APPENDIX 7

Traffic Impact Study (TIS)

Outline of Requirement for a Traffic Impact Study

1.0 Introduction

The main purpose of a Transportation Impact Study ("TIS") is to demonstrate that the transportation impacts of a proposed development or redevelopment will be manageable and that the transportation aspects of the proposal are consistent with the objectives of the Township. The TIS also provides the basis for the identification and evaluation of transportation-related improvements or measures to be included as conditions of approval for the development or redevelopment application. The TIS will also assess the impacts the development would have on the present and future transportation system.

The overall goals, objectives and benefits of TISs may include:

- Provide a rationale for evaluating whether the development scale is appropriate for the site;
- Identify future localized transportation system deficiencies requiring improvement;
- Demonstrate that the site access and circulation is sufficient;
- Address transportation issues that may concern neighbouring property owners;
- Provide a basis for negotiations for the funding of improvements through the planning process.

The onus is on the Developer to retain a qualified Consultant to conduct a TIS to address the transportation-related issues of the development and obtain approval of the study. The TIS must be dated, signed and sealed by a registered Professional Engineer in the Province of Ontario. The signing Engineer is verifying that appropriate assumptions and methodologies have been utilized in the completion of the TIS and they are the individual who is taking corporate/professional responsibility for the work. The Township has prepared these guidelines to streamline the approval process and provide a standardized framework for consultants to follow when submitting the TIS for review. The guidelines should be complemented with good transportation engineering judgment.

2.0 General Requirements

2.1 Need for a Traffic Impact Study

In general, a TIS is submitted in support of any proposed development which is expected to generate a total of at least additional (new) 50 vehicle trips (combined inbound and outbound) during the peak hour of the adjacent roadway or the peak hour of the proposed development.

A Traffic Impact Study may also be required even if there are less than 50 additional vehicles during peak hours when one or more of the following conditions are anticipated or present:

- The development is located in an area of high roadway congestion and/or a high expected rate of population or employment growth;
- The access or type of operation of the development is not envisaged by local land use or transportation plans;
- As part of the proposed development, a new traffic signal or other traffic control device(s) is proposed;
- Existing transportation issues in the local area, such as a high crash location, complex intersection geometrics, heavy traffic corridors;
- The development has the potential to create adverse operational and safety impacts on the local road network such as:
    - Inadequate horizontal or vertical sight distance at access points;
    - The proximity of the proposed access points to other existing driveways or intersections;
    - Lack of existing left or right-turn lane(s) on the adjacent roadway at the proposed access points; and
    - The vehicular traffic generated by the development would result in volume/capacity (v/c) ratios at a signalized intersection becoming critical (i.e., greater than 0.85 overall or for a shared through/turning movement, or greater than 0.90 for an exclusive turning movement).

2.2 Staff Consultant and Preliminary Investigation

Before commencing a TIS for a particular site, Developers or their Consultants are advised to discuss with Township staff in order to review the level of detail, verify the study scope and study area, determine data requirements, and to confirm assumptions used in the analysis.

The TIS should take into account the findings of previous studies and transportation system concerns pertaining to the study area. The study should also consider traffic generated from adjacent sites with the potential for developments within the time horizon being considered in the study, including coordination with works anticipated by such other developments.

3.0 Traffic Impact Study Outline

The Traffic Impact Study should contain the sections outlined below.

3.1 Description of the Proposed Development

This includes but not limited to the following elements:

- Municipal address;

- Existing land uses or permitted use provisions in an Official Plan, Official Plan Amendments, Zoning By-law etc.;
- Existing planning studies that may impact the development, including Transportation Master Plans and Active Transportation Plans;
- Proposed land uses and relevant planning regulations to be used in the study;
- Total building size and building location;
- Floor space including a summary of each type of use/number of residential units;
- Anticipated date of occupancy;
- Approximate hours of operations;
- Planned phasing of the developments;
- The location of access points and type of access (full movement, right-in-right-out, turning movement restrictions, etc.);
- Surrounding road networks, intersections and type of controls;
- Transit stops and services;
- Bicycle and pedestrian links and facilities;
- Nearby curb parking and off-street parking;
- Nearby developments and their access points;
- Proposed internal parking arrangement and circulations; and
- Internal provisions for traffic calming and speed control.

