



American Association of
State Highway and
Transportation Officials

**Guidelines for
Geometric
Design of Very
Low-Volume
Local Roads
(ADT \leq 400)**

2001



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Geometric
Design of Very
Low-Volume
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(ADT \leq 400)

American Association of State Highway
and Transportation Officials

444 North Capitol St., N.W., Suite 249
Washington, DC 20001

(202) 624-5800
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—
Ken Kobetsky, P.E. and Jim McDonnell, P.E., AASHTO, Staff Liaisons

- ALABAMA— Arkle, Don T.
Chief, Design Bureau
Alabama Department of Transportation
1409 Coliseum Boulevard
Montgomery, AL 36130-3050
- ALABAMA— Walker, Steven E.
Assistant Chief Design Engineer
Alabama Department of Transportation
1409 Coliseum Boulevard
Montgomery, AL 36130-3050
- ALASKA— Hogins, Gary
Chief of Design & Construction
Standards
Alaska Department of Transportation &
Public Facilities
3132 Channel Drive
Juneau, AK 99801-7898
- ARIZONA— Louis, John L.
Assistant State Engineer, Roadway Group
Arizona Department of Transportation
205 South 17th Ave., Mail Drop 611E
Phoenix, AZ 85007-3213
- ARKANSAS— Loe, Dale F.
Assistant Chief Engineer—Design
Arkansas State Highway & Transportation
Department
P.O. Box 2261, 10324 Interstate 50
State Highway Building
Little Rock, AR 72203-2261
- ARKANSAS— McConnell, Phillip L.
Engineer of Roadway Design
Arkansas State Highway & Transportation
Department
P.O. Box 2261, 10324 Interstate 50
State Highway Building
Little Rock, AR 72203-2261
- CALIFORNIA— Sutliff, Karla
Acting Chief, Division of Design
California Department of Transportation
1120 N Street, Room 2106 (M.S. #28)
Sacramento, CA 95814
- COLORADO— Van De Wege, Dean
Project Development Branch Manager
Colorado Department of Transportation
4201 East Arkansas Avenue, Room 406
Denver, CO 80222
- CONNECTICUT— Bard, Carl F.
Principal Engineer
Connecticut Department of Transportation
P.O. Box 317546/2800 Berlin Turnpike
Newington, CT 06131-7546
- CONNECTICUT— Byrnes, James F.
Chief Engineer
Connecticut Department of Transportation
P.O. Box 317546/2800 Berlin Turnpike
Newington, CT 06131-7546
- CONNECTICUT— Smith, Bradley J.
Manager of State Design
Connecticut Department of Transportation
P.O. Box 317546/2800 Berlin Turnpike
Newington, CT 06131-7546
- DELAWARE— Angelo, Michael A.
Assistant Director, Design Support
Delaware Department of Transportation
P.O. Box 778, Bay Road, Route 113
Dover, DE 19903-0778
- DELAWARE— Canning, Kevin
Supervising Engineer—Road Design
Delaware Department of Transportation
P.O. Box 778, Bay Road, Route 113
Dover, DE 19903-0778
- DELAWARE— Simmons, Michael H.
Road Design Engineer
Delaware Department of Transportation
P.O. Box 778, Bay Road, Route 113
Dover, DE 19903-0778
- FLORIDA— Blanchard, Brian
State Roadway Design Engineer
Florida Department of Transportation
605 Suwannee Street, MS 32
Tallahassee, FL 32399-0450
- FLORIDA— Hattaway, Billy L.
Director, Office of Design
Florida Department of Transportation
605 Suwannee Street, MS 38
Tallahassee, FL 32311-0450
- FLORIDA— Mills, Jim
Roadway Design Engineer
Florida Department of Transportation
605 Suwannee Street
Tallahassee, FL 32399-0450
- GEORGIA— Buchan, Ben
Georgia Department of Transportation
2 Capitol Square, Room 356
Atlanta, GA 30334
- GEORGIA— Kennerly, James
State Road and Airport Design Engineer
Georgia Department of Transportation
2 Capitol Square, Room 444
Atlanta, GA 30334
- GEORGIA— Palladi, Joseph
State Urban and Multi-Modal Design
Engineer
Georgia Department of Transportation
No. 2 Capitol Square, Room 356
Atlanta, GA 30334
- HAWAII— Abe, Casey
Engineer Program Manager, Design
Branch, Highways Division
Hawaii Department of Transportation
601 Kamokila Boulevard, Room 688A
Kapolei, HI 96707

