CHAPTER 4 – TRANSPORTATION IMPACT STUDY

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CHAPTER 4 – TRANSPORTATION IMPACT STUDY

4.1 INTRODUCTION

4.1.1 General

This chapter contains the policies and guidelines necessary for the preparation of Transportation Impact Studies (TIS) for development proposals for the Local Entity. The policies exist to ensure consistent and proper traffic planning and engineering practices when land use actions are being considered within the Local Entity. The guidelines provide for a standard process, set of assumptions, set of analytic techniques, and presentation format to be used in the preparation of the TIS. For projects within Loveland (city limits only) it also provides the technical requirements that must be satisfied in order for a land use application to comply with the Adequate Community Facilities ordinance found in Title 18.15 of the Loveland Municipal Code needs updated to the current code For projects within Fort Collins (city limits only) it also provides the process, requirements, and terms that apply to TIS certification by the Local Entity Engineer and reservation of intersection capacity for the project. Additionally for projects within Fort Collins (city limits only) it also provides the technical requirements that must be satisfied in order for a land use application to comply with the Adequate Public Facilities ordinance found in Title 3.7.3 of the Fort Collins Municipal Code.

4.1.2 Applicant Responsibility

The responsibility for assessing the traffic impacts associated with an application for development approval rests with the Applicant. The Local Entity serves in a review capacity. The assessment of these impacts shall be contained within a TIS report as specified herein. It shall be prepared under the supervision of, and sealed by, a Licensed Professional Engineer in the State of Colorado with experience in traffic engineering and transportation planning/engineering.

For all State Highways within the study area, the Applicant is required to meet the requirements of the Colorado Department of Transportation.

4.1.3 Capacity and Safety Issues

Development of property has a direct impact on transportation, including vehicular, transit, bicycle, and pedestrian traffic. In order to meet capacity and safety needs as they relate to the traffic generated from a particular land use, specific improvements can be made. The goal of the TIS is to address the traffic related issues that result from the new development and to determine the improvements required such that appropriate levels of service are safely maintained. The various objectives of vehicular movement, pedestrians, bicyclists, and others must be balanced in the development review process. A combination of elements is needed to provide streets that serve all transportation modes. The TIS will provide information and guidance as plans are developed and decisions made for the approved plan.

A. Vehicular Traffic Improvements.

Examples of capacity and safety improvements for vehicular traffic include: road widening, turn lanes, acceleration and deceleration lanes, intersection through lanes, traffic signals, stop signs, roundabouts, design speed adjustments, and modifications to access points.

B. Pedestrian Traffic Considerations and Improvements.

Examples of safe, comfortable, and convenient pedestrian services are narrower roadways with fewer lanes, short blocks, low traffic speeds, tree-lined sidewalks, smaller corner radii, well-defined crosswalks, bulbouts, median refuges and channelized islands in large street crossings, on-street parking, and bicycle lanes. Underpasses or overhead structures are examples of safety improvements if vehicular traffic causes unsafe conditions for pedestrians, space is available, and construction is feasible.

C. Bicycle Traffic Improvements.

The addition of on-street bicycle lanes or off-street bicycle paths may be needed to achieve connectivity between the proposed project and the existing bikeway system.

D. Transit Traffic Improvements.

Examples of Transit Traffic Improvements include accommodation of public transit facilities such as buses, bus stops, bus bays, stations, and transit stop facilities.

4.1.4 TIS Process Overview

A. Define TIS

1. Attend Scoping Meeting: Section 4.2.1 .
2. Confirm the type of study, Master or Individual TIS: Section 4.2.2 .
3. Identify Level of Analysis: Section 4.41 .
4. Write an amendment letter if required: Section 4.2.3 .

B. Define Study Parameters

1. Develop the project description: Section 4.3.1 .
2. Determine which Analysis Horizons to use: Section 4.3.2 .
3. Determine the limits of the study area: Section 4.3.3 .
4. Determine the evaluation components for the applicable type of TIS: **Section 4.3.4** .

C. Evaluate Traffic Volume

1. Vehicular Traffic
   a. Existing Traffic
      1) Perform roadway traffic turning movement counts: **Section 4.4.2 A**.
      2) Determine intersection level of service: **Section 4.4.2 B**.
   b. Background Traffic
      1) Determine short-range turning movement projections: Section 4.4.3 A.
   c. Project Generated Traffic
      1) Determine trip generation rate: Section 4.4.4 A.
      2) Determine the trip distribution and assignment: Section 4.4.4 F and Section 4.4.4 G.
2. Pedestrian and Bicycle Traffic and Facilities
   a. Existing Traffic.
   b. Background Traffic.
   c. Project Traffic.
   d. Total Traffic.
   e. Existing and Planned Facilities

D. Conduct Project Impact Analysis

1. Vehicular Traffic
   a. Identify the project impact using evaluation elements for the selected type of TIS: **Section 4.5.1** in Loveland (city limits and GMA) and **Section 4.5.2 in** Fort Collins (city limits and GMA).
   b. Evaluate each element under the following traffic conditions:
      1) Existing traffic conditions.
      2) Future traffic conditions without the proposed development.
      3) Future traffic conditions with proposed development.
   c. Identify all significant negative impacts: Section 4.5.1
2. Pedestrian Traffic

   Conduct the same procedure as for vehicular traffic in above **Section 4.5.3 B**
3. Bicycle Traffic

   Conduct the same procedure as for vehicular traffic in above **Section 4.5.3 B**

E. Determine Mitigation Measures

1. Vehicular Traffic

   Refer to **Section 4.6**. Also refer to **Section 4.6.1** if transportation demand management is used for mitigation.

2. Pedestrian Traffic

3. Bicycle Traffic

F. Determine Study Recommendations.

Identify the improvements that are needed to achieve the required LOS for the proposed land use action and background traffic in each design year.

1. Vehicular Traffic

2. Pedestrian Traffic

3. Bicycle Traffic

G. Present the Completed TIS

1. Submit the specified number of copies of the stamped and signed completed study to the Local Entity as an attachment to the land use application.

2. Revise and resubmit the TIS as necessary to address review comments provided to the applicant by the Local Entity Engineer.

H. TIS Certification and Intersection Capacity Reservation (Fort Collins city limits only)

1. Approved studies are certified by the Local Entity Engineer. See **Section 4.7.3.**

2. Certified Full TIS's reserve intersection capacity for the life of the project development application. See **Section 4.7.3.**

4.1.5 Listing of Attached TIS Worksheets

The worksheets listed below are included at the end of this chapter, as Attachments A through I. Note that Attachments E through I apply only to projects in Loveland (city limits and GMA) and Fort Collins (GMA).

A. Base Assumptions

Refer to **Section 4.2.1 B, Meeting Setup and Content.**

B. Pedestrian Analysis Worksheet

Refer to **Section 4.2.1 B, Meeting Setup and Content.**

C. Transportation Worksheet

Refer to **Section4.2.2 B,**

D. Recommended Improvements Summary -

Refer to **Section 4.7.1 D, Summary Presentation.** This sheet is an example of what a Developer must submit.

E. Peak Hour Intersection Level of Service Summary - Loveland (city limits and GMA) and Fort Collins (GMA)

Refer to the discussion of Intersection Delay in **Section 4.5.3 A, Motor Vehicle Impact Evaluations**. This sheet is an example of what a Developer must submit.

4.2 REQUIREMENTS AND STUDY TYPES

4.2.1 Scoping Meeting

A. Purpose.

The purpose of the scoping meeting is to determine the type of study to be completed and the parameters for the study for a specific development project. The parameters determined in the scoping meeting represent general agreement between the Local Entity and the consulting engineer, but they may not be all-inclusive. The Local Entity retains the right to determine the level of study and to require any additional information and / or analysis to complete an evaluation of the proposed development project.

