### Lane and Shoulder Width Standards CHAPTER 5

Recent reports have concluded that Minnesota is likely to face tough fiscal decisions in the future as projected revenues fall short of estimated spending.<sup>1</sup> In its 1994 report, Minnesota Planning recommended a number of ways in which future state and local government budget gaps could be addressed. One recommendation was to reduce right-of-way, lane width, and other standards for highways, particularly lower volume roads. Minnesota Planning estimated that reducing standards for newly constructed or reconstructed roads could save between \$26 million and \$265 million on county state-aid highways alone.

In 1995, the Minnesota Department of Transportation (Mn/DOT) created a Geometric Design Standards Task Force to review department standards for low volume rural state trunk highways and state-aid highways in Minnesota. The Task Force focused on lane and shoulder width standards for rural highways serving fewer than 2,000 vehicles per day. In December 1996, the Task Force finalized its recommendations, but its report has not yet been adopted by the Commissioner of Mn/DOT. Changes in administrative rules would be needed in order to adopt the recommendations affecting state-aid highways.

This chapter examines the work of Mn/DOT's Task Force and, like the Task Force, focuses primarily on lane and shoulder width standards for low volume, two-lane rural roads on the State Trunk Highway (STH) System and the County State-Aid Highway (CSAH) System. In this chapter, we address the following questions:

- How do Minnesota's current and proposed lane and shoulder width standards compare with nationally recommended standards, as well as standards in other midwestern states?
- How does the lane width of Minnesota's roads compare with lane widths in other states?

<sup>1</sup> Minnesota Planning, *Within Our Means: Tough Choices for Government Spending* (St. Paul, January 1995); John Brandl and Vin Weber, *An Agenda for Reform: Competition, Community, Concentration--A Report to Governor Arne H. Carlson* (St. Paul, November 1995); and Office of the Legislative Auditor, *Trends in State and Local Government Spending* (St. Paul, February 1996).

- What impact would the recommendations made by Mn/DOT's Geometric Design Standards Task Force have on the State Trunk Highway and County State-Aid Highway systems?
- Has the Task Force adequately considered the benefits and costs of alternative standards, as well as other important factors?

### **RURAL HIGHWAYS**

Minnesota has approximately 10,800 miles of rural trunk highways and about 28,800 miles of rural county state-aid highways. Roughly half of the rural trunk highways and more than 90 percent of the rural county state-aid highways were the subject of the Task Force's study. Specifically, 5,600 miles of trunk highways and 27,700 miles of county state-aid highways carry fewer than 2,000 vehicles per day.

Most of these low volume rural highways are paved. Only about 25 miles, or less than 1 percent, of the rural trunk highways are unpaved, while about 6,200 miles, or 22 percent, of the rural county state-aid highways are gravel roads. These unpaved county roads are very lightly traveled. Two-thirds of them carry fewer than 150 vehicles per day, and less than 3 percent serve 400 or more vehicles per day.

Table 5.1 shows that the vast majority of rural trunk highways have 12-foot lanes. Only about 5 percent have 11-foot lanes and 1 percent have 10-foot lanes. In contrast, about one-fourth of the paved rural county state-aid highways have lanes which are less than 12 feet wide. As Table 5.2 shows, most of these have 11-foot lanes.

Table 5.1: Miles of Rural State Trunk Highways by Lane Width and Average Daily Traffic, 1996 Lane Width Percentage Less Than Average Daily Traffic 10 Feet 11 Feet 12 Feet 12 Feet 52<sup>a</sup> 0-749 162 1.599<sup>b</sup> 12% 750-1,499 28 124 2,535 6 3 1,500-1,999 6 26 1,100 2.000 or More 50 221 4,928 5 Totals<sup>c</sup> 137 532 10,162 6% Percentage 1% 5% 94% Source: Minnesota Department of Transportation.

<sup>a</sup>Includes 14 miles of gravel roads.

<sup>b</sup>Includes 11 miles of gravel roads.

<sup>c</sup>Some totals do not add due to rounding.

Most rural trunk highways have 12-foot lanes.

	frame, 1990		Lane Width		Demoster
Three-fourths of the rural	Projected Average <u>Daily Traffic</u> <sup>a</sup>	10 Feet or Less	<u>11 Feet</u>	<u>12 Feet</u>	Percentage Less Than <u>12 Feet</u>
county state-aid highways have 12-foot lanes.	0-399 400-749 750-999 1,000-1,499 1,500-1,999 2,000 or More	54 89 18 23 22 74	1,714 1,793 640 526 220 <u>256</u>	5,731 4,584 1,697 1,719 911 <u>2,498</u>	23% 29 28 24 27 <u>12</u>
	Totals <sup>b</sup> Percentage	280 1%	5,148 23%	17,140 76%	24%
	Source: Minnesota Departr		ion.		

# Table 5.2: Miles of Rural Paved County State-AidHighways by Lane Width and Projected Average DailyTraffic, 1996

<sup>a</sup>Based on projected traffic levels in 20 years.

<sup>b</sup>Some totals do not add due to rounding.

