Managed Lanes Case Studies

A companion to the Preliminary Investigation
Impacts of Increasing Vehicle-Occupancy Requirements on HOV/HOT Lanes

Requested by
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I. Florida

I-95 Express, Miami

1. Project Description

a) From the *Priced Managed Lane Guide* (pages 1-20 to 1-22):

> The 21-mile I-95 express facility converts a single HOV lane into two high-occupancy toll (HOT) lanes in each direction by narrowing the travel lanes from 12' to 11' and narrowing the shoulders. Construction includes some bridge and interchange improvements to maintain continuity of the dual managed lane facility. The project is being constructed in phases. Phase one is open and phase two will be completed in late 2014.
>
> …
>
> Toll exempted vehicles: Registered carpools of three or more passengers, South Florida vanpools and registered hybrid vehicles can drive toll-free, but they must be registered with South Florida Commuter Services. Motorcycles can use the express lanes toll-free and do not need to register.

b) From *Evaluation and Performance Measurement of Congestion Pricing Projects* (page 99):

> The Florida Department of Transportation (FDOT) operates a total of 1,471 centerline miles of Interstate highway out of a statewide network of 121,526 miles of roads. There are a total of 44 standalone toll facilities in Florida, the largest number of any state. Toll revenues represented approximately 12 percent of FDOT total revenues in 2007, or nearly $1.1 billion out of $9.2 billion (AASHTO Center for Excellence in Project Finance). FDOT is converting and expanding 21 miles of HOV lanes on I-95 between I-395 in Miami and I-595 in Fort Lauderdale—known as 95 Express—with the support of a $62.9 million Urban Partnership Agreement (UPA) grant from USDOT. It is also implementing a $1.8 billion expansion of I-595 on a public-private partnership basis. The expansion will feature a new three-lane reversible flow, 10.5-mile, variably priced HOT lane that, with the converted I-95 facility, will create the beginning of a network of priced lanes in the Miami-Fort Lauderdale region.

c) See also:

- *A Domestic Scan of Congestion Pricing and Managed Lanes* (page 31).
- *Operational Performance Management of Priced Facilities* (page 24).

2. Why Occupancy Was Increased

a) From *HOT Lane Policies and Their Implications* (pages 23-24):

> … the GPLs as well as HOV lanes on I-95 were not able to provide reliable travel. 95 Express Lanes project was designed to reduce congestion and make travel along this portion of I-95 a better experience for drivers, residents, and transit users alike. Ultimately, "it will create more travel options and encourage the use of ridesharing and transit alternates. The first of its kind in the state, this managed lanes project is part of an overall long-term strategy of initiatives designed to help improve the safety, throughput and reliability of mobility along the roadways within southeast Florida" (Kimley-Horn, 2008).
>
> The conversion of the I-95 HOV lanes to Express Lanes focuses on the throughput enhancement of the whole I-95 corridor and not only the HOV lanes. Also, it is designed to encourage the use of ridesharing and transit. The preference given to 3+ carpools probably stems from the objective of encouraging ridesharing.

b) According to the *95 Express Annual Report* (page 5), performance goals are improving safety, throughput and mobility reliability.

c) From *Evaluation and Performance Measurement of Congestion Pricing Projects* (page 99):

> The impetus for the 95 Express conversion was congestion on the existing I-95 HOV lanes, which no longer offered reliable trips during peak travel periods. Working with multiple partners— including the metropolitan planning organizations of Miami-Dade & Broward Counties, Miami-Dade & Broward County Transit, Florida's Turnpike Enterprise (FTE), Miami-Dade Expressway Authority, and South Florida Commuter Services—FDOT took advantage of USDOT's UPA program to gain funding for the conversion and implement transit enhancements in the corridor.
>
> The goals established for the I-95 Express Lanes are as follows:
>
> 1. Maximize throughput
> 2. Maintain free-flow speed on the Express Lanes and travel time savings
> 3. Increase trip reliability
> 4. Incentivize transit and carpooling
> 5. Reduce congestion by diverting traffic to non-peak periods
> 6. Meet increasing travel demand in the future
> 7. Facilitate trip-reducing carpool formation
>
> A conscious decision was made by FDOT to maximize the throughput and operational efficiency of the 95 Express, rather than optimize revenues. However, it is not guaranteed that the express lanes will be congestion-free during peak hours, even with the payment of a toll. Nonetheless, motorists are provided a high level of reliability to expect free-flow conditions.

d) See also: *Operational Performance Management of Priced Facilities* (page 24).

3. Other Actions Taken

a) From the *Priced Managed Lane Guide* (pages 1-20 to 1-22):

- Congestion Pricing
- Ridesharing Incentives
- Ramp Metering
- New BRT Service
- All Electronic Tolling

b) According to the *Priced Managed Lane Guide* (pages 1-20 to 1-22), new transit services include the addition of 535 parking spaces to the Golden Glades Park and Ride Lot, and:

- 95X - connects various locations in northern Miami-Dade County with various locations downtown.
- Route 195 (Dade-Broward Express - Sheridan Street.)
- Route 195 (Dade-Broward Express - Broward Boulevard)
- Route 107 (Pines Boulevard Express)

c) From the *FHWA Priced Managed Lane Guide* (pages 1-8):

> Several HOV-to-HOT conversion projects, notably I-95 in Miami and I-10 in Los Angeles, added a design change that accommodated a second managed lane without roadway widening next to the original HOV lane, thus adding capacity and better management to both directional lanes at the same time.

4. Public and Political Outreach

a) From the *95 Express Annual Report* (page 4):

> … 31% of survey participants use 95 Express two to four times per week and 80.4% agree or strongly agree that the express lanes provide a more reliable trip than the I-95 general purpose lanes.

b) From: *A Domestic Scan of Congestion Pricing and Managed Lanes* (page 32):

> FDOT has conducted public meetings, workshops and hearings to educate the public about managed lanes and variable tolls. In 2005, during the development process of the Interstate Master Plan (IMP) for the Interstate 95 Corridor, a Public Involvement Plan (PIP) was prepared. The PIP identified and defined strategies to engage the users, property owners, agencies, private groups and governmental entities in the IMP development process. Strategies included meetings, presentations and public hearings in addition to the distribution of handouts, flyers, newsletters and brochures. The media helped inform the public about the development process and a web site was created to further educate the public about managed lanes and variable tolls.

5. Impacts and Lessons Learned

a) From the *Priced Managed Lane Guide* (pages 1-20 to 1-22):

- ADT Un-tolled: 1,000

- ADT Tolled: 59,000
- Total ADT: 60,000
- Hourly Operational Capacity: 2700 to 3300 vehicles per direction
- Peaking Characteristics: Weekdays – AM Peak (6AM to 9AM); PM Peak (4PM to 7PM)

b) FDOT includes monthly, midyear and annual reports on the performance of these lanes: http://www.sunguide.org/index.php/tmc_reports/

- Most recent monthly report: http://www.sunguide.org/sunguide/images/uploads/tmc_reports/2012_11_29_95_EL_Monthly_October_2012_rjs_final.pdf
- Midyear report (2009): http://www.sunguide.org/sunguide/images/uploads/tmc_reports/95X_1A_UPA_Eval_Midyear_Report__10_30_2009__FINAL.pdf
- Most recent annual report: http://www.sunguide.org/sunguide/images/uploads/tmc_reports/95X_P1_UPA_Eval_FY_11_Annual_Report__02_17_2012_rjs__FINAL.pdf
- FDOT's reports page includes more detailed transit evaluation reports, including the most recent November 2011 report: http://www.sunguide.org/sunguide/images/uploads/tmc_reports/HOV_Report_Analysis_Memo_FINAL_3.14_.12_.pdf

c) From the *95 Express Annual Report* (pages 3-4):

> The program has considerably improved the overall operational performance of I-95. Customers, including transit riders, choosing to use the express lanes (EL) have significantly increased their travel speed during the AM peak (6am-9am, southbound) and PM peak (4pm-7pm, northbound) periods – from an average speed in the high occupancy vehicle (HOV) lane of approximately 20 MPH (prior to program implementation) to a monthly average of 62 MPH and 56 MPH in the southbound and northbound directions, respectively. Drivers travelling via the general purpose lanes (GPL) have also experienced a significant peak period increase in average travel speed since implementation of 95 Express – from an average of approximately 15 MPH (southbound) and 20 MPH (northbound) to a monthly average of 50 MPH and 41 MPH, respectively.
>
> Probably more important than the improved speeds when it comes to operational performance are the improvements to the travel time reliability of the facility. Average volume along the express lanes in the AM and PM peak periods were nearly 8,300 vehicles (over 30% of the total I-95 traffic during peak periods); a 12.2% increase in volume over FY2010. These vehicles were traveling at speeds greater than 45 MPH during the AM peak period nearly 100% of the time and almost 92% of the time in the northbound direction during the PM peak period. The federal requirement for HOV to HOT lane conversion is a minimum of 90% for 45 MPH speeds during the peak period.

According to the *Annual Report*, the project introduced new bus rapid transit routes in January 2010 (page 16); by November 2011, ridership has increased 145 percent since before the HOT lanes were introduced.

d) From *HOT Lane Policies and Their Implications*:

> i) Travel time savings (page 26):

Table 2 PM Peak Period Travel Speed Comparison- 2008 vs 2009 (Northbound) (Cain, 2009)

	Travel Speed (mph)		Travel Time (min: sec)	
	HOV/ HOT	GPL	HOV/ HOT	GPL
2008	18.1	18.8	25:02	24:06
2009	56.8	39.7	7:59	11:25
Change	38.7	20.9	-17:03	-12:41
% Change	213%	111%	-68%	-53%

The travel time of vehicles in the HOV lanes decreased from 25 minutes to 8 minutes after the Express Lanes. Since express bus use the Express Lanes, the bus travel time also decreased by 17 minutes.

ii) Ridership (pages 26-27):

There was an increase of 30 percent in the ridership of the express bus service comparing ridership data from January-March 2009 to that of January/March 2008 (see Table 3). However, at the corridor level, bus ridership actually dropped by 4.6 percent. This is likely due to small system-wide reductions in service quantity and significant fare increases, coupled with exogenous factors like lower gas prices as described previously as well as economic recession. In addition to those, the 95 Express accounts for less than one fifth of total corridor ridership (the two other routes—77 and 277—run parallel to I-95 on 7th Avenue). Thus the ridership increase on the express bus was not reflected at the corridor level. The higher income profile of express bus users is one reason why the fare increase has not impacted 95 Express ridership as dramatically as it has impacted the MDT system as a whole. The express bus riders sample has 7 percent of respondents with annual household income less than $20,000 while 71 percent of MDT's system wide ridership had annual household incomes under $20,000 (Cain, 2009).

iii) Mode shift due to transit (pages 27-28):

95 Express bus riders were asked how long they have been traveling by bus and what was their previous mode of travel before using the bus service. 92 percent of respondents (307 out of 334) mentioned they have been traveling the 95 Express bus before the Express Lanes started. Only, 8 percent respondents (27 out of 334) began using the bus after the Express Lanes opened. Among them, 50 percent (13 out of 27) had their previous mode as drive alone and none of them carpooled previously. Therefore, 95 Express bus ridership consisted primarily of those who have been using the service prior to Express Lanes implementation and the small mode shift from highway to transit was mostly from SOVs. Note that the number of respondents is too small to make any conclusions (Cain, 2009).

Respondents were also asked whether or not the opening of the Express Lanes had influenced their decision to ride the 95 Express bus service. 16.4 percent of those respondents (52 out of 315) who have been riding the Express bus before the implementation of Express Lanes stated that their decision to ride the Express Lanes was influenced by the Express lane project. This could mean that these riders are either riding the 95 Express bus more frequently, or have decided to continue using the service while otherwise they would have shifted to other modes. Only 9 users indicated that they started using the bus after the Express Lanes started, with four of these users indicating that the opening of the Express Lanes influenced their decision to ride the 95 Express bus (Cain, 2009).

In May 2009, bus riders were asked their perception of different elements of transit as compared to pre -Express lane implementation. The majority of the respondents mentioned service

reliability (55 percent) and travel time (75 percent) are better after the Express Lanes opened (Cain, 2009).

The above findings indicate that the improvement in the traffic conditions on the Express Lanes (travel time saving of 17 minutes as compared to pre-Express Lanes) overshadowed the reduced fiscal benefit (due to reduced gas prices and increased bus fare) of using transit. Additionally, the increased ridership on the express bus can be attributed mostly to Express lane implementation.

iv) Impact on carpooling (page 29):

There was a 4.6 percent increase in the person throughput of the whole corridor (see Table 4). … This indicates that the 256 percent increase of SOVs in the HOV lanes is mostly due to the mode shift from within the corridor and not due to the overall increase in travelers. The overall decrease in the number of HOV2 person volume shows that these carpools either shifted to SOV mode (an overall 33 percent increase in SOVs) or they shifted to higher occupancy (overall 9.6 percent increase in HOV3). The decrease in HOV2 person volume in managed lanes could be because of the toll imposed on them for Express lane use, and the access points reduced to just either end of the facility. However, the decrease in access points would also affect the HOV3 vehicle volumes in the Express Lanes and in place of tolls they have strict guidelines for carpool registration. This mode shift will be examined in the following sections.

Table 4 Person Throughput by Vehicle Type in Managed Lanes 2008 vs 2009 (Northbound; PM Peak Period- 4 to 6 PM) (Cain, 2009)

Vehicle Type	Managed Lanes			Facility (GPLs + Express)		
	Total Person Volume per Peak Period			Total Person Volume per Peak Period		
	2008	2009	% Change	2008	2009	% Change
SOV	1061	3778	256.1%	9141	12206	33.5%
HOV2	3040	1899	-37.5%	10437	8181	-21.6%
HOV3	477	171	-64.2%	2335	2558	9.6%
Transit	810	821	1.4%	810	821	1.4%
Total	5387	6669	23.8%	22723	23766	4.6%

v) Throughput (page 35):

Comparing 2008 and 2009, the person throughput during the PM peak hour (4 PM-5 PM) in HOV/HOT lanes and GPLs increased by 23 percent and 8 percent respectively. The person throughput in Express Lanes increased even when the average vehicle occupancy dropped from 1.95 (2008) to 1.39 (2009) due to SOVs being allowed in Express Lanes. Overall, the person throughput increased by 1,325 or 12 percent in the facility after the Express Lanes implementation (FDOT, 2009). It should be noted that there was an addition of one more lane in the northbound direction.

During the first six months of operations, on average, during the PM peak period (4 PM to 7 PM) the Express Lanes carried 27.7 percent of the total traffic on the corridor (6,910 in Express Lanes and 18,064 in GPLs) with 33 percent of the total capacity (2 Express Lanes and 4 GPLs) (FDOT, 2009).

vi) Travel time reliability (page 35):

In the first six months of Express lane operations, the Express Lanes considerably improved the overall operational performance of I-95. The travel speed during PM peak periods (4 PM-7 PM)

significantly increased from an average speed in the HOV lane of approximately 20 mph to an average of 57 mph. The speed in the GPLs has also increased from an average of approximately 20 mph to an average of 41 mph. Average volume along the Express Lanes in the PM peak period (4 PM to 7 PM) was nearly 7,000 vehicles (approximately 28 percent of the total I-95 northbound traffic). After one year of the Express Lanes operations in December 2009, Express Lanes operated at a speed of 45 mph or greater for 99.3 percent of the time (FDOT, 2009).

vii) Transit (page 36):

Due to the Express Lanes, the travel time of buses decreased from 25 minutes to 8 minutes and the travel time reliability increased. The bus ridership also increased by 30 percent as compared to the year before Express Lanes. After one year of operation in December 2009, buses (Miami Dade Transit and Miami Dade School) represented 36 percent (2782 buses) of the total toll exempt registration (7801).

viii) Ridesharing (page 36):

The total number of HOV3+ registrations increased from 1356 in first six months to 1705 after one year (22 percent of total toll exempt vehicles). The number of Hybrid registrations also increased from 2891 to 3264 during this period (FDOT District Six, 2010 and FDOT, 2009) and have the highest share (42 percent after one year) among all the toll exempt registered vehicles. Therefore, the highest proportion of monthly toll exempt trips is by Hybrids only (67 percent of total toll exempt monthly trips averaged over first six months) (FDOT, 2009).

e) From *A Domestic Scan of Congestion Pricing and Managed Lanes* (page 32):

Lessons learned in the Miami metropolitan area include:

1. Successful implementation of a first project is important to facilitating the implementation of other projects. Much of the concern about congestion pricing is addressed by a successful project.
2. It is important to involve the Federal Transit Administration and Federal Highway Administration early in the process of development of congestion pricing and managed lanes projects to ensure their support and approval.

f) From *Improving Value of Travel Time Savings Estimation* (abstract):

By using information from the first survey to collect trip-specific data on the 95 Express corridor in Miami, Florida, it was found that the estimated VTTS of those travelers is approximately 49 percent of their hourly wage based on annual household income, with a range of $2.27 to $79.32 per hour and a mean of approximately $32.00 per hour.

g) According to Greg Jones, FHWA (personal correspondence with James Colyar and Jesse Glazer), the requirement to register led to a reduction in the number of carpool users of managed lanes.

6. Revenue Control and Use

a) From the *Priced Managed Lane Guide* (pages 1-20 to 1-22):

i) Revenue:

- Annual operating costs: $7.63 million

- Annual revenue: $14.79 million (projected FY 2011/12)
- Toll operator: SunPass (Florida's Turnpike Enterprise)

ii) Revenue use:

- $3.61 Million Transit
- $0.03 Million
- $0.50 Million Phase 2 build out
- $4.00 Million R&R Reserve/Sinking Account
- ($0.97) Million Escrow

b) From *Operational Performance Management of Priced Facilities* (page 25):

> Tolls are the sole source of revenue and are used in priority order: 1) operation and maintenance of the lanes, 2) paying back the contractor who put up advance funding, 3) transit, and 4) any state road.

7. Sources

Facility web site: http://www.95express.com/

95 Express Annual Report. Florida Department of Transportation, 2012.
http://www.sunguide.org/sunguide/images/uploads/tmc_reports/95X_P1_UPA_Eval_FY_11_Annual_Report__02_17_2012_rjs__FINAL.pdf

A Domestic Scan of Congestion Pricing and Managed Lanes. Federal Highway Administration, 2009.
http://ops.fhwa.dot.gov/publications/fhwahep09044/fhwahep09044.pdf

Evaluation and Performance Measurement of Congestion Pricing Projects. NCHRP Report 694, 2011.
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_694.pdf

HOT Lane Policies and Their Implications. Texas A&M, 2010.
http://repository.tamu.edu/bitstream/handle/1969.1/ETD-TAMU-2010-05-7961/GOEL-THESIS.pdf?sequence=3

Improving Value of Travel Time Savings Estimation. University of South Florida, 2011.
http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_PTO/FDOT_BDK85_977-21_rpt.pdf

Greg Jones, FHWA, personal correspondence with James Colyar and Jesse Glazer, 2013.
Appendix A.

Operational Performance Management of Priced Facilities. Texas Transportation Institute, 2011.
http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/0-6396-1.pdf

Priced Managed Lane Guide (Draft). Federal Highway Administration, 2012.
Available by request from FHWA.

II. Georgia

Express 85, Atlanta

1. Project Description

GDOT converted 16 miles of HOV lanes on I-85 in Atlanta into HOT lanes, which opened in October 2011. Toll-exempted vehicles include (registered vehicles only): HOV3+, motorcycles, transit, emergency vehicles and alternative fuel vehicles (AFV) with AFV license plates.

2. Why Occupancy Was Increased

Occupancy was increased to help improve mobility and provide reliable trip times through value pricing. From *The I-85 Express Lanes Project 2012 NASCIO Recognition Award Nomination* (page 1):

> Mobility in the metro-Atlanta area has been a challenge for the region for many years. The need for a new mobility choice was evident on the Interstate 85 (I-85) corridor, north of Atlanta. High Occupancy Vehicle (HOV) lanes were consistently over or under capacity leading to unreliable travel times for motorists. In addition, the corridor had limited transit options. Shoulder width constraints made it unrealistic to add new capacity to the corridor.

3. Other Actions Taken

From the *Priced Managed Lane Guide* (pages 1-23 to 1-24):

- Tolling.
- Transit facilities were added, including two new Park-and-Ride lots and expansion at two existing lots for a total of 2,200 new parking spaces. 36 new commuter coaches were added.

4. Public and Political Outreach

a) From *The I-85 Express Lanes Project 2012 NASCIO Recognition Award Nomination* (page 4):

> An extensive quantitative survey of transit riders, carpoolers, and single drivers was conducted in order to develop a solution that would be adopted by commuters. The following survey results show previous use of the HOV lane by I-85 carpoolers:
>
> - 63% were in two-person carpools
> - 45% used the HOV lane three or more times per week
> - 40% never or only occasionally used the HOV lane
> - 64% indicated they would continue to carpool if the HOV lane did not exist
>
> …
>
> Aggressive education and outreach for the Express Lanes began in March 2011. The transponder issuance goals included approximately 13,000 transponders issued by the end of the first month of operation and 35,000 transponders issued within the first year. The marketing and communications efforts yielded an unprecedented return on investment. Before the opening of the Express Lanes,

> approximately 75,000 transponders had been issued. By the end of the first month of operations, more than 100,000 Peach Pass transponders were issued.

b) News accounts, including articles from a February 2012 issue of *The New York Times* (http://www.nytimes.com/2012/02/26/automobiles/hov-access-to-the-car-pool-lane-for-a-price.html?pagewanted=1&_r=1) and an October 2012 issue of *The Atlanta Journal-Constitution* (http://www.ajc.com/news/news/local/first-year-of-i-85-hot-lane-brings-drivers-but-les/nSRyT/), suggest that the lanes were widely disliked, at least initially.

5. Impacts and Lessons Learned

a) From *The I-85 Express Lanes Project 2012 NASCIO Recognition Award Nomination* (page 5):

> To date, more than 150,000 new Peach Passes have been issued to motorists and approximately 71,000 different customers have used the Express Lanes since opening. In addition, usage in the lanes has more than quadrupled, increasing from 3,200 registered trips on the first day of operation to 16,000 trips per day on average. Also, transit ridership has increased since the opening of the Express Lanes. Overall, motorists who use the Express Lanes are experiencing significant time savings in their commutes.

b) The Georgia State Road and Tollway Authority releases monthly travel data summaries for I-85 (http://www.georgiatolls.com/programs/i-85-travel-data/):

- Monthly trips: 446,660 in October 2012
- Percent of trips non-tolled: 14 percent
- Weekday trips average: 17,701
- Daily fare average: $1.51

c) First-year performance as cited by the *Priced Managed Lane Guide* (pages 1-23 to 1-24):

- ADT un-tolled: 14 to 18 percent in first year of operation.
- ADT tolled: 82 to 86 percent in first year of operation.
- Total ADT: 18,600 trips in first year of operation.
- Hourly Operational Capacity: 1,800 to 2,000 vehicles per hour
- Peaking characteristics: Longer full corridor trips and higher toll rates in AM, shorter length trips and low
- Toll rates in PM.

d) A February 2012 *New York Times* article (http://www.nytimes.com/2012/02/26/automobiles/hov-access-to-the-car-pool-lane-for-a-price.html?pagewanted=1&_r=1) cites the following weekly commute data published December 2011: http://www.peachpass.com/uploads/Commute_Data_Release_121211.pdf. *The New York Times* article notes that by January 2012, lanes were seeing 11,600 trips per weekday, and:

> In the first full work week of December, average speeds during the morning peak ranged from 39 to 63 m.p.h., compared with 30 to 57 m.p.h. in the general lanes. Toll rates reached no more than $3.75, and the daily trip averages for the month were $1.16.

e) According to Greg Jones, FHWA (personal correspondence with James Colyar and Jesse Glazer), the requirement to register led to a reduction in the number of carpool users of managed lanes.

f) A more in-depth evaluation of the impacts of the HOT conversion is under way by Georgia Tech investigators:

> **Effective Capacity Analysis and Traffic Data Collection for the I-85 HOV to HOT Conversion**, Georgia Institute of Technology, ongoing.
> http://transportation.ce.gatech.edu/hov2hot
> Investigators are evaluating the effectiveness of this conversion by measuring traffic volume and speed as well as vehicle occupancy and license plate information (for demographic studies) before and after the implementation of the HOT lanes. (We could find no other information on the status of this project).

6. Revenue Control and Use

a) From the *Priced Managed Lane Guide* (pages 1-23 to 1-24):

- Operating costs and revenues have yet to be determined.
- Revenue use: Operation and maintenance, per the Section 166(c) of Title 23, United States Code.
- Toll operator: State Road and Tollway Authority.

b) From *Operational Performance Management of Priced Facilities* (page 36):

> The SRTA is in the process of drafting the policies of MLs regulating the use of revenues. The revenue will be used to pay back debt and for operation of the lanes. The FTA anticipates having some portion of revenue to be used on transit improvements.

7. Sources

Facility web sites:

- http://www.dot.state.ga.us/travelingingeorgia/expresslanes/I85expresslanes/Pages/default.aspx
- http://www.georgiatolls.com/programs/i-85-express-lanes/
- http://www.peachpass.com/peach-pass-toll-facilities/about-i-85-express-lanes

"Access to the Car Pool Lane Can be Yours, for a Price," *The New York Times*, February 24, 2012.
http://www.nytimes.com/2012/02/26/automobiles/hov-access-to-the-car-pool-lane-for-a-price.html?pagewanted=1&_r=3&

"First Year of I-85 HOT Lane Brings Drivers But Less Money Than Expected," *The Atlanta Journal-Constitution*, October 2, 2012.
http://www.ajc.com/news/news/local/first-year-of-i-85-hot-lane-brings-drivers-but-les/nSRyT/

The I-85 Express Lanes Project 2012 NASCIO Recognition Award Nomination. Georgia State Road and Tollway Authority (SRTA), 2012.
Appendix B.

Greg Jones, FHWA, personal correspondence with James Colyar and Jesse Glazer, 2013.
Appendix A.

Operational Performance Management of Priced Facilities. Texas Transportation Institute, 2011.
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Priced Managed Lane Guide (Draft). Federal Highway Administration, 2012.
Available by request from FHWA.

Texas

U.S. 290 (Northwest Freeway)/I-10 (Katy Highway), Houston

1. Project Description

a) From the *Priced Managed Lane Guide* (pages 1-41 to 1-42 and 1-35 to 1-36):

> The US 290 HOT lane is a 14-mile, single lane, reversible-flow facility scheduled to open in the fall of 2012.
>
> …
>
> The Katy Managed Lanes are a 12-mile HOT facility providing two travel lanes in each direction in the median of I-10 between SH6 and SH 610. The new lanes replaced an existing single-lane reversible-flow HOT lane. It is separated from the general-purpose lanes by pylons.

b) According to the *Priced Managed Lane Guide*, occupational requirements for U.S. 290 are "2+ except 645-800am inbound when requirement is 3+," during which HOV2 but not SOV vehicles can pay a toll to use the lanes.

c) From Charles Fuhs, Parsons Brinckerhoff, personal correspondence with Joe Rouse:

> Houston raised occupancy requirements from 2+ to 3+ during the peak periods only (not the off-peak periods) in the late 1980s on the I-10 HOV lane due to overcrowding. The same situation occurred about a decade later when they raised occupancy requirements from 2+ to 3+ on the US 290 Northwest HOV lane during the peak periods.

d) From an online FHWA project summary:

> **VPP Projects Involving Tolls: Priced Lanes—High-Occupancy Toll (HOT) Lanes**, Federal Highway Administration, undated.
> http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/involving_tolls/priced_lanes/hot_lanes/tx_hotlane_i10us290.htm
> In January 1998, Houston's "QuickRide" pricing program was implemented on existing HOV lanes of I-10, also known as the Katy Freeway. It was implemented on US 290 in November 2000. The HOV lanes are reversible and restricted to vehicles with three or more persons during the peak hours of the peak periods. The pricing program allows a limited number of two-person carpools to buy into the lanes during the peak hours. Participating two-person carpool vehicles pay a $2.00 per trip toll while vehicles with higher occupancies continue to travel free. Single-occupant vehicles are not allowed to use the HOV lanes. The QuickRide project is completely automated and no cash transactions are handled on the facility. Results from surveys conducted on I-10 indicate that the primary source of QuickRide participants is persons who formerly traveled in single-occupant vehicles on the regular lanes. Toll revenues from several hundred vehicles each day pay for all program operational costs.

e) From *HOT Lane Policies and Their Implications* (page 99):

> The QuickRide program started in January 1998 on Katy freeway (I-10) and in November 2000 on Northwest freeway (US 290). The program allows the two-person carpool to use the HOV lanes for a fixed fee of $2.00 per trip for limited time periods. These HOT lanes are the only HOT lane projects which do not allow access to the SOVs. And unlike all other lanes the toll for HOV2 is a flat per trip fee. Therefore, these HOT lanes have not been compared to any other existing HOT lane.
>
> The Katy HOT lane is 13.3 miles long, single reversible lane (except for a short 2-lane segment near the eastern end) and barrier separated from the GPLs (see Figure 20). The lane is 19 feet wide or wider in most locations. The time period for HOV2 pricing is limited to 6:45 AM to 8:00 AM and from 5:00 PM to 6:00 PM and HOV2s may use the facility free of charge outside of these periods. HOV3+ can use the lanes for free at all times.

f) See also:

- *Evaluation and Performance Measurement of Congestion Pricing Projects* (pages 107-108).
- *Managed Lanes: A Cross-Cutting Study* (Chapter 3).
- *A Guide for HOT Lane Development* (Katy, pages 73-76, and US 290, pages 76-77).

2. Why Occupancy Was Increased

a) From *Value Pricing Pilot Program: Lessons Learned* (page 2-2):

> The Houston "QuickRide" HOT Lane projects on I-10 (Katy Freeway) and US-290 (Northwest Freeway) were created because of concerns about congestion, but in this case heavy congestion in HOV lanes. The I-10 HOV lane initially started allowing only buses and vanpools, then opened to carpools with 2 or more occupants, but grew congested over time. Subsequent restriction to 3+ carpools (peak period) led to excess capacity and the eventual policy of pricing 2-person carpools in 1998. A similar approach was introduced on the US-290 HOV Lane in 2000.

b) From *HOT Lane Policies and Their Implications:*

> i) HOT lanes were considered on Katy because of severe congestion (page 99).
>
> ii) For Katy Freeway (page 101:
>
> > When the Katy HOV lane opened in 1984, only transit buses and registered vanpools could use the lane. To make better use of this road capacity, the restrictions were relaxed in stages until any vehicles with two or more occupants (HOV2+) were allowed. The lane soon became congested during peak traffic periods due to the high number of carpool vehicles using the lane. Prompted by this, Houston METRO (transit agency responsible for the operation of the HOV lanes) along with TxDOT, restricted usage of HOV lanes to HOV3+ during the morning peak period (6:45 a.m. to 8:15 a.m.) in 1988. The time period was later changed to 6:45 AM to 8:00 AM in 1990. Soon after, HOV3+ restriction was also extended to during the afternoon peak period (5:00 PM to 6:00 PM) because of increased congestion.
> >
> > As a consequence, these occupancy restrictions (HOV3+) resulted in a considerable reduction in peak period traffic and available capacity in the HOV lanes. Also, the number of persons moved by the lane during the peak hour declined by 30 percent. However, less onerous restrictions (HOV2+) had resulted in excess demand and congestion on the lanes. As a solution, the

QuickRide program was created allowing HOV2s to use the lanes for a price during the peak periods. This would limit demand to an acceptable level, make more efficient use of the lane, and provide a revenue source to help pay for the program.

iii) For U.S. 290 (pages 102-103):

Through the 1990s, the Northwest freeway HOV lane use grows, and by 1998, the facility served 6,400 vehicles and 16,200 passengers per day. From September 1997 to April 1999, the lane witnessed a 37 percent increase in the number of peak hour vehicles. This rapid increase, particularly during the AM peak, caused operations to deteriorate. Average speeds in the Northwest HOV lane slowed to between 20 mph and 30 mph in the AM peak and the level-of-service (LOS) reduced to "F" (FHWA website).

