TRANSPORTATION IMPACT STUDY GUIDELINES

2022 | February

CITY OF VAUGHAN

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ACKNOWLEDGMENTS

The City of Vaughan Development Engineering Department consulted a number of agencies with extensive public and private experience in the preparation and review of transportation impact studies. In addition to the Development Planning Department of the City of Vaughan, the Transportation Engineering group would like to thank the following consulting companies for their assistance in the preparation of these guidelines:

- Marshall Macklin Monaghan
- Cole, Sherman and Associates
- Entra Consultants Inc.
- Cansult
- Totten Sims Hubicki Associates
- IBI Group
- Mark Engineering
- McCormick Rankin Corporation.

1 INTRODUCTION

1.1 General

A transportation impact study (TIS) provides valuable information and analysis for the City of Vaughan and others in the review of development and redevelopment proposals and applications. The *City of Vaughan's Transportation Impact Study Guidelines* have been compiled to outline the process and structure required to produce a comprehensive TIS for the City.

1.2 Purpose

The main purpose of a Transportation Impact Study (TIS), also referred to as Transportation Impact Assessment (TIA) is to analyze the traffic generated by proposed developments with new accesses or increased use of existing ones. A TIS generally includes a description of the scope and intensity of the proposed project, a summary of the projected impacts and any required mitigation measures to ensure that the surrounding road network can safely accommodate the proposed development. A well-prepared transportation impact assessment helps the developer and permitting agency accomplish the following:

- Quantitatively forecast the traffic impacts created by the proposed development based on accepted practices, not perceptions;
- Assess mobility needs for all road users including motorists, trucks, pedestrians, cyclists and transit users
- Determine improvements needed to accommodate the proposed development including to roadways and traffic control with consideration to all transportation network users;
- Relate land use decisions with traffic conditions;
- Evaluate the number, location, and design of access points;
- Update traffic data (projections); and
- Provide a basis for determining the developer's responsibility for specific off-site improvements.

The following guideline is intended to assist developers and consultants in better understanding the department's requirements and expectations regarding TIS. This document is not intended to provide technical engineering guidelines, but rather to provide a framework for the documentation of such reports.

1.3 City of Vaughan Transportation Goals and Objectives

Vaughan Vision is the "umbrella" document that guides the City of Vaughan's planning for the future. Part of the Vaughan Vision is to have Vaughan recognized as a well-planned, growing, innovative city. Outlined in **Table 1.0** are several transportation-related excerpts from the Vaughan Vision document and how they relate to these guidelines and the transportation planning process.

Table 1.0 Fulfillment of the Vaughan Vision	
Specific Strategy	**Application**
Goal 3.4 To establish a long-term transportation system.	
3.4.1 Establish a transportation master plan/strategy.	Ensure that the development proposal and associated transportation activities conform to City transportation plans and strategies.
3.4.3 Co-ordinate land use and transportation planning.	Provide the transportation infrastructure to support the planned land use.
3.4.4 Promote the use of transit services throughout the community.	Ensure that suitable transit services are provided for, through the development process.
3.4.5 Maintain and operate the transportation system in an efficient manner.	Provide transportation related improvements to accommodate present and future demands.
Goal 3.5 To establish healthy communities.	
3.5.1 Establish an urban design and transportation strategy which integrates streets as part of our living environment.	Support transportation networks and strategies which are "livable" and integrate into our existing and future neighbourhoods.
3.5.6 Provide for pedestrian friendly, transit supportive land use pattern. 3.5.7 Establish a multi-use pedestrian and bicycle system throughout the City.	Ensure that future transportation network plans and strategies incorporate pedestrian, bicycle and transit needs and demands in a safe environment.
Goal 3.7 To identify, support and maintain municipal infrastructure and information technology for the present.	
3.7.1 Identify both the present and future infrastructure requirements. 3.7.4 Develop strategic alliances with both the public and private sector for the provision of future infrastructure.	Make provisions for the staging and construction/ reconstruction of required transportation infrastructure elements.

The key issues need to be addressed are to ensure the;

- City's integration of land use and transportation;
- Minimize impacts of transportation improvements on the natural environment; and
- Reduce dependence on the automobile, through minimizing the growth in travel demand and through providing a greater menu of travel choices.

In addition to the above goals, the Transportation Engineering Division is dedicated to the timely review of development related study work undertaken by others. This document is one step towards the efficient and consistent approach for the review of transportation impact studies.

1.4 Need and Justification for TIS Guidelines

The City of Vaughan has experienced record growth in the past few years. Likewise, the number of transportation impact studies submitted for consideration by the City's Transportation Engineering Division has increased dramatically. In an attempt to streamline the approval process, the City's Transportation Engineering Division has prepared a set of guidelines which form the framework for all transportation impact studies submitted to the City for review. Compliance with these guidelines will reduce the time necessary for review and the need for further revisions or submissions.

1.5 Applicability

The following document outlines general guidelines for the preparation of transportation impact studies in the City of Vaughan. The City recognizes that some of the following guidelines and assumptions may not be applicable to certain locations or projects. The purpose of this document is to provide a general framework for the preparation of transportation impact studies, and it should be complemented with good engineering judgement.

It is important to recognize that the policies, guidelines and requirements outlined in this document are relevant at the time of printing. The guidelines will be reviewed and updated as necessary to reflect current policy, practice and accepted standards. The proponent or consultant should contact the City of Vaughan Transportation Engineering Division to identify any major modifications to this document since its compilation date.

For additional information or for clarification of any of the material contained in this document, please contact the following departments at the City of Vaughan, as applicable:

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2 GENERAL REQUIREMENTS

2.1 Need for Study

There are several considerations in determining the need and level of detail for a TIS. The level of detail and the required components will be a function of the location, size and operation of the development/ redevelopment proposal. Generally, TIS is required when one or more of the following criteria are anticipated or present:

- If the development/redevelopment will add 100 trips or more during the peak hour to the surrounding road network.
- If in the opinion of the City, the development has the potential to create adverse operational or safety impacts on the road network.
- The development will require a new traffic signal or modification to an existing signal.
- The proposed development is located in an area of high roadway congestion or high population/employment growth area.
- The proposed development is not envisioned by the City's land use or transportation plans, or requires a change or exception to a City planning or by-law policy, strategy or plan.

The City of Vaughan reserves the right to require the submission of a TIS notwithstanding the criteria listed above. It is the proponent's responsibility to demonstrate that a TIS is not required or to request a reduced scope to the satisfaction of the City.

2.2 TIS Terms of Reference

It is recommended for the consultant to confirm the scope of the TIS and determine data requirements / availability with City staff and other relevant reviewing agencies prior to commencing the study. The consultant should prepare a TIS Terms of Reference (ToR) that specifies all details required for the study as described in this guideline. A high-level overview of sections that should be included in the TIS is presented in **Section 2.8** and described in further detail in this guideline.

