

**Traffic Impact Study (TIS)
Manual**

Pickaway County, Ohio

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Traffic Impact Study (TIS) Manual

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1.0 PURPOSE AND INTENT

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 County 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 County'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.

This Traffic Impact Study (TIS) manual establishes the requirements and guidelines for achieving responsive and consistent traffic impact and access studies for proposed developments in Pickaway County, Ohio. The County Engineer has determined it to be befitting to require the submission of an appropriate traffic study for all planned/proposed development.

2.0 TRAFFIC STUDY WARRANTS

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 County Engineer may also identify the need for a traffic impact study or operations analysis in response to an access permit application.

2.1 Study Warrants for a Traffic Impact Study

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

- 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).

- 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 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.
- Nearby congestion. A development meets this criterion if the proposed development is expected, in the opinion of County 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.
- High traffic impact area. This criterion is met when, in the opinion of County 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.

2.2 Study Warrants for a Traffic Operations Analysis

A traffic operations analysis will 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:

- Requests for a driveway (or driveway modification) on any public road.
- Existing sight distance limitations or high accident experience adjacent to the subject site.
- 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.
- 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.

3.0 PRE-MEETING AND MEMORANDUM OF UNDERSTANDING

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

1. Study area
2. Study years
3. Development phasing, if applicable
4. Field data collection requirements
5. Acceptable data associated with traffic volumes, accident history, and signal operations
6. Peak traffic hours (analysis hours)
7. Trip generation, trip distribution, and assignment methods
8. Applicable planning documents (including the County’s Thoroughfare Plan and Access Management Plan)
9. Other traffic impact studies prepared for developments in the study area
10. Utilization of travel demand models
11. Background traffic and growth factors
12. Acceptable levels of service (LOS)
13. Analyses methodology and software (capacity, signal warrants, etc.)
14. Cycle lengths at signalized intersections
15. Safety issues (sight distances, accident data, etc.)
16. Committed and planned roadway, transit, bikeway, and pedestrian improvements and schedule
17. 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 County staff concurrence with the contents of the MOU. The MOU should be submitted to the County in a timely manner following the pre-meeting. The County will make its best effort to render comments on the submitted MOU within 10-15 business days of receipt.

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

4.0 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.

5.0 STUDY GUIDELINES

5.1 Study Area

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 should be included in the study area conditions section of the report:

- Study area boundaries.
- Study area land-uses (existing and anticipated future development).
- 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.).
- TIS intersections (defined in the Memorandum of Understanding):
 - Lane usages and traffic control devices.
 - Sight distances (compare existing distances with established criteria).
 - Accident experience (if requested).

5.2 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 design year – which is 20 years beyond the anticipated build-out year. Some general guidelines are as follows:

- All the study intersections should be analyzed with respect to existing conditions.
- For site access points (and immediately adjacent intersections as appropriate), analyses should be performed for both build-out and design year conditions. Such driveways and intersections should be configured to meet design year requirements. Analyses of build-out conditions should define what elements of the long-term configuration need to be made to yield acceptable conditions in the build-out year.
- For all other study intersections, analyses should 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.

- 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.

5.3 Study Days and Hours

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, zoos, theme parks, stadiums, and arenas), restaurants, schools, churches, and garden centers.

The analysis time period (and condition) should 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.

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 commuter hours (unless otherwise directed by County staff).

5.4 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 County 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).

5.4.1 Non-Site Traffic

- Non-Site (or 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.
- *Non-Site Development within Study Area.* The impacts of the anticipated non-site development should be assessed to aid both the County and the applicant in the determination of base transportation infrastructure needs. All significant developments within the study area that have been approved or are likely to occur

by the specific horizon years should be identified and incorporated into the study. The land-use type and magnitude of the probable future developments in the horizon years should be identified in conversations with staff of the County and other relevant public agencies.

- *Non-Site Development Outside Study Area.* In some cases, the County 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 County 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.

5.4.2 Site Traffic

- *Site Development.* Development proposed to be located on the site under study should 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.) should be provided. Land area is insufficient to provide a basis for analysis. 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 should be made using classifications contained in the *Trip Generation* report.
- 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.
- Distribution and assignment of site traffic shall be based on engineering judgment and the method should be pre-approved by the County. 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.

