



TOWN OF WESTFORD

ENGINEERING DEPARTMENT

PAUL M. STARRATT, P.E.
Town Engineer
JEREMY R. DOWNS, P.E.
Assistant Town Engineer

To: Chris Kluchman, AICP

From: Paul Starratt, P.E. *P.S.*

Re: Boston Road Traffic Impacts

Date: August 17, 2016

Regarding the traffic impacts on Boston Road as the result of any proposed development at 66 Boston Road, it may be helpful for the Drew Garden Task Force to refer to the attached, "Guidelines for the Preparation of a Transportation Impact Assessment." This document is used by the Planning Board for any project that generates 20 or more vehicle trips in any hour of the day. If the proposed development includes a restaurant, the project will very likely generate more than 20 trips at peak hours, and the Planning Board will require a Transportation Impact and Access Study (TIAS).

The objective of the manual is to provide, "guidance on potential structural and non-structural improvements that should be considered for roadways, intersections, pedestrian and bicycle facilities and other modal forms of transportation. Transportation Demand Management (TDM) programs and traffic calming measures to minimize or offset capacity and safety impacts associated with the proposed development should also be considered." In other words, larger projects that create traffic issues at a particular location are required to offset those traffic hardships that are a result of the project.

In recent decisions by the Planning Board, a TIAS has resulted in project developers having to install traffic signals at Cornerstone Square and Boch Honda and road widenings and turning lanes at Orchard Square. It has been my experience as support staff to the Planning Board that Planning Board members look very carefully at traffic impacts and typically retain the services of a Professional Traffic Operations Engineer to peer review a TIAS.

Engineering Department
28 North Street • Westford, MA 01886-2597
Tel. (978) 692-5520 • (978) 692-5517 • Fax (978) 399-2739

Town of Westford

**GUIDELINES FOR PREPARATION OF A
TRANSPORTATION IMPACT ASSESSMENT**



SEPTEMBER 15, 2004

(Revised January 6, 2006)

(Revised January 18, 2006)

Objective

The objective of this Transportation Impact Assessment Guideline Manual is to better define thresholds under which a proposed land development project proposal is required to submit a transportation impact and access study (TIAS), and to provide guidance of the framework and technical data/analysis required in the TIAS. This manual also provides guidance on potential structural and non-structural improvements that should be considered for roadways, intersections, pedestrian and bicycle facilities and other modal forms of transportation. Transportation Demand Management (TDM) programs and traffic calming measures to minimize or offset capacity and safety impacts associated with the proposed development should also be considered.

(1) TIAS Thresholds and Scoping Determination

(a) Thresholds Requiring Preparation of a TIAS

A TIAS shall be required for any projects that will generate 20 or more vehicle trips in any single hour of the day. The number of vehicle trips generated by the project shall be determined based on the latest edition of the Institute of Transportation Engineers (ITE) Trip Generation. The Town Engineer shall make the final determination of the number of vehicle trips generated by the project in cases of dispute.

(b) Study Area Roadways Scoping Letter

The Applicant shall prepare a scoping letter for submittal to the Town Engineer that specifies assumptions used in the selection of proposed study roadways in the TIAS including a summary of the project size, location and proposed access, trip generation summary, and projected distribution of trips on area roadways. Guidance on determining an appropriate trip distribution is provided in Section 5 of this Manual.

The study area shall at a minimum include the first 3000 feet of roadway including intersections and side streets from the entrance(s) of the development and/or locations that are projected to experience a 10 percent or more increase in peak hour volume in any lane or lane group. However, the Town Engineer may increase or decrease the study area if based on engineering judgment and an understanding of existing traffic conditions surrounding the site determine that there is sufficient justification to do so. A locus map that shows the site and the study area boundaries, in relation to the surrounding transportation system, must be included.

(c) Scoping Meeting

Following submittal of the Study Area Roadways Scoping Letter, the Applicant is invited to meet with the Town Engineer, Planner, and the Highway Superintendent to discuss the proposed development and study area, and to identify specific parameters to be included in the TIAS for the development. The Town Engineer will make the final determination of the specific parameters.

