended to consider traffic safety impacts explicitly, and to avoid creating, continuing or exacerbating safety deficiencies that may not be captured through the traditional planning and operational aspects of the traffic impact study process.

SISs are intended to be applicable both on site and off site. The scope would include all modes of transportation including cycling, transit and pedestrians. The SIS will ensure that sufficient information of acceptable quality is provided to the municipality to allow for an evaluation of the safety impacts of proposed developments.

The function of a SIS is not to put up barriers that discourage development but to work towards making the development as safe as possible for all road users. The SIS is a benefit to the developer in delivering a safer project, and to the community in addressing local safety concerns.

The following table is a general guide to the required complexity of the SIS. Note that agreement on the SIS should be had during the Pre-Study Conference.

	Level 1 – Screening	Level 2 – Planning	Level 3 – Detailed
Development Characteristics	Small residential and commercial devleopments that do not require a TIS. Not all of these developments will require a SIS. For these types of developments, the Region reserves the right to request a SIS where the Region knows or has reason to believe that a safety concern exists, could be exacerbated by, or created by, the proposed devleopment.	Moderate-sized commercial development and office complexes where any one of the following criteria are satisfied: • A TIS is required; • The development provides direct access to an arterial road; • There is a change in intersection traffic control as the result of the development; • There is a significant increase in pedestrian or cyclist traffic or the type and size of the development is known to be a pedestrian or cyclist generator; • The development creates a significant pedestrian-vehicle conflict; • An increase in commercial traffic by 20%, or; • The proposed development is proximate to and impacts on a road with an existing or proposed sensitive land use (i.e. a school, seniors residence, hospital, etc.).	Very large mixed-use and commercial developments or where any one of the following criteria are satisfied: • The traffic impact study indicates that the proposed development will add more than 150 peak-hour, peak direction vehicle trips; • A traffic signal or roundabout is added to the public street network; • There is more than one direct access proposed to an artieral road; • There is more than three accesses required for the proposed development on any type of road; • The proposed development impacts on a facilitiy (road link or intersection) with a worse than expected safety performance.
Study Area	The development site and the section of street or intersection that is being accessed by the development.	The development site and each access are to be analyzed. In addition, the first control point beyond each access point is also studied. Control points are intersections controlled by traffic signals, roundabouts or stop signs. For cases where a traffic control device does not exist, Regional staff will determine the extent of the study.	The development site and each access are to be analyzed. In addition, the first control point beyond each access point and other key intersections that will be affected by the proposed development. The exact area to be studied will be determined by Regional staff with input from the developer's consultant.
Analysis	An assessment of the existing safety performance in the study area, and at a minimum, a review of new pedestrian desire lines, parking layout and vehicular accesses.	An assessment of the existing safety performance in the study area, and a full review of safety issues arising from the proposed development in a qualitative manner. The analysis should (at a minimum) include new pedestrian desire lines, parking layout, and vehicular accesses, sight distances, auxiliary lane requirements and design, and traffic/intersection control devices.	An assessment of the existing safety performance in the study area including recommendations for mitigating collision risk at locations that have a worse than expected safety performance. In addition, a full review of safety issues arising from the proposed development, and the available design options in a quantitative manner. The analysis should (at a minimum) include new pedestrian desire lines, parking layout, and vehicular accesses, sight distances, auxiliary lane requirements and design, and traffic/intersection control devices.
Product	Letter report documenting the existing safety performance of the study area, a collision diagram, and a brief assessment of how safety issues are being addressed.	A road safety assessment containing mainly qualitative assessments of collision risk.	A road safety assessment that includes a quantitative assessment of design options for the proposed development. In additiona, for developments that impact on a location with a worse than expected safety performance, a report for an in-service road safety review (with the intent of mitigating the safety problem(s)) is required.

Generally, the SIS should consider:

- Roadway geometry must be reviewed related to MTO/TAC guidelines for:
  - Sight distances (stopping distance, intersection sight triangles, departure sight distance, signal sight distance) utilising MTO guidelines for approach and departure sight distances for all existing roadways to be impacted directly by the development, accesses, entrances, new roadways, etc.;
  - Roadway curves (vertical and horizontal) standards;
  - Roadway cross-sections;
  - Clear zone;
  - Conflicting vehicle movements within and adjacent to the development;
  - Design vehicles (buses, fire trucks, garbage trucks, etc., as appropriate).
- The Safety Review shall also identify any potential safety or operational issues associated with the following, as applicable:
  - Weaving;
  - Merging;
  - Corner clearances;
  - Vehicle-pedestrian conflicts;
  - Traffic infiltration;
  - Access conflicts;
  - Cyclist movements;
  - Heavy truck movement conflicts.
- A discussion of safety review must be included in the report.
- The Safety Review must include all modes of transportation that might access or travel through, and in the proximity of, the proposed development.

