


Project Bulletin 4160-15B

Project 0-4160: Operating Freeways with Managed Lanes

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Year 3 Annual Report of Progress: Operating Freeways with Managed Lanes



The managed lane concept is currently being considered on major freeway projects in Texas cities. While the high-occupancy vehicle (HOV) concept is familiar in most urban areas, motorists are less familiar with managed lanes.

In this multi-year research project, researchers are investigating the complex issues surrounding the safe and efficient operation of managed lanes using various operating strategies. The research team also plans to develop a managed lanes manual to help the Texas Department of Transportation (TxDOT) make informed planning, design, and operational decisions when considering these facilities across the state.

This bulletin summarizes the activities of the first two years of this multiyear project, highlights the accomplishments to date, provides a status report of efforts underway, and

outlines planned activities for the coming year.

Completed Work . . .

During the first two years of work, the project team undertook several tasks that helped set the tone for the entire effort. These included the following:

- Development of a definition of managed lanes for Texas;
- Conduct of a literature review that highlights key managed lane operational strategies currently in use;
- the compilation of a glossary of terms related to managed lanes;
- the organization of a managed lanes symposium to begin generating a dialogue between all potential partners and to provide insight into their concerns regarding operation of managed lanes;
- the development of typical managed lane design guidelines for weaving distances per lane and minimum distance between a freeway entrance or exit and a managed lanes facility entrance or exit;
- an assessment of ramp issues and managed lanes, including guidelines on when to consider direct connect ramps;
- the development of concept marketing strategies that are most effective for communicating and building consensus for managed lanes based on corridor and community goals;
- the assessment of legislative needs in Texas to support managed lanes operations;
- the identification of financing methods for managed lanes facilities; and

- the assessment of enforcement and its relationship to successful operation of managed lanes.

Work Underway . . .

During year 3 of the project, the research team continued work on several tasks that will be completed in subsequent years. The following sections outline milestones and progress to date and highlight key issues or interim findings that are of critical importance

Decision Matrix

The type of users authorized to use a managed lane facility will play a critical role in the feasibility, design, and operation of a managed facility. A matrix of possible operating strategies for various eligible user groups can correlate eligibility decisions with realistic considerations for planning, designing, and operating a managed lane facility.

This task is an ongoing process throughout the research effort to develop a framework for supporting decisions related to the development of managed lane projects. It is envisioned that research results will be incorporated into the framework over time. Furthermore, the process of developing the framework itself will lead to identification of gaps in the knowledge base that the research project can address.

Recent efforts have focused on the development and refinement of a conceptual decision-making framework that depicts the sequential elements considered in implementing a managed lanes project. The most recent version of the framework is shown in Figure 1. Features of this framework include the following:

- incorporation of financial goals, particularly those involving

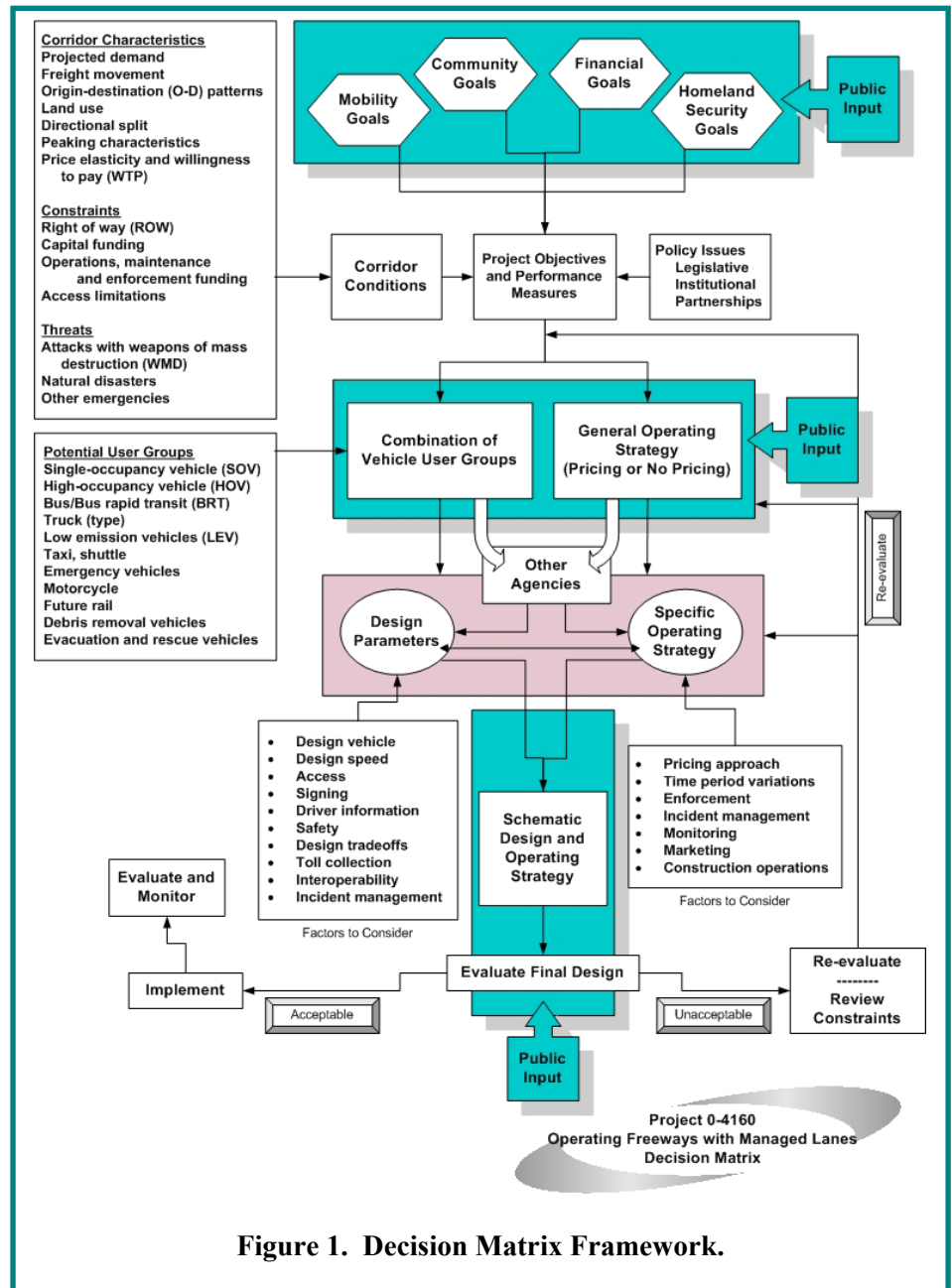


Figure 1. Decision Matrix Framework.

- revenue generation, into the general policy framework;
- objective-based decision making in determining potential user groups and the use of pricing for demand management and/or revenue generation;
- the combination of vehicle user groups and operating strategy as the basis for determining design parameters for the project;
- the involvement of other agencies in the process, as well
- as multiple opportunities for public input;
- a strong link between design and operations in the development of schematic design; and
- a re-evaluation process if expected performance does not meet desired outcome.

As the backbone of the managed lanes manual, this framework will ultimately be converted to a user-friendly computer-based decision support

system (DSS) or expert system that provides links to supporting resources and information within a constructed database and/or on the Internet. It will produce guidance on optimal operating strategy and eligible vehicle groups for the proposed managed lane facility and guidance and/or links to resources for design and operations based on the specific operating strategy selected.

Managed Lanes Manual

To assist in implementation of the managed lanes research results of this project, particularly in areas that are in the beginning phase of planning such a project, the team is developing a Managed Lanes Manual, which is currently in draft form with many chapters yet to be developed. This document will include all of the research in a usable format, providing a clear, concise, and step-wise approach to planning, designing, operating, and enforcing a managed lanes facility.

Traveler Information

One of the more critical aspects of managed lanes is the need for information of the traveler using the managed lanes. Depending on the intended user groups and the operational options of the lanes, the information needed to make critical travel decisions varies. All of this information is necessary in order for the intended user group to make informed decisions and perform required maneuvers in a safe and efficient manner so as to maximize the performance of the lanes.

