

APPENDIX B
TRAFFIC IMPACT STUDY CRITERIA

Appendix B - Traffic Impact Study Criteria

Traffic Impact Studies

Traffic impact studies (TIS) may be required by the County in order to adequately assess the impacts of a development proposal on the existing and/or planned street system. A (TIS) shall be required for proposed developments with peak hour trip generation volumes anticipated to exceed 50 vehicles during any peak hour. The primary responsibility for assessing the traffic impacts associated with a proposed development will rest with the applicant, with the County serving in a review capacity.

The following shall require a written TIS:

a. A rezoning, inclusive of major amendments to a planned development and use by special review applications.

In the case of a rezoning where the proposed zoning is anticipated to generate less traffic than the existing zoning, a letter summarizing the trip generation characteristics of the application, including a comparison to the trip generation characteristics of the existing zoning may be submitted in lieu of a full TIS. (see Traffic Impact Study Compliance Letter requirements in this Appendix B)

b. A preliminary plan or final plat.

c. Site access is required off a State Highway. Prior to issuing an access permit, approval from both the County and the Colorado Department of Transportation (CDOT) must be obtained.

d. Additional access off a State Highway to an existing use is being requested.

e. Any change of use affecting access from a State Highway.

f. The applicant will be required to submit a new TIS if, after submitting the original TIS for any of the above submittals, the land use intensity is increased by more than 20% or the land use is changed so that trip generation is increased by more than 20%.

g. The applicant will be required to update an existing TIS if the existing TIS related to the development is more than two years old, unless the County determines the conditions have not changed significantly.

Scoping the TIS

Transportation consultants are required to meet with and discuss projects with County staff prior to starting the TIS. At a minimum, topics for discussion at such meetings will include trip generation, directional distribution of traffic, trip assignment, definition of the study area, intersections requiring capacity/level of service (LOS) analysis, and methods for projecting build-out volume.

Specific requirements will vary depending on the site location and development proposal. The scope of the TIS shall be commensurate with the scale and scope of probable operational and safety impacts to the general street system. A general guideline related to determining the extent of the study area, is to carry the analysis out at least as far as those areas where newly generated site traffic represents 5 percent or more of a roadway's peak hour capacity. Where site generated traffic will be less than 5 percent of the roadway capacity, the study area limits would, at minimum, include all site accesses,

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adjacent roadways and adjacent major intersections, and at maximum would also include all roadways and collector/collector and collector/arterial intersections, extending from the proposed development to and including the intersection with the nearest state or federal highway. The study area and/or improvement commitments may extend into other jurisdictions or incorporated areas.

The TIS will be the responsibility of the applicant and must be prepared, stamped and signed by a licensed Professional Engineer registered in the State of Colorado with adequate experience in Transportation Engineering. Upon submission of a draft TIS, the County will review the study data sources, methods, and findings. Comments will be provided in a written form. The applicant and the project engineer will then have an opportunity to incorporate necessary revisions prior to submitting a final report.

TIS Format

In order to provide consistency and to facilitate staff review of a TIS, the following format must be followed in the preparation of such studies by transportation consultants.

Introduction

The introduction portion of the TIS must contain the following:

a. Development Site and Study Area Boundaries – A brief description of the size of the land parcel, existing land uses, general terrain features, and the location within the jurisdiction shall be included.

The exact limits of the study area shall be based on engineering judgment, and an understanding of existing traffic conditions surrounding the site. In all instances, however, the applicant, engineer, and the County must mutually agree upon the study area limits. These limits will usually result from initial discussions with staff.

A vicinity map that shows the site and the study area boundaries, in relation to the surrounding transportation system, must be included.

b. Proposed Development Description – The specific proposed land use types(s) and size(s) must be identified. If the development is to be built in a phased manner, the types and sizes of the land use in each phase, as well as the projected completion date of each phase, shall be identified. If specific land uses are not known, the most intense use (in terms of traffic generation) allowed by current or proposed zoning must be assumed for the TIS.

c. TIS Scope – The agreed upon scope of the TIS, in terms of the study intersections, driveways, and roadway segments, time periods and future scenarios to be analyzed, must be briefly described.

Existing Conditions

The current traffic conditions within the study area must be identified.