(d) Qualified Engineer

Any firm or individual which prepares a TIAS or traffic study for the Town of Westford, or presents such an assessment or study to the Town of Westford shall do so under the direct supervision of a professional civil or traffic engineer registered in the Commonwealth of Massachusetts having at least five (5) years experience in the field of traffic and/or transportation engineering. The TIAS shall be stamped by such registered engineer prior to acceptance or review by the Town of Westford.

(2) Project Overview

The introductory portion of the TIAS must contain the following information:

(a) Site Description

A brief overview of the project site, locus, size, current zoning and roadways affording access to the site must be identified. To set the regional and local context of the site within the Town of Westford, provide a map showing the proposed site in relation to existing roadways for a radius of at least two (2.0) miles of the project locus. Provide a zoning map that indicates current zoning of the site and adjacent parcels, and a description of relevant zoning regulations and requirements that pertain to the site. Any proposed changes in zoning should be discussed relative to the initial and/or full development of the site.

(b) Existing and Proposed Site Uses

A description of existing and proposed uses of the site must be identified in terms of the various zoning categories of the Town. The proposed site use(s) must be identified in terms of gross square footage, number of units, projected employment levels and/or other variables to which existing Bylaws, rules or regulations apply. In addition, proposed access, parking supply and key aspects of site circulation shall be described and compared with applicable zoning standards for the site.

Include a site plan showing all land owned by the Applicant, the proposed building location(s), access point(s), parking layout, circulation elements, and loading/service facilities for the site. The site plan shall be provided at a standard engineering scale that is specified on the drawing(s).

The site plan and associated development program specified in the TIAS shall serve as the basis for analysis and associated structural/non-structural mitigation for the project. To the extent the development program is modified by the Applicant in terms of use, size, and/or dimension, the Planning Board may require re-submittal of the TIAS and/or supplemental analyses to reflect the revised development program.

(3) Existing Conditions

(a) Existing Roadways and Intersections

The TIAS must describe geometric, traffic control, regulatory and jurisdictional aspects of existing roadways and intersections within the study area. Proposed

improvements that have been funded by government agencies and other development projects affecting the study area shall also be described. This includes the nature of the improvement project, its extent, implementation schedule, and the agency or funding source responsible. A map must be provided showing the location of such improvements or facilities. An official list of funded projects may be obtained from the Town Planning Department.

(b) Traffic and Pedestrian Volumes

Existing daily traffic volume data for roadways onto which access is sought shall be quantified based on automatic traffic recorder (ATR) counts conducted over a 48-hour weekday period (excluding Mondays and Fridays) and in the case of retail developments, an additional 24-hour Saturday period. Manual turning movement counts (TMCs) at study intersections shall be conducted for a weekday morning period (7 AM to 9 AM), and a weekday evening period (4 PM to 6 PM). Weekday midday (11 AM to 2 PM) TMCs or other midday periods may be required by the Town Engineer dependent upon the projects location, proposed land use and potential impacts. For retail developments, TMCs shall also be conducted for a Saturday Midday period (11 AM to 2 PM). The TMC data shall also include pedestrian data, and shall classify vehicle types between passenger vehicles and trucks. All count data presented in the TIAS shall be no more than one (1) year old from the date the TIAS is submitted by the Applicant, unless prior approval to use more dated count information is validated and approved by the Town Engineer.

Seasonal variation of traffic volumes shall be described based on available permanent count station data or other available studies and data for roadways within the Town of Westford. Seasonal adjustments are to be made to produce daily and hourly traffic volumes that are representative of average seasonal conditions for analysis purposes.

Graphics depicting existing daily and peak hour traffic and pedestrian data, adjusted to reflect average season conditions, shall be presented in the TIAS.

(c) Accident History

Traffic accident data for study area intersections and roadways shall be tabulated and described. Data shall be obtained from the MassHighway accident crash database for the latest available three (3) year period. The Town of Westford Police Department records shall also be researched for crash data. Comparison of crash rates to MassHighway district and statewide rates shall be tabulated and described. For locations exceeding the average district and/or statewide crash rates, supplemental research of accident data shall be conducted in coordination with the Westford Police Department. Collision diagrams shall be prepared and described for these high accident locations in the TIAS.

Estimates of increased or decreased accident potential shall be evaluated for the development, particularly if the proposed development might affect existing traffic safety problems in the study area as determined by the Town Engineer. Safety improvements/countermeasures shall be recommended where necessary.