- HAWAII— Fronda, Julius
Highway Design Engineer
Hawaii Department of Transportation
601 Kapolei Boulevard, Room 609
Kapolei, HI 96707
- IDAHO— Hutchinson, Steven C.
Assistant Chief Engineer—Development
Idaho Transportation Department
P.O. Box 7129, 3311 W. State Street
Boise, ID 83707
- IDAHO— Thomas, Loren D.
Roadway Design Engineer
Idaho Transportation Department
P.O. Box 7129, 3311 W. State Street
Boise, ID 83707
- ILLINOIS— Hine, Michael
Chief of Design and Environment
Illinois Department of Transportation
2300 S. Dirksen Parkway
Springfield, IL 62764
- INDIANA— Klika, Phelps H.
Director, Division of Design
Indiana Department of Transportation
100 N. Senate Avenue, Room N642
Indianapolis, IN 46204-2217
- IOWA— Dillavou, Mitch
Director, Office of Design
Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010
- IOWA— Little, David
Assistant District Engineer
Iowa Department of Transportation
1420 Fourth Street, SE
Mason City, IA 50402-0742
- IOWA— Stein, Will
Methods Engineer
Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010
- KANSAS— Adams, Richard G.
Road Design Engineer
Kansas Department of Transportation
915 Harrison Ave., 9th Floor
Topeka, KS 66612-1568
- KANSAS— Armstrong, LaMonte
Road Design Engineer
Kansas Department of Transportation
Docking State Office Building
915 Harrison Ave., 9th Floor
Topeka, KS 66612-1568
- KANSAS— Brewer, James O.
Engineering Manager—State Road Office
Kansas Department of Transportation
Docking State Office Building
915 Harrison Ave., 9th Floor
Topeka, KS 66612-1568
- KENTUCKY— Kratt, David
Location Branch Manager
Kentucky Transportation Cabinet,
Division Of Highway Design
High and Clinton Streets, 6th Floor
Frankfort, KY 40622
- KENTUCKY— Sharpe, Gary
Director, Division of Highway Design
Kentucky Transportation Cabinet
501 High Street, 6th Floor
Frankfort, KY 40622
- KENTUCKY— Sperry, Kenneth R.
Assistant State Highway Engineer
Kentucky Transportation Cabinet, State
Highway Engineer's Office
501 High Street, State Office Building
Frankfort, KY 40622
- LOUISIANA— Israel, N. Kent
Roadway Design Engineer Administrator
Louisiana Department of Transportation
and Development
P.O. Box 94245, 1201 Capitol Access Road
Baton Rouge, LA 70804-9245
- LOUISIANA— Kalivoda, Nicholas
Traffic and Geometrics Design Engineer
Louisiana Department of Transportation
and Development
Trenton, LA 86250
- LOUISIANA— Porta, Lloyd E.
Louisiana Department of Transportation
and Development
P.O. Box 94245, 1201 Capitol Access Road
Baton Rouge, LA 70804-9245
- MAINE— Casey, Jerry A.
Program Manager—Urban and Arterial
Highways
Maine Department of Transportation
Transportation Building, State House
Station 16
Augusta, ME 04333-0016
- MARYLAND— Douglass, Robert D.
Deputy Chief Engineer-Highway
Development
Maryland Department of
Transportation, State Highway
Administration
707 N. Calvert Street, Mail Stop C102
Baltimore, MD 21202
- MARYLAND— McClelland, Kirk G.
Highway Design Division Chief
Maryland Department of
Transportation, State Highway
Administration
707 N. Calvert Street
Baltimore, MD 21202
- MASSACHUSETTS— Blundo, John
Deputy Chief Engineer, Highway
Engineering
Massachusetts Highway Department
10 Park Plaza, Room 6340
Boston, MA 02116-3973
- MASSACHUSETTS— Wood, Stanley
Highway Location and Design Engineer
Massachusetts Highway Department
10 Park Plaza
Boston, MA 02116
- MICHIGAN— Miller, Paul F.
Engineer of Design
Michigan Department of Transportation,
Design Division
State Transportation Building
425 W. Ottawa Street, P.O. Box 30050
Lansing, MI 48909
- MINNESOTA— Elasky, Richard
State Design Engineer
Minnesota Department of Transportation
Transportation Building, MS 670
395 John Ireland Boulevard
St. Paul, MN 55155-1899