B. Meeting Setup and Content.

The Applicant is required to contact the Local Entity to arrange for a Scoping Meeting to discuss the TIS requirements and determine the base assumptions. It is incumbent upon the Applicant to bring a completed Transportation Impact Study Base Assumptions Form and a complete Pedestrian Analysis Worksheet (included at the end of this chapter as Attachments "A" and "B") to the meeting and be prepared to discuss the following:

1. Previous TIS prepared for the site, if any;
2. Location of the site;
3. Proposed access(es) and its relationship to adjacent properties and their existing/proposed access;
4. Preliminary estimates of the site's trip generation and trip distribution at build-out;
5. Identification of proposed year of build-out;
6. Trip adjustment factors proposed, if any;
7. Approved and proposed developments in the study area, and the associated committed roadway improvements;
8. Anticipated roadway improvements to be provided by the Applicant;

9. Phasing plan proposed;
10. Potential bicycle and pedestrian connections to the nearest attraction (existing or imminent) within 1320' of the site. This distance may be increased up to 1.5 miles for residential projects near existing or proposed school sites. Thompson School District generally does not provide transportation (busing) for students who live within 1.5 miles of an elementary school.
11. Special analysis needs.

C. Results of Meeting

The Scoping Meeting shall conclude with the Local Entity and Applicant in mutual agreement with regard to determining the type of study and level of detail and extent to which the TIS will need to address each of the following:

1. Study area for the impact analysis;
2. Other developments within the study area;
3. Existing intersection counts;
4. Intersections to be studied in detail;
5. Background traffic volume forecasts;
6. Location of the nearest bicycle and pedestrian facilities and
7. Special analysis needs. (Non-traditional peak hour volumes for some uses, neighborhood impacts, access management plans, etc.)
8. For studies involving signalized intersection analysis the local entity will provide detailed assumptions for evaluation methodology and/or software files to be utilized.

D. Documentation after Meeting

The approved scoping meeting form and attachments shall be inserted into the TIS.

E. Time Between Scoping Meeting and Project Submittal

If a scoping meeting was conducted more than six months prior to submittal, the Local Entity Engineer may require another scoping meeting.

4.2.2 Types of Study

A. Master TIS.

Where large complex projects are planned or a project is phased over a multi-year build-out, it may be appropriate to prepare a Master TIS for the overall land use action followed by periodic updates for specific phases. The Master TIS must include overall phasing of improvements to coincide with project phasing. Updates to the Master TIS shall be submitted with the land use applications for the specific phases.

The updates shall be either Full, Intermediate or Memorandum level studies as determined by the local entity engineer..

B. Full TIS.

A Full TIS shall be required if one or more of the following conditions occur:

1. The site generated traffic is expected to exceed 1,000 trips/day or 100 peak hour trips by any travel mode, or
2. New high volume access is requested for an arterial street or State Highway.
3. There is significant citizen concern due to expected traffic impacts.

C. Intermediate TIS.

An Intermediate TIS may be required if any of the following requirements are met:

1. The site generated traffic via any travel mode is expected to be between 501 trips/day and 1,000 trips/day inclusive, or the peak hour trip generation is between 51 and 100,
2. Site traffic will impact adjacent, existing residential areas.
3. There is significant citizen concern due to expected traffic impacts.

D. Transportation Memorandum.

A Traffic Memorandum, in lieu of a more detailed study, may be considered if all the following requirements are met:

1. The site generated traffic via any travel mode is expected to be less than or equal to 500 trips/day, and/or the peak hour trip generation is less than or equal to 50.
2. Any new access requests are for local or collector streets only.

E. No TIS Required.

Upon submittal of a Transportation Worksheet (Attachment "C") by the Applicant and/or written acceptance by the Local Entity Engineer, the TIS requirement may be waived if all of the criteria below are satisfied:

Note that in Loveland (GMA and city limits), the proposed land use will be exempt from demonstrating compliance with the transportation Adequate Community Facilities requirements, if the TIS requirement is waived. In Fort Collins (city limits only), the proposed land use will be exempt from demonstrating compliance with the transportation Adequate Public Facilities requirements, if the TIS requirement is waived.

1. Daily vehicle trip-end generation is less than 200 trips/day and/or the peak hour trip generation is less than 20.
2. There are no proposed minor or major street intersections on collectors, arterials, or State Highways;
3. If the property is being redeveloped, the increase in the number of vehicular trips for the proposed use does not exceed the trip generation from the existing use by more than 20 peak hour trips or 200 daily trip ends;
4. Any new or change in the type of traffic to be generated (i.e. the addition of new truck traffic) is not expected to adversely affect the traffic within, and adjacent to, the property;
5. The scale or use of the proposed development or redevelopment is not likely to cause less than acceptable levels of service on the adjacent public streets, accesses, and intersections; and
6. The proposed development or redevelopment is not in the vicinity of a street or intersection with a history of safety and/or accident problems.
7. There is no change of land use with access onto a State Highway.
8. Site traffic will not impact adjacent, existing residential areas.
9. There is no significant citizen concern due to expected traffic impacts.
10. Site traffic will not negatively impact adjacent bicycle or pedestrian facilities.

4.2.3 Revisions and Updates

A revision or update to an approved TIS may be required when a previously approved land use action proposes an expansion, a change to access, or a change in use where new trip generation estimates exceed the original trip generation estimates (or actual trips in the case of existing land uses),by 20 percent or by more than 20 peak hour trips or 200 daily trips, whichever is less. If the currently approved study was prepared within the last three years, an amendment letter addressing the changes may be accepted and satisfy the requirements of this guideline. The letter must address: a) an estimate of site trip generation, b) existing site trip generation, c) the differences between anticipated estimates and existing trip generation and d) changes to the bicycle or pedestrian facilities. If the original study is older than three years, an entirely new study may be required by the Local Entity Engineer.

4.3 STUDY PARAMETERS

4.3.1 Project Description

A description of the proposed project will be prepared and include the type of land use and size of the proposed project (number of dwelling units or building square footage).

Any proposed phasing will be discussed and the anticipated completion date established. A figure depicting the proposed site plan will also be included and the proposed vehicular access locations will be described. This section will also include a description of how pedestrian and bicycle travel will be accommodated within the proposed site plan. This will include a discussion of types of sidewalks (attached/detached), pathways, and connections to local and perimeter destinations.

4.3.2 Analysis Horizons.

Three study horizons are required for a Master or Full TIS analysis: the existing (current), the short range (short range build-out) and the long range (20 year). It may be acceptable for the short range and long range horizons to be identical for some large projects.

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 that 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 Regional Transportation Plan 20-year planning horizon and related modeling, except where the existing counts identify discrepencies in the regional model. In such situations, the current counts shall be increased by application of a growth rate established by the Local Entity or as approved by the Local Entity Engineer. The intent of the long range planning horizon is to evaluate the implications of the fully developed proposed project on the long-range traffic condition. Data from the current official North Front Range Transportation & Air Quality Planning Council (MPO) regional computer model is available by contacting the Local Entity. This study horizon is for the Local Entity's use as an indicator of traffic for planning purposes and the determination of the necessary Right-of-Way. The Local Entity Engineer may elect to disallow use of the regional model when the data is deemed unreliable.

4.3.3 Study Area

The limits of the transportation network to be studied shall be defined for all levels of TIS analysis and are based on the size and extent of the application for development approval, the existing and future land uses, and traffic conditions on and near the site.

In Fort Collins (GMA and city limits), the study area determination begins with major streets and intersections within one mile of the project. This may be increased or

decreased, at the discretion of the Local Entity Engineer. The exact limits of the study area are to be based on good engineering judgment, and an understanding of existing and future land use and traffic conditions at and around the site. The limits of the study area shall be agreed upon at the Scoping Meeting. In the case of a Master TIS, its identified study area shall generally be used for all subsequent updates.

