

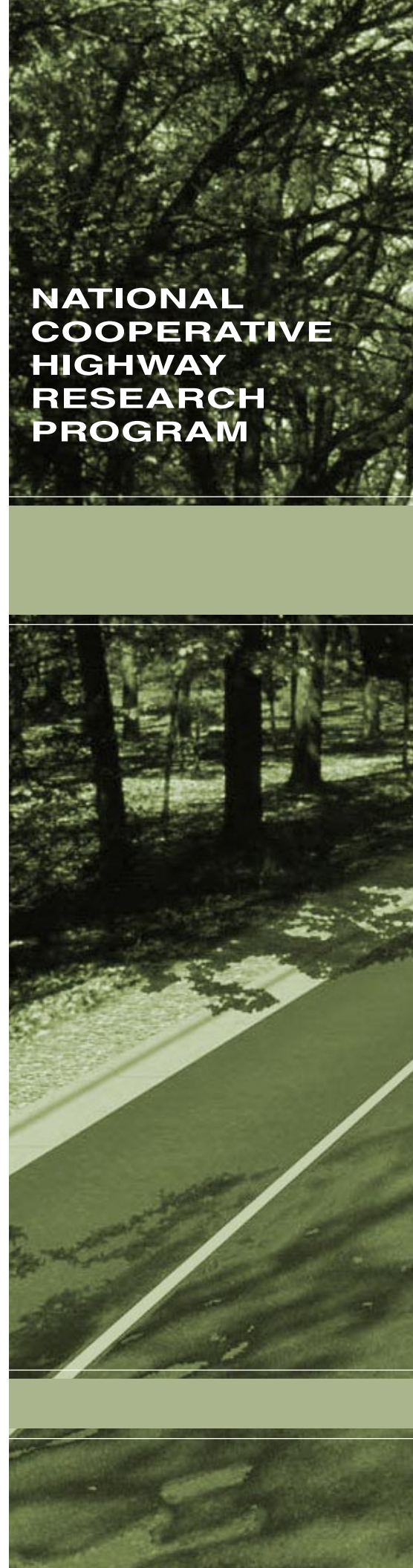
# NCHRP

REPORT 480

NATIONAL  
COOPERATIVE  
HIGHWAY  
RESEARCH  
PROGRAM

## A Guide to Best Practices for Achieving Context Sensitive Solutions

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**NCHRP REPORT 480**

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**A Guide to Best Practices for  
Achieving Context Sensitive Solutions**

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## FOREWORD

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This guide demonstrates how state departments of transportation (DOTs) and other transportation agencies can incorporate context sensitivity into their transportation project development work. The guide is applicable to a wide variety of projects that transportation agencies routinely encounter. While the guide is primarily written for transportation agency personnel who develop transportation projects, other stakeholders may find it useful in better understanding the project development process. Example project documents are included on the accompanying CD-ROM (*CRP-CD-23*).

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Seven qualities of excellence in transportation design and eight characteristics of the process that would yield excellence were identified during the seminal “Thinking Beyond the Pavement: A National Workshop on Integrating Highway Development with Communities and the Environment,” held in May 1998. These qualities and characteristics were termed principles of “context sensitive design.” Many barriers to context sensitive design were identified during the workshop, including rigid segmentation of responsibility during project development, failure to consider the full range of design alternatives, and lack of clear communication between the stakeholders and the transportation agency.

In September 1998, a National Training Steering Committee was created to oversee pilot efforts to institutionalize context sensitive design principles in five state DOTs: Connecticut, Kentucky, Maryland, Minnesota, and Utah. It was agreed that each of these states would proceed with a policy review and a training program tailored to its individual institutional needs, but that the five states would benefit from frequent exchange of information about the design and progress of these pilot efforts and that all 50 states would then benefit from understanding the experiences of these five states.

Under NCHRP Project 15-19, CH2M Hill identified approaches for adopting context sensitive design principles, barriers to adoption in a transportation agency, and ways to overcome those barriers. They met with each of the five pilot states and other transportation agencies to learn how each is integrating context sensitive design into its existing project development processes. The information gathered was condensed into an easy-to-read guide that highlights the advantages of context sensitive design, identifies potential disadvantages, describes a range of approaches for adopting and applying context sensitive design principles in the project development process, documents how barriers to context sensitive design are being overcome within state DOTs, and illustrates context sensitive design through case studies.