20. Conclusions and Recommendations

- Summary of key findings on the impacts of the proposed development on the adjacent road, transit, cycling, trail and sidewalk systems;

- Summary of recommended improvements. This should include, but not limited to, type of access, entrance design, roadway improvement including right/left turn lanes, tapers, visibility triangles, signalization and signage, bike lanes, sidewalks, transit improvements, trails, etc.

21. **Maps, Diagrams, Drawings and Figures**

- All diagrams, drawings and figures contained in the TIS shall be of a sufficient scale to be legible. All drawings, tables, and exhibits/figures included in the TIS shall be appropriately labeled and listed at the front of the TIS (after the Table of Contents) under the appropriate headings. Unless otherwise noted in these Guidelines or in the pre-consultation meeting, any maps or study/development/redevelopment area diagrams submitted as part of the TIS shall identify:
  - All adjacent and nearby roads, indicating road names, the number and width of lanes, jurisdiction, and posted speed – for both sides of the road;
  - All adjacent, opposing and affected accesses, driveways and intersections, indicating type of control, lane configurations, lane widths, and any turning or similar restrictions;
  - If appropriate, on-street parking spaces/standing/stopping restrictions in the vicinity of the development site and those which would affect the operation of key intersections being analyzed;
  - Transit routes and service frequency;
  - On and off-road cycling facilities;
  - Sidewalks and trails, including crosswalks;
  - Other features of interest; and
  - Heavy vehicle routes and/or restrictions.

4 Disclaimer

Notwithstanding the above, the Niagara Region may require additional information and analysis depending on the complexity of the proposal and the anticipated transportation impacts.

5 Appendices

Appendix A – Transportation Impact Study Process Flow Chart

Appendix B – Sample Summary Tables

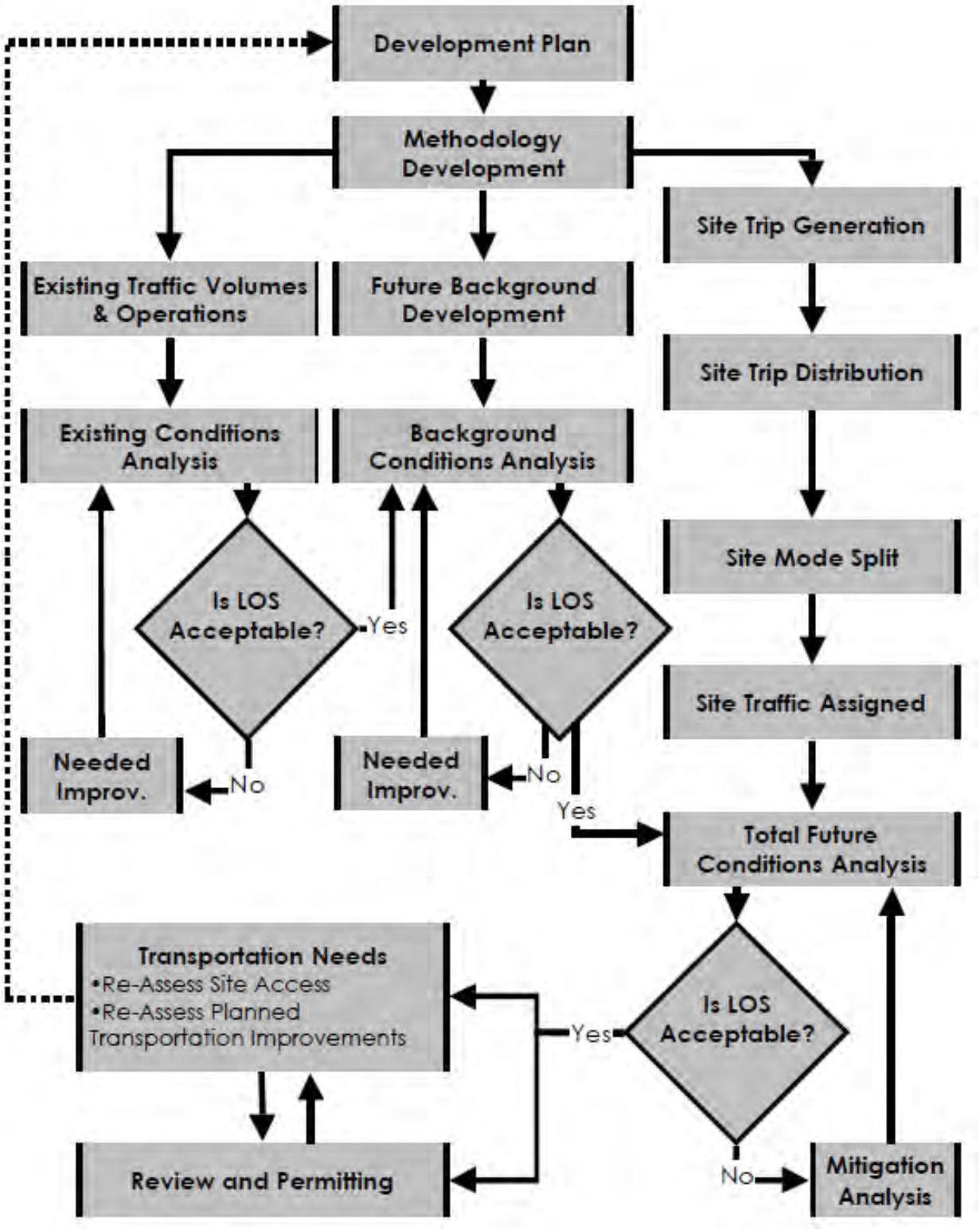
Appendix C – Roundabout Screening Details

