APPENDIX B TRANSPORTATION IMPACT STUDY GUIDELINES

B.1 GENERAL

These Transportation Impact Study (TIS) guidelines are established to help ensure a standard process, set of assumptions, set of analytic techniques, and presentation format to be used in the preparation of the TIS. All TISs prepared for the County shall be prepared in conformance with these guidelines.

B.1.1 Types of Study

A. Master TIS

Where large, complex projects (big box retail or residential developments over 100 acres) are planned or a project is phased over a multi-year build-out, it may be appropriate to prepare a Master TIS for the initial action followed by periodic updates for specific phases. The Master TIS must include overall phasing of improvements to coincide with project phasing.

B. Individual Site TIS

An individual site TIS is prepared for a project that stands alone or is a phase of a master development. It can be for a new use in an existing or remodeled building, the construction of a new building (either single occupant or multi-user), construction of multiple buildings, or the construction of new residential development.

B.1.2 Levels of Analysis

For an Individual Site TIS, the following levels of analysis apply:

A. Full TIS

A full TIS is required if one or more of the following conditions occur:

- Vehicular Traffic: The site-generated traffic exceeds 1,000 trips/day or 100 peak-hour trips, or new high-volume access to an arterial roadway or State Highway is proposed.
- Pedestrian Traffic: Paved pedestrian facilities exist or will be constructed on or adjacent to the site, or the proposed use will generate an increase in new pedestrian traffic.
- Bicycle Traffic: Paved bicycle lanes or paths exist or will be constructed on or adjacent to the site, or the proposed use will generate an increase in new bicycle traffic.

B. Intermediate TIS

An Intermediate TIS may be considered instead of a Full TIS if all the following requirements are met:

- Vehicular Traffic: Daily vehicle trip-end generation is between 501 and 1,000 inclusive, the peak hour trip generation is between 51 and 100, no high volume access to arterials or State Highways are proposed, and the Level of Service (LOS) of the adjacent facility when the development is

completed equals or exceeds the minimum allowable LOS standard established for that facility.

- Pedestrian Traffic: No paved pedestrian facilities exist or will be constructed on or adjacent to the site, or the proposed use will not generate any new pedestrian traffic.
- Bicycle Traffic: No paved bicycle lanes or paths exist or will be constructed on or adjacent to the site, or the proposed use will not generate any new bicycle traffic.

C. Transportation Memorandum

A Traffic Memorandum may be considered if all the following requirements are met:

- Vehicular Traffic: Daily vehicle trip-end generation is less than or equal to 500, or the peak hour trip generation is between 21 and 50, and the proposed access is for local roadways or minor collector roadways only.
- Pedestrian Traffic: Paved pedestrian facilities exist or will be constructed on, or adjacent to, the site; or, the proposed use will not generate an increase in new pedestrian traffic.
- Bicycle Traffic: Paved bicycle lanes or paths exist or will be constructed on, or adjacent to, the site; or, the proposed use will not generate an increase in new bicycle traffic.

D. No TIS Required

No TIS is required if all of the criteria below are satisfied:

- Vehicular Traffic: (1) Daily vehicle trip-end generation is less than 100 or the peak hour trip generation is less than 10; (2) there are no additional proposed minor or major roadway intersections on major collectors, arterials, or State Highways; (3) the increase in the number of vehicular trips does not exceed the existing trip generation by more than 10 peak hour trips or 100 daily trip ends; (4) the change in the type of traffic to be generated (i.e., the addition of truck traffic) does not adversely affect the traffic currently planned for and accommodated within, and adjacent to, the property; (5) acceptable LOS on the adjacent public roadways, accesses, and intersections will be maintained; (6)no roadway or intersection in the immediate vicinity has a history of safety or accident problems; and (7) there is no change of land use with access to a State Highway.
- Pedestrian Traffic: Paved pedestrian facilities exist or will be constructed on, or adjacent to, the site; or, the proposed use will not generate any new pedestrian traffic.
- Bicycle Traffic: Paved bicycle lanes or paths exist or will be constructed on, or adjacent to, the site; or, the proposed use will not generate any new bicycle traffic.

B.1.3 Revisions and Updates

An approved TIS that has been prepared in the last three years may be revised or updated where a proposed access is changed or a change in the proposed action may result in new trip generation that exceeds the original trip generation estimates. An amendment letter addressing the changes may be accepted provided the letter adequately addresses: (1) an estimate of site trip generation, (2) existing site trip generations, (3) the differences between anticipated estimates and existing trip generation, and (4) changes to the bicycle or pedestrian facilities. If the original TIS is older than three years, an entirely new TIS shall be prepared.

B.2 TIS PARAMETERS

A TIS shall include the following information.

