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16. Abstract The Annual Project Monitoring Committee Workshop for Texas Department of Transportation (TxDOT) Research Project 0-4160 – Operating Freeways with Managed Lanes – was held in Austin, Texas on August 30, 2001. The purpose of the workshop was for the project team to give an annual status report on project progress and to gain consensus of attendees regarding the direction of the project for the upcoming year. The key agenda items included a review of first year activities, updates of five specific tasks by task leaders, an overview of managed lanes facilities in various cities across the United States, and an overview of those activities planned for the second year. A project monitoring committee meeting will occur at the end of each year of the research project.					
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**Texas Department of Transportation
Project No. 0-4160**

**Meeting Summary
2001 Annual Project Monitoring Committee
Workshop
August 30, 2001**

**The Center for Transportation Training and Research
Texas Southern University**

Authors' Disclaimer

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Acknowledgments

The project directors and their respective organizations are as follows:

Program Coordinator - Gary Trietsch, P.E., Houston District, Texas Dept. of Transportation

Project Director - Carlos Lopez, P.E., Traffic Operations Div., Texas Dept. of Transportation

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Meeting Summary

Annual Project Monitoring Committee Workshop

August 30, 2001

The Annual Project Monitoring Committee Workshop for Texas Department of Transportation (TxDOT) research project 0-4160 – Operating Freeways with Managed Lanes – was held in Austin, Texas on August 30, 2001. The purpose of the workshop was for the project team to give an annual status report on project progress and to gain consensus of the committee regarding the direction of the project for the upcoming year. The key agenda items included a review of first year activities, updates of five specific tasks by task leaders, an overview of managed lanes facilities in various cities across the United States, and an overview of those activities planned for the second year (Appendix A, Agenda). A project monitoring committee meeting will occur at the end of each year of the research project. The following is a summary of the meeting. The list of workshop attendees is included in Appendix B, Attendees.

1.1 Overview

Beverly Kuhn, co-research supervisor for the project, opened the meeting and began her comments by focusing attention on the definition of managed lanes as discussed at the Managed Lanes Symposium held in February 2001. The definition developed by the Project Monitoring Committee states that a managed lane is, “[A] facility that increases freeway efficiency by packaging various operational and design actions. Lane management operations may be adjusted at any time to better match regional goals.” This definition is broad and discussion throughout this workshop will result in review of the definition, given areas that are challenging the project team.

1.2 Review of Year 1 Activities

Beverly Kuhn, Research Supervisor

Kuhn initially reviewed the vision of managed lanes research in Texas and the role of this specific research project within that vision. The vision of managed lanes research is to develop a better understanding of how managed lanes can improve mobility for transportation system users. The intent is for the research to support the managed lanes related projects occurring at TxDOT. The specific objective of this project is to investigate the complex and interrelated issues surrounding the safe and efficient operation of managed lanes and to develop a managed lanes manual to help TxDOT make informed planning, design, and operational decisions when considering these facilities for their jurisdiction. The list of questions the project is designed to cover is as follows:

Planning Managed Lanes Facilities

- What are the operational options available for a managed lane facility?
- Are there any interim or temporary uses for a managed lane facility?

- How does an intended user or group(s) affect its design and operations?
- What defines a successful managed lane project?
- How can I fund and finance a managed lane project?
- How do I market a managed lane project to help make it a success?
- How do I integrate other key agencies (transit, law enforcement, toll, etc.) into a managed lane project to help to overcome institutional issues and barriers?

Designing Managed Lanes Facilities

- How do I design a managed lane facility to handle a selected user group?
- How can I design a facility to be flexible for future needs?
- What safety issues do I need to be aware of when designing a facility?
- What interoperability issues do I need to be aware of when designing a facility?
- What information do users need to make decisions about using a managed lane facility?
- What approaches to delivering user information can be used to provide that information appropriately?

Operating Managed Lanes Facilities

- What is the best way to enforce a managed lane facility?
- How do I handle incidents on a managed lane facility?
- What staff do I need to manage a managed lane facility and what training do they need?
- How do I evaluate and monitor a managed lane facility to determine success?

Further, the attendees were asked to review the schedule to determine whether the tasks for years, three and beyond, are still appropriate or whether tasks need to shift to meet the needs of TxDOT.

The *state-of-the-practice* review and opening symposium are key milestones accomplished in the first year. The literature review includes more than 100 sources focusing on operational strategies that define managed lanes: among them high occupancy vehicle (HOV) lanes, high occupancy toll (HOT) lanes, express lanes, and other managed lanes treatments. Also reviewed are the key issues that engineers need to address such as safety, operational, enforcement, user information, and legislative issues. The initial review also established a framework for future research. These findings will be published as a technical memorandum and as an appendix to the annual report.