Crowded HOV conditions also impacted buses and bus passengers using the facility. Buses serving the Northwest's park-and-ride facilities experienced on average 15-minutes of delay as well as increased operating expenses. Additionally, the large number of cars exiting the HOV facility at its terminus at the Northwest Transit Center negatively impacted the efficiency of bus movements and bus transfers that take place there. Commuters who arrive at park-and-ride lots along the facility and use buses on the Northwest HOV lane to reach downtown were particularly distressed. Commuter complaints to Metro noted deteriorating operations, delays, reliability problems, and lateness (FHWA website).

Due to the success of QuickRide on Katy freeway, Houston Metro considered HOV3+ operation similar to as a possible solution. In early 2000, Metro changed occupancy requirements on the Northwest HOV from two-plus to three-plus carpools from 6:45 to 8:00 AM. The facility experienced a noticeable drop in usage, alleviating crowding and restoring levels of service for transit users. In November 2000, QuickRide operations were launched on the Northwest Freeway (FHWA website).

iv) Objectives of both lanes (page 103):

The overall objectives of the QuickRide program were to (Shin and Hickman, 1999):

- Increase person-throughput in the Katy Freeway corridor during peak periods.
- Increase travel speeds on the GPLs during peak periods, assuming that many vehicles currently using the GPLs will divert to the HOV lane.
- Efficiently manage demand without adverse operating impacts on both the HOV lane and the GPLs.

3. Other Actions Taken

From the *Priced Managed Lane Guide* (pages 1-41 to 1-42):

- Tolling
- Direct-access ramps with some transit facilities

4. Public and Political Outreach

a) From *Value Pricing Pilot Program: Lessons Learned (*Appendix B, pages 1-14 to 1-17):

- QuickRide marketing campaign began on January 5, 1998, with advertisements in the Houston Chronicle (both general circulation and neighborhood editions) and radio spots played during rush-hour traffic reports.
- Advertisements were coordinated with issuance of QuickRide application packets so potential users could view the packets at the same time the ads were run.
- Nearly 1,400 individuals participated in 14 public meetings and two focus groups to measure public opinion on the QuickRide project before it was implemented. One focus group consisted entirely of Katy Freeway users, while the second consisted of members of the general public. The users group included SOV drivers, carpoolers and transit riders, while the general public group did not contain any regular Katy Freeway users, but did include a cross-section of population representing a variety of socioeconomic backgrounds (Collier and Goodin, 2002).
- Members of the Katy users group felt that QuickRide would be a good way of using excess capacity, yet the majority did not anticipate using the service every day. Some bus riders felt the project would result in more carpools and fewer bus riders.
- Focus group members felt that if the project were to be acceptable, use of project revenues should be clearly defined and the public must feel confident in the ability of agencies involved to operate and enforce the pricing project.
- The Katy user's focus group ultimately recommended against the project, recommending improvements in bus service and the HOV lane. The general public group also felt that project would not be worth the effort and would not encourage the use of carpools and transit.

  …

- Social equity was not an issue for the Katy users focus group. Most felt that pricing was an economic solution where one pays for premium service.
- The general public focus group did not indicate a bias toward low-income users. They felt that if the program were successful in alleviating congestion, everyone would benefit (with the exception of 3-person carpools since the HOV lane would have more users).
- Some members of the general public focus group expressed the opinion that it was unfair to pay for roads initially financed and constructed with tax money. They felt that the project should be used to generate revenue to support transit improvements and/or improvements on the main lanes of all freeways, rather than just the HOV lanes.

b) From *Considerations for High Occupancy Vehicle (HOV) Lane to High Occupancy Toll (HOT) Lane Conversions Guidebook* (pages 2-6 to 2-7):

> Establishing transportation taskforces and technical committees consisting of business, community members, and elected officials is a proven key to successful implementation for managed lane projects. For example, the QuickRide Program in Houston over individuals participated in 14 public meetings which helped bring forward issues such as access points and directional flow.

c) From: *A Guide for HOT Lane Development*

i) Page 76:

> Before launching the QuickRide program, Houston Metro and TxDOT, along with a private consultant, conducted a number of focus groups to assess public sentiment toward the proposed fee system. Additionally, the public information staffs of both agencies identified issues that would be important to address when crafting marketing and public information materials for launching the QuickRide program.
>
> Rather than create a separate administrative entity for the QuickRide system, the project sponsors chose to direct potential users to the Metro carpool matching service. In program brochures and on the QuickRide website, potential customers are instructed to call the METRO RideShare Information Line for an application.
>
> In late December 1997, public advertisements for the QuickRide program began to appear in print and radio media outlets. Outreach efforts also included distributing press releases and direct mailing brochures and applications to households in targeted zip codes.
>
> The QuickRide webpage has been another source of information for the public. (See http://www.houmetro.harris.tx.us/services/quickride/asp.) The site is simple in comparison to webpages for the privately owned SR-91 and publicly operated I-15, but it provides necessary information about the facility and its operations. By contrast, the SR-91 website allows potential users to apply for an account online, and offers current users the ability to manage existing transponder accounts online. The I-15 website provides a downloadable application form for its FasTrak program. Applicants to the QuickRide program may download an application from the QuickRide webpage or may call the Metro RideShare to request one.

ii) See also pages 79-80.

d) From *Reaction to Value Pricing by Different Suburban Populations* (abstract):

> Overall, it was found that the majority of travelers on I-10E and I-10W are not favorable to the implementation of value pricing for the future expansion of these corridors. However, I-10W travelers seem to be more willing to pay for travel time savings. This is likely due to the fact that travelers on I-10W have higher average household incomes, are more likely to use I-10W on a regular basis for commute purposes, and are more often exposed to some traffic congestion.

5. Impacts and Lessons Learned

a) For U.S. 290, from the *Priced Managed Lane Guide* (pages 1-41 to 1-42):

- Hourly operational capacity: About 1500 vph

b) For Katy, from the *Priced Managed Lane Guide* (pages 1-35 to 1-36):

- ADT Un-tolled: 5,201 vpd
- ADT Tolled: 8,307 vpd
- Total ADT: 13,508 vpd

- Hourly Operational Capacity: 2,200 vehicles per hour per lane
- Peaking Characteristics: Weekday Morning Peak Hours (6 am – 8 am) and Weekday Evening Peak Hours (4 pm – 6 pm)

c) From Charles Fuhs, Parsons Brinckerhoff, personal correspondence with Joe Rouse:

> Greg Paquette, manager of the HOV lanes during this period, provided the following anecdotal analysis of "before" and "after" volumes in the AM period on the Katy HOV lane.
>
> *Katy HOV Lane, Houston, Texas*
> "Before" (During 2+ Operation) Peak hour traffic volume was 1700 vph, resulting in stop & go conditions due to several merges. Traffic queue was stop & go for about two miles. Average speed over the 13 mile length was 22 mph, or Level-of-Service "F".
>
> "After" (During 3+ Operation) Peak Hour Traffic Volume was 600 vph. Traffic flowed smoothly. Average speed for 13 miles was 53 mph or Level-of-Service "A".
>
> During the past 10 years or so, 3+ vehicles has grown to about 1200 vph during the same peak hour. A small number (less than 10% of total), are now tolled 2-occupant carpools using toll tags who were allowed back on the HOV lane about four years ago.
>
> During the peak period (6-9AM) when looking at the before and after data, the number of carpool passengers was nearly identical! Therefore, changing to a 3+ did not discourage carpooling. It caused people to change their driving habits. The 15 minutes before and after 3+ time had an expected increase in the number of 2+ vehicles. So people changed their driving "time". The 600 cars that used the lane at the 3+ restriction found the additional passenger—sometimes within the park-and-ride lots, so they increased their "occupancy".
>
> The operating agencies were quite happy because the HOV lane was moving the same number of people in fewer vehicles within a few days after the changeover. But the lane did look empty. Also, opportunities for moving additional people were created during the 3+ restricted hours. Buses were moving, so METRO park & ride service was attractive and usage continued to grow.
>
> Attitudinal surveying of HOV users suggested that a lot of people would stop using the HOV lane if it was restricted to 3+. But many adjusted and continued to use the HOV lane. Traveling on the Katy Freeway during peak hour at 18-22 mph was incentive for people to make the adjustment.
>
> "Before" data was collected about a month before the 3+ restriction was enacted, and the "After" data was collected about two months following the changeover.

d) From *Value Pricing Pilot Program: Lessons Learned (*page 2-5):

> Travel and Traffic evaluations of other HOT lane projects are also positive. On I-10 in Houston, the addition of the HOT caused HOV2 volume to increase 40 percent, while the HOV3 volume changed very little. Also on I-10, the total volume on the HOV lane increased by 21 percent during the AM peak. Average speed on general-purpose lanes was 25mph, while average speed on the HOT was 59 mph (over 17-minute time saving for 13 mile trip). On U.S. 290, relative travel time savings were 11 minutes for a 15-mile trip. Surveys indicate that most HOT users formerly traveled in single-occupant vehicles on the general purpose lanes, suggesting positive impacts on traffic there. Not unexpectedly, there also was a significant shift of 2-person carpools from the general purpose lanes

to the HOT lane. Diversion of bus, vanpool and 3+ occupant carpoolers to the HOT was between 5 and 8 percent of the HOT lane trips.

e) From *Value Pricing Pilot Program: Lessons Learned (*Appendix B, pages 1-14 to 1-17):

- Thirteen-mile I-10 HOV lane was initially open to buses and registered vanpools and later allowed carpools with 2 or more occupants. As the lane became congested 1990s, occupancy requirement were changed to allow only carpools with 3 or more occupants during peak hours. This led to excess capacity and a significant reduction in number of persons typically moved during peak hours.

…

- In a little more than a year, 650 transponders had been issued and between 100 to 200 tolled trips daily were made on the I-10 QuickRide lane during the two peak periods combined. As of April 2002, over 1,500 transponders had been issued for QuickRide access on both the Katy Freeway and U.S. 290. By 2004, there were 2,200 registered QuickRide users.

…

- Surveys indicate that most QuickRide participants are persons who formerly traveled in single-occupant vehicles on the regular lanes (a quarter to a third of QuickRide trips). (FHWA/ops/quarterly report) There was, however, a significant movement of 2-person carpools from the general purpose lanes to the QuickRide lane.
- Diversion of bus, vanpool and 3+ occupant carpoolers to QuickRide appeared to be limited to roughly 5 to 8 percent of the QuickRide trips. (Shin and Hickman, 1999a and b; LKC Consulting Services, Inc. and Texas Transportation Institute, 1998 in Road Value Pricing, 2003.)
- Most participants only use the facility occasionally, with about 25 percent of QuickRide users using their tag on any given day and only about 6.5 percent of enrolled tags producing five or more commute trips a week (out of 10 possible trips).
- After six months of program initiation, only about 25 percent of registered QuickRide tags had been used. Of those, about 40 percent were second tags owned by single household. It appears that many participants value having an electronic tag as insurance to meet occasional needs.
- On I-10, during AM peak, average speed on general purpose lanes was 25 mph, while average speed on the QuickRide lane was 59 mph (over 17-minute time saving for 13-mile trip). During the PM peak, average general purpose lane speed was 27 mph, while average QuickRide lane speed was 58 mph (a 15-minute time savings). [Burris and Stockton].
- On U.S. 290, the QuickRide time savings (relative to travel on the mixed use lanes) were 11 minutes for a 15-mile trip. The addition of QuickRide program caused the HOV2 volume to increase 40.3 percent between 2000 and 2001, while the HOV3 volume changed very little (-2.7 percent). The total volume on the HOV lane increased by 21.1 percent.
- The Katy/290 HOT lanes receive considerably lower patronage than HOT lane projects in California have experienced. The fact that the Texas HOT lanes are buy-ins by 2-person carpools rather than single occupant vehicles likely explains much of this difference, with survey results showing that the effort/disutility of forming a carpool was a major deterrent to QuickRide participation. The $2 toll was not found to be a significant deterrent to participation in the QuickRide program. (Burris and Appiah.)

f) From *HOT Lane Policies and Their Implications:*

i) Estimating available capacity (page 102):

> Before and after studies of the Katy showed that its HOT lane application had the following positive results (FHWA website):
>
> - It increased the number of three-plus carpools during the peak;
> - It redistributed two-plus carpools to before and after the peak hour;
> - It increased average traffic speeds and improved the Katy HOV's level of service; and
> - It transported the same number of passengers more efficiently.

ii) Effects on transit (page 104): Because the HOT lane only operates during peak periods, there are no significant effects.

iii) Effects on carpooling (page 105):

> A survey of 185 QuickRide (Hickman et al., 2000) enrollees was conducted shortly after the program began. Over half of the QuickRide trips were found to be SOVs moving into the HOV lane (51 percent in the morning, 58 percent in the evening). About one-quarter of the trips are two-person carpools moving from the main freeway lanes into the HOV lane (23 percent in the morning, 29 percent in the evening). In the morning, about 18 percent of QuickRide trips are diverted from higher occupancy modes, but in the evening only 1 percent represent diverted HOV trips. Among QuickRide participants, the number of 3+ carpool trips in the evening increased by 6.1 percent. This suggests that QuickRide may have had some effect in encouraging overall carpooling in the evening peak.

iv) Usage (page 105-107):

> The change from HOV2+ to HOV3+ in June 2000 caused the volume of HOV2s to drop 62.4 percent during the morning peak while 3-person vehicles increased by 60.7 percent. However, the total volume on the HOV lane decreased by 44.5 percent in the morning peak. The addition of the QuickRide program caused the HOV2 volume to increase 40.3 percent between 2000 and 2001, while the HOV3 volume changed relatively little (-2.7 percent). Additionally, the total volume of the HOV lane increased 21.1 percent.
>
> …
>
> By allowing the additional HOV2s during the peak period, the person throughput of the HOT lanes increased however, the QuickRide usage was too small to increase the person throughput of the corridor. Also, no change in the travel speed of the GPLs can be expected because of the few travelers shifting to the HOT lanes during the peak period. Therefore, in terms of objectives the QuickRide program cannot be termed as a success.

g) According to *Evaluation and Performance Measurement of Congestion Pricing Projects* (page 10), Houston benefited from an unanticipated "soft" opening, in which "the facility was opened in a phased sequence—first to HOVs only and then later to paying vehicles." This gave it a better understanding of HOV utilization and "gave the public time to become accustomed to the lanes and for HCTRA to conduct outreach activities."

h) From Greg Jones, FHWA, personal correspondence with James Colyar and Jesse Glazer:

> Texas: Houston had two HOV facilities that became congested at the 2+ level back in the 90's. These were the I-10 (Katy Freeway) and US-290 (Northwest Freeway). Both of these were 1 lane reversible, barrier separated facilities that flowed inbound in the morning and outbound in the afternoon. In response to congested conditions during the peak periods, both instituted a policy of requiring 3+ occupancy during the peak periods, and allowing 2+ during the shoulder and off-peak times. Once this change was made, the volumes dropped by approximately 70%. In an effort to better utilize the lane, TxDOT implemented a quasi-HOT lane that allowed only 2-person vehicles to pay a fixed toll to use the lane with a transponder during the times requiring 3+ occupancy. These facilities have the most extensive studies on the carpooling aspects surrounding the 2+ and 3+ requirements. Ginger Goodin from TTI would be the best source to contact along with Chuck Fuhs from PB. As a side note, when the 3+ change went into effect, there was an informal growth of "slugging" at a couple of the park-and-ride facilities along these corridors.

i) From: *HOT Lanes in Houston—Six Years of Experience* (page 17):

> The QuickRide program receives relatively modest usage (an average of 208 trips per day in 2003) partially due to the limited amount of room available on either of the single HOV lanes. This relatively limited usage is comprised of a large number of users taking advantage of QuickRide on an infrequent basis (less than 2.5 trips per month). Despite the limited usage, the program provides a net societal benefit, primarily due to travel-time savings obtained by QuickRide participants.

j) From *Current HOT Lane Usage* (page 2):

> Based on these data it is clear that traffic speeds during the afternoon rush hour on the US 290 HOT lane often drop below 45 mph.
>
> … In comparing the speeds on the GPLs and the HOT lanes it was clear the HOT lanes offered a much more reliable trip. Speeds on the US 290 HOT lane were generally between 56 mph and 66 mph, while the GPLs ranged from 12 mph to 64 mph. Katy Freeway speeds were similar. This lead to considerable travel time savings on the HOT lanes, exceeding 20 minutes in the afternoon on US 290.

The report also notes that there has been a decrease in QuickRide use since 2005 and that there are high violation rates, as high as 40 percent during time periods with HOV3+ requirements.

k) From the ongoing *Evaluation of the I-10 Katy Freeway Managed Lanes* (abstract):

> The purpose of this study is to perform a comprehensive evaluation of the Katy Freeway Managed Lanes, including aspects such as congestion, safety, enforcement, maintenance, pricing, access design, lane separation, operating policy, public perception, and project delivery. Using a combination of available data and new data collection, the evaluation will cover many of the critical areas of project development, design and operation with the purpose of supporting successful implementation of managed lanes across Texas.

l) From *Effectiveness of the Katy Freeway HOV-Lane Pricing Project: Preliminary Assessment* (abstract):

> The use of QuickRide during its first 6 months is reported, and an analysis of the program's effectiveness is presented. QuickRide usage and data from before and after implementation are

employed to analyze users' travel patterns, observed travel time-savings, and changes in person-throughput in the Katy Freeway corridor. The results of this analysis show that the participation in the QuickRide program is too low to observe significant impacts on travel speeds and person-throughput in the general-purpose lanes and the Katy HOV lane. Also, the analysis indicates that use of the QuickRide program reached a plateau about two months after start-up. Participants seem to be using QuickRide occasionally or infrequently, and a majority of the participants do not use it at all in any given week. Most of the QuickRide users appear to be previous two-person carpool commuters, with a substantial minority of single-occupant vehicle (SOV) drivers now forming carpools to participate. Higher vehicle-occupancy modes are not losing many patrons to the QuickRide program. An analysis shows that travel time-savings for participants are substantial and are worthwhile for two-person carpools, with a value of time exceeding $6.57/hr. However, the analysis also indicates that, at this initial stage, the observed changes in vehicle- and person-throughput are not statistically meaningful. To improve participation in the program, a lower fee is recommended, and marketing efforts should be enhanced, especially to SOV drivers.

m) See also:

- *Impacts of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane 12-Month "After" Evaluation* (Appendix E).
- *Houston High Occupancy Vehicle Lane Operations Summary* (Appendix D).

6. Revenue Control and Use

a) From *Value Pricing Pilot Program: Lessons Learned* (page 2-3):

> The Texas Department of Transportation owns and operates the freeways, but the QuickRide lanes are operated by the Metropolitan Transit Authority of Harris County (Houston Metro), which operates all HOV lanes in the region.

b) On use of revenues for U.S. 290, from the *Priced Managed Lane Guide* (pages 1-41 to 1-42):

> Policy is to cover O&M first. Any excess revenue is split 50/50 between Houston METRO and TxDOT.

c) On the use of revenues for Katy, from the *Priced Managed Lane Guide* (pages 1-35 to 1-36): Operations/Maintenance/Debt Services.

d) From *Value Pricing Pilot Program: Lessons Learned (*Appendix B, pages 1-14 to 1-17):

- Toll revenues from several hundred vehicles each day pay for costs of maintaining and servicing accounts (approximately $100,000 per year). This excludes the costs of capital, marketing and start-up costs paid with Federal pricing grant funds as well as costs of enforcement and enrollment services already in place as part of other METRO programs (TRB News, September-October 1999).
- Revenues generated by the program between 1998 and 2003 totaled $417,734.
- The Texas Department of Transportation owns and operates the freeways, but the QuickRide lanes are operated by the Metropolitan Transit Authority of Harris County (Houston Metro), which operates all HOV lanes in the region.
- TxDOT, Houston Metro, the Federal Highway Administration, and the Federal Transit Administration, as well as the Harris County Toll Road Authority, all have a stake in the projects

completed and planned in the Houston area, necessitating the negotiation of cooperative agreements to implement any pricing project on the region's HOV lanes.

e) From *Evaluation and Performance Measurement of Congestion Pricing Projects* (page 108):

> Prior to the opening of the Katy Managed Lanes, HCTRA expected that the facility would lose money. However, monthly revenue has been approximately $550,000; while annual maintenance costs amount to only $350,000. Revenue from the Katy Managed Lanes is "coded" and traceable and is not initially pooled with toll proceeds from other HCTRA facilities. This enables HCTRA and its partners to track the extent to which it has been able to recoup its $237.5 million contribution toward the reconstruction of the Katy Freeway.

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APPENDIX A

Changing HOV Definitions

PI Folks,

Below is a nice summary of results of changing HOV definitions -- in Miami, Atlanta, Houston, and our own SR-91. Although we already "knew" most of this, there were several items I did not know. (Greg Jones works at the FHWA Resource Center, and is one of our Managed-Lanes specialists.)

Our PI study is getting attention In Washington State and elsewhere.

- Jesse

From: Jones, GregM (FHWA)
Sent: Wednesday, January 30, 2013 6:55 AM
To: Colyar, James (FHWA)
Cc: Glazer, Jesse (FHWA)
Subject: RE: HOV 2+ to 3+

James:

The two recent examples are Miami and Atlanta.

Miami: As part of the UPA project, I-95 in Miami/Dade Co. actually expanded from a 1 lane 2+ HOV to a 2 lane 3+ HOT. In addition, to adding one new lane of capacity, the number of carpoolers was greatly reduced by the change from 2+ to 3+. On top of the occupancy change, FDOT also required a registration process for all the 3+ carpools, and required them to have a transponder as well.

Atlanta: As part of the CRD project, I-85 in Atlanta converted a 1 lane 2+ HOV to a 1 lane 3+ HOT. Like Miami, Atlanta required the 3+ carpoolers to register and use a transponder.

There is no doubt that in both cases the implementation of the registration process led to a greater reduction in the number of carpool users of the managed lanes. In both cases the change from 2+ HOV to 3+ HOT (registered) was done in one phase. Thus, it is was not possible to separate out the % change due to raising the occupancy rate versus the % change due to the registration process.

Texas: Houston had two HOV facilities that became congested at the 2+ level back in the 90's. These were the I-10 (Katy Freeway) and US-290 (Northwest Freeway). Both of these were 1 lane reversible, barrier separated facilities that flowed inbound in the morning and outbound in the afternoon. In response to congested conditions during the peak periods, both instituted a policy of requiring 3+ occupancy during the peak periods, and allowing 2+ during the shoulder and off-peak times. Once this change was made, the volumes dropped by approximately 70%. In an effort to better utilize the lane, TxDOT implemented a quasi-HOT lane that allowed only 2-person vehicles to pay a fixed toll to use the lane with a transponder during the times requiring 3+ occupancy. These facilities have the most extensive studies on the carpooling aspects surrounding the 2+ and 3+ requirements. Ginger Goodin from TTI would be the best source to contact along with Chuck Fuhs from PB. As a side note, when the 3+ change went into effect, there was an informal growth of "slugging" at a couple of the park-and-ride facilities along these corridors.

California: In a somewhat different twist, SR-91 in Orange County adopted a policy of allowing 3+ carpools to use these Express Toll lanes for free except for the most extreme congested periods. During those times the 3+ carpools pay half price. The 3+ carpools are identified by having the vehicles pass through a "declaration lane" . In San Francisco, The Golden Gate and Oakland Bay bridges offer a 3+ carpool discount during the peak periods. They require transponders and using certain toll lanes to get the discount. There is some informal "slugging" that developed to take advantage of the 3+ advantage here as well.

APPENDIX A

CalTrans (Joe Rouse) has just announced a study to look into the effects of changing from 2+ to 3+ as they have a number of HOV facilities approaching degraded status and are interested in understanding this issue better. Jesse Glazer is very familiar with the study, and I have copied him on the e-mail as well. Joe is a member of the HOV Pool-fund study that Mark Leth is the chair.

Finally, we do have short fact sheets on the Miami and Houston projects if you'd like more details on them, just let me know.

I hope this helps.

Greg

From: Colyar, James (FHWA)
Sent: Monday, January 28, 2013 5:04 PM
To: Jones, GregM (FHWA)
Subject: HOV 2 to 3+

Hi Greg,
Dan Mathis has asked me to gather some national information on HOV facilities that have gone from HOV 2+ to HOV 3+ or HOV 2+ to HOT 3+. I believe we have talked about this before. I think Atlanta and Miami are the only examples I can think of, but seem to recall Dallas or somewhere in Texas as well. And I know the LA area is seriously considering this as well.
Any background info you can provide would be appreciated,
James

APPENDIX B

The I-85 Express Lanes Project

2012 NASCIO Recognition Award Nomination

Submitting Agency: State Road and Tollway Authority

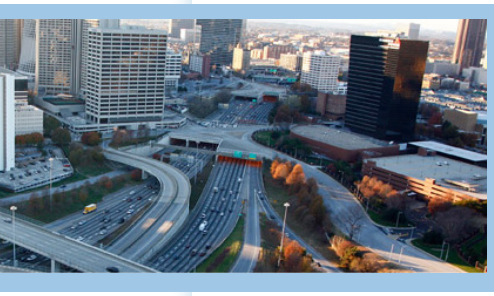
Nomination Category: Enterprise IT Management Initiatives

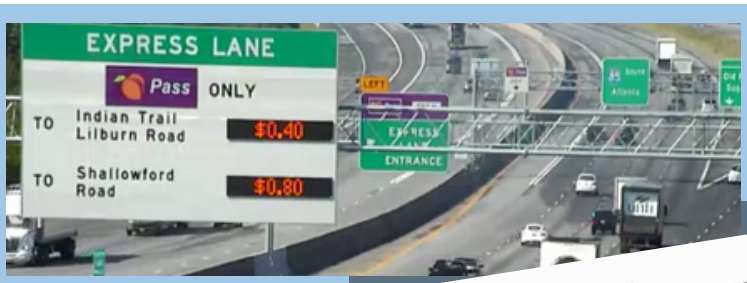
Contact: Malika Reed Wilkins
Director, Marketing Communications

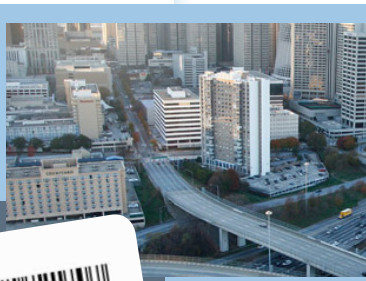
State: Georgia

Project Initiation Date: October 1, 2010

Project Completion Date: September 30, 2011







EXECUTIVE SUMMARY

According to **Forbes Magazine**, Atlanta was the number one worst city for commuters in 2008. Mobility in the metro-Atlanta area has been a challenge for the region for many years. The need for a new mobility choice was evident on the Interstate 85 (I-85) corridor, north of Atlanta. High Occupancy Vehicle (HOV) lanes were consistently over or under capacity leading to unreliable travel times for motorists. In addition, the corridor had limited transit options. Shoulder width constraints made it unrealistic to add new capacity to the corridor.

About the Situation:

In November 2008, the United States Department of Transportation (USDOT) awarded a $110 million Congestion Reduction Demonstration (CRD) Program grant to Atlanta. This grant allowed for implementation of an integrated mobility solution for congestion-priced High Occupancy Toll (HOT) lanes, enhanced transit service and innovative technology. The State Road and Tollway Authority (SRTA), Georgia Department of Transportation (GDOT) and the Georgia Regional Transportation Authority (GRTA) led the implementation of the CRD project.

The all-electronic toll lanes on I-85 include a host of innovative technology and equipment which work in tandem at lightning speed.

Innovative Solution:

The CRD I-85 Express Lanes project converted approximately 15.5 miles of existing HOV lanes to HOT lanes (north and south bound). GDOT managed the construction of the lanes and SRTA managed and installed the tolling technology and equipment.

The I-85 Express Lanes Project is the **the occupancy requirement** from 2+ persons to 3+ persons for toll-free passage, **while introducing pricing to allow single-occupant vehicles to buy access.**

DESCRIPTION

The CRD I-85 Express Lanes project included innovative elements and technology that made it unique from any other HOT lane conversion project in the country.

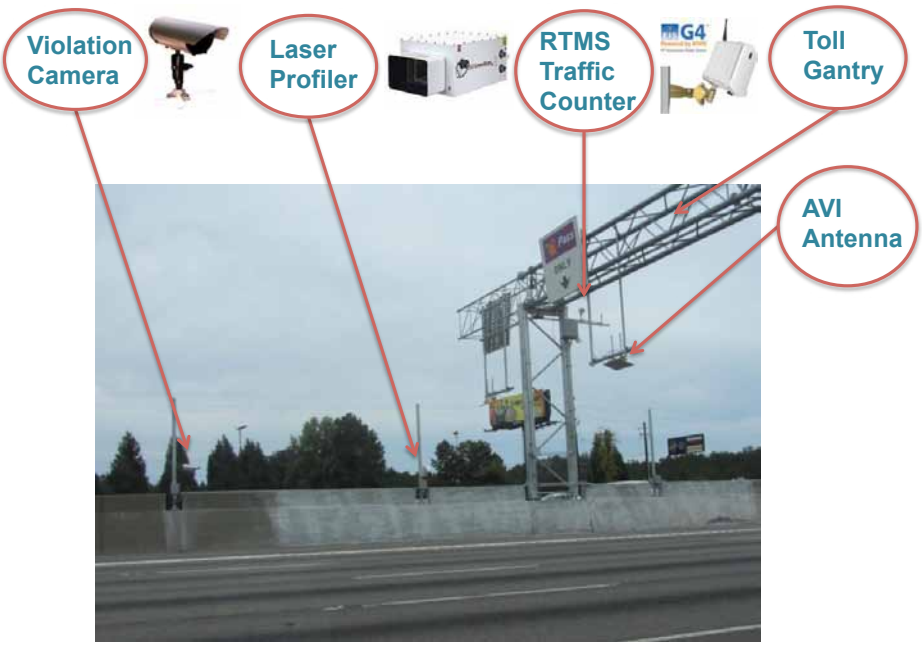
These elements included:

- Patented Gantry Controlled Access (GCA- #8,044,824) electronic enforcement is used to eliminate the need for physical barriers.
- Mobile Automatic License Plate Readers (ALPR) aid with enforcement of occupancy requirements for vehicles using the HOT lanes.
- Motorists are required to pre-register before using the roadway.
- Demand for the lanes is managed through dynamic pricing that changes based on
- SRTA utilized Georgia Technology Authority's (GTA) Enterprise Critical Projects Review (ECPR) Panel to oversee this process and conducted monthly Stage-Gate reviews. The dashboard was also used to assess the project's overall health and risk. The Stage-Gate reviews were an integral part of successfully managing the I-85 Express Lanes Project.