5.5 Capacity Analyses

5.5.1 Level of Service Criteria

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.

The minimum acceptable design level of service (LOS) in the County 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.

Level-of-Service “D” may be considered acceptable under special circumstances as decided upon at the pre-meeting and clearly stated in the MOU. An example of this situation is when a study intersection lies all or in part within ODOT jurisdiction. In this case, LOS criteria as established in ODOT’s Analysis & Traffic Simulation Manual would likely apply.

5.5.2 Methodology

- The use of HCS or Synchro software is acceptable for capacity analyses. When using Synchro, reports from HCM module should be used.
- In general, a Peak Hour Factor (PHF) of 0.90 should 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.)
- 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 should be configured for design year conditions.
- Capacity and level of service calculations shall be performed for all other study intersections for:
 - Existing conditions (i.e., current volumes on existing roadway system).
 - 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, County 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.

- Build-out year ‘Build’ (i.e., non-site plus site) traffic volumes on existing (or planned and programmed) roadway system.

- 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.
- Build conditions on proposed roadway system.

5.5.3 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) should be provided illustrating the improvements/modifications that properly mitigate the traffic impacts of the proposed development.

5.6 Turn Lane Criteria

- Intersection capacity analysis procedures of the current Highway Capacity Manual shall be used to determine the number and type of lanes at intersections.
- At signalized intersections, turn lanes needed to meet required LOS levels should be provided based on capacity analyses.
- At unsignalized intersections, left turn lanes should be provided when any of the following criteria are met:
 - On multi-lane roads and highways with posted speed limits greater than 40 mph, with two-way design hour volumes greater than 200 vph, and with left turn design hour volumes greater than 10 vph. (The design hour volume shall include all through and turning vehicles in both directions on the road or highway being evaluated.)
 - On two-lane arterial and major collector roadways with posted speed limits greater than 40 mph, with two-way design hour volumes greater than 100 vph, and with left turn design hour volumes greater than 10 vph. (The design hour volume shall include all through and turning vehicles in both directions on the road or highway being evaluated.)
 - On all other roadways and highways in accordance with the left turn lane warrants contained in the ODOT *Location and Design Manual Volume I* and in the ODOT State Highway Access Management Manual.

- At unsignalized intersections, right turn lanes should be provided in accordance with the right turn lane warrants contained in the *ODOT Location and Design Manual Volume I* and in the *ODOT State Highway Access Management Manual*.
- Note that the criteria or warrants apply only to the free flow approach of the unsignalized intersection. Turn lanes on the minor approach (under STOP –sign control) should be provided based on capacity analyses.
- Left or right turn lanes may also be provided when deemed necessary for safety purposes by County representatives.
- The length of left and right turn lanes should be based on the criteria contained in the *ODOT Location and Design Manual Volume I* or, where appropriate, on the results of queuing analyses associated with the capacity calculations. The length of turn lanes should be based on a design speed five miles per hour above the posted speed limit. For roadways with unposted speed limit, a design speed of 55 MPH should be used.

5.7 Traffic Signal Warrant Criteria

- Warrant analyses for the installation of a traffic signal is required if a signal is recommended as a mitigating measure.
- Signal warrants, as contained in the latest edition of the Ohio Manual of Traffic Control Devices (OMUTCD), shall be used for any formal request associated with the installation of a traffic signal.
- In general, the County does not install a traffic signal unless the criteria specified in Warrant 1 (Eight-Hour Vehicular Volume) are met.
- If a signal is shown to be warranted in a horizon year, but is not warranted in the build-out year, estimates shall be made regarding the year that the signal may become warranted.
- 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 County’s Access Management Regulations or in the ODOT State Access Management Manual (if applicable) for the access category assigned by the County’s Thoroughfare Plan.

5.8 Site Access, Circulation, Parking and Roadway Plans

- The following should also be addressed in the TIS:

- On-site traffic operations and control (as they may affect traffic operations on the external roadway system).
 - On-site queuing provisions.
 - 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 should be to a scale.