B.2.1 Project Description

A description of the proposed project shall be prepared and include the type of land use and size of the proposed project (e.g., number of dwelling units of building square footage, etc.). Any proposed phasing shall be discussed and the anticipated completion date established. A figure depicting the proposed site plan shall also be included and the proposed vehicular access location shall be described. This section of the TIS shall also include a description of how pedestrians and bicycle travel will be accommodated within the proposed site plan. This shall include a discussion of types of sidewalks (attached/detached), pathways, and connections to local and perimeter destinations.

B.2.2 Analysis Horizons

Three study horizons are required for a Master TIS analysis: the existing (current), the short-range (short-range) and the long-range build-out (20-25 years). An Individual TIS analysis shall be based on build-out.

A. Existing Horizon

The intent of completing an analysis of the existing (current) study horizon is to establish a baseline of traffic conditions.

B. Short-Range Horizon

The intent of the short-range planning horizon is to investigate the immediate impacts of the completed, proposed project on the existing and committed roadway network. The short-range planning horizon year is defined as one year after the full occupancy of the project. If the project is proposed to occur over multiple phases, each phase shall be evaluated for impacts one year after the occupancy of the phase for the short-range analysis.

C. Long-Range Horizon

The third planning horizon is the long-range planning horizon. It shall be based on the current MTCP planning horizon and related modeling. The model shall be updated based on existing counts where necessary. In such situations, the current counts shall be increased by application of a growth rate established by the ECM Administrator. The intent of the long-range planning horizon is to

evaluate the implications of the fully developed project on the long-range traffic condition. This study horizon is for the ECM Administrator's use as an indicator of traffic for planning purposes and the determination of the necessary right-of-way.

B.2.3 Study Area

The limits of the transportation network to be studied shall be based on the size and extent of the proposed development, the existing and future land uses, and traffic conditions on and near the site.

The limits of the study area shall be agreed to by the ECM Administrator before preparing the TIS. The Master TIS shall generally establish the study area for all subsequent Individual TISs.

A. Study Area Basis for Master TIS

- All adjacent and internal collector and arterial roadways;
- Offsite collector and arterial links within the study area that are impacted by 10 percent or more by the project;
- Continuity and adequacy of pedestrian and bicycle facilities to the nearest attraction (existing or planned);
- Access to the most direct public transportation services facility or public transportation services route where public transportation services are available; or
- Any pedestrian routes within 2 miles of a school.

B. Study Area Basis for Individual Full TIS

- All adjacent roadways, intersections, and high-volume accesses;
- Nearest offsite major intersection(s);
- Offsite collector and arterial links within the study area that have impacted intersections as defined below or provide the primary connections between the project and urban services;
- Internal public roads, including establishing the road classification;
- Additional offsite major intersections where: the project contributes a 10 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a LOS of C or better in the Short-Range Horizon, or the project contributes a 5 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a LOS of D or worse in the Short-Range Horizon;
- Additional offsite minor intersection where the project contributes a 30 percent increase in volume (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where any existing leg of the intersection is currently operating at a LOS of E or worse;
- Pedestrian and bicyclist destinations (existing or planned) to the nearest attraction;

- Access to the most direct public transportation services facility or public transportation services route (existing or planned) within 1,320 feet of the site where public transportation services are available; or
- Any pedestrian routes within 2 miles of a school (residential land uses only).

C. Study Area Basis for Individual Intermediate TIS

- All adjacent roadways, intersections, and high-volume accesses;
- The nearest offsite major intersection(s) only if: the project contributes a 10 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a LOS of C or better in the Short-Range Horizon, or the project contributes a 5 percent impact (during either the A.M. or P.M. peak hour) to any approach leg of the intersection where the intersection is operating at a LOS of D or worse in the Short-Range Horizon,
- Offsite collector and arterial links within the study area that have impacted intersections;
- Internal public roads, including establishing the road classification;
- Pedestrian and bicyclist destinations (existing or planned) to the nearest attraction;
- Access to public transportation services where available; or
- Any pedestrian routes within 2 miles of a school (residential land uses only).

D. Traffic Memorandum

- All adjacent roadways, intersections, and high-volume accesses;
- Internal public roads, including establishing the road classifications;
- Continuity and adequacy of pedestrian and bicycle facilities adjacent to the site; or
- Access to the most direct public transportation services facility or public transportation services route adjacent to the site.