The SRTA professionals worked together to ensure registered vehicle detection when entering and exiting the lane, properly posted toll rates on overhead signage and appropriate toll posting to the customer's account.

The price to use the I-85 Express Lanes ranges from .01 cent to .90 cents per mile and As demand for use of the Express Lanes increases, the toll amount rises to ensure the optimal number of cars can continue moving through the lanes. Motorists see the posted toll amount before they enter the Express Lanes and are able to decide whether they want to use them. Tolls on the I-85 Express Lanes are collected electronically, meaning no toll booths are needed and drivers do not have to slow down or stop.
maintain highway speeds.

Image to the right:
Construction components of I-85 Express Lanes. Project included a wide range of physical and logical components from rumble stripes covering double white lines to cameras.



Each tolling location includes a violation

,

Remote T
Sensor (R
counter, toll gantry,
Automatic Vehicle
VI) antenna
and roadside civil and tolling cabinets.

Toll Mode and Enforcement Technologies

Automated License Plate Readers (ALPR).
passes by and its account has been declared as a non-toll status. Exempt vehicles include transit vehicles, carpools with three or more occupants, motorcycles, emergency vehicles and alternative fuel vehicles. However, an account must still be set up for these vehicles to use the HOT lane.

- Three-person carpool mode, no toll will be collected, can be self-declared by changing the vehicles' toll mode via phone, website interfaces or mobile application.
- Occupancy is enforced by law enforcement, but aided by the tolling system and Automatic License Plate Recognition (ALPR).
- Gantry Controlled Access (GCA) creates an electronic barrier to deter improper use of the HOT lane.

To remotely monitor performance of the roadway, an SRTA Toll Operations Center (TOC) was created for support of dynamic pricing and management of toll rates as related to incidents or accidents on the roadway. Through GDOT's TMC NaviGAtor tolling system the TOC continuously monitors the roadway streaming real-time online

Through the use of this state-of-the-art operation, important functions were seamlessly managed, including:

1. Dynamic toll rates
2. coordinating with GDOT's T Management Center (TMC)
3. Monitoring tolling equipment

SIGNIFICANCE

Mobility in the metro-Atlanta area has been a challenge for the region for many years. The need for a new mobility choice was evident on the I-85 corridor as the previous HOV lanes were either over or under capacity consistently and not providing reliable travel times for motorists. In addition, the corridor had limited transit options as well as physical constraints that made it unrealistic to add new capacity to the corridor due to the shoulder width. An extensive quantitative survey of transit riders, carpoolers, and single drivers was conducted in order to develop a solution that would be adopted by commuters. The following survey results show previous use of the HOV lane by I-85 carpoolers:

- 63% were in two-person carpools
- 45% used the HOV lane three or more times per week
- 40% never or only occasionally used the HOV lane
- 64% indicated they would continue to carpool if the HOV lane did not exist

Prior to the launch of the Express Lanes, Georgia had one optional toll road, GA 400, with a static rate of $0.50 for most motorists that had been in effect for nearly 20 years. Unlike other cities that implemented Express Lanes, a key challenge is that I-85 Express Lanes require motorists to pre-register for a Peach Pass account and install the Peach Pass transponder in their vehicle in order to access the Express Lanes.

In addition, motor fuel tax funds for transportation improvement projects continue to dwindle as the

quality of life and mobility. The primary goal of the I-85 Express Lanes is to provide reliable travel times for motorists that chose to use them. By managing the demand for

Pass customers are experiencing time savings, including single occupant motorists who were not able to access the HOV lanes in the past.

BENEFITS

The goal of the I-85 Express Lanes Project was to provide more reliable travel times for registered motorists that choose to use the lanes. Prior to the conversion, nearly 90% of motorists in that stretch of the I-85 corridor were single-occupant motorists who could not access the HOV lane. Now with the opening of the Express Lanes, all registered motorists have the choice to access the lanes, a choice that was not available in the past.

Aggressive education and outreach for the Express Lanes began in March 2011. The transponder issuance goals included approximately 13,000 transponders issued

. The marketing and communications efforts yielded an unprecedented return on investment. Before the opening of the Express Lanes, approximately 75,000

than 100,000 Peach Pass transponders were issued.

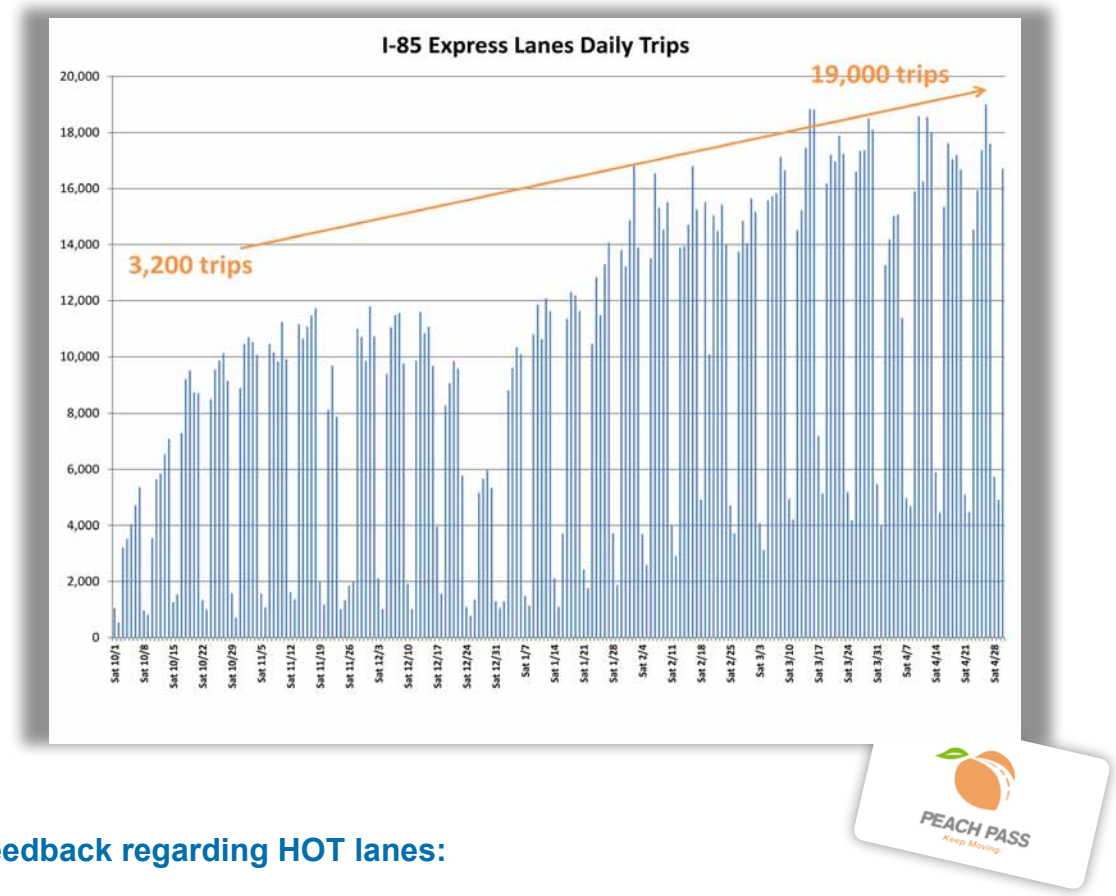
Peach Pass Transponders
I-85 Express Lane Project

	GOAL	ACTUAL
Month One	13,000	75,000
Year One	35,000	100,000

To date, more than **150,000 new Peach Passes** have been issued to motorists and approximately **71,000 different customers have used the Express Lanes** since opening. In addition, usage in the lanes has more than quadrupled, increasing from

Also, transit ridership has increased since the opening of the Express Lanes. Overall,

their commutes.



and feedback regarding HOT lanes:

-
- Are easy and convenient to use
- Get you where you need to be in a timely manner
- Make for a more enjoyable commute by reducing travel times
- Provide a choice and are optional – “You do NOT have to use it”

Increased Trip Time Reliability: T lanes are assessed to ensure consistent and reliable travel times, particularly during peak travel periods.

More Commuter Choices: In congested corridors with HOV facilities and transit service, HOT lanes provide Single Occupancy Vehicle (SOV) motorists with an additional travel choice: the option of paying for a dependable, congestion-free trip.

Transit Enhancements: Transit riders are still able to use HOT lanes for free since transit vehicles are among those vehicles that are exempt from paying tolls. In addition, transit users can depend on reliable trip times for their commute.

APPENDIX C

"Fuhs, Charles A."
<Fuhs@pbworld.com>
11/05/2009 01:15 PM

To Joseph Rouse <joseph_rouse@dot.ca.gov>
cc "Ungemah, David" <Ungemah@pbworld.com>
bcc
Subject RE: Katy Freeway conversion from HOV 2+ to HOV 3+

Joe, I've dug up a considerable bit of information from the archives on the 2+ to 3+ peak conversion on I-10 in Houston (summary below and in attachments). Fortunately, this corridor had one of the longest and most enduring performance monitoring efforts, so you will be able to take the data provided (pp. 12-14(and see for yourself the impacts and how quickly volumes came back. There was fully a 10 year gap in time between the raising of these occupancies and QuickRide that did not come along until the late 1990s.

We can dig for a more definitive study TTI did, but most of the HOV2s moved to the fringes of the peak hours (3+ was only implemented the peak period). There was a smaller bit of diversion to a parallel route (US 290), and some modal shifting, but the large majority time shifted. We did not see reports about any dummies.

And yes, the occupancy requirement was upped on I-95 in Miami and will be upped in Atlanta when pricing is added to those corridors next year.

Hope this helps.
Chuck

(David, do you know how we might find the more definitive TTI report on what happened --or try a text search in my report library?)

A summary follows:
Findings from Houston
RE: Changing from 2+ to 3+ Occupancy Restrictions during the Peak Hour, implemented in the late 1980s.

Background
Houston raised occupancy requirements from 2+ to 3+ during the peak periods only (not the off-peak periods) in the late 1980s on the I-10 HOV lane due to overcrowding. The same situation occurred about a decade later when they raised occupancy requirements from 2+ to 3+ on the US 290 Northwest HOV lan during the peak periods. Greg Paquette, manager of the HOV lanes during this period, provided the following anecdotal analysis of "before" and "after" volumes in the AM period on the Katy HOV lane.

Katy HOV Lane, Houston, Texas
"Before" (During 2+ Operation)
Peak hour traffic volume was 1700 vph, resulting in stop & go conditions due to several merges. Traffic queue was stop & go for about two miles. Average speed over the 13 mile length was 22 mph, or Level-of-Service "F".

"After" (During 3+ Operation)
Peak Hour Traffic Volume was 600 vph. Traffic flowed smoothly. Average speed for 13 miles was 53 mph or Level-of-Service "A".

During the past 10 years or so, 3+ vehicles has grown to about 1200 vph during the same peak hour. A small number (less than 10% of total), are now tolled 2-occupant carpools using toll tags who were allowed back on the HOV lane about four years ago.

During the peak period (6-9AM) when looking at the before and after data, the number of carpool passengers was nearly identical! Therefore, changing to a 3+ did not discourage carpooling. It caused people to change their driving habits. The 15 minutes before and after 3+ time had an expected increase in the number of 2+ vehicles. So people changed their driving "time". The 600 cars that used the lane at the 3+ restriction found the additional passenger-sometimes within the park-and-ride lots, so they increased their "occupancy".

The operating agencies were quite happy because the HOV lane was moving the same number of people in fewer vehicles within a few days after the changeover. But the lane did look empty. Also, opportunities for moving additional people were created during the 3+ restricted hours. Buses were moving, so METRO park & ride service was attractive and usage continued to grow.

Attitudinal surveying of HOV users suggested that a lot of people would stop using the HOV lane if it was restricted to 3+. But many adjusted and continued to use the HOV lane. Traveling on the Katy Freeway during peak hour at 18-22 mph was incentive for people to make the adjustment.

"Before" data was collected about a month before the 3+ restriction was enacted, and the "After" data was collected about two months following the changeover.

-----Original Message-----
From: Joseph Rouse [mailto:joseph_rouse@dot.ca.gov]
Sent: Thursday, November 05, 2009 12:26 PM
To: Fuhs, Charles A.
Subject: Katy Freeway conversion from HOV 2+ to HOV 3+

Hi Chuck - First, thanks for your offer to help on the HOV Guidelines update. I'll include you on the circulation list of reviewers as we complete work on the different pieces. I'll probably also need your help
in focusing on the access issues.

We are trying to get some statistics on what happens with 2-person carpoolers when the occupancy requirement on an HOV lane is increased. I
know that both the Katy and Northwest Freeways in Houston upped their occupancy requirements due to congestion in the HOV lane. I believe there
was a bit of a time gap between that change and the implementation of QuickRide. Can you point me to someone who might be able to provide us with some data as to what happened with those 2-person carpoolers? Were they tracked in the first place? And if so...

- Did they shift travel times to the periods when it was a 2-person minimum?
- Did they find a third person?
- Or did they go back to being solo drivers or jump to transit?

If I remember right, they upped the occupancy requirement on I-95 in

Miami
as part of the Express Lane implementation, but I suspect it is too
early
to tell what's happening there.

I appreciate your help.

Joe Rouse, P.E.
HOV, Express Lanes, Park and Ride Program Manager
Caltrans Traffic Operations
(916) 654-6448 (office) | (916) 969-6206 (cell) | jrouse@dot.ca.gov

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Houston HOV data historic record to September 2006.pdf


Freeway HOV-3 Lanes Inventory.doc


1988 HOV Conference (exerpts on Houston experience).pdf

APPENDIX D

Houston High Occupancy Vehicle Lane Operations Summary

Katy Freeway (IH 10W) / North Freeway (IH 45N)
Gulf Freeway (IH 45S) / Northwest Freeway (US 290)
Southwest Freeway (US 59S) / Eastex Freeway (US 59N)

Volume – Passenger Utilization
Quarterly Report

Prepared for

Metropolitan Transit Authority of Harris County

By

Texas Transportation Institute
The Texas A&M University System

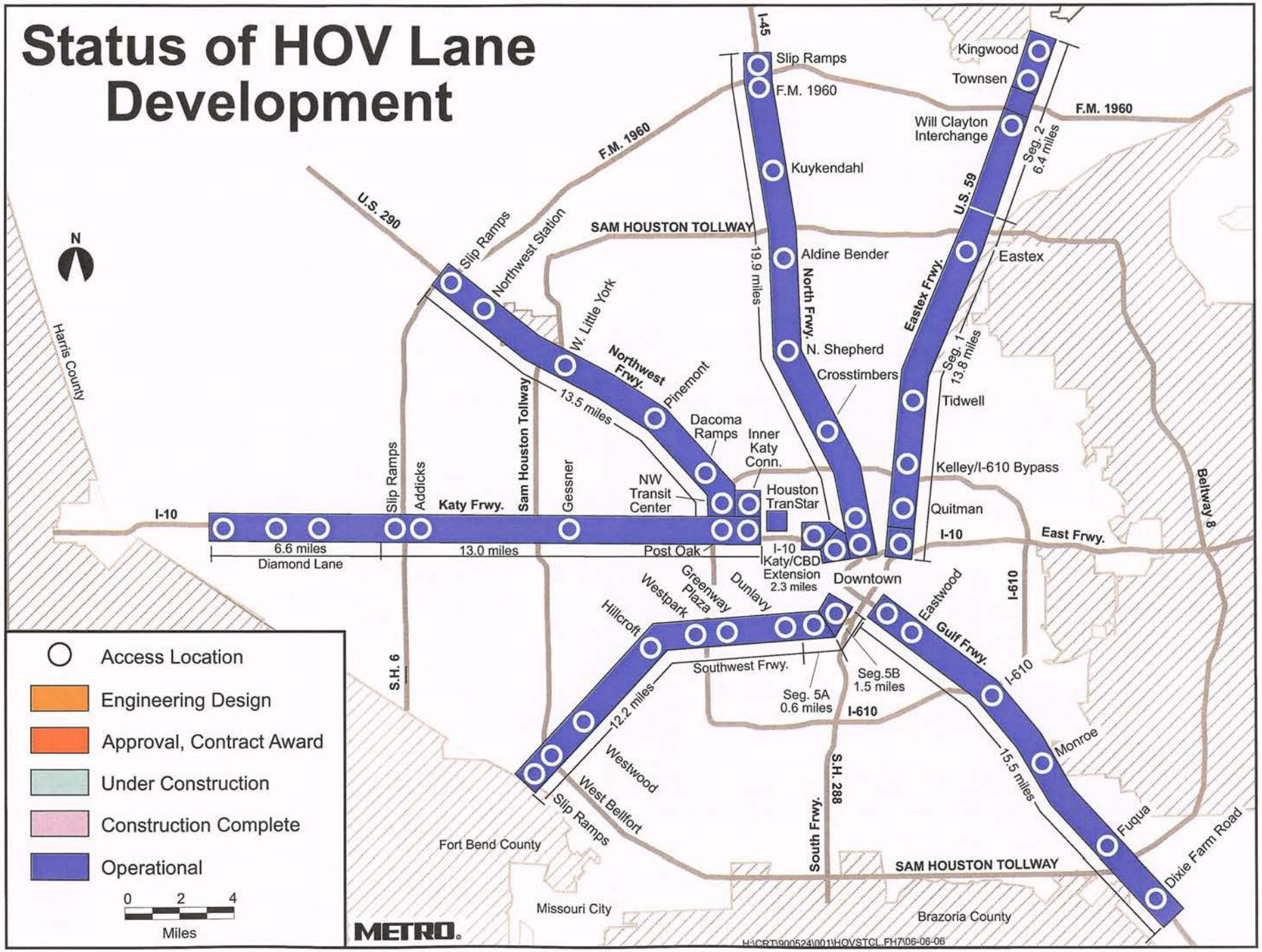
September 2006

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report documents a summary of Houston High Occupancy Vehicle Lane (HOV) operations for September 2006. The page following general information shows a comparison of September 2006 data to that of September 2005 and June 2006. Total system utilization in September 2006 was measured at 45,079 daily vehicle trips and 135,709 daily passenger trips. Support facility utilization was measured at 19,620 daily parked vehicles.

Weekend utilization for the Katy Freeway HOV lane at Post Oak was unavailable during this reporting period as the ramp was closed on weekends due to freeway reconstruction. Katy Freeway and Katy HOV operating speed data were also unavailable during this reporting period as automatic vehicle identification (AVI) equipment remains disconnected in conjunction with freeway reconstruction.


Status of HOV Lane Development
I-45
Slip Ramps
F.M. 1960
Kingwood
Townsen
F.M. 1960
Will Clayton Interchange
Seg. 2 6.4 miles
U.S. 59
Kuykendahl
F.M. 1960
U.S. 290
SAM HOUSTON TOLLWAY
Slip Ramps
Northwest Station
Aldine Bender
Eastex
Eastex Frwy.
19.9 miles
North Frwy.
W. Little York
Northwest Frwy.
N. Shepherd
Seg. 1 13.8 miles
Pinemont
Crosstimbers
13.5 miles
Tidwell
Dacoma Ramps
Inner Katy Conn.
Harris County
Slip Ramps
Addicks
Sam Houston Tollway
Gessner
NW Transit Center
Houston TranStar
Kelley/I-610 Bypass
Beltway 8
I-10
Katy Frwy.
Quitman
I-10
East Frwy.
6.6 miles
Diamond Lane
13.0 miles
Post Oak
I-10 Katy/CBD Extension 2.3 miles
Downtown
Greenway Plaza
Dunlavy
Westpark
Hillcroft
Eastwood
I-610
Gulf Frwy.
S.H. 6
Southwest Frwy.
Seg.5B 1.5 miles
Seg. 5A 0.6 miles
I-610
12.2 miles
Westwood
15.5 miles
Monroe
S.H. 288
South Frwy.
West Bellfort
Slip Ramps
Fuqua
Dixie Farm Road
Fort Bend County
SAM HOUSTON TOLLWAY
Missouri City
Brazoria County
N
Access Location
Engineering Design
Approval, Contract Award
Under Construction
Construction Complete
Operational
0 2 4
Miles
METRO.
H:\CRT\900524\001\HOVSTCL.FH7\06-06-06

GENERAL INFORMATION

Hours of Operation:

Facility	Monday – Friday	Saturday	Sunday
IH 10W Katy HOV	5-11 AM, 2-8 PM	5 AM-8 PM (outbound)	5 AM-8 PM (inbound)
IH 10W Katy Downtown Connector (two-way)	5 AM-8 PM	Closed	Closed
IH 10W Katy Diamond Lanes – Inbound	24 hours	24 hours	24 hours
IH 10W Katy Diamond Lanes – Outbound	24 hours	24 hours	24 hours
IH 45N North HOV	5-11 AM, 2-8 PM	Closed	Closed
IH 45S Gulf HOV	5-11 AM, 2-8 PM	Closed	Closed
US 59N Eastex HOV	5-11 AM, 2-8 PM	Closed	Closed
US 59S Southwest HOV	5-11 AM, 2-8 PM	Closed	Closed
US 290 Northwest HOV	5-11 AM, 2-8 PM	Closed	Closed

Monday-Friday Occupancy Requirements – All Lanes 2+ except:

Facility	3+ AM	3+ PM
IH 10W Katy HOV[1]	6:45-8:00 AM	5:00-6:00 PM
IH 10W Katy Downtown Connector (two-way)	-	-
IH 10W Katy Diamond Lanes – Inbound[1]	6:45-8:00 AM	-
IH 10W Katy Diamond Lanes – Outbound[1]	-	5:00-6:00 PM
IH 45N North HOV	-	-
IH 45S Gulf HOV	-	-
US 59N Eastex HOV	-	-
US 59S Southwest HOV	-	-
US 290 Northwest HOV	6:45-8:00 AM	-

[1] Katy HOV lane and Katy Diamond lanes operate at 2+ occupancy during open hours on Saturdays and Sundays

Data Collection Site Locations:

Facility	Data Collection Site Location
IH 10W Katy HOV	Post Oak
IH 10W Katy HOV	Eastern Extension
IH 10W Katy Downtown Connector	Downtown Terminus
IH 10W Katy Diamond Lane	Barker Cypress
IH 45N North HOV	Shepherd
IH 45S Gulf HOV	South of the Eastwood Transit Center
US 59N Eastex HOV	South of the Tidwell Transit Center
US 59S Southwest HOV	North of the Hillcroft Transit Center
US 290 Northwest HOV	Dacoma

Definitions:

- AM Peak Period – time period from 6:00-9:30 AM
- PM Peak Period – time period from 3:30-7:00 PM
- AM Peak Hour – four consecutive fifteen minute periods within the AM Peak Period with the single highest person movement volume, e.g., 7:00-8:00 AM, 7:15-8:15 AM, etc.
- PM Peak Hour – four consecutive fifteen minute periods within the PM Peak Period with the single highest volume person movement volume

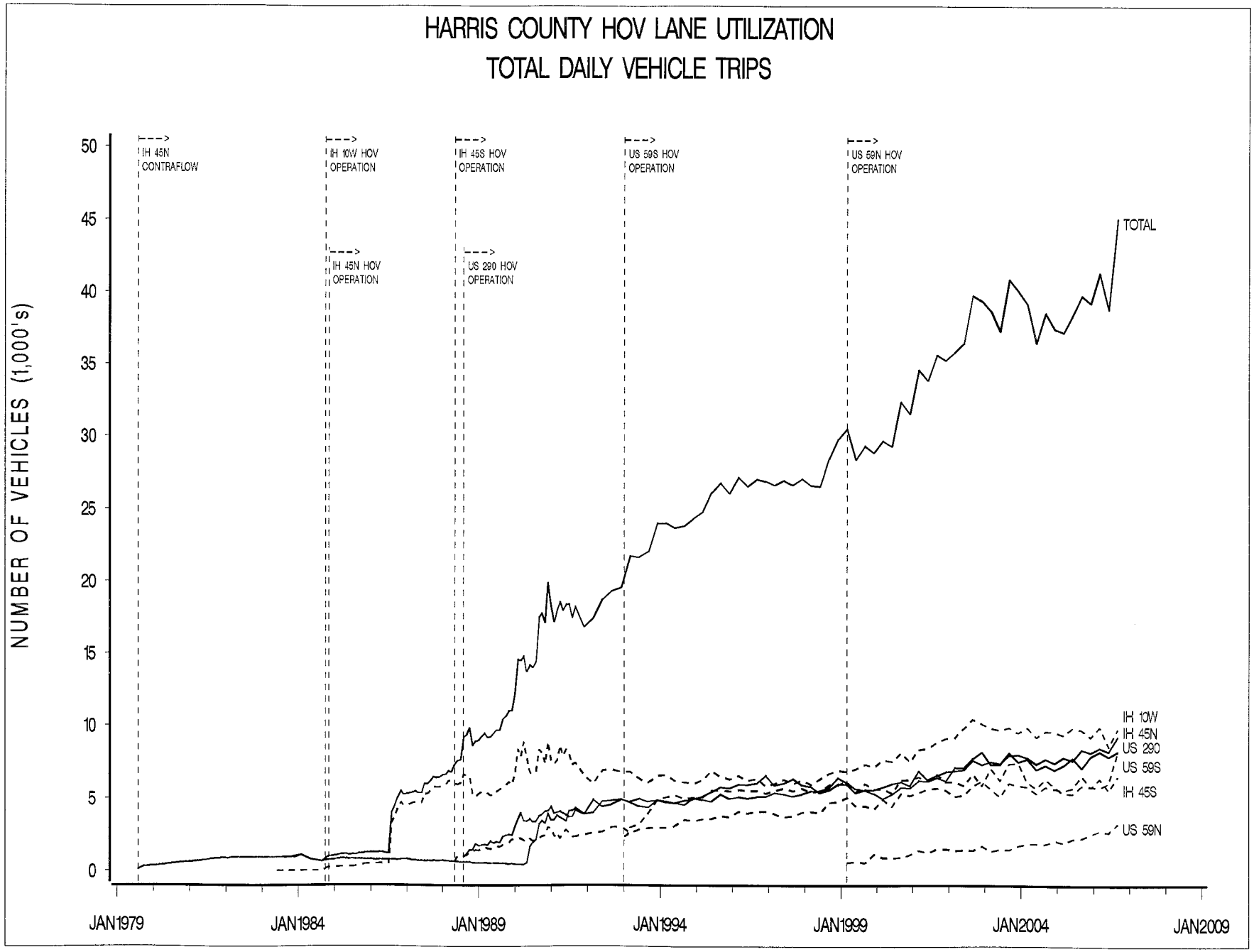
HIGH-OCCUPANCY VEHICLE LANE COMPARISON

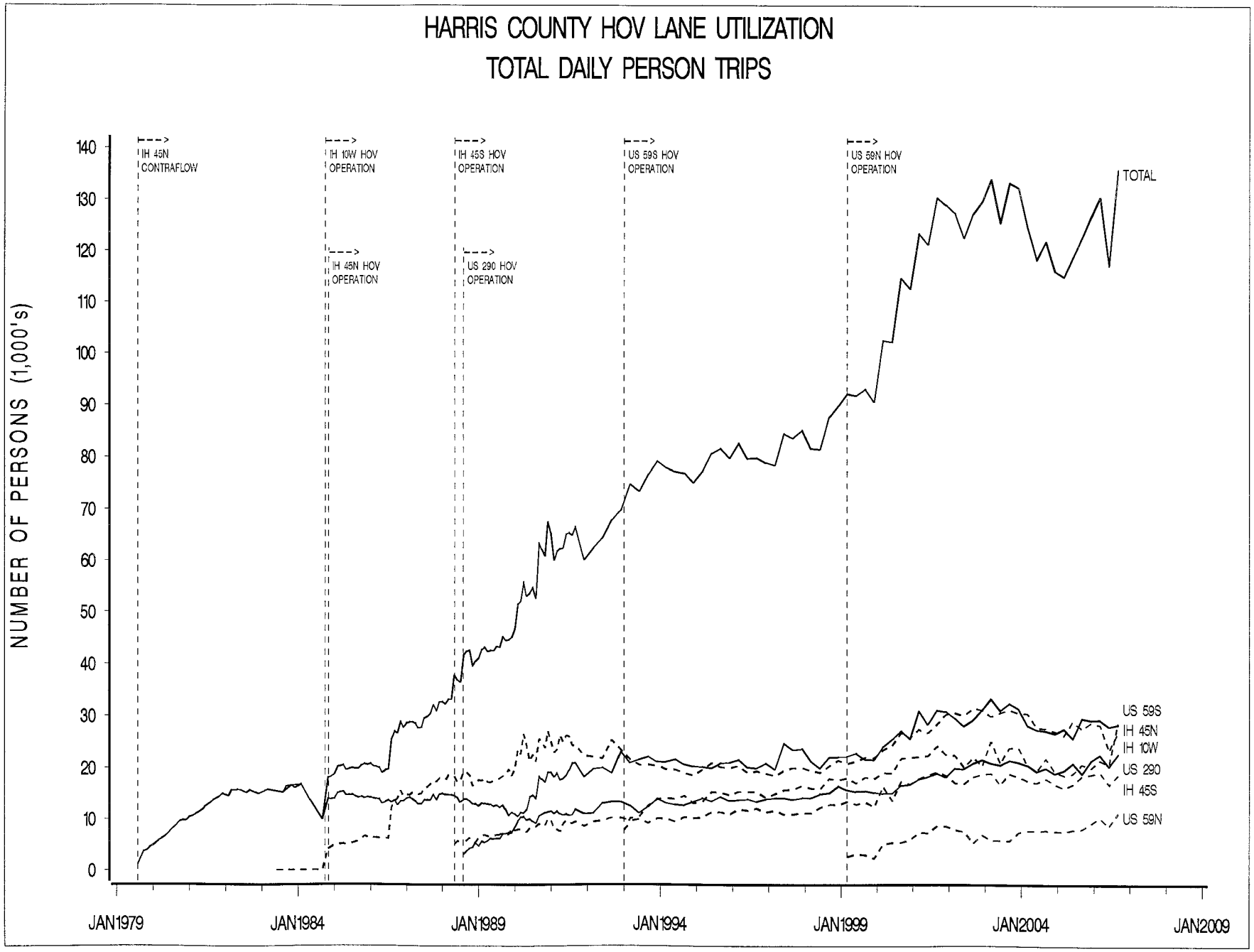
FACILITY	MEASURE	SEPT 2005	JUNE 2006	SEPT 2006	YEARLY PERCENT CHANGE	QUARTERLY PERCENT CHANGE
KATY FREEWAY (I-10W) HOV LANE						
A.M. Peak Period	TOTAL VEHICLES	3,640	3,296	3,741	2.77	13.5
	TOTAL PERSONS	10,841	9,314	10,585	-2.36	13.65
	TOTAL CARPOOLS	3,388	3,028	3,481	2.74	14.96
	TOTAL CARPOOLERS	7,048	6,406	7,196	2.1	12.33
P.M. Peak Period	TOTAL VEHICLES	3,626	3,190	3,792	4.58	18.87
	TOTAL PERSONS	11,750	9,892	11,746	-0.03	18.74
	TOTAL CARPOOLS	3,346	2,931	3,521	5.23	20.13
	TOTAL CARPOOLERS	7,145	6,409	7,379	3.28	15.13
NORTH FREEWAY (IH-45N) HOV LANE						
A.M. Peak Period	TOTAL VEHICLES	3,661	3,368	4,046	10.52	20.13
	TOTAL PERSONS	13,571	12,555	13,162	-3.01	4.83
	TOTAL CARPOOLS	3,377	3,096	3,754	11.16	21.25
	TOTAL CARPOOLERS	6,788	6,273	7,728	13.85	23.19
P.M. Peak Period	TOTAL VEHICLES	3,593	3,593	3,964	10.33	10.33
	TOTAL PERSONS	13,721	12,849	12,678	-7.6	-1.33
	TOTAL CARPOOLS	3,271	3,348	3,703	13.21	10.6
	TOTALCARPOOLERS	6,702	6,929	7,655	14.22	10.48
GULF FREEWAY (IH-45S) HOV LANE						
A.M. Peak Period	TOTALVEHICLES	3,330	2,601	3,113	-6.52	19.68
	TOTAL PERSONS	9,594	8,202	9,045	-5.72	10.28
	TOTAL CARPOOLS	3,148	2,405	2,940	-6.61	22.25
	TOTAL CARPOOLERS	6,433	4,869	5,927	-7.87	21.73
P.M. Peak Period	TOTAL VEHICLES	2,643	2,405	2,818	6.62	17.17
	TOTAL PERSONS	7,585	7,385	8,369	10.34	13.32
	TOTAL CARPOOLS	2,487	2,234	2,666	7.2	19.34
	TOTAL CARPOOLERS	5,132	4,601	5,483	6.84	19.17
NORTHWEST FREEWAY (US-290) HOV LANE						
A.M. Peak Period	TOTAL VEHICLES	2,970	3,589	3,697	24.48	3.01
	TOTAL PERSONS	8,012	9,295	10,444	30.35	12.36
	TOTAL CARPOOLS	2,787	3,370	3,457	24.04	2.58
	TOTAL CARPOOLERS	5,429	6,825	7,048	29.82	3.27
P.M. Peak Period	TOTAL VEHICLES	3,316	3,436	3,619	9.14	5.33
	TOTAL PERSONS	9,239	9,320	10,348	12	11.03
	TOTAL CARPOOLS	3,106	3,213	3,357	8.08	4.48
	TOTAL CARPOOLERS	6,139	6,490	6,789	10.59	4.61
SOUTHWEST FREEWAY (US-59S) HOV LANE						
A.M. Peak Period	TOTAL VEHICLES	2,832	2,431	3,766	32.98	54.92
	TOTAL PERSONS	10,594	8,650	13,465	27.1	55.66
	TOTAL CARPOOLS	2,653	2,244	3,545	33.62	57.98
	TOTAL CARPOOLERS	5,878	4,688	7,403	25.94	57.91
P.M. Peak Period	TOTAL VEHICLES	2,307	2,797	3,457	49.85	23.6
	TOTAL PERSONS	8,567	10,230	13,166	53.68	28.7
	TOTAL CARPOOLS	2,143	2,594	3,199	49.28	23.32
	TOTAL CARPOOLERS	4,563	5,610	6,850	50.12	22.1
EASTEX FREEWAY (US-59N) HOV LANE						
A.M. Peak Period	TOTAL VEHICLES	974	1,136	1,565	60.68	37.76
	TOTAL PERSONS	3,516	3,872	5,254	49.43	35.69
	TOTAL CARPOOLS	864	998	1,392	61.11	39.48
	TOTAL CARPOOLERS	1,768	2,037	2,867	62.16	40.75
P.M. Peak Period	TOTAL VEHICLES	1,038	1,198	1,449	39.6	20.95
	TOTAL PERSONS	3,990	4,044	5,343	33.91	32.12
	TOTAL CARPOOLS	910	1,068	1,288	41.54	20.6
	TOTAL CARPOOLERS	1,795	2,229	2,733	52.26	22.61