(4) Project Trip Generation

Provide a summary table and description of trip generation for the proposed land use(s) for peak hour and daily periods. These periods include weekday daily, Saturday daily (for retail developments), weekday AM peak hour, Weekday PM peak hour, and Saturday Middy peak hour (for retail developments). Additional periods may be requested by the Town Engineer if the land use type justifies, such as industrial uses, school uses, or other uses that are characterized as having peak generating periods beyond those specified above.

Trip generation must be calculated for the proposed uses based on the latest edition of the ITE Trip Generation. In the event that data is not available for the proposed land use, the Town Engineer must approve estimated rates prior to acceptance of the TIAS. Empirically-derived and/or locally-derived trip generation data may be provided in the TIAS for comparison purposes, but may only serve as a substitute for ITE trip rates upon approval by the Town Engineer. Empirical/local data to be considered for use may include the following:

- (a) Recent traffic volume counts for an acceptable number of similar existing uses if no published rates are available. Counts of this nature must be acceptable to the Town Engineer.
- (b) Additional sources from other jurisdictions if acceptable to the Town Engineer.

Adjustment of trip generation estimates to account for pass-by traffic and/or internal site trips must be justified in the TIAS based on guidance provided in the latest edition of the ITE Trip Generation Handbook, but in no case shall exceed 25 percent of total trip generation for pass-by trips or 10 percent for internal site trips unless approved by the Town Engineer.

(5) Trip Distribution

The estimates of percentage distribution of trips from the proposed development to destinations, both within and outside the Town, must be clearly stated in the report using the north, south, east, and west compass points.

Market studies, planning data, driveway counts at adjacent uses, US Census journey-to-work data or other information concerning origin of trip attractions to the proposed development may be used to support these assumptions where available.

A map showing the percentage of site traffic on each street must be provided as part of the TIAS graphic material. Where microcomputer modeling is used, such a map need not be provided, but the model's distribution methodology must be discussed.

(6) Trip Assignment

Assignment of site-generated peak hour vehicle trips to study area roadways and intersections shall be presented in graphical format in the TIAS based on projected trip generation and distribution described above.

The assumed trip distribution and assignment must represent the most logically traveled route for drivers accessing the proposed development. These routes can be determined by location of proposed access points to the site, building location and parking allocation, observation of travel patterns to existing land uses in the study area, shortest time travel path, and by other defensible means of analysis presented in the TIAS.

(7) Future Conditions

Prepare future-year peak hour traffic volume networks for the “no-build” and “build” scenarios based on a 5-year horizon from existing conditions. Methodologies for developing these networks are as follows:

- (a) No-build traffic networks represent existing traffic volumes adjusted to reflect average annual growth plus traffic associated with specific development(s) for which development application(s) have previously been submitted to the Town for review, or that have received local /state approvals but are not yet built. Development of an annual growth rate used in the TIAS must be based on historic traffic count data available through MassHighway, the Town and/or the Regional Planning Authority. The TIAS shall also present a summary of specific area developments considered in developing background traffic in the no-build scenario, and the source of data used to estimate associated traffic volumes. The Town Planning Office and the Massachusetts Environmental Policy Act (MEPA) office are potential sources of information on other area developments and should be contacted to ascertain this information. In cases where developments are noted but documented trip generation characteristics are not available, the TIAS shall estimate the likely trip generation and distribution data for these developments based on methodologies described in sections 4 through 6 of this Manual and provide sufficient documentation in the report.

The No-build traffic volume networks shall also account for any proposed changes to the roadway network for which funds have been allocated or are to be built by others as cited in formal development agreements/conditions of approval.

- (b) Build traffic networks represent No-Build traffic volumes adjusted to add site-generated traffic volumes based on methodologies cited in sections 4 through 6 of this Manual. The TIAS must certify that the build traffic networks represent the highest level of combined traffic volumes for adjacent streets and the proposed development (e.g., “design hour” conditions). If there are additional periods outside of weekday morning, weekday evening and Saturday midday periods during which higher combined volumes (and therefore impacts) are possible, the TIAS shall provide supplemental traffic networks and analysis for these periods.

(8) Analysis of Impacts

- (a) Capacity Analysis.