The concerns related to specific land use actions on specific studies vary greatly, at a minimum, the factors to be considered for the establishment of the limits of the study area should include:

A. Master TIS

1. All adjacent and internal collector and arterial streets and intersections.
2. Loveland (GMA and city limits). Offsite collector and arterial roadways and intersections within the study area that are impacted by 10% or more by the project, or provide the primary connections between the project and the urban services, unless otherwise approved by the Local Entity Engineer.
3. Fort Collins (GMA and city limits). Offsite arterial and collector roadways and intersections expected to be impacted and identified by local entity engineer during scoping.
4. Continuity and adequacy of pedestrian and bike facilities to the nearest attraction (existing or imminent) within 1320 feet of the site.
5. Access to the most direct transit facility or transit route within 1,320 feet of the site.
6. Any pedestrian routes within 1-1/2 miles of a school.

B. Full TIS

1. All adjacent streets, intersections, and High-Volume Driveways.
2. Nearest offsite major intersection(s).
3. Internal public roads, including establishing the road classification.
4. Loveland (GMA and city limits). Additional offsite major intersections where:
   a. 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 level of service of C or better in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer, or
   b. 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 level of service of D or worse in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer.
5. Loveland (GMA and city limits). Additional offsite minor intersections 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 level of service of E or worse.

6. Fort Collins (GMA and city limits). Offsite arterial and collector roadways and intersections expected to be impacted and identified by local entity engineer during scoping.
7. Pedestrian and bicyclist destinations (existing or imminent) within 1320 feet of the site.
8. Access to the most direct transit facility or transit route (existing or imminent) within 1,320 feet of the site.
9. Any pedestrian routes within 1-1/2 miles of a school (residential land uses only).

C. Intermediate TIS

1. All adjacent streets, intersections, and High-Volume Driveways;
2. Loveland (GMA and city limits). The nearest offsite major intersection(s) only if:
   a. 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 level of service of C or better in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer, or
   b. 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 level of service of D or worse in the Short Range Horizon, unless otherwise approved by the Local Entity Engineer.
3. Fort Collins (GMA and city limits). Offsite arterial and collector roadways and intersections expected to be impacted and identified by local entity engineer during scoping
4. Internal public roads, including establishing the road classification;
5. Pedestrian and bicyclist destinations (existing or imminent) within 1320 feet of the site.
6. Access to the most direct transit facility or transit route (existing or imminent) within 1,320 feet of the site.
7. Any pedestrian routes within 1-1/2 miles of a school (residential land uses only).

D. Traffic Memorandum

1. All adjacent streets, intersections, and High-Volume Driveways;
2. Internal public roads, including establishing the road classification;
3. Continuity and adequacy of pedestrian and bike facilities adjacent to the site.
4. Access to the most direct transit facility or transit route adjacent to the site.

4.3.4 Evaluation Elements

A. Master TIS.

The purpose of the Master Transportation Impact Study 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 development (i.e. roadway widening, connecting key gaps in the street system, etc.).

While the Master Transportation Impact Study does not need to include intersection analyses, they may be required by the local entity engineer, or included at the Applicant's option especially if the Applicant intends to proceed with a specific phase of the project immediately following approval of the General Development Plan in Loveland (GMA and city limits) or Overall Development Plan in Fort Collins (GMA and city limits).

In cases where a developer seeks vesting with a Planned Unit Development (PUD) Zoning Document or Overall Development Plan, the Master Transportation Impact Study is required to present all the detailed information required in a Full or Intermediate Transportation Impact Study as determined by the Local Entity

For example, for a large Planned Unit Development (PUD) Zoning Document or Overall 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 at the Development Plan or Preliminary Plat stage, with each phase of the project a new 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:

1. Conformity with the adopted Transportation Master Plan including any adopted access control plans.
2. Intersection analysis as identified during scoping (see peak hour level of service requirements in Table 4-1 and Table 4-2)
3. Adherence to relevant adopted planning documents (such as corridor plans);
4. Functional classifications and anticipated typical sections for any new roadways.
5. Appropriateness of access locations;
6. Multi-modal and TDM opportunities;
7. Pedestrian/bike requirements and/or improvements;
8. Safety and accident analysis.

9. Other items as requested by the Local Entity Engineer and agreed to in the Scoping Meeting.

10. Neighborhood and public input issues.

B. Full TIS.

The key elements of the Full TIS shall be specified by the Local Entity Engineer from the following list:

1. Conformity with the adopted Transportation Master Plan, including any adopted access plans.

2. Adherence to relevant adopted planning documents (such as corridor plans).

3. Peak hour intersection and driveway level of service (see Table 4-1 and Table 4-2).

4. Appropriateness of access locations.

5. 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 per Local Entity or CDOT requirements;

6. Sight distance evaluations and recommendations (intersection, driveway, stopping, passing, etc.).

7. Multi-modal and TDM opportunities;

8. Continuity and adequacy of pedestrian and bike facilities to the nearest attraction (existing or imminent) within the study area.

9. 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.

10. Traffic signal and stop sign warrants.

11. Progression analysis for signalized intersections.

12. Appropriateness and/or any needed changes to existing roadway signing, striping, and other traffic control devices.

13. Safety and accident analysis.

14. Other items as requested by the Local Entity Engineer and/or agreed to in the Scoping Meeting.

15. Neighborhood and public input issues.

C. Intermediate TIS.

No Long Range Horizon analysis is required as part of an Intermediate TIS. The key elements of the TIS shall be specified by the Local Entity Engineer from the following list:

1. Conformity with the adopted Transportation Master Plan, including any adopted access plans.
2. Adherence to relevant adopted planning documents (such as corridor plans).
3. Peak hour intersection and driveway level of service (see Table 4-1 and Table 4-2).
4. Appropriateness of access locations.
5. 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 per Local Entity or CDOT requirements.
6. Sight distance evaluations and recommendations (intersection, driveway, stopping, passing etc.).
7. Multi-modal and TDM opportunities.
8. Continuity and adequacy of pedestrian and bike facilities to the nearest attraction (existing or imminent) within the study area.
9. 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.
10. Traffic signal and stop sign warrants.
11. Progression analysis for signalized intersections.
12. Appropriateness and/or any needed changes to existing roadway signing, striping, and other traffic control devices.
13. Safety and accident analysis.
14. Other items as requested by the Local Entity Engineer and/or agreed to in the Scoping Meeting.
15. Neighborhood and public input issues.

D. Traffic Memorandum.

No Long Range Horizon is required as part of a Traffic Memorandum. The key elements of the Memorandum shall be specified by the Local Entity Engineer from the following list:

1. Peak hour driveway and/or intersection level of service (see Table 4-1 and Table 4-2)
2. Appropriateness of access locations.
3. 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 per Local Entity or CDOT requirements.
4. Sight distance evaluations and recommendations (intersection, driveway, stopping, passing etc.)
5. Continuity and adequacy of pedestrian and bike facilities within the study area;
6. Appropriateness and/or any needed changes to existing roadway signing, striping and other traffic control devices.
7. Other items as requested by the Local Entity Engineer and/or agreed to in the Scoping Meeting.
8. Neighborhood and public input issues.

4.4 TRAFFIC ANALYSIS

4.4.1 Analysis Methodolgy

Assessment techniques shall include a capacity and level of service (LOS) analysis for the key intersections identified in the study area during the identified analysis time periods. The analyses shall be completed using the operational analysis methodology shown in the latest edition of the Highway Capacity Manual published by the Transportation Research Board. Base assumptions and signal timing parameters for the analysis shall be approved by the Local Entity, and any changes from existing noted in the TIS.

Roundabout analysis shall be completed as detailed in Appendix I of these standards (Roundabout Design Manual) or as otherwise specified by the Local Entity Engineer.

4.4.2 Existing Traffic

A. Roadway Traffic Volumes/Traffic Counts.

Current A.M. and P.M. peak hour traffic counts as specified by the Local Entity Engineer 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 (or as specified by the Local Entity Engineer) and shall include fifteen (15) minute count data to clearly identify the peak hours.