2.3 Data Collection Requirements

The scope of data collection should be confirmed with City staff prior to commencement. The applicant must provide all raw data collected as part of the TIS study which includes, but not limited to the following:

- Turning movement counts (TMCs)
    - Traffic volumes may be acquired from the City's Traffic Engineering Division (traffic.services@vaughan.ca), York Region's Transportation Department

(traffic.data@york.ca) or from previous transportation planning, traffic operation or transportation impact studies undertaken in the vicinity of the proposed development.
    - Counts more than two years old or counts that do not appear to reflect existing conditions should be updated to ensure that they reflect current traffic conditions.
    - When new TMC's are required, the data collection should capture peak period demands relevant to the development on both weekdays and weekends. At minimum, the following time periods should be covered:
        - Typical weekday (Tuesday through Thursday) during the following hours
            - 7 a.m. – 10 a.m.
            - 11 a.m. – 2 p.m. (as applicable)
            - 4 p.m. – 7p.m.
        - Weekend peak period (as applicable)
- Traffic signal timings
    - Traffic signal timings cards should be confirmed through field investigations by the applicant as required.
- ATR and AADT Counts
- Collision Records
- Proxy Site Surveys for parking studies and trip generation
    - Note that proxy site surveys used in parking studies should be conducted based on the requirements described in the City's Parking Study Guideline
- Transportation Tomorrow Survey data
- Travel Demand Model outputs as applicable
- Transit Operations and Ridership Data
- Field observation surveys

The scope of the data collection should fully support the TIS requirements and analysis methodologies described in this guideline.

2.4 TIS Study Updates

A transportation impact study will usually have a "shelf life" of three years before a new study will be required. However, an updated TIS study may also be required if traffic data utilized exceeds two years or when there are changes to the development proposal. Major changes within the study area may reduce the life of the document if they were not considered in the TIS.

2.5 Qualifications for Preparing the TIS

It is the applicant's responsibility to retain a qualified transportation engineering consultant to prepare the TIS. The consultant must be a registered professional on the Province of Ontario as a Professional Engineer, Certified Engineering Technologist or Planner.

2.6 Study Timing

Transportation needs are a major consideration for new or expanding development. In general, stages in the development process whereby transportation impact studies are potentially appropriate are:

- Zoning and rezoning applications
- Land subdivision applications
- Site plan approval
- Secondary plans, Block Plans or phases thereof
- Amendments to the Official Plan.

2.7 Funding Development-Related Works

The City of Vaughan funds transportation growth related infrastructure from tax levies and City-wide development charges as per the City's DC By-law and Ontario Regulation 82/98. Transportation infrastructure required to mitigate the impact of the development related transportation impacts are funded in one or more of the following ways:

- Where the work is identified and included in the City-wide development charge capital forecast, the proponent will not be required to fund the work above the development charge levies.

- If the work is identified in the development charge capital forecast, but the timing and cost does not coincide with the proposed schedule, the proponent may be asked to "front-end" its cost.

- If the work is not identified in the development charge capital plan, the proponent will be expected to finance 100 percent of its cost.

The City of Vaughan will assess the need for transportation related infrastructure based on information provided in the TIS, as well as with technical warrants and sound judgment.

2.8 Recommended TIS Framework

All TIS submissions should include the following pages at the beginning of the report:

1. Title Page
2. Cover letter / Signature Page
3. Table of Contents
4. Executive Summary

The following details should be included in the main body of the report and supplemented by technical appendices containing detailed analysis.

5. Description of the development proposal (**Section 3.1**)

6. Establish scope of TIS
    - Study Area (**Section 3.2**)
    - Horizon year (**Section 3.3**)
    - Time periods for analysis (**Section 3.4**)
7. Transportation Policy Review (**Section 3.5**)
8. Existing conditions traffic analysis (**Section 4.1**)
9. Future background conditions (**Section 4.2**)
10. Site generated transportation demand (**Section 4.3**)
11. Total Future Traffic Conditions (**Section 4.4**)
12. Assessment of Active Transportation an Transit Impacts (**Section 5 and 6**)
13. Mitigation measures (**Section 7**)
14. Site plan, parking and access management review (**Section 8**)
15. Transportation Demand Management Plan (**Section 9**)
16. Conclusion and Recommendations

3 DEVELOPMENT CONTEXT & ANALYSIS SCOPE

3.1 Description of the Development Proposal

A description of the development proposal should be included at the beginning of the TIS. The following details should be included as appropriate:

- Existing and proposed land uses
- Permitted use provisions in the Official Plans, Zoning By-laws and site-specific amendments.
- Development location including municipal addresses
- Total building size and floor space
- Expected completion date of construction
- Hours of operation (as applicable)
- Planned phasing of the development
- Highlight significant features of the study area such as ongoing or planned construction work, location of schools or major attractions to be discussed in further detail in subsequent sections of the report.

A site plan or draft plan of a suitable scale (as indicated in the Site Plan Criteria Guide) must be submitted for consideration in the evaluation of a TIS. The site plan or draft plan should be presented in the description of the development proposal and provide the following details as applicable:

- Location, type and number of site accesses
- Intersection control and turning restrictions at site accesses
- Number and type of parking spaces and loading areas
- Traffic calming measures
- Proposed cycling and pedestrian facilities (connection to destinations e.g. school and park, pedestrian crossover)

Note that a detailed assessment of transportation features on the site plan or draft plan should be provided as its own section of the TIS.

3.2 Study Area

Generally, the study area will be a function of the size and nature of the development/ redevelopment proposal and the existing and future operations of the surrounding road network. The study area should encompass all City, Regional and Provincial roadways that could be noticeably affected by the transportation impacts of the project. Since every development is unique, it is recommended that the applicant consults with the City and other reviewing agencies to confirm the study area at the start of the study. Typically, the following criteria will be used to determine the study area:

- Intersections with turning movements that are operating at or above capacity which will likely be impacted by development generated traffic
- Intersection control and design for all intersections on a walking and cycling route within 600m (10min walk) of the site
- All roadway or intersections where the peak hour vehicular traffic or pedestrian demand is expected to increase notably as a result of the development

The City reserves the right to establish the study area as deemed necessary by staff.

A description or illustration of the study area should be provided and include, but not be limited to, the following:

- Description of roadways in the study area including number and configuration of travel lanes, jurisdiction, posted speed, transit stops or bays and sidewalks.