Over 90 individuals attended the Managed Lanes symposium held in February 2001. In addition to hearing speakers address the general topic of managed lanes, attendees participated in one of three breakout groups which determined similar issues, concerns, and priorities including eligibility, access, legislative issues, safety, and operational concerns. Independent thinking within the three groups led to similar results. Attendees of the symposium represented a cross section of individuals in transportation including metropolitan planning organizations (MPOs), city officials, transit, and TxDOT personnel.

1.3 Task Leader Updates

Steve Venglar, Analysis of Operational Scenarios Based on User Groups (Task 5)

According to Venglar, the key issue regarding operational scenarios is whether there are any unknowns in the literature about how managed lanes are operated. The purpose of this task is to identify and fill any of these knowledge gaps. The intent is to model certain decisions made in the operating strategy of a managed lanes facility to demonstrate their impacts and evaluate related design and spacing issues to improve operations in the managed lanes portion of the freeway. Another key element of this task is to examine “what if” strategies. Emphasis was placed on Katy Freeway (IH-10) in Houston as the experiential case for the “what if” scenario. Based on an analysis of current research and methodologies, the following operational issues were identified as unknowns and requiring analysis in this task.

- Freeway weaving – the distance required for vehicles to enter the managed lane.
- Freeway weaving – when vehicles are exiting the special use lane, the distance required to cross the main lanes to exit the freeway.
- Vehicle stream separation of eligible groups of users.

There are many known aspects of operation that are fairly well covered in existing manuals, eg. weaving within managed lanes is similar to weaving in standard lanes.

The two-phase modeling effort includes one 13-mile section of the Katy Freeway facility and smaller models to address specific issues. The chosen modeling software is – VISSIM and Highway Capacity Software (HCS). The modeled facility includes barrier and non barrier lanes. Also, in addressing the key operating variables, it is not possible to isolate them in such a long, 13-mile section. Therefore, smaller sections are delineated to isolate issues that need examining.

Venglar stated this effort will either verify standard rules of thumb or challenge them. For instance, the research team investigated whether the rule of thumb that 500 feet of weaving distance per lane accommodates any weaving scenario. Some of the techniques in HCS are indifferent to the weaving distance, which may indicate that it is not an appropriate modeling tool for all managed lanes scenarios. For scenarios where HCS might not be applicable, VISSIM is being used. A side benefit of the research could be the range of applicability and limitations of HCS and VISSIM. This effort will be finished by the end of October 2001.

The results will include a set of results that links user groups with recommendations of what weaving distances will be required. Maneuvers will be described by various user groups. Also included will be the distance required by various vehicle scenarios.

While it is tempting to utilize the most demanding design and speed scenario, cost is an issue. Therefore, the highest design scenario will not necessarily be used.

Kay Fitzpatrick, Development of Geometric Design Recommendations (Task 10)

This task begins in September 2001 and builds upon Task 5. Regardless of the user group, the performance of the facility is paramount. Fitzpatrick explains this task focuses on the trade-offs of different designs. The design can be very complex; for instance, the options for design can vary from an HOV lane that does not allow trucks to one that is a truck only managed lane. Those two circumstances will call for very different designs, although both are managed lanes. Further, the tasks must fit with other TxDOT projects. An added issue with the managed lanes weaving distance is the percentage of vehicles using the lane and making the weave may be far higher than the number of vehicles making the weave for a left exit.

Over the next 12 months, Fitzpatrick will identify existing design guidelines, define problems and issues, and identify knowledge gaps to be addressed in this research. Using this information, design guidelines will be developed. Interviews and site visits, phone interviews, and conversations with TxDOT employees will occur. Also, e-mails and mail surveys will be used to identify gaps. This effort will build upon the modeling results of Task 5 and the interface between the VISSIM and other models and the geometric design. The research will explore sight distances and other geometric design issues that may impact decisions regarding access point location and other design features.

Bill Eisele, Facilitate AASHTO Revision of Design Guides (Task 12)

This task focuses on facilitating the revision of two AASHTO design guides last published in 1992: *“Guide for the Design of High Occupancy Vehicle Facilities.” American Association of State Highway and Transportation Officials, Washington, DC, 1992* and *“Guide for the Design of Park-and-Ride Facilities.” American Association of State Highway and Transportation Officials, Washington, DC, 1992*. The AASHTO Task Force for Public Transportation Facilities Design Subcommittee on Design met in May 2001 to begin work on these revisions. Since 1992, many changes in practice have occurred and research has been conducted without much being done to update the manuals. Task force participants were gathered from different states and asked to identify sections needing revision. State leaders were identified to lead specific delineation of deficiencies. Work is occurring by sections with the guides to be reviewed and revised through October 2002; peer review of both documents is to be scheduled by November 2002 with the final documents being published in 2003. In the interim, TTI will organize the material and present it in readable form for the 2002 meeting.