A composite site plan of a suitable scale should be provided for consideration in the review of the traffic impact study.

3.2 Study Area

The study area should extend far enough from the development to contain all Township, County or Provincial roadways that will be noticeably impacted by the site traffic. Typically, this will include the area that may be impacted as follows:

- An increase of 5% or more traffic volumes on an intersection approach;
- Volume/capacity (v/c) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or greater;
- V/c ratios for exclusive turning movements increase to 0.90 or greater; or
- Locations where other traffic operational issues may be of concern.

The Township reserves the right to establish the study area as may be deemed necessary, including a requirement to provide sufficient traffic analysis to confirm whether the above-noted parameters are met or mitigation work may be required. It is recommended to consult with Township staff prior to initiating the study.

The Traffic Impact Study should contain a map that identifies relevant information such as the following:

- All adjacent roads including the road classifications, number of lanes, on-street bike lanes, posted speeds, traffic calming and pedestrian crossing facilities;
- All adjacent and affected intersections including type of control, lane configurations, lane widths, and any turning or similar restrictions;
- If appropriate, on-street parking spaces, stopping restrictions, and parking meters in the vicinity of the development site and those which would affect the operation of key intersections being analyzed;
- Transit routes, stops and terminals;
- Heavy vehicle prohibitions and restrictions; and
- Other transportation facilities such as trails and walkways, etc.

Potential future transportation improvements that are currently being considered and may facilitate the traffic demand produced by the development/redevelopment should be identified. These improvements should be described to a level of detail sufficient to assess their implications for travel to/from the development. In each case, identify the status and anticipated date of implementation.

3.3 Horizon Years and Peak Periods

3.3.1 Horizon Years

Identify horizon years for the analysis, which will be:

- The year of completion of the development;
- In general, five (5) years after the completion of the development. For very large developments that will be phased over longer periods, a five (5) and ten (10) year horizon may be used;
- If the development is to be carried out in phases, impact analysis for each phase should be undertaken; and
- Additional horizon years that may be required depending on the magnitude of the development, any major transportation system changes, or other planned significant land use changes.

3.3.2 Peak Periods

The critical time period is directly associated with the peaking characteristics of both the development related traffic and the nearby transportation system traffic.

Typically the AM and PM peak traffic period will constitute the “worst scenario” combination of site related and background traffic.

In the case of retail, entertainment, religious, institutional, sport facility uses or industrial uses, the Saturday, Sunday or site peak period may require analysis. As part of the consultation process with the Township prior to commencing the study, the Consultant should propose a peak period of time for analysis. Seasonal traffic variations may also be a consideration in determining the peak design period.

3.4 Existing Traffic Conditions

The Traffic Impact Study should provide exhibits showing the existing traffic volumes and turning movements for roadways and intersections in the study area, including pedestrian and cyclist volumes and heavy truck movements.

Typically, new traffic data will need to be collected by the proponent, unless recent counts are available from other sources. The traffic data must be based on the most recent traffic/transit counts available. The Consultant should take additional traffic counts where existing data is more than two (2) years old or where existing data appears to be inconsistent. The additional traffic counts should be collected for a minimum of two hours during the peak period at each affected intersection. A greater duration of count may be required depending on the type of development and its peaking characteristics.

The raw data collected by the consultant should be included in the appendices of the report and should include date, time, road surface and weather conditions. Any ongoing road constructions or detours should be identified if they affect the counts being collected.

3.5 Background Traffic

3.5.1 Background Traffic

The background traffic growth should be established in consultation with town staff through one of the following methods:

- Estimation of roadway growth factors from a calibrated traffic forecast model;
- Regression analysis of historical traffic growth; and
- A growth rate based on area transportation studies.

3.5.2 Other Area Developments

All significant developments under construction, approved, or in the approved process within the study area and are likely to occur within the same time horizons should be identified and recognized in the study. The land-use type and magnitude of the probable future developments in the horizon years should be identified in consultation with Township staff.

The trips that are expected to be generated by these developments should be included in the future background volumes.