### **CURRENT AND PROPOSED STANDARDS**

Currently, Mn/DOT has separate standards for trunk highways and state-aid highways. For the State Trunk Highway System, Mn/DOT has one set of design standards which applies to the construction or reconstruction of roads and another which applies to reconditioning or resurfacing projects. Similarly, for the County State-Aid Highway System, Mn/DOT has two different sets of standards.

### **Construction and Reconstruction Standards**

Table 5.3 shows the current construction and reconstruction standards for lane and shoulder widths on the STH and CSAH systems.<sup>2</sup> Since the Task Force focused on highways carrying fewer than 2,000 vehicles per day, the table only shows the lane and shoulder width standards for those roads.

Generally, Mn/DOT's current standards call for newly constructed or reconstructed roads to have paved lane widths of 12 feet. The required width of each shoulder varies by average daily traffic and, for trunk highways, by the functional classification of roads. On paved roads, the minimum shoulder width currently required is 4 feet. Thus, Mn/DOT's current standards require that paved trunk highways and state-aid highways have at least a 32-foot top--namely, 2 lanes

<sup>2</sup> Mn/DOT has other construction and reconstruction standards besides lane and shoulder widths. Both the Task Force and this report focus on lane and shoulder widths because they are very important and have been studied extensively in the national literature. More information is available on the safety implications of lane and shoulder width configurations than is available on the implications of other types of construction standards.

# Table 5.3: Current and Proposed Construction/ReconstructionStandards for Low Volume Rural State Trunk Highways and CountyState-Aid Highways, 1996

		Lar	ne Width (in fe	eet)			Shou	ılder Width (in	feet)	
	State Trur	nk Highways	(Current)	County State-Aid		State Trun	<u>k Highways</u>	(Current) <sup>b</sup>	County State-Aid	
Projected Daily Traffic	Principal Arterials	Minor <u>Arterials</u>	Collectors	Highways (Current)	Proposed <u>Standards</u>	Principal <u>Arterials</u>	Minor <u>Arterials</u>	Collectors	Highways (Current)	Proposed <u>Standards</u>
0-49 50-149 150-749 750-1,499 1,500-2,000	12 12 12 12 12	12 12 12 12 12 12	12 12 12 12 12 12	11 <sup>a</sup> 11 <sup>a</sup> 12 12 12	11 <sup>a</sup> 11 <sup>a</sup> 12 12 12	8 8 8 10	6 6 6 8	4 4 6 6	1 <sup>a</sup> 3 <sup>a</sup> 4 6 8	1 <sup>a</sup> 3 <sup>a</sup> 4 4 6

Source: Minnesota Department of Transportation.

<sup>a</sup>Unpaved roads.

<sup>b</sup>On trunk highways, Mn/DOT generally requires at least 2 feet of the shoulder width to be paved, except on collector roads with projected daily traffic less than 750.

of at least 12 feet each and 2 shoulders of at least 4 feet each.<sup>3</sup> The only exception to this general rule is CSAH roads carrying fewer than 150 vehicles per day. This latter group of roads are gravel roads and are only required to have lane widths of 11 feet. Shoulders narrower than 4 feet are also permitted on these gravel roads.

Also included in Table 5.3 are the Task Force's proposed new construction and reconstruction standards. The Task Force has recommended reductions in minimum shoulder widths for some types of roads at certain traffic levels but has recommended no changes in minimum lane widths. Except for gravel roads, the proposed standards would still require roads to have at least 12-foot lanes and 4-foot shoulders or, in other words, a 32-foot top.

Table 5.4 shows that:

• The proposed changes in construction and reconstruction standards would ultimately affect 12 percent of rural trunk highways and 5 percent of rural county state-aid highways.

Currently, 3,460 miles of trunk highways and about 12,250 miles of paved county state-aid highways do not meet construction and reconstruction standards for lane and shoulder widths.<sup>4</sup> The proposed standards would reduce the number of substandard miles to 2,215 miles of trunk highways and 10,800 miles of paved county state-aid highways. In other words, 12 percent of the STH system and 5 percent of the CSAH system are affected by the proposed change in standards. The impact of the proposal is primarily on roads which have substandard shoulder

A task force is proposing changes in lane and shoulder width standards for low volume rural highways.

*<sup>3</sup>* Current standards for state trunk highways also require that 2 or more feet of each shoulder be paved, except on collector or local roads carrying fewer than 750 vehicles per day. CSAH standards do not require paving of any portion of the shoulders.

<sup>4</sup> These estimates are based on combined lane and shoulder widths and use current, rather than projected, traffic levels.

#### Table 5.4: Impact of Proposed Construction/Reconstruction Standards for Rural State Trunk Highways and County State-Aid Highways With Average Daily Traffic Less Than 2,000 Vehicles

	State Tru	nk Highways		ounty I Highways <sup>a</sup>
	<u>Miles</u>	Percent	<u>Miles</u>	Percent
Current Standards Not Met Proposed Standards Not Met	3,460 <u>2,215</u>	32% <u>20</u>	12,253 <u>10,802</u>	43% <u>38</u>
Miles Affected by Change in Standards	1,245	12%	1,451	5%
Total Rural Miles	10,831		28,764 <sup>b</sup>	
Source: Minnesota Department of Transportation.				