A capacity analysis shall be conducted for all roads and intersections in the study area following procedures outlined in the latest edition of the Transportation Research Board Report 209: Highway Capacity Manual (HCM). Computerized models acceptable to the Town of Westford for this purpose include the latest available

version of the Highway Capacity Software (HCS) and/or SYNCHRO® software. For rotary analysis, the Town will allow use of the latest available version of aaSIDRA®.

The weekday AM, weekday PM, and any other peak period specified by the Town Engineer shall be included as part of the capacity analysis. Capacity analysis shall be presented for existing, future no-build and build traffic conditions for each analysis period at each study intersection. Level-of-Service, volume-to-capacity and delay values for individual intersection approaches and the overall intersection must be provided in clear, tabular format and described.

(b) Queuing Analysis.

Vehicle queue results for each lane or lane grouping at study intersections shall be tabulated based on HCS, SYNCHRO®, aaSIDRA® computerized modeling or based on well established engineering protocol as approved by the Town Engineer shall be presented for existing, future no-build and build traffic conditions for each analysis period at each study intersection. Comparison to available lane storage capacities is to be provided and described in the TIAS for each analysis period.

(c) Traffic Signal Warrants Analysis.

The need for new traffic signals at proposed site access points will be based on an evaluation of warrants contained in the current Manual on Uniform Traffic Control Devices (MUTCD). A warrant describes threshold conditions that suggest the potential benefit of signals based upon average or normal travel conditions. Key warrants to be considered by the Town include the Eight-Hour Vehicular Volume, Four-Hour Vehicular Volume, Peak Hour Volume, Pedestrian Volume, School Crossing, Coordinated Signal Design, and Crash Experience. Alternatives to signal installation such as traffic calming, driveway turn restrictions, police officer control, and safety countermeasures must be considered in the analysis. Installation of traffic signal(s) on municipal roadways under jurisdiction of the Town of Westford must be endorsed by the Town Engineer and presented to the Board of Selectmen for their approval. Signal installation may be denied in cases where the signal would create a serious disruption to progressive traffic flow or where alternative measures to signalization are available. In determining the location of a new signal, pedestrian and vehicular safety, and traffic progression are of paramount importance.

In the event that traffic signals meet warrants and present an appropriate traffic solution to the Town Engineer, Planning Board and Board of Selectmen (where applicable), the following guidelines apply to design of the signal(s):

- (1) Pedestrian movements must be considered in the evaluation, and adequate pedestrian clearance provided in the signal cycle-split assumptions.
- (2) Cycle-split assumptions must relate to volume assumptions in the capacity analysis of individual intersections; and where computerized progression analysis techniques are used, they must be of the type that utilize turning movement volume data and pedestrian clearance times in the development of time/space diagrams.

- (3) The green time allocated to the cross street shall be no less than the time which is required for a pedestrian to clear the main street using the current “Manual on Uniform Traffic Control Devices” standards.

(d) Pedestrian and Bicycle Impacts

The impacts of the project on pedestrian and bicycle traffic through the study area shall be reviewed and possible improvements addressed. The review shall include but is not limited to possible connections to existing walkways and bike paths, hazards for pedestrians and bicycles especially at intersections and possible improvements to address the hazards.

The Applicant shall also show how they are working to connect sidewalks in the area of the proposed project to the Town of Westford’s Sidewalk Master Plan. Sidewalk connection shall be required in priority designation 1 areas, previously proposed areas or areas of high pedestrian concentration. Projects in priority designation 2 areas shall at least show sidewalk improvements in the immediate area of the project (Priority designation areas are defined in the Town of Westford Sidewalk Master Plan). All sidewalk improvements shall comply with the Town of Westford’s Sidewalk Master Plan policies, standard details, and requirements by the federal and state ADA requirements.

Projects where the project parcel or abutting Town owned land is within the Town of Westford Regional Recreational Trail system shall show how the project is implementing the installation of this portion of the trail system. Trail installations shall include a review of the possibility of including the use of bicycle use on that portion of the trail. The possibility of installing a bike lane along the adjacent roadway(s) to the proposed project should also be reviewed. All bicycle improvements shall adhere to the current Mass Highway “Manual for Improving Community Bicycling Conditions” specifications.