3.5.3 Transportation Network Improvements

Changes to the present or planned transportation networks should be determined in consultation with Township staff. A realistic assessment of timing and certainty should be made. The impacts of the transportation system changes should be identified. In particular, diversions of volumes from other facilities to new or improved facilities should be estimated.

3.5.4 Transit Considerations

In areas with existing or potential transit services, these services should be identified and evaluated as having potential significant impact and possible changes in modal split.

3.6 Estimate of Travel Demand

All trip generation, trip distribution, trip assignment and modal split assumptions should be in accordance with standard/accepted techniques and be based on local parameters. Sources should be well documented and any assumptions which may be considered less than conservative must be justified.

3.6.1 Trip Generation

The method of determining trip generation rates should be clearly identified. Trip generation methods may include one or more of the following and will be a function of the proposed development and its intended operations:

- Trip generation surveys from similar developments in the Township or other comparable municipalities which have similar operating characteristics as the proposed development;
- Modifications should be made to the trip generation rates to account for difference in the surveyed and proposed development sites;
- ITE Trip Generation Manual (most recent edition) rates or equations, provided that difference in the site nature and size are accounted for; and
- “First principles” calculations of anticipated trips to/from site.

Where appropriate it may be justified to reduce the base trip generation rates of the proposed development to account for:

- Redundant Land Use – Trips which are generated by existing land use activity and reflected in current traffic volumes that have been collected and which will be replaced by the proposed development. Unless otherwise accounted for, these trips are normally subtracted from the trip generation estimates on the surrounding road network but not from the calculation of the trips generated to/from the proposed accesses;
- Pass-by trips – Trips that represent intermediate stops on a trip already on the road network, e.g., a motorist stopping into a retail store on their way home from work. It should be recognized that pass-by trips must be accounted for in the turning movements into/out of the site;
- Captive market effects/“Synergy” – Represents trips which are shared between two or more uses on the same site, e.g., a motorist visiting a retail store and a grocery store on the same site; and
- Travel Demand Management (TDM) strategies – Reductions in automobile travel to the site to account for travel to/from the site by public transit, walking and cycling. No reductions in the trip generation should be made for these alternative modes if they have already been accounted for in the methods/data that has been used to forecast the vehicular trip generation.

All trip generation assumptions and adjustments assumed in the calculation of “new” vehicle trips should be supported and documented. Sensitivity analysis should be undertaken where trip generation parameters have the potential to vary considerably and most probable values cannot be readily identified.

A table should be provided in the study report identifying the categories and quantities of land uses, with the corresponding trip generation rates or equations and the resulting number of trips. For large developments that will be phased in over time, the table should identify each significant phase separately.

3.6.2 Trip Distribution

The directions from which traffic will approach and depart the site can vary depending on several location-specific factors, including:

- Size of the proposed development;
- Type of proposed development;
- Surrounding, and in some cases competing land uses, population, and employment distributions; and
- Prevailing condition on the existing road network.

Trip distribution assumptions should be supported by one or more of the following:

- Transportation Tomorrow Survey (TTS) data;
- Origin-destination surveys;
- Comprehensive travel surveys;
- Proximity of adjacent employment and population centres;
- Market studies; and
- Existing/anticipated travel patterns.

Engineering judgements should be used to determine the most applicable of the above methodologies for each particular application.

3.6.3 Trip Assignment

Traffic assignments should consider logic routings, available and projected roadway capacities, and travel time. Traffic assignments may be estimated using a transportation planning model or "hand assignment" based on knowledge of the proposed/future road network in the study area.

The assumptions shall take into account projected "pass-by" trips, "diverted" trips and internal "Synergy" trips.

3.6.4 Summary of Traffic Demand Forecasts

A summary of the existing and future traffic demands should be provided in the form of exhibits/illustrations that summarize the following:

- Existing traffic;
- Future background;
- Site generated traffic;
- Pass-by or other diversionary traffic; and
- Future total traffic (future background plus site generated traffic).

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.

If there are significant numbers of large trucks, buses, and recreational vehicles, a typical adjustment factor of 2.0 Passenger Car Units (PCUs) may be used to convert these vehicles to equivalent passenger cars, particularly for inputs to queuing requirements.