<sup>a</sup>Based on projected traffic levels in 20 years. Includes only paved roads not meeting standard

<sup>b</sup>Includes both paved and unpaved roads.

widths, since the proposal does not affect lane widths on construction and reconstruction projects.

#### **Reconditioning and Resurfacing Standards**

Table 5.5 shows Mn/DOT's current reconditioning and resurfacing standards for trunk highways and the CSAH system. These standards specify the minimum lane and shoulder widths required for reconditioning or resurfacing projects to proceed. The specified widths are lower than those contained in Mn/DOT's construction/reconstruction standards. If the lower set of standards is not met, then a road cannot be reconditioned or resurfaced and must instead be reconstructed at a much higher cost to meet the more demanding standards. <sup>5</sup> Reconditioning or resurfacing standards permit a highway agency to preserve existing roads at a reasonable cost, unless the roads are considerably below standard.

The current standards for the STH system distinguish between reconditioning projects and resurfacing projects, while the current standards for the CSAH system do not make this distinction and are simply called resurfacing standards. For state trunk highways, resurfacing projects are considered to be less costly than reconditioning projects and generally only provide a new surface for the existing pavement in order to improve the ride and prolong the life of the roadway. In addition to a new surface, reconditioning projects may involve modest safety or other improvements, although they generally stay within the existing right-of-way.

Mn/DOT's current standards for the STH system call for a minimum lane width of 11 feet before a resurfacing project can be undertaken. No minimum shoulder width is required prior to resurfacing a state trunk highway. The current standards

<sup>5</sup> On the STH system, Mn/DOT has sometimes found it feasible to widen a road as part of a reconditioning project.

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for reconditioning work on the STH system are greater. Reconditioning a trunk highway can only be done if a road's lanes already are 12 feet wide or will be widened to 12 feet during the project. In addition, the combined lane and shoulder width of a rural low volume trunk highway must be between 14 and 18 feet, depending on projected daily traffic and the road's functional class.

The current CSAH resurfacing standards are more similar to STH reconditioning standards than to STH resurfacing standards.<sup>6</sup> Current CSAH standards for resurfacing projects call for 11-foot lanes for existing traffic volumes below 1,000 vehicles per day and 12-foot lanes for higher traffic volumes. Combined lane and shoulder widths must be 13 feet or more at daily traffic volumes under 750 and 15 feet or more at higher traffic volumes.

The proposed "reconditioning" standards for both the STH and the CSAH systems do not distinguish between reconditioning and resurfacing like the old STH standards. The proposal lumps both types of work together and defines reconditioning as work which extends the life of the roadway by overlaying the existing pavement or structure and may include modest safety or operational improvements but little or no additional right-of-way.

As Table 5.5 shows, the proposed standards would generally reduce the minimum lane width required for reconditioning or resurfacing work, but may lower or raise the combined lane and shoulder width required. The proposed standards raise the combined lane and shoulder width required on most STH resurfacing projects and lower the combined width required on most STH reconditioning projects and all CSAH resurfacing projects.

Table 5.6 shows that the proposed standards will loosen standards for about 1,200 miles, or 4 percent of the rural county state-aid highways. For resurfacing projects, the proposed standards will have virtually no impact on rural trunk highways.<sup>7</sup> For more extensive reconditioning projects, the proposed standards would be less restrictive for about 1,500 miles of trunk highways, or 14 percent of all rural trunk highways.

### **COMPARISON WITH OTHER STATES**

In this section, we compare Minnesota's proposed standards with nationally recommended standards and those of other states. In addition, we compare lane widths in Minnesota with those in other states. In general, we find that Minnesota's proposed construction and reconstruction standards are more

<sup>6</sup> Current STH reconditioning and CSAH resurfacing standards for shoulder widths are hard to compare because the trunk highway reconditioning standards vary by a road's functional class. However, since 94 percent of the county state-aid highways are collectors or local roads, it is reasonable to compare the CSAH standards to the trunk highway reconditioning standards for collectors.

<sup>7</sup> For resurfacing projects, the proposal would loosen lane width standards for a small number of rural trunk highways with 10-foot lanes but raise combined lane and shoulder width standards for other trunk highways.

## Table 5.6: Impact of Proposed Reconditioning Standards for Rural State Trunk Highways and County State-Aid Highways

		State Trunk	k Highways <sup>a</sup>			ity State-Aid ighways
	Recondi	tioning	Resu	rfacing		
	<u>Miles</u>	Percentage	<u>Miles</u>	Percentage	<u>Miles</u>	Percentage
Current Standards Not Met Proposed Standards Not Met	1,653 <u>105 to 146</u>	15% _ <u>1</u>	137 <u>105 to 146</u>	1% 1	1,713 <u>502</u>	6% <u>2</u>
Affected Miles	1,507 to 1,548	14%	-9 to 32	0%	1,211	4%
Total Rural Miles	10,831				28,764	
Source: Minnesota Department of T	ransportation and a	analysis by the Offi	ice of the Legisla	tive Auditor.		
<sup>a</sup> Includes all rural trunk highways, in	cluding those with a	average daily traffi	c of 2,000 or mo r	e vehicles per day.		

demanding than nationally recommended standards and those of most of the midwestern states which Mn/DOT recently contacted. In addition, data from the Federal Highway Administration show that Minnesota has a higher percentage of roads with 12-foot lanes than the national average and most midwestern states.

