

APPENDIX B - TRAFFIC IMPACT STUDIES

Appendix B - Traffic Impact Studies

Traffic studies for new development and redevelopment within the City shall follow the procedures outlined by this document and must be approved by the City Engineer or his/her designee. Traffic access and impact studies are intended to determine the need for any improvements to the adjacent and nearby roadway system to maintain a satisfactory level of service and the appropriate access provisions for a proposed development.

The primary objectives of a traffic study are as follows:

- Provide a basis for assessing the transportation impacts of a new development or expansion of an existing development; identify the need for any improvements to the supporting roadway system to provide satisfactory levels of service; and, to address safety issues.
- Address relevant transportation issues associated with development proposals that may be of concern to neighboring residents, businesses, and property owners.
- Determine the appropriate location, spacing, and design of the access system for the proposed development in compliance with City standards.
- Evaluate the internal circulation and connectivity systems of the proposed development to provide safe and efficient internal traffic flow and access to/from the adjacent and nearby roadway system.
- Allow compliance with the most current edition of the City's Thoroughfare Plan (or other applicable thoroughfare plans).
- Provide a basis for improvement and funding discussions in conjunction with zoning, special permit, and subdivision plat approvals.

1. TRAFFIC STUDY GUIDELINES

The need for either a detailed traffic impact study or a limited traffic operations analysis will be identified when rezoning, variance, or plan approval petitions are filed (or discussed with public officials). The City Engineer may also identify the need for a traffic impact study or operations analysis in response to an access permit application.

a) Study Warrants for a Traffic Impact Study

A complete traffic impact study (TIS) will be required for any proposed development or redevelopment that meets one or more of the following criteria:

- 1) *Significantly-sized project.* A development meets this criterion if it generates more than 100 trip ends (i.e., two-way vehicle-trips) during any one hour of an average

weekday. These trip ends shall be calculated using the latest edition of Trip Generation as published by the Institute of Transportation Engineers (or upon special studies of unique land-uses as approved by the reviewers).

- 2) *Modifications to roadways.* This criterion is met when the proposed development is expected by the reviewers to significantly impact a roadway segment, or roadway segments, identified in thoroughfare plans and/or improvement programs of the City, County, State, or other jurisdictions. This criterion is also met when access for the proposed development occurs on a public road that may be widened or improved in accordance with adopted thoroughfare plans.
- 3) *Nearby congestion.* A development meets this criterion if the proposed development is expected, in the opinion of City staff, to significantly impact surrounding roadways, intersections, or sets of intersections which are already operating at level of service "D" or worse during any hour (on a design day, or days, selected for analysis purposes). The level of service will be determined by an analysis prescribed in the current edition of the Highway Capacity Manual (Transportation Research Board) using data that reflects the current traffic conditions.
- 4) *High traffic impact area.* This criterion is met when, in the opinion of City staff, the proposed development is located in a high traffic impact area. Such reflects special sensitivity to traffic condition changes due to existing congestion, problematic circulation patterns, burgeoning traffic operations problems, or other traffic conditions of special concern. A traffic impact study will be requested for any proposed new development or modifications to existing development within a high traffic impact area.

b) Study Warrants for a Traffic Operations Analysis

A traffic operations analysis may be requested for petitions which do not meet the warrants for a detailed traffic impact study. A traffic operations analysis will be requested for any one of the following conditions:

- 1) Requests for a driveway (or driveway modification) on any public road.
- 2) Existing sight distance limitations or high accident experience adjacent to the subject site.
- 3) Modifications to a site plan for an existing development where the parking layout and/or internal circulation system could affect traffic operations on the external roadway system.
- 4) Requests or probable need for a new traffic signal to control driveways serving a proposed or existing development.

Examples of traffic operations analyses include studies of proposed driveway locations, resulting

sight distances, driveway and intersection geometry and control, turn lane needs and design, accommodation of projected queuing conditions, accident experience and safety, and traffic signal warrant and progression analysis.