The CD-ROM included with this printed report (*CRP-CD-23*) reorganizes the material into a matrix of project development process steps and issues related to context sensitivity. It also includes significant background material drawn from actual projects (e.g., evaluation criteria, public involvement plans, aesthetic design guidelines, and animated views of design alternatives) that provide concrete examples of context sensitive solutions.



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## A. INTRODUCTION

For many years, planning, design, and construction of highways and streets has been left mostly to the “professionals” – highway and traffic engineers. Selection of routes, the design of the alignment, location of intersections, and the roadway features were based primarily on engineering considerations, with the objective being to provide the highest quality service at the lowest construction cost. Solutions to mobility and safety problems have been infrastructure-oriented, reflecting the training and background of those responsible for solving the problems. Substantive decisions regarding the design of a road itself were left to professional engineers and planners with limited input from the public and external agencies.

As the nation moved into the latter part of the 20th century, the automobile emerged as the predominant mode of travel for both persons and goods. With growth in both the population and national economy, demand for travel increased, resulting in more autos and more and larger trucks using the highway system.

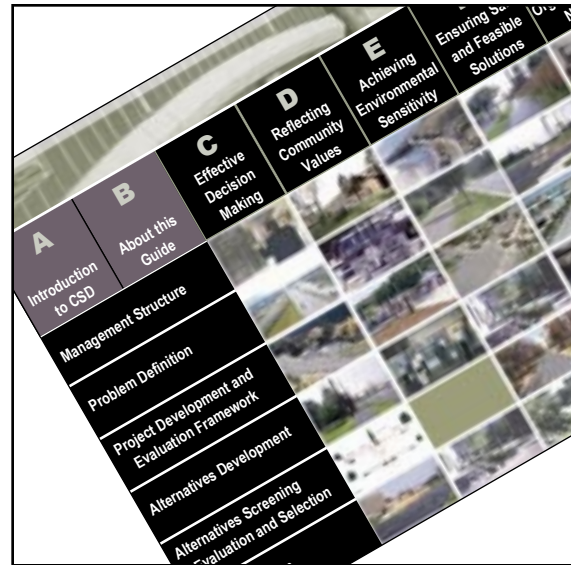
The nation’s engineers, through state and federal transportation agencies, responded to the increase in demand for travel and to public policy directives to promote highway travel with more and “better” roads, i.e., roads that enabled traffic to move faster and safer to the travelers’ destinations. Their efforts, foremost among them being the 42,000-mile interstate system, have done much to shape the landscape of America. And, despite the significant increase in travel, highway travel has become increasingly safer, with fatalities decreasing significantly over the past 20 years.

Beginning in the 1960s, strong cultural trends emerged. The general public began to have concern and interest in the adverse environmental impacts of man’s intrusions on the landscape (including, but certainly not limited to road building). Such interest culminated in the passing of what was among the most important pieces of legislation of the latter 20th century, the National Environmental Policy Act (NEPA) in 1969. From this point forward, roadway design and construction, and indeed, all public works, became more than a matter of building the most economic, shortest, widest, or fastest facility. Rather, engineers and planners are now required to consider features and effects such as wetlands, threatened and endangered species, adverse noise, and other environmental considerations.

The public also has begun to generate a renewed interest and concern with the cultural, historic, and other values that define a community. Americans have become more aware of their sense of place and history, both locally and regionally. Any changes to a community, whether to develop open space, tear down a long-standing building

with unique architecture, or build a new road are now increasingly viewed as potential threats to that sense of place and the cultural fabric of the community.