Some improvements cited by Eisele include schematic updates and more recent photographs; vehicle eligibility; towing, pricing, trucks and cross sections. For example, managed lanes and pricing are not mentioned in the guides. Other issues needing inclusion are access and material included in the new Manual on Uniform Traffic Control Devices (MUTCD). System connectivity is also needed in both documents. Consideration should also be given to rail facilities. Analysis tools are needed to help the planner determine when a Park-and-Ride is needed as well as Americans with Disabilities Act (ADA) compliance guidelines.

Ginger Daniels, Development of a Decision Matrix (Task 6)

Development of a decision matrix is the key task that ties everything together. It is designed to display what is known about managed lanes, what knowledge is coming out of this research, and serve as a mechanism for feeding information into the manual and identifying gaps in knowledge. Daniels described the multi-dimensional framework. She stated that everything related to design and operation is hinged on the vehicle user group. The combinations of objectives are fed by a group of goals, issues, and corridor conditions. Demand, origins and destinations, financial goals, and policy issues should be related to user groups. Ideally these factors would relate to managed lane project objectives, like financial goals/revenue goals. Based on the user group, designers and planners can then answer questions about signage, technology, design parameters, and operating strategy. The decision matrix will form the backbone of the decision support systems and the managed lanes manual. The focus is to provide user-friendly tools to help the transportation professional make educated decisions, with the idea of having a web-based tool providing links to resources for the user. The idea is not to necessarily provide all the answers, but provide tools to plan, design, and operate a managed lanes project.

Ginger Daniels, Concept Marketing (Task 8)

The concept marketing effort is intended to build an understanding of the managed lane concept and identify effective approaches for communicating and building consensus within a community. This task will develop effective resources, including position papers for policy makers and media editorial boards. A technical advisory committee has been established to help direct the task. Members include several public information representatives and project representatives from several TxDOT districts and representatives from Dallas Area Rapid Transit (DART), and Harris County Metropolitan Transit Authority (METRO). The task force is reviewing the scope of work and will review products as they progress. The focus of this task will include researching public perceptions, communication mechanisms, and methods of gaining support. A key element will look at pricing, which is a unique part of the marketing to focus on public perception relative to pricing. Two position papers will be prepared in January 2002.

1.4 Managed Lanes Projects in the United States

Examples were provided from California, Seattle and New Jersey as described below. Each of the projects uses electronic tolling to handle fees.

I-15 FasTrak, San Diego, CA: Single Occupancy Vehicles (SOV) can buy in while, 2+ may travel for free. Dynamic pricing is in effect with tolls changing as frequently as every 6 minutes. Demand is partially controlled through access with, only 2 access points. All tolls are collected electronically.

SR-91 Express Lanes, Orange County, CA.: The managed lane is separated with a soft buffer. A private company built and operates the facility under a 30-year contract with California Department of Transportation (Caltrans). Variable pricing is used with higher prices during the peak period. Preferential treatment is provided for HOV with 3+ vehicles and motorcycles, both receiving a 50% discount. The facility is 10 miles long with two access points; there is no intermediate access and trucks are not allowed.

I-5 and I-90 Express Lanes, Seattle, WA: The facilities are reversible and serve downtown Seattle. The facility provides express service to SOVs, but HOVs and transit have designated access points that SOVs cannot use. HOVs are controlled through access. The design is with a flyover, so the HOV access is below.

The difference between dynamic and variable pricing is, as conditions change, the price goes up or down. Prices range from .50 to generally \$4 (although it can increase to \$8, in some circumstances) and the price can change .50 every 6 minutes. Time variable pricing is a posted toll on a schedule, therefore, the price structure is based on the time-of-day.

NJ Turnpike: The turnpike has a variety of management techniques. It is a 148-mile facility with 28 access points (5 mile average spacing); there are 30 miles of dual/dual roadway where the inside roadway has 3 lanes for passenger cars only and the outside roadway is for other vehicles, mostly trucks. Within a 20-mile section HOV 3s are allowed on the facility. All vehicles are tolled, and there is no special pricing for HOVs. Pricing is by vehicle classification by time-of-day and it is a very complicated structure. Access management is also used to control congestion.