2. PRE-MEETING AND MEMORANDUM OF UNDERSTANDING

Prior to commencing the preparation of a traffic impact study, the preparer shall schedule a meeting with appropriate City staff. Other participants in this pre-meeting shall be representatives of other jurisdictions and agencies as deemed appropriate by City personnel. The participants at the meeting shall identify and agree upon the following issues and needs prior to the preparation of the TIS:

- a) Study area
- b) Study years
- c) Development phasing, if applicable
- d) Field data collection requirements
- e) Acceptable data associated with traffic volumes, accident history, and signal operations
- f) Peak traffic hours (analysis hours)
- g) Trip generation, trip distribution, and assignment methods
- h) Applicable planning documents (including the City's Thoroughfare Plan and Access Management Plan)
- i) Other traffic impact studies prepared for developments in the study area
- j) Utilization of travel demand models
- k) Background traffic and growth factors
- l) Acceptable levels of service (LOS)
- m) Analyses methodology and software (capacity, signal warrants, etc.)
- n) Cycle lengths at signalized intersections
- o) Safety issues (sight distances, accident data, etc.)
- p) Committed and planned roadway improvements and schedule
- q) TIS submittal date

The preparer shall submit a Memorandum of Understanding (MOU) which details the assumptions and methodologies agreed upon regarding the items above – and the preparer shall request City staff concurrence with the contents of the MOU. The MOU shall be submitted to the City within one week subsequent to the pre-meeting. The MOU will be approved by City staff within one week of receipt – assuming that all items are properly addressed.

If not addressed in the MOU, the preparer shall make a separate submission regarding traffic growth rates, vehicle-trip generation rates, and directional distributions of site generated traffic to the City for concurrence and City staff will respond to the preparer on these items within one week of receipt.

3. PREPARER QUALIFICATIONS

Traffic Impact Studies shall be prepared by professionals with training and experience in traffic engineering/transportation planning and under the supervision of a registered professional engineer in Ohio with training and experience in traffic engineering (operations and safety analysis experience). The preparer shall not be a member of the TIS review team; neither shall the preparer be related to a review team member nor hold a financial interest in the project under study. The final document shall be signed and stamped by a Professional Engineer registered in the State of Ohio.

4. STUDY GUIDELINES

a) Study Areas

Any complete transportation study analyzing off-site access needs and impacts will include at least all site access points and major intersections (signalized and unsignalized) adjacent to the site. Beyond this area, the review team will determine any additional area to be included based on local or site-specific deficiencies, development size, traffic conditions, or local policy potentially affected by the proposed development. The study area will also encompass vacant parcels of land believed to impact the intersections being analyzed so as to analyze the proposed project in the context of other previously approved or anticipated developments in the surrounding area. Generally, the study area must be large enough to encompass the critical intersections to be analyzed. In high traffic impact areas, the study area may include the entire zone in order to capture the cumulative impact of future development within the area.

The following shall be included in the study area conditions section of the report:

- 1) Study area boundaries
- 2) Study area land-uses (existing and anticipated future development)
- 3) Site accessibility (existing and future roadway system; document basic features to include jurisdiction, functional classification, pavement widths, lane usages, traffic control devices, speed limits, etc.)
- 4) TIS intersections (defined in the Memorandum of Understanding):
 - i. Lane usages and traffic control devices
 - ii. Sight distances (compare existing distances with established criteria)
 - iii. Accident experience (if requested)

b) Study Years

Beyond the assessment of current conditions, traffic impact studies are to address conditions in the anticipated build-out year of the proposed development and the design year – which is 20 years beyond the anticipated build-out year. Alternate time frames for smaller developments may be considered on a case by case basis. Some general guidelines are as follows:

- 1) All the study intersections shall be analyzed with respect to existing conditions.
- 2) For site access points (and immediately adjacent intersections as appropriate), analyses shall be performed for both build-out and design year conditions. Such driveways and intersections shall be configured to meet design year requirements. Analyses of build-out conditions shall define what elements of the long-term configuration need to be made to yield acceptable conditions in the build-out year.
- 3) For all other study intersections, analyses shall be performed (with and without the proposed development) for the build-out year. The impacts associated with site generated traffic must be appropriately mitigated at these intersections.
- 4) If the proposed development is to be implemented in phases, it may be appropriate to analyze each major phase (e.g., initial phase, an intermediate phase, and full project build-out) in order to define the potential for staging defined roadway improvements/modifications.

c) Study Days and Hours

- 1) For each defined horizon year, specific time periods are to be analyzed. In most cases, only analyses of weekday street peak hours will be required. However, land-use classifications which experience their highest trip generation levels during periods other than street peak hours may require analyses for such periods to determine proper site access and turn lane storage requirements. Examples of land-use classifications which typically have substantially higher site trip generation peaks at times other than weekday street peak hours are: shopping centers, discount stores, recreational uses (e.g., theaters, stadiums, and arenas), restaurants, schools, churches, and garden centers.
- 2) The analysis time period (and condition) shall be discussed and designated by the reviewers at the initial meeting. The objective is to designate the design day(s) and time period(s) so as to cause evaluation of conditions during the design hour or design hours. The selection of the proper design day and hour is particularly important for a development which exhibits significant seasonal variations in trip generation (such as shopping centers). Special consideration must also be given to a development located in a zone that experiences (or will experience) significant seasonal variations in traffic volumes due to unique land-uses.

- 3) The design hour(s) to be used in a TIS will be discussed and designated by the reviewers at the initial meeting. At a minimum, all studies must include assessments of conditions during both the AM and PM peak hours (unless otherwise directed by City staff).

d) Traffic Counts

- 1) In areas without current traffic counts, unless otherwise approved, traffic counts shall be conducted for a minimum of 3 days.
- 2) For areas with current traffic counts, counts may be taken for a minimum of 1 day. These counts will be compared with traffic counts on file. If the counts are comparable, the newly collected counts will be considered adequate for the study. If the counts are not comparable, the developer and the City shall hold discussions to determine the source of the difference and whether new counts should be considered, or what existing counts should be used for the study.
- 3) The City may require longer traffic count timeframes to account for unique circumstances. This will be determined on a case by case basis.

e) Traffic Volume Projections

The total anticipated transportation infrastructure requirements in the study horizon year(s) depend on traffic projections and are needed so that the City can accurately evaluate implications associated with the applicant's request for development approval. However, the impacts and infrastructure needs will be assessed separately for the baseline condition (horizon year development excluding site) and total development (horizon year development including site).

1) Non-Site Traffic

- i. Non-Site (background) traffic volumes are composed of existing volumes, accepted general growth of traffic, and traffic generated by previously approved new developments in the study area.
- ii. *Non-Site Development within Study Area.* The impacts of the anticipated non-site development shall be assessed to aid both the City and the applicant in the determination of sources of transportation infrastructure needs. All significant developments within the study area that have been approved or are likely to occur by the specific horizon years shall be identified and incorporated into the study. The land-use type and magnitude of the probable future developments in the horizon years shall be identified in conversations with staff of the City and other relevant public agencies.
- iii. *Non-Site Development Outside Study Area.* In some cases, the City may request the applicant to specifically consider and include traffic generated by large developments located outside the defined study area. In such cases, a

TIS prepared for the identified development will be provided to the applicant by the City to permit the inclusion of relevant traffic volumes within the subject TIS. The applicant will not be required to undertake vehicle-trip generation and trip distribution for developments outside the study area.