The above trends have produced what in retrospect seems an inevitable result. Departments of Transportation (DOTs) and professional engineers trained to provide a certain quality of design using traditional approaches began to run into resistance from the public and community interests, when highway projects were perceived as having clear, measurable adverse impacts on the communities through which they passed. No longer are the benefits of these “improvements” (faster travel times, greater safety, less delay) widely accepted or perceived as worth the costs in terms of right-of-way, community disruption, etc. No longer does the public unquestioningly accept the proposals of engineering professionals, regardless of how well thought-out they are. Roads, along with other major infrastructure projects, despite being recognized as necessary to the public health and economic well-being of a community, are now increasingly viewed as permanent intrusions on the landscape.



*Context Sensitive Design* (CSD) is among the most significant concepts to emerge in highway project planning, design, and construction in recent years. Also referred to as “Thinking Beyond the Pavement,” CSD reflects the increasingly urgent need for DOTs to consider highway projects as more than transportation. CSD recognizes that a highway or road itself, by the way it is integrated within the community, can have far-reaching impacts (positive and negative) beyond its traffic or transportation function. The term CSD refers to as much an approach or process as it does to an actual outcome.

*“Context sensitive design asks questions first about the need and purpose of the transportation project, and then equally addresses safety, mobility, and the preservation of scenic, aesthetic, historic, environmental, and other community values. Context sensitive design involves a collaborative, interdisciplinary approach in which citizens are part of the design team.”*

THINKING BEYOND THE PAVEMENT, MARYLAND STATE  
HIGHWAY ADMINISTRATION WORKSHOP, 1998

## LEGISLATIVE BACKGROUND ON CONTEXT SENSITIVE DESIGN

Beginning in 1969, NEPA required that agencies performing federally funded projects undergo a thorough analysis of their impacts to both natural and human environmental resources. Since that time, the U.S. Congress passed a series of policy acts and regulations to strengthen and increase the commitment to environmental quality. In 1991, Congress emphasized the federal commitment to preserve historic, scenic, and cultural resources as part of the Intermodal Surface Transportation Efficiency Act. Section 1016(a) of that Act provides approval for transportation projects that affect historic facilities or are located in areas of historic or scenic value only if projects are designed to appropriate standards or if mitigation measures allow for the preservation of these resources.

In 1995, Congress passed the National Highway System Designation Act, emphasizing, among other things, flexibility in highway design to further promote preservation of historic, scenic, and aesthetic resources. This act provided funding capabilities for transportation enhancements and supported applications to modify design standards for the purpose of preserving important historic and scenic

resources. Most importantly, the Act extended these considerations to federally funded transportation projects not on the National Highway System.

Thirty years of history in national environmental policy making has demonstrated a response to increasing public interest and concern about transportation projects’ impacts. The public and local officials have begun to question not only the design or physical features of projects, but also the basic premise or assumptions behind them as put forth by the many agencies. Evidence of this trend is the great number of major projects around the country that have been significantly delayed or stopped, not for lack of funding or even demonstrated transportation need, but for lack of satisfaction that the proposed solution met community and other non-transportation needs.

## RECENT ACTIVITIES IN CONTEXT SENSITIVE DESIGN

By the mid 1990s a clear consensus emerged that new approaches to solving traditional highway projects were needed. The recent laws and statements of public policy required those charged with the planning, design, and construction of highways to adopt a new direction. In response, the Federal Highway Administration (FHWA) and other agencies committed to develop a program to change the way highway projects are performed.

The following activities have framed where the transportation profession stands with CSD:

- The FHWA partnered with AASHTO, Bicycle Federation of America, National Trust for Historic Preservation, and Scenic America to produce a landmark publication, *Flexibility in Highway Design*. This design guide illustrates how it is possible to make highway improvements while preserving and enhancing the adjacent land or community. *Flexibility in Highway Design* urges highway designers to explore beyond the most conservative use of *A Policy on the Geometric Design of Highways and Streets* (AASHTO Green Book). Within an open, interdisciplinary framework, project teams should develop roadway designs that fully consider the aesthetic, historic, and scenic values along with considerations of safety and mobility—the essence of CSD.
- An invitation-only conference, “Thinking Beyond the Pavement: A National Workshop on Integrating Highway Development with Communities and the Environment” was held in May 1998. This conference, co-sponsored by the Maryland State Highway Administration, FHWA, and AASHTO, was targeted at state DOTs and environmental and community stakeholder groups.