B.2.4 Evaluation Elements

A. Evaluation Elements for a Master TIS

The purpose of the Master TIS is to provide a general sense of the overall impacts to the transportation system and to identify the larger scale improvement needs necessitated by the proposed zoning (i.e., widening of arterials, connecting key gaps in the roadway system, etc.). For example, for a large development plan with a multi-phase build-out, the Master TIS would not only address the overall project, but also identify key measurable criteria that would trigger the construction of some incremental portion of the overall infrastructure improvement plan. Typically, with each phase of the project a new individual site TIS specific to that phase would be prepared. This new study would verify the

accuracy of the original traffic projections, both on site and background, and check the criteria identified for infrastructure improvements and other pertinent information.

The key elements of the project impact assessment for a Master TIS shall include the following minimum evaluations:

- Conformity with the adopted MTCP and ECM;
- Peak hour link volume and LOS;
- Appropriateness of access locations;
- Multi-modal and Transportation Demand Management (TDM) opportunities;
- Pedestrian/bicycle requirements and improvements;
- Safety and accident analysis. Other items requested by the ECM Administrator in the Scoping Meeting; and
- Neighborhood and public input issues.

In cases where a developer seeks vesting with a Site Specific Development Plan, the Master TIS is required to present all the detailed information required in an Individual Site Transportation Impact Study.

B. Evaluation Elements for a Full TIS

The key elements of the project impact assessment shall be specified by the ECM Administrator from the following list:

- Conformity with the adopted MTCP and ECM;
- Peak hour link volume and LOS;
- Peak hour intersection and access LOS;
- Appropriateness of access locations;
- Location and requirements for turn lanes or acceleration/deceleration lanes at accesses or intersections, including recommendations for taper lengths, storage length, acceleration/deceleration lengths, and other geometric design requirements;
- Sight distance evaluations and recommendations (intersection, stopping, passing);
- Multi-modal and TDM opportunities;
- Continuity and adequacy of pedestrian and bicycle facilities to the nearest attraction (existing or planned) within the study area;
- Recommended traffic control devices for intersections which may include two-way stop control, four-way stop control or yield signs, school flashes, school crossing guards, crosswalks, traffic signals, or roundabouts;
- Traffic Signal and stop sign warrants;
- Progression analysis for signalized intersections;
- Appropriateness of the existing roadway signing and striping;
- Safety and accident analysis;

- Other items as requested by the ECM Administrator in the Scoping Meeting; and
- Neighborhood and public input issues.

C. Evaluation Elements for an Intermediate TIS

- The key elements of the project impact assessment shall be specified by The ECM Administrator from the following list:
- Conformity with the adopted MTCP and ECM;
- Peak hour link volume and LOS;
- Peak hour intersection and access LOS;
- Appropriateness of access locations;
- Location and requirements for turn lanes or acceleration/deceleration lanes at accesses or intersections, including recommendations for taper lengths, storage length, acceleration/deceleration lengths, and other geometric design requirements;
- Sight distance evaluations and recommendations (intersection, stopping, passing);
- Continuity and adequacy of pedestrian and bicycle facilities to the nearest attraction (existing or planned) within the study area;
- Recommended traffic control devices for intersections, which may include two-way stop control, four-way stop control or yield signs, school flashers, school crossing guards, crosswalks, traffic signals, or roundabouts;
- Traffic signal and stop sign warrants;
- Progression analysis for signalized intersections;
- Appropriateness of the existing roadway signing and striping;
- Safety and accident analysis;
- Other items as requested by the ECM Administrator in the Scoping Meeting; and
- Neighborhood and public input issues.

D. Traffic Memorandum

The key elements of the project impact assessment shall be specified by the ECM Administrator from the following list:

- Peak hour link volume and LOS;
- Peak hour access LOS;
- Appropriateness of access locations;
- Location and requirements for turn lanes or acceleration/deceleration lanes at the access, including recommendations for taper lengths, storage length, acceleration/deceleration lengths, and other geometric design requirements;

- Sight distance evaluations and recommendations (intersection, stopping, passing);
- Continuity and adequacy of pedestrian and bicycle facilities within the study area;
- Appropriateness of the existing roadway signing and striping;
- Other items as requested by the ECM Administrator in consultation with the applicant's traffic engineer; and
- Neighborhood and public input issues.

E. Board of County Commissioners Rights Reserved

The BOCC reserves the right and ability to review the cumulative impacts created by the proposed development and to require improvements to mitigate the impacts.

B.3 ASSESS TRAFFIC VOLUMES

B.3.1 Existing Traffic

A. Roadway Traffic Volumes/Traffic Counts

Current A.M. and P.M. peak hour traffic counts as specified by the ECM Administrator shall be obtained for the roadways within the study area for one, non-holiday Tuesday, Wednesday, or Thursday. Each peak hour count shall be conducted over a two-hour period and shall include fifteen (15)-minute count data to clearly identify the peak hours.