### **Nationally Recommended Standards**

At the national level, there are two sets of standards which have been recommended for construction and reconstruction projects on paved rural highways carrying fewer than 2,000 vehicles per day.<sup>8</sup> One set of standards is recommended by the American Association of State Highway and Transportation Officials (AASHTO). The other set was recommended in a recent research report prepared for the National Cooperative Highway Research Program (NCHRP) by the Transportation Research Board and the National Research Council.<sup>9</sup> The recommendations in the latter report were based on the results of extensive research which had previously been conducted on rural low volume highways across the United States. Accident data from a number of states including Minnesota were examined in this report.

As shown in Table 5.7:

• Minnesota's proposed construction and reconstruction standards generally require wider lanes than nationally recommended standards.

Both the current and proposed Mn/DOT standards for construction and reconstruction projects require that paved roads have lanes at least 12 feet wide. The NCHRP report recommends 11-foot lanes for paved roads carrying fewer

The proposed standards generally require wider lanes than nationally recommended standards.

<sup>8</sup> We are not aware of any nationally recommended standards for reconditioning or resurfacing projects.

<sup>9</sup> Zegeer C., Stewart R., Council F., and Neumann T. for the Transportation Research Board and the National Research Council,*National Cooperative Highway Research Program Report 362* (Washington, D.C., 1994).

## Table 5.7: Proposed Minnesota and Nationally RecommendedConstruction/Reconstruction Standards for Low Volume Rural Highways,1996

	Lane Width (in Feet)			Should	Shoulder Width (in Feet)			
Projected Daily Traffic	Minnesota <u>(Proposed)</u>	<u>AASHTO<sup>a</sup></u>	<u>NCHRP<sup>b</sup></u>	Minnesota <u>(Proposed)</u>	<u>AASHTO</u>	<u>NCHRP</u>		
0-49	11 <sup>c</sup>	11	11	1 <sup>c</sup>	2	2		
50-149	11 <sup>c</sup>	11	11	3 <sup>c</sup>	2	2		
150-399	12	11	11	4	2	2		
400-1,499	12	11	11	4	4	4		
1,500-2,000	12	12	11	6	6	6		

Source: Minnesota Department of Transportation.

<sup>a</sup>American Association of State Highway and Transportation Officials.

<sup>b</sup>National Cooperative Highway Research Program.

<sup>c</sup>Unpaved Roads.

than 2,000 vehicles per day. AASHTO standards call for lanes at least 11 feet wide for traffic levels under 1,500 vehicles per day and at least 12 feet wide for traffic levels between 1,500 and 2,000 vehicles per day.

Minnesota's proposed standards for shoulder widths on construction and reconstruction projects are slightly more demanding than the AASHTO and NCHRP standards. For the most part, the proposed standards for paved roads are the same as the nationally recommended standards. For traffic levels between 150 and 399 vehicles per day, however, the proposed Minnesota standards would require 4-foot shoulders, while the nationally recommended standards call for 2-foot shoulders.

Table 5.8 shows that:

• Implementing the NCHRP standards, particularly for county state-aid highways, could potentially lower future construction and reconstruction costs much more than the Task Force's proposed standards.

The NCHRP standards would generally require 11-foot lanes to be built, while the proposed standards would require 12-foot lanes. The Task Force's proposed standards would affect only 5 percent of the CSAH system. In contrast, implementing the NCHRP standards would bring 28 percent of the CSAH system into compliance with standards. In addition, the NCHRP standards would reduce the costs needed to reconstruct and pave the more than 2,000 miles of gravel roads which have projected traffic volumes of 150 or more vehicles per day and thus require paving according to Mn/DOT standards.<sup>10</sup> The difference between the

<sup>10</sup> A county may elect to reconstruct a road projected to carry 150 or more vehicles per day as a gravel road. However, the road must be built wide enough to meet the width standards applicable to its projected traffic level.

# Table 5.8: Impact of Nationally Recommended Construction/Reconstruction Standards for Paved Low Volume Rural Highways onMinnesota's Trunk Highways and County State-Aid Highways

	State Tru	nk Highways		ounty I Highways <sup>a</sup>
	<u>Miles</u>	Percent	<u>Miles</u>	Percent
Current Minnesota Standards Not Met	3,460	32%	11,814	41%
Nationally Recommended (NCHRP) Standards Not Met	<u>1,628</u>	<u>15</u>	3,645	<u>13</u>
Difference Between NCHRP Recommended Standards and Current Minnesota Standards	1,832	17%	8,169	28%
Total Rural Miles	10,831		28,764 <sup>b</sup>	
Source: Minnesota Department of Transportation.				