During the course of the research, the study team has revisited the definition of managed lanes to ensure that operational strategies are not overlooked within that definition. One of the issues of concern is the phrase, “increases freeway efficiency.” Examining the projects just discussed, they don’t necessarily increase overall freeway efficiency, but rather provide advantages for a specific set of users. When considering managed lanes, one could look at packaging incident management and other actions, which would still improve efficiency across the full cross section of the freeway. This view contrasts with the concept of looking at a subsection and improving efficiency for a specific group of users.

1.5 Second Year of the Project

Kuhn indicated that stakeholder involvement should be a critical part of this project and that interested parties are being sent information electronically to keep abreast of developments. She also noted that a web page is being produced, as well as a quarterly newsletter. This is important in order to get public endorsement; there must be a mechanism to involve

stakeholders. An external stakeholder committee is being formed with representatives from such groups as MPOs, cities, transit organizations, trucking industry, and toll authorities. They will meet once a year and TxDOT will formally invite these groups to participate in discussions about managed lanes.

Kuhn noted that several items are on the agenda this year for TxDOT to follow-up as priorities. Those tasks are as follows:

- State and federal legislative issues;
- Funding and financing;
- Enforcement; and
- Revisions to portions of the Traffic Operations Manual. This ongoing task will include a review of the portions that need to be modified with reference to the Managed Lanes Manual.

Kuhn also asked the group whether there was anything else that TxDOT needed to address and if the project was on the right track.

1.6 General Group Discussion

The group discussion centered on several key issues described below.

- It is important to be cautious in what is promised to the public about managed lanes. Recognize the intent to provide improved efficiency across the entire freeway facility.
- Design guidelines must be sensitive to balance maintaining free flow operation on managed lanes and avoiding the perception of under-utilization. There may be some cases where free flow operation is not expected.
- Each city may have a different design guideline. For example, the design guideline in Houston is 50 mph minimum speed on the managed lanes while Dallas uses a managed lane volume of 1800 vehicles per lane per hour. These differences reflect the flexibility of the managed lane definition.
- Continue on-going dialog with other agencies in the state that are exploring questions about managed lanes including traffic levels, tolling, and new legislation that may be needed.
- Twelve issues are under development by the Harris County Toll Authority, which may provide additional insight in several key areas including traffic volumes and revenue generation.
- Several newsletters and on-line publications are available to apprise those interested of progress and interim findings, including *FastLane*, the project quarterly newsletter.
- Ensure that research includes trade-offs relative to shoulder provision, desired cross-sections, turning radii for tow trucks, and other key design features that might be critical to managed lane success.
- TxDOT is encouraged to contact the researchers throughout the year with questions or comments.

Appendices

Appendix A

PROJECT NO. 0-4160 OPERATING FREEWAYS WITH MANAGED LANES

**Annual Project Monitoring Committee Workshop
30 August 2001
2:30 – 4:30 p.m.
TxDOT Traffic Operations Division
Building 118 E. Riverside, 1st Floor Conference Room**

AGENDA

Introductory Remarks Carlos Lopez, TxDOT	5 minutes
Review of Year 1 Activities Beverly Kuhn, Texas Transportation Institute	5 minutes
Task Updates Steve Venglar, Texas Transportation Institute – Task 5 Bill Eisele, Texas Transportation Institute – Task 12 Kay Fitzpatrick, Texas Transportation Institute – Task 10 Ginger Daniels, Texas Transportation Institute – Tasks 6 and 8	25 minutes
Overview of Managed Lane Projects in the United States Ginger Daniels, Texas Transportation Institute	15 minutes
Break	30 Minutes
Overview of Year 2 planned Activities Beverly Kuhn, Texas Transportation Institute	10 minutes
Discussion Priorities for Year 2	30 minutes
Adjourn	

Appendix B

LIST OF ATTENDEES

Program Coordinator

Gary Trietsch, P.E., Houston District, TxDOT

Project Director

Carlos Lopez, P.E., Traffic Operations Division, TxDOT

Technical Panel

Mike Behrens, P.E., Exec. Dir. For Engineering Operations, TxDOT

TxDOT

Bill Garbade, P.E., Austin District, TxDOT

John Kelly, P.E., San Antonio District, TxDOT

Jay Nelson, P.E., Dallas District, TxDOT

Mary Owen, P.E., Tyler District, TxDOT

Jim Randall, P.E., Transportation Plng. and Programming Div., TxDOT

Steve Simmons, P.E., Fort Worth District, TxDOT

Richard Skopik, P.E., Waco District, TxDOT

Research Team

Beverly Kuhn, TTI

Ginger Daniels, TTI

Bill Eisele, TTI

Kay Fitzpatrick, TTI

Steve Venglar, TTI

Carol Lewis, TSU

Others

Dennis Christiansen, TTI

Ed Seymour, TTI

Bill Stockton, TTI