- MINNESOTA— Gerdes, Delbert
Director, Technical Support
Minnesota Department of Transportation
Transportation Building, MS 675, 395
John Ireland Boulevard
St. Paul, MN 55155-1899
- MISSISSIPPI— Pickering, John B.
Roadway Design Engineer
Mississippi Department of Transportation
P.O. Box 1850, 401 North West Street
Jackson, MS 39215-1850
- MISSISSIPPI— Ruff, Wendel T.
Assistant Chief Engineer—Preconstruction
Mississippi Department of Transportation
P.O. Box 1850, 401 North West Street
Jackson, MS 39215-1850
- MISSOURI— Heckemeyer, Diane
State Design Engineer
Missouri Department of Transportation
105 West Capitol Avenue, P.O. Box 270
Jefferson City, MO 65101
- MISSOURI— Nichols, David B.
Director of Project Development
Missouri Department of Transportation
105 W. Capitol Avenue, P.O. Box 270
Jefferson City, MO 65101
- MONTANA— Peil, Carl S.
Preconstruction Engineer
Montana Department of Transportation
P.O. Box 201001, 2701 Prospect Avenue
Helena, MT 59620-1001
- MONTANA— Williams, Ron
Road Design Engineer
Montana Department of Transportation
P.O. Box 201001, 2701 Prospect Avenue
Helena, MT 59620-1001
- NEBRASKA— Allyn, Dawn
Nebraska Department of Roads
1500 Nebraska Highway 2
P.O. Box 94759
Lincoln, NE 68509-4759
- NEBRASKA— Poppe, Eldon D.
Roadway Design Engineer
Nebraska Department of Roads
1500 Nebraska Highway 2
P.O. Box 94759
Lincoln, NE 68509-4759
- NEBRASKA— Turek, Don
Assistant Design Engineer
Nebraska Department of Roads
1500 Nebraska Highway 2
P.O. Box 94759
Lincoln, NE 68509-4759
- NEVADA— Kinder, Wayne
Chief Road Design Engineer
Nevada Department of Transportation
1263 S. Stewart Street
Carson City, NV 89712
- NEW HAMPSHIRE— Green, Craig A.
Administrator, Bureau of Highway Design
New Hampshire Department of
Transportation
John O. Morton Building, P.O. Box 483
1 Hazen Drive
Concord, NH 03301-0483
- NEW JERSEY— Dunne, Richard W.
Director, Design Services
New Jersey Department of Transportation
1035 Parkway Avenue, CN 600
Trenton, NJ 08625-0600
- NEW JERSEY— Eisdorfer, Arthur J.
Manager, Bureau of Civil Engineering
New Jersey Department of Transportation
1035 Parkway Avenue, CN 600
Trenton, NJ 08625-0600
- NEW JERSEY— Miller, Charles
Executive Assistant, Office of the Director
New Jersey Department of Transportation,
Division Of Design Services
1035 Parkway Avenue, CN 600
Trenton, NJ 08625-0600
- NEW MEXICO— Maestas, Roy
Chief, Internal Design Bureau
New Mexico State Highway and
Transportation Department
P.O. Box 1149, 1120 Cerrillos Road
Santa Fe, NM 87504-1149
- NEW MEXICO— Trujillo, Charlie V.
Deputy Secretary of Transportation
Planning and Design
New Mexico State Highway and
Transportation Department
P.O. Box 1149, 1120 Cerrillos Road
Santa Fe, NM 87504-1149
- NEW MEXICO— Valerio, Max
Consultant Design Program Manager
New Mexico State Highway and
Transportation Department
P.O. Box 1149, 1120 Cerrillos Road
Santa Fe, NM 87504-1149
- NEW YORK— Bellair, Peter J.
Director of Design Services Bureau
Bureau
New York Department of Transportation
Building 5, State Office Campus
1220 Washington Avenue
Albany, NY 12232-0750
- NEW YORK— Clark, Phillip J.
Deputy Chief Engineer/Director, Design
Division
New York Department of Transportation
Building 5, State Office Campus
1220 Washington Avenue
Albany, NY 12232-0748
- NEW YORK— D'Angelo, Daniel
Director, Design Quality Assurance Bureau
New York Department of Transportation
1220 Washington Ave.
Building 5, Room 410
Albany, NY 12232-0751
- NORTH CAROLINA— Alford, John E.
State Roadway Design Engineer
North Carolina Department of
Transportation
P.O. Box 25201, 1 South Wilmington Street
Raleigh, NC 27611-5201
- NORTH CAROLINA— Barbour, Deborah M.
State Design Engineer
North Carolina Department of
Transportation
P.O. Box 25201, 1 South Wilmington Street
Raleigh, NC 27611-5201
- NORTH CAROLINA— Hill, Len
Deputy Administrator, Pre-Construction
North Carolina Department of
Transportation
P.O. Box 25201, 1 South Wilmington Street
Raleigh, NC 27611-5201

