JEFFERSON COUNTY

TRANSPORTATION IMPACT STUDY GUIDELINES

April - 2008

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I. Requirements for Transportation Impact Studies (TIS)

General: In considering the transportation aspects of land development, it is important to determine early in the process if and when a Transportation Impact Study (TIS) will be required. The trip generation from a proposed development is the main quantitative threshold; however, existing transportation issues such as a high crash location, complex intersection geometrics or other specific problems or deficiencies may also necessitate a TIS. The final determination to require a TIS shall be made by the Division of Highways & Transportation (H&T) in conjunction with the Planning & Zoning Division.

Traffic Generation Thresholds: The minimum threshold requiring a TIS for trips generated by a proposed development shall be *1000* trips per day or *100* trips per peak hour period. A proposed development generating less than *500* trips per day should not require a TIS; however, a local safety or capacity deficiency may necessitate the need for further study.

Study Timing: The submittal of a TIS should be consistent with the Planning & Zoning Division requirements. A plat submittal requesting a *15%* or greater increase in trip generation for the development may require a revised TIS. Any TIS greater than *2* years old may also be required to be revised.

II. Responsibility for Transportation Impact Studies

General: The impacts from a proposed development as assessed in the TIS are the primary responsibility of the applicant and their engineer. The Division of Highways & Transportation (H&T) serves as the review and approval agency for the TIS.

Review Process: H & T supports an iterative process that begins when the development's planning is initiated, not after the plan is prepared and TIS completed. The applicant and their engineer preparing the TIS should meet with the Planning and Development Division and H&T at the earliest possible point in the study process.

Certification: The TIS should be prepared under the supervision of a qualified and experienced transportation professional who has specific training in traffic and transportation engineering and planning. All transportation operations and design work shall be completed under the supervision of an experienced professional in conformance with the State of Colorado requirements. The TIS shall be signed and sealed by a registered professional engineer in the State of Colorado.

III. Transportation Impact Study Format

i. **Introduction and Summary**: The purpose of the TIS should be clearly stated. This section should contain an Executive Summary that concisely summarizes the principal findings, conclusions and recommendations of the TIS.

ii. **Proposed Development**: Provide a description of the land parcel size, general terrain features and location within the county. The off site as well as site specific development should be described. This includes a discussion of

land use and intensity, location, site plan and zoning. Proposed phasing should be introduced and addressed in this section.

iii. **Existing Area Conditions**: Limits of the study area should be described in this section. The limits shall be mutually agreed to between the applicant and the County. Roadways that provide access to the site as well as future roadways included in the study area are included in this section. Existing intersections within the study area as well as geometrics and traffic signals should be identified. The existing and proposed uses of the site should be identified in terms of various zoning categories of the County. The land use generating the most trips should be used for the analysis.

iv. **Projected Traffic**: One of the most critical elements of the TIS is estimating the amount of traffic being generated. ITE's *Trip Generation Handbook* provides guidance on how to select between rates and equations when both are available. The national published data provided by ITE should be used as starting points in estimating the amount of traffic by a specific building type or land use.

Computer Software: A number of computer software packages are available that are designed to either produce trip generation data or accept trip generation data for further analysis. These include but are not limited to McTrans Trip Generator, TRAFFIX, EMME/2, CUBE (TP+,TRANPLAN, TRIPS, MinUTP), QRS II, TMODEL, TransCAD and VISUM.

Trip Distribution: The direction from which traffic will access the site can vary depending on many factors such as the type of proposed development and the area which it will attract traffic, surrounding land uses and population and conditions of the surrounding street system. Document the methods and assumptions made in this section.

Trip Assignment: The final product of this process is total project generated trips, by direction and turning movement, on each segment of the TIS area roadway network. The assignment should reflect the horizon years and consider future conditions of the roadway. Typically, the County uses a 3 year projected and 20 year projected traffic volume. Additional horizon years may be necessary depending on proposed phasing.

Internal Trips: Trips captured internally by a proposed development may be applicable depending on the use. The internal capture rates used should be based on ITE's *Trip Generation Handbook (2004).*

Pass-by trips: Trip generation analysis yields the number of vehicle trips that a site is expected to generate at its driveways. Many land uses do not generate only new trips to the roadway system. A percentage of their trips are simply diverted from trips already passing by on the adjacent roadway system. Pass by trips diverted from a roadway should be rechecked if they represent more than 15% of the traffic volume on that roadway.

v. **Transportation Analysis**: Capacity analysis is required for each of the major street and site access locations (signalized and un-signalized) within the TIS area. A clearer understanding of both the transportation related implications of the project and the necessary improvements to ensure acceptable operating conditions should result from this section of the TIS. In addition, several factors should be considered, including the following:

- ✓ Safety
- ✓ Neighborhood Impacts
- ✓ Traffic Control Needs
- ✓ Transit Needs or Impacts
- ✓ Transportation Demand Management
- ✓ Circulation Patterns
- ✓ On-site Parking Adequacy and Off-site Parking Facilities
- ✓ Pedestrian and Bicycle Movements
- ✓ Service and Delivery Vehicle Access

Transportation Safety: The initial review of existing conditions within the TIS area should include analysis of crash data from the 3 most recent years. Any intersection experiencing a crash rate of over 1 per million entering vehicles may need additional analysis. The proposed site plan should ensure that the internal circulation system and external access points improve pedestrian safety and minimize vehicle/pedestrian conflict points.

Guidelines: Impacts on transportation operations shall be measured based on the definitions contained in the *Highway Capacity Manual (Transportation Research Board 2000)***.** For each analysis period studied (typically 3 and 20 year periods) and for each phase of the project a projected total traffic volume must be estimated for each critical intersection and roadway segment being analyzed. The projected total traffic volumes (consisting of the summation of existing traffic, background growth traffic, background development traffic and site traffic) will be used in the next step-capacity analysis of future conditions.

Signalized Intersections: Level Of Service (LOS) is based on roadway system characteristics that include:

- traffic volume
- lane geometry
- percentage of trucks
- peak hour factor
- number of lanes
- signal progression
- ratio of green time to cycle time (G/C)
- roadway grades
- parking conditions
- pedestrian flows

The LOS categories established in the *Highway Capacity Manual* are used by the County and are detailed in adopted Community Plans. In general, LOS ratings of A to D are acceptable while E & F ratings must be mitigated. Specific LOS rating requirements may vary as specified in adopted community plans for approved re-zoning cases. These Community Plans are available through the Planning & Zoning Division.

The *Highway Capacity Manual* no longer supports manual computations. Computer software (McTrans 2005) or the following packages are acceptable

for computing LOS at signalized intersections: AIMSUM, aaSIDRA, CUBE DYNASIM, Paramics, PASSER II-02, PASSER V-03, PASSER III-98, SIGNAL 2000, SIG/Cinema, SimTraffic, Synchro, TEAPAC, TRANSYT-7F, TSIS (CORSIM) and VisSim.

Unsignalized Intersections: LOS for two way stop controlled (TWSC) and all way stop controlled (AWSC) intersections must be determined by computing or measuring control delay. Where driveway capacity analysis shows a LOS of D or worse, an analysis should be completed to determine if a signal or turn restriction might be needed.

Roundabouts: H & T supports the use of roundabouts where appropriate. Each proposed location will be evaluated on a case by case basis. The capacity of a roundabout must be evaluated, and appropriate tools selected such as aaSIDRA, ARCADY, HCS+, Paramics, Rodel, Synchro 6, TRAFFIX 7.7 or VisSim.

vi. **Improvement Analysis**: The improvements required to accommodate existing, background and site generated traffic are summarized in this section. Intersections serving the development should be analyzed first. The analysis should include the following steps:

- ✓ Identification of critical movements and corresponding intersection approaches.
- ✓ Evaluation of each critical movement under potential scenarios of adding lanes, altering signal phasing, signal timing or lane use.
- ✓ Evaluation of signal locations, phasing and timing, with particular emphasis on corridor signal progression.
- ✓ Evaluation of queue lengths for both turn and through lanes to ensure adequate storage space.
- ✓ Identification of potential improvements within the contexts of right of way availability, intersection spacing, signal progression, County design standards and practical feasibility.

vii. **Findings & Recommendations**: Throughout the TIS, data should be presented in tables, graphs, maps and diagrams in lieu of a narrative, for clarity and ease of review. The examples contained in ITE's 2006 Publication No. RP-020C *Transportation Impact Analysis of Site Development* is an excellent source of information. The information proposed in this section of the TIS should be discussed with H&T several times before being finalized. A draft report should be submitted for comment prior to making final recommendations.

Appendix

Example Report Outline

As a guide for the organization of the report, the following sample table of contents is offered:

I. Introduction and Summary
   A. Purpose of Report and Study Objectives
   B. Executive Summary
      1. Site location and study area
      2. Development description
      3. Types of studies undertaken (impacts, signal warrant, site access, etc.)
      4. Principal findings
      5. Conclusions
      6. Recommendations

II. Proposed Development (Site and Nearby)
   A. Off-Site (or Background) Development
   B. Description of On-Site Development
      1. Land use and intensity
      2. Location
      3. Site plan
      4. Zoning
      5. Phasing and timing

III. Existing Area Conditions
   A. Study Area
      1. Area of influence
      2. Area of significant transportation impact (may also be part of Chapter IV)
   B. Study Area Land Use
      1. Existing land uses
      2. Existing zoning
      3. Anticipated future development

   C. Site Accessibility
      1. Area roadway system
         a. Existing
         b. Future
      2. Traffic volumes and conditions
      3. Transit service
      4. Pedestrians and bicyclists
      5. Existing relevant transportation system management programs
      6. Other as applicable

IV. Projected Traffic
   A. Site Traffic (each horizon year)
      1. Trip generation
      2. Trip distribution
      3. Modal split
      4. Trip assignment
   B. Through Traffic (each horizon year)
      1. Method of projection
      2. Non-site traffic for anticipated development in study area

        a. Method of projections
        b. Trip generation
        c. Trip distribution
        d. Modal split
        e. Trip assignment
    3. Through traffic
    4. Estimated volumes
C. Total Traffic (each horizon year)

V. Transportation Analysis
A. Site Access
B. Capacity and Level of Service
    1. Existing conditions
    2. Background conditions (existing plus growth) for each horizon year
    3. Total traffic (existing, background and site) for each horizon year
C. Transportation Safety
D. Traffic Signals
E. Site Circulation and Parking

VI. Improvement Analysis
A. Improvements to Accommodate Existing Traffic
B. Improvements to Accommodate Background Traffic
C. Additional Improvements to Accommodate Site Traffic
D. Alternative Improvements
E. Status of Improvements Already Funded, Programmed, or Planned
F. Evaluation

VII. Findings
A. Site Accessibility
B. Transportation Impacts
C. Need for Any Improvements
D. Compliance with Applicable Local Codes

VIII. Recommendations
A. Site Access/Circulation Plan
B. Roadway Improvements
    1. On-site
    2. Off-site
    3. Phasing, if appropriate
C. Transit, Pedestrians and Bicycles
D. Transportation System Management/Transportation Demand Management Actions
    1. Off-site
    2. On-site operational
    3. On-site
E. Other

IX. Conclusions

BIBLIOGRAPHY: Institute of Transportation Engineers: Publication No. RP-020C, *Transportation Impact Analysis for Site Development 2006.*