TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM

Project Summary Report 3942-S

Project 7-3942: Investigation of HOV Lane Implementation and Operational Issues

Authors: Douglas A. Skowronek, P.E., Stephen E. Ranft, and Joseph D. Slack

PROJECT SUMMARY REPORT

Project Monitors HOV Lane Operations

Limited capital investment for major transportation improvements and growth in metropolitan areas requires efficient use of the existing transportation system. Provisions of the Clean Air Act Amendments and TEA-21 further intensify the need for efficiency.

One means to improve mobility is high-occupancy vehicle (HOV) lanes. The concept of an HOV lane is to increase the person-carrying capacity of freeways by providing higher-speed dedicated lanes for multi-occupant vehicles without negatively impacting the congestion in the adjacent freeway general-purpose lanes. HOV lanes, however, are receiving negative publicity in several areas across the country.

HOV lanes in two corridors in New Jersey (I-287 and I-80) were recently closed as a result of public criticism. In the wake of the actions of New Jersey, legislation introduced in California limits implementation of new HOV lanes and may remove existing HOV lanes. Inappropriate data, such as vehicle volumes, is used as a basis for removing the facilities. The states of Colorado, Virginia, and Georgia have also proposed legislation to either eliminate HOV lanes or convert them to high-occupancy toll (HOT) lanes.

Figure 1. Barrier-separated contraflow lane

While some of the claims against HOV lanes may be justified, a need exists to evaluate new HOV lanes implemented in the Dallas area, as well as to continue an evaluation of existing HOV lanes.

While an extensive system of permanent HOV lanes is planned for the Dallas-Fort Worth urbanized area, the Texas Department of Transportation (TxDOT) and Dallas Area Rapid Transit (DART) continue to pursue short-term or interim HOV lane projects that enhance public transportation and overall mobility. There are currently 35.4 miles of interim HOV lanes operational in the Dallas area, including a barrier-separated contraflow lane on I-30 (East R.L. Thornton Freeway [Figure 1]) and buffer-separated concurrent flow HOV lanes on I-35E North (Stemmons Freeway) and I-635 (Lyndon B. Johnson Freeway [Figure 2]).

What We Did...

The objective of this research was to investigate the

operational effectiveness of the Dallas area HOV lanes. Issues such as person movement, carpool formation, travel time savings, violation rates, safety, and project cost-effectiveness were addressed. By understanding the operational performance and issues of both concurrent flow (buffer-separated) HOV lanes and contraflow (barrier-separated) HOV lanes, planners can make recommendations on suggested HOV lane policies, including the type of permanent HOV lanes to be implemented in the Dallas area.

The operational performance of the HOV lanes was measured in terms of vehicle and person volumes, occupancy rates, transit impacts, cost-effectiveness, enforcement, safety, and public acceptance. Operational data was collected several times per year so that changes can be identified and documented. The evaluation included a "before" and "after" HOV lane comparison, as well as comparisons with a control corridor that does not have an HOV lane, I-35E South (South R.L. Thornton Freeway).

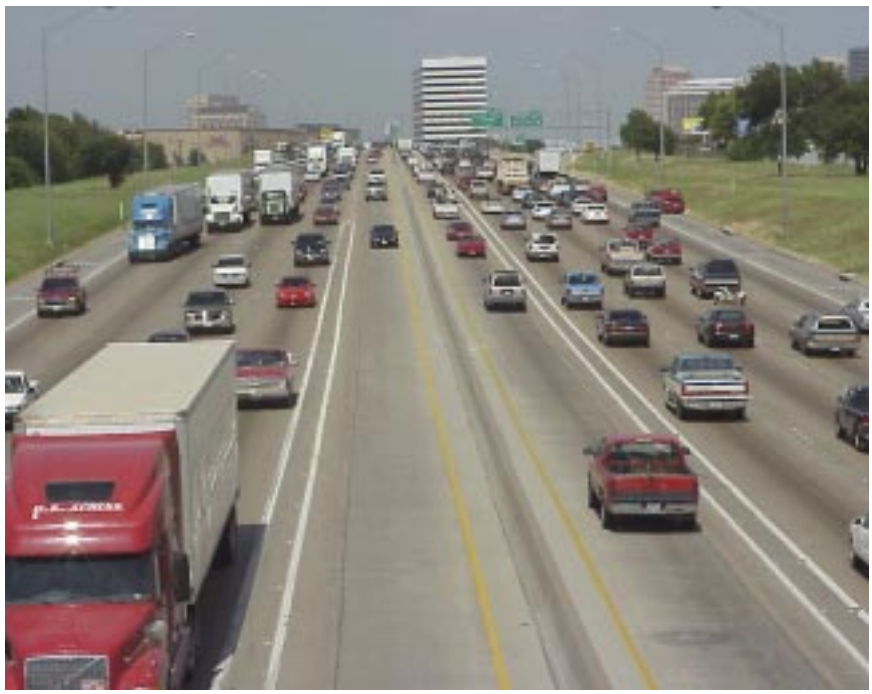

Figure 2. Buffer-separated concurrent flow lanes

What We Found...