- List of existing intersections and mid-block crossings in the study area indicating, as relevant:
    - Lane configurations
    - Type of vehicular and active transportation control
    - Turning restrictions
    - Medians and channelization

- Cross-rides

- Description of land uses in the study area and location of adjacent accesses
- Planned and on-going roadway, transit and active transportation projects within the study area
- Inventory of on-street parking and stopping restrictions near the proposed site. The time periods for which the restrictions are in effect shall be provided.
- Truck routes or heavy vehicle restrictions, by time of day or day of week, as applicable.
- Transit facilities and routes which serve or will serve the development proposal including location of transit stops.

3.3 Horizon Years

It is recommended that City of Vaughan Transportation Staff be consulted when determining appropriate horizon years for the TIS. The TIS should include analysis for several horizon years including, but not limited to, the following:

- Existing conditions
- Opening year: Full site build-out and occupancy
- 5-year horizon after full site build-out
- For larger developments generating more than 1,000 peak hour trips, a 10-year horizon should be considered

Interim horizon years should also be evaluated to assess phasing for developments, interim site access arrangements and layouts.

3.4 Analysis Time Periods

Identification of appropriate time periods for the analysis should be based on the following factors:

- Type and size of development
- Potential peak period trip generation
- Hours of operation
- Recurring special events
- Seasonal fluctuations

Typical analysis periods include:

- Weekday AM Peak (One hour between 7 a.m. to 10 a.m.)
- Weekday PM Peak (One hour between 4 p.m. to 7 p.m.)
- Saturday or Sunday (usually applies to retail or commercial land uses)

- Site Specific (usually applies to institutional land uses)

The weekday AM and PM peak periods will usually represent the "worst case" combination of site related and background trips. However, for some land uses such as retail, entertainment, religious, institutional and sports facility uses, the Saturday, Sunday or site-specific peak may require analysis. Analysis time periods should be confirmed with City staff before starting the TIS study.

3.5 Transportation Policy Review

The City of Vaughan is a rapidly growing and intensifying municipality, home to a diverse population and employment base. As the City continues to grow and intensify, the strategic planning and design of development and redevelopment will contribute immensely to how people within the City travel, and the City's long-term sustainability.

In addition to the City's transportation objectives outlined in **Section 1.3**, the following background documents should be reviewed:

- Vaughan Official Plan (2010)
- City of Vaughan Transportation Master Plan (2012)
- York Region Official Plan (2010)
- York Region Transportation Master Plan (2016)
- York Region Transportation Mobility Plan Guidelines (2016)
- Vaughan Vision 20/20 – Strategic Plan (2007)
- Comprehensive Zoning By-law Review (On-going)
- Vaughan Traffic Management Strategy (On-going)
- Vaughan Pedestrian and Bicycle Master Plan Update (2019)
- City-wide Streetscape Implementation Manual and Financial Strategy (2014)
- Natural Heritage Network Study (2014)
- City-Wide Parking Strategy (On-going)
- Secondary Plans, Block Plans and Environmental Assessments as applicable to the study area

4 ANALYSIS OF TRANSPORTATION SCENARIOS

At minimum, the transportation analysis should include the following scenarios:

- Existing Traffic Conditions
- Background Traffic Conditions
- Future Total Traffic Conditions including Site Generated Traffic

This section presents requirements and considerations that should be included in the analysis for each scenario.

4.1 Existing Traffic Conditions

The existing traffic conditions analysis should include the following components, as applicable:

- Exhibit(s) showing the existing and balanced turning movement counts for the roadways and intersections in the study area, including pedestrian volumes and heavy vehicle percentages. An overview of the City's traffic volume balancing requirements is presented below in **Section 4.1.1**. A detailed overview of the City's data collection requirements is presented in **Section 2.3**.

- Exhibit(s) showing type of traffic control at intersections and accesses in the study area.

- Discussion of field observations and surveys such as on-site safety assessments, travel time surveys, gap surveys and vehicle queueing observations. Field surveys may be requested at the discretion of City staff to address concerns related to safety or model calibration. A discussion of model calibration and the use of field survey data is presented in **Section 4.1.2**.

- Review of collisions and accidents history at key locations in the study area.

- Intersection analysis of the existing conditions for all peak periods using the methodologies described in **Section 4.5** and **4.6**.

4.1.1 Traffic Volume Balancing

Traffic volume balancing involves reconciling discrepancies in field collected count data between upstream and downstream intersections. These discrepancies can arise for a number of reasons such as counting errors, difference in counting days, traffic sources and sinks between locations, and queueing. Discrepancies in count data should be reconciled before proceeding to model development. The transportation consultant should first determine probable causes for discrepancies in count data. In general, the following principle should be following when conducting traffic volume balancing:

- Any traffic volume adjustments for the purposes of balancing must be justifiable based on probable causes and supported by City staff
- Traffic counts should be balanced to at-least 10% discrepancy between adjacent intersections.
- Traffic volumes should be balanced to the most "reliable" counts in the study area such as count data at major intersections or data that best meets the City's data collection requirements (**See Section 2.3 Data Collection Requirements**)
- Through movements should be adjusted first for volume balancing purposes before turning movements. Any adjustment to turning movements must be carefully considered and include justification to the satisfaction of City staff.

4.1.2 Model Calibration

Model calibration should be undertaken as part of the existing conditions analysis to ensure the model

reflects field conditions, especially when there are known operating issues in the study area. Typical field observations include travel time or delay, number of stops, saturation flow rates, critical gap acceptance, vehicle queue lengths and general field notes. Field data collection efforts should be supplemented by surveyor data collection sheets, photographic log of the project area or videotaping the corridor.

Field data that is collected for the purposes of model calibration should be during the same periods that is modelled and reflect typical conditions. The data collection process should avoid impacts that could affect the results obtained in the field, such as construction or low activity seasons, as much as possible. The scope of this guideline will only provide an overview of model calibration for Synchro/Simtraffic models. Any synchro parameters that are modified for the purposes of mode calibration should be documented and discussed in the transportation analysis. An overview of Synchro parameters, the City's default values and how they can be adjusted for calibration purposes is presented in **Section 4.6**. Unrelated design changes to the model such as modifying lane configurations for the purposes of calibration should be avoided.

4.2 Background Traffic Conditions

Background traffic generally consists of two components: background traffic growth and other developments within the area. Both of these components are discussed below. Assessment of background traffic conditions should follow the capacity analysis methodologies accepted by the City that are described in **Section 4.5** and **4.6**.

4.2.1 Background Traffic Growth

Background traffic growth rates can be estimated using the following methodologies:

- Transportation demand forecasting model (regional or sub-area model)
- Historical traffic counts (TMCs, AADT, etc)
- Recent background transportation studies (Environmental assessments, secondary plans, other traffic studies, etc)
- Consultation with the City and other reviewing agencies

Engineering judgment should be used to select the most appropriate methodology for calculating background traffic growth. In the absence of historical data, a 2% per annum growth rate may be assumed.