HIGH-OCCUPANCY VEHICLE LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

MEASURE	KATY HOV LANE		NORTH HOV LANE		GULF HOV LANE		NORTHWEST HOV		SOUTHWEST HOV		EASTEX HOV LANE		TOTAL HOV LANES	
	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons
A.M. PEAK HOUR														
Buses	34	1,315	50	2,075	30	1,210	24	1,305	44	2,465	16	960	198	9,330
Vanpools	16	80	25	167	15	117	13	80	6	27	5	36	80	507
Carpools	1,292	2,698	1,601	3,213	1,450	2,904	1,347	2,821	1,615	3,390	718	1,478	8,023	16,504
Motorcycles	49	49	35	35	29	29	50	50	20	20	36	36	219	219
Total	1,391	4,142	1,711	5,490	1,524	4,260	1,434	4,256	1,685	5,902	775	2,510	8,520	26,560
A.M. PEAK PERIOD														
Buses	88	3,005	120	4,940	69	2,705	59	2,970	113	5,725	37	2,025	486	21,370
Vanpools	50	262	64	386	45	354	50	295	38	267	38	264	285	1,828
Carpools	3,481	7,196	3,754	7,728	2,940	5,927	3,457	7,048	3,545	7,403	1,392	2,867	18,569	38,169
Motorcycles	122	122	108	108	59	59	131	131	70	70	98	98	588	588
Total	3,741	10,585	4,046	13,162	3,113	9,045	3,697	10,444	3,766	13,465	1,565	5,254	19,928	61,955
P.M. PEAK HOUR														
Buses	36	1,385	45	1,900	27	1,110	28	1,420	48	2,545	20	1,050	204	9,410
Vanpools	35	217	55	506	10	74	11	52	21	183	18	92	150	1,124
Carpools	1,186	2,498	1,346	2,736	1,089	2,192	1,278	2,608	1,329	2,823	581	1,235	6,809	14,092
Motorcycles	32	32	35	35	23	23	50	50	30	30	29	29	199	199
Total	1,289	4,132	1,481	5,177	1,149	3,399	1,367	4,130	1,428	5,581	648	2,406	7,362	24,825
P.M. PEAK PERIOD														
Buses	111	3,875	109	4,285	66	2,645	68	3,110	119	5,735	44	2,310	517	21,960
Vanpools	68	400	76	662	29	184	51	306	61	503	40	223	325	2,278
Carpools	3,521	7,379	3,703	7,655	2,666	5,483	3,357	6,789	3,199	6,850	1,288	2,733	17,734	36,889
Motorcycles	92	92	76	76	57	57	143	143	78	78	77	77	523	523
Total	3,792	11,746	3,964	12,678	2,818	8,369	3,619	10,348	3,457	13,166	1,449	5,343	19,099	61,650
TOTAL DAILY														
Buses	199	6,880	229	9,225	135	5,350	127	6,080	232	11,460	81	4,335	1,003	43,330
Vanpools	118	662	140	1,048	74	538	101	601	99	770	78	487	610	4,106
Carpools	9,206	18,983	8,678	17,825	6,161	12,520	7,710	15,629	7,700	16,165	2,900	6,040	42,355	87,162
Motorcycles	214	214	184	184	116	116	274	274	148	148	175	175	1,111	1,111
Total	9,737	26,739	9,231	28,282	6,486	18,524	8,212	22,584	8,179	28,543	3,234	11,037	45,079	135,709

Note: Daily system totals for non-METRO buses are 126 buses and 3,580 persons.


HARRIS COUNTY HOV LANE UTILIZATION
TOTAL DAILY VEHICLE TRIPS
NUMBER OF VEHICLES (1,000's)
50
45
40
35
30
25
20
15
10
5
0
IH 45N CONTRAFLOW
IH 10W HOV OPERATION
IH 45N HOV OPERATION
IH 45S HOV OPERATION
US 290 HOV OPERATION
US 59S HOV OPERATION
US 59N HOV OPERATION
TOTAL
IH 10W
IH 45N
US 290
US 59S
IH 45S
US 59N
JAN1979
JAN1984
JAN1989
JAN1994
JAN1999
JAN2004
JAN2009


HARRIS COUNTY HOV LANE UTILIZATION
TOTAL DAILY PERSON TRIPS
NUMBER OF PERSONS (1,000's)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
IH 45N CONTRAFLOW
IH 10W HOV OPERATION
IH 45N HOV OPERATION
IH 45S HOV OPERATION
US 290 HOV OPERATION
US 59S HOV OPERATION
US 59N HOV OPERATION
TOTAL
US 59S
IH 45N
IH 10W
US 290
IH 45S
US 59N
JAN1979
JAN1984
JAN1989
JAN1994
JAN1999
JAN2004
JAN2009

KATY FREEWAY (IH-10W) HOV LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	0	0	-	4	50	12.50			
Peak Period	4	50	12.50	9	140	15.56	13	190	14.62
Off-Peak	0	0	-	0	0	-	0	0	-
Total	4	50	12.50	9	140	15.56	13	190	14.62
NON-METRO BUSES									
Peak Hour	6	150	25.00	3	60	20.00			
Peak Period	13	290	22.31	15	360	24.00	28	650	23.21
Off-Peak	0	0	-	0	0	-	0	0	
Total	13	290	22.31	15	360	24.00	28	650	23.21
BUSES (60 PERSON)									
Peak Hour	28	1,165	41.61	29	1,275	43.97			
Peak Period	71	2,665	37.54	87	3,375	38.79	158	6,040	38.23
Off-Peak	0	0	-	0	0	-	0	0	-
Total	71	2,665	37.54	87	3,375	38.79	158	6,040	38.23
VANPOOLS									
Peak Hour	16	80	5.00	35	217	6.20			
Peak Period	50	262	5.24	68	400	5.88	118	662	5.61
Off-Peak	0	0	-	0	0	-	0	0	-
Total	50	262	5.24	68	400	5.88	118	662	5.61
CARPOOLS									
Peak Hour	1,292	2,698	2.09	1,186	2,498	2.11			
Peak Period	3,481	7,196	2.07	3,521	7,379	2.10	7,002	14,575	2.08
Off-Peak	962	1,924	2.00	1,242	2,484	2.00	2,204	4,408	2.00
Total	4,443	9,120	2.05	4,763	9,863	2.07	9,206	18,983	2.06
MOTORCYCLES									
Peak Hour	49	49	1.00	32	32	1.00			
Peak Period	122	122	1.00	92	92	1.00	214	214	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	122	122	1.00	92	92	1.00	214	214	1.00
TOTAL VEHICLES									
Peak Hour	1,391	4,142	2.98	1,289	4,132	3.21			
Peak Period	3,741	10,585	2.83	3,792	11,746	3.10	7,533	22,331	2.96
Off-Peak	962	1,924	2.00	1,242	2,484	2.00	2,204	4,408	2.00
Total	4,703	12,509	2.66	5,034	14,230	2.83	9,737	26,739	2.75

Data collected at Post Oak and Eastern Extension.

HOV Lane operates from 5:00 a.m. to 12:00 p.m. inbound and from 1:00 p.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane except from 6:45 a.m. to 8:00 a.m. and 5:00 p.m. to 6:00 p.m. when a 3+ requirement is in effect.

AM Peak Hour was 6:45 a.m. - 7:45 a.m.

PM Peak Hour was 4:15 p.m. - 5:15 p.m.

Source: Texas Transportation Institute

HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR KATY FREEWAY (IH 10W) HOV LANE

					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Temporary Kingsland P-N-R Open		0.0		09/80						
Addicks P-N-R Open		0.0		01/82						
Begin HOV Lane Operation	Post Oak to Gessner	4.7	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	10/29/84	X	X				
West Belt P-N-R Open	Post Oak to Gessner	4.7	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	01/85	X	X				
Carpool Operation (4+ Authorized)	Post Oak to Gessner	4.7	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	04/01/85	X	X	X			
HOV Lane Extended to West Belt	Post Oak to West Belt	6.4	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	05/02/85	X	X	X			
Authorized Carpool 3+ Operation	Post Oak to West Belt	6.4	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	11/04/85	X	X	X	X		
Kingsland P-N-R Open	Post Oak to West Belt	6.4	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	11/85	X	X	X	X		
Unauthorized Carpool 2+ Operation (90 Day Test)	Post Oak to West Belt	6.4	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	08/11/86	X	X	X	X	X	
Revise Hours of Operation	Post Oak to West Belt	6.4	5:45 AM - 11:00 AM, 2:00 PM - 7:00 PM	08/25/86	X	X	X	X	X	
Unauthorized Carpool 2+ Operation (2nd 90 Day Test)	Post Oak to West Belt	6.4	5:45 AM - 11:00 AM, 2:00 PM - 7:00 PM	11/10/86	X	X	X	X	X	
Mason P-N-P Open	Post Oak to West Belt	6.4	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	1986	X	X	X	X		
Barker Cypress P-N-P Open	Post Oak to West Belt	6.4	5:45 AM - 9:30 AM, 3:30 PM - 7:00 PM	1986	X	X	X	X		

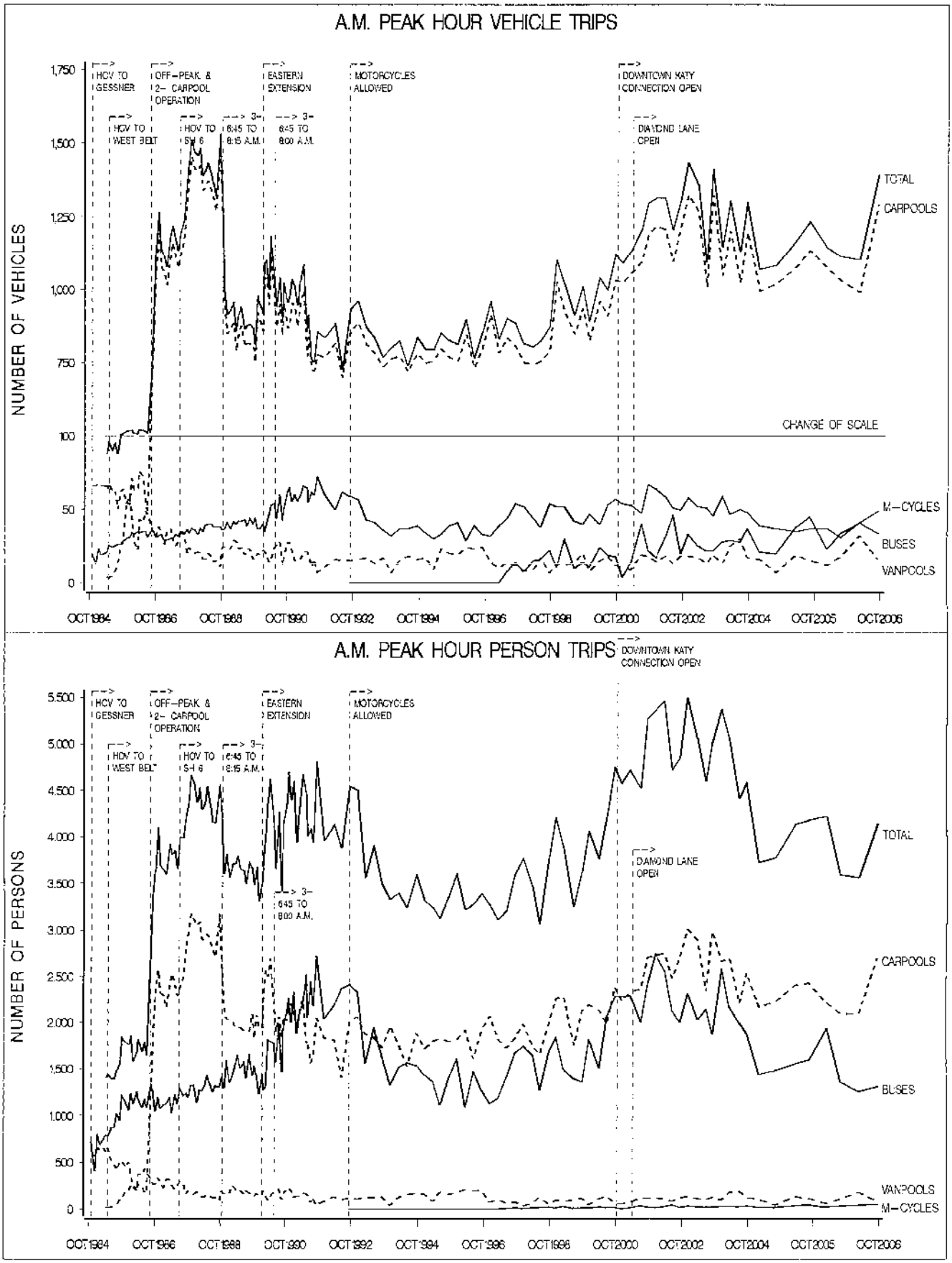
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR KATY FREEWAY (IH 10W) HOV LANE

					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Unauthorized Carpool 2+ Operation	Post Oak to West Belt	6.4	5:45 AM - 11:00 AM, 2:00 PM - 7:00 PM	02/09/87	X	X	X	X	X	
HOV Lane Extended to SH 6	Post Oak to SH 6	11.5	5:45 AM - 11:00 AM, 2:00 PM - 7:00 PM	06/29/87	X	X	X	X	X	
Revise Hours of Operation	Post Oak to SH 6	11.5	5:45 AM - 11:00 AM, 2:00 PM - 8:00 PM	06/29/87	X	X	X	X	X	
Fry P-N-P Open	Post Oak to SH 6	11.5	5:45 AM - 11:00 AM, 2:00 PM - 8:00 PM	1987	X	X	X	X	X	
Revise Hours of Operation	Post Oak to SH 6	11.5	4 AM - 1 PM, 2 PM - 10 PM	06/25/88	X	X	X	X	X	
Restrict Carpools (3+ in AM Peak Hour)	Post Oak to SH 6	11.5	6:45 AM - 8:15 AM	10/17/88	X	X	X	X		
Addicks P-N-R 1st Expansion	Post Oak to SH 6	11.5	4 AM - 1 PM, 2 PM - 10 PM	1988	X	X	X	X	X	
Begin Weekend Operation	Post Oak to SH 6	11.5	4 AM - 10 PM	10/01/89	X	X	X	X	X	
Eastern Extension Open	SPRR to SH 6	12.3	4 AM - 1 PM, 2 PM - 10 PM	01/09/90	X	X	X	X	X	
Modify 3+ Carpool Restriction	SPRR to SH 6	12.3	6:45 AM - 8:00 AM	05/24/90	X	X	X	X		
Restrict Carpools (3+ in PM Peak Hour)	SPRR to SH 6	12.3	5 PM - 6 PM	09/16/91	X	X	X	X		
Motorcycles Allowed	SPRR to SH 6	12.3	4 AM - 1 PM, 2 PM - 10 PM	09/08/92	X	X	X	X	X	X
End Weekend Operation	SPRR to SH 6	12.3	4 AM - 10 PM	03/07/94						

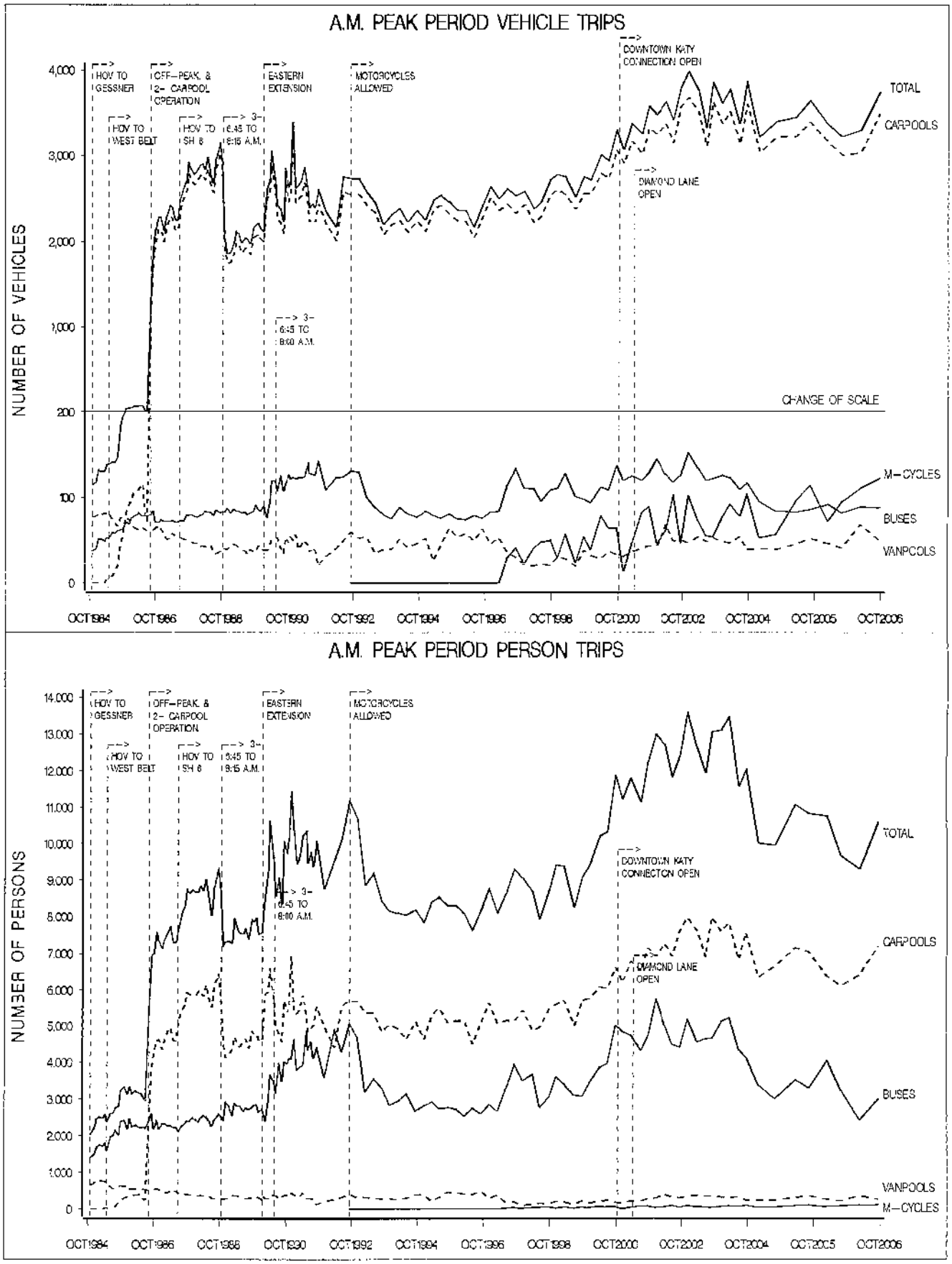
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR KATY FREEWAY (IH 10W) HOV LANE

					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Revise Hours of Operation	SPRR to SH 6	12.3	5 AM - 10 AM, 3 PM - 8 PM	03/14/94	X	X	X	X	X	X
Resume Weekend Operations	SPRR to SH 6	12.3	5 AM - 9 PM	04/02/94	X	X	X	X	X	X
Revise Hours of Operation	SPRR to SH 6	12.3	5 AM - 12 PM, 2 PM - 9 PM	04/04/94	X	X	X	X	X	X
Revise Hours of Operation	SPRR to SH 6	12.3	5 AM - 11 AM, 2 PM - 8 PM	09/30/96	X	X	X	X	X	X
Addicks P-N-R 2nd Expansion	SPRR to SH 6	12.3	5 AM - 11 AM, 2 PM - 8 PM	1997	X	X	X	X	X	X
Begin QuickRide Program	SPRR to SH 6	12.3	6:45 AM - 8:00 AM, 5 PM - 6 PM	01/26/98	X	X	X	X	X	X
Katy Downtown Connector Open	Downtown to/from Katy Freeway	1.9	5 AM - 11 AM, 2 PM - 8 PM	10/16/00	X	X	X	X	X	X
Katy Diamond Lanes Open	SH 6 to SH 99	6.3	5 AM - 11 AM, 2 PM - 8 PM	04/02/01	X	X	X	X	X	X
Addicks P-N-R 3rd Expansion	SPRR to SH 6	12.3	5 AM - 11 AM, 2 PM - 8 PM	09/01	X	X	X	X	X	X
Kingsland P-N-R Expansion	SPRR to SH 6	12.3	5 AM - 11 AM, 2 PM - 8 PM	02/03	X	X	X	X	X	X
Revise Hours of Operation	SPRR to SH 6	12.3	5 AM - 12 PM, 1 PM - 8 PM	06/21/04	X	X	X	X	X	X
West Belt P-N-R Closed	SPRR to SH 6	12.3	5 AM - 12 PM, 1 PM - 8 PM	10/04	X	X	X	X	X	X

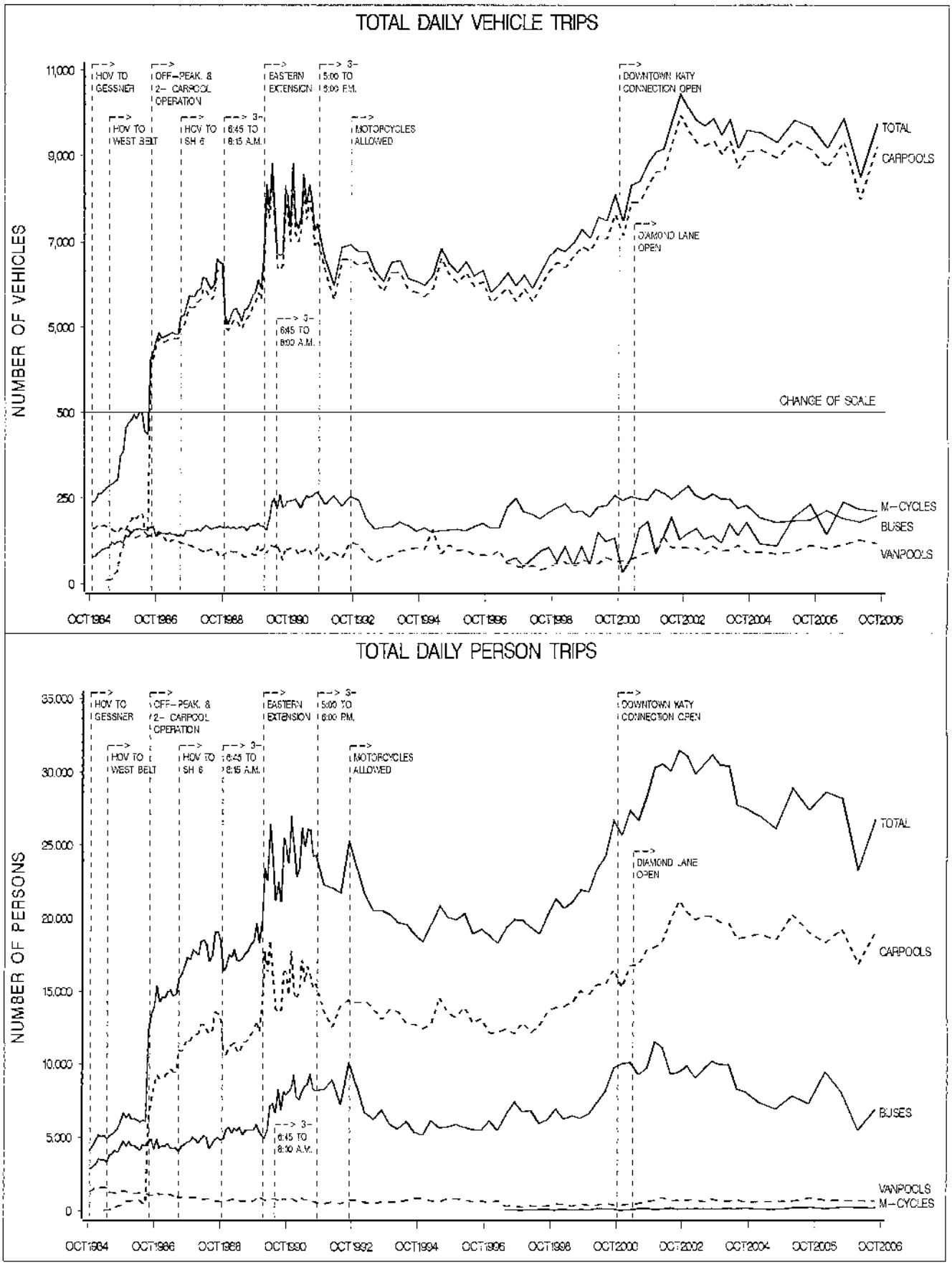
KATY FREEWAY (IH 10W) HOV LANE UTILIZATION



KATY FREEWAY (IH 10W) HOV LANE UTILIZATION



KATY FREEWAY (IH 10W) HOV LANE UTILIZATION



KATY FREEWAY (IH-10W) HOV LANE WEEKEND UTILIZATION – DAILY VOLUME HISTORICAL SUMMARY

	Post Oak		Eastern Extension		Total Katy HOV Lane	
	Saturday	Sunday	Saturday	Sunday	Saturday	Sunday
Sep-00	461	904	1,878	2,938	2,339	3,842
Dec-00	800	1,277	1,964	2,969	2,764	4,246
Mar-01	634	945	1,840	3,005	2,474	3,950
Jun-01	698	1,682	2,108	3,774	2,806	5,456
Sep-01	741	1,319	2,017	3,169	2,758	4,488
Dec-01	820	1,481	2,513	3,396	3,333	4,877
Mar-02	629	1,533	2,647	4,107	3,276	5,640
Jun-02	736	1,497	2,893	3,838	3,629	5,335
Sep-02	856	1,510	3,484	4,518	4,340	6,028
Dec-02	1,101	1,606	3,433	4,136	4,534	5,742
Mar-03	870	1,386	2,850	3,691	3,720	5,077
Jun-03	1,564	1,420	2,551	3,931	4,115	5,351
Sep-03	775	1,692	2,390	2,988	3,165	4,680
Dec-03	862	1,615	2,944	4,180	3,806	5,795
Mar-04	837	1,498	3,176	3,977	4,013	5,475
Jun-04	707	1,300	3,247	3,762	3,954	5,062
Sep-04	-	-	2,976	4,821	2,976	4,821
Dec-04	-	-	3,115	3,855	3,115	3,855
Mar-05	-	-	3,705	4,492	3,705	4,492
Jun-05	-	-	4,304	5,805	4,304	5,805
Sep-05	-	-	3,369	4,173	3,369	4,173
Dec-05	-	-	2,958	2,438	2,958	2,438
Mar-06	-	-	2,869	3,787	2,869	3,787
Jun-06	-	-	1,940	2,743	1,940	2,743
Sep-06	-	-	2,149	2,937	2,149	2,937

Note: Post Oak entrance/exit ramp was closed on weekends due to freeway reconstruction.