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

- Location and spacing of all site access points and driveways (including relationships to other nearby roadways, intersections, and driveways),
 - External roadway improvements/modifications,
 - Lane configurations and control,
 - Queuing and vehicle storage distances,
 - Spacing of traffic signals to permit proper traffic progression on the adjacent roadway system,
 - Sight distances (as defined in the *ODOT Location and Design Manual Volume I*),
 - Adequate pedestrian, bicycle, and public transit provisions (if applicable),
 - Sufficient emergency and service/delivery access, and
 - Proper on-site circulation and parking layout so as not to affect traffic flow and operations on the external street system.
- Where applicable, the calculation of ADTs on internal site roadways of proposed residential developments may be requested. Direct access will not be permitted along internal roadways or roadway segments with ADTs greater than 1500. Site plans should be created to adhere to this criterion.
- More detailed location and design studies may be requested to deal with such items as geometrics, right-of-way requirements, topography, physical constraints, and sight distances.
- In addition to the above, the following should be made in the traffic study if applicable:
- Recommendations regarding speed limits.
 - Impact on current high-accident locations.
 - Accommodation of school zones, pedestrian and bicycle movements, transit system requirements, service and emergency vehicles, etc.

6.0 REPORT CONTENTS

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 should be complete and concise and should include the following:

- Cover
 - Development name and location
 - Applicant's name
 - Preparer's name
 - Report date
- Title Page
 - Development name and location
 - Applicant's name, address, and phone number
 - Preparer's name, address, phone number and engineering registration seal
 - Report date
- Table of Contents
- List of Figures
- List of Tables
- List of Appendices
- Executive Summary
 - Site location and study area
 - Development description
 - Types of studies undertaken (impacts, signal warrants, site access etc.)
 - Principal findings
 - Conclusions and Recommendations
- Summary of Revisions (for revised reports)
- Introduction
 - Site Description
 - Study Area Conditions
 - Study Hours and Study Years
- Traffic Volumes
 - Existing Traffic Volumes
 - No-Build Traffic Volumes
 - Site Generated Traffic Volumes
 - Build Traffic Volumes
- Traffic Analyses
 - Site Access Point(s) Evaluation
 - Signal warrant analyses
 - Turn lane warrants

- Turn lane length computations
- Capacity analyses
- Sight distances
- o Off-Site Public Road Intersection Analyses
 - Signal warrant analyses
 - Accident analyses (if requested)
 - Capacity analyses
 - Existing conditions (current volumes)
 - No-Build conditions (build-out year)
 - Build conditions (build-out year)
 - Mitigation (build-out year)
- Conclusions and Recommendations
- Appendix
 - o Memorandum of Understanding
 - o Site Plan
 - o Traffic Count Data
 - o Traffic Analyses (capacity analyses, signal warrants, and turn lane warrants and length worksheets)

The following Figures (Exhibits) should be included in the report:

1. Site Location Map
2. Map of the Existing Roadway Systems that serve the site showing major and minor streets – along with any transit, bicycle, and major pedestrian routes
3. Existing Conditions (current lanes and traffic control at study intersections)
4. Existing Traffic Volumes
5. No-Build Traffic Volumes
6. Directional Distribution of Site Traffic
7. Site Generated Traffic Volumes
8. Build Traffic Volumes
9. Proposed Traffic Control and Lane Usages

The following Tables should be included in the report:

1. Site Trip Generation Factors
2. Site Trip Generation Volumes
3. Level of Service Summary

Site access and roadway plans can be included in the body of the report or provided as attachments.

7.0 SUBMITTAL REQUIREMENTS

Completed reports can be submitted to the County via email. Submissions should include a portable document format (PDF) of the report and appendices. Other electronic files may be requested such as the capacity analysis files in their software file format (e.g., .syn for Synchro files).

It is the County’s goal to review and respond within 30 days of the submittal date of a traffic study report. If the document is deemed inadequate, the applicant will be notified in writing and shall have an opportunity to correct the deficiencies and resubmit the report. If the document is deemed adequate, the applicant will be notified in writing of formal approval.

When other jurisdictions are involved with the review process, the County will include those jurisdictions in correspondence with the applicant.

8.0 PUBLIC RECORD

All submitted and formally accepted 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 should be cited when taken from prior submittals.

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