- Five pilot state DOTs (Connecticut, Kentucky, Maryland, Minnesota, and Utah) were selected to work with FHWA in defining and institutionalizing CSD principles and practices. Policy reviews, training, and other activities have been conducted, with the results shared with other AASHTO members at national conferences and meetings.
- A second conference, co-sponsored by FHWA and the American Society of Civil Engineers (ASCE), was held in Reston, Virginia, in June 1999. This conference, “Flexibility in Highway Design,” was targeted at highway design professionals. It introduced the concepts of CSD, presented case studies, and produced findings regarding design professional needs to meet CSD demands.
- Following the success of *Flexibility in Highway Design*, AASHTO embarked on developing their own publication to provide further guidance on how designers can develop flexible highway designs. NCHRP Project 20-7 (Task 114) was commissioned to prepare a companion document (referred to as a “bridging document”) to *Flexibility in Highway Design* based on the work of four AASHTO Task Forces.
- An FHWA/AASHTO International Scanning Tour was conducted in 2000 to visit European countries and uncover their CSD problems, practices, and solutions.

This report summarizes findings from National Cooperative Highway Research Project 15-19, *Application of Context Sensitive Design Best Practices*. The research was performed to summarize activities in the CSD field, and to provide transportation planning and design practitioners and their organizations with a guide for implementing CSD at both the organizational and project level.

Research tasks performed to support the findings in this report are summarized below:

- Literature on environmental process, highway safety and design, community and public involvement, and related subjects was reviewed.
- Telephone interviews were conducted with agency staff in DOTs and other transportation agencies to gain perspective on the extent and commonalities of CSD problems and solutions.
- Visits were made to the five pilot states and to the Eastern Federal Lands (FHWA) offices to interview staff working on CSD initiatives, review projects, and collect materials from these agencies.
- National and regional conferences in Connecticut and Montana on CSD were attended and further information and insights gained on national activities.

## TERMINOLOGY

The principles and concepts behind CSD have many advocates. Different organizations have coined their own terminology to express CSD. In Maryland, the first state DOT to embrace and institutionalize CSD, the term “Thinking Beyond the Pavement” (TBTP) was adopted to express the viewpoint that a highway project in many perspectives extends beyond just the highway itself. Scenic America refers to “place sensitive design,” focusing on the topographic, visual, and community surroundings.

Many agencies, including most notably the Utah DOT, are concerned with outcomes rather than just process. Successful transportation projects include not only a “design” process or task, but also construction, maintenance, and operations. A successful project is sustainable in the sense that promises and commitments are maintained past any construction. Thus, a context sensitive solution (CSS) integrates all key functions of an agency.

Another view of context sensitivity emphasizes the broad nature of potential solutions. Not every context sensitive project includes a design component. Operational “solutions” may be appropriate.

For many, the term “Context Sensitive Solutions” (rather than design) better captures the overall intent and philosophy of the movement.

While no firm consensus on one set of terms has emerged, the terms context sensitive design and context sensitive solutions are well understood. In this document the acronym CSD/CSS will be used to express the concept.

## THE CSD/CSS VISION

The seminal national workshop held in Maryland in 1998 developed a strong vision for the CSD/CSS movement. The vision developed by the workshop participants addressed both the outcome (qualities of the project) and the process (characteristics):

### **A vision for excellence in transportation design includes these qualities:**

- The project satisfies the purpose and needs as agreed to by a full range of stakeholders. This agreement is forged in the earliest phase of the project and amended as warranted as the project develops.
- The project is a safe facility both for the user and the community.
- The project is in harmony with the community and preserves environmental, scenic, aesthetic, historic, and natural resource values of the area.

- The project exceeds the expectations of both designers and stakeholders and achieves a level of excellence in people’s minds.
- The project involves efficient and effective use of resources (time, budget, community) of all involved parties.
- The project is designed and built with minimal disruption to the community.
- The project is seen as having added lasting value to the community.