KATY FREEWAY (IH-10W) HOV LANE WEEKEND UTILIZATION – HOURLY VOLUME SUMMARY
SEPTEMBER 2006

	Post Oak		Eastern Extension		Total Katy HOV Lane	
	Saturday	Sunday	Saturday	Sunday	Saturday	Sunday
4 - 5	-	-	1	1	1	1
5 - 6	-	-	4	3	4	3
6 - 7	-	-	11	7	11	7
7 - 8	-	-	45	15	45	15
8 - 9	-	-	65	55	65	55
9 - 10	-	-	90	140	90	140
10 - 11	-	-	155	171	155	171
11 - 12	-	-	157	218	157	218
12 - 13	-	-	178	234	178	234
13 - 14	-	-	275	342	275	342
14 - 15	-	-	285	283	285	283
15 - 16	-	-	167	297	167	297
16 - 17	-	-	159	316	159	316
17 - 18	-	-	209	424	209	424
18 - 19	-	-	195	316	195	316
19 - 20	-	-	144	105	144	105
20 - 21	-	-	9	10	9	10
21 - 22	-	-	0	0	0	0
Total	-	-	2,149	2,937	2,149	2,937

Data collected at Post Oak and Eastern Extension.

HOV Lane operates from 5:00 a.m. to 8:00 p.m. outbound on Saturdays and 5:00 a.m. to 8:00 p.m. inbound on Sundays.

All 2+ vehicles are eligible to use the HOV lane.

Source: Texas Transportation Institute

Note: Post Oak entrance/exit ramp was closed on weekends in June due to freeway reconstruction.

KATY FREEWAY (IH-10W) DIAMOND LANE UTILIZATION - DAILY VOLUME HISTORICAL SUMMARY

DATE	INBOUND VOLUME	OUTBOUND VOLUME
Sep-01	3,280	2,702
Dec-01	3,861	3,461
Mar-02	4,225	3,002
Jun-02	4,090	4,351
Sep-02	4,206	4,982
Dec-02	4,391	3,906
Mar-03	5,196	3,712
Jun-03	5,536	4,643
Sep-03	5,671	4,407
Dec-03	5,153	4,623
Mar-04	6,298	4,013
Jun-04	5,001	4,834
Sep-04	5,376	3,564
Dec-04	5,527	3,610
Mar-05	4,183	3,857
Jun-05	4,019	4,526
Sep-05	5,108	4,170
Dec-05	4,377	3,302
Mar-06	4,530	4,067
Jun-06	3,236	2,330
Sep-06	4,130	1,579

KATY FREEWAY (IH-10W) DIAMOND LANE UTILIZATION - HOURLY VOLUME SUMMARY
SEPTEMBER 2006

TIME	INBOUND VOLUME	OUTBOUND VOLUME
0 - 1	1	1
1 - 2	0	0
2 - 3	0	0
3 - 4	0	0
4 - 5	6	0
5 - 6	161	11
6 - 7	1,006	6
7 - 8	1,128	9
8 - 9	789	7
9 - 10	243	6
10 - 11	120	12
11 - 12	123	14
12 - 13	65	21
13 - 14	57	47
14 - 15	49	97
15 - 16	62	160
16 - 17	56	359
17 - 18	54	365
18 - 19	49	278
19 - 20	35	141
20 - 21	55	30
21 - 22	65	6
22 - 23	4	6
23 - 24	2	3
TOTAL	4,130	1,579

*The Katy Diamond Lanes are open 24 hours per day 7 days per week.
Data collected at Barker Cypress.
All 2+ vehicles are eligible to use the HOV lane except
from 6:45 a.m. to 8:00 a.m. and 5:00 p.m. to 6:00 p.m.
when a 3+ requirement is in effect.
Source: Texas Transportation Institute

KATY FREEWAY (IH-10W) DOWNTOWN CONNECTOR - INBOUND OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - INBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	11	210	19.09	3	50	16.67			
Peak Period	33	680	20.61	15	240	16.00	48	920	19.17
Off-Peak	0	0	-	0	0	-	0	0	-
Total	33	680	20.61	15	240	16.00	48	920	19.17
NON-METRO BUSES									
Peak Hour	0	0	-	1	20	20.00			
Peak Period	0	0	-	1	20	20.00	1	20	20.00
Off-Peak	0	0	-	0	0	-	0	0	
Total	0	0	-	1	20	20.00	1	20	20.00
BUSES (60 PERSON)									
Peak Hour	37	1,680	45.41	9	210	23.33			
Peak Period	100	4,230	42.30	16	345	21.56	116	4,575	39.44
Off-Peak	0	0	-	0	0	-	0	0	-
Total	100	4,230	42.30	16	345	21.56	116	4,575	39.44
VANPOOLS									
Peak Hour	1	2	2.00	0	0	-			
Peak Period	3	9	3.00	1	8	8.00	4	17	4.25
Off-Peak	0	0	-	0	0	-	0	0	-
Total	3	9	3.00	1	8	8.00	4	17	4.25
CARPOOLS									
Peak Hour	462	1,049	2.27	55	115	2.09			
Peak Period	1,165	2,493	2.14	158	333	2.11	1,323	2,826	2.14
Off-Peak	178	356	2.00	119	238	2.00	297	594	2.00
Total	1,343	2,849	2.12	277	571	2.06	1,620	3,420	2.11
MOTORCYCLES									
Peak Hour	9	9	1.00	3	3	1.00			
Peak Period	28	28	1.00	7	7	1.00	35	35	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	28	28	1.00	7	7	1.00	35	35	1.00
TOTAL VEHICLES									
Peak Hour	520	2,950	5.67	71	398	5.61			
Peak Period	1,329	7,440	5.60	198	953	4.81	1,527	8,393	5.50
Off-Peak	178	356	2.00	119	238	2.00	297	594	2.00
Total	1,507	7,796	5.17	317	1,191	3.76	1,824	8,987	4.93

Data collected at Downtown Terminus.

HOV Lane operates from 5:00 a.m. to 8:00 p.m. inbound.

All 2+ vehicles are eligible to use the HOV lane.

AM Peak Hour was 7:15 a.m. - 8:15 a.m.

PM Peak Hour was 4:45 p.m. - 5:45 p.m.

Source: Texas Transportation Institute

KATY FREEWAY (IH-10W) DOWNTOWN CONNECTOR - OUTBOUND OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - OUTBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	0	0	-	3	100	33.33			
Peak Period	0	0	-	7	150	21.43	7	150	21.43
Off-Peak	0	0	-	0	0	-	0	0	-
Total	0	0	-	7	150	21.43	7	150	21.43
NON-METRO BUSES									
Peak Hour	0	0	-	0	0	-			
Peak Period	0	0	-	0	0	-	0	0	-
Off-Peak	0	0	-	0	0	-	0	0	
Total	0	0	-	0	0	-	0	0	-
BUSES (60 PERSON)									
Peak Hour	0	0	-	8	490	61.25			
Peak Period	0	0	-	17	865	50.88	17	865	50.88
Off-Peak	0	0	-	0	0	-	0	0	-
Total	0	0	-	17	865	50.88	17	865	50.88
VANPOOLS									
Peak Hour	0	0	-	0	0	-			
Peak Period	0	0	-	1	5	5.00	1	5	5.00
Off-Peak	0	0	-	0	0	-	0	0	-
Total	0	0	-	1	5	5.00	1	5	5.00
CARPOOLS									
Peak Hour	6	10	1.67	245	496	2.02			
Peak Period	11	18	1.64	526	1,043	1.98	537	1,061	1.98
Off-Peak	0	0	-	90	180	2.00	90	180	2.00
Total	11	18	1.64	616	1,223	1.99	627	1,241	1.98
MOTORCYCLES									
Peak Hour	0	0	-	2	2	1.00			
Peak Period	1	1	1.00	4	4	1.00	5	5	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	1	1	1.00	4	4	1.00	5	5	1.00
TOTAL VEHICLES									
Peak Hour	6	10	1.67	258	1,088	4.22			
Peak Period	12	19	1.58	555	2,067	3.72	567	2,086	3.68
Off-Peak	0	0	-	90	180	2.00	90	180	2.00
Total	12	19	1.58	645	2,247	3.48	657	2,266	3.45

Data collected at Downtown Terminus.

HOV Lane operates from 5:00 a.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane.

AM Peak Hour was 7:00 a.m. - 8:00 a.m.

PM Peak Hour was 4:30 p.m. - 5:30 p.m.

Source: Texas Transportation Institute

NORTH FREEWAY (IH-45N) HOV LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	5	80	16.00	3	60	20.00			
Peak Period	11	210	19.09	10	220	22.00	21	430	20.48
Off-Peak	0	0	-	0	0	-	0	0	-
Total	11	210	19.09	10	220	22.00	21	430	20.48
NON-METRO BUSES									
Peak Hour	9	390	43.33	9	370	41.11			
Peak Period	25	980	39.20	24	970	40.42	49	1950	39.80
Off-Peak	0	0	-	0	0	-	0	0	
Total	25	980	39.20	24	970	40.42	49	1950	39.80
BUSES (60 PERSON)									
Peak Hour	36	1,605	44.58	33	1,470	44.55			
Peak Period	84	3,750	44.64	75	3,095	41.27	159	6,845	43.05
Off-Peak	0	0	-	0	0	-	0	0	-
Total	84	3,750	44.64	75	3,095	41.27	159	6,845	43.05
VANPOOLS									
Peak Hour	25	167	6.68	55	506	9.20			
Peak Period	64	386	6.03	76	662	8.71	140	1048	7.49
Off-Peak	0	0	-	0	0	-	0	0	-
Total	64	386	6.03	76	662	8.71	140	1048	7.49
CARPOOLS									
Peak Hour	1,601	2,213	2.01	1,346	1,736	2.03			
Peak Period	3,754	7,728	2.06	3,703	7,655	2.07	7,457	15,383	2.06
Off-Peak	470	940	2.00	751	1,502	2.00	1,221	2,442	2.00
Total	4,224	8,668	2.05	4,454	9,157	2.06	8,678	17,825	2.05
MOTORCYCLES									
Peak Hour	35	35	1.00	35	35	1.00			
Peak Period	108	108	1.00	76	76	1.00	184	184	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	108	108	1.00	76	76	1.00	184	184	1.00
TOTAL VEHICLES									
Peak Hour	1,711	5,490	3.21	1,481	5,177	3.50			
Peak Period	4,046	13,162	3.25	3,964	12,678	3.20	8,010	25,840	3.23
Off-Peak	470	940	2.00	751	1502	2.00	1,221	2,442	2.00
Total	4,516	14,102	3.12	4,715	14,180	3.01	9,231	28,282	3.06

Data collected at Shepherd.

HOV Lane operates from 5:00 a.m. to 11:00 a.m. inbound and from 2:00 p.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane.

AM Peak Hour was 6:30 a.m. - 7:30 a.m.

PM Peak Hour was 4:15 p.m. - 5:15 p.m.

Source: Texas Transportation Institute

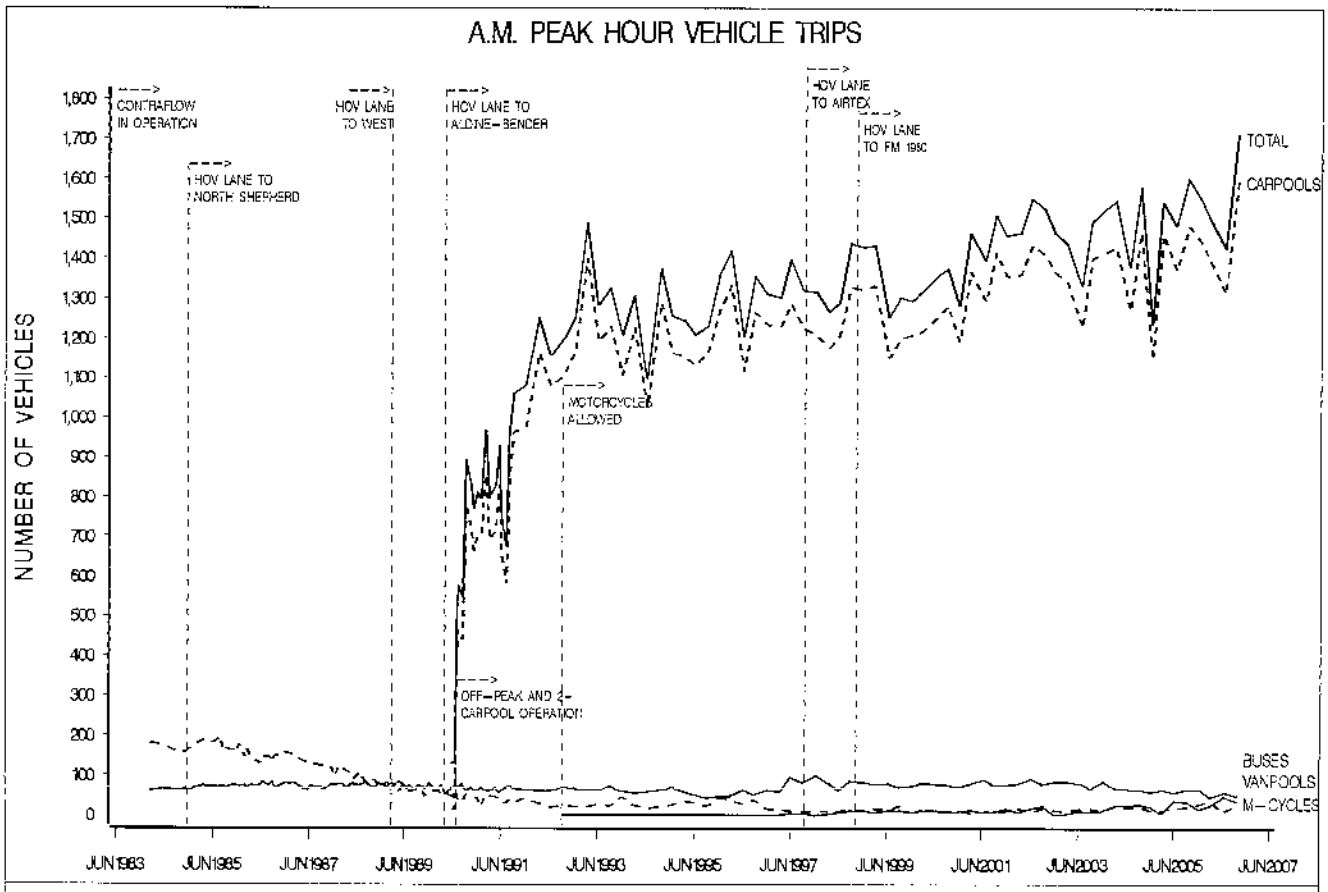
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR NORTH FREEWAY (IH 45N) HOV LANE

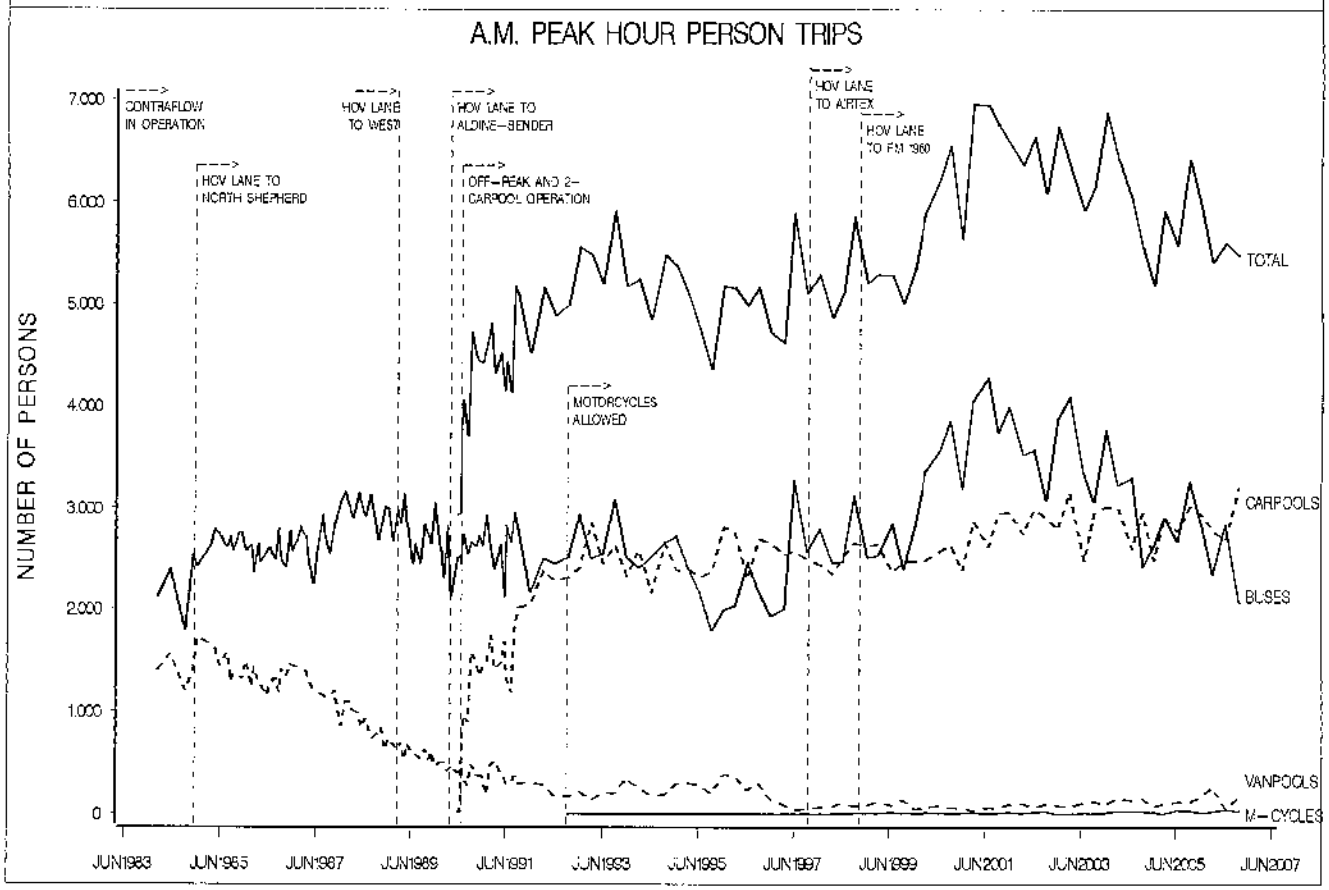
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Contra Flow Operation	CBD to N. Shepherd	9.1	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	08/28/79	X	X				
Kuykendahl P-N-R Open	CBD to N. Shepherd	9.1	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	01/80	X	X				
Shepherd P-N-R Open	CBD to N. Shepherd	9.1	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	04/80	X	X				
Kuykendahl P-N-R 1st Expansion	CBD to N. Shepherd	9.1	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	1980	X	X				
Concurrent Flow Lanes	West Rd. to N. Shepherd	3.8	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	03/31/81	X	X				
Spring P-N-R Open	West Rd. to N. Shepherd	3.8	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	10/82	X	X				
Shepherd P-N-R 1st Expansion	West Rd. to N. Shepherd	3.8	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	1982	X	X				
Seaton Lake P-N-R Open	West Rd. to N. Shepherd	3.8	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	04/83	X	X				
Kuykendahl P-N-R 2nd Expansion	West Rd. to N. Shepherd	3.8	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	1983	X	X				
Begin HOV Lane Operation	CBD to N. Shepherd	9.1	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	11/23/84	X	X				
Woodlands P-N-R open	CBD to N. Shepherd	9.1	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	1985	X	X				
Concurrent Flow Lane Not In Operation	West Rd. to N. Shepherd	3.8	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	11/25/88-12/31/88						
HOV Lane Extended	CBD to Aldine-Bender	13.4	5:45 AM - 8:45 AM, 3:30 PM - 7:00 PM	04/02/90	X	X				

HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR NORTH FREEWAY (IH 45N) HOV LANE

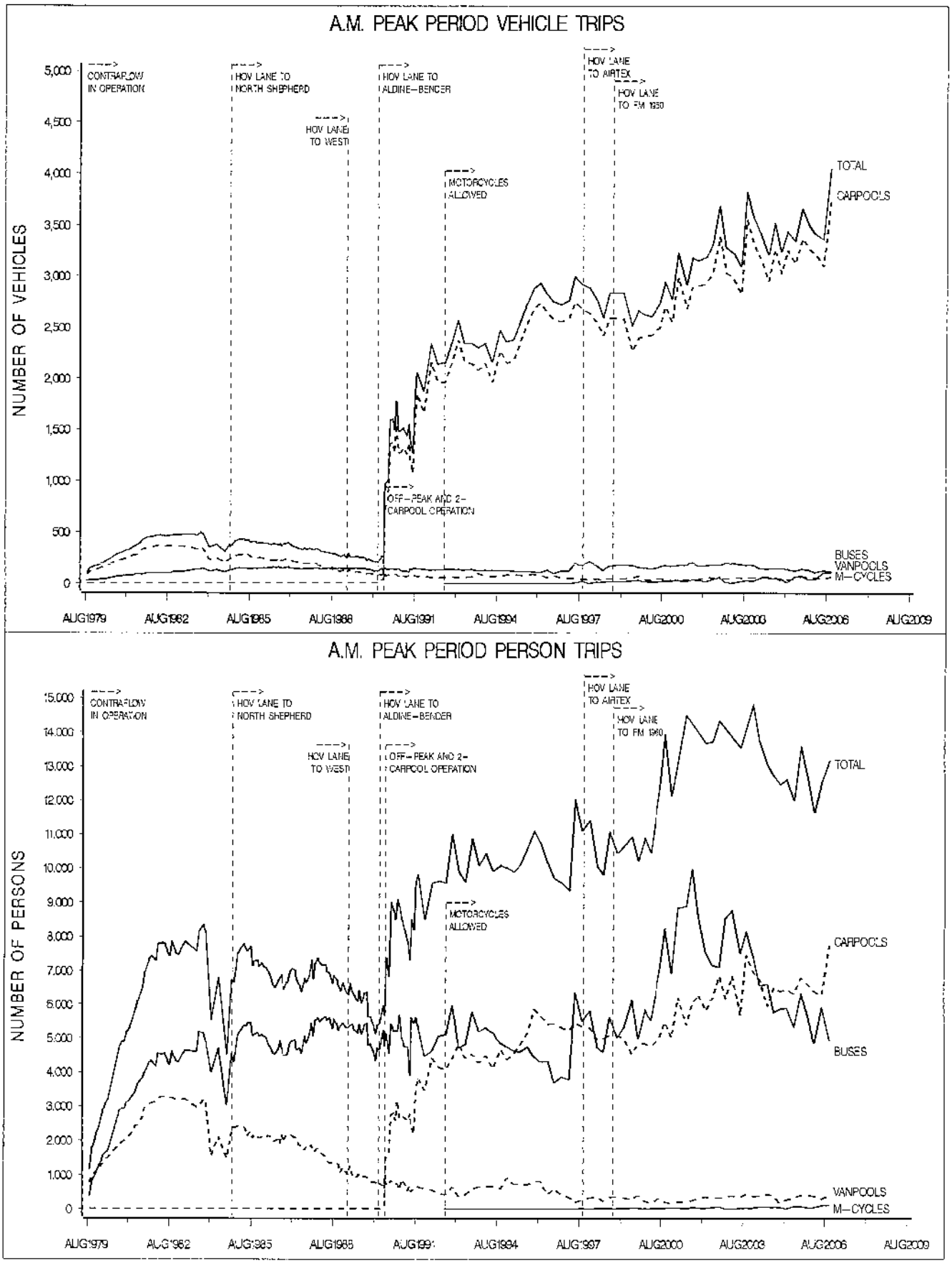
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Begin Carpool and Off-Peak Operation	CBD to Aldine-Bender	13.4	4 AM - 1 PM, 2 PM - 10 PM	06/26/90	X	X	X	X	X	
Begin Weekend Operation	CBD to Aldine-Bender	13.4	4 AM - 10 PM	06/30/90	X	X	X	X	X	
End Weekend Operation	CBD to Aldine-Bender	13.4	4 AM - 10 PM	10/05/91						
Woodlands P-N-R Expansion	CBD to Aldine-Bender	13.4	4 AM - 1 PM, 2 PM - 10 PM	1991	X	X	X	X	X	
Motorcycles Allowed	CBD to Aldine-Bender	13.4	4 AM - 1 PM, 2 PM - 10 PM	09/08/92	X	X	X	X	X	X
Revise Hours of Operation	CBD to Aldine-Bender	13.4	5 AM - 10 AM, 3 PM - 8 PM	03/14/94	X	X	X	X	X	X
Revise Hours of Operation	CBD to Aldine-Bender	13.4	5 AM - 12 PM, 2 PM - 9 PM	04/04/94	X	X	X	X	X	X
Revise Hours of Operation	CBD to Aldine-Bender	13.4	5 AM - 11 AM, 2 PM - 8 PM	09/30/96	X	X	X	X	X	X
Kuykendahl P-N-R 3rd Expansion	CBD to Aldine-Bender	13.4	5 AM - 11 AM, 2 PM - 8 PM	1996	X	X	X	X	X	X
HOV Lane Extended	CBD to Airtex	16.8	5 AM - 11 AM, 2 PM - 8 PM	09/22/97	X	X	X	X	X	X
HOV Lane Extended	CBD to FM 1960	19.3	5 AM - 11 AM, 2 PM - 8 PM	10/19/98	X	X	X	X	X	X
Smith Street Exit Closed Due to Downtown Construction	CBD to FM 1960	19.3	5 AM - 11 AM, 2 PM - 8 PM	03/31/04	X	X	X	X	X	X

NORTH FREEWAY (IH 45N) HOV LANE UTILIZATION

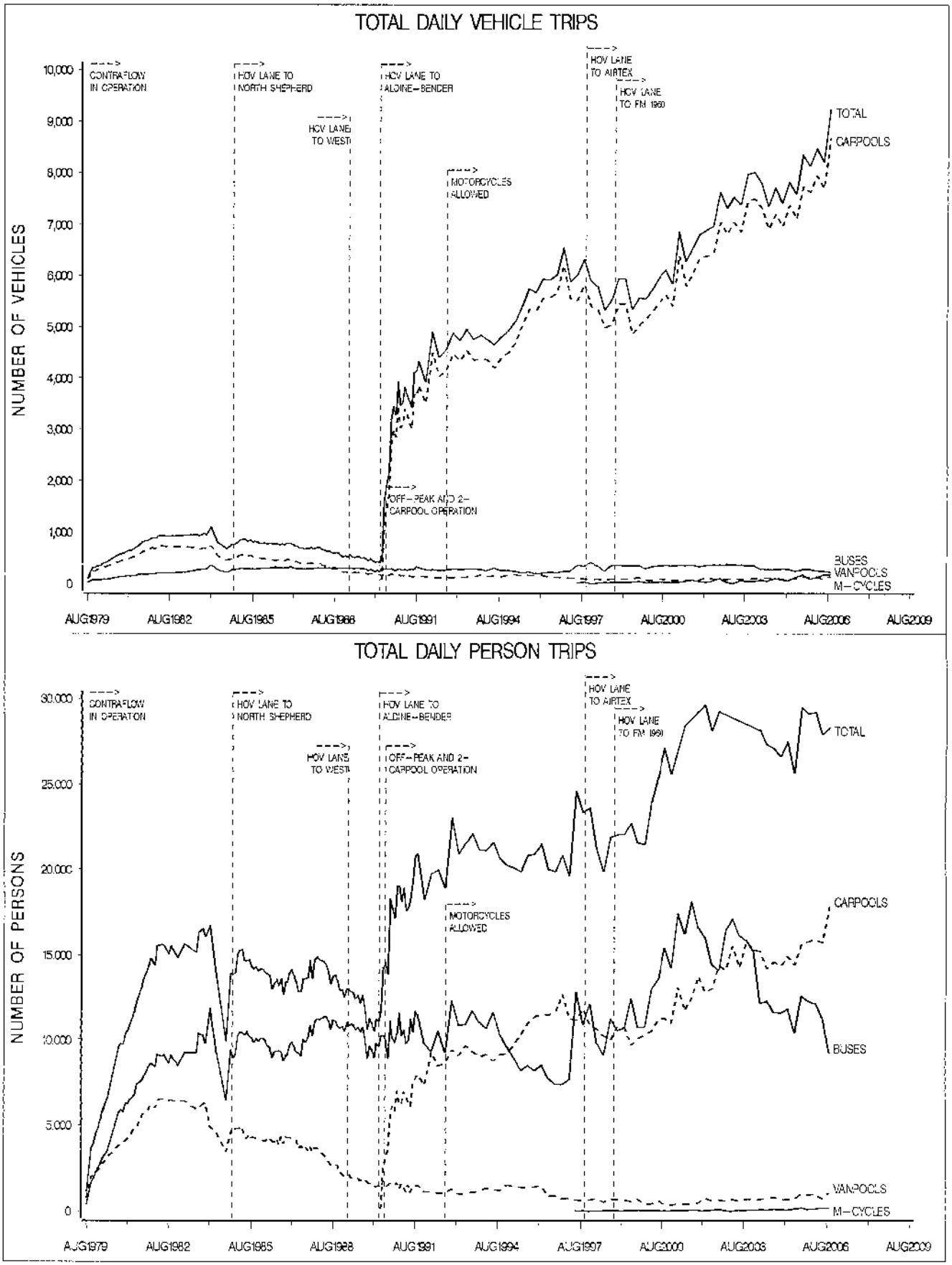




NORTH FREEWAY (IH 45N) HOV LANE UTILIZATION



NORTH FREEWAY (IH 45N) HOV LANE UTILIZATION



GULF FREEWAY (IH-45S) HOV LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	5	100	20.00	4	110	27.50			
Peak Period	13	250	19.23	13	310	23.85	26	560	21.54
Off-Peak	0	0	-	0	0	-	0	0	-
Total	13	250	19.23	13	310	23.85	26	560	21.54
NON-METRO BUSES									
Peak Hour	0	0	-	0	0	-			
Peak Period	3	100	33.33	1	40	40.00	4	140	35.00
Off-Peak	0	0	-	0	0	-	0	0	
Total	3	100	33.33	1	40	40.00	4	140	35.00
BUSES (60 PERSON)									
Peak Hour	25	1,110	44.40	23	1,000	43.48			
Peak Period	53	2,355	44.43	52	2,295	44.13	105	4,650	44.29
Off-Peak	0	0	-	0	0	-	0	0	-
Total	53	2,355	44.43	52	2,295	44.13	105	4,650	44.29
VANPOOLS									
Peak Hour	15	117	7.80	10	74	7.40			
Peak Period	45	354	7.87	29	184	6.34	74	538	7.27
Off-Peak	0	0	-	0	0	-	0	0	-
Total	45	354	7.87	29	184	6.34	74	538	7.27
CARPOOLS									
Peak Hour	1,450	2,904	2.00	1,089	2,192	2.01			
Peak Period	2,940	5,927	2.02	2,666	5,483	2.06	5,606	11,410	2.04
Off-Peak	211	422	2.00	344	688	2.00	555	1,110	2.00
Total	3,151	6,349	2.01	3,010	6,171	2.05	6,161	12,520	2.03
MOTORCYCLES									
Peak Hour	29	29	1.00	23	23	1.00			
Peak Period	59	59	1.00	57	57	1.00	116	116	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	59	59	1.00	57	57	1.00	116	116	1.00
TOTAL VEHICLES									
Peak Hour	1,524	4,260	2.80	1,149	3,399	2.96			
Peak Period	3,113	9,045	2.91	2,818	8,369	2.97	5,931	17,414	2.94
Off-Peak	211	422	2.00	344	688	2.00	555	1,110	2.00
Total	3,324	9,467	2.85	3,162	9,057	2.86	6,486	18,524	2.86

Data collected South of the Eastwood Transit Center.