Weekend counts and/or average daily counts on local streets may also be required where appropriate when requested by the Local Entity Engineer. Local Entity or CDOT average weekday traffic (AWT) counts may be used when available.

Pedestrian counts and bike 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), unless otherwise approved by the Local Entity Engineer. The source(s) of each of the existing traffic volumes shall be explicitly stated (CDOT counts, new counts by Applicant, Local Entity counts, etc.) Summaries of current traffic counts shall be provided. The Local Entity may require the use of seasonal adjustment factors depending on when data was collected and if the project is considered to be in an affected area (i.e. tourism).

B. Intersection Level of Service.

1. Existing and Short Range Horizon. Use calculated peak hour factors or 0.85, whichever is higher. Traffic signal timing parameters for the existing conditions will be the actual signal timing in effect unless determined otherwise by the Local Entity.

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 Local Entity Engineer. Traffic signal timing parameters for the existing conditions will be the actual signal timing in effect unless determined otherwise by the Local Entity.

4.4.3 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 (or, in Fort Collins [city limits only], projects with reserved intersection capacity established through a certified TIS), plus background growth (as adjusted to avoid duplicative consideration of the identified development traffic from the approved land uses 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.

In Loveland (GMA and city limits), 100% of the committed trips from the build out of the planned (i.e. documented in a complete land use application accepted by the City) and approved projects in the study area must be included in the short range volume projection. The assumed baseline surface transportation network should reflect existing facilities (without the proposed project improvements) plus any committed improvements by the Local Entity, other public agencies, and/or other approved land uses within the study area as described in Title 16.41.080.C of the Loveland Municipal Code.

In Fort Collins (GMA and city limits), only the percentage of trips from the approved projects that are expected to be generated in the short range year must be included.

In both communities, the short range planning horizon background traffic growth rate shall be based on a growth rate from the Scoping Meeting based on one of the following methodologies:

1. Straight line projection for the build out year between the existing traffic volumes and the twenty year North Front Range Transportation and Air Quality Planning Council's (MPO) regional model forecast, CDOT rates or
2. Historical traffic counts projected to the build-out year (at least three years of traffic data should be used for this), or
3. Area-wide traffic count analysis which considers traffic volume trends in the study area's circulation system and uses proportion/extrapolation methods.

B. Long Range Volume Projections in Loveland (GMA and City Limits)

Long range A.M. and P.M. peak hour planning horizon traffic volume projections shall be based on the traffic modeling volumes contained in the most recent update to the Transportation Master Plan. Special requests for projections not contained in the accepted and published model results will require special approval by the Local Entity Engineer. Note that the modeled projections are based on future year population and employment projections that reflect a regional perspective on growth and development. The Applicant will need to investigate the land use assumptions as they apply to the transportation network to be studied to document in the TIS any projection adjustments if necessary. For the long range planning horizon network analysis, all planned and funded surface transportation facilities as per the Local Entity's Transportation Master Plan within the study area may be included for the baseline assumptions. In addition, use the growth rate agreed upon with the Local Entity Engineer.

C. Long Range Volume Projections in Fort Collins (GMA and City Limits)

Long range peak hour planning horizon traffic volume projections shall be based on one or more of the following as determined in the scoping meeting:

1. Straight line projection for the build out year between the existing traffic volumes and the twenty year North Front Range Transportation and Air Quality Planning Council's (MPO) regional model forecast, CDOT rates or
2. Historical traffic counts projected to the build-out year (at least three years of traffic data should be used for this), or
3. Area-wide traffic count analysis which considers traffic volume trends in the study area's circulation system and uses proportion/extrapolation methods, or
4. Growth rate agreed upon with the Local Entity Engineer.

4.4.4 Project Traffic

A. Trip Generation Rate.

Trip generation should be calculated from the latest data contained within the Institute of Transportation Engineers' Trip Generation Manual or be based on local data approved by the Local Entity Engineer. Other industry publications (such as the ITE Journal or other sources) may be approved by the Local Entity. Data limitations, data age, choice of peak hours (for the land use or adjacent street traffic), choice of independent variables, and choice of average rate versus statistically significant modification should 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 Local Entity 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, and/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.

The Applicant shall prepare 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 driveway, the resultant total trips generated. The data source shall be stated (state ITE land use code, if used). Build-out land uses and trip generation shall be used for both the short range and long range planning horizons. Land use action proposed that is of a type that build-out in the short-range is not feasible due to the size of development (as agreed upon by the Local Entity at the Scoping Meeting), may propose phases (such as 2-year increments) for the development.

D. Committed Trips/Capacity in Loveland (GMA and City Limits)

To assure the public and the Local Entity that the traffic impact analysis adequately addresses the full impact of the development, the trip generation stated in the TIS will establish the maximum number of trips permitted entering and exiting the development. If the amount of committed trips is reached prior to full occupancy, the Local Entity reserves the right to request from the owner, at the owner'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 street standards can be implemented, the Applicant shall obtain a exception from the City Council for the non-conformity with the ACF requirements 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 Local Entity Engineer 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 or pre-approved rates from other sources. 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.

Several situations will be closely reviewed. One 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. Another is when reductions in the trip generation rates are assumed based on reductions due to travel demand management. Finally, adjustments may be considered for higher than typical mode split. Adjustments to trip generation must be agreed to by the Local Entity Engineer during TIS scoping.

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 report or other industry publications may be considered with appropriate explanation and documentation. Pass-by traffic must remain assigned to driveways and access points. They are not additive to the background traffic stream. A technical appendix, table or map that illustrates the re-diversion of pass-by trips is required which may be submitted as a legible, hand-written work sheet(s).

2. Internal Site Trips/TDM. Analytic support documentation of internal site trips, transit use, and TDM (Transportation Demand Management) actions shall be provided to show how trip adjustments are derived. Optimistic assumptions regarding transit 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 project initiation.

3. Mode Split. Mode split assumptions and subsequent reduction in vehicular trips may be considered with appropriate explanation and documentation.

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: regional MPO 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 and documented.

G. Trip Assignment.

The project traffic will be assigned to the roadway system according to the trip distribution established above. 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 for Fort Collins (GMA and city limits). Separate maps or values are required when the trip distribution differs by more than 10% between the short and long range analysis horizons.

4.4.5 Total Traffic

The total traffic projections will be determined for each of the analysis horizons identified earlier 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 and the Local Entity's street standards and Transportation Master Plan, the Applicant shall provide roadway functional classification recommendations. For Loveland (GMA and city limits), a roadway projected to carry between 3,500 and 5,000 vehicles per day would be recommended as a Major Collector Street, where as if the projected traffic was between 1,000 and 2,500 vehicles per day, it would be recommended as a Connector Local Street.

4.5 PROJECT IMPACTS

4.5.1 Significant Negative Impacts In Loveland (GMA and City Limits)

Significant Negative Impacts are defined as:

A. Exceeding Maximum Traffic Volume.

When the project's (land use action) traffic causes the estimated traffic to exceed the established maximum traffic volumes allowed for the specific classes of roadways; or

B. Exceeding the LOS standard.

When the added project traffic causes any portion of an intersection to exceed the LOS standard; or

C. Failing the ACF delay standard

When the project traffic when added to all other traffic in the design year, will cause any movement or leg of an intersection to fail the ACF delay standard; unless the increased delay caused by the project is less than or equal to two percent of the ACF delay standard for that movement or leg of the intersection.

D. Calculation Basis

The project traffic analysis shall be calculated based upon the cumulative increase in traffic and/or the cumulative increase in intersection delay of all phases, lots, tracts or other subsections of a GDP or any subsection not contained within a GDP.

4.5.2 Significant Negative Impacts in Fort Collins (GMA and City Limits)

This section applies primarily to vehicular related impacts associated with the proposed project. A project is defined as significantly impacting a study intersection when one of the following criteria are satisfied:

A. For Signalized Intersections.

1. When the added project traffic causes movements, approaches or the overall intersection to fail the minimum acceptable level of service standards in Table 4-3; or
2. When the background traffic conditions (without project traffic) causes an intersection to fail the minimum acceptable level of service standards; and when the project adds additional traffic (10 or more trips during the peak hour); or
3. When added project traffic is determined to create potential safety problems.