**A vision of the process which would yield excellence includes these characteristics:**

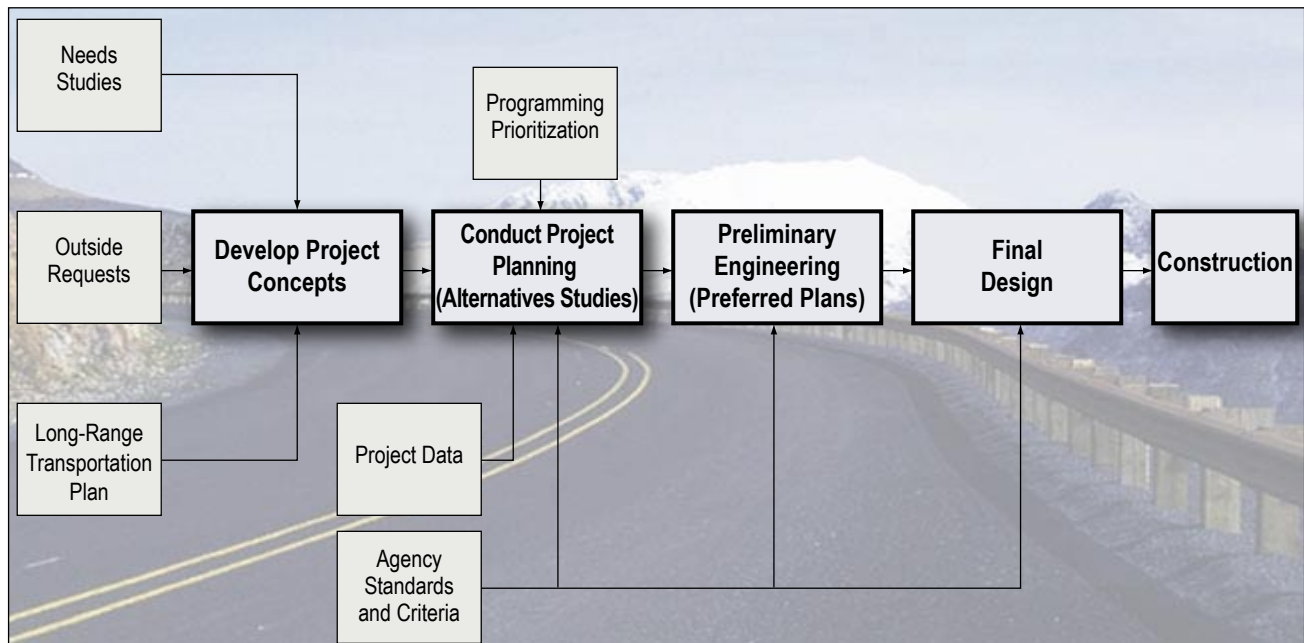
- Communicate with all stakeholders in a manner that is open and honest, early and continuous.
- Tailor the highway development process to the circumstances. Employ a process that examines multiple alternatives and that will result in consensus on approaches.
- Establish a multi-disciplinary team early with disciplines based on the needs of the specific project and include the public.
- Seek to understand the landscape, the community, and valued resources before beginning engineering design.
- Involve a full range of stakeholders with transportation officials in the scoping phase. Clearly define the purposes of the project and forge consensus on the scope before proceeding.
- Tailor the public involvement process to the project. Include informal meetings.
- Use a full range of tools for communication about project alternatives (e.g. visualization).
- Secure commitment to the process from top agency officials and local leaders.

## INSIGHTS ON CSD/CSS

As expressed by the vision statement above, the terms *Context Sensitive Design* and *Context Sensitive Solutions* refer to an approach or process as much as it they do an outcome. What is unique and “groundbreaking” is that CSD/CSS recognizes that road and highway projects are not just the responsibility or concern of engineers and constructors, or for that matter only the responsibility of the DOT or transportation agency. Instead, CSD/CSS calls for the interdisciplinary collaboration of technical professionals, local community interest groups, landowners, facility users, the general public, and essentially any and all stakeholders who will live and work near or use the road. It is through this process and team approach that the owning agency gains an understanding and appreciation of community values and strives to incorporate or address these in the evolution of the project.