- NORTH DAKOTA— Birst, Kenneth E.
Design Engineer
North Dakota Department of Transportation
608 E. Boulevard Avenue
Bismarck, ND 58505-0700
- OHIO— Misel, Cash
Assistant Director and Chief Engineer
Ohio Department of Transportation
1980 West Broad Street
Columbus, OH 43223-1102
- OHIO— Sutherland, Larry F.
Deputy Director, Roadway Engineering
Ohio Department of Transportation
1980 West Broad Street
Columbus, OH 43223
- OKLAHOMA— Senkowski, Christine M.
Division Engineer, Roadway Design
Oklahoma Department of Transportation
200 N. E. 21st Street, Room 2c-2
Oklahoma City, OK 73105-3204
- OKLAHOMA— Taylor, Bruce E.
Chief Engineer
Oklahoma Department of Transportation
200 N.E. 21st Street
Oklahoma City, OK 73105-3204
- OREGON— Greenberg, Dave
Design Unit Manager
Oregon Department of Transportation
355 Capitol Street N.E., Room 200
Salem, OR 97310
- OREGON— Nelson, Catherine
Manager, Roadway Engineering Section
Oregon Department of Transportation
200 Transportation Building
Salem, OR 97310
- OREGON— Scheick, Jeff
Manager, Technical Services
Oregon Department of Transportation
Transportation Building, 355 Capitol Street
Salem, OR 97310
- PENNSYLVANIA— Schreiber, Dean A.
Director, Bureau of Design
Pennsylvania Department of Transportation
P.O. Box 2966
Harrisburg, PA 17105-2966
- PUERTO RICO— Ramos Hernandez, Javier E.
Director, Design Area
Puerto Rico Highway and Transportation
Authority
P.O. Box 42007, Minillas Station
San Juan, PR 00940-2007
- RHODE ISLAND— Bennett, J. Michael
Managing Engineer, Highway Design
Rhode Island Department of Transportation
State Office Building, 2 Capitol Hill
Providence, RI 02903-1124
- SOUTH CAROLINA— Kneece, Rocque L.
C Fund Manager
South Carolina Department of
Transportation
Silas N. Pearman Building, 955 Park Street
Box 191
Columbia, SC 29202-0191
- SOUTH CAROLINA— Pratt, Robert I.
Project Development Engineer
South Carolina Department of
Transportation
Silas N. Pearman Building, 955 Park Street
Box 191
Columbia, SC 29202-0191
- SOUTH CAROLINA— Walsh, John V.
Program Development Engineer
South Carolina Department of
Transportation
Silas N. Pearman Building, 955 Park Street
Box 191
Columbia, SC 29202-0191
- SOUTH DAKOTA— Bjorneberg, Timothy
Chief Road Design Engineer
South Dakota Department of Transportation
700 East Broadway Avenue
Pierre, SD 57501-2586
- SOUTH DAKOTA— Feller, Joe
Chief Materials and Surfacing Engineer
South Dakota Department of Transportation
700 East Broadway Avenue
Pierre, SD 57501-2586
- TENNESSEE— Jones, Jeff C.
Director, Design Division
Tennessee Department of Transportation
505 Deaderick Street, Suite 700
Nashville, TN 37243-0339
- TENNESSEE— Zeigler, James
Director, Bureau of Planning and
Development
Tennessee Department of Transportation
700 James K. Polk Building,
Fifth and Deaderick
Nashville, TN 37243-0339
- TEXAS— Marek, Mark A.
Engineer of Roadway Design
Texas Department of Transportation
125 East 11th Street
Austin, TX 78701-2483
- TEXAS— Wilson, Robert L.
Director, Design
Texas Department of Transportation
125 East 11th Street
Austin, TX 78701-2483
- UTAH— Mohanty, P. K.
Roadway Design Engineer
Utah Department of Transportation
4501 South 2700 West
Salt Lake City, UT 84119
- VERMONT— Lathrop, Donald H.
Plan Support Engineer
Vermont Agency of Transportation
State Administration Building
133 State Street
Montpelier, VT 05633-5001
- VERMONT— Shattuck, Robert F.
Roadway and Traffic Design Program
Manager
Vermont Agency of Transportation
State Administration Building
133 State Street
Montpelier, VT 05633-5001
- VIRGINIA— Mirshahi, Mohammad
Assistant Division Administrator
Virginia Department of Transportation
1401 E. Broad Street
Richmond, VA 23219
- WASHINGTON— Albin, Richard
Standards Engineer
Washington State Department of
Transportation
Transportation Building
310 Maple Park, P.O. Box 47329
Olympia, WA 98504-7329

