APPENDIX H
4-Lane vs. 5-Lane Comparison/Recommendation

US-81 Corridor Study
4-Lane vs. 5 Lane Comparison/Recommendation

CITY	CRITERIA CONSIDERED					RECOMMENDATION
	TRAFFIC	SAFETY	INTERSECTION DENSITY	DRIVEWAY DENSITY	COMMERCIAL DENSITY	
Pocasset	No	No	Yes	No	No	4 lane undivided
Minco	No	No	Yes	Yes	No	4 lane undivided
Union City	No	No	Yes	No	No	4 lane undivided

9.4 TWO-WAY LEFT-TURN LANES (TWLTL)

Designs using the two-way left-turn lane (TWLTL) are often a cost-effective method to accommodate a continuous left-turn demand and to reduce delay and accidents. These lanes will often improve operations on roadways which were originally intended to serve the through movement but now must accommodate the demand for accessibility created by changes in adjacent land use.

9.4.1 Warrants

9.4.1.1 General

The physical conditions under which a TWLTL should be considered typically include:

1. areas with a high number of driveways per mile (e.g., 45 driveways total per mile on both sides);

2. areas of high-density commercial development; and

3. areas with substantial mid-block left turns.

The applicability of the TWLTL is a function of the traffic conditions resulting from the adjacent land use. The designer should evaluate the area to determine the relative attractiveness of a TWLTL as compared to alternative access techniques. For example, a TWLTL may perpetuate more strip development. If this is not desirable, a raised median is an alternative treatment.

9.4.1.2 Functional Class

An undivided, 4-lane urban or suburban arterial is the most common candidate for the implementation of a TWLTL. This is commonly referred to as a 5-lane facility. The use of a TWLTL on a 2-lane arterial (i.e., a 3-lane facility) may also be appropriate.

9.4.1.3 Traffic Volumes

Traffic volumes are a significant factor in the consideration of a TWLTL. When evaluating its use based on traffic volumes, the designer should use volumes projected for the project design year (see Chapters Twelve and Thirteen). As general guidance, the following should be used:

1. On 4-lane highways, a TWLTL will often be advantageous for traffic volumes between 10,000 and 25,000 ADT with a significant number of left-turning vehicles. On 2-lane highways, a TWLTL will often be advantageous for traffic volumes between 5000 and 12,000 ADT.

2. For traffic volumes greater than 30,000 ADT and/or greater than 1000 DDHV, a raised median should be considered; however, a 6-lane highway with a TWLTL (i.e., a 7-lane facility) may be the more advantageous design selection, especially where roadside development is extremely dense.

3. The decision on whether to provide a TWLTL for traffic volumes between 25,000 and 30,000 ADT will be determined on a case-by-case basis. See Reference (7) for additional information.

9.4.1.4 Pedestrians

Pedestrian crossing volumes are also a consideration because of the large paved area which must be traversed when a TWLTL is present (i.e., no pedestrian refuge exists).

the intersection (i.e., provide no exclusive left-turn lane).

3. Minimum Length of TWLTL. The TWLTL should have sufficient length to operate properly, and the type of intersection treatment will determine the length of the TWLTL. The appropriate minimum length will be influenced by through traffic volumes and operating speeds on the highway. The following guidance may be used:

   a. On facilities where V $\leq$ 30 mph and/or lower traffic volumes exist, the minimum uninterrupted length of a TWLTL should be 300-400 ft.

   b. On facilities where V > 30 mph and/or higher traffic volumes exist, the minimum uninterrupted length of a TWLTL should be 500-600 ft.

   The final decision on the length of the TWLTL will be based on site conditions in coordination with the Traffic Engineering Division and the Urban Design Division, Geometric Design Branch.

9.4.2.3 Railroad Crossings

A TWLTL should not extend across a railroad/highway grade crossing. The TWLTL is striped out in advance of the crossing on both sides by a distance of 100-ft desirable and 50-ft minimum. The designer should coordinate with the Traffic Engineering Division.

9.4.3 Rural Transition Section

9.4.3.1 Warrants

In some cases, a rural transition section may be appropriate, which is a variation of the TWLTL. The rural transition section provides a design which may be advantageous in areas which have both urban and rural features. The use of this section should be considered in transitional areas where design speeds are 50 mph or higher and on the following facilities:

1. major collectors on the State highway system with design year ADT between 8000 and 18,000;

2. principal arterials (other than freeways and arterials with partial control of access) with design year ADT between 5000 and 18,000; and

3. other arterials with design year ADT between 7200 and 18,000.

The rural transition section may also be considered in urban areas on facilities which meet these criteria. For this purpose, an urban area is defined as an area currently developed or having probable future development (within the forecast period) as strip commercial or lot development of 0.5 acres or less and where at-grade access is allowed.