HOV Lane operates from 5:00 a.m. to 11:00 a.m. inbound and from 2:00 p.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane.

AM Peak Hour was 7:15 a.m. - 8:15 a.m.

PM Peak Hour was 4:45 p.m. - 5:45 p.m.

Source: Texas Transportation Institute

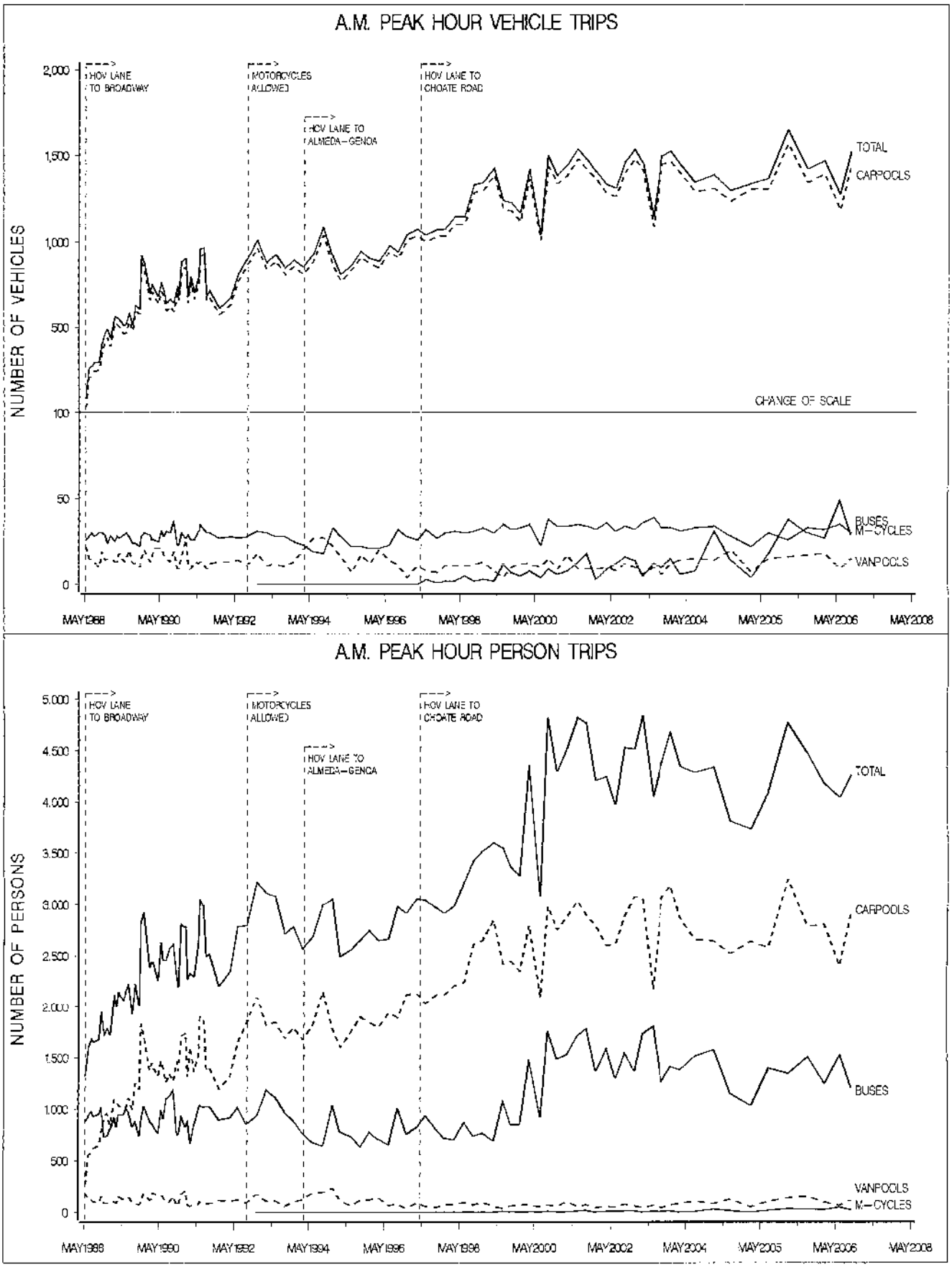
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR GULF FREEWAY (IH 45S) HOV LANE

					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Temporary Edgebrook P-N-R Open		0.0		03/77						
Temporary Bay Area P-N-R Open		0.0		03/80						
Edgebrook P-N-R Open		0.0		03/81						
Bay Area P-N-R Open		0.0		04/84						
Begin HOV Lane Operation	CBD to Broadway	6.5	4 AM - 1 PM, 2 PM - 10 PM	05/16/88	X	X	X	X	X	
Eastwood Transit Center Open	CBD to Broadway	6.5	4 AM - 1 PM, 2 PM - 10 PM	05/88	X	X	X	X	X	
Begin Weekend Operation	CBD to Broadway	6.5	4 AM - 10 PM	10/01/89	X	X	X	X	X	
End Weekend Operation	CBD to Broadway	6.5	4 AM - 10 PM	10/05/91						
Motorcycles Allowed	CBD to Broadway	6.5	4 AM - 1 PM, 2 PM - 10 PM	09/08/92	X	X	X	X	X	X
Revise Hours of Operation	CBD to Broadway	6.5	5 AM - 10 AM, 3 PM - 8 PM	03/14/94	X	X	X	X	X	X
HOV Lane Extended to Almeda-Genoa	CBD to Almeda-Genoa	11.6	5 AM - 10 AM, 3 PM - 8 PM	03/14/94	X	X	X	X	X	X
Revise Hours of Operation	CBD to Almeda-Genoa	11.6	5 AM - 12 PM, 2 PM - 9 PM	04/04/94	X	X	X	X	X	X
Monroe P-N-R Open	CBD to Almeda-Genoa	11.6	5 AM - 12 PM, 2 PM - 9 PM	01/95	X	X	X	X	X	X
Fuqua P-N-R Open	CBD to Almeda-Genoa	11.6	5 AM - 12 PM, 2 PM - 9 PM	06/96	X	X	X	X	X	X
Edgebrook P-N-R Closed	CBD to Almeda-Genoa	11.6	5 AM - 12 PM, 2 PM - 9 PM	07/96	X	X	X	X	X	X

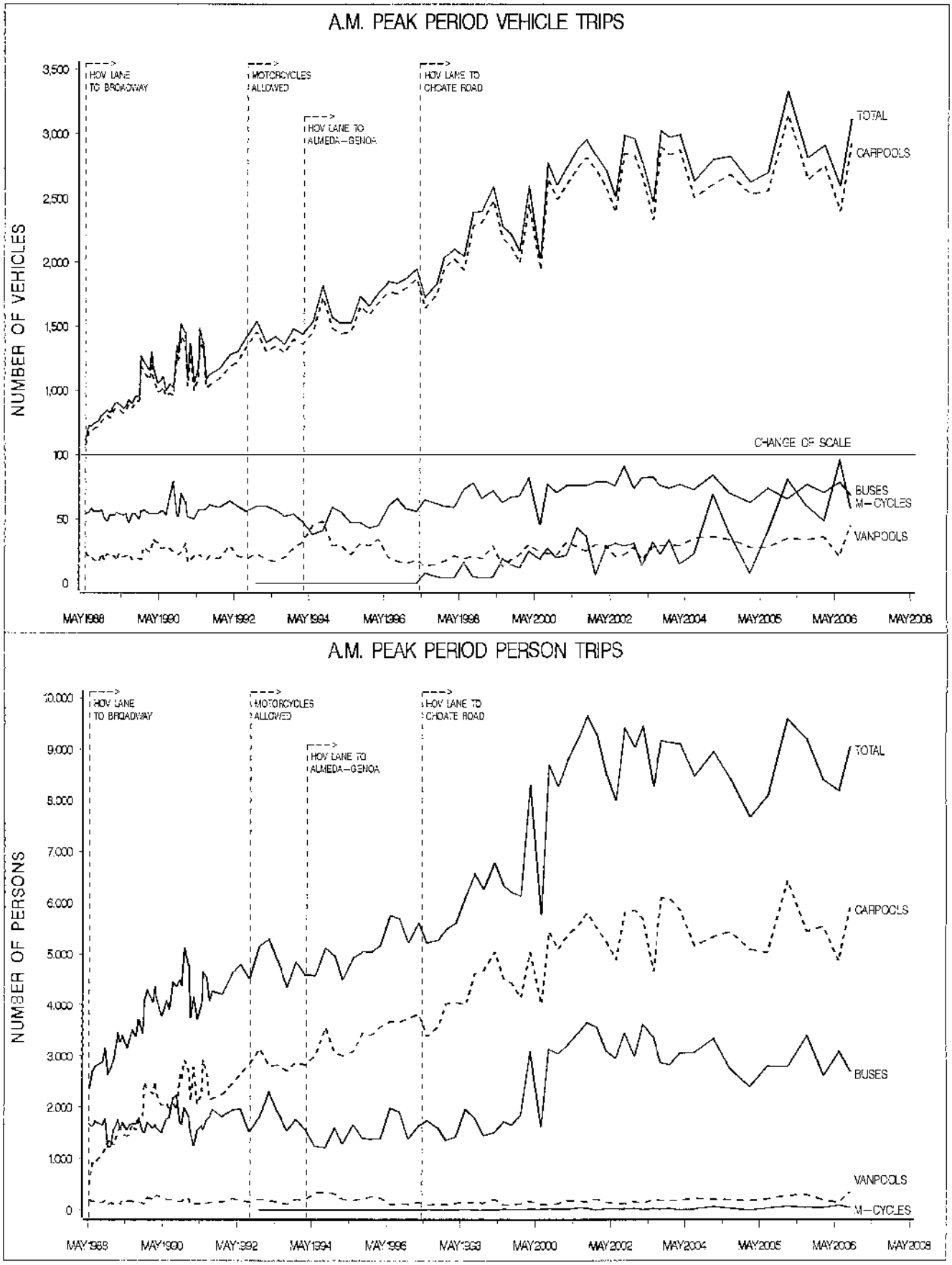
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR GULF FREEWAY (IH 45S) HOV LANE

					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Revise Hours of Operation	CBD to Almeda-Genoa	11.6	5 AM - 11 AM, 2 PM - 8 PM	09/30/96	X	X	X	X	X	X
HOV Lane Extended to Choate Road	CBD to Choate	15.0	5 AM - 11 AM, 2 PM - 8 PM	04/14/97	X	X	X	X	X	X
Fuqua P-N-P Open	CBD to Choate	15.0	5 AM - 11 AM, 2 PM - 8 PM	04/97	X	X	X	X	X	X
Resume Weekend Operations	CBD to Choate	15.0	3 PM - 9 PM	05/24/97	X	X	X	X	X	X
End Weekend Operation	CBD to Choate	15.0	3 PM - 9 PM	09/01/97						
Bay Area P-N-P Open	CBD to Choate	15.0	5 AM - 11 AM, 2 PM - 8 PM	04/98	X	X	X	X	X	X
Bay Area P-N-P Expansion	CBD to Choate	15.0	5 AM - 11 AM, 2 PM - 8 PM	01/99	X	X	X	X	X	X

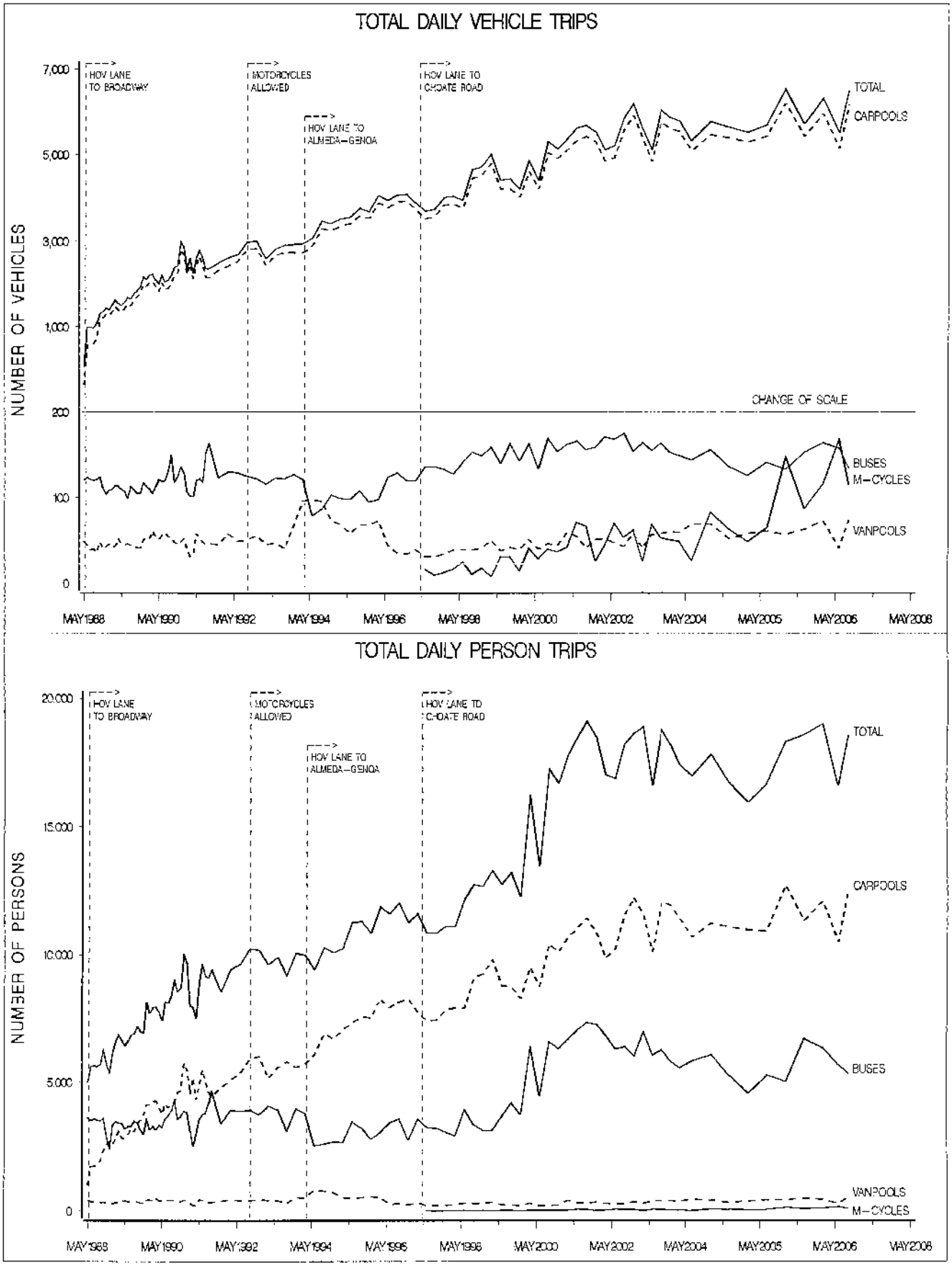
GULF FREEWAY (IH 45S) HOV LANE UTILIZATION



GULF FREEWAY (IH 45S) HOV LANE UTILIZATION



GULF FREEWAY (IH 45S) HOV LANE UTILIZATION



NORTHWEST FREEWAY (US-290) HOV LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	0	0	-	0	0	-			
Peak Period	0	0	-	0	0	-	0	0	-
Off-Peak	0	0	-	0	0	-	0	0	-
Total	0	0	-	0	0	-	0	0	-
NON-METRO BUSES									
Peak Hour	0	0	-	0	0	-			
Peak Period	0	0	-	5	60	12.00	5	60	12.00
Off-Peak	0	0	-	0	0	-	0	0	
Total	0	0	-	5	60	12.00	5	60	12.00
BUSES (60 PERSON)									
Peak Hour	24	1,305	54.38	28	1,420	50.71			
Peak Period	59	2,970	50.34	63	3,050	48.41	122	6,020	49.34
Off-Peak	0	0	-	0	0	-	0	0	-
Total	59	2,970	50.34	63	3,050	48.41	122	6,020	49.34
VANPOOLS									
Peak Hour	13	80	6.15	11	52	4.73			
Peak Period	50	295	5.90	51	306	6.00	101	601	5.95
Off-Peak	0	0	-	0	0	-	0	0	-
Total	50	295	5.90	51	306	6.00	101	601	5.95
CARPOOLS									
Peak Hour	1,347	1,821	2.09	1,278	2,608	2.04			
Peak Period	3,457	7,048	2.04	3,357	6,789	2.02	6,814	13,837	2.03
Off-Peak	426	852	2.00	470	940	2.00	896	1,792	2.00
Total	3,883	7,900	2.03	3,827	7,729	2.02	7,710	15,629	2.03
MOTORCYCLES									
Peak Hour	50	50	1.00	50	50	1.00			
Peak Period	131	131	1.00	143	143	1.00	274	274	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	131	131	1.00	143	143	1.00	274	274	1.00
TOTAL VEHICLES									
Peak Hour	1,434	4,256	2.97	1,367	4,130	3.02			
Peak Period	3,697	10,444	2.82	3,619	10,348	2.86	7,316	20,792	2.84
Off-Peak	426	852	2.00	470	940	2.00	896	1,792	2.00
Total	4,123	11,296	2.74	4,089	11,288	2.76	8,212	22,584	2.75

Data collected at Dacoma.

HOV Lane operates from 5:00 a.m. to 11:00 a.m. inbound and from 2:00 p.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane except from 6:45 a.m. to 8:00 a.m. when a 3+ requirement is in effect.

AM Peak Hour was 6:45 a.m. - 7:45 a.m.

PM Peak Hour was 5:15 p.m. - 6:15 p.m.

Source: Texas Transportation Institute

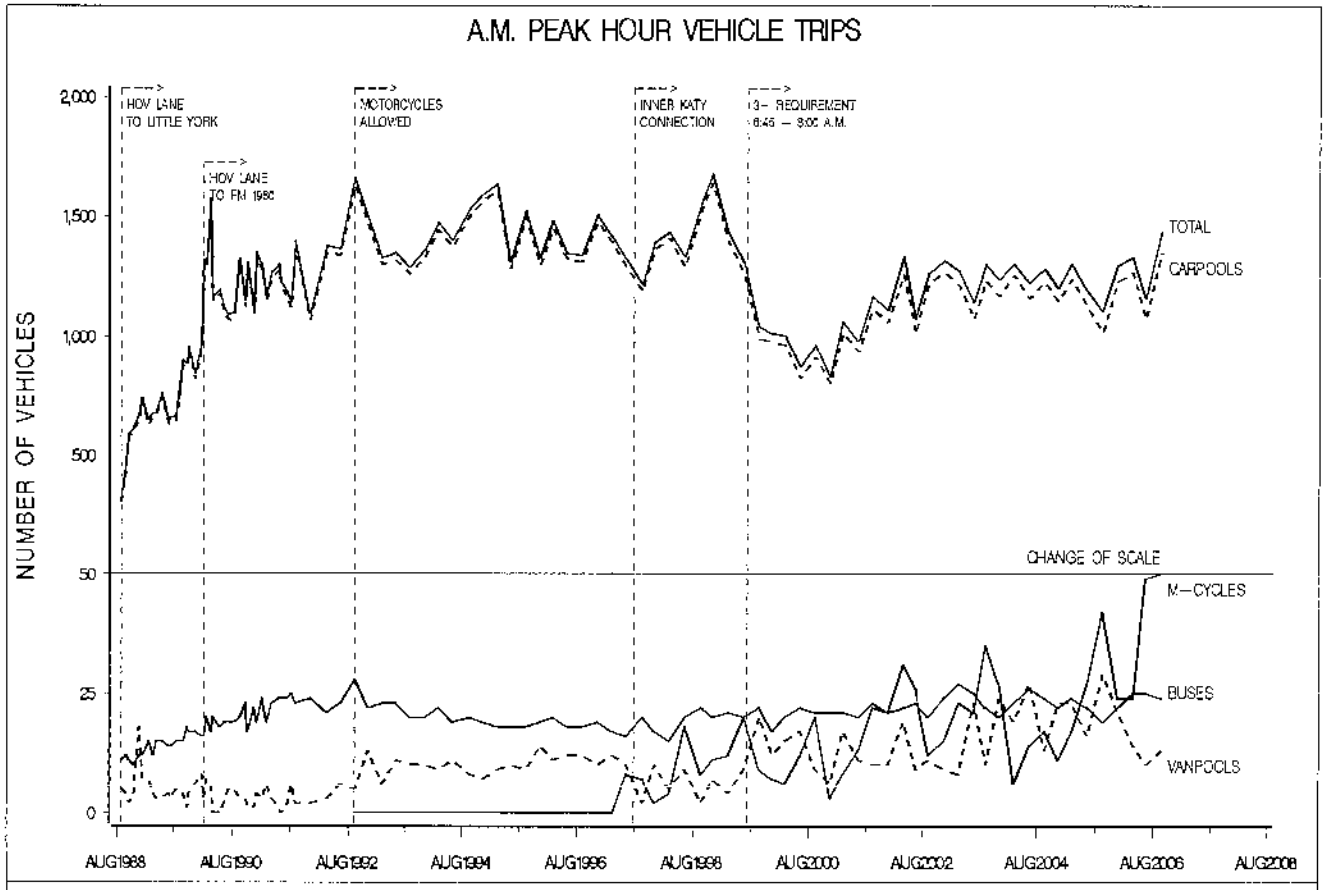
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR NORTHWEST FREEWAY (US 290) HOV LANE

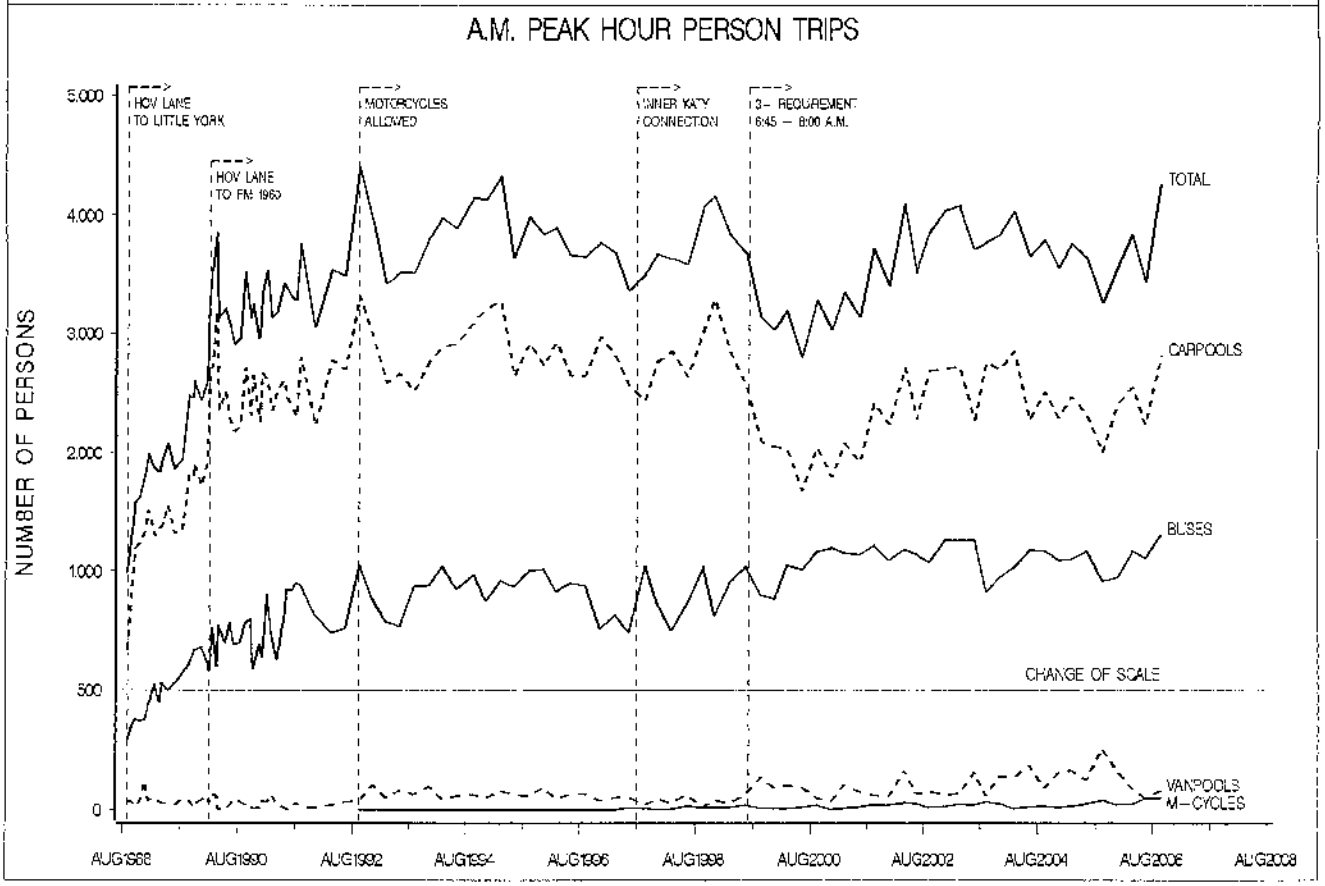
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Northwest Station P-N-R Open		0.0		04/84						
Begin HOV Lane Operation	Northwest Transit CTR to Little York	9.5	4 AM - 1 PM, 2 PM - 10 PM	08/29/88	X	X	X	X	X	
W Little York P-N-R Open	Northwest Transit CTR to Little York	9.5	4 AM - 1 PM, 2 PM - 10 PM	08/88	X	X	X	X	X	
Pinemont P-N-R Open	Northwest Transit CTR to Little York	9.5	4 AM - 1 PM, 2 PM - 10 PM	03/89	X	X	X	X	X	
HOV Lane Extended to FM 1960	Northwest Transit CTR to FM 1960	13.4	4 AM - 1 PM, 2 PM - 10 PM	02/09/90	X	X	X	X	X	
Northwest Transit Center/ P-N-R Open	Northwest Transit CTR to FM 1960	13.4	4 AM - 1 PM, 2 PM - 10 PM	04/01/90	X	X	X	X	X	
Begin Weekend Operation	Northwest Transit CTR to FM 1960	13.4	4 AM - 10 PM	10/06/90	X	X	X	X	X	
Northwest Station P-N-R 1st Expansion	Northwest Transit CTR to FM 1960	13.4	4 AM - 1 PM, 2 PM - 10 PM	1990	X	X	X	X	X	
End Weekend Operation	Northwest Transit CTR to FM 1960	13.4	4 AM - 10 PM	10/05/91						
Motorcycles Allowed	Northwest Transit CTR to FM 1960	13.4	4 AM - 1 PM, 2 PM - 10 PM	09/08/92	X	X	X	X	X	X
Northwest P-N-R 2nd Expansion	Northwest Transit CTR to FM 1960	13.4	4 AM - 1 PM, 2 PM - 10 PM	1993	X	X	X	X	X	X
Revise Hours of Operation	Northwest Transit CTR to FM 1960	13.4	5 AM - 10 AM, 3 PM - 8 PM	03/14/94	X	X	X	X	X	X
Revise Hours of Operation	Northwest Transit CTR to FM 1960	13.4	5 AM - 12 PM, 2 PM - 9 PM	04/04/94	X	X	X	X	X	X
Revise Hours of Operation	Northwest Transit CTR to FM 1960	13.4	5 AM - 11 AM, 2 PM - 8 PM	09/30/96	X	X	X	X	X	X

HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR NORTHWEST FREEWAY (US 290) HOV LANE

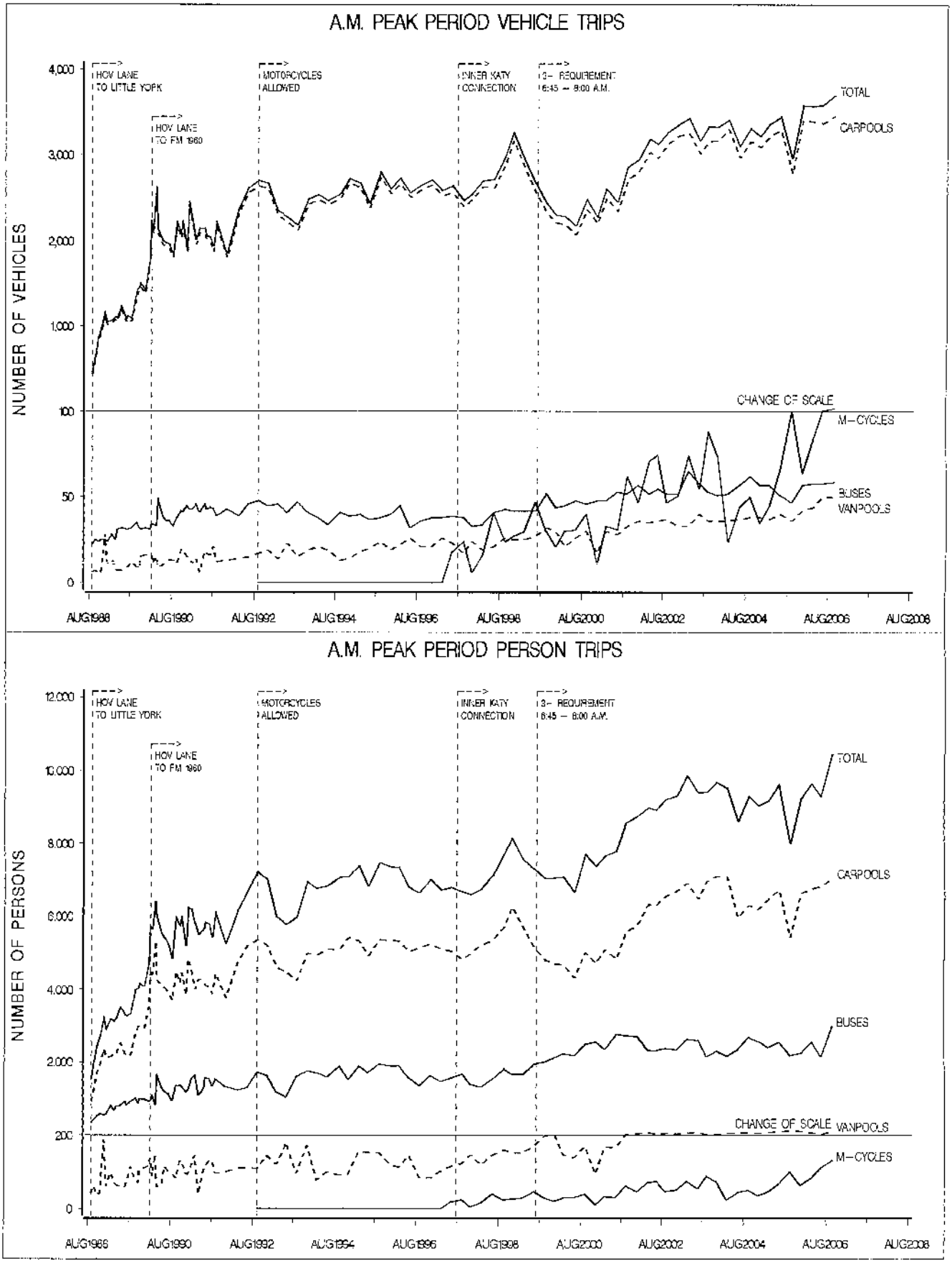
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Inner Katy Connector Open	Northwest Transit CTR to / from Katy Freeway	AM-0.6 PM-0.7	5 AM - 11 AM, 2 PM - 8 PM	07/28/97	X	X	X	X	X	X
Restrict Carpools (3+ in AM Peak Hour)	Northwest Transit CTR to FM 1960	13.4	6:45 AM - 8:00 AM	07/06/99	X	X	X	X		X
Begin QuickRide Program	Northwest Transit CTR to FM 1960	13.4	6:45 AM - 8:00 AM	11/09/00	X	X	X	X	X	X
Northwest Station P-N-R 3rd Expansion	Northwest Transit CTR to FM 1960	13.4	5 AM - 11 AM, 2 PM - 8 PM	2001	X	X	X	X	X	X
WB Inner Katy Connector Closed Due to Freeway Reconstruction	Northwest Transit CTR from Katy Freeway	PM-0.7	5 AM - 11 AM, 2 PM - 8 PM	10/11/2003						