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a. Roadway Network – Within the study area, the applicant must describe existing roadways and intersections including roadway classification, speed limits, geometrics, traffic control etc. A map must be provided showing the location of such facilities as well as surrounding land use and zoning.

b. Traffic Volumes – The current traffic volumes at identified intersections (turning movements) and roadway links (24 hour volume counts) for the study time periods must be measured. At a minimum morning and evening (A.M. and P.M.) peak period turning movement counts will be required. Turning movement volumes for other periods may be required.

Traffic volumes over two years old will not be accepted. A graphic showing these volumes shall be included.

All raw traffic count data (including average daily traffic volumes and peak hour turning movements) shall be included in the appendices of the report.

c. Levels of Service (LOS) – The current traffic operations LOS within the study area shall be described during the identified time periods. LOS shall be determined using the operational methodology as detailed in the most recent version of the Highway Capacity Manual (HCM). The County will provide the appropriate existing traffic signal timing values.

All calculations must be included in the appendices of the TIS and electronic data files must accompany the TIS submittal.

d. Traffic Safety Analysis – Analysis of available entering sight distance at all proposed site access points (per Chapter 4 of these Standards). Traffic crash data for roadway corridors affected by the proposed development may be required for the TIS. The safety analysis period will normally be the most recent three years. The County will specify when a traffic safety analysis will be required.

Site Traffic/Trip Projections

a. Site Trip Generation – A summary table listing type, size, the Institute of Transportation Engineers (ITE) Trip Generation - Land Use Code for each land use in the development, trip generation rates used, and the resultant total trips for each time period analyzed must be provided.

Trip generation rates from the most current ITE Trip Generation manual shall be used. In the event that data for the proposed development is unavailable, trip generation from similar land uses, either from other sources, jurisdictions, or field studies, may be used with County approval. With approval, these sources may be used to supplement ITE Trip Generation data.

For phased developments, trip generation for each phase, as well as development build-out, shall be provided.

b. Site Trip Reductions – Use of the following types of trip reduction factors may be considered with approval of the County.

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- Pass-by factors as published in the current ITE Trip Generation manual. Pass-by factors are to be used to reduce the projected additional total daily traffic to street(s) serving a proposed development. They are not to be applied directly to reduce trip generation and turning movement volumes at driveways serving the proposed development.

- Internal trip assumptions with analytical support.

- Modal split assumptions with analytical support. For example, when the proposed development is located in a transit oriented development or within a quarter of a mile of a major transit corridor, a trip reduction may be applicable.

c. Site Trip Distribution – The estimates of percentage distribution of trips from the proposed development to destinations in the metro region must be clearly stated in the report using the north, south, east, and west compass points. Trip distribution should be based on actual traffic data. Market studies and information concerning origin of trip attractions to the proposed development may be used to support these assumptions where available. A graphic showing the percentage of site traffic on each street must be provided as part of the TIS.

d. Traffic Assignment – The direction of approach of site-generated traffic via the area’s street system must be presented in this section. The technical analysis steps, basic methods, and assumptions used in this work must be clearly stated and agreed to by the County. The assumed trip distribution and assignment must represent the most logically traveled routes for drivers accessing the proposed development. These routes can be determined by observation of travel patterns to existing land uses in the study area. A graphic showing the site traffic assignment on the surrounding roadway network must be included.

Background Conditions

Background traffic growth for intersections and roadways within the study area must be determined for the opening date of the proposed development (short-term) and in the twenty-year planning horizon or area build-out (long-range) without influence of the proposed site, as determined by the County. For large developments, analysis of additional horizons may be required.

a. Approved Developments – Traffic from platted but un-built developments within the study area, or having impact on the study area, shall be added to the appropriate planning horizon (based on expected level of build-out of the approved plat(s)). Typically this will primarily affect the background traffic at the time of the opening of the proposed development; however traffic generated by some larger approved projects may not impact the area until after opening. This traffic must be added into the twenty-year planning horizon.

b. General Growth – In addition to approved developments, regional traffic growth will affect background traffic volumes at both analysis scenarios. Future traffic growth shall be developed through means determined appropriate by Douglas County, such as the DRCOG, Douglas County Transportation Master Plan, growth rate methodology etc. The County will determine whether proposed general traffic growth rates are acceptable.

