

APPENDIX B

GUIDELINES FOR TRAFFIC STUDIES

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Traffic consultants are required to discuss projects with the County and its representatives prior to study startup. A meeting will be scheduled for large projects to identify the study area and specific roads and intersections that will be analyzed.

There are two basic kinds of Traffic Studies that a traffic consultant shall submit to the County. The first kind is a traffic study for a development which has collectors and arterials within its boundary. The intent of this first kind of traffic study would be to establish an "Access Control Plan" for the collectors and arterials within that development. The second kind of traffic study shall be to analyze the impact, and establish the most efficient and safe access points, for the development onto existing collectors and arterials within the County. The County may require either kinds of traffic studies, both kinds of traffic studies, or an analysis of these and other factors which the County believes may affect the County roadway system. If both kinds of traffic studies are requested, they may both be incorporated into the same report as separate sections or chapters.

I. GENERAL TRAFFIC STUDY REQUIREMENTS

All traffic studies shall contain, as a minimum, the following information:

- A. A summary table listing each type of land use, the units involved, the general rates used (daily and am/pm peaks), and the resultant trip generation.
- B. A map that shows the location of each type of land use within the site.
- C. Traffic study graphics will show for current year and design year.
 - 1. a.m. Peak-Hour Site Traffic (in and out).
 - 2. p.m. Peak-Hour Site Traffic (in and out).
 - 3. a.m. Peak-Hour Total Traffic (in and out).
 - 4. p.m. Peak-Hour Total Traffic (in and out).
 - 5. Total Daily Traffic (with daily site traffic shown in parentheses).
- D. All project generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by the County Engineer.
- E. Pedestrian movements should also be considered in the evaluation. In the initial meeting with the County, the significant pedestrian issues should be defined as well as the specific methodology and criteria to be used for analyzing pedestrian issues.
- F. The operational analysis will show impacts on the existing roadway system, the expected future roadway system, and any interim roadway system that may correspond to expected development phases.
- G. Level of service D shall be the minimum objective for highway and intersection traffic operations during the a.m. and p.m. peak hours. The design year shall coincide with

the design periods ad identified in the *2010 Transportation Study* of the Douglas County Master Plan (as amended).

- H. Trip generation shall be based on average rates contained within the most recent Institute of Transportation Engineers' Trip Generation Guide. The County Engineer shall approve any estimated rates, in the event that data are not available for the proposed land use.
- I. Internal trips shall not exceed 10 percent. All estimates of trip distribution, assignments, and modal split are subject to review and approval by the County.
- J. The study shall summarize expected project traffic impacts on existing and future (20-year) traffic conditions, and state improvements proposed to mitigate those impacts.

The County may request that the Traffic Study address other issues deemed to be important or relevant to the roadways in the vicinity of the project.

II. ACCESS CONTROL PLAN

A. Purpose

The purpose of these guidelines is to develop and maintain a hierarchy of roadways classified to perform a primary mobility function while providing safe, efficient, and reasonable levels of access. While access frequency may increase for succeeding lower classifications on the functional hierarchy, it is intended that these guidelines reflect the concepts developed in the Douglas County Comprehensive Transportation Plan.

B. General Guidelines

General access spacing guidelines have been defined by Douglas County in the Roadway Design and Construction Standards manual which reflect the intent of the access control purpose. These guidelines include:

<u>Category</u>	<u>General Functional Name</u>	<u>Spacing Guidelines</u>
A	Regional Arterials and Major Arterials	2 Intersection/Mile (1/2 Mile Spacing)
B	Minor Arterials	4 Intersections/Mile (1/4 Mile Spacing)
C	Major Collectors	8 Intersections/Mile (1/8 Mile Spacing)
D	Minor Collectors	16 Intersections/Mile (1/16 Mile Spacing)

Category A and B roadways typically have signalized intersections along any given segment, while Category C roadways are generally signalized only when they intersect Category A and B roadways, or, in some cases, other Category C roadways. Category D roadways often do not meet signal warrants except in special circumstances and usually operate under

stop sign control. As a consequence, progression analyses are usually only applicable for Category A and B roadways.

The primary objective of maintaining mobility along an arterial roadway is measured in terms of bandwidth. Bandwidth is measured in seconds and as a percentage of the cycle length. It represents the length of a continuous platoon of vehicles which can negotiate a segment of roadway without being stopped by a red signal indication and is sensitive to several factors including desired speed of the platoon as well as signal cycle length.

However, the maximum attainable bandwidth for a given roadway is primarily controlled by the phasing conditions at critical intersections; generally high volume intersections having multiple phasing and pedestrian clearance requirements.

Table 1 documents the general consequences of intersection streets of differing categories. Of primary significance are two Category A streets which results in a maximum through band in the range of 35%. The most restrictive situation occurs for the intersection of a Category A street with a Category B street which results in a through band on the Category B street in the range of 30%.