Weekend counts and average daily counts on local roadways may also be required where appropriate when requested by the ECM Administrator. The DOT or CDOT average weekday traffic (AWT) counts may be used when available. Pedestrian counts and bicycle usage should be obtained. Vehicle classification counts may be required.

In any case, these volumes shall be no more than one year old (from the date of application submittal). The source(s) of each of the existing traffic volumes shall be explicitly stated. Summaries of current traffic counts shall be provided. The ECM Administrator may require the use of seasonal adjustment factors depending on when data was collected and if the project is considered to be in an area of higher risk for lower levels of services (i.e., Tourism).

B. Intersection LOS

A.M. and P.M. peak hour intersection LOS shall be determined for the existing collector and arterial signalized and unsignalized intersections within the transportation network to be studied. The analysis shall use procedures described in the Highway Capacity Manual. Factors for intersections will be by approach and those used for roadways will be by facility unless otherwise directed by the ECM Administrator.

1. Existing and Short-Range Horizon

Use calculated peak hour factors or 0.85, whichever is higher, and

2. Long-Range Horizon

A peak hour factor of 0.95 may be used for the Long-Range Horizon. Greater values may be used if approved by the ECM Administrator.

C. Roadway Links

Roadway links shall be analyzed. Acceptable maximum traffic volumes allowed for the specific class of roadway are shown in Table B-1.

Table B-1. Threshold Capacity

Facility Type	Lanes	ADT Threshold Capacity (Urban/Rural)
Local (low volume)/Local (rural)	2	300/750
Collector-Non-Residential	2	20,000
Local (urban)/Minor Collector (rural)	2	3,000/1,500
Major Collector	2	10,000/3,000
Minor Arterial	4	20,000/10,000
Principal Arterial (4-lane)	4	40,000/40,000
Principal Arterial (6-lane)	6	40,000/40,000
Expressway (4-lane)	4	48,000/48,000
Expressway (6-lane)	6	48,000/48,000

B.3.2 Background Traffic

A. Short-Range Volume Projections

The traffic forecast for the short-range planning horizon shall be the sum of existing traffic volumes plus cumulative development traffic from approved land use actions (projects with reserved intersection capacity established through a certified Full TIS), plus background growth (as adjusted to avoid duplicative consideration of the identified development traffic from the approved land use already considered). The cumulative development traffic shall be based, in part, on the A.M. and P.M. peak hour and (ADT) data established and accepted from planned and approved land use actions within and near the study area. The assumed baseline surface transportation network shall reflect existing facilities (without the proposed project improvements) plus any committed improvements within the study area.

The short-range planning horizon background traffic growth rate shall be based:

- Straight line projection for the build-out year between the existing traffic volumes and the MTCP model forecast, CDOT rates;
- Historical traffic counts projected to the build-out year (at least three years of traffic data should be used for this); or

- Area-wide traffic count analysis that considers traffic volume trends in the study area's circulation system and uses proportion/extrapolation methods.

B. Long-Range Volume Projection

- Straight line projection for the build-out year between the existing traffic volumes and the MTCP model forecast, CDOT rates;
- Historical traffic counts projected to the build-out year (at least three years of traffic data should be used for this);
- Area-wide traffic count analysis which considers traffic volume trends in the study area's circulation system and uses proportion/extrapolation methods; or
- Growth rate agreed upon with the ECM Administrator.

B.3.3 Project Traffic

A. Trip Generation Rate

Trip generation shall be calculated from the latest data contained within the Institute of Transportation Engineers' Trip Generation Manual. Other industry publications (such as the ITE Journal or other sources) may be approved by the ECM Administrator. Data limitations, data age, choice of peak hours (for the land use or adjacent roadway traffic), choice of independent variables, and choice of average rate versus statistically significant modification shall be discussed in the study when appropriate. When data is not available for a proposed land use or a modification is proposed, the Applicant must conduct a local trip generation study following procedures prescribed in the ITE Trip Generation Manual and provide sufficient justification for the proposed generation rate. This rate must be approved by the ECM Administrator prior to its use in the written study.

B. Preliminary Land Use Assumptions

The trip generation values contained in studies submitted prior to the establishment of a site-specific development plan shall be based on the maximum number of dwelling units permitted for the approved land uses or the maximum trip generation rates for the non-residential development proposed land use action. When a TIS is being developed for a project with an established site-specific development plan, trip generation shall be based on actual dwelling unit counts and square footage(s) proposed on the final plan.

C. Trip Generation Table

A Trip Generation Table, listing each type of land use within the site at build-out, the size and unit of measure for each land use, trip generation rates (total daily traffic, A.M. and P.M. peaks), directional splits for each in/out access, and the resultant total trips generated shall be provided. The data source shall include ITE land use code. Build-out land uses and trip generations shall be used for both the short-range and long-range planning horizons.