<sup>a</sup>Based on current traffic levels. Includes only paved roads not meeting standards.

<sup>b</sup>Includes both paved and unpaved roads.

proposed standards and NCHRP standards potentially affects more than 8,500 miles on the CSAH system.

Under the current formula for allocating state aid to counties, half of the state aid paid to counties is for construction needs. If a road has not been reconstructed in the last 25 years, it is eligible for construction needs aid. The amount of aid a road receives depends on the estimated reconstruction costs, which in turn depend on the standards set for the CSAH system. Implementing the NCHRP standards would redirect a portion of the funds away from certain low volume rural roads and permit counties to use state aid to more frequently reconstruct or resurface CSAH highways.<sup>11</sup> The state aid formula could also be modified to permit more funds to be used for maintenance purposes.

The impact on trunk highways would be less significant. The proposed standards would reduce the miles of state trunk highways below lane and shoulder width standards from 3,460 to 2,215 miles. In contrast, implementing the NCHRP standards would reduce the miles of substandard trunk highways to 1,628 miles. The difference in miles affected by the proposed standards and the NCHRP standards is less than 600 miles of trunk highways. It is not known how many of these miles of trunk highways, if any, are likely to be reconstructed or widened in future years.

Nationally recommended standards would impose less stringent standards on 8,500 miles of county state-aid highways.

<sup>11</sup> We estimate that it takes about 60 to 70 years from the time of the last reconstruction for counties to receive sufficient funds to reconstruct a road again. This estimate does not include an allowance for the resurfacing needs between reconstructions.

### **Standards of Other Midwestern States**

At our request, Mn/DOT gathered information on lane and shoulder width standards for several midwestern states, including Iowa, Michigan, South Dakota, and Wisconsin. Three of these four states permit certain low volume rural roads to have 11-foot lanes. Wisconsin permits 11-foot lanes on state and county trunk highways which are collector or local roads and have a projected traffic volume under 1,500 vehicles per day. Iowa's standards call for 11-foot lanes on rural local roads, collector highways, and some minor arterials. The cutoff point between 11-foot lanes and 12-foot lanes varies from a projected traffic level of 1,000 vehicles per day for certain minor arterials and major collectors to 3,000 for local roads. Michigan's standards say that 12-foot lanes are desirable but that 11-foot lanes are acceptable for 2-lane rural highways with projected traffic volumes under 750 vehicles per day. Only the South Dakota Department of Transportation reported to Mn/DOT that its standards call for a minimum lane width of 12 feet on all state highways. South Dakota's standards were, however, "very preliminary" and had not yet been adopted by the department.

### **Comparison of Lane Widths**

Having higher standards than other states or than nationally recommended standards might make sense if Minnesota's roads were narrower than other states and the higher standards served to help Minnesota catch up with other states.<sup>12</sup> According to data from the Federal Highway Administration, however:

• Minnesota already has a higher percentage of highways with 12-foot lanes than the national average and surrounding states.

Table 5.9 shows that about 74 percent of the rural roads in Minnesota have lane widths of 12 feet or more.<sup>13</sup> This compares with a national average of 43 percent and figures ranging from 31 percent to 64 percent for other midwestern states. South Dakota and North Dakota are the only other midwestern states which have lane widths of 12 feet or greater on more than 50 percent of their rural roads. However, many of the rural roads with 12-foot lanes in these two states may be gravel roads. While only 17 percent of Minnesota's rural roads (excluding local roads) are gravel, the share of unpaved roads is 42 percent in South Dakota and 47 percent in North Dakota.<sup>14</sup>

Table 5.10 shows that:

• The difference in lane widths between Minnesota and other states is most significant for rural collector roads.

14 Excluding local roads, 16 percent of rural roads across the nation are gravel.

Minnesota's rural roads have wider lanes than the average for many midwestern states and the nation as a whole.

<sup>12</sup> Having higher standards might also make sense if those standards were based on factors unique to Minnesota. However, under any of these circumstances having higher standards only makes sense if they are justified based on an analysis of benefits and costs.

<sup>13</sup> Available data include roads of all functional classes except local roads. It is not possible to compare lane widths across states for just state or county roads.

States, 1994		Percent	age of Roads wit	h Various Lane V	<i>N</i> idths <sup>a</sup>	
	Less Than <u>9 Feet</u>	<u>9 Feet</u>	<u>10 Feet</u>	<u>11 Feet</u>	<u>12 Feet</u>	Over <u>12 Feet</u>
Minnesota	0%	1%	4%	20%	71%	3%
Wisconsin	0	0	17	49	34	0
Michigan	0	5	29	35	31	0
lowa	1	1	5	43	35	14
Illinois	5	11	21	26	34	4
North Dakota	4	5	12	15	63	1
South Dakota	5	8	10	15	60	2
National Average	5%	10%	24%	19%	40%	3%
Source: Federal H	Highway Admini	istration.				
<sup>a</sup> Excludes local ro	ads.					