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c. Currently Planned Roadway Improvements – Roadway improvements that would impact traffic conditions within the study area and that are currently planned and funded may be included in the future base conditions, as appropriate. Include the nature of the improvement project, its extent, implementation schedule, and the agency or funding source responsible.

d. Background LOS – The background traffic LOS within the study area, without influence of the proposed site, shall be described during the identified time periods. LOS shall be determined using the operational methodology as detailed in the most recent version of the (HCM).

The extent of vehicle queuing and its potential impact to adjacent intersections shall be evaluated using a Poisson’s distribution methodology (see the Queuing Analysis section of this Appendix B), or other method approved by the County.

For unsignalized intersections, the current HCM methodology for determining LOS shall be used to identify projected background traffic conditions.

Background traffic volumes and LOS shall be shown in graphical format for each analysis scenario studied. All LOS calculations shall be included in an appendix to the TIS and electronic data files must accompany the TIS submittal.

Projected Site Traffic Impacts

Traffic impacts of the proposed development shall be analyzed for the anticipated opening time frame, including all project phases, and the identified planning horizon.

Short-term

a. Total Traffic – Site Opening. The total projected traffic volumes at the day of development completion shall be determined by adding the proposed site generated traffic to the short-term background traffic. Total traffic volumes on study area roadways at proposed opening shall be shown in graphical format.

b. Level of Service – Site Build-out. The LOS within the study area at development completion shall be described during the identified time periods. LOS shall be determined using the operational methodology as detailed in the most recent version of the (HCM).

For signalized intersections and/or roadway segments in zoning applications, LOS “D” will be the design objective in urban areas and LOS “C” will be the design objective in nonurban areas. Urban and nonurban areas shall be determined by County staff based on the Douglas County Comprehensive Master Plan. For all other types of development (not related to zoning), LOS “D” will be the design objective for overall signalized intersection operation at development opening and build-out. Under no circumstances shall the development cause a drop below an overall LOS “E” at signalized intersections for any analysis scenario.

For analysis of unsignalized intersections, the current HCM methodology for determining LOS shall be used to identify projected traffic conditions.

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c. Mitigation – Site Opening. At intersections within the study area with projected LOS “E” or worse, mitigation measures shall be identified to bring the intersection operation to an acceptable level.

Long-range

a. Total Traffic – Long-range Projection. The total projected traffic volume at the long-range horizon year shall be determined by adding the proposed site generated traffic to the long-term background traffic. Total traffic volumes at the long-range horizon year shall be shown in graphical format.

b. Level of Service – Long-range Projection. The long-range LOS within the study area shall be described during the identified time periods. LOS shall be determined using the operational methodology as detailed in the most recent version of the HCM.

The design objective for the long-range LOS with the proposed development should be no worse than the long-range LOS projections (background) without the influence of the proposed site.

The extent of queuing and its potential impact to adjacent intersections shall be evaluated using a Poisson’s distribution methodology (see Queuing Analysis section of this Appendix B), or other method approved by the County.

The current HCM methodology for determining LOS shall be used to identify projected traffic conditions at unsignalized intersections.

c. Mitigation – Long-Range Projection. At intersections with unacceptable projected LOS (as defined in b., above), mitigation measures shall be identified to bring intersection operation to an acceptable level.

LOS values shall be tabulated in a single table for all study intersections, analyzed time periods, and analysis scenarios. All LOS calculations shall be included in the appendices and electronic data files must accompany the TIS submittals.

Conclusions and Recommendations

This chapter of the TIS is a description of the study findings and shall include:

a. Identified Improvements. This section describes the location, nature, and extent of proposed improvements that would be necessary to ensure sufficient roadway capacity at design objective LOS. A graphic of each improvement should be provided showing the length, width and other pertinent geometric features of the proposed improvements.

b. Operational Analysis at Critical Points. Another iteration of the LOS analysis must be described, which demonstrates the anticipated level of service as a result of making the proposed improvements.

c. Traffic Volume Proportion. Percentages based on the traffic impact analysis may be required by the County to identify the proportion of traffic using various public improvements (both existing and proposed) from several developments within the study area.

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Fair share percentage calculations shall be based on the traffic growth and not a percentage of the total (growth plus site) traffic.

Potential Mitigation Measures

Any type of potential mitigation measures, including new roadways, additional traffic lanes on existing roadways, and changes to traffic control are required to be approved by Douglas County.

Roundabouts as Mitigation Measures – At intersections of two roadways that are projected to operate at a poor LOS or require signalization, Douglas County will require evaluation of a modern roundabout as a mitigation measure.