B. For Unsignalized Intersections.

1. When the added project traffic causes movements at an intersection or the overall intersection to fail the minimum acceptable level of service standards in Table 4-3; or
2. When backstacking (queuing) would create impeded traffic flows and/or excessive congestion; or
3. When added project traffic is determined to create potential safety problems.

4.5.3 Project Impact Assessment.

The key elements of the project impact assessment include evaluations of issues outlined for a specific Analysis Level. Refer to **Section 4.3.4** for a listing of the Evaluation Elements.

A. Motor Vehicle Impact Evaluations

1. Existing Condition Diagrams in Loveland (GMA and city limits). Drawings shall be prepared and included in the report to document traffic counts, lane geometrics

(including striping, signing and other pavement markings), traffic control, existing access locations, lane lengths, widths, tapers, and any other notable features. When arterial roadways are impacted by the proposed project, the report shall include a tabulation or diagram which identifies the number of existing and proposed accesses contained within, and up to one-quarter mile of, the evaluated arterial road and/or intersection

2. Within one block (approximately 500 to 1000 feet) of an intersection with a street of higher functional classification, additional through and turning lanes may be required on a street to meet the level of service requirements for the intersection. The additional lanes shall not be considered a reclassification of the street.

3. Intersection Delay

    a. An A.M. and P.M. peak hour intersection level of service analysis shall be conducted for each intersection analyzed in the TIS, based on procedures specified in the most recent release of the Highway Capacity Manual. **In Loveland (GMA and city limits),** specific level of service summary work sheets shall be included in the TIS. See **Attachments "H" and "I"** for sample forms for reporting the results of the intersection level of service evaluations.

    b. 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 short range planning horizon traffic will result in a significant impact and an unacceptable level of service. For definition purposes, the thresholds for acceptable level of service are as shown in Table 4-2 and Table 4-3. All intersection components shall meet the following requirements. All intersection components shall meet the following requirements:

Table 4-1
Loveland (GMA and City Limits)
Motor Vehicle LOS Standards (Intersections)

Intersection Component	Major Intersection[1]	Minor Intersection[2]	Driveway
Overall (City Limits)	LOS C	LOS C	No Limit
Overall (GMAs)	LOS D	LOS D	No Limit
Any Leg	LOS D	LOS E	No Limit
Any Movement	LOS E	LOS F	No Limit

[1] Includes all signalized and unsignalized arterial/arterial and arterial/ major collector intersections.
[2] Includes all unsignalized intersections (except major intersections) and high volume driveways
[3] There are no LOS standards for I-25 Interchanges.
[4] On State Highways, overall LOS D is acceptable.

Table 4-2
Fort Collins (GMA and City Limits)
Motor Vehicle LOS Standards (Intersections)

	Overall	Any Approach leg	Any Movement
Signalized	D[1]	E	E[2]
Unsignalized Arterial / Arterial Collector / Collector	E[3]	F[4]	
Unsignalized Arterial / Collector Arterial / Local Collector / Local Local / Local	D[3]	F[4]	
Roundabout	E [3,5]	E[54]	E[5]

[1] In mixed use district including downtown as defined by structure plan, overall LOS E is acceptable
[2] Applicable with at least 5% of total entering volume
[3] Use weighted average to identify overall delay
[4] Mitigation may be required
[5] Apply unsignalized delay value thresholds to determine LOS

4. Driveway Access. The design, number, and location of access points to collector and arterial roadways must be submitted for approval by the Local Entity Engineer. State Highway accesses require the issuance of an Access Permit from CDOT. The number of access points must be kept to a minimum and be designed to be consistent with the type of roadway facility. If multiple adjacent roadways are available for access, access should be taken from the lowest classified roadway available. Access points will be reviewed and approved by the Local Entity based on the following information:

    a. Access location(s) as shown on the site plan.

    b. Proposed traffic turning movements.

    c. Analysis of on-site (driveway) stacking/queuing and impacts to adjacent streets.

    d. Signalization requirements and design in accordance with these guidelines.

    e. Geometric design of the access and proposed improvements to the Local Entity facilities in accordance with these standards.

    f. Compliance with the CDOT State Highway Access Code and any adopted access management plans if access is requested to a State Highway.

    g. In Fort Collins, access spacing standards shown in Table 7-3.

5. Traffic Signals.

    a. Proposed and existing access points, proposed intersections, and existing intersections affected by the land use actions being analyzed in the report that have any potential for signalization will be reviewed and discussed during the scoping meeting. Discussion will include review of existing signals/potential modifications, proposed signals, school signals for school crossings, school flashers, pedestrian signals/crossings, and any other potential for signal devices and signal interconnect issues.

    b. During the Scoping Meeting an outline of locations for signal warrant analysis will be agreed upon. Generally, most traffic signal locations have been predetermined by each Local Entity Engineer and policies have been set in the comprehensive Transportation Plan of the Local Entity for its planning area including the Growth Management Area.

    c. Signal Warrant Analysis for potential signal locations shall consist of a review of the applicable signal warrants contained in the Manual on Uniform Traffic Control Devices.

    d. If any location proposed for signalization is not spaced according to the appropriate Comprehensive Transportation Plan or Local Entity's signal spacing policy, then a traffic signal progression analysis shall be required. The analysis limits, parameters (including allowable phasing, split times, walk timing, clearances and methods) to be used for the study will be discussed at the Scoping Meeting.

e. Alternatives to signalization at potential signal locations will be discussed in the scoping meeting and the report. The alternatives to adding new intersections to be discussed should include no new intersection, limited movements, and roundabouts.

f. If any signal timing and/or phasing changes are proposed, an appropriate signal progression analysis may be required.

B. Pedestrian and Bicycle Impact Evaluations.

All projects are expected to achieve the minimum acceptable LOS standard for on-site and off-site bicycle and pedestrian facilities. Refer to the *City of Fort Collins Multimodal Level of Service Criteria Manual* located in **Appendix H** and **Loveland (GMA and city limits), Table 4-3** for detailed descriptions of the LOS standards. Pedestrian and bike facility demand shall be identified and related items for discussion should include:

1. School routing plans per the MUTCD between the project and all schools within 1-1/2 miles of the project boundary;

2. The demand for pedestrian and bike facilities to serve high pedestrian activity areas within the land use;

3. The need for links of bicycle or pedestrian facilities to neighboring land uses or attractions (trails, etc.) within 1320’ (or greater if applicable to unique pedestrian oriented destinations) of the project site;

4. Existing and proposed sidewalk width, separation from traffic, and space available for trees, transit stops (if any), or other related elements (if any).

5. Geometric improvements and recommended traffic control devices to accommodate pedestrians and bicyclists;

6. Existing and proposed pedestrian and bike facilities shall be evaluated for compliance with the following elements:

   a. Directness. Walking distance to destinations like transit stops, schools, parks, and commercial or activity areas should 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 street system.

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

   c. Street Crossings. Safety and comfort is essential while crossing streets, intersections and mid-block crossings. Factors that affect the LOS 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.

d. Visual Interest and Amenity. Pedestrians enjoy visually appealing environments that are compatible with local architecture and include street lighting, fountains, and benches.

e. Security. Pedestrians should be visible to motorists, separated from motor vehicles and bicycles, and under adequate street lighting.

f. Surface Condition. Pedestrian facilities should be free from obstructions, cracks, and interruptions.