- WASHINGTON— Mansfield, Cliff
 State Design Engineer
 Washington State Department of
 Transportation
 P.O. Box 47329
 Olympia, WA 98504-7329
- WEST VIRGINIA— Clevenger, David E.
 Consultant Review Section Head
 West Virginia Department of
 Transportation, Engineering Division
 1900 Kanawha Boulevard East, Building 5
 Charleston, WV 25305-0440
- WEST VIRGINIA— Epperly, Randolph T.
 Deputy State Highway Engineer-Project
 Development
 West Virginia Department of
 Transportation
 1900 Kanawha Boulevard East, Building 5
 Charleston, WV 25305-0440
- WEST VIRGINIA— Roush, Norman H.
 Deputy Commissioner of Highways
 West Virginia Department of
 Transportation
 1900 Kanawha Boulevard East, Building 5
 Charleston, WV 25305-0440
- WISCONSIN— Haverberg, John E.
 Director, Bureau of Highway Development
 Wisconsin Department of Transportation
 P.O. Box 7910
 4802 Sheboygan Avenue
 Madison, WI 53707-7910
- WISCONSIN— Pfeiffer, Robert F.
 Project Development Chief
 Wisconsin Department of Transportation,
 District 2, Waukesha
 P.O. Box 798
 Waukesha, WI 53187-0798
- WYOMING— Bercich, Paul
 Project Development Engineer
 Wyoming Department of Transportation
 P.O. Box 1708, 5300 Bishop Boulevard
 Cheyenne, WY 82003-1708
- DISTRICT OF
 COLUMBIA— Sandhu, Harbhajan S.
 Chief, Design and Engineering Division
 District of Columbia Department of Public
 Works
 2000 14th Street, N.W., 5th Floor
 Washington, D.C. 20009
- BRITISH COLUMBIA,
 CANADA— Voyer, Richard
 Senior Standards and Design Engineer
 British Columbia Ministry of
 Transportation and Highways
 5B - 940 Blanshard Street
 Victoria, British Columbia V8W 3E6
 CANADA
- ONTARIO,
 CANADA— Bucik, Joseph A.
 Manager, Highway Design Office
 Ministry of Transportation of Ontario
 301 St. Paul Street
 St. Catherines, Ontario L2R 7R4
 CANADA

Preface

These Guidelines were developed as part of the continuing work of the Standing Committee on Highways. The Committee, then titled the Committee on Planning and Design Policies, was established in 1937 to formulate and recommend highway engineering policies. This Committee has developed *A Policy on Geometric Design of Rural Highways*, 1954 and 1965 editions; *A Policy on Arterial Highways in Urban Areas*, 1957; *A Policy on Design of Urban Highways and Arterial Streets*, 1973; *Geometric Design Standards for Highways Other Than Freeways*, 1969; *A Policy on Geometric Design of Highways and Streets*, 1984, 1990, 1994, and 2001; *A Policy on Design Standards—Interstate System*, 1956, 1967, and 1991; and a number of other AASHO and AASHTO policy and “guide” publications.