3.7 Evaluation of Impacts of Site Generated Traffic

An evaluation of signalized and un-signalized intersections which will be affected by site generated traffic for all time horizons and scenarios is required and summaries are to be provided in a tabular format.

The objective should be to ensure that no new “problem” movements are created by the development and that “problem” movements which exist with the addition of site generated traffic are not worsened by this addition.

Documentation should be provided in an appendix to the traffic impact study of all assumptions used in the analysis concerning lane configuration/use, on-street parking, vehicle classification, pedestrian activity, saturated flows, traffic signal cycle length, phasing and timing, utilization of the inter-green phase and other relevant parameters. Existing signal timings should be used for existing intersection and signal timing modifications/optimization may be considered as a measure to address capacity or level of service deficiencies.

Supplementary surveys or analyses may be needed to assess saturation flows, gap availability, projected queue lengths and possible blocking queues.

3.7.1 Capacity Analysis at Intersections

The summary should include level-of-service including average vehicle delay and v/c ratios for overall intersection operations and individual critical movements for all analysis periods and time horizons. Full documentation of results of all level of service analysis should be provided in an appendix. The Township may require that a copy of the computer software model be provided for review and approval.

Analysis may be performed using the most current versions of *Highway Capacity Manual* (HCM) and *Canadian Capacity Guide* (CCG), using computer models that are currently used within the industry (e.g., Sychro, SimTraffic, Arcady, etc.).

The analysis should include the identification of signalized intersections where,

- v/c ratios for overall intersection operation, through movements or shared/turning movements increased to 0.85 or above;
- v/c ratios for exclusive movements increased to 0.90 or above; or
- Queues for an individual movement are projected to exceed available turning lane storage.

Identification of un-signalized intersections where,

- Level of service (LOS) based on average delay per vehicle, on individual movements at LOS “E” or “F”; or

- The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

Conventional signal timing plans should be used and all proposed adjustments to traffic signal timing, phasing and cycle lengths should be evaluated in terms of pedestrian crossing time, effects on queue lengths, adequacy of existing storage and effects on the existing signal coordination.

The need for a new traffic signal and/or underground provisions should be evaluated in conformance to the guidelines in "*Ontario Traffic Manual - Book 12*".

3.7.2 Site Operations

The TIS should provide a summary of operations that may affect the ability for vehicles to circulate on-site without impacting driveways and related adjacent road operations. Site operations described in the TIS will include:

- Driveway locations and confirmation that the driveways meet Township and TAC standards;
- Parking supply and layout;
- Pedestrian and cycling facilities; and
- Site circulation, drive-through requirements (if any), loading operations, access for waste vehicles, access for fire trucks.

3.7.3 Safety Analysis

Identification of potential safety or operational issues associated with the following, as applicable:

- Weaving;
- Merging;
- Corner clearances;
- Sight distances and sight triangle/daylight triangle as per Transportation Association of Canada (TAC) standards;
- Vehicle-pedestrian conflicts;
- Traffic infiltrations;
- Access conflicts;
- Cyclist and pedestrian movements;
- Heavy truck movements/conflicts;
- Transit operational conflicts;

- Internal circulation, if applicable; and
- Other safety issues that have been identified on a site-specific basis.

Where the proposed development is in the vicinity of an intersection or roadway with identified safety problems, existing collision data must be reviewed and an assessment of the impact of the proposed development provided.

3.8 Access Analysis

3.8.1 Access Geometrics

The number and location of access points must not adversely impact the flow of traffic along abutting roads. Access points should be located on minor roads where feasible and justifications for more than one access must be based on capacity of site traffic and not design preference.

The locations should be adequately spaced from adjacent streets and driveway intersections. The number of exit lanes, radii and vehicle storages should be appropriate to accommodate traffic demands placed on them. The throat lengths at the road should be sufficiently long to minimize conflicts with street traffic and within the site.

Access points should be evaluated in terms of capacity, safety and adequacy of queue storage capacity. Access points should be free of all encumbrances and provide appropriate sight distances/daylight triangles. Proposed truck loading facilities and access to these facilities should be evaluated to ensure that they are adequately sized, designed and provided with suitable access so that they will not adversely affect operations on municipal roads.