Table 4-3
Loveland (GMA and City Limits)
Pedestrian Levels of Service

QUALITY INDICATORS	A	B	C	F
SECURITY	Well used, good lighting levels and unobstructed lines of sight	Unobstructed lines of sight, good lighting levels	Sidewalk configuration and parked cars present sight problems, moderate lighting	Major pedestrian visibility problems, streetscape is pedestrian intolerant
DIRECTNESS	< 1.4	1.4-1.8	1.8-2.2	> 2.2
CONTINUITY	Quality, continuous pedestrian networks that are physically separated from street and built to current standards	Continuous sidewalk network on both sides of the street. May not be built to current standards	Sidewalk network where there may not be sidewalks on both side of the street or there are minor interruptions in connectivity	Breakdown in pedestrian network to where each pedestrian chooses a different route
STREET CROSSINGS Signalized Intersection	3 or fewer lanes to cross, clear indications (striping, etc.), well marked crosswalks, good lighting, standard curb ramps, automatic pedestrian signal, pedestrian amenities, unobstructed views	4 or 5 lanes to cross, clear indications, well marked crosswalks, pedestrian refuge area, standard curb ramps, pedestrian amenities, standard curb ramps, unobstructed views	6 or more lanes to cross, clear indications, well marked crosswalks, pedestrian refuge area, standard curb ramps, pedestrian amenities, unobstructed view	Missing 5 elements of A, 4 elements of B, and 2 elements of C
STREET CROSSINGS No Signal	Well-marked cross walks, good lighting levels, standard curb ramps, street character suggests pedestrian crossing, unobstructed views	Missing 1 element of A	Missing 2 elements of A	Missing 3 or more elements of A
VISUAL APPEAL AND PEDESTRIAN AMENITIES	Visually appealing and compatible with local architecture and artist themes, wide sidewalks, window shopping, pedestrian lighting, trees and street furniture	Wide sidewalks, visual clarity, some street furniture and landscaping	Functionally operational with less importance placed on visual appeal	Design ignores pedestrian with negative metal image, intimidating
SURFACE CONDITION	Smooth asphalt or concrete with few breaks or cracks	Relatively smooth asphalt or concrete with frequent breaks or cracks	Rougher, broken surface such as older concrete or cobblestone	Difficult, unpaved terrain such as hiking trails

C. Special Studies.

This section provides the Local Entity with opportunities to request specific focused traffic analyses that may be unique to the proposed land use action. The Applicant

and the Local Entity will determine if special studies are required in the Scoping Meeting. These may include, but are not limited to the following:

1. Access Management Plan Analysis in Loveland (GMA and city limits). If a development is proposing a new access location on an arterial and an Access Management Plan does not exist, the Local Entity may require the Applicant to provide an Access Management Plan
2. Access spacing,
3. Accident/safety concerns (accident statistics),
4. Truck routing,
5. Emergency and snow routes,
6. Hazardous material routes.
7. 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 should be followed:
    a. Examine existing transportation conditions within the neighborhood. This should follow the same procedure as set forth earlier for the transportation impact analysis. Daily and peak hour traffic volumes should be collected for the local streets to be included in the analysis.
    b. Determine project generated traffic for all modes within the neighborhood and show on a figure.
    c. Determine total traffic projections for the local streets. This should follow the same procedures as described earlier, including other projects and area wide growth if applicable.
    d. Determine if the proposed project would create significant impacts to the residential streets using the criteria stated earlier.
    e. If necessary, develop measures, including but not limited to traffic calming techniques, to mitigate any significant impacts.
    f. The neighborhood TIS should also discuss how pedestrians and bicyclists would access the proposed project to/from the adjacent neighborhood(s), and the need for special facilities to enhance direct pedestrian and bicycle connectivity.
8. Sight Distance. Sight distance concerns that are anticipated or observed which may impact driveway, 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 should be provided by

the Applicant's traffic engineer for detailing on the final development, site plan, or final construction plans.

4.6 MITIGATION MEASURES

When a project's vehicular impacts are determined to not meet the minimum acceptable level of service 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 the Local Entity's standards and codes. Potential mitigation categories/strategies are listed below and may not be all-inclusive.

The LOS should 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 for all transportation modes (vehicle, bicycles, and pedestrians). If mitigation that is reasonably related and proportional to impact is not feasible (or not desired by the Local entity) to address the specific LOS issue then the following can occur:

1. For bicycle and pedestrian level of service issues Section 4.6.7 Variances can be utilized.
2. For vehicular level of service issues related to intersection approaches or movements, Section 4.6.7 Variances can be utilized.
3. For vehicular level of service issues related to overall intersections Section 4.6.8 Alternative Mitigation Strategies can be utilized.

4.6.1 Transportation Demand Management (TDM) Measures (GMA and City Limits)

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 Local Enity, the applicant will be allowed to reduce total project vehicle trips by an amount commensurate with applicable trip reduction policies.

A. Examples of TDM measures

1. Vehicle trip reduction incentives and services offered by employers to encourage employees to utilize alternative modes of travel such as carpooling, vanpooling, riding public transit, bicycling, walking, telecommuting, etc.
2. Vehicle trip reduction incentives and services affecting visitors to the project, such as shoppers, clients, patrons, etc.
3. Financial support for the capital and/or operating costs of enhanced transit or vanpool service to the project.

4. Provision of a mix of land uses in close proximity, facilitating trip making by walking, bicycling, or local shuttles.
5. 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.
6. Site trip cap and/or parking cap including trip-monitoring agreements.

4.6.2 Transit Capacity and Access Improvements.

A. Suggested elements of a transit program

1. Contributions of equipment or funds to increase the capacity of existing transit systems
2. Transit shuttles provided by applicant (e.g., bus, taxicab, van, etc.)
3. Contributions toward transit stations or centers

4.6.3 Traffic Signal Operations Improvements.

Traffic Signal Operational improvements would include upgrading signal to include additional signal phases and/or, signalization of an unsignalized intersection. Signalization of project access drives would not be considered as a mitigation measure. The Local Entity Engineer must approve signal improvements and/or installations.

4.6.4 Street Widening and Other Physical Improvements

Mitigation measures, which include street widening, and other physical improvements must be demonstrated to be physically feasible and must meet minimum City standards and codes for both on-site and off-site improvements.

4.6.5 Street Restriping and Parking Regulations

The Local Entity Engineer must approve proposed striping and parking regulation mitigation(s). Generally, street restriping is not a preferred mitigation measure because it often requires parking regulations, which may cause secondary impacts in certain commercial and residential areas. Therefore, any parking impacts should be clearly identified and proposed for mitigation to the extent feasible.

4.6.6 Geometric Improvements

Turn lanes and other auxiliary lane needs shall be identified for each access. Warrants and design standards are shown in Chapter 8. In addition to the standards shown in Chapter 8, all proposed project entrances onto State Highways shall be evaluated as to whether they require acceleration lanes or deceleration lanes as per the current Colorado Department of Transportation State Highway Access Code. The design speed shall be selected from the ranges given in the **Street Design Technical Standards Table 7-3** or **7-4**.

4.6.7 Variances

Requests for variances to the requirement for mitigation measures should follow the process outlined in Section 1.9.4. In Fort Collins and Loveland (City Limits Only), such a variance is applicable for level of service issues related to bicycle, pedestrian and/or intersection approach or movements.

4.6.8 Alternative Mitigation Strategies

In cases where a study intersection does not meet overall level of service standards, and reasonably related and proportional mitigation to address the level of service is not possible or not desired by the Local Entity, an Alternative Mitigation Strategy may be requested and considered using the following process:

1. The applicant submits preliminary information from the Transportation Impact Study related to the intersection, the impact, mitigation measures considered, discussion related to feasibility and any recommendations for alternative mitigation to the Local Entity.

2. The Local Enity identifies a multi-departmental team of at least two staff members. Staff members may typically come from Department or Divisions related to Transportation Engineering, Traffic Operations, FCMoves (Fort Collins Only), Streets and/or Planning.

3. The team reviews the submitted information, develops an Alternative Mitigation Strategy and identifies the reasonably related and proportional contribution based on impact. The Strategy should be specifically linked to project impact, and may include improvements for any mode of travel at the impacted intersection or elsewhere, or a fee in lieu of improvements towards a project anticipated to be constructed within three years. If the Local Entity Engineer determines that no reasonably related and proportional mitigation based on impact is possible or desired by the Local Entity Engineer, no alternative mitigation may be required.