4.2.2 Other Developments within the Area

The future background traffic should include trips from all significant developments that are:

- Under construction, approved or in the approval process;
- Within or close to the study area; and
- Likely to occur by the analysis horizon years

Active development applications within the City and related studies can be found on the City's Planit Application View. The consultant should confirm with City staff to establish / confirm the list of background developments to be included in the study scope.

4.2.3 Planned Roadway Improvements

Planned roadway improvements can have significant changes to travel patterns in the study area. The impact of planned roadway improvements on the background traffic volume should be reflected in the transportation analysis. The methodology used to represent changes to existing travel patterns as a result of planned infrastructure should be discussed and approved by City staff. This can include use of travel demand models or logical adjustments to existing travel patterns based on review of background transportation studies.

4.2.4 Multi-Modal Shifts

The methodology used to estimate the mode split in the analysis should be discussed and approved by City staff. In general, the methodology should be based on the following considerations:

- Existing mode split and historical trends in the area
- Proxy site surveys at similar existing developments. Proxy sites and data collection methodology should be agreed upon with City staff
- Maturity of the transit or active transportation network within the study area for a horizon year
- Justification based on planned infrastructure in the area and supporting studies
- Outputs from transportation demand modelling forecasts
- Background transportation studies such as transportation master plans, secondary plans and environmental assessments

Note that any assumptions in the mode split must include detailed justification and be approved by City staff. Visionary or policy mode splits for future horizon years should not be used to reduce automobile demand. It is important for the transportation study to represent a conservative analysis, that does not under-estimate automobile demand, to identify suitable mitigation measures. Refer to **Section 5** for further discussion on transit and active transportation assessment.

Some intensification areas of the City, such as the Vaughan Metropolitan Centre (VMC), are expected to see significant mode shifts from automobile demand to more sustainable modes of transportation in future horizon years. In areas where major improvements to the transportation system are planned, a minimum of two scenarios must be included to review the impact of the development with and without these major transportation system improvements. It should be noted that the "without" scenario will cover situations where risk factors such as funding and necessary permits that may not be available within the horizon year are considered.

4.3 Site Generated Traffic

4.3.1 Auto Trip Generation

Consultation with City of Vaughan Transportation Staff is recommended to ensure that appropriate and agreed upon trip generation rates are being employed in the TIS. Available trip generation methods, in order of preference, include:

- Trip generation surveys from similar developments in the City of Vaughan or York Region which have similar operating characteristics as the proposed development. Selected proxy sites and the survey methodology should be agreed upon with City staff prior to data collection.
- Latest Institute of Transportation Engineers (ITE) Trip Generation Manual. Application of ITE trip trips should be undertaken with professional judgement recognizing the differences between the City of Vaughan and major U.S. cities. The quality of ITE data including number of data points and R^2 value should also be considered. In the absence of quality data, or if the development lies on the extremely high or low end of the data plot, independent trip generation surveys should be considered or required by City staff.
- "First principles" calculations of anticipated trips to and from the site

Where appropriate, it may be justified to adjust the trip generation of the proposed development to account for the following:

- **Synergy / internal trips** which are shared between two or more uses on the same site. For example, a motorist might visit a retail store and a grocery store on the same development in one trip. These trips should be estimated using an established method, such as from ITE, proxy site surveys or a "first principles" based approach approved by City staff.

- **Pass-by trips** that are attracted from the traffic passing the site on adjacent streets. Although pass-by trips are not part of the new trip generation, pass-by trips will impact trip assignments at site accesses and adjacent intersections, therefore it should be included in the analysis. The number of pass-by trips should be estimated using survey data collected for the development or the ITE trip generation manual. It should also be noted that pass-by trips are only applicable to retail/ commercial developments such as shopping centre, fast-food restaurants or gas stations.

- **Mode split assumptions** used to reduce the number of auto trips generated by the development should follow the same considerations described in **Section 4.2.4** for background mode splits. Note that trip rates contained in the ITE Trip generation manual are based on surveys of existing developments in major U.S. cities that already have a mature transit and active transportation system. Until the transit and active transportation network in the City of Vaughan matures, it might not be appropriate to reduce those trip rates to any greater extent. This can be confirmed with City staff.

4.3.2 Trip Distribution and Assignment

Site generated traffic must be distributed and assigned to the existing or future road network using established methods agreed upon by City staff. Some common trip distribution methodologies are listed below:

- Transportation Tomorrow Survey (TTS) data
- Origin-destination surveys
- Comprehensive travel surveys
- Existing or anticipated travel patterns
- Output from transportation planning models
- First principles-based approach

Trip distribution and assignment assumptions should reflect the most probable travel patterns expected based on knowledge of the proposed or future transportation network in the study area. The effects of any traffic control devices or traffic calming measures planned for the area should be accounted for in the trip distribution and assignment.

4.4 Total Future Traffic Conditions

Total future traffic volumes should be estimated using the summation of total background trips and site generated trips. Exhibits showing total traffic volumes should be provided in the report for each analysis horizon year and peak period.

In some cases, interim traffic conditions may need to be assessed to reflect phasing of developments, interim site access arrangements or planned transportation system improvements. Assessment of future traffic conditions should follow the capacity analysis methodologies accepted by the City that are described below.

4.5 Vehicle Capacity Analysis

Vehicle capacity and Level of Service analysis should be conducted for all signalized and unsignalized intersections and crossings in the study area. The traffic study should report on the vehicle delay for the intersection and individual movements, volume to capacity ratios, and queueing analysis. A summary and discussion of these results should be provided in the body of the report with detailed documentation and model outputs provided as Appendices. At minimum, the traffic analysis should identify and discuss critical vehicle movements following the criteria outlined below:

- For signalized intersections:
    - Volume to capacity (V/C) ratios for overall intersection operations, through movements, or shared through/turning movements increase to 0.9 or above
    - V/C ratios for exclusive movements increase to 0.95 or above

- The estimated 95th percentile queue length for an individual movement are projected to exceed available turning lane storage.

- For unsignalized intersections:
  - Levels of service (LOS), based on average delay per vehicle, on individual movements exceed LOS E.
  - The estimated 95th percentile queue length for an individual movement exceeds the available queue storage or, for through movements, extends beyond the upstream intersection or major driveway.