D. Committed Trips/Capacity

The trip generation stated in the TIS will establish the maximum number of trips permitted entering and exiting the development. If the number of committed trips is reached prior to full occupancy, the ECM Administrator reserves the right to require from the sponsor, at the sponsor's expense, supplemental traffic analyses prior to the issuance of additional building permits. This information shall demonstrate that uncommitted capacity is available on the transportation network to serve the excessive trips, or that additional transportation mitigation improvements can be reasonably installed to maintain compliant operation with the excessive trips. If no additional capacity is available, or no reasonable mitigation conforming to the requirements of these roadway standards can be implemented, the owner shall obtain an exception from the ECM Administrator for the non-conformity or scale back the intensity of the proposed land uses as needed to achieve compliance. If the project is fully occupied and it is determined that the approved land use action's traffic exceeds that which was included in the approved TIS, the ECM Administrator is authorized to require the property to conduct additional traffic analysis and provide additional mitigation measures.

E. Adjustments to Trip Generation

Trip-making reduction factors may be used after first generating trips at full ITE rates. These factors fall into two categories: those that reassign some portion of generated trips to the background stream of traffic, and those that remove or move generated trips. In all cases, the underlying assumptions of the ITE trip generation rates must be recognized and considered before any reductions are used in the TIS. Two specific situations will be closely reviewed. The first is when the traffic study assumes rates where the collection of mixed uses, such as at a shopping center, result in lower peak hour trips than when applying individual rates to each land use. The second is when reductions in the trip generation rates are assumed based on reductions due to travel demand management.

1. Pass-by Trips

This first category may be considered when trips to the proposed development currently exist as part of the background traffic stream, referred to as a pass-by trip. Pass-by percentages identified in the ITE Trip Generation Manual will be considered with appropriate explanation and documentation. Pass-by traffic must remain assigned to driveways and access points, but should not be added to the background traffic stream. A technical appendix, table, or map that illustrates the re-diversion of pass-by trips is required.

2. Internal Site Trips/ Transportation Demand Management (TDM)

Analytic support documentation of internal site trips, public transportation services use, and TDM actions shall be provided to show how trip adjustments are derived. Optimistic assumptions regarding public transportation use and TDM actions will not be accepted unless

accompanied by specific implementation proposals that will become a condition of approval. Such implementation proposals must have a high expectation of realization within a 5-year period after projection initiation.

F. Trip Distribution

Trip Distribution must be documented in the TIS. It may be based on the professional engineer's judgment applied to one or more of the following: MTCP traffic volume projections, gravity model, market analysis, existing traffic flows, or applied census data. Regardless of the basis of the estimates, the procedures and rationale used in determining the trip distributions must be fully explained, documented, and approved by the ECM Administrator.

G. Trip Assignment

The project traffic will be assigned to the roadway system according to the trip distribution. The resulting project site-generated traffic and total site traffic will be depicted on figures for each analysis horizon. These figures will include peak hour traffic volume information, plus daily traffic volume information. Separate maps or values are required when the trip distribution differs by more that 10 percent between the short-and long-range analysis horizons.

B.3.4 Total Traffic

The total traffic projections will be determined for each of the analysis horizons identified in the base assumptions. The total traffic projections will include the existing traffic, plus the future background traffic, plus the project generated traffic. The future total traffic projections will be depicted on figures for each study year. Based upon the total traffic projections, roadway standards, and MTCP, the applicant shall provide roadway functional classification recommendations.

B.4 ASSESS PROJECT IMPACTS

B.4.1 Project Impact Assessment

The key elements of the project impact assessment include evaluations of issues outlined for a specific Analysis Level.

A. Project Impacts

The key elements of the project impact analysis include:

- Generalized Daily Traffic Volume Level of Service
- Using the daily traffic volumes forecast and general daily level of service thresholds, a general evaluation should be made of the arterial roadway system for the short term and long-term horizon years. Incremental differences attributable to the land use action should be identified. A map showing generalized levels of service should be presented for each design year.
- For unsignalized intersections of 2 lane (and rarely on 4-lane) roads, where traffic on the main road is not stop controlled, an evaluation for the

need for auxiliary speed change lanes is to be provided (reference Section 2.3.7.D).