2) Site Traffic

- i. *Site Development.* Development proposed to be located on the site under study shall be categorized by specific land-use type consistent with classifications contained in the latest edition of Trip Generation (Institute of Transportation Engineers). The proposed number of development (building) units (e.g., gross square feet of building area, dwelling units, hotel rooms, etc.) shall be provided. Land area is insufficient to provide a basis for analysis.
- ii. If the proposed land-use or density is inconsistent with the current land-use plan, comparison of the proposed land-use and the land-use plan recommendation shall be made using classifications contained in the Trip Generation report.
- iii. Trips generated by the proposed development shall be calculated using the most current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. Methodologies contained in the ITE Trip Generation Handbook shall be used for internal trips and pass-by trips calculations.
- iv. Distribution and assignment of site traffic shall be based on engineering judgment and the method shall be pre-approved by the City. The directions from which traffic will access the site will depend on various factors, including:
 - Type of proposed development and the area from which it will attract traffic,
 - Size of proposed development,
 - Competing developments (if applicable),
 - Surrounding land uses and population, and
 - Conditions on surrounding roadway system.

3) Pass-By Trips

- i. Pass-by trips will be permitted for retail/commercial developments.
- ii. Pass-by trips shall be in accordance with ITE Trip Generation guidelines.

f) Capacity Analysis

The standard criterion used to define quality of traffic flow is "level of service" (LOS). This is a qualitative assessment of factors such as speed, volume, geometry, delays, and ease of

maneuvering. All analysis techniques specify the quality of operations as a letter - with 'A' representing the best operating condition and 'F' representing the worst. Refer to the Highway Capacity Manual for LOS criteria.

The minimum acceptable design level of service (LOS) in the City is 'C'. At intersections, analyses should show an overall LOS of 'C' with no individual movement operating at less than 'D' to be acceptable. Where unacceptable levels of service are calculated for background or "no-build" conditions, the applicant is responsible for only maintaining the same level of service when site traffic is added to the roadway element.

1) Methodology

- i. The use of HCS software is acceptable for capacity analyses.
- ii. In general, a Peak Hour Factor (PHF) of 0.90 shall be used for horizon year analyses. (A different PHF may be more appropriate for certain land uses (e.g., a school); such conditions will be discussed at the initial meeting.)
- iii. Capacity and level of service calculations shall be performed for each site drive intersection for build-out year and design year conditions. Site driveway intersections shall be configured for design year conditions.
- iv. Capacity and level of service calculations shall be performed for all other study intersections for:
 - A. Existing conditions (i.e., current volumes on existing roadway system).
 - B. Build-out year 'No-build' (non-site) traffic volumes on existing (or planned and programmed) roadway system.
 - If improvements/modifications to the existing roadway system are planned and programmed, City staff will provide this information to the applicant and the improved roadway system will be used as a base for testing horizon year traffic conditions – as appropriate.
 - If roadway improvements or modifications beyond those formally planned or programmed are assumed in the 'no-build' analysis, then these improvements or modifications will be considered to be the responsibility of the applicant. If this is not the case, then the rationale for considering such improvements must be clearly described.
 - C. Build-out year 'Build' (i.e., non-site plus site) traffic volumes on existing (or planned and programmed) roadway system.
 - D. Build-out year 'Build' traffic volumes on improved/modified roadway

system that mitigates the traffic impacts of the proposed development.

- Produce a table for each intersection, study period, and study horizon year listing the level of service and delay (or v/c ratio) by (1) individual movement, and (2) overall intersection for: Existing conditions, No-Build conditions, Build conditions on existing roadway system, and Build conditions on proposed roadway system.

2) Mitigation

Recommendations shall be made in the TIS for the site access points and external roadway improvements (such as additional through lanes, turn lanes, and traffic control devices) necessitated as a result of the proposed development. The traffic impacts of the proposed/planned development must be properly mitigated. Suggested improvements/modifications must be practical and acceptable to the appropriate agency/jurisdiction. A scaled concept sketch or (at least a schematic figure) shall be provided illustrating the improvements/modifications that properly mitigate the traffic impacts of the proposed development.