4. Implementation of an identified Alternative Mitigation Strategy serves as fulfillment of intersection level of service requirements. In Fort Collins (City Limits Only) the administrative determination with regard to an Alternative Mitigation Strategy is final and may only be appealed pursuant to City of Fort Collins Land Use Code Division 2.1.3.

4.7 REPORT CONCLUSIONS

4.7.1 Recommended Improvements

The findings of the Transportation Impact Study should be provided in summary format, including the identification of any areas of significant impacts and recommended improvements/mitigation measures to achieve the LOS standards for all modes. If variance requests or Alterative Mitigation Strategies are being utilized, those shall be detailed in the report.

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 also be identified. This information shall be made available to the project civil engineer for use in preparing scaled drawings.

B. Responsibility.

The Applicant shall describe the location, nature, and extent of all transportation improvements that the Applicant recommends to achieve the required Level of Service for each analysis horizon's year. In addition, the party(ies) responsible to complete the improvements shall be identified. For this discussion, the following definitions apply:

1. Master Planned. Improvements planned having committed funding, including those identified in short range capital improvement programs by the City of Loveland, a special district, MPO, CDOT or other agency. These may be identified in the Scoping Meeting. The Local Entity will provide this information to the Applicant.

2. Background Committed. Improvements committed to by previously approved development as identified in the Scoping Meeting provided by the City at the Scoping Meeting.

3. Applicant Committed. There are two conditions when improvements need to be identified:

    a. Existing plus cumulative traffic with planned and background improvements exceed established levels of service, the Applicant shall identify mitigation to offset project impacts.

    b. Existing plus cumulative traffic with planned and background improvements do not exceed established levels of service, but the addition of project traffic lead to non-compliance, the Applicant shall identify mitigation to achieve established levels of service.

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 Local Entity. 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 Local Entity's and the MPO's Transportation Demand Management Program.

D. Summary Presentation.

The Applicant shall submit a Recommended Improvements Summary Table similar to the example shown in **Attachment "D"** to present the recommendations. The recommended improvements identified on the Recommended Improvement Table shall be categorized as Master planned, Background Committed, or Applicant Committed. Each project should 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 the improvements should be identified, either by local governments, districts, or by the Applicant.

4.7.2 Adequacy Statement in Loveland (GMA and City Limits)

The TIS shall include a clear statement clarifying whether or not the transportation facilities will be adequate and available to serve the proposed development within one year of full build out of the project. The statement shall include specific reference to the facility status paragraph (selected from items in Title 18.15.03.03 of the Loveland Municipal Code) that supports the adequacy conclusion.

A. Alternative Solutions.

The Applicant should assure that all practical solutions (project phasing, reductions in development intensity, etc) have been considered when developing the list of necessary improvements, so that the resulting operating conditions are made to approach the established level of service.

B. Cost Considerations.

When identifying improvement possibilities (either by the Applicant, the Local Entity or the State) necessary to yield an acceptable level of service, the cost of the improvements shall not be considered a limiting constraint within the context of the TIS.

4.8 TIS CERTIFICATION AND INTERSECTION'S CAPACITY RESERVATIONS IN FORT COLLINS CITY LIMITS ONLY

4.8.1 TIS Certification

When a TIS is submitted to the Local Entity Engineer for review, the developer will submit an application for TIS certification.

Once all Local Entity TIS review comments have been satisfactorily addressed, the Local Entity Engineer will issue a letter documenting that the TIS has been accepted and certified by the Local Entity Engineer.

A TIS must be certified by the Local Entity Engineer prior to approval of its associated development application.

4.8.2 Effect of TIS Certification

Once a TIS has been certified, its findings regarding compliance with the Level of Service standards contained in 3.6.4 of the Fort Collins Land Use Code will remain valid for the effective life of the development application unless the character of the proposed development that is the subject of the development application is significantly changed.

4.8.3 Pre-Submittal TIS Certification

A TIS may be certified prior to the submission to the City of a development application for the project. Any such independent certification shall be valid for a period of one year, within which a complete development application for the project must be received by the City, or the TIS certification shall lapse. If a complete development application for the project is received by the City the TIS certification shall be valid for the life of the development application.

4.8.4 Intersection Capacity Reservation

Once a TIS has been certified, the projected traffic volumes associated with the project must be included in the background traffic assumptions of all subsequent TIS that address intersections included in the certified TIS. The Local Entity Engineer will provide this information to the developer in the scoping meeting. A certification of a Master TIS will not reserve intersection capacity. Reserved intersection capacity may not be transferred between projects.

A. Intersection Capacity Reservation Lapse:

If a development application should lapse for whatever reason, any intersection capacity reserved by the project shall also lapse.

Attachment A
Transportation Impact Study Base Assumptions

Project Information			
Project Name			
Project Location			
TIS Assumptions			
Type of Study	Full:		Intermediate:
	MTIS:		Memo:
Study Area Boundaries	North:		South:
	East:		West:
Study Years	Short Range:		Long Range:
Future Traffic Growth Rate			
Study Intersections	1. All access drives		5.
	2.		6.
	3.		7.
	4.		8.
Time Period for Study	AM: 7:00-9:00	PM: 4:00-6:00	Sat Noon:
Trip Generation Rates			
Trip Adjustment Factors	Passby:		Captive Market:
Overall Trip Distribution	SEE ATTACHED SKETCH		
Mode Split Assumptions			
Design Vehicle Information			
Committed Roadway Improvements			
Other Traffic Studies			
Areas Requiring Special Study			

Date: _____

Traffic Engineer: _____

Local Entity Engineer: _____

Attachment B
Transportation Impact Study
Pedestrian Analysis Worksheet

		DESTINATION						
Origin (project land use)		Rec.	Res.←	Inst.	Ofc/Bus.	Com.	Ind.	Other (Specify)
	Recreation							
	1) Residential							
	Institution (school, church, civic)							
	Office/Business							
	Commercial							
	Industrial							
	Other (specify)							

INSTRUCTIONS:
Identify the pedestrian destinations within 1320' (1.5 miles for schools) of the project boundary in the spaces above. The pedestrian Level of Service for the facility/corridor linking these destinations to the project site will be based on the directness, continuity, types of street crossings, walkway surface condition, visual interest/amenity, and security of the selected route(s).

← 12 Dwelling units or more.

Attachment C
Transportation Worksheet

This form must be completed and submitted when requesting a waiver of the TIS submittal and compliance requirements. This form is not required with building permit applications for residential projects proposing twelve dwelling units or less and no substantial access changes on a collector or arterial roadway.

Project Name: _____

Date: _____

Property Legal Description (lot, block, subdivision) _____

_____

_____

_____

Developer: _____

By: _____

Title: _____

Address: _____

Phone #: _____

Fax #: _____

Email: _____

NON-RESIDENTIAL DEVELOPMENT:

Provide the following information for all non-residential projects:

A. Existing use:

1. Description of existing land use: (if none, proceed with Proposed Use) _____

   _____

   _____

2. Existing building area (square footage) for above use(s): (2)_____
3. Number of employees on site each day: (3)_____
4. Daily trip ends for employees [mult. line (3) by the number 4]: (4)_____
5. Number of customers on site each day: (5)_____
6. Daily trip ends for customers [multiply line (5) by the number 2] (6)_____
7. Number of venders on site each day (include trash, ups, etc): (7)_____
8. Daily Trip Ends for venders [mult. line (7) by the number 2]: (8)_____
9. Total Vehicular Daily Trip Ends [line (4) plus line (6) plus line (8)]: (9)_____
10. Source of trip generation data (circle one): ITE, business records, traffic engineer,

personal estimate, other: _____. **Attach documentation to support your data**.