Capacity analysis results are required to be presented in table formats including all the necessary parameters. Sample templates are provided below:

Table 2.0
Vehicle Capacity Analysis Results Template – Signalized Intersections

Intersection	[AM/PM/Sat] Peak Hour										
	Overall			Movements							
	V/C	Delay (s)	LOS	Movement	Traffic Volume (vph)	V/C	Delay (s)	LOS	Queue (m)		Available Storage Length (m)
									50th	95th	
[Name of Intersection]				[ex NBL]							
[Name of Intersection]											

Table 3.0
Vehicle Capacity Analysis Results Template – Unsignalized Intersections

Intersection	Movement	[AM/PM/Sat] Peak Hour					
		Traffic Volume (vph)	Delay (s)	V/C	LOS	95th Queue (m)	Available Storage Length (m)
[Name of Intersection]	[ex NBL]						
[Name of Intersection]							

The traffic study should also include identification of potential safety or operational issues associated with:

- Weaving and merging
- Vehicle queueing and blockages
- Corner clearances and sight distances
- Vehicle-pedestrian conflicts
- Access conflicts
- Traffic infiltration
- Cyclist movements
- Emergency vehicle response
- Heavy truck movement conflicts, etc.

Provision of supplementary analysis or field surveys to address operational or safety issues may be required.

4.6 Accepted Capacity Analysis Methodologies and Assumptions

The City of Vaughan currently accepts the *Canadian Capacity Guide* (CCG) and *Highway Capacity Manual* (HCM) methodologies for intersection analysis. Any computer software packages that are used must be based on these methodologies unless otherwise justified. The City reserves the right to request that certain intersection analyses be undertaken using specific software packages should the verification of results be required.

In the absence of site-specific data, the following model parameter values should be used. All modelling assumptions must be documented in the TIS and agreed upon with City staff.

4.6.1 Speed Limit

The on-street speed limit for existing roadways should match existing regulatory or posted speed limits. For newly proposed roadways, the speed limit should be based on the City of Vaughan's Speed Limit Policy dated April 15, 2020.

4.6.2 Heavy Vehicle Percentages and Passenger Car Equivalents

The percentage of heavy vehicle traffic in a vehicle stream will vary by location and development. Heavy vehicle percentages should be calculated based on field collected data and incorporated into the analysis to reflect existing conditions. For future traffic scenarios, a minimum of 5.0% trucks and heavy vehicles should be assumed on industrial roads for peak period analysis.

The Synchro default for the heavy vehicle equivalency factor is 2.0 passenger car units (pcu). For planning purposes, an average of 2.0 pcu can be assumed for trucks, buses and recreational vehicles. However, the pcu for heavy vehicles can range significantly due to variations such as in truck length, type and power-

to-weight ratio. In situations where a high percentage of multi-unit or heavily loaded vehicles can be reasonably expected, the use of a higher pcu must be used and documented through field observation.

4.6.3 Ideal Saturation Flow Rate

The ideal saturation flow rate is a measure of the rate which vehicles may enter a signalized intersection on a green phase under *ideal* conditions. The maximum base through saturation flow rate for City of Vaughan intersections is considered to be 1900 pcuphplg (passenger car units per hour per lane green).

Although higher values are not recommended for City intersections, a proposed saturation flow rate may be accepted only if is justified through a documented saturation flow rate survey. The survey approach and methodology should be confirmed with City staff.

Reductions to the Synchro default saturation flow rate must be confirmed with City staff and may be required to reflect field conditions such as intersection geometry, traffic control conditions, and to account for heavy pedestrian volumes or multiple lanes. Field surveys should be undertaken to determine appropriate assumptions under these circumstances.

4.6.4 Peak Hour Factor

When the HCM methodology is used for the analysis of signalized or unsignalized intersections, a suitable peak hour factor (PHF) must be employed to account for the peak 15-minute traffic volume within the one-hour analysis period. Actual PHFs should be assumed for all existing intersection analyses. A PHF of 0.90 should be assumed for proposed or future intersections. Higher PHFs may be used if supported by documented field surveys.

4.6.5 Pedestrian Walking Speeds

Generally, a pedestrian walking speed of 1.0 m/s is accepted as design criteria for pedestrian crossing times. Pedestrian walking speed assumptions should consider such factors as school children and seniors utilizing the area intersections. Walking speeds may be reduced in these areas down to 0.9 m/s. Pedestrian crossing times must be accommodated in the intersection signal timing where it is reasonable to expect pedestrian movements at the intersection.

4.6.6 Cycle Length and Signal Phasing

Signal phasing and cycle length assumptions incorporated into the analysis of existing conditions must reflect actual timings. Analysis of future conditions may utilize modified phasing to:

- Minimize overall delay at the intersection
- Minimize the degree of saturation for critical movements or major traffic flows
- Implement queue management
- Balance flow ratios
- Better accommodate pedestrians.

Modifications to the cycle length and existing signal phasing employed by the City must be explicitly identified and justified. Typically, the City will accept cycle lengths in the range of 60 to 120 seconds. All revised (existing intersection) and proposed (future intersection) signal timings must be approved by City staff. If the signal is part of a coordinated system, then the system cycle length may be used in the analysis.

Proposed signal timings at City intersections should not incorporate split phasing or extended/lagging fully protected phasing unless agreed upon, in advance, by the City.

4.6.7 Green Intervals

Signal timings must satisfy motorist and pedestrian expectations, as both expect and require a reasonable length of green time. The expectation varies depending on the movements to be accommodated and local operating conditions. Provided in **Table 4.0** are the minimum green times to be provided at City of Vaughan intersections.

TABLE 4.0
Minimum Green Intervals

Signal Indication	Min. Major Street Duration (s)	Min. Minor Street Duration (s)	Exceptional Min. Duration (s)
Green (steady green)	20	12	7 (minor street) 15 (major street)
Left or Right Turn Advance (arrow)	7	7	5
Note: Minimum pedestrian crossing times must be accommodated where it is reasonable to expect pedestrian movements.			

These minimum green times outlined above may need to be increased in areas where intersections accommodate significant volumes of multi-unit or heavily loaded commercial vehicles.

4.6.8 Intergreen Periods

At signalized intersections, intergreen (amber plus all-red) periods are based on a number of factors including operating speeds, approach grades, and local driving habits. The intergreen periods used in the analysis of existing conditions should reflect actual signal timings. For planning purposes, current intergreen periods should be utilized at existing intersections. In the case of future or proposed intersections, a minimum intergreen period of 6.0 seconds should be assumed.

4.6.9 Lost Time Adjustment

The following Lost Time Adjustment default values are used:

- For off peak analysis, use 0; and
- For peak period analysis, use -1.

The above is based on the formula: **Lost Time Adj. = Start Up Lost Time - Extension of Effective Green**, where:

- Start Up Lost Time is two seconds; and
- Extension of Effective Green is two seconds for off peak and three seconds for peak conditions.

Reasonable adjustment values of less than three seconds are permitted for critical movements. However, the City may request field studies to support the adjustments.