- Peak Hour Intersection Level of Service
- An a.m. and p.m. peak hour intersection level of service analysis shall be conducted for each intersection, based on procedures specified in the Highway Capacity Manual. All level of service analysis worksheets shall be included in the Appendix.
- The principal objective of the intersection level of service traffic impact analysis is to identify whether the traffic from the proposed project when added to the existing plus short and long term planning horizon traffic will result in a significant impact and an unacceptable LOS. For definitional purposes, the threshold for acceptable LOS is C during off-peak hours and not less than LOS D for peak hours.
- Significance for signalized intersections is defined as when the added project traffic causes an intersection to fail the minimum acceptable LOS standard; or when the background traffic conditions (without project traffic) causes an intersection to fail the minimum acceptable LOS standards; and when the project traffic causes more that a 2 percent increase in the intersection delay. Significance for unsignalized intersections is defined when backstacking to adjacent intersections would create impeded traffic flows and/or excessive congestion; when added project traffic is determined to create potential safety problems.

B. Traffic Signals and Access Locations

Traffic signals warranted by the land use action a signal warrant analysis (based on the MUTCD) shall be identified. The acceptability of the signal locations must be demonstrated through a signal progression (time-space) analysis. The analysis shall consider any existing access or intersection or a possible future signal location along the arterial for a distance of at least one mile in each direction of the proposed signal. A cycle length of between 80 and 120 seconds should be selected and agreed to by the ECM Administrator. A travel speed of 45 mph on majors and 35 mph on minors, unless the existing posted speed limit is less, must be used. A major arterial bandwidth of 50 percent and a minor arterial bandwidth of 40 percent are considered desirable, and must be used where existing conditions allow. Where intersections or other accesses have no signals presently, but are expected to have signals, a 60 percent mainline, 40 percent cross roadway, and cycle split should be assumed. Where more detailed information is available from turning movement projections, other split assumptions may be made.

Any access where a signal would reduce the desirable bandwidth shall be identified. In general terms, that access should remain unsignalized and have turning movements limited by access design or median islands, unless the impacts to traffic operation and safety are made worse. The implications of the

land use action upon the adequacy of the signal locations for each design year shall be provided. Distances between signalized intersections (centerline) shall be indicated. Signal progression worksheets (time-space diagrams) shall be included in the TIS Appendix.

The following signalization and access parameters shall also be addressed:

- Turn lane storage needs shall be identified for the "necessary" situation, based on projected turning volumes and AASHTO analytic techniques. Appropriate documentation of the calculations must be provided;
- The identification of project sight distance at the project entrances and all internal roadways shall be conducted. Line of sight triangles for determining sight distances and landscape restrictions shall be prepared and submitted.
- Appropriateness of acceleration or deceleration lanes.
- All proposed project entrances on arterials shall be evaluated as to whether they require acceleration lanes or deceleration lanes per the requirements presented in these Standards.

C. Pedestrian and Bicycle Impact Evaluations

Pedestrian and bicycle facility demand shall be identified and related items for discussion shall include:

- School routing plans shall be developed per the MUTCD between the project and all schools within 2 miles of the project boundary.
- The demand for pedestrian and bicycle facilities to serve high pedestrian activity areas with the land use shall be evaluated and properly accommodated for the planning of the project.
- The need for links of bicycle or pedestrian facilities to neighboring land uses or attractions (trails, etc.) within 1,320 feet or greater if applicable to unique pedestrian-oriented destinations) of the project site.
- Existing and proposed sidewalk width, separation from traffic, and space available for trees, public transportation services stops (if any), or other related elements (if any).
- Geometric improvements and recommended traffic control devices to accommodate pedestrians and bicyclists.

D. Pedestrian and Bicycle Level of Service

Existing and proposed pedestrian and bicycle facilities shall be evaluated for compliance with the following elements:

1. Directness

Walking distance to destinations like public transportation services stops, schools, parks, and commercial or activity areas shall be direct. Measurement of directness is the ratio of the actual distance to a

destination via a sidewalk or pathway divided by the minimum distance characterized by a grid roadway system,

2. Continuity

The sidewalk/walkway system shall be complete, without gaps. The pedestrian corridor shall be integrated with the activities along the corridor and shall provide continuous access to destinations,

3. Roadway Crossings

Safety and comfort is essential while crossing roadways, intersections, and mid-block crossings. Factors that affect safety include number of lanes to cross, crossing delay for pedestrians, signal indication, cross-walks, lighting, raised medians, visibility, curb ramps, pedestrian buttons, convenience, comfort, and security,

4. Visual Interest and Amenity

Pedestrians enjoy visually appealing environments that are compatible with local architecture and include roadway lighting, fountains, and benches.

5. Security

Pedestrians shall be visible to motorists, separated from motor vehicles and bicycles, and under adequate roadway lighting.

6. Surface Condition

Pedestrian facilities shall be free from obstructions, cracks, and interruptions.