### Table 5.9: Lane Width of Existing Rural Roads, Minnesota and Other States, 1994

 Table 5.10: Lane Width of Existing Rural Roads by Functional Class,

 Minnesota and the United States, 1994

		Percentage of Roads with Various Lane Widths <sup>a</sup>						
		Less than <u>9 Feet</u>	<u>9 Feet</u>	<u>10 Feet</u>	<u>11 Feet</u>	<u>12 Feet</u>	Over <u>12 Feet</u>	
Interstate	MN	0%	0%	0%	0%	100%	0%	
	US	0	0	0	0	97	3	
Other Principal	MN	0	0	4	7	84	5	
Arterials	US	0	0	2	10	83	4	
Minor Arterials	MN	0	0	2	8	86	3	
	US	0	2	12	19	63	5	
Major Collector	MN	0	1	5	26	68	1	
	US	3	9	29	24	33	3	
Minor Collector	MN	1	2	5	23	62	7	
	US	12	21	31	16	17	3	
Source: Federal Highwa	y Administra	ation.						

<sup>a</sup>Data on minor collectors are from 1992.

In Minnesota, 69 percent of rural collector roads have lane widths of 12 feet or more. Nationally, only 36 percent of rural major collectors and 20 percent of minor collectors have lane widths of 12 feet or more. There are also some differences in lane widths on minor arterials. About 89 percent of Minnesota's rural minor arterials have lane widths of 12 feet or more compared with 68 percent nationally. There is very little difference between Minnesota and other states, however, in lane widths on rural interstates or principal arterials.

### DISCUSSION OF TASK FORCE'S RECOMMENDATIONS

The Geometric Design Standards Task Force has recommended new lane and shoulder width standards for both construction and reconstruction projects and reconditioning or resurfacing work on trunk highways and state-aid highways. These standards would apply to rural two-lane highways serving fewer than 2,000 vehicles per day. In addition, the Task Force has recommended the state-aid variance process be improved by increasing the use of administrative variances for exceptions to standards and reducing the time required to process variance requests.

### Strengths

We think that:

• The Task Force has made reasonable recommendations for changing the current reconditioning and resurfacing standards and has correctly recognized the need for greater flexibility and timeliness in the state-aid variance process.

The proposed reconditioning standards provide needed flexibility for highway authorities at a time when fiscal realities place a greater emphasis on preserving existing roads than on expanding existing roads. The proposed standards particularly provide additional flexibility for county state-aid highways. These roads have been subject to a much more stringent standard than trunk highways for resurfacing projects.<sup>15</sup>

Changes in the variance process are also needed since standards cannot fully anticipate all possible circumstances. Ideally, decisions about a particular project should take into account the project's unique circumstances and involve a careful analysis of advantages and disadvantages of various options. Standards which are well suited for one set of circumstances may be ill suited for another. A speedy but fair process is needed so that variances can be granted in a timely manner in those circumstances in which they are warranted. It remains to be seen exactly what specific changes in the variance process Mn/DOT will choose to implement.

In addition, we feel that the Task Force has suggested some reasonable improvements to the existing construction and reconstruction standards for shoulder width. The proposal sets the cutoff point between 4-foot shoulders and 6-foot shoulders at 1,500 vehicles per day and thus reduces minimum shoulder widths for certain highways. This cutoff point was established using benefit-cost analysis with actual cost data from county state-aid highways. The proposal, however, still deviates from nationally recommended standards. For roads carrying 150 to 399 vehicles per day, the proposal calls for shoulders to be at least

Some of the Task Force's recommendations deserve support.

<sup>15</sup> Current state-aid practices, however, partially penalize counties for resurfacing highways with state-aid funds received because of construction needs.

4 feet wide, while AASHTO and NCHRP standards call for shoulders to be 2 feet wide. The Task Force and Mn/DOT need to examine more carefully the rationale for this difference, including whether the accident reduction benefits of 4-foot shoulders outweigh the additional costs.

### Weaknesses

We do not believe, however, that the Task Force has adequately considered the need for 12-foot lanes, rather than 11-foot lanes, on low-volume rural roads. The proposed standards still call for wider lanes than recommended by national organizations or studies. In particular, we note that:

• The proposed construction and reconstruction standards for lane width are not justified by Mn/DOT's own benefit-cost analysis.

As part of the Task Force's study, Mn/DOT staff from the Office of Investment Management prepared an analysis which examined the benefits and costs of five different lane and shoulder width options at various traffic levels.<sup>16</sup> The analysis measured the benefits of wider lanes or shoulders in terms of the value of reduced fatality, injury, and property-damage-only accidents. It used cost estimates for various lane and shoulder width options, which had been prepared by Mn/DOT's Engineering Cost Data and Estimating Unit. Estimates, rather than actual cost data, were used, because actual data were not available for several of the options. The only paved trunk highways or county state-aid highways which have been built in recent years have 12-foot lanes and at least 4-foot shoulders.