4.6.10 Left Turns on Intergreen

The number of left turns on intergreen ("sneakers") can vary considerably from one signalized intersection to the next. For design purposes, a maximum of 2.0 left turns on intergreen/cycle may be assumed at typical intersections, and 2.5 left turns on intergreen/cycle may be assumed at congested intersections. Note that in shared lanes with permissive left turns, the number of left turns on intergreen is assumed to be zero unless otherwise supported by documented surveys at the subject location(s).

4.6.11 Right Turns on Red

The number of right turns on red (RTOR) at signalized intersections is generally a function of conflicting vehicular and pedestrian volumes on the cross street. The RTOR volume is assumed to be zero in shared right turn lanes, unless the right turn volumes are high enough to expect that the lane functions as an exclusive right turn lane. Channelized right turns that are not under signal control may be removed from the analysis. Right turn on red volumes assumed in the existing intersection analysis should reflect those observed in the field. Intersection analysis for future scenarios should include reasonable assumptions relating to RTOR volumes.

4.6.12 Critical Gaps

Used in unsignalized intersection analyses, a critical gap represents the time interval a motorist is willing to accept when proceeding across or turning into a higher-order traffic flow. Critical gap assumptions should reflect the most recent research provided in the *Highway Capacity Manual*. Deviations from these values must be justified. The City of Vaughan will consider alternative gap data based on representative documented field surveys.

4.6.13 Lane Utilization Factor and HOV Lanes

Traffic lanes are not equally utilized because of vehicles stopping in the curb lane, the absence of right turn and/or left-turn lanes, the presence of a HOV lane, vehicles wishing to turn right or left, presence of street cars, road conditions and the presence of unused streetcar tracks. The lane utilization factor (LUF) adjusts the saturated flow rate to account for the uneven distribution of traffic between lanes. The default LUFs calculated by Synchro, correspond with those specified in HCM 2000 and are accepted unless field studies show otherwise. If field observations confirm traffic is evenly distributed across all lanes in a lane group, then a LUF of 1.0 can be used.

LUFs can be used to simulate the effect of HOV lanes in Synchro. Field studies may be conducted to count traffic volumes for each lane in a lane group to calculate the LUF using the following formula:

$$\boldsymbol{LUF} = \frac{Unadjusted\ Volume\ for\ the\ Lane\ Group\ (Veh/Hr)}{Number\ of\ Lanes\ \times Unadjusted\ Volume\ from\ Highest\ Single\ Lane\ (Veh/Hr)}$$

If a field saturation flow study is conducted at an intersection, then the lane utilization factor used for the specific intersection analysis (along with the other adjustment factors) can be set to 1.0 so that the influence of the adjustment factors are not double counted. However, note that Synchro is not an ideal option for doing analysis of HOV lanes and microsimulation software should be considered.

4.7 Microsimulation (SimTraffic) Analysis

Simtraffic is the animation portion of Synchro that can be used to perform microsimulation by modelling the performance of individual vehicles using a range of vehicle types and behaviours. Note that Simtraffic and Synchro results for the same model may not be the same due to differences in the analysis approach. The following complex situations should be modelled using Simtraffic:

- Closely spaced signals
- Intersections operating under congested conditions
- Ramp signals

Since one simulation may not be representative of typical conditions, at-least five (5) separate simulation runs must be conducted and the average results then reported. The following details must be considered before running the Simtraffic model:

- The seeding duration for the model must provide enough time for a vehicle to traverse the entire network between the two most distant points. For example, if the travel time is typically 10 minutes during the study period, then the seeding time must be at-least 10 minutes.
- The recording time should be a minimum of 60 minutes. Four 15-minute recording intervals should be set up. The “PHF Adjust” parameter should be set to “Yes” for the 3rd recording interval. The “Anti-PHF Adjust” should be set to “Yes” for the first, second and fourth intervals.

- It is desirable and sometimes necessary to model upstream "dummy" intersections that can stop traffic for an extended period of time to simulate realistic vehicle travel patterns and platooning.
- The default values in SimTraffic such as for vehicle and driver types should be retained unless otherwise justified.

5 TRANSIT IMPACTS

An assessment of transit services around the development area may be required as part of the TIS. The scope of the transit impact assessment will depend on the size, location and operating characteristics of the proposed development and should be confirmed with City staff.

5.1 Existing Transit Services

To provide a representative picture of the existing transit conditions within the study area, the TIS should include, as applicable:

- A description of existing transit routes including headways and exhibit(s) illustrating the existing transit routes, stops and facility locations
- Approximate walking distance to the transit services, or where appropriate, walking distance contours
- Current ridership and residual capacity on each route, by bus and average peak passenger hour.

5.2 Anticipated Growth in Transit Demand or Service

An assessment of transit ridership changes resulting from the development, travel growth and other area development should be incorporated into the analysis. The proponent should contact York Region Transit, Vaughan Operations to establish suitable assumptions for growth in transit demand. Anticipated growth in transit demand should recognize:

- The transit travel aspirations of the City of Vaughan
- Transit modal split assumptions based on current local data for short-term forecasts, and targets as established by the City for mid- to long-term forecasts
- Projects that are approved or under construction prior to the proposed development.

The number of transit trips generated by the development can be estimated using an appropriate mode split assumption. It is recommended that the City of Vaughan and York Region Transit be contacted early in the transportation study process to establish mutually acceptable assumptions for the mode split. Transit demand for the subject development may be established by:

- Proxy site surveys at similar existing developments. Proxy sites and data collection methodology should be agreed upon with City staff
- Existing published surveys such as the Transportation Tomorrow Survey (TTS).

- Background transportation studies such as transportation master plans, secondary plans and environmental assessments
- Outputs from transportation demand modelling forecasts
- "First principle" calculations of anticipated transit trips

Note that any assumptions in the mode split must include detailed justification and be approved by City staff. Transportation planning projections or goals should be considered, but they should not replace good engineering judgement and actual modal split data. To achieve the proposed transit modal splits, the site may be required to have a supporting TDM Plan (See **Section 9**).

5.3 Evaluation of Site Transit Level of Service

Evaluation of transit mode level of service should follow the methodology that is described in York Region's Mobility Plan Guideline for Development Applications. Transit mode level of service performance is based on the following criteria:

- Access to transit stops
- Transit headways
- Transit vehicle performance at the intersection approach

The results of the transit evaluation should be used to inform the following:

- Identification of situations, locations, time periods and corrective opportunities where:
    - Transit service is not provided in the area and is required
    - The provision of transit service or facilities are desired on site
    - Demand exceeds residual capacity of the existing transit service (in which case times of day, duration and days of week should be specified as applicable)
    - Transit service hours do not coincide with the times when transit will be required
    - It would be beneficial to provide increase transit frequency or service requirements for special events or peak arrival or departure times.

- Identification of pedestrian connections required to access transit services.