E. Special Studies

This section provides the ECM Administrator with opportunities to require specific focused traffic analyses that may be unique to the proposed land use action. The ECM Administrator will determine if special studies are required in a Scoping Meeting. These may include, but are not limited to, the following:

1. Access Management

- If a development is proposing a new access location on an arterial and an Access Management Plan does not exist, the ECM Administrator may require an Access Management Plan. Proposals to access roads classified as arterials and above shall require review through the Major Thoroughfares Task Force Process;
- Access spacing;
- Accident/safety concerns (accident statistics);
- Truck routing;
- Emergency and snow routes; and
- Hazardous materials routes.

2. Neighborhood Transportation Impact Evaluation

The TIS may be required to include a focused analysis of the potential project-related impacts on adjacent residential neighborhood quality of life issues, such as potential cut-through traffic and speeding/volume concerns. If it is determined that a neighborhood transportation impact evaluation is required, the following procedure shall be followed:

- Examine existing transportation conditions within the neighborhood following the procedure as set forth for the transportation impact analysis. Daily and peak hour traffic volumes shall be collected for the local roadways to be included in the analysis;
- Determine project-generated traffic for all modes within the neighborhood and show on a figure;

3. Determine total traffic projections for the local roadways

This shall follow the same procedures as described earlier, including other projects and area-wide growth, if applicable:

- Determine if the proposed project would create significant impacts to the residential roadways;
- If necessary, develop measures including, but not limited to, traffic calming techniques, to mitigate any significant impacts; and
- The neighborhood TIS shall also discuss how pedestrians and bicyclists would access the proposed project from the adjacent neighborhood(s), and the need for special facilities to enhance direct pedestrian and bicycle connectivity.

4. Sight Distance

Sight distance concerns that are anticipated or observed which may impact access, intersection, or roadway operation and safety need to be discussed in the TIS. Recommendations regarding stopping sight distance, intersection sight distance, and passing sight distance needs shall be provided for detailing on the final development, site plan, or final construction plans.

B.5 DEVELOP MITIGATION MEASURES

When a project's vehicular impacts do not meet the minimum acceptable LOS standard, the TIS shall include feasible measures, which would mitigate the project's impacts. The mitigation measures are intended to be in addition to the minimum required improvements necessary to meet these standards. One goal of the mitigation measure(s) should be to minimize the demand for trips by single occupant vehicles and to increase the use of the alternative modes.

The intersection LOS shall be recalculated to reflect the effectiveness of the proposed mitigation measures and show that the project-related impacts have been reduced to an acceptable LOS.

The LOS findings shall be shown in tabular form. The following mitigation categories are not listed in order of priority.

B.5.1 Transportation Demand Management Measures

Transportation Demand Management measures are designed to facilitate the use of alternate transportation modes in an effort to decrease demand on the roadway system by single occupant vehicles. A detailed description of the proposed TDM measures and implementation plan must be included in the TIS for any project seeking TDM-related trip reductions. If the TDM program is acceptable to The ECM Administrator, the total project vehicle trips may be reduced by an amount commensurate with applicable trip reduction policies.

A. Examples of TDM Measures

- Vehicle trip reduction incentives and services offered by employers to encourage employees to utilize alternative modes of travel, such as carpooling, vanpooling, riding public transportation services, bicycling, walking, telecommuting, etc.;
- Vehicle trip reduction incentives and services affecting visitors to the project, such as shoppers, clients, patrons, etc.;
- Financial support for the capital or operating costs of enhanced public transportation services or vanpool service to the project;
- Provision of a mix of land uses in close proximity, facilitating trip making by walking, bicycling, or local shuttles;
- Provision of on-site facilities that encourage the use of alternate forms of transportation, such as bicycle lanes and amenities, enhanced pedestrian connections, telecommuting facilities, etc.; and
- Site trip cap and/or parking cap including trip-monitoring agreements.

B.5.2 Public Transportation Service

Suggested elements of a public transportation services program include:

- Contributions of equipment or funds to increase the capacity of existing public transportation systems,
- Public transportation shuttles provided by Applicant (e.g., bus, taxicab, van, etc.), and
- Contributions toward park and ride lots, public transportation services stations or centers.

B.5.3 Traffic Control

There are many ways to control traffic and enhance safety and mobility for motorists, pedestrians and bicyclists. Each component of a traffic control system must be viewed as a single unit in an overall network.

A. Medians

Medians are grouped into three general types (i.e., raised, depressed, and flush) and are designed for both through traffic and access control.

B. Signals

Design of all traffic signals shall be in accordance with the MUTCD and the CDOT Standards and Specifications. Traffic signal plans shall be submitted to and approved by the ECM Administrator prior to initiating installation.

C. Signing and Striping

Signing and Striping plans are required for signing/striping of new roadways and re-signing/striping of existing roadways. All plans shall be prepared in accordance with the MUTCD and included with the final construction plans for review and approval.