g) Turn Lane Criteria

- 1) Turn lanes at signalized intersections (existing or warranted upon on build-out day) and at off-site unsignalized intersections shall be provided based on capacity analyses (as part of mitigation).
- 2) Left turn lanes shall be provided at site access points under the following conditions:
 - i. On major and minor arterial roadways with speed limits greater than 40 mph, or
 - ii. On major and minor collector roadways with speed limits greater than 40 mph and more than 10 left turning vehicles during the peak hour of the development, or
 - iii. Per graphs 401-5aE, 401-5bE and 401-5cE, which are the left turn lane warrants contained in the ODOT Location and Design Manual Volume I. (These are Graphs 1, 2, and 3 in the ODOT State Highway Access Management Manual.) Note that the warrants apply only to the free flow approach of the unsignalized intersection. Turn lanes on the minor approach (under stop-sign control) shall be provided based on capacity analyses.
- 3) Right turn lanes shall be provided at site access points per graphs 401-6aE, 401-6bE, 401-6cE and 401-6dE, which are the right turn lane warrants contained in ODOT Location and Design Manual Volume I. (These are Graphs 4, 5, 6 and 7 in the ODOT State Highway Access Management Manual.)
- 4) Left or right turn lanes may also be required when deemed necessary for safety

purposes by the City Engineer. The length of left and right turn lanes shall be based on the criteria contained in the ODOT Location and Design Manual Volume I Section 401-9E and 401-10E or, where appropriate, on the results of queuing analyses associated with the capacity calculations. The length of turn lanes shall be based on a design speed five miles per hour above the posted speed limit. For roadways with an unposted speed limit, a design speed of 55 MPH shall be used.

h) Traffic Signal Warrant Criteria

Warrant analyses for the installation of a traffic signal shall be required if a signal is recommended as a mitigating measure. Signal warrants, as contained in the latest edition of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), shall be used for any formal request associated with the installation of a traffic signal. In general, if any one or more of the eight warrants as found in the OMUTCD is met, a traffic signal may be considered. Signal warrant analyses may be conducted using projected traffic volumes to identify the potential need for the installation of traffic signals. However, traffic signals will not be installed unless: (1) the subject intersection is unquestionably projected to meet warrants on build-out day of the development, or (2) actual counts at the intersection meet warrant thresholds

Any intersection that meets signal warrant thresholds must also be evaluated in terms of location and spacing based on the standards noted in the City's Access Management Regulations or in the ODOT State Access Management Manual (if applicable) for the access category assigned by the City's Thoroughfare Plan.

i) Site Access, Circulation, Parking and Roadway Plans

The following shall also be addressed in the TIS:

- 1) On-site parking needs.
- 2) Ease of internal circulation.
- 3) On-site queuing provisions.
- 4) On-site traffic operations and control (as they may affect traffic operations on the external roadway system).
- 5) Design of site driveways to include pavement widths, lane usages, proposed median widths, traffic control devices, etc.

Plans showing site access and any roadway improvements/modifications shall be submitted with all requested traffic impact studies and/or traffic operations analyses. These plans shall be to a practical scale.

The site access and roadway plan(s) shall be of sufficient detail to show:

- 1) Location and spacing of all site access points and driveways (including relationships to other nearby roadways, intersections, and driveways),
- 2) External roadway improvements/modifications,
- 3) Lane configurations and control,
- 4) Queuing and vehicle storage distances,
- 5) Spacing of traffic signals to permit proper traffic progression on the adjacent roadway system,
- 6) Sight distances,
- 7) Adequate pedestrian, bicycle, and public transit provisions (if applicable),
- 8) Sufficient emergency and service/delivery access, and
- 9) Proper on-site circulation and parking layout so as not to affect traffic flow and operations on the external street system.

5. SUBMITTAL REQUIREMENTS

All traffic impact studies and traffic operations analyses must be documented in a report. The results of traffic operations analyses can be summarized in a memorandum type report – while the results of traffic impact studies must be submitted in standard report formats. Such traffic impact reports shall be complete and concise. Two copies of the report shall be submitted to the City for review.

6. PUBLIC RECORD

All submitted documents, including both reports and data, become public record upon submittal. Information contained in these submittals may be used by agency staff or other study preparers in subsequent studies. The original sources of data and information shall be cited when taken from prior submittals.