An AASHTO publication is typically developed through the following steps: (1) The Committee selects subjects and broad outlines of material to be covered. (2) The appropriate subcommittee and its task forces, in this case, the Subcommittee on Design and its Task Force on Geometric Design, assemble and analyze relevant data and prepare a tentative draft. Working meetings are held and revised drafts are prepared, as necessary, and reviewed by the Subcommittee, until agreement is reached. (3) The manuscript is then submitted for approval by the Standing Committee on Highways. Standards and policies must be adopted by a two-thirds vote by the Member Departments before publication. During the developmental process, comments are sought and considered from all the states, the Federal Highway Administration, and representatives of the American Public Works Association, the National Association of County Engineers, the National League of Cities, and other interested parties.

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Foreword

As highway designers, highway engineers strive to provide for the needs of highway users while maintaining the integrity of the environment. Unique combinations of design requirements that are often conflicting result in unique solutions to the design problems. The geometric design of very low-volume local roads presents a unique challenge because the very low traffic volumes and reduced frequency of crashes make designs normally applied on higher volume roads less cost effective. The guidance supplied by this text, *Geometric Design Guidelines for Very Low-Volume Local Roads (ADT ≤ 400)*, addresses the unique needs of such roads and the geometric designs appropriate to meet those needs. These guidelines may be used in lieu of the guidance in *A Policy on Geometric Design of Highways and Streets*, also known as the Green Book. The guidance presented here will be incorporated in a future edition of that policy.

The guidelines for geometric design of very low-volume local roads are the result of a research and development process initiated by AASHTO in 1996. These guidelines were initially developed through two projects of the National Cooperative Highway Research Program (NCHRP), which is jointly sponsored by AASHTO and FHWA. After completion of the NCHRP research, these guidelines went through the normal AASHTO review process. During the development process, representatives of other interested organizations such as the National Association of County Engineers, the American Society of Civil Engineers, the U.S. Forest Service, the American Public Works Association, and the National League of Cities have participated in review of the guidelines.

Design values are presented in this document in both metric and U.S. customary units and were developed independently within each system. The relationship between the metric and U.S. customary values is neither an exact (soft) conversion nor a completely rationalized (hard) conversion. The metric values are those that would have been used had the policy been presented exclusively in metric units; the U.S. customary values are those that would have been used if the policy had been presented exclusively in U.S. customary units. Therefore, the user is advised to work entirely in one system and not attempt to convert directly between the two.

The fact that new design values are presented herein does not imply that existing streets and highways are unsafe, nor does it mandate the initiation of improvement projects. *A Policy on Geometric Design of Highways and Streets* states that specific site investigations and crash history analysis often indicate that the existing design features are performing in a satisfactory manner. The cost of full reconstruction for these facilities, particularly where major realignment is not needed, will often not be justified. This is especially true for very low-volume roads which experience substantially fewer crashes than higher volume roads. These guidelines recommend an approach to geometric design for very low-volume roads, including both new construction and projects on existing roads, that is based on research concerning the safety cost-effectiveness of geometric elements and on reviews of site-specific safety conditions.

These guidelines address issues for which appropriate geometric design guidance for very low-volume local roads differs from the policies normally applied to higher volume roads. For any geometric design issues not addressed by these guidelines, design professionals should consult *A Policy on Geometric Design of Highways and Streets*.

The intent of these guidelines is to assist the designer by referencing a recommended range of values for critical dimensions. It is not intended to be a detailed design manual that could supersede the need for the application of sound principles by the knowledgeable design professional. Flexibility in application of these guidelines is encouraged so that independent designs tailored to particular situations can be developed.

The highway, vehicle, and individual users are all integral parts of transportation safety and efficiency. While this document primarily addresses geometric design issues, a properly equipped and maintained vehicle and reasonable and prudent performance by the user are also necessary for safe and efficient operation of the transportation facility.