Table 1
Typical Attainable Bandwidths by Roadway Category

Analysis Segment Category	Cross Street Category	Percent Cycle Allocation (Bandwidths)			
		Analysis Segment		Cross-Street	
		Lefts	Through	Lefts	Through
A	A	15%	35%	15%	35%
A	B	15%	40%	15%	30%
A	C	12%	55%	0%	33%
A	D	12%	60%	0%	28%
B	B	15%	35%	15%	35%
B	C	12%	50%	0%	38%
B	D	12%	55%	0%	33%
C	C	0%	50%	0%	50%
C	D	0%	55%	0%	45%

Note: Above splits subject to meeting the minimum pedestrian phase requirement calculated at 4 ft./sec. + 6 seconds.

For each category of roadway, the minimum bandwidths shown in Table 2 should be provided unless the Base Case analysis (see Section V.B), documents that these minimum bandwidths are not achievable.

**Table 2
Minimum Bandwidths by Roadway Category**

Analysis Segment Category	Minimum Bandwidth (Unless Lower Bandwidth Documented in Base Case Analysis)
A	35%
B	30%
C	25%

Progression through equal or higher roadway classifications at terminus intersections may not be necessary. See Section V, Item A for determination of logical sectional termini.

IV. CRITERIA FOR VARIANCES TO THE GUIDELINES

It is recognized that constraints imposed by topography, drainages, existing land uses, and the economic development of vacant areas will result in the need to vary from the general access guidelines. However, such variances should not substantially detract from the primary mobility function of the arterial roadway network. In addition, because the greatest reduction in mobility is caused by the introduction of signalized intersections, those roadways having the potential for signalization are the primary concern.

Where exceptions to the general access spacing guidelines are necessary or desirable on roadways having the potential for signalization, the following criteria will be applied:

- A. For any category of roadway, additional restricted movement access points may be granted to serve a demonstrated need. Such restricted movement access points may include right-in/right-out and right-in/right-out/left-in accesses provided that adequate physical and operational controls are implemented to positively prohibit unallowed movements, especially left turn movements onto the arterial roadway.
- B. For any category roadway where the options provided in Item 1 above do not provide sufficient relief, all full movement accesses having the potential for signalization must meet the following parameters and provisions of a progression analysis.

V. PARAMETERS AND PROCEDURES FOR PROGRESSION ANALYSES

A. Initial Review Meeting

The applicant and County should meet to discuss the physical and operational constraints supporting the proposed access plan including substantiation that restricted movement accesses are unsatisfactory.

The second purpose of the initial meeting is to define the analytical assumptions and conditions to be used in the progression analysis. These items will include:

- Definition of the category designation of the roadway segment to be analyzed (Section II).
- Definition of logical termini for the segment to be analyzed. Logical termini generally include intersections with roadways of an equal or higher category designation.
- Determination of existing or "given" intersections along the segment to be analyzed which have the potential for signalization and determination of their category designation per Section II.

Based upon these determinations an initial progression analysis will be conducted to establish the Base Case parameters against which additional access points will be compared.

B. Analytical Parameters

The key analytical parameters to be included in the initial base case progression analysis include progression speed, cycle length, and side street splits.

A detailed traffic analysis of the peak hour utilization of the road segment being analyzed is the preferred approach in defining the analytical parameters. In instances where detailed information is not available or cannot be projected with reasonable accuracy, the following default values may be utilized as preliminary assumptions:

- Cycle Length 90 - 120 Seconds
- Progression Speed 35 - 34 MPH
- Side-Street Splits (per Table 1)

The initial progression analysis will be conducted to define the maximum bandwidth achievable within the designated ranges of cycle length and progression speed. Additional access points having the potential for signalization will be required to maintain the Base Case bandwidth or the minimum bandwidth for the analysis segment category documented previously in Table 2, whichever is less. All proposed accesses will be presumed to be signalized unless documentation is provided that signal warrants will not be met or that restricted movements will be implemented.

C. Evaluation of Additional Access Points

If the travel shed characteristics of the proposed access point are known, peak hour traffic forecasts should be used to determine appropriate phasing and cycle splits while maintaining minimum pedestrian times. If sufficient traffic data is unavailable the proposed access should be categorized according to the categories defined in Section II and side street splits should be used as documented in Table 1 to define the parameters necessary for operational evaluation.

Whether a computerized progression model or a graphical technique is used, the following procedures are to be followed:

- For a specific location, the timing characteristics of the proposed signalized intersection must maintain the minimum bandwidth of Table 2 or as defined in the Base Case progression analysis, whichever is less. If this cannot be achieved then options, (such as restricted turn movements), should be considered.
- If the location of the proposed access is variable, the Base Case progression analysis will identify ranges within which a signalized intersection is appropriate. Comparison with topographic and land use constraints will determine the preferred location.
- To avoid a proliferation of signals on arterial roadways, no more than two and preferably one intersection, having the potential for signalization may be added to the basic intersection frequency established by Roadway Category presented in Section II.