Appendix D – Niagara Region Roadway Design Standards

Appendix E – Road Cross Section Policy

Appendix F – ROSCO Safety Impact Assessment Guidelines

Appendix A – Transportation Impact Study Process Flow Chart



Source: Transportation Impact Analyses for Site Development: A Recommended Practice, ITE

Appendix B – Sample Summary Tables

Trip Generation Table Sample

Land Use	ITE Code	Size	AM Peak Hour				PM Peak Hour			
			Rate/Equation	In	Out	Total	Rate/Equation	In	Out	Total

Trip Distribution Table Sample

Origin / Destination	Percent Distribution			
	AM Peak Hour		PM Peak Hour	
To / From the North	In	Out	In	Out
Via Street A				
Via Street B				
Via Street C				
Etc…				
To / From the South				
Via Street A				
Via Street B				
Via Street C				
Etc…				
To / From the East				
Via Street A				
Via Street B				
Via Street C				
Etc…				
To / From the West				
Via Street A				
Via Street B				
Via Street C				
Etc…				

Intersection Analysis Summary Table Sample

Analysis Period	Intersection	Control Type	Evaluation Metrics		Direction/Movement/Approach									
					Overall	EB-LT	EB-THRU	EB-RT	EB APP	Overall	WB-LT	WB-THRU	WB-RT	WB APP
AM Peak Hour	Street "A" @ Street "B"		LOS											
			Delay											
			v/c											
			Queue	Required										
				Existing										
				Available										
PM Peak Hour	Street "A" @ Street "B"		LOS											
			Delay											
			v/c											
			Queue	Required										
				Existing										
				Available										

Appendix C – Roundabout Screening Details

A roundabout screening prepared for the purposes of the TIS should include:

- Scope of intersection improvements required to implement traffic signals and other auxiliary turning lanes and the scope to implement a roundabout (including any property acquisition, etc.);
- Preliminary lane configuration of the roundabout;
- Preliminary cost estimates to implement traffic signals and to implement a roundabout; and
- Development of a 20-year injury collision cost for each of the alternatives, adjusted to present value.

If the total cost of the roundabout is found to be significantly more than the total cost of traffic signals, the roundabout would not be considered feasible unless other issues warrant additional consideration.

Horizon Year	10 years with sensitivity analysis of when the 10 year design will start to perform at a LOS "D" or worse
Capacity Analysis	For traffic signals: • HCS; • Synchro; For roundabouts: • RODEL or approved equivalent
Present Value Calculations	Use the most recent calculated value of the discount rate, and the injury collision cost as per current Transport Canada estimation
RODEL Confidence Level	• 50% for capacity analysis • 85% for sensitivity analysis • 95% for estimating queue lengths
Collision Rates	Niagara Region will supply expected collision rates for traffic signals. Expected collision rates for roundabout are assumed to be 50% of the signalized rate
Design Vehicle	WB-20

Appendix D – Niagara Region Roadway Design Standards

Appendix E – Road Cross Section Policy

Appendix F – ROSCO Safety Impact Assessment Guidelines