Access standards should be in conformance with those outlined in the "*Geometric Design Guide for Canadian Road,*" 2017 edition, issued by the Transportation Association of Canada (TAC) and the Ontario Traffic Manuals.

3.8.2 Turn Lane Requirements

The requirements for left-turn and right-turn lanes should be examined. Adequate spacing should be provided between access points to avoid potential turn lane overlaps. All design standards must be in conformance with those outlined in the TAC manual and the Ontario Traffic Manuals.

Where turning lanes are warranted or proposed the length of storage and taper must be documented.

3.9 Traffic Collision Analysis

Where the development is adjacent to an area with identified problems, existing collision data should be reviewed and an assessment of the impact of the proposed development provided. Such information may be helpful to minimize any additional problems through the design or location of access points.

3.10 Sight Distance Evaluation

At each access and at each intersection where a new road is proposed, the sight distance requirements should be determined based on appropriate standards (TAC Manual), and the availability of sight distance determined from actual field measurements.

3.11 Transportation System Mitigation Measures

The physical and operational road network deficiencies identified in the Traffic Impact Study must be addressed and feasible solutions to mitigate these deficiencies identified. Functional design plans or detailed design drawings may be required for identified improvements to all modes of transportation, to ensure their feasibility.

A preliminary cost estimate will be required for all identified infrastructure improvements.

3.12 TIS Recommendations

All reasonable attempts should be made to identify transportation improvements that mitigate the development proposal such that:

- Pedestrian and cycling needs are safety accommodated;
- The capacity of transit services or facilities is sufficient to accommodate site-generated transit demand, if required;
- Site-generated traffic does not have an unmanageable adverse impact on transit operations, where available;
- Transportation Demand Management (TDM) measures are identified that would mitigate the traffic or transit impacts from site generated travel demand; and
- Traffic calming measures are proposed to ensure that safety and speed-related issues have been adequately addressed.

It is important to structure recommendations for improvements within appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-range, and long-range network improvements that are already planned and their schedules;
- Anticipated time schedule of adjacent developments;

- Size and timing of individual phases of the proposed development;
- Logical sequencing of various improvements or segments;
- Right-of-way needs and availability of additional right-of-way within the appropriate time frames;
- Local priorities for transportation improvements and funding;
- Cost-effectiveness of implementation improvements at a given stage of development; and
- Necessary lead-time for additional design and construction.

3.13 Documentation and Reporting

The following is a suggested study structure:

- Executive summary;
- Study purpose and objectives;
- Site/development description;
- Study area;
- Existing conditions;
- Analysis periods;
- Background traffic demand including existing and future background;
- Site generated traffic (tables required);
- Trip distribution and modal split;
- Traffic assignment for site generated traffic;
- Pass-by trips and diverted trips;
- Total traffic demand including all trips mentioned above;
- Exhibits are required for:
    - Site Plan or Plan of Subdivision;
    - Study area;
    - Existing and future background conditions;
    - Existing lane configurations;
    - Existing traffic volumes;
    - Future traffic volumes after being adjusted by annual growth rates;
    - Other new development trip distributions (if applicable);
    - Trip distribution;
    - Trip assignment for site generated trips;
    - Pass-by and diverted trips (if applicable);
    - Total trips;

- Improvement alternatives required to mitigate traffic impacts;
- Traffic impacts for future background and total traffic with and without mitigation measures (tabular summaries);
- Access considerations;
- Conclusions and recommendations;
- Traffic reports;
- Signal warrant analysis (if applicable);
- Left turn lane warrant analysis (if applicable); and
- Sight distance and sight triangle/daylight triangle analysis (if applicable).

Two copies of the final Traffic Impact Study complete with engineer stamp and signature, supporting documentation, electronic analysis traffic files should be submitted to the Township for review. The study will be forwarded to the Town's consultant for Peer Review. The cost(s) associated with that review will be the responsibility of the proponent/owner.

All information submitted to Township staff in connection with any Traffic Impact Study will be considered to be in the public domain.