The Applicant shall also consider on-site pedestrian features that facilitate connections between off-site sidewalks and building entrances.

(e) Sight Line Evaluation

A sight line evaluation is required for proposed access points to the development, and shall include but not be limited to the following elements:

- (1) Documentation of posted speed limits and roadway grades in the vicinity of the proposed access points.
- (2) Measurement of ambient travel speeds in the vicinity of the proposed access point(s) for both travel directions, as measured during a “non-peak” period – typically a mid-morning or mid-afternoon weekday period. Measurement protocol shall consist of random sampling of a statistically significant number of passing vehicles, not less than 50 per direction per hour for a one-hour period. Speed observations may be converted to equivalent spot speeds by measuring travel times over a known distance between points (the “enoscope”

method”), use of radar technology, or use of calibrated automatic traffic recorder (ATR) equipment with capability of measuring travel speeds mechanically. Results of the travel speed survey shall be presented in tabular form to include average (50th percentile), 85th percentile, minimum and maximum speeds.

- (3) Calculate required Stopping Sight Distance (SSD) for both directions of approach for each proposed access point following guidelines in the latest edition of the American Association of State Highway and Transportation Officials’ (AASHTO) “A Policy on Geometric Design of Highways and Streets” (the “Green Book”). Calculations shall account for existing road grade and shall be presented for (a) posted speed limits and (b) measured 85th percentile travel speeds.
- (4) Calculate required Intersection Sight Distance (ISD) for each proposed access point following guidelines in the latest edition of the AASHTO Green Book.
- (5) Conduct field measurement of available SSD and ISD at each of the proposed access points. SSD measurements should measure maximum available sight line distance from the center of approaching travel lane 3.5 feet above road grade to a point 2.0 feet above road grade at the edge of travel way at the proposed driveway. ISD measurements should measure maximum available sight line distance from a point approximately 5 feet behind the STOP bar, 3.5 feet above road grade to the centerline of the approaching lane and 3.5 feet above road grade. At the discretion of the Town Engineer, the Applicant may also be required to provide profile data that graphically demonstrate available SSD and ISD sight lines.
- (6) A tabular comparison of measured SSD and ISD to calculated minimum standards for posted and 85th percentile travel speeds shall be provided and described. In the event that minimum SSD and/or ISD standards are not met, the Applicant is required to develop measures to ensure these standards are met or exceeded.

(9) Assessment of Mitigation

In the event that the analyses indicates unsatisfactory levels of service (below “D”) for any study location or results in an increase in delay of 10 seconds or greater to a signalized intersection, then the Applicant must develop improvement alternatives returning the study area locations to LOS D or better, or operating levels of services calculated under the no-build conditions. For Major commercial projects and Major retail projects refer to Section 173.9.3A.4.6.E. Level of Service Maintenance or Improvement of the Town of Westford zoning by-laws. . All reasonable and feasible measures necessary to minimize delays shall be evaluated to obtain the operating levels of services stated above. Improvement alternatives shall also include measures to offset impacts of the project on the Town’s transportation system including vehicular, pedestrian and bicycle systems if these impacts are determined by the Town Engineer to exacerbate high accident locations, result in undue pedestrian conflict, or create potentially hazardous conditions. The engineering and

implementation of these remedial improvement alternative measures shall be the full responsibility of the Applicant.

Improvement proposals can include projects by the Town or State for which funds have been appropriated and obligated. The assumptions regarding all future roads and lanes in an analysis shall require approval from the Town Engineer.

The Applicant should consider both non-structural and structural improvement alternatives as follows:

(a) Non-Structural Improvements

- (1) Transportation Systems Management (TSM). These measures include modification of existing traffic signal(s) to provide operational efficiencies.
- (2) Transportation Demand Management (TDM). These measures are aimed at reducing dependence on single-occupant automobiles and promotion of alternative travel modes and may include (but are not limited to): flextime policies, enhancing connections from the development to area public transportation, employee carpooling/vanpooling programs and incentives, provision of on-site amenities such as food service and other services that reduce employee demand for off-site travel, incentives that promote use of public transportation as an alternative travel mode, on-site showers/lockers and bicycle storage lockers/racks that promote walking/bicycle travel modes, guaranteed ride home program for employees who chose to use public transportation. TDM programs and facilities are also described in Section X of the Transportation Plan for the Northern Middlesex Region, 2003-2025, as prepared by the Northern Middlesex Council of Governments (NMCOG). A copy of this long range plan is available on the NMCOG website at www.nmcog.org, or by calling the NMCOG office (978-454-8021).