- Identification of impacts on transit operations directly associated with the site generated traffic volumes or operations, and corrective measures.

- Preliminary concept of route configuration and integration of new routes into existing network.

- Estimates of expected service frequency, additional vehicle requirements and cost to accommodate site demand.

6 ACTIVE TRANSPORTATION IMPACTS

An assessment of active transportation facilities around the development area may be required as part of the TIS. The scope of the assessment will depend on the size, location and operating characteristics of the proposed development and should be confirmed with City staff.

6.1 Existing Active Transportation Facilities

A description of existing active transportation facilities that service the development area should be included as applicable, including the following:

- Review of existing pedestrian and cycling facilities, such as sidewalks, bike lanes, multi-use trails, bicycle parking and crossings.
- A description of the surrounding active transportation network such as connections to trails, parks, schools and transit
- Safety audit of active transportation infrastructure

6.2 Planned Active Transportation Infrastructure and Anticipated Growth

The proposed development should identify and support both the City's planned active transportation infrastructure and provide on-site connections as required. The City's strategic plan to grow its active transportation infrastructure can be found in the 2019 City of Vaughan Pedestrian and Bicycle Master Plan Update.

The number of active transportation trips generated by the development can be estimated using an appropriate mode split assumption. It is recommended that the City of Vaughan and York Region Transit be contacted early in the transportation study process to establish mutually acceptable assumptions for the mode split. Active transportation demand can be estimated by:

- Proxy site surveys at similar existing developments. Proxy sites and data collection methodology should be agreed upon with City staff
- Existing published surveys such as the Transportation Tomorrow Survey (TTS).
- Background transportation studies such as transportation master plans, secondary plans and environmental assessments
- "First principle" calculations

Note that any assumptions in the mode split must include detailed justification and be approved by City staff. Transportation planning projections or goals should be considered, but they should not replace good engineering judgement and actual modal split data. To achieve targeted modal splits, the site may be required to have a supporting TDM Plan (See **Section 9**).

6.3 Evaluation of Active Transportation Level of Service

Evaluation of active transportation LOS should follow the methodology that is described in York Region's Mobility Plan Guideline for Development Applications. The analysis should report on the LOS at both the segment (between two intersections) and at intersections.

The results of the active transportation evaluation should be used to inform the following:

- Identify the need and responsibilities to enhance existing active transportation facilities based on the analysis and anticipated demand
- Identify potential safety concerns and provide mitigation measures for existing and proposed active transportation facilities
- Identify and propose connections to existing and planned transit stops, schools, parking's and other active transportation facilities.
- Identify and proposed to build missing connections such as disconnected portions of the sidewalk or crossings that service the development
- Provide on-site active transportation facilities such as bicycle parking

7 MITIGATIVE MEASURES

Physical and operational mitigative measures should be recommended to address all deficiencies, safety concerns, and improvements identified in the TIS for all transportation modes including vehicular traffic, transit, and active transportation. A TDM plan (See **Section 9**) may also be required as a proposed mitigation measure.

7.1 Identification of Required Road Network Modifications

Physical and operational road network modifications identified in the TIS must address and ensure that:

- Site generated traffic does not create conditions in which the road network capacity is exceeded
- Motorist, pedestrian and cyclist needs are accommodated
- Vehicular, pedestrian and cyclist operations and safety are maintained or improved
- Site generated traffic will not have an adverse impact on existing or proposed residential communities.

Additional analysis shall be provided to demonstrate that the proposed mitigative measures will address the impacts of the site generated traffic. The City may request preliminary design plans for identified physical modifications to ensure their feasibility.

7.2 Intersection Control Improvements

Proposed changes to existing intersection controls such as new signals or all-way stop control must be supported by the requirements and warrants outlined in the Ontario Traffic Manual (OTM) and approved by City staff.

Proposed modifications to existing signal timings must be developed following both the requirements outlined in OTM and in **Section 4** of this guideline.

Detailed design drawings showing proposed traffic signals, signage and pavement marking designs, as applicable, should be submitted to the City for review.

7.3 Traffic Calming Measures

A traffic calming plan should be provided to improve safety for motorists, pedestrians and cyclists in the development area. The traffic calming plan should follow the City's traffic calming policy and procedure which can be found here.

7.4 Identification of Required Transit System Modifications

The physical and operational transit system and service modifications identified in the TIS must address the following:

- The existing capacity of the transit service and facilities, to ensure it can accommodate the anticipated site generated transit demand.
- Site generated traffic, to ensure it will not have an adverse impact on transit operations.
- If required, that there is provision for:
    - Transit service to the area or to the site including potential transit routes
    - An increase in transit frequency or hours of operation
    - Special event service
    - High Occupancy Vehicle (HOV) lanes or transit priority
    - Transit facilities such as terminals, bays or stops.

Additional analysis shall be provided to demonstrate that the proposed mitigative measures will address the impacts of the site generated traffic. The proponent or consultant should consult with York Region Transit, Vaughan Operations to confirm the feasibility of new or expanded transit services and facilities.

8 SITE PLAN, PARKING AND ACCESS REQUIREMENTS

This section addresses site plan criteria, parking and access locations to develop a plan that will be harmonized with the surrounding developments and provide acceptable access and site circulation for pedestrians, cyclists, transit users, motorists and persons with disabilities.

8.1 Site Plan

The site plan should be completed in accordance with the City of Vaughan Site Servicing and Site Plan Criteria Guide, the Zoning By-Law 1-88 and any applicable official plan requirements, policies and/or standards.

8.2 Parking Study

The City's parking study guidelines for development applications can be found here. A parking study is required in the following situations:

1. A parking reduction equal to or greater than 10% of the minimum parking requirements of Zoning By-Law 1-88 is proposed

2. A parking reduction beyond the recommended minimum parking rates of the City's Draft Parking Standards (*IBI, 2010*)[1] is proposed

Despite the thresholds above, if the City has received concerns from the public or is aware of parking constraints on a given site, a Parking Study may still be requested.