9.4.3.2 Design

The rural transition section is designed according to the typical criteria in Table 9.4A.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

DATE: June 17, 1997

TO: Roadway Design Manual Holders

FROM: Assistant Director - Preconstruction

SUBJECT: Addition to Roadway Design Manual - Section 9.4

Attached are the 4 lane/5 lane design guidelines. Effective immediately, this should be used as guidance for the design of the 4 lane/5 lane sections. Please insert these pages into section 9.4 of your Roadway Design Manual.

Veldo Goins

VG:RBL:km

Could you please give copies to All: Engr. Mngrs.
Prof. Engrs
Squad Supvr.

RECEIVED
JUN 23 1997
ROADWAY DESIGN
DIVISION

9.4.4 4 Lane/5 Lane Design Guidelines

The following tables are intended for use by the designer for determining the best typical section on both rural and urban routes. It gives guidance of which there is still much room for overlap. All features of a particular route should be considered to come up with the best alternative. The designer should not focus on one particular feature when selecting a typical section, but rather look for a preponderance of the features which make that the most suitable alternative. It is advisable to conduct a thorough site review of each project to check for site specific traffic generators which may dictate a change in the typical section.

Table 9.4B

4 LANE/5 LANE DESIGN GUIDELINES

Feature	4- Lane Undivided		4-Lane Divided	5-Lane w/TWLTL(a)	
	Curbed	10' Shoulders		Curbed	10' Shoulders
Functional Class	Collectors or Minor Arterials		Principal Arterials	All Routes (c)	
Traffic Volumes	DHV < 1000 vph ADT < 10,000 vpd		DHV > 1000 vph ADT > 7200 vpd	DHV <1000 vph ADT <30,000 vpd	DHV < 1000 vph ADT < 20,000 vpd
Projected Development	Low to Moderate		Low - Isolated Traffic Generators	Moderate to High	
Intersection Density (d)	≤ 4 intersections./mi.		≤ 4 int/mi.	> 4 intersections/mi.	
Driveway Density	≤ 45 drives/mi. 40% or more Commercial	≤45 drives/mi. Predominately Residential	≤ 45 drives/mi.	> 45 drives/mi. Predominately Commercial	> 45 drives/mi. Predominately Residential
Pedestrian Traffic	Curb or sidewalk warranted (b)	Minimal Pedestrian Traffic	Minimal Pedestrian Traffic	Curb or sidewalk warranted (b)	Minimal Pedestrian Traffic
Design Speed (e)	45 mph	65 mph	65 mph+	45 mph	55/65 mph (g)
Access Control	None	None	Full or Partial (f)	None	None

Footnotes:

(a) Complete TWLTL warrants are covered in section 9.4 of the Design Manual.

(b) See Section 8.1.5 of the Design Manual for curb warrants and Section 8.1.6 of the Design Manual for sidewalk warrants.

(c) 5-Lane section should be avoided on NHS routes except where there is existing high density commercial development.

(d) Intersections include any public streets or roads as well as drives which generate a large volume of left turns, such as those into malls or large retail outlets.

(e) Design speed noted in the table may of course be increased. Posted speed may be based on appropriate speed studies.

(f) Full control required on interstate or other facilities designed to Interstate standards. Partial control (access at section line and quarter section line) is preferred, but not required, on all others.

(g) In order to increase to a 65 mph design speed, the median must be 16' paved with rumble strips adjacent to the inside travel lanes.

Table 9.4C

ADVANTAGES (+) AND DISADVANTAGES (-) OF THE DESIGN ALTERNATIVES

Advantage/Disadvantage	4 Undivided		4 Divided	5 w/TWLTL	
	Curbed	Shoulders		Curbed	Shoulders
Cost					
Initial	-	+	-	-	+
Maintenance	+	+	-	+	+
R/W Needs	+	+	-	+	+
Design Speed	-	+	+	-	-
Capacity	-	-	+	+	+
Delay Time	-	-	+	+	+
Control of Future Improvements	-	-	+	-	-
Access to Adjoining Properties	+	+	-	+	+
Left Turn Storage	-	-	+	+	+
Accident Reduction					
Angle	-	-	+	-	-
Rear End	-	-	+	+	+
Head On	-	-	+	+	+
Sideswipe	-	-	+	-	-
Pedestrian Safety					
Length Crossing	+	+	-	-	-
Refuge @ Median	-	-	+	-	-
Refuge Along Facility	+	-	-	+	-
Side Street Traffic					
Crossing Highway	-	-	+	-	-
Turning Left Onto Highway	-	-	+	+	+
Mail Delivery [a]	-	+	+	-	+
School Bus [b]	-	+	+	-	+

(a) Assuming mail boxes are located on opposite sides of the highway (mail delivery vehicle must go up one side and down the other).