During this year, the emphasis of this task has been to fully identify the interrelationships that exist between various managed lane design options, operational strategy combinations, and information needs for travelers wishing to enter or exit a managed lane facility. Initially, researchers worked on

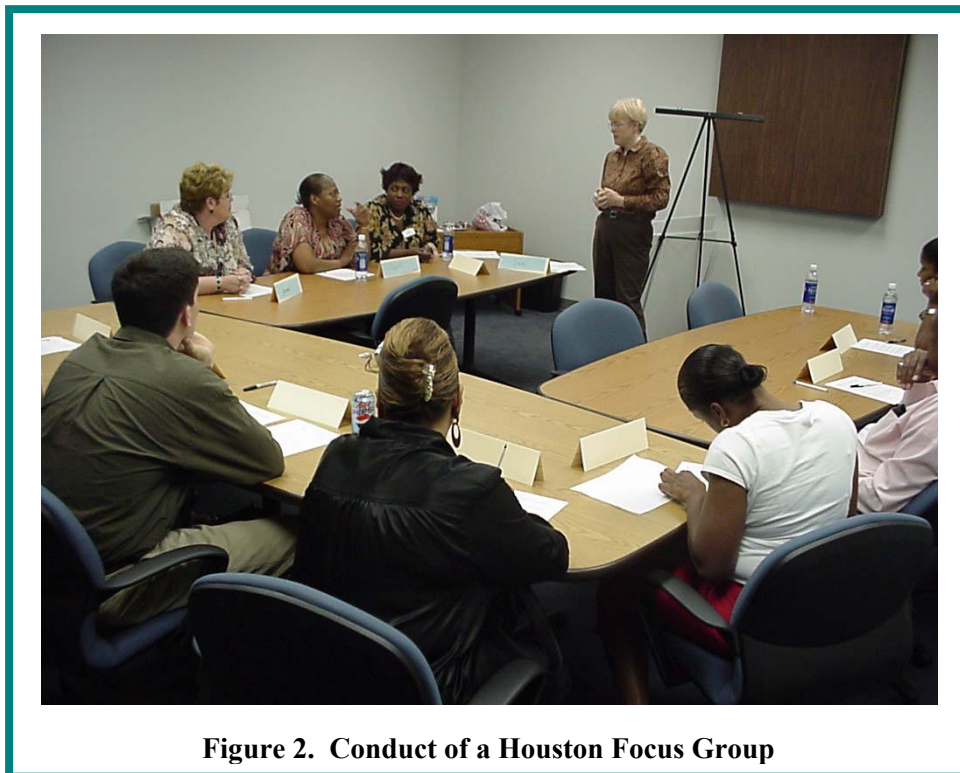


Figure 2. Conduct of a Houston Focus Group

developing a managed lane design/operational strategy matrix to help define and prioritize at a conceptual level the information needs of managed lane travelers. Researchers have utilized the draft signing and marking plans of the Houston Katy Managed Lanes Project as a case study to more fully understand, characterize, and prioritize the difficulties that arise in meeting traveler information needs within the context of a particular managed lane configuration. The results of this effort helped to focus the research activities being undertaken on the task addressing traffic control devices to develop better traffic control device guidance for managed lane facilities.

Researchers are also extracting key positive guidance principles and other human factors considerations from the literature as they pertain to roadway signing and marking concepts. These principles and considerations are being consolidated as guidance fundamentals to assist practitioners

in addressing conflicts that arise when developing signing and marking plans for future managed lane facilities.

Traffic Control Devices

Perhaps the most critical design element of managed lanes outside of the physical facility is the user information system. This system, consisting of traffic control devices, is the manner in which key operational information about the facility is provided to travelers. Delivered in the form of traffic signs, pavement markings, and general delineation, this system provides appropriate information to travelers at the correct time and in a format easily understood. If the user information system does its job correctly, travelers can make informed decisions regarding their use of the managed lane facility and can navigate into, through, and out of the facility in a safe and efficient manner. Obviously, the challenges associated with providing this information are complex given the varied information and decision-

making needs that will be identified in the user information task.