NORTHWEST FREEWAY (US 290) HOV LANE UTILIZATION

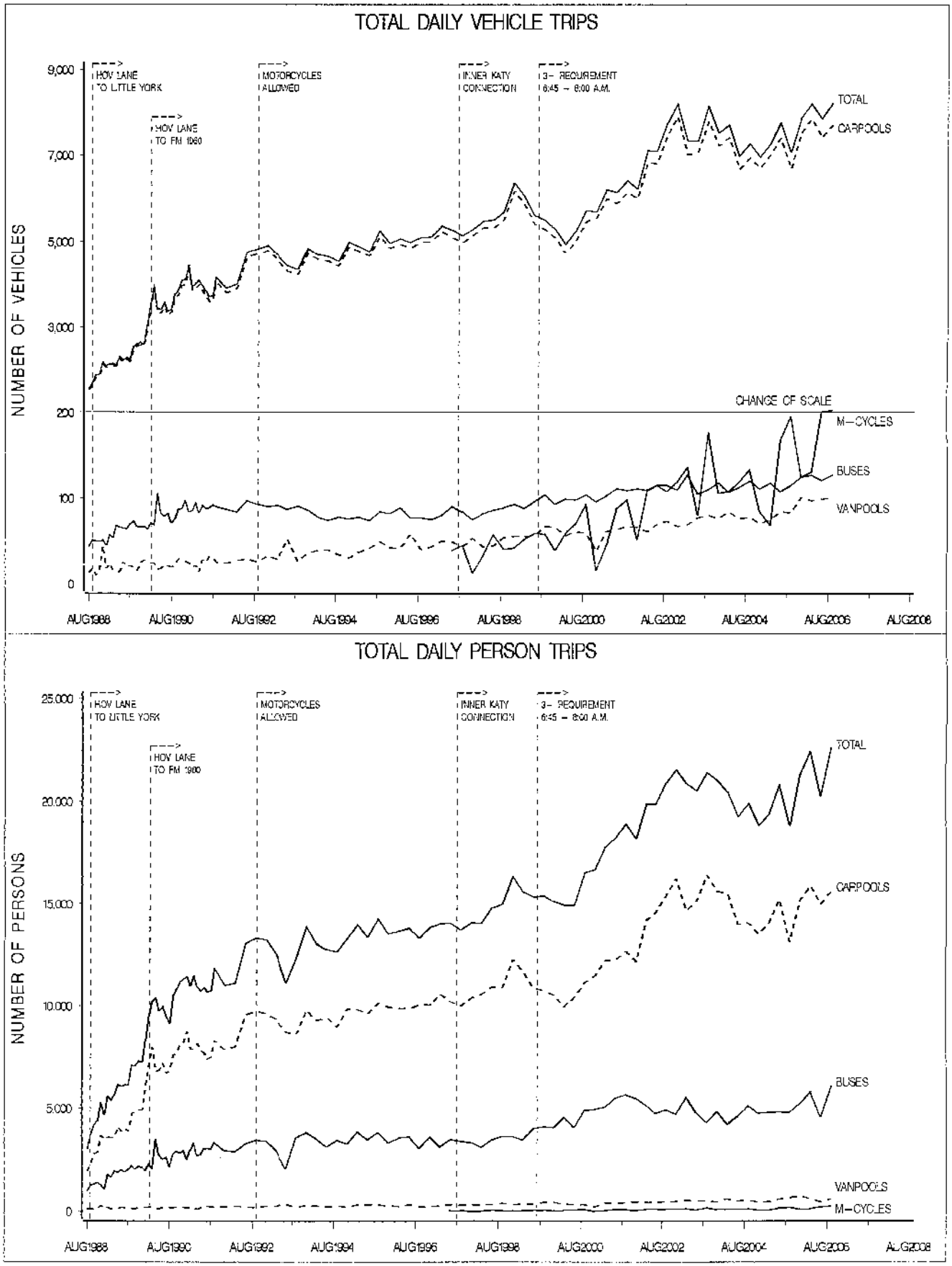




NORTHWEST FREEWAY (US 290) HOV LANE UTILIZATION



NORTHWEST FREEWAY (US 290) HOV LANE UTILIZATION



SOUTHWEST FREEWAY (US-59S) HOV LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	3	110	36.67	2	50	25.00			
Peak Period	15	420	28.00	12	240	20.00	27	660	24.44
Off-Peak	0	0	-	0	0	-	0	0	-
Total	15	420	28.00	12	240	20.00	27	660	24.44
NON-METRO BUSES									
Peak Hour	5	170	34.00	5	170	34.00			
Peak Period	12	410	34.17	10	350	35.00	22	760	34.55
Off-Peak	0	0	-	0	0	-	0	0	
Total	12	410	34.17	10	350	35.00	22	760	34.55
BUSES (60 PERSON)									
Peak Hour	36	2,185	60.69	41	2,325	56.71			
Peak Period	86	4,895	56.92	97	5,145	53.04	183	10,040	54.86
Off-Peak	0	0	-	0	0	-	0	0	-
Total	86	4,895	56.92	97	5,145	53.04	183	10,040	54.86
VANPOOLS									
Peak Hour	6	27	4.50	21	183	8.71			
Peak Period	38	267	7.03	61	503	8.25	99	770	7.78
Off-Peak	0	0	-	0	0	-	0	0	-
Total	38	267	7.03	61	503	8.25	99	770	7.78
CARPOOLS									
Peak Hour	1,615	3,390	2.10	1,329	2,823	2.12			
Peak Period	3,545	7,403	2.09	3,199	6,850	2.14	6,744	14,253	2.11
Off-Peak	321	642	2.00	635	1,270	2.00	956	1,912	2.00
Total	3,866	8,045	2.08	3,834	8,120	2.12	7,700	16,165	2.10
MOTORCYCLES									
Peak Hour	20	20	1.00	30	30	1.00			
Peak Period	70	70	1.00	78	78	1.00	148	148	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	70	70	1.00	78	78	1.00	148	148	1.00
TOTAL VEHICLES									
Peak Hour	1,685	5,902	3.50	1,428	5,581	3.91			
Peak Period	3,766	13,455	3.58	3,457	13,166	3.81	7,223	26,631	3.69
Off-Peak	321	642	2.00	635	1,270	2.00	956	1,912	2.00
Total	4,087	14,107	3.45	4,092	14,436	3.53	8,179	28,543	3.49

Data collected North of the Hillcroft Transit Center.

HOV Lane operates from 5:00 a.m. to 11:00 a.m. inbound and from 2:00 p.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane.

AM Peak Hour was 7:15 a.m. - 8:15 a.m.

PM Peak Hour was 5:00 p.m. - 6:00 p.m.

Source: Texas Transportation Institute

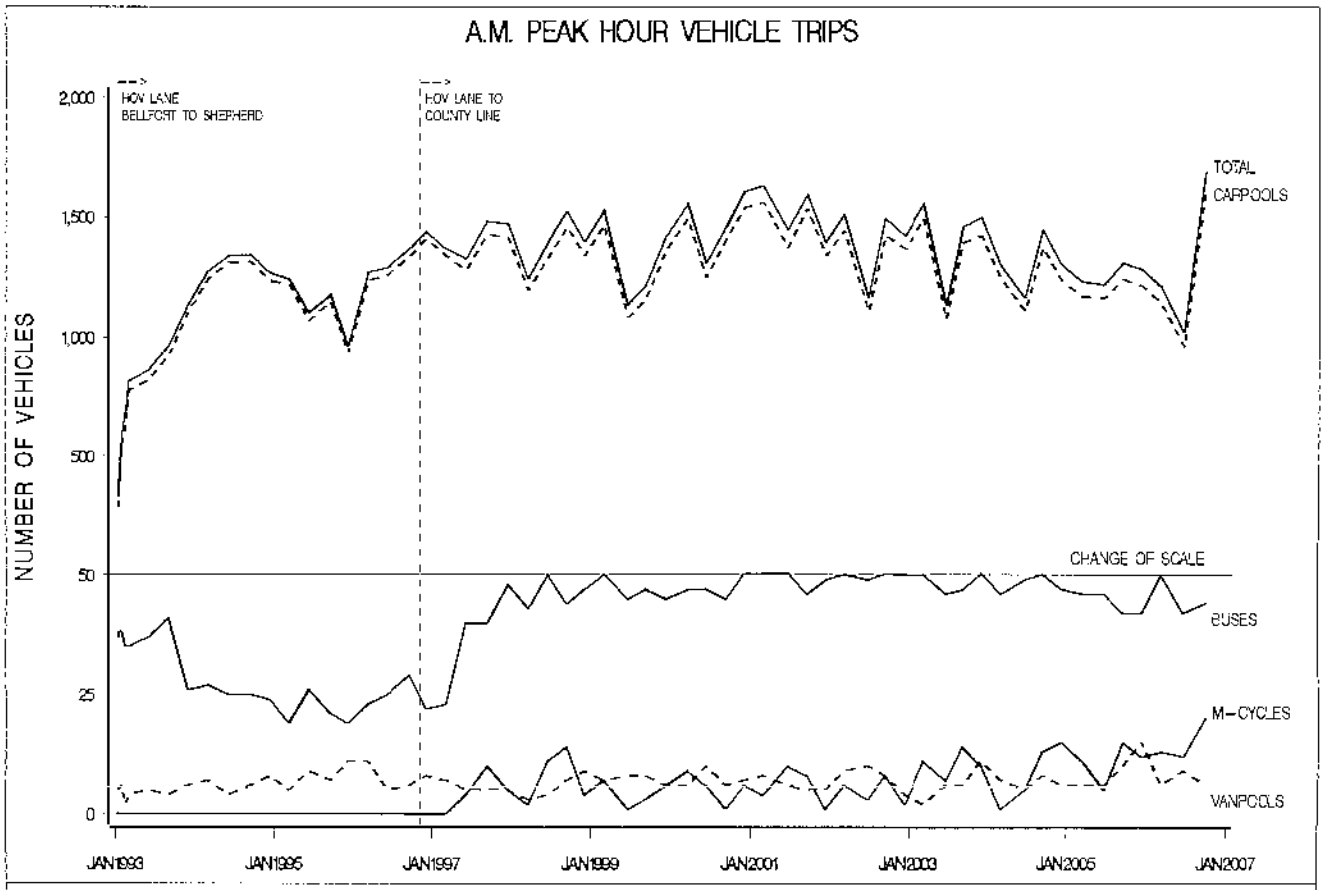
HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR SOUTHWEST FREEWAY (US 59S) HOV LANE

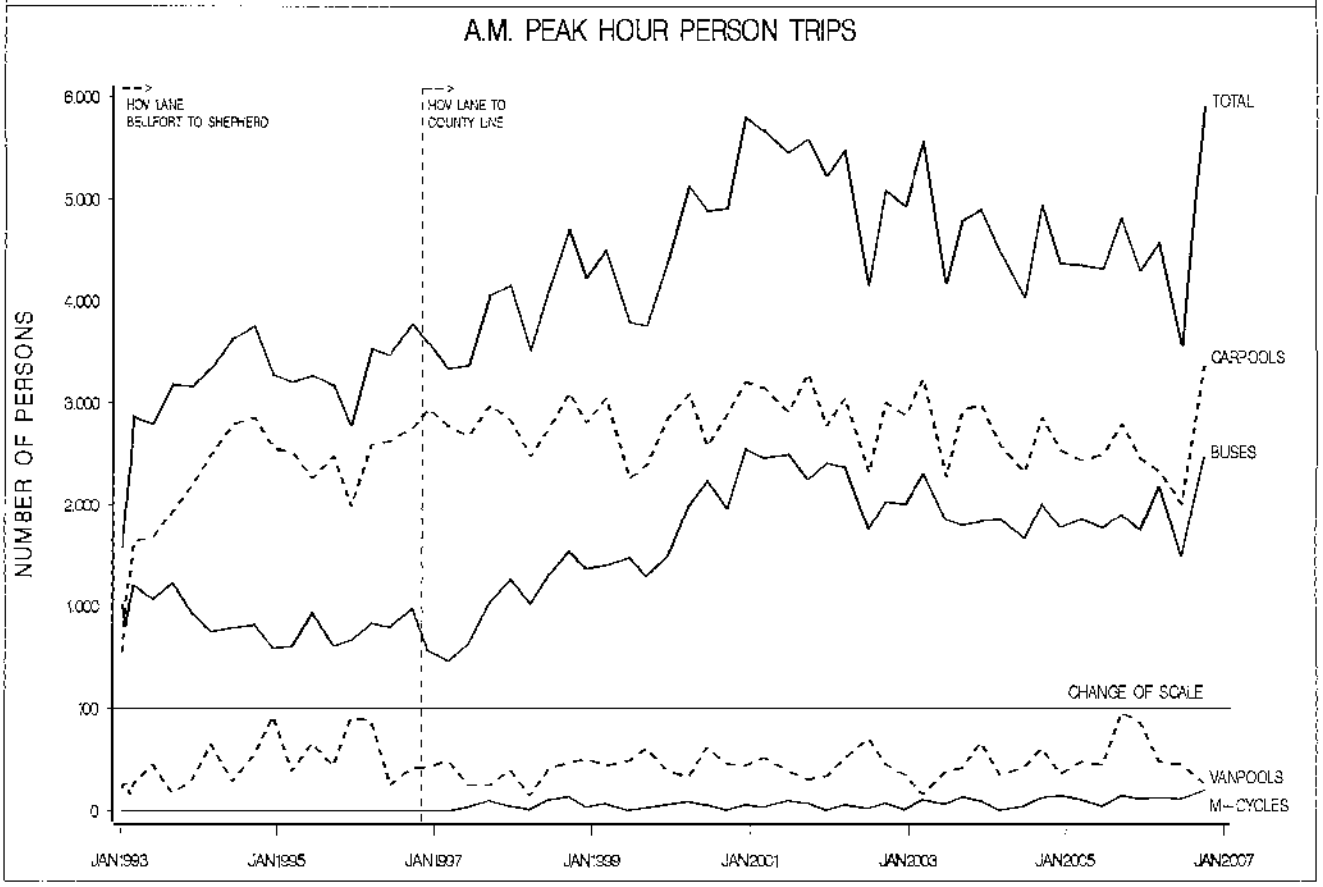
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Temporary West Loop P-N-R Open		0.0		06/77						
Temporary Westwood P-N-R Open		0.0		05/78						
Alief P-N-R Open		0.0		04/81						
Westwood P-N-R Open		0.0		07/81						
Missouri City P-N-R Open		0.0		11/81						
West Loop P-N-R Open		0.0		05/83						
Mission Bend P-N-R Open		0.0		02/92						
Begin HOV Lane Operation	Shepherd to Bellfort	11.1	4 AM - 1 PM, 2 PM - 10 PM	01/11/93	X	X	X	X	X	X
W Bellfort P-N-R Open	Shepherd to Bellfort	11.1	4 AM - 1 PM, 2 PM - 10 PM	01/93	X	X	X	X	X	X
Hillcroft Transit Center / P-N-R Open	Shophord to Bellfort	11.1	4 AM - 1 PM, 2 PM - 10 PM	05/93	X	X	X	X	X	X
Revise HOV Lane Operations	Shepherd to Bellfort	11.1	5 AM - 10 AM, 3 PM - 8 PM	03/14/94	X	X	X	X	X	X
Revise HOV Lane Operations	Shepherd to Bellfort	11.1	5 AM - 12 PM, 2 PM - 9 PM	04/04/94	X	X	X	X	X	X
Revise HOV Lane Operations	Shepherd to Bellfort	11.1	5 AM - 11 AM, 2 PM - 8 PM	09/30/96	X	X	X	X	X	X
Gessner P-N-R Open	Shepherd to Bellfort	11.1	5 AM - 11 AM, 2 PM - 8 PM	1996	X	X	X	X	X	X
HOV Lane Extended to Permanent Slip Ramps	Shepherd to Co. Line	11.5	5 AM - 11 AM, 2 PM - 8 PM	11/04/96	X	X	X	X	X	X
Greenway Plaza Ramp Open	Shepherd to Co. Line	11.5	5 AM - 11 AM, 2 PM - 8 PM	05/30/00	X	X	X	X	X	X

HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR SOUTHWEST FREEWAY (US 59S) HOV LANE

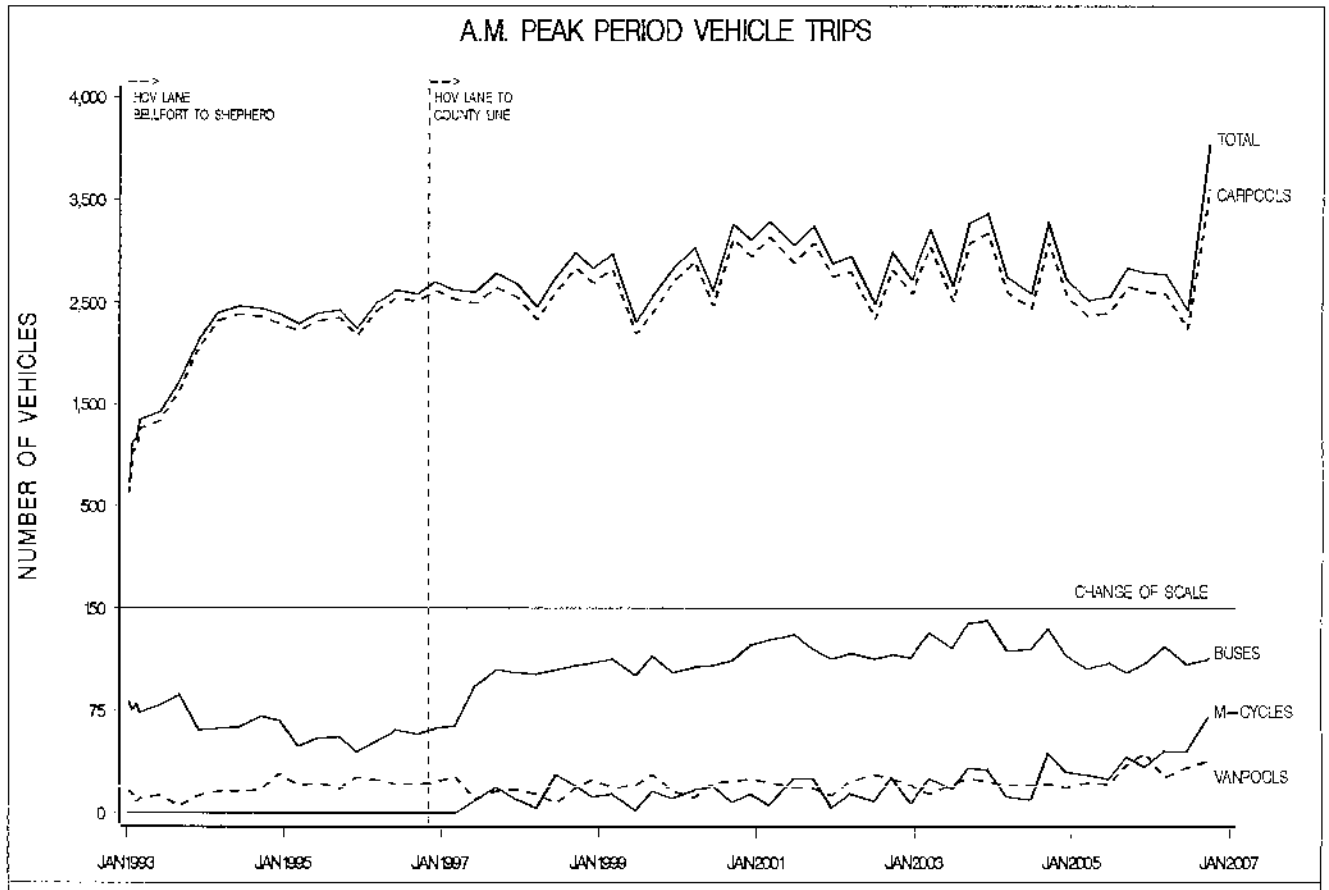
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Westpark Ramp Closed due to Construction	Shepherd to Co. Line	11.5	5 AM - 11 AM, 2 PM - 8 PM	01/02	X	X	X	X	X	X
W. Bellfort P N R Expansion	Shepherd to Co. Line	11.5	5 AM - 11 AM, 2 PM - 8 PM	01/03	X	X	X	X	X	X
Alief-Boone P-N-R Closed	Shepherd to Co. Line	11.5	5 AM - 11 AM, 2 PM - 8 PM	01/22/05	X	X	X	X	X	X
Westchase P-N-R Open	Shepherd to Co. Line	11.5	5 AM - 11 AM, 2 PM - 8 PM	06/04	X	X	X	X	X	X
HOV Lane Extended	Louisiana to Co. Line	14.3	5 AM - 11 AM, 2 PM - 8 PM	05/22/06	X	X	X	X	X	X

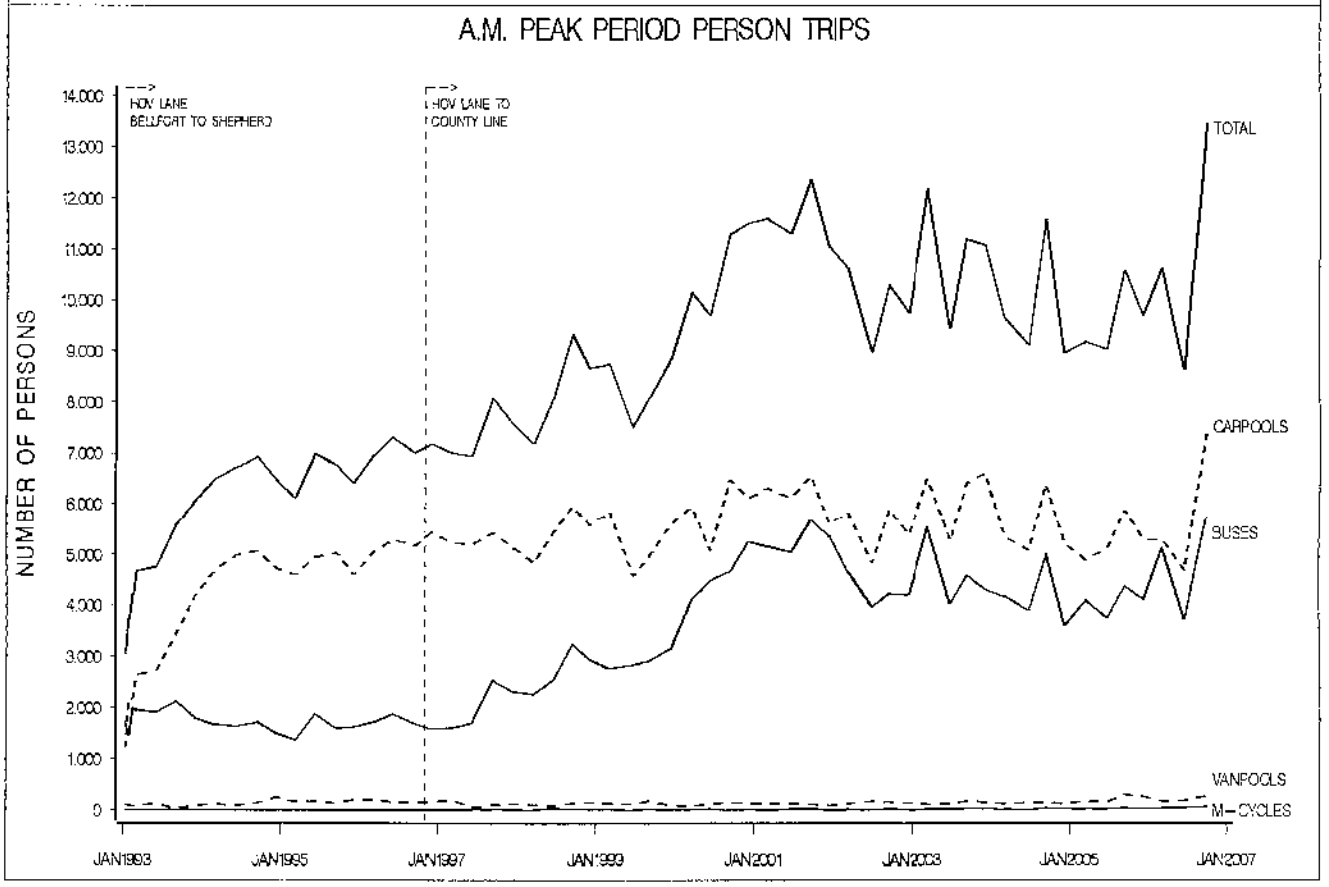
SOUTHWEST FREEWAY (US 59S) HOV LANE UTILIZATION



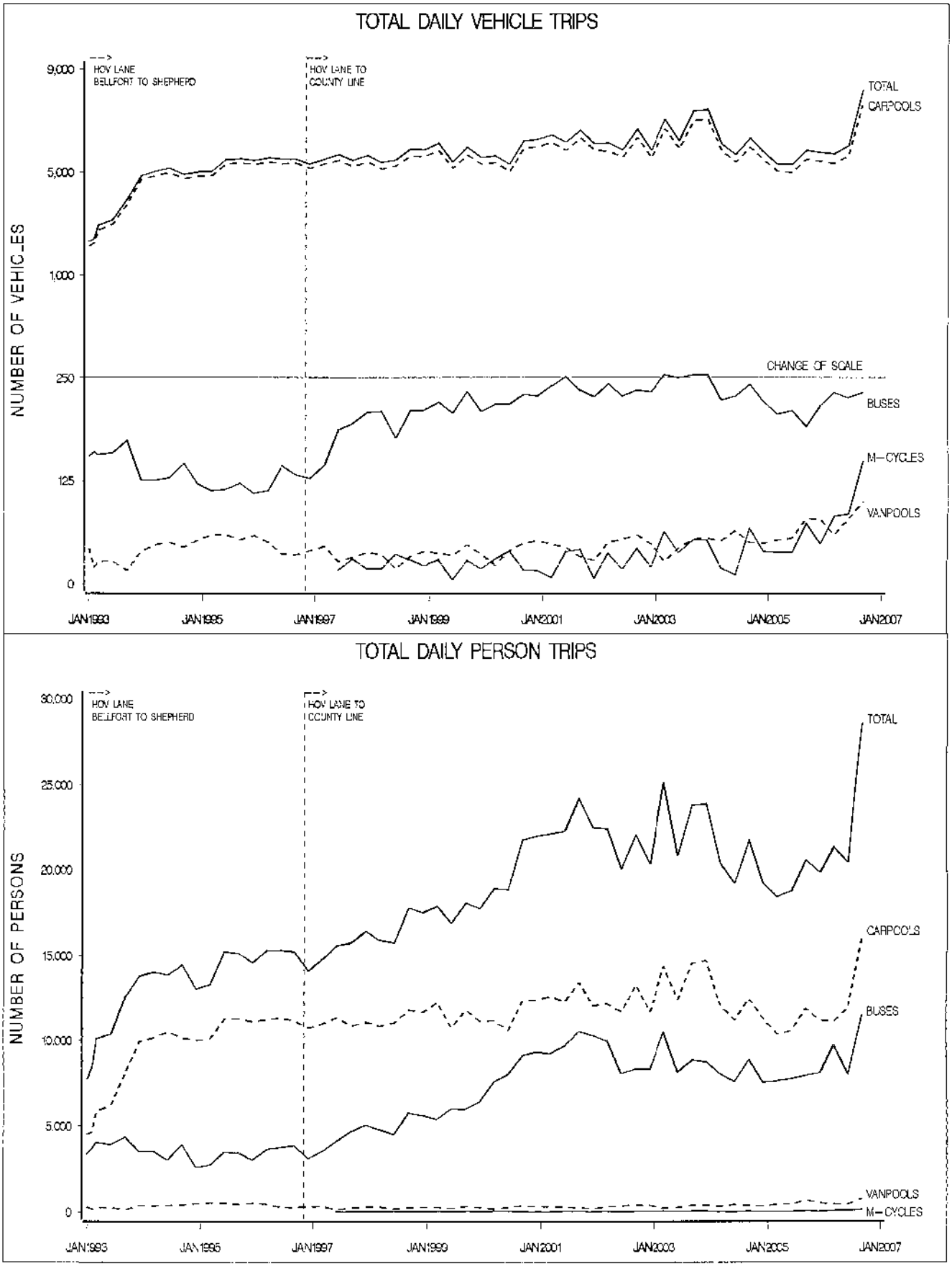


SOUTHWEST FREEWAY (US 59S) HOV LANE UTILIZATION





SOUTHWEST FREEWAY (US 59S) HOV LANE UTILIZATION



EASTEX FREEWAY (US-59N) HOV LANE OPERATIONAL SUMMARY
SEPTEMBER 2006

VEHICLE CLASS	A.M. - INBOUND			P.M. - OUTBOUND			TOTAL		
	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy	Vehicles	Persons	Average Occupancy
BUSES (40 PERSON)									
Peak Hour	0	0	-	0	0	-			
Peak Period	0	0	-	0	0	-	0	0	-
Off-Peak	0	0	-	0	0	-	0	0	-
Total	0	0	-	0	0	-	0	0	-
NON-METRO BUSES									
Peak Hour	0	0	-	0	0	-			
Peak Period	0	0	-	0	0	-	0	0	-
Off-Peak	0	0	-	0	0	-	0	0	
Total	0	0	-	0	0	-	0	0	-
BUSES (60 PERSON)									
Peak Hour	15	840	56.00	20	1,050	52.50			
Peak Period	37	2,025	54.73	44	2,310	52.50	81	4,335	53.52
Off-Peak	0	0	-	0	0	-	0	0	-
Total	37	2,025	54.73	44	2,310	52.50	81	4,335	53.52
VANPOOLS									
Peak Hour	5	36	7.20	18	92	5.11			
Peak Period	38	264	6.95	40	223	5.58	78	487	6.24
Off-Peak	0	0	-	0	0	-	0	0	-
Total	38	264	6.95	40	223	5.58	78	487	6.24
CARPOOLS									
Peak Hour	718	1,478	2.06	581	1,235	2.13			
Peak Period	1,392	2,867	2.06	1,288	2,733	2.12	2,680	5,600	2.09
Off-Peak	101	202	2.00	119	238	2.00	220	440	2.00
Total	1,493	3,069	2.06	1,407	2,971	2.11	2,900	6,040	2.08
MOTORCYCLES									
Peak Hour	36	36	1.00	29	29	1.00			
Peak Period	98	98	1.00	77	77	1.00	175	175	1.00
Off-Peak	-	-	-	-	-	-	-	-	-
Total	98	98	1.00	77	77	1.00	175	175	1.00
TOTAL VEHICLES									
Peak Hour	775	2,510	3.24	648	2,406	3.71			
Peak Period	1,565	5,254	3.36	1,449	5,343	3.69	3,014	10,597	3.52
Off-Peak	101	202	2.00	119	238	2.00	220	440	2.00
Total	1,666	5,456	3.27	1,568	5,581	3.56	3,234	11,037	3.41

Data collected South of the Tidwell Transit Center.