D. Traffic Control Plans

Traffic control during construction shall be planned and performed in accordance with the MUTCD and be included with the final construction plans for review and approval.

B.5.4 Roadway Widening and Other Physical Improvements

Mitigation measures, which include roadway widening, and other physical improvements must be demonstrated to be physically feasible and must meet minimum ECM standards.

B.5.5 Roadway Restriping and Parking Regulations

The ECM Administrator must approve proposed striping and parking regulation mitigation(s). Generally, roadway restriping is not a preferred mitigation due to resulting parking impact. Therefore, any parking impacts should be clearly identified and proposed for mitigation to the extent feasible.

B.5.6 Geometric Improvements

Turn lanes and other auxiliary lane needs shall be identified for each access.

B.5.7 Traffic Calming

This section presents acceptable methods of neighborhood traffic calming for urban collector or rural minor collectors and local roads. This section also provides for specific design criteria for a number of traffic calming methods.

A. Intended Use

The necessity or desire for traffic safety and calming stems from the perception that local and minor collector roadways are not always functioning as intended. These roadways should be low traffic volume roadways used for direct access to property. They are also intended as a system that is shared by vehicular, bicycle, and pedestrian traffic, in a manner that minimally impacts residents in these areas.

Traffic calming measures are intended to minimize these issues and return the quality of life to the neighborhood. Care must be taken by the designer so that the installation of traffic calming devices does not create unintended hazards that delay emergency response or jeopardize the safety of bicyclists, pedestrians, or motorists.

B. Traffic Calming for New Roadway Design

New local and minor collectors roadways are to be designed to minimize cut-through traffic, high volumes, and high-speed operation and to maximize the efficiency of the roadway to provide vehicular access and bicycle and pedestrian traffic.

C. Roundabouts and Mini Roundabouts

Roundabouts and Mini roundabouts are considered traffic control measures. These traffic control measures may be used in new or existing roadway design if the appropriate criteria are met.

D. Traffic Calming Design Criteria

Table B-2 presents a brief list of traffic calming solutions and their intended uses. Traffic calming devices may only be used on local and minor collector roadways.

Table B-2. Traffic Calming Solutions

Device	Intended Use	Reference
Signals, Signs, and Striping	Creates a system that calms traffic through warnings, progression control, and highlighting surrounding land uses	Chapter 2, Transportation Facilities
Mini Roundabouts	An intersection device that can slow traffic through the use of specialized roadway geometry	Chapter 2, Transportation Facilities
Neckdowns	An intersection device that slows traffic through the use of narrowed roadway geometry	Standard Detail
Drop Off Zone for Schools	Creates a traffic calming condition by highlighting school bus operations, the presence of pedestrians and changes in roadway section	Standard Detail
Realigned Intersections	Creates a disruption in travel patterns by offsetting the standard intersection geometry	Chapter 2, Transportation Facilities

B.6 RECOMMENDATIONS AND REPORT CONCLUSIONS

B.6.1 Recommended Improvements

The findings of the TIS shall be provided in summary format, including the identification of any areas of significant impacts and recommended improvements/mitigation measures to achieve LOS standards.

A. Geometric Improvements

The TIS shall include recommendations for all geometric improvements, such as pavement markings, signs, adding through or turn lanes, adding project access and assorted turn lanes, acceleration lanes, and changes in medians. Sufficient dimensions/data shall be identified to facilitate review. Anticipated right-of-way needs shall be identified.

B. Responsibility

The location, nature, and extent of all transportation improvements recommended to achieve the required LOS for each analysis horizon shall be identified. In addition, the sponsor responsible to complete the improvements shall be identified.

C. Proposed Transportation Demand Management

If TDM measures are recommended to mitigate the traffic impact of the proposed land use action, a specific TDM Implementation Proposal shall be developed and presented to the ECM Administrator. If accepted, this Implementation Proposal will become a condition of approval of the land use action requested. Each TDM Implementation Proposal shall be developed in conformance with the ECM Administrator's and the PPACG's Transportation Demand Management Program.

D. Summary Presentation

A Recommended Improvements Summary Table shall be prepared. The recommended improvements identified on the Recommended Improvement Table shall be categorized as Master Planned, Background Committed, or Project Committed. Each project shall include a description of its location, the type of project, right-of-way needs (for roadways), and signal or turn lane improvements (for intersections). Commitment to funding and constructing each of the improvements shall be identified.

B.7 SIGNATURE AND APPROVAL BLOCK

El Paso County: County report review is provided only for general conformance with County standards and design criteria. The County is not responsible for the accuracy and adequacy of the data, analysis, or conclusions. The County through the approval of this document assumes not responsibility for completeness and/or accuracy of this document.