During this year, researchers identified the user information needs for the various facility types and user groups served by managed lanes. In the related task on traffic control devices, researchers are currently developing recommendations for traffic control devices (TCDs) to convey this information. Candidate signs, dynamic messages, and pavement marking treatments are being identified through contact with other agencies and literature review. One challenge to effective conventional signing on a managed lane facility is the limited area on the center median for sign supports. Ground-mounted signs must be kept small so they do not impinge on travel lanes. Overhead-mounted signs are a clear alternative, but when placed on the same structure as main lane signing, they may add to driver information overload. The use of horizontal signing, in the form of words and symbols on the road surface, is another way to provide lane-specific information that is under consideration. Another planning issue under review is trailblazing signs placed on the feeder/collector network surrounding access points to the managed lanes.

Incident Management

A key strategy to successfully operating a facility with managed lanes is to have an organized procedure for handling incidents within the facility. This procedure needs to consider the various agencies that might be involved in handling an incident, their specific needs related to their role in incident management, the institutional and technical challenges for inter-agency cooperation, and the variety of strategies available to handle



incidents of different types and severity.

Researchers will offer a framework for managing incidents within a managed lane facility such that the incident is cleared in a safe, effective, and efficient manner so as to minimize its impact on the managed lanes and the entire facility. This framework might include a matrix for use in identifying the appropriate strategy or strategies for handling specific incidents and the decisions and procedures for incident management based on the agencies involved and the needs of the travelers.

Year 4 Efforts . . .

In year 4 of the project, the research team will complete work on the traveler information, traffic control devices, and incident management tasks in addition to continuing work on the decision matrix and the managed lanes manual. Additionally, researchers will undertake one additional task focused in interoperability, as described below.

Interoperability

With the rapid innovation and adoption of technologies in the transportation arena, researchers need to examine solutions for interoperability and flexibility. For any implementation, potential

solutions must first be examined with respect to:

- the operational concepts of the facility,
- the associated needs of the technology in use,
- the needs of the agencies involved,
- the data requirements, and
- future growth needs.

Additionally, each solution may also need to be evaluated for compliance with TxDOT standard practices, the intelligent transportation systems (ITS) architecture, national standards such as the National Transportation Communications for ITS Protocol (NTCIP) and other applicable agency considerations.

Finally, engineers must also evaluate potential solutions for items such as:

- monitoring,
- management,
- enforcement,
- communications,
- multimodal operations,
- security,
- revenue/costs/benefits,
- public private operations, and
- legislative constraints.

All of these factors combine to form a multidimensional decision matrix. When incorporated into the Managed Lanes Manual, this interoperability information will identify the critical elements of the decision matrix, assist the engineer in using the matrix to evaluate

technologies, and guide the engineer towards a solution that meets the overall needs for interoperability and flexibility, within the realm of a managed lanes operation.

Ongoing Activities . . .

Internet Site & Newsletter

To help implement research results, the research team developed a project website to provide an avenue for disseminating research results and exposure to the research surrounding managed lanes. The managed lanes site (<http://www.managed-lanes.tamu.edu>), as shown in Figure 3 highlights ongoing research that TTI is conducting for TxDOT on managed lanes, provides key research results and access to related products, has information on meetings and other events related to managed lanes across the country, and has links to key related Internet sites.

Readers can also access the quarterly newsletter, FastLane, online and join the mailing list. The newsletter is published quarterly to document lessons learned throughout the duration of the project. It allows department engineers and other key personnel quick access to implementable research findings without having to wait until completion of the project. The team publishes the newsletter electronically, with the approval of the Project Director (PD), and distributes it to the project mailing list of over 300 transportation professionals and reaches an even broader audience by posting the newsletter on the project website.

Project Contacts

The project team continues to periodically contact TxDOT staff who are instrumental in the various managed lanes projects across the

For More Details . . .

Related Report:

Report 4160-15, *Year 3 Annual Report of Progress: Operating Freeways with Managed Lanes.*

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Project Website:

<http://managed-lanes.tamu.edu>

Disclaimer

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state. Since the inception of this project, the research team has met with representatives from the Austin, Dallas, Fort Worth, Houston, San Antonio, and Waco TxDOT districts to discuss project progress and key findings relevant to their specific projects.

finding more pieces of the complex puzzle of managed lanes.

Final Remarks . . .

The research team looks forward to another productive project year and the success of