HOV Lane operates from 5:00 a.m. to 11:00 a.m. inbound and from 2:00 p.m. to 8:00 p.m. outbound.

All 2+ vehicles are eligible to use the HOV lane.

AM Peak Hour was 7:15 a.m. - 8:15 a.m.

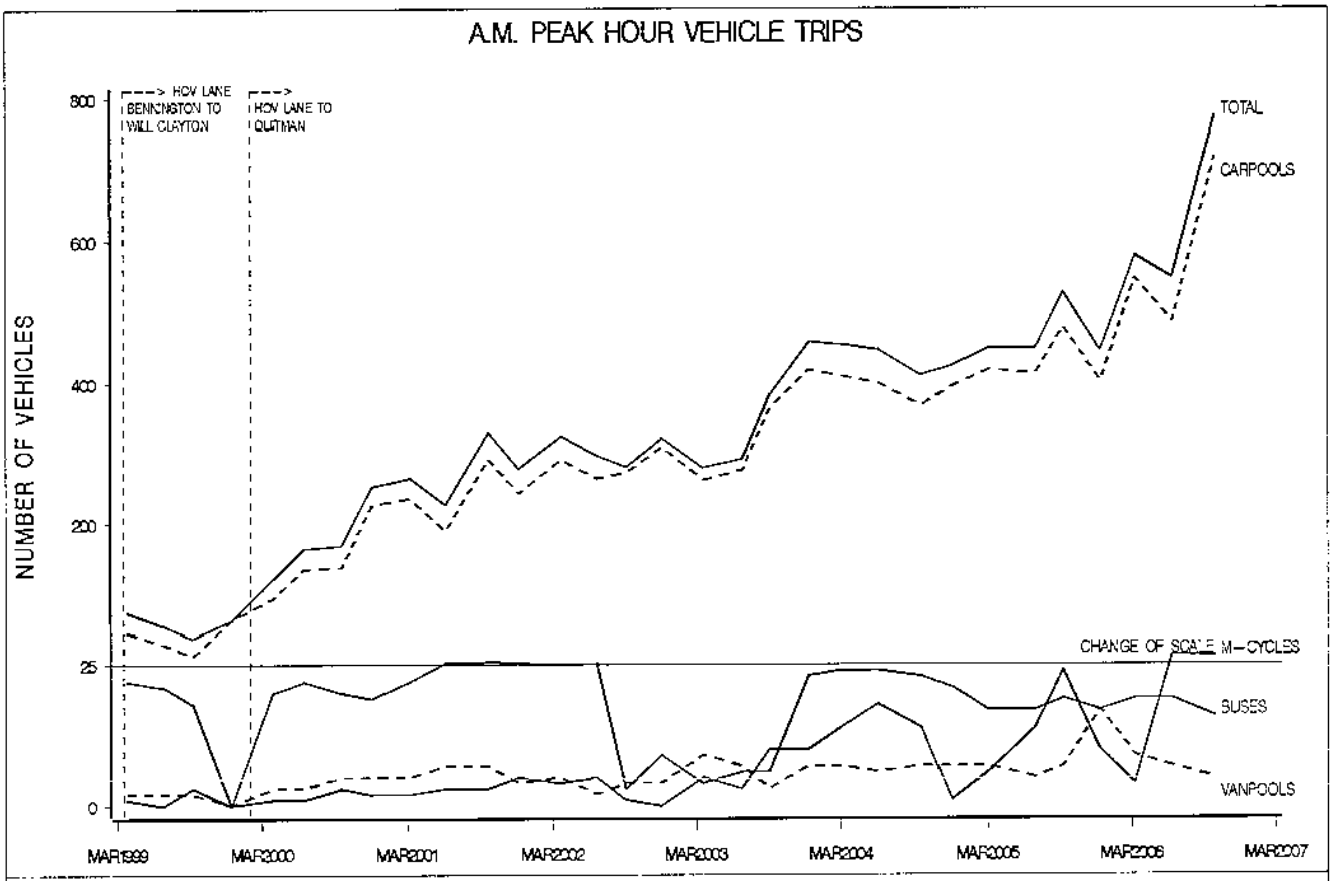
PM Peak Hour was 5:00 p.m. - 6:00 p.m.

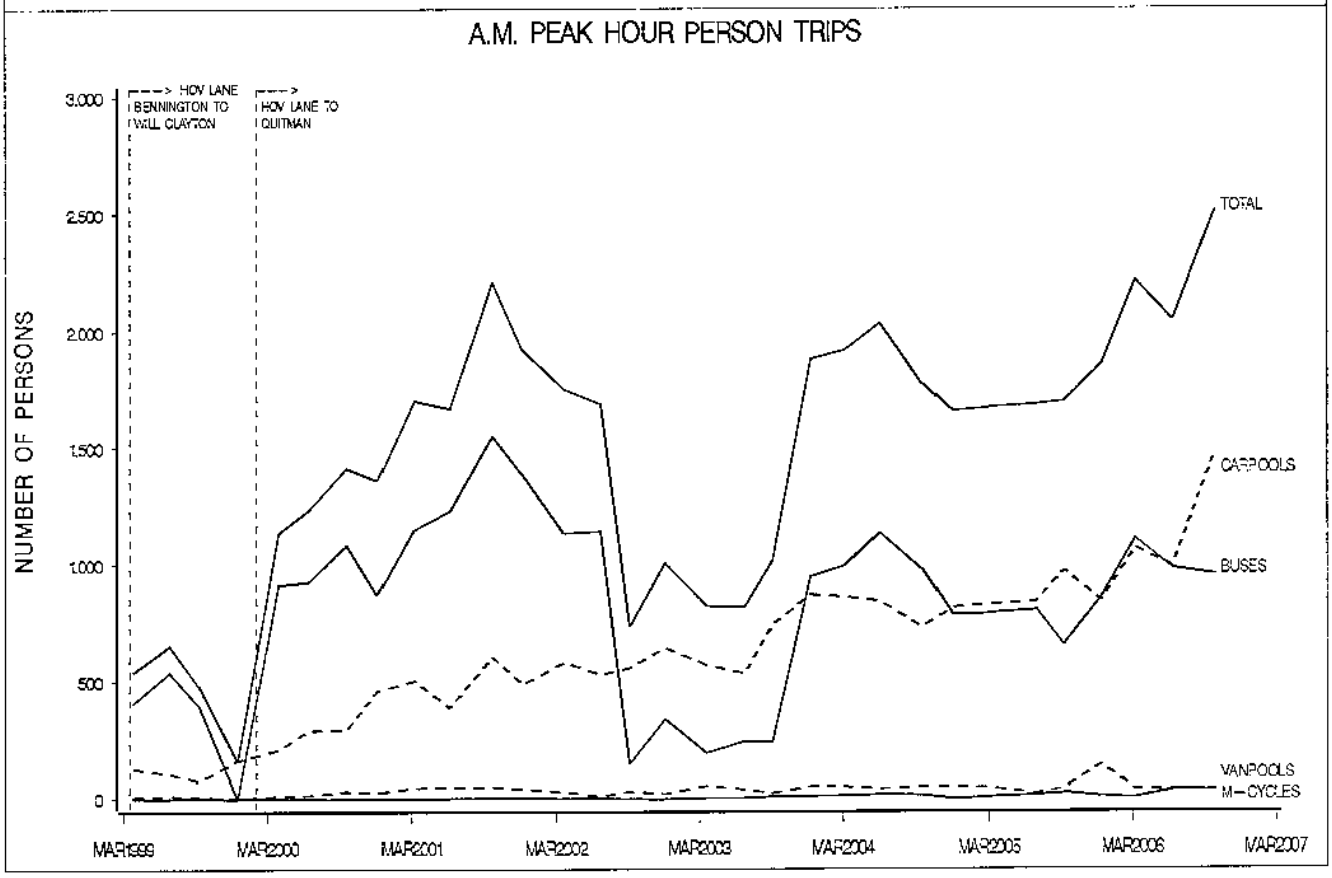
Source: Texas Transportation Institute

HOV LANE OPERATION - OPENING DATES AND VEHICLE AUTHORIZATION FOR EASTEX FREEWAY (US 59N) HOV LANE

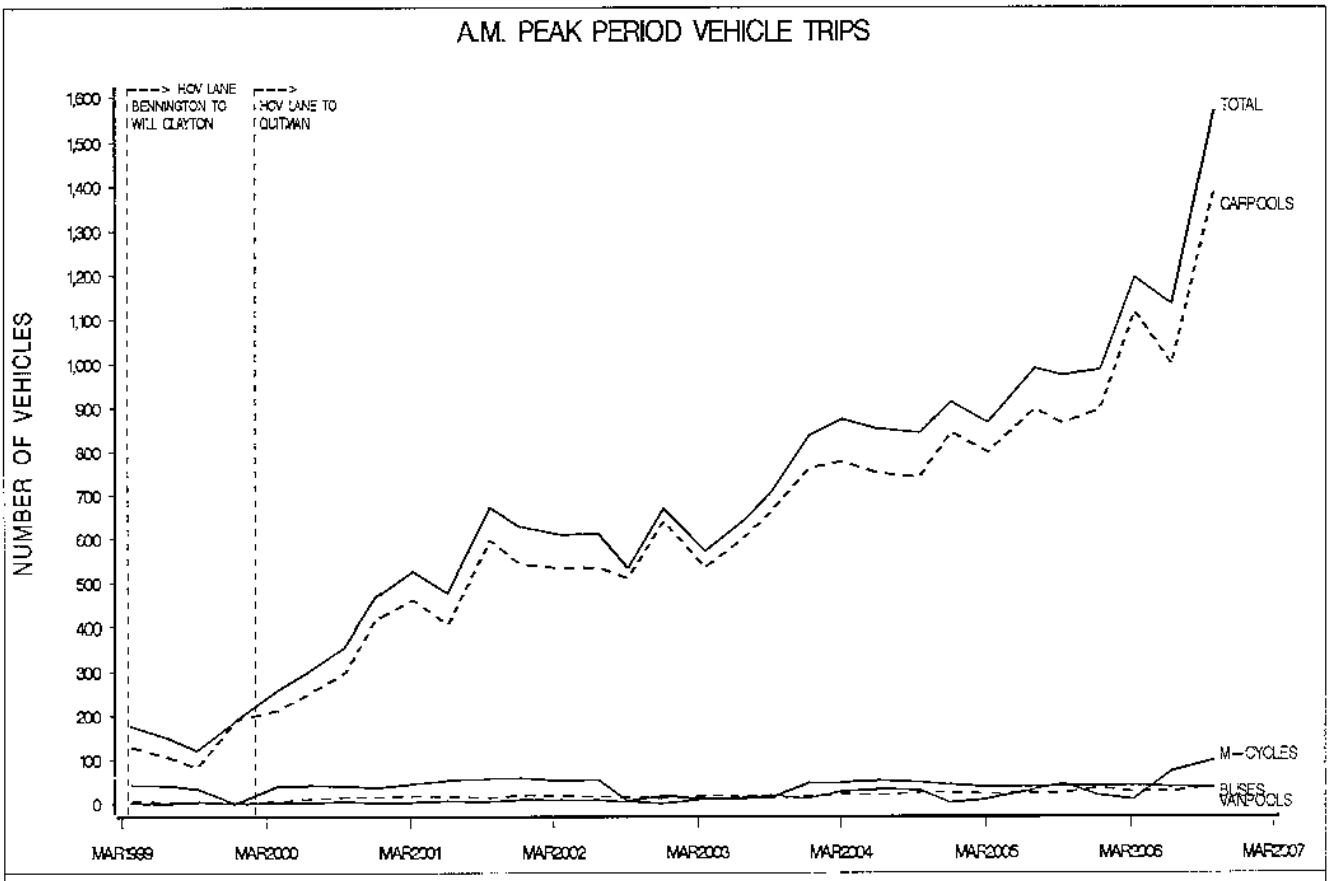
					Authorized Vehicles					
Operation	Limits	Length	Time	Date	Buses	Vanpools	Carpools			Motorcycle
							4 plus	3 plus	2 plus	1 plus
Temporary Kingwood P-N-R Open		0.0		11/79						
Kingwood P-N-R Open		0.0		01/81						
Eastex P-N-R Open		0.0		07/83						
Tidwell Transit Center / P-N-R Open		0.0		12/90						
Begin HOV Lane Operation	Bennington to Will Clayton	11.9	5 AM - 11 AM, 2 PM - 8 PM	03/15/99	X	X	X	X	X	X
HOV Lane Extended	Quitman to Will Clayton	14.8	5 AM - 11 AM, 2 PM - 8 PM	02/01/00	X	X	X	X	X	X
Townsen P-N-R Open	Quitman to Will Clayton	14.8	5 AM - 11 AM, 2 PM - 8 PM	2001	X	X	X	X	X	X
HOV Lane Extended	CBD to South of Kingwood Drive	19.9	5 AM - 11 AM, 2 PM - 8 PM	1/19/04	X	X	X	X	X	X

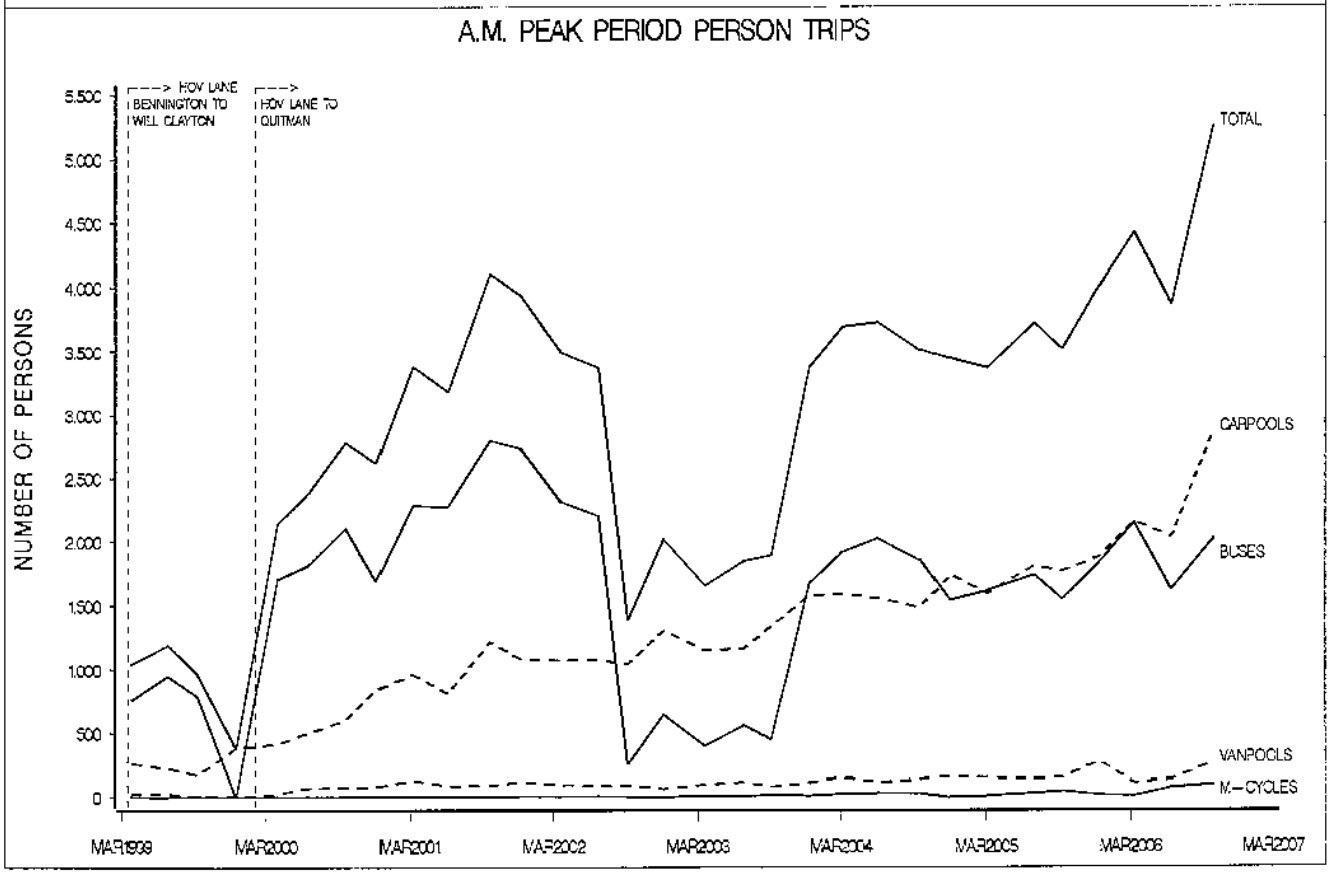
EASTEX FREEWAY (US 59N) HOV LANE UTILIZATION



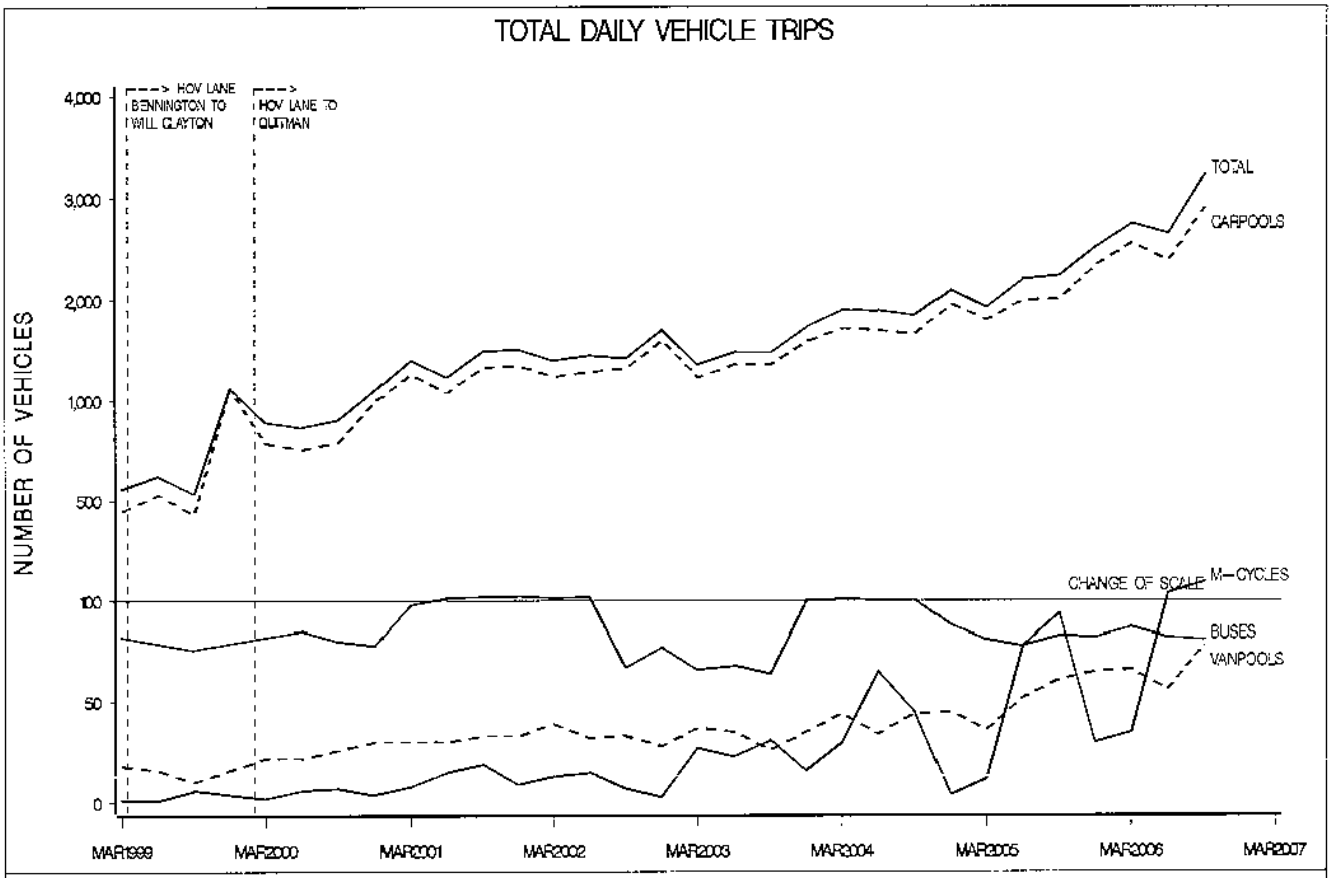


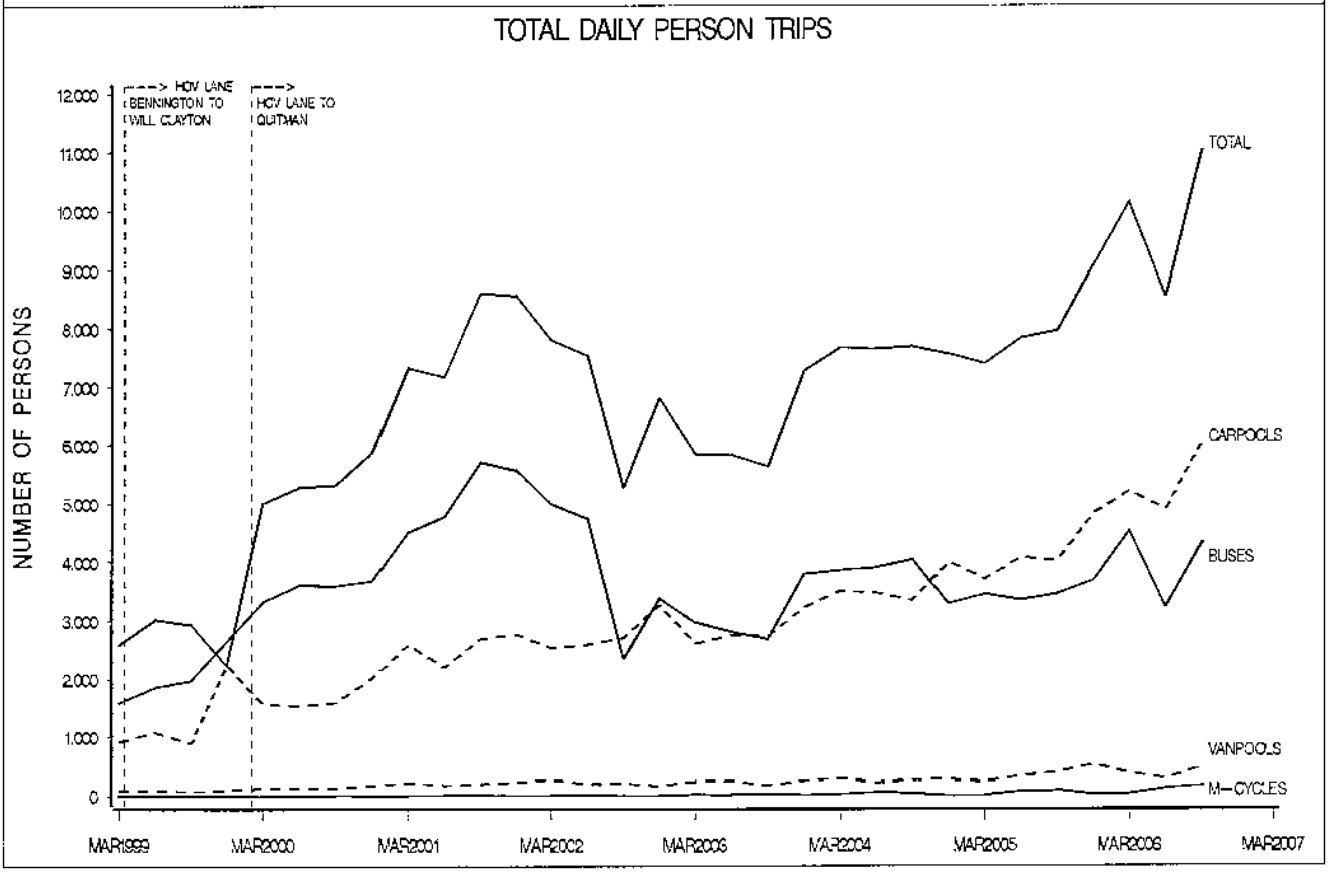
EASTEX FREEWAY (US 59N) HOV LANE UTILIZATION





EASTEX FREEWAY (US 59N) HOV LANE UTILIZATION





KATY FREEWAY

OPERATING SPEED DATA NOT AVAILABLE

FOR SEPTEMBER 2006

DUE TO CONSTRUCTION ACTIVITIES

KATY FREEWAY

MAINLANE AVI SPEED DATA NOT AVAILABLE

FOR SEPTEMBER 2006

DUE TO CONSTRUCTION ACTIVITIES

KATY FREEWAY

HOV AVI SPEED DATA NOT AVAILABLE

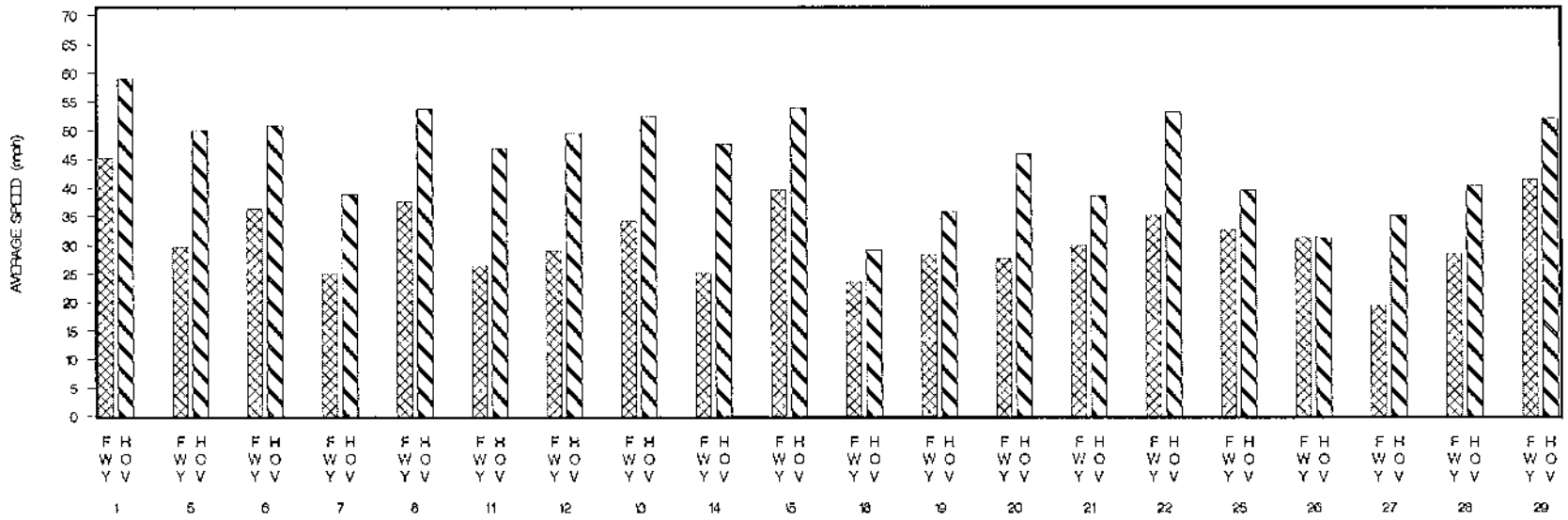
FOR SEPTEMBER 2006

DUE TO CONSTRUCTION ACTIVITIES

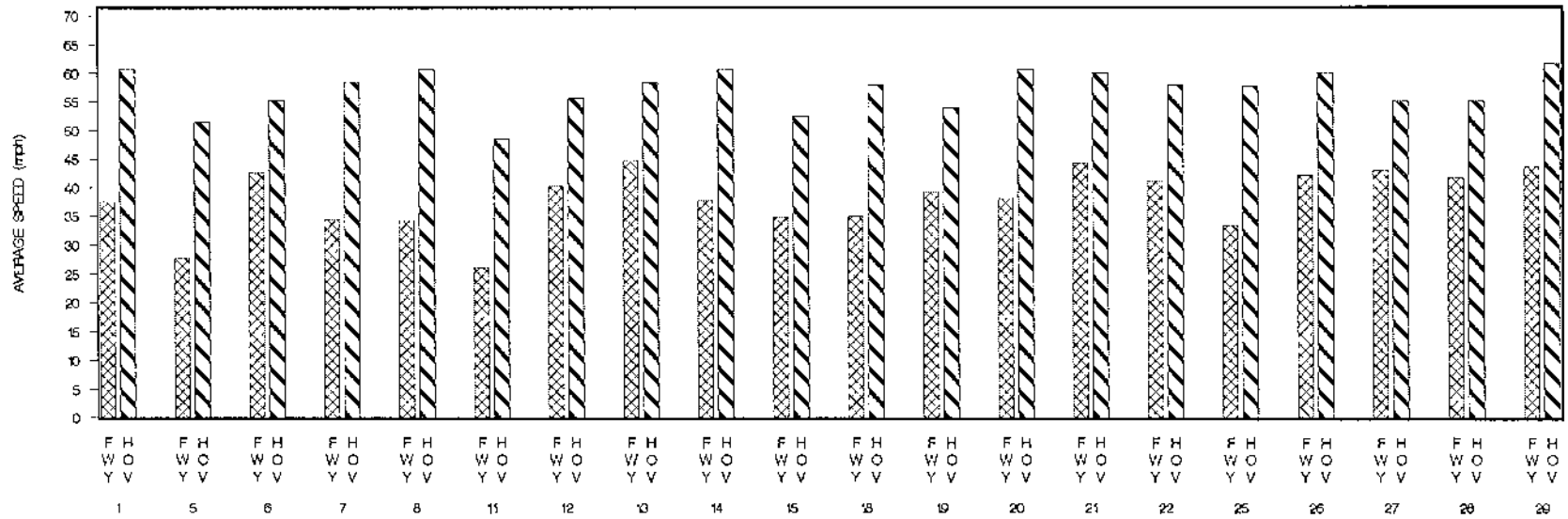
IH 45N NORTH FREEWAY AND HOV LANE OPERATING SPEEDS (September 2006)

(HOV Limits: FM 1960 to Crosstimbers; FWY Limits: FM 1960 to Quitman)

DIRECTION= INBOUND (AM)



DIRECTION= OUