Traffic Impact Study Guidelines

City of Guelph

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Engineering and Capital Infrastructure Services
Infrastructure, Development & Enterprise

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1.0 INTRODUCTION

As a single-tire municipality, the City of Guelph has jurisdiction over the road system from arterial roads to minor local streets, and provides transit service through Guelph Transit. The city's road network also includes both Provincial and County of Wellington roads.

The city's *Official Plan*, *Transportation Master Plan* and *Transit Growth Strategy and Plan* provide a general outline of desired development patterns and the anticipated evolution of the general road network. As specifics of a development are known, it is necessary to examine its impacts on the transportation system. In most cases, the onus is on the developer to conduct a Transportation Impact Study (ITS) to address the transportation-related issues of the development and obtain approval of the study.

2.0 GENERAL REQUIREMENTS

2.1 Traffic Impact Study

The purpose of a Traffic Impact Study is to identify the need for modifications to the city's transportation system regarding a new development/redevelopment by estimating the travel demands related to the development and assessing the impacts that the development would have on the present and future transportation system. Transportation Demand Management (TDM), transit and non-motorized modes will all be taken into account in estimating travel demand.

The purpose of following guidelines is to ensure that a Traffic Impact Study meets the following criteria:

- Objective assessment – the study will evaluate the impacts of proposed development in a rational manner;
- Consistency – the study will utilize assumptions consistent with the city's accepted methodologies and parameters and thus be comparable to other traffic studies in the City;
- Recognized by developers and consultants – the guidelines will provide a standard approach to be followed and will reduce confusion and delay in processing development proposals;
- Promote understanding of process – the steps outlined in these guidelines will enable proponents/consultants, reviewers and elected officials to understand the process more effectively; and

- Ease of review by staff – a standardized set of guidelines will aid the efficiency of staff in reviewing.

2.2 Need for a Traffic Impact Study

In general, a Traffic Impact Study is submitted in support of any proposed development which is expected to generate a total of at least additional (new) 100 vehicle trips (inbound and outbound) during the adjacent roadways' peak hour or the development's peak hour.

A traffic impact study may also be required even if there are less than 100 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 a roundabout is proposed;
- Existing transportation problems in the local area, such as a high crash location, complex intersection geometrics, heavy traffic corridors;
- The development has the potential to create unacceptable 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.)

2.3 Staff Consultant and Preliminary Investigation

Before commencing a Traffic Impact Study for a particular site, developers or their consultants are advised to discuss with city 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 Traffic Impact Study should take into account the findings of previous studies and transportation system concerns pertaining to the study area. The study should also

consider adjacent sites with the potential for developments within the same time horizon as the subject site, wherever possible through a joint Traffic Impact Study for the group sites.

3.0 TRAFFIC IMPACT STUDY OUTLINE

The Traffic Impact Study should contain the sections outlined below.

3.1 Description of the Proposed Development

The Traffic Impact Study should provide a full description of the project. 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.;
- 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;
- Approximately hours of operations;
- Planned phasing of the developments;
- The location of access points and type of access (full turn, 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; and
- Proposed internal parking arrangement and circulations.

A 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 city roadways that will be noticeably affected 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 adjacent facilities;
- Volume/capacity (v/c) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or greater; or
- V/c ratios for exclusive turning movements increase to 0.90 or greater.

The city reserves the right to establish the study area as may be deemed necessary. It is recommended to consult with city staff prior to initiating the study.

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

- All adjacent roads including the road classifications, number of lanes, on-street bike lanes and posted speeds;
- 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;
- Five (5) years after the completion of the development;
- 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.

However in the case of retail, entertainment, religious, institutional, sport facility uses, the Saturday, Sunday or site peak may require analysis. As part of the consultation process prior to the commencing the study, the consultant should determine in conjunction with the city for the selected time for the study.

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.

Traffic volumes may be acquired from the city. The traffic data must base 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 one hour during the peak period at each affected intersection.

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.

3.5 Background Traffic

3.5.1 Background Traffic

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

- Estimation of roadway growth factors from the city's travel demand forecasting 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-sue type and magnitude of

the probably future developments in the horizon years should be identified in consultation with the city 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 city 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 transit services, the existing transit service 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 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 city or 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 actively and reflected in current traffic volumes and will be replaced by the proposed development. Unless otherwise accounted for, these trips normally subtracted from the trip generation estimates;
- Pass-by trips
  Trips that represent intermediate stops on a trip already on the road network, i.e. 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, i.e., 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, waling and cycling.

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

Trip distribution assumptions should be supported by one or more of the followings,

- Transportation Tomorrow Survey (TTS) data;
- Origin-destination surveys;
- Comprehensive travel surveys;
- Existing / anticipated travel patterns; and
- Output from the city's travel demand forecasting model.

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 city has a travel demand forecasting model available and can provide assistance upon request.

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.

For large trucks, buses, and recreational vehicles, an average factor of 2.0 PCUs should be used to convert them to passenger cars.

3.7 Evaluation of Impacts of Site Generated Traffic

An evaluation of signalized and unsignalized 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 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.

Analysis may be performed using the most current versions of *Highway Capacity Manual* (HCM), *Canadian Capacity Guide* (CCG), and/or *Synchro*. The analysis should incorporate adequate crossing time for pedestrians and should use conventional signal timing plans.

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 unsignalized intersections where,

- Level of service (LOS) based on average delay per vehicle, on individual movements exceeds LOS “E”; 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 co-ordination.

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 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 TAC standards (considerations may be given to reducing the triangle size in the Urban Growth Centre/downtown area);
- Vehicle-pedestrian conflicts;
- Traffic infiltrations;
- Access conflicts;
- Cyclist movements;
- Heavy truck movements conflicts;
- Transit operational conflicts;
- Internal circulation, if applicable; and
- Etc.

Where the proposed development is in the vicinity of an intersection or roadway with identified safety problems, existing collision data (available from the city) 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 negatively 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 sufficient 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 triangles/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 the city roads.

Access standards should be in conformance with those outlined in the "*Geometric Design Guide for Canadian Road*", 1999 edition, issued by the Transportation Association of Canada (TAC).

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.

Where turning lanes are warranted 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 (available from the city) should be reviewed and an assessment of the impact of the proposed development be 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 and detailed design drawings may be required for identified improvements to ensure their feasibility.

3.12 Recommendations

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 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;
- 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 including
        - 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;
- Synchro/SimTraffic reports;
- Signal warrant analysis (if applicable);
- Left turn lane warrant analysis (if applicable); and
- Sight distance and sight triangle/daylight triangle analysis (if applicable).

Four (4) copies of the final Traffic Impact Study complete with engineer stamp and signature, supporting documentation, electronic Synchro and SimTraffic files should be submitted to city staff for review.

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