Mn/DOT's analysis showed that:

• The 11-foot lane, 2-foot shoulder option was the most cost-effective option at traffic volumes less than about 950 vehicles per day. <sup>17</sup>

For some of the options examined, the 11-foot lane, 2-foot shoulder option was cost-effective at traffic volumes up to 1,300 vehicles per day. In addition, if a 7 percent discount rate was used instead of 4.5 percent, the 11-foot lane, 2-foot shoulder option was judged to be more cost-effective than all the other options at traffic volumes less than 1,200 and than some of the options at traffic volumes up to 1,600 vehicles per day.<sup>18</sup>

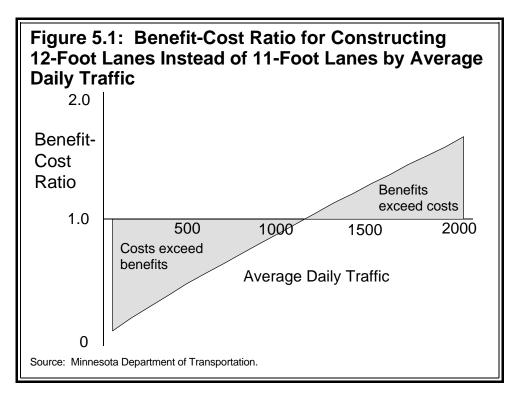
Figure 5.1 illustrates the relationship between traffic volumes and benefit-cost ratios for two of the options: 11-foot lanes, 4-foot shoulders and 12-foot lanes,

*18* The discount rate is the interest rate which is used to convert future benefits or costs to a present value. A discount rate is used because it is generally assumed that people value \$1 in benefits received today more than \$1 in benefits received at some future date. Mn/DOT generally uses a 4.5 percent discount rate, while the Federal Highway Administration uses a 7 percent discount rate.

But the recommended lane widths for construction projects are not supported by national studies or Mn/DOT's own benefit-cost analysis.

*<sup>16</sup>* Five options were included in the analysis: 11-foot lanes and 2-foot shoulders, 11-foot lanes and 4-foot shoulders, 12-foot lanes and 3-foot shoulders, 12-foot lanes and 4-foot shoulders, and 12-foot lanes and 6-foot shoulders.

<sup>17</sup> By "cost-effective" we mean that the additional costs of any other option relative to the costs of the 11-foot lane, 2-foot shoulder option exceeded the difference in benefits, as measured by the estimated reduction in accidents.



4-foot shoulders. At 100 vehicles per day, the benefit-cost ratio is 0.12. In other words, the costs of building 12-foot lanes instead of 11-foot lanes are about 8 or 9 times the benefits. At 500 vehicles per day, the benefit-cost ratio is 0.49, and the costs of 12-foot lanes are about twice the benefits. At traffic levels between 1,100 and 1,200 vehicles per day, the benefits of 12-foot lanes begin to equal the costs, and they exceed the costs at higher traffic levels.

There is reason to believe, however, that the cost estimates used in Mn/DOT's analysis understate the real difference in costs per mile between the various options. Table 5.11 shows the costs per mile of reconstructing a highway to various lane and shoulder width combinations, as estimated by Mn/DOT in the

## Table 5.11: Costs Per Mile for Reconstruction of aRural Two-Lane Highway

Optie	ons	Cost	Per Mile <sup>a</sup>
Lane Width	Shoulder Width	Mn/DOT Estimates	Actual Costs for County State-Aid Highways
11	2	\$86,606	NA
11	4	101,323	NA
12	3	103,924	NA
12	4	109,601	\$192,775
12	6	112,998	204,731

NA = Not available.

Source: Minnesota Department of Transportation.

<sup>a</sup>Mn/DOT's estimates include the paving of at least two feet of each shoulder, while the actual costs for county state-aid highways do not include paved shoulders.

analysis mentioned above as well as in another analysis. In the second analysis, Mn/DOT used actual construction cost data for county state-aid highways constructed with 12-foot lanes and either 4-foot or 6-foot shoulders. The actual cost per mile for county state-aid highways was significantly higher than the estimates per mile prepared by Mn/DOT's estimators. In addition, the difference in actual cost per mile between the 12-foot lane, 4-foot shoulder option and the 12-foot lane, 6-foot shoulder option was much higher (\$11,956) than the difference when the cost estimates are used (\$3,397).

Assuming Mn/DOT's cost estimates understated the cost differences among the various options, then 11-foot lanes would be cost-effective at average daily traffic levels higher than Mn/DOT staff originally concluded. In fact:

#### • Judging from the actual cost data for county state-aid highways, 11-foot lanes would probably be cost-effective at traffic volumes up to 1,500 or possibly 2,000 vehicles per day.

This result is not surprising, since nationally recommended standards call for 11-foot lanes at traffic volumes in that range and for 12-foot lanes at traffic volumes exceeding 1,500 or 2,000 vehicles per day.

The Task Force indicated that there may be situations in which 11-foot lanes are acceptable but recommended standards calling for 12-foot lanes on all paved roads. As support for its recommendation, the Task Force cited Minnesota's past safety record, past road construction practices, public expectations, climate, the size of trucks and other large vehicles, and shoulder drop-off problems. However, there are no data which support the Task Force's conclusion that the public expects 12-foot lanes and certainly no data which suggest that the public is willing to pay the additional costs of wider lanes on lightly traveled roads.<sup>19</sup> Climate, the size of vehicles, and shoulder drop-off problems are potential problems which are faced by other states besides Minnesota.<sup>20</sup> Most other states find 11-foot lanes adequate in certain situations, and three of the four nearby states which sent their standards to Mn/DOT permit 11-foot lanes for low volume roads.