8.3 Access Requirement

When determining the location of an access, consideration should be given to how the access will affect the surrounding road network, area residents and area businesses. Approval must be granted from the affected agency for access onto roadways not under the jurisdiction of the City of Vaughan. Some considerations with respect to site plan criteria, parking and access are:

- All commercial and multiple-family dwelling developments access should be provided from collector roads where possible versus local streets
- Provision of a secondary and/or emergency access should be considered when a development is proposed for 40 or more residential units or a commercial/office addition with 2,000m^2
- Minimizing the number of accesses on collector roads and providing justification for all accesses above the secondary access
- The possibility of consolidating or sharing access with adjacent developments
- The possibility of restricting one or more site access to right in/right out only

1 Review of Parking Standards Contained Within the City of Vaughan's Comprehensive Zoning By-law: March 2010 by IBI Group https://www.vaughan.ca/projects/policy_planning_projects/city_wide_parking_standards_review/General%20Documents/FINAL%20DRAFT%20TTR_2010-04-15%20Web%20Version%20(2).pdf

- The potential for mutual interference with other adjacent or opposed access points, or with operations within municipal rights-of-way
- Provision of aligning accesses with existing intersection and/or private driveways
- The provision of adequate sight lines and recommendation of any mitigation measures (i.e. parking prohibition, removal and/or relocation of shrubs, trees, signage, etc.)
- The location of delivery vehicle loading/unloading facilities to allow for convenient access away from any municipal rights-of-way
- The provision of safe and convenient pedestrian and bicycle routes within the site, particularly to and from transit services
- The provision of facilities for persons with personal mobility limitations.

In the case of development/redevelopment proposals incorporating drive-throughs, service kiosks, automatic gates or similar facilities, a queuing analysis may be required to demonstrate that the maximum probable queue can be accommodated within the proposed site plan without extending onto public streets or blocking access to parking areas.

It may be beneficial for the proponent to discuss access opportunities and constraints with City Staff prior to the preparation of site plans and establishment of building locations.

9 TRANSPORTATION DEMAND MANAGEMENT (TDM)

The City of Vaughan has completed its TDM Guideline which requests the submission of the TDM Toolkit and Implementation Table for all applications. The City's TDM Guideline and all submission documents can be downloaded via the project website:

https://www.vaughan.ca/TDMGuide

In the Vaughan Official Plan (adopted by Council in September 2010), it is policy to require the preparation and implementation of TDM Plans to support sustainable transportation. TDM Plans are strongly encouraged for all applications and are required, at a minimum, for all Site Plan approval applications for office uses greater than 2,000m^2 or residential apartment or mixed-use buildings with greater than 50 residential units. Staff may require the submission of a TDM Plan at their discretion for any application.

TDM Plans should be prepared with the aim to encourage/enhance shifts to sustainable modes of transportation through ongoing action before and after occupation. As stated in the Vaughan Official Plan (VOP), the TDM Plan shall:

a) be integrated with required transportation impact assessments submitted to support the proposed development;
b) identify design and/or programmatic means to reduce single occupancy vehicle use;
c) identify the roles and responsibilities of the landowner with respect to each recommended program and its implementation; and

d) *identify the operational and financial roles and responsibilities of the landowner including, but not limited to, program development, implementation and ongoing management and operations of the travel demand management plan and/or program.*

TDM Requirement Summary

Based on the above, a TDM Plan shall be included within or attached to the Traffic Impact Study (TIS). The TDM Plan shall involve the completion of the TDM Toolkit, involving either a Level 1 or Level 2 TDM Plan. Level 1 TDM Plans must satisfy the Zoning By-Law requirements and York Region requirements, as applicable. Level 2 TDM Plans must satisfy Level 1 and fully complete the TDM Toolkit, which is an interactive spreadsheet that will identify the minimum score requirements and applicable TDM measures depending on the characteristics of the proposal. The minimum score must be met and the TDM Toolkit submitted as part of the TIS. The Implementation Table (or similar such as the York Region TDM Checklist) must also be submitted and accompany the TDM Toolkit. To meet the requirements of the VOP, the following contents are required for the TDM Plan, which are primarily built into the TDM Toolkit:

a) **Targets** - The TDM Plan should include the modal split assumptions/targets in the TIS. The future modal split assumptions for this development must contribute to a transit modal split of 30/40/50% during peak periods for the City by 2031 (VOP, 2010, Policy 4.1.1.2).

b) **TDM Toolkit** - The TDM Toolkit will recommend a mix of hard and soft measures that support and link to the modal split assumptions for a development. The recommended measures will also include both 'education, promotion and outreach' measures, and 'incentive/disincentive' measures (as defined by Transport Canada).

c) **Implementation Table** - The TDM Plan should identify roles and responsibilities for all parties, including the landowner, TDM Coordinator (e.g. property management, employer representative), Transportation Management Association (e.g. Smart Commute North Toronto Vaughan), internal and external partners via the Implementation Table. The estimated cost for each recommended TDM measure or task should be provided as part of the TDM Plan via the Implementation Table or similar, including the cost of monitoring, and the financial roles and responsibilities of the landowner. The TDM Plan should also include additional details when relevant if considering target dates, phasing of the development, and information about ongoing management of the TDM Plan.

d) **Monitoring** – Those developments that meet the minimum thresholds are required to complete a monitoring program (residential and mixed-use developments generating 50+ peak hour trips, or non-residential developments at the request of staff). More information can be obtained via the TDM Guideline. The monitoring program will require a baseline survey at full occupancy, and a follow-up survey 2-3 years after full

occupancy. A monitoring report must be submitted to the City including both survey findings as well as evidence that the TDM "hard" and "soft" measures continue to be provided.

For more information on satisfying the TDM requirements, please see:

- City of Vaughan TDM Guideline
- York Region Transportation Mobility Plan Guidelines

The City may request the provision of a TDM Plan where adverse impacts are forecasted onto the transportation network which cannot be mitigated through other means, despite the provided thresholds. It is recommended that the need for a TDM Plan be verified with City staff through either the submission of the Terms of Reference for the TIS, and/or through discussion with City staff. Where a TDM Plan is required by both the City and York Region, both requirements must be met. The York Region TDM Checklist can function as the Implementation Table required by the City such that it includes details on responsibilities and cost.

10 DOCUMENTATION AND REPORTING

Two (2) copies of the final transportation impact study report and technical appendices should be provided to the City of Vaughan Transportation Engineering Division of the Development Engineering Department for review both in digital and hardcopy formats. Similar requirements are made for addendums and subsequent work submitted in support of the original TIS. Should changes to the original TIS be requested and these changes are deemed substantial by the City of Vaughan, then an update TIS will be requested to replace the original.

The results of the 'Synchro' analysis along with the results of 'SimTraffic' analysis shall be supplemented as part of the TIS submission, both in digital and hardcopy format.

If the study area for the analysis includes transportation facilities under the jurisdiction of agencies other than the City of Vaughan, then copies of the TIS report should be submitted to these agencies for review.

The TIS should consist of a main text document containing key maps, illustrations, summary tables and detailed analysis. A technical appendix included under another cover should be provided in the case were the analysis and other technical material is too substantial to provide in one document. Where possible, key maps, diagrams, graphs, tables and other exhibits should be placed adjacent to the relevant text as opposed to an appendix.

The TIS and all related information submitted to the City of Vaughan will be considered as public domain once approved or addressed in Committee of the Whole or Council, in whole or in part.