CSD/CSS is first and foremost about a transportation agency carrying out its mission—providing for the safety and mobility of the public. CSD/CSS is thus all about *completing projects*, whether it’s freeway reconstruction, major arterial widening, local street improvements, or bicycle path construction. The principles of CSD/CSS, shown in Exhibit A-1, apply essentially to any transportation project, with the main aim being to assure that the full range of stakeholder values is brought to the table and actively incorporated into the design process and final result (as the project needs are defined).

Exhibit A-1 Project Development Process



CSD\_162\_2

CSD/CSS begins early, and continues throughout the entire project development process (from project concepts through alternative studies to construction), and indeed, to beyond project completion. CSD/CSS means maintaining commitments to communities.

Much literature, including most notably the publication *Flexibility in Highway Design*, stresses the importance of being “context sensitive” where a highway runs through or adjacent to parklands, scenic areas, or special environmental areas or viewsheds. While such facilities are clearly of special interest, the notion of context sensitivity extends beyond these “special” projects.

*CSD/CSS applies essentially anywhere and everywhere.* That is, every project has a context as defined by the terrain and topography, the community, users, and the surrounding land use. The CSD/CSS approach applies to urban streets, suburban arterials, rural highways, low volume local roads, and high traffic volume freeways. The particular CSS (solution) would depend on the context. Exhibit A-2 provides examples of the diversity of roads and contexts for which CSD/CSS applies.

### CSD/CSS FRAMEWORK

A consensus of the research and practitioners, and review of pilot state activities and projects confirms that there are four essential aspects to achieving a successful CSD/CSS

project. These include *effective decision making and implementation*, outcomes that *reflect community values* and are *sensitive to environmental resources*, and ultimately, project solutions that are *safe and financially feasible*. CSS savvy teams and organizations responsible for project development employ specific processes and tools to achieve success in each of these areas.

In terms of the project development process, there are six key steps that define complex projects and that must be considered with care. The overall *management structure*, including organization and project management issues, is clearly of vital importance. *Problem definition* – defining the nature, scope, and severity of the transportation problem being solved is a key early step in the process. Referring to Exhibit A-1 above, project proposals resulting from identification of a problem or need can come from many sources (outside requests, safety, or asset needs study, long range plan implementation).

The development of a solution involves a series of key steps that take place during the project planning and study phases. *Project development framework, alternatives development, and alternatives screening, evaluation, and selection* are all key phases of any project. These phases are where active engagement of stakeholders, open discussion, creativity, and weighing of choices are accomplished. Finally, *implementation* of a selected solution translates the hard planning work to a constructed or completed project



that will yield real benefits. It also includes activities and actions of the agency after construction, including maintenance, operation, and monitoring of the performance of the implemented project solution.

## ORGANIZATION OF THIS GUIDE

The above discussion suggests a two-dimensional framework for describing CSD/CSS. This framework is used to organize and present recommendations and findings in the following manner. The document has been prepared to be interactive in a CD-ROM format.

Following brief introductory comments in Sections A and B, the material on CSD/CSS is presented in the following six sections :

- Effective Decision Making (Section C)
- Reflecting Community Values (Section D)
- Achieving Environmental Sensitivity (Section E)
- Ensuring Safe and Feasible Solutions (Section F)
- Organizational Needs (Section G)
- Case Studies in CSD/CSS (Section H)

The first four sections (C through F) are project-focused. The text focuses on best practice discussions, with “box” inserts integrated to highlight particular lessons learned from projects around the country. Section G, Organizational Needs, addresses management issues and lessons learned from those transportation agencies that have institutionalized CSD/CSS. Section H presents a series of case studies.

Each section is organized around the six key steps in the project development process outlined above. For example, in Section E, the body of knowledge related to Environmental Sensitivity is organized around the process from beginning (problem definition) to end (implementation). Each chapter includes a bibliography of resources related to its topic. These are combined into a master bibliography in Appendix A/B. In the interest of keeping the presentation as brief as possible and to minimize resources needed to produce this document, additional examples and other supporting materials are assembled in the Appendices located on the accompanying CD.