CHAPTER 1

INTRODUCTION

This document presents geometric design guidelines for very low-volume local roads. The purpose of the guidelines is to help highway designers in selecting appropriate geometric designs for roads with low traffic volumes traveled by motorists who are generally familiar with the roadway and its geometrics. The design guidelines presented here may be used on very low-volume local roads in lieu of the applicable policies for design of local roads and streets presented in AASHTO *Policy on Geometric Design of Highways and Streets (1)*, commonly known as the Green Book.

This chapter defines very low-volume local roads, describes the scope of the design guidelines, explains the relationship of the guidelines to other AASHTO policies, and presents the organization of the remainder of this document.

DEFINITION OF VERY LOW-VOLUME LOCAL ROADS

The guidelines presented in this document are applicable to very low-volume local roads. Very low-volume local roads are defined as follows:

A very low-volume local road is a road that is functionally classified as a local road and has a design average daily traffic volume of 400 vehicles per day or less.

The preceding statement clarifies that the functional classification of a road is a key element of the definition of a very low-volume local road. A local road is a road whose primary function is to provide access to residences, farms, businesses, or other abutting property, rather than to serve through traffic. Although some through traffic may occasionally use a local road, through traffic service is not its primary purpose. The term local road is used here to refer to the functional classification of the road and is not intended to imply that the road is necessarily under the jurisdiction of a local or municipal unit of government. Administrative arrangements for operation of the highway system vary widely and, in different parts of the United States, roads that are functionally classified as local roads may be under Federal, state, or local control.

The guidelines presented in this document may also be applied in the design of roads that are functionally classified as collectors, so long as the road has a design average daily traffic volume of 400 vehicles per day or less and primarily serves drivers who are familiar with the roadway. There are roads in some states that, because of their length and position in the road network, are functionally classified as collectors, even though they serve very low volumes of primarily local or repeat drivers. Collector roads, by their nature, serve more through traffic than local roads; however, much of that through traffic consists of familiar drivers moving between local roads and arterials. The risk assessment on which the design guidelines are based is applicable to any roadway with design average daily traffic volume of 400 vehicles per day or less that serves primarily familiar drivers. Therefore, throughout the remainder of this document, when reference

is made to very low-volume local roads, it should be understood that the guidelines are also applicable to very low-volume collector roads that primarily serve familiar drivers.

Nearly 80 percent of the roads in the United States have traffic volumes of 400 vehicles per day or less. The very low-volume local and collector roads, defined above, to which the guidelines presented in this document are applicable, should include most of this extensive road mileage. In some states, portions of the state numbered route system meet the definition of very low-volume collector roads that serve familiar drivers and can be addressed with these guidelines.

SCOPE OF GUIDELINES

The guidelines presented in this document are intended for application in the design of very low-volume local roads, as defined above, including application in both new construction and in the improvement of existing roads. The scope of the guidelines includes roads in both rural and urban areas.

The design guidelines enable designers for projects on very low-volume local roads to apply design criteria that are less restrictive than those generally used on higher volume roads. The risk assessment on which the guidelines are based shows that these less restrictive design criteria can be applied on very low-volume local roads without compromising safety. The guidelines discourage widening of lanes and shoulders, changes in horizontal and vertical alignment, and roadside improvements except in situations where such improvements are likely to provide substantial safety benefits. Thus, projects designed in accordance with these guidelines are less likely to negatively impact the environment, roadway and roadside aesthetics, existing development, historic and archeological sites, and endangered species. In reviewing the geometric design for sections of existing roadway, designers should strive for consistency of design between that particular section and its adjoining roadway sections. The potential effects of future development that may affect the traffic volume and vehicle mix on the roadway should also be considered.

The design guidelines are intended to encourage rational safety management practices on very low-volume local roads. Expenditures for safety improvements are discouraged at sites where such improvements are likely to provide little safety benefit, but are strongly encouraged at sites where safety problems exist that can be corrected by a roadway or roadside improvement. Designers are provided substantial flexibility to retain the existing roadway and roadside design, where that existing design is performing well, but are also provided flexibility to recommend improved designs, even designs that exceed the guidelines presented here, where necessary to correct documented safety problems.

The scope of the guidelines includes geometric design for new construction and for improvement of existing roads. Geometric design criteria for new construction apply to construction of a new road where none existed before. Projects on existing roads may involve reconstruction, resurfacing, rehabilitation, restoration, and other types of improvements.