11. Number of accesses existing onto the public street(s) from this property: _____

12. Number of pedestrians visiting the site each day: _____

13. Number of bicyclists visiting the site each day: _____

14. Do sidewalks exist along street(s) adjacent to the property? Yes___ No___

15. Are bike lanes existing (striped) along major collector or arterial street(s) adjacent to this property (on both sides of the street)? Yes___No___ NA___

16. Is the property adjacent to a major collector or arterial street as shown on the City's transportation plan? Yes___ No___

B. Proposed use:

1. Description of proposed land use: _____
_____
_____
_____

2. Proposed building area (square footage) for above use(s): (2)_____

3. Anticipate number of employees on site each day: (3)_____

4. Daily Trip Ends for employees [multiply line (3) by the number 4]: (4)_____

5. Anticipate number of customers on site each day: (5)_____

6. Daily trip ends for customers [multiply line (5) by the number 2]: (6)_____

7. Anticipate number of venders on site each day: (7)_____

8. Daily Trip Ends for venders [multiply line (7) by the number 2]: (8)_____

9. Total Daily Trip Ends [line (4) plus line (6) plus line (8)]: _____

10. Source of trip generation data (circle one): ITE, business records, traffic engineer, personal estimate, other: _____.
Attach documentation to support your data.

11. Proposed number of accesses onto the public street(s) from this property (does NOT include any existing accesses proposed to remain for use): _____

11. Number of existing accesses proposed to remain and be used: _____

13. Number of pedestrians visiting the site each day: _____

14. Number of bicyclists visiting the site each day: _____

15. Are sidewalks proposed to be installed (or exist in good condition) along the street(s) adjacent to the property? Yes___ No ___

16. Are bike lanes existing or proposed to be installed (to be striped with any required no parking signs installed) along major collector or arterial street(s) adjacent to this property (on both sides of the street)? Yes___ No___ NA___

17. Is the property adjacent to a major collector or arterial street as shown on the City's current transportation plan? Yes___ No___

If the total trip new trips, (that is the difference between the daily trip ends calculation for any existing use and the total daily trip ends calculated for the proposed use), is less than 200 and if peak hour and/or daily traffic counts demonstrate that the existing traffic plus the site generated traffic volumes are within the limits set by City Street Standards, the applicant may request a waiver of the Traffic Impact Study submittal requirements by signing below.

_____

Signature Date

Full TIS Required: _____ Intermediate TIS Required:_____ TIS Waived:

By: _____ Date:

RESIDENTIAL DEVELOPMENT:

The following residential development projects require an Intermediate or full Traffic Impact Study.

1. Any application proposing more than 20 single family detached dwelling units.

2. Any application proposing more than 24 multi-family dwelling units where dwelling units are within duplex, triplex, or four-plex structures.

3. Any application proposing more than 34 multi-family dwelling units where dwelling units are within structures containing five or more units.

4. Any application proposing a substantial access change onto a major collector or arterial roadway.

Fill out the table below and indicate in the table the number of dwelling units or access changes proposed for the type(s) of residential development included in your development. If the number of dwelling units and changes in access are less than the thresholds established above and if peak hour and/or daily traffic counts demonstrate that the existing traffic plus the site generated traffic volumes are within the limits set by City policy, the applicant may request a waiver from the TIS requirement by signing your name below.

_____

Signature Date

Full TIS Required: _____	Intermediate TIS Required:_____	TIS Waived:
By: _____	Date:	

NUMBER	RESIDENTIAL DEVELOPMENT TYPE
	Single family detached/dwelling units
	Multi-family dwelling units in duplex, triplex, or four-plex structures
	Multi-family dwelling units in structures containing five or more units
	Access changes onto a collector or arterial roadway
Yes___ No___	Sidewalks exist along streets adjacent to this property, and exist offsite to provide a pedestrian connection to this property?
Yes___ No___	Bike lanes exist and are striped on the major collector or arterial street(s) adjacent to this property (on both sides of the street) and exist offsite to provide a bicycle connection to this property? The property is not adjacent to a major collector or arterial street as shown on the City's Latest Master Transportation Plan.
Yes___ No___	Sidewalks are proposed to be constructed for this use.
Yes___ No___	Bike lanes along the major collector or arterial roadways (both sides of street) are proposed to be constructed for this use.
NA	The property is not adjacent to a major collector or arterial street as shown on the City's Latest Master Transportation Plan

Attachment D
Recommended Improvements Summary

Improvement Description and Location [1]	Responsible Party		
	Applicant Committed	Background Committed [2]	Master Planned [3]
Year 20_ (Short Range)			
Year 20_ (Long Range)			

1. Describe improvement type and location (i.e. intersection or roadway widening, number of lanes needed, functional classification). Example: Widen First St from Boise Ave to Denver Ave to 2-lane arterial standards. Be certain to include any necessary offsite bicycle and pedestrian improvements.
2. The responsible party or project must be identified in this table for any improvements assigned in this column.
3. Master planned improvements committed by the City or State must be approved and fully funded at the time this table is completed.

Attachment E (Loveland city limits and GMA, and Fort Collins GMA)
Peak Hour Intersection Level of Service Summary

Intersection and Critical Movements	Existing		2006 w/o Project		2006 w/ Project		ACF
	AM	PM	AM	PM	AM	PM	Compliant?
SIGNAL CONTROL	LOS	LOS	LOS	LOS	LOS	LOS	(Yes/No)
Madison@1st Street 4-WAY	**B**	**C**	**C**	**C**	**C**	**C**	**YES**
Northbound Left	C	D	D	D	D	E	YES
Northbound Through	B	B	C	C	B	C	YES
Northbound Right	A	C	C	D	B	B	YES
Southbound Left	C	C	C	D	E	E	YES
Southbound Through	A	B	D	C	C	C	YES
Southbound Right	A	A	B	C	D	B	YES
Eastbound Left	D	D	B	D	B	D	YES
Eastbound Through	B	B	D	B	D	C	YES
Eastbound Right	A	A	C	B	C	B	YES
Westbound Left	B	C	B	D	C	D	YES
Westbound Through	B	C	D	B	B	B	YES
Westbound Right	B	B	B	B	B	B	YES
Boise@1st Street 4-WAY	**B**	**C**	**C**	**C**	**C**	**C**	**YES**
Northbound Left	C	D	D	D	D	E	YES
Northbound Through	B	B	C	C	B	C	YES
Northbound Right	A	C	C	D	B	B	YES
Southbound Left	C	C	C	D	E	E	YES
Southbound Through	A	B	D	C	C	C	YES
Southbound Right	A	A	B	C	D	B	YES
Eastbound Left	D	D	B	D	B	D	YES
Eastbound Through	B	B	D	B	D	C	YES
Eastbound Right	A	A	C	B	C	B	YES
Westbound Left	B	C	B	D	C	D	YES
Westbound Through	B	C	D	B	B	B	YES
Westbound Right	B	B	B	B	B	B	YES
Madison@7th Street 2-WAY	**B**	**C**	**C**	**C**	**C**	**C**	**YES**
Northbound Left	C	D	D	D	D	E	YES
Northbound Through	B	B	C	C	B	C	YES
Northbound Right	A	C	C	D	B	B	YES
Southbound Left	C	C	C	D	E	E	YES
Southbound Through	A	B	D	C	C	C	YES
Southbound Right	A	A	B	C	D	B	YES
Eastbound Left	D	D	B	D	B	D	YES
Eastbound Through	B	B	D	B	D	C	YES
Eastbound Right	A	A	C	B	C	B	YES
Westbound Left	B	C	B	D	C	D	YES
Westbound Through	B	C	D	B	B	B	YES
Westbound Right	B	B	B	B	B	B	YES

Stop Sign LOS Criteria
LOS A = < or =10 seconds average delay
LOS B = >10 and < or = 15 seconds
LOS C = >15 and < or = 25 seconds
LOS D = > 25 and < or = 35 seconds
LOS E = >35 and < or = 50 seconds
LOS F = more than 50 seconds average delay