Traffic Signals as Mitigation Measures – The need for new traffic signals will be based on warrants contained in the Manual on Uniform Traffic Control Devices (MUTCD) and any additional warrants established by the National Committee on Uniform Traffic Control Devices. In determining the location of a new signal, traffic progression is of paramount importance. Generally, a spacing of one-half mile for all signalized intersections should be maintained. This spacing is usually desirable to achieve good speed, capacity, and optimum signal progression. Pedestrian movements must be considered in the evaluation and adequate pedestrian clearance provided in the signal cycle split assumptions.

To provide flexibility and ensure optimum two-way signal progression, an approved traffic engineering analysis must be made to properly locate all proposed accesses that may require signalization. The section of roadway to be analyzed for signal progression will be determined by the County and will include all existing and possible future signalized intersections.

The progression pattern calculations must use a cycle consistent with current signal timing policies of the County. A desirable bandwidth of 50% of the signal cycle should be used where existing conditions allow. Where intersections have no signals presently, but are expected to have signals, typically a 60% mainline, and 40% cross street cycle split should be assumed. Cycle split assumptions must relate to volume assumptions in the capacity analysis of individual intersections and consider pedestrian clearance times in the development of time/space diagrams.

The green time allocated to the cross street will be no less than the time which is required for a pedestrian to clear the main street using MUTCD standards. Those intersections that would reduce the optimum bandwidth if a traffic signal were installed may be required to remain unsignalized and have turning movements limited by access design or median islands. Refer to section 3 of the State Highway Access Code for signal spacing on State highways.

Queuing Analysis

A 95%-ile (using Poisson's distribution) queue length will be used as the basis of storage length design and verification of the adequacy of existing storage lengths. Alternative methodologies, such as Synchro™ 95th percentile length calculations may be used with County approval. At signalized intersections, a background cycle length of 120 seconds shall be assumed. Green times for specific movements shall be based on the movement's proportion of the critical lane volume, subject to phase

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minimums. Minimum greens shall be assumed to be 10 seconds for through movements and 4 seconds for left turns. Yellow change and red clearance intervals shall be assumed to be 3 seconds and 2 seconds, respectively for left turn movements and 4 seconds and 2 seconds, respectively for through movements. For lane groups that have multiple lanes, a lane utilization factor, in accordance with the HCM methodology, shall be applied to the calculation of queue lengths.

Electronic data files must accompany the TIS submittal.

Revisions to Traffic Impact Study

Revisions to the TIS must be provided as required by the County. The need to require revisions will be based on the completeness of the TIS, the thoroughness of the impact evaluation, the adequacy of proposed improvements and mitigation measures, and the compatibility of the TIS with the proposed access and development plan.

Traffic Impact Study Compliance Letter

A standard TIS approved for a development that has been master planned may be used as reference for the further development of individual lots or subareas. The required TIS for subareas may take the form of a TIS Compliance Letter. The applicant in this case may submit a Compliance Letter confirming the original standard TIS validity as related to the current application. The County may also require additional information beyond the Compliance Letter.

Compliance Letter Qualifying Conditions

A TIS Compliance Letter may be considered if all of the following conditions are present:

- A standard TIS for the area has been completed, and accepted by the County.
- Total projected Trip Generation (per the ITE Trip Generation Manual) including the lot or subarea is less than or equal to the build-out scenario assumptions in the standard TIS.
- Trip distribution is expected to be similar to those projected in the standard TIS.
- Access to the lot or subarea is unchanged from the standard TIS.

If the standard TIS is out of date as determined by County staff, additional data collection and analysis may be required.

Submittal of a Compliance Letter

The applicant must provide the following information in a letter prepared, stamped, and signed by the transportation consultant engineer.

The Compliance Letter shall include at a minimum the following figures and tables:

- Introduction/Project Description
 - Figure: vicinity map
 - Figure: proposed development site plan
- Proposed Conditions

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- Site trip generation
- Table: trip generation summary
- Table: comparison of standard TIS trip generation and proposed site uses
- Conclusions/Recommendations
 - Compare/Contrast standard TIS with proposed development.
 - Finding of no significant change to any site attributes including:
 - Operations
 - Access
 - Parcel layout
 - Conclusion page(s) of standard TIS
- Appendix
 - Cover page of standard TIS
 - Trip generation page(s) of standard TIS
 - Master site plan