Trip generation may be reduced for those land uses potentially served by transit. The effects of vanpooling would not be considered as a portion of "ride sharing." The use of any transit percentage adjustments must be justified in the text of the report. The current maximum allowable transit use assumption is 5%.

Transit reductions would only apply to employee-intensive uses and residential uses. Uses not expected to have transit reductions would include hotels, restaurants, retail and financial uses.

For employee-intensive uses, such as office buildings, trip rates may be reduced to account for the effects of ride sharing. The text of the report shall fully justify the use of any ride sharing percentage adjustments.

Ride-sharing reductions will not be applied to such uses as hotels, restaurants, retail, financial, or medical related uses.

Additional peak-hour adjustment factors shall only be considered for employee intensive projects, which are candidates for improvements through Transportation System Management (TSM) measures as listed in the Massachusetts Intermodal Transportation Policy Plan. Such measures proposed by the Applicant must be fully and described under Mitigation for this credit to be considered in the analysis.

- (3) Development Alternatives. Alternative land use types and/or densities in some instances should be evaluated as a means of potential traffic mitigation to the extent that other non-structural or structural measures do not result in offsetting development impacts to capacity or safety.

(b) Structural Improvements

This section must describe the location, nature, and extent of proposed structural improvements to ensure sufficient roadway capacity and/or safety. These improvements may include but are not limited to new roadways, roadway widening, traffic signal installation, sidewalks/paths and pedestrian crossings.

A sketch of each improvement should be provided showing the length, width, and other pertinent geometric features of the proposed improvements. (Sketches are only necessary for major improvements that would result in significant changes in circulation patterns.)

Capacity and queuing analyses and associated tabular summaries shall be presented in this section and compared to no-build conditions to quantify operational benefits associated with proposed structural and non-structural improvements.

The TIAS should clearly identify costs associated with proposed improvements, responsible party, and timing of improvements. A mechanism by which these commitments will be executed and their intended time frame for implementation, should be indicated.

(10) Revisions to Traffic Study

Revisions to the traffic study must be provided as required by the Town. The Town, through its Engineering Department, will determine whether revisions are necessary.

The need for revisions will be based on the completeness of the traffic study, the thoroughness of the impact evaluation, and the nature of proposed improvements and their effectiveness to mitigate development capacity and safety impacts.

(11) Executive Summary

The executive summary of the report must be a clear, concise description of the study findings. It is anticipated that the report's final chapter will serve as an executive summary.

It must include a general description of all data, project scope and purpose, findings, conclusions, and mitigation measures and recommendations.

Technical publications and calculations, documentation, data reporting and detail design must not be included in this section.

The executive summary should be short, complete in itself, and not dependent on supplementary data included by reference.

(12) Required Technical Data of Final Report

The following technical data should be provided in the appendices of the TIAS:

(a) Traffic Count Data and tabular summaries

1. Turning movement counts
2. Automatic traffic recorder counts
3. Calculated peak hour factors for the intersection
4. Travel Speed survey data and calculations

(b) Permit sketches and layouts (traffic signals)

(c) Seasonal Adjustment Factors

(d) Growth Factor data and specific development (background) traffic

(e) Trip generation land use code sheets, calculations and adjustments

(f) Plotted sight distance measurements

(g) Signal warrant analyses

(h) Capacity and vehicle queue analysis data and outputs

(i) Maps and Improvement Plans. All maps and graphics involving improvements shall be drawn on a twenty-four by thirty-six (24 x 36) inch plan sheet to a scale of one (1) inch equals forty (40) feet with roadway geometries appropriately dimensioned (e.g. road width, lane widths, etc). Intersection geometries shall include bus stops, parking areas, pedestrian crossings, site distance obstructions (trees, fences, walls, etc), driveway restrictions, etc. The maps and graphics submitted shall have a title block, north arrow and street names.

NOTES:

In the absence of the Town Engineer, the Planning Board shall designate all responsibilities of the Town Engineer discussed in this document to its agent or traffic consultant.