Vehicle and Person Volumes and Occupancy

Since each of the HOV lanes has opened, there has been a significant increase in the number of 2-or-more person (2+) carpools on each of the facilities (Figure 3). The percent increase in carpools ranged from 79 percent on eastbound I-635 to a 296 percent increase on I-35E North. One of the objectives of an HOV lane is to increase the person-throughput on a facility. On I-35E South, the control facility without an HOV lane, there was a 3 percent decrease in the AM peak hour person trips, while the facilities with HOV lanes had at least a 14 percent increase in person trips. Additionally, an HOV lane should carry at least as many people as an adjacent freeway mainlane. Due to several bus routes that utilize the I-30 HOV lane, the HOV lane carries twice the number of people as an adjacent general-purpose lane during the peak hour, while the HOV lanes on I-635 and I-35E North carry person volumes slightly more than those of the adjacent general-purpose lanes (Figure 4).

Increases in automobile occupancy indicate that motorists are forming carpools to utilize the benefits of the HOV lanes. The freeways with an HOV lane had an 8 percent to 12 percent increase in average automobile occupancy, while the average automobile occupancy on I-35E South, without an HOV lane, has decreased by 2 percent.

Travel Times and Speeds

To encourage motorists to rideshare in order to utilize the HOV lane, it is essential that vehicles in the HOV lane be able to travel faster than those in the general-purpose lanes; further, in order to maintain positive public perception, the HOV lane should not negatively impact traffic in the adjacent general-purpose lanes. The HOV lanes typically save motorists at least five minutes over the general-purpose lanes on incident-free days. Opening an HOV lane on I-35E North and I-635 eastbound and westbound had an insignificant impact on the mainlane operating speeds (neither positive or negative), while there was an increase in mainlane speeds on I-30 after the HOV lane was opened.

Transit

While there are not any fixed DART bus routes on I-635, the bus operating speeds on I-30 and I-35E North have more than doubled since the opening of the HOV lanes on these facilities. Also, the travel time savings has decreased the bus operating costs on I-30 by approximately $400,000 and by $185,000 on I-35E North because fewer buses are required to run than in the "before" bus routes.

Cost-Effectiveness

Comparing the costs and benefits (peak-period travel time savings) will determine if a project is cost-effective. All three HOV lane projects are cost-effective and have attained, or are projected to attain, a benefit/cost ratio greater than 1.0 within the first five years of operation.

Enforcement

The HOV lanes are routinely enforced during the peak periods and sporadically enforced during the off-peak periods by the DART transit police. Due to the presence of enforcement officers, the violation rates on I-30 are approximately 1 percent, while the violation rates on the concurrent flow facilities ranged from 3 percent to 6 percent. The violation rates on the concurrent flow lanes, however, are at the lower end of typical nationally reported concurrent flow HOV lane violation rates, ranging between 5 percent and 40 percent.

Safety

The I-35E North and the I-635 HOV lanes have been operational for a little more than two years, and limited data is available to draw conclusions regarding the safety of concurrent flow HOV lanes. Only one year of accident data was available since the opening of the HOV lanes at the time this summary was prepared. The accident data, obtained from the Texas Department of Public Safety, will continue to be monitored as it becomes available so that the safety implications can be documented.

Public Acceptance

A survey of I-30 HOV users cited that the primary reasons carpoolers use the HOV lane are cost savings over driving alone and time savings. Bus riders use the HOV lane because it is cheaper and more convenient than driving alone. To date, there has not been a public acceptance study performed on I-35E North or I-635 HOV lanes. DART has been receptive to the public's comments to improve operations, including extending the limits of the eastbound I-30 HOV lane and adding an additional access location on the westbound I-635 HOV lane.

Other Issues

There are also several other qualitative HOV lane issues that must be analyzed including design requirements, implementation time, capacity, and flexibility, when different alternatives for HOV lanes are studied.

Researchers Recommend...

All three HOV lane projects are cost-effective and have attained, or are projected to attain, a benefit/cost ratio greater than 1.0 within the first five years of operation. Each has also generated a substantial number of carpools, increased the person movement in the corridor, and increased the occupancy rate in the corridor—without negatively impacting the operation of the adjacent freeway general-purpose lanes.

Experience from Houston, however, indicates that two to four years of operation of a facility is required before a complete and thorough assessment can be made. It is, therefore, recommended that the facilities continue to be monitored and a reassessment of their effectiveness and safety be conducted when additional data is available. This will be conducted with a follow-up research project (7-4961) beginning in fiscal year 2000.