Minnesota's accident and fatality rates have generally been below the national average, but it is unlikely that Minnesota's wider lanes explain much of the difference between state and national rates. Driving under the influence of alcohol or drugs, speeding, and inattentive or reckless driving are among the most significant factors causing accidents. The failure to use selt belts also increases the severity of injuries in accidents. The benefit-cost analysis done by Mn/DOT was based on nationally respected research which estimated the relationship

20 Mn/DOT needs to do a more comprehensive analysis of future maintenance and rehabilitation costs under various lane and shoulder width options. The Task Force cited the shoulder drop-off problem for 11-foot lanes but did not mention the additional pavement maintenance costs which would be incurred with 12-foot lanes.

The Task Force cited factors for deviating from the benefit-cost analysis but did not fairly evaluate those factors.

*<sup>19</sup>* The Task Force cited a national survey in which highway users rated their satisfaction with lane widths higher than their satisfaction with other safety items. As we have seen, the share of lanes which are less than 12-feet wide is much larger nationally (57 percent) than in Minnesota (26 percent). Perhaps the Task Force should have concluded that national highway users are satisfied with having more than half of their roads narrower than 12 feet and that higher standards, particularly for low volume roads, are an unnecessary cost.

between the number of accidents and lane and shoulder width. At a traffic level of 500 vehicles per day, research indicates that a highway with 12-foot lanes and 4-foot shoulders would have only one fewer accident per year than a highway with 11-foot lanes and 4-foot shoulders for every 78 miles of road.<sup>21</sup>

Considering Mn/DOT's own benefit-cost analysis, national standards and research, data showing the share of roads which are less than 12 feet wide nationally, and the Task Force's rationale, we recommend that:

- Mn/DOT should reject the Task Force's lane width recommendations, and
- Mn/DOT should permit 11-foot lanes on certain low volume rural highways and determine the projected traffic level at which the standard should be 12 feet.

The CSAH system would be more affected by a change in the status quo regarding lane width standards. Only 6 percent of trunk highway miles have lane widths below 12 feet, and Mn/DOT is unlikely to reconstruct these roads in the near future. It makes sense to lower the lane width standard on certain low volume roads, but some counties may resist this change because it reduces the amount of state aid they receive. Counties should be permitted to build a road wider than 11 feet if they want, but they should pay the extra costs. State aid does not need to be provided at a level which permits the highest construction standards to be met. State aid should be sufficient to build or rebuild roads to a reasonable standard, which is supported by an analysis of benefits and costs. The Task Force's recommendations on lane width are not supported by national research or the benefit-cost analysis conducted by Mn/DOT staff.

We also think the Task Force's recommendation on lane width for construction and reconstruction projects fails to consider the fiscal realities faced by state and local highway agencies in Minnesota. Given the current level of funding, highway agencies must emphasize preservation of the existing infrastructure over improvements, particularly improvements which do not deliver benefits in excess of their costs. State government, including Mn/DOT, should not set standards for local governments which are excessive and not cost-effective. Just as Mn/DOT finds it beneficial to have increased flexibility from the federal government in decisions about federally-funded projects, Mn/DOT should permit local governments greater flexibility in designing state-funded projects at the local level and in meeting local needs.

### SUMMARY

The Geometric Design Standards Task Force sponsored by Mn/DOT has developed some reasonable recommendations for new highway standards. In

Mn/DOT should reexamine the Task Force's recommendations for construction and reconstruction projects.

<sup>21</sup> Data on crashes on rural county state-aid highways in Minnesota indicate that only 1 percent of crashes involve fatalities, while 36 percent involve injuries, and 63 percent are property-damage-only incidents.

particular, its recommended reconditioning standards seem practical and may help to reduce unnecessary highway expenditures on a limited number of highway miles.

The Task Force's recommended standards for lane widths on construction and reconstruction projects are somewhat arbitrary and deviate from the results of Mn/DOT's own benefit-cost analysis. That analysis suggests, like reputable national studies, that the costs of constructing 12-foot lanes outweigh accident reduction benefits for lesser-traveled rural highways. Minnesota has significantly more rural roads with 12-foot lanes than the national average, and the Task Force's proposal maintains a lane width standard in excess of nationally recommended standards.

We urge Mn/DOT and the Task Force to reconsider the Task Force's recommendations for construction and reconstruction projects. Given the fiscal realities facing state and local governments in Minnesota, it is important that every reasonable effort be made to maximize the cost-effectiveness of government spending. Mn/DOT and local governments need to focus on building a transportation system that is affordable and practical from a benefit-cost standpoint, not on building the best possible system. Adopting lane and shoulder width standards more like nationally recommended standards could free up funds which are needed to preserve the existing infrastructure and to respond to congestion, economic development, and other safety needs.