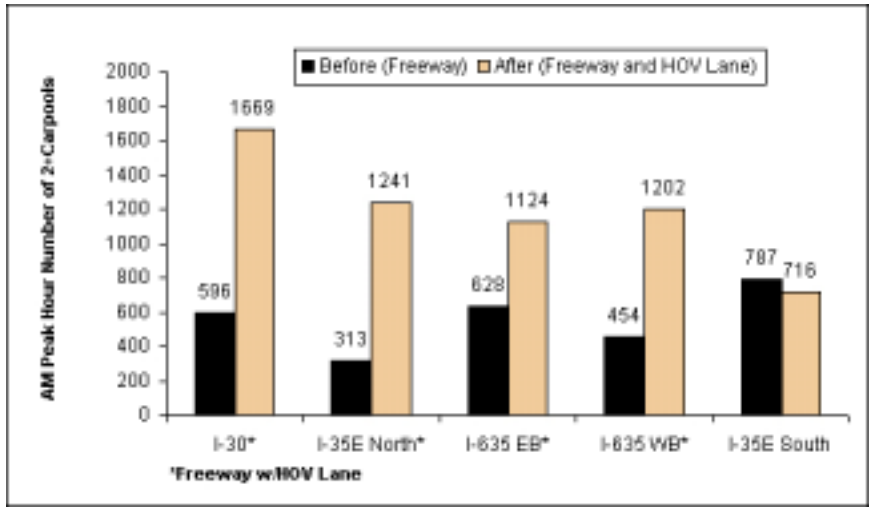

Figure 3. Increase in carpools

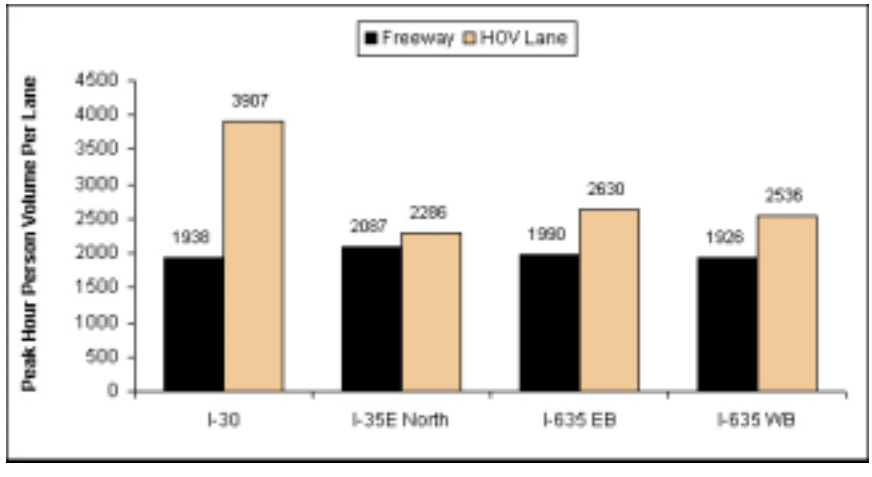

Figure 4. Peak hour person volume

For More Details...

Project 7-3942 "Investigation of HOV Lane Implementation and Operational Issues"

Research Supervisor: Douglas A. Skowronek, TTI, d-skowronek@tamu.edu, (817) 462-0511

Researcher: Stephen Ranft, TTI, s-ranft@tamu.edu, (817) 462-0520

TxDOT Project Director: Stan Hall, (214) 320-6155

To obtain copies of these reports, contact Dolores Hott at the Information & Technology Exchange Center, (979) 845-4853, or e-mail d-hott@tamu.edu.

TxDOT Implementation Status July 1999

By Dr. Khali Persad, P.E., CSTR Research Engineer
Phone: (512) 465-7908 or e-mail kpersad@mailgw.dot.state.tx.us

The following are the products identified for this project:

1. Guidelines for the design, implementation, and operation of HOV lanes in the Dallas area.
2. Assessment of TxDOT standards for concurrent HOV lane signs and pavement markings and a review of various configurations currently used in other states.

These products have been received by TxDOT. A substantial increase in crashes has been noted, and the causes should be determined before further implementation.

Since the Dallas HOV lanes are fairly new, the project director agrees that evaluation should continue. This research is continuing under project 7-4961 "An Evaluation of Dallas Area HOV Lanes" (9/99-8/02).

Contact: TxDOT Project Director, Stan Hall, at (214) 320-6155.

YOUR INVOLVEMENT IS WELCOME!

This research was performed in cooperation with the Texas Department of Transportation (TxDOT). The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names are used solely for information and not for product endorsement. The engineer in charge of this project was Douglas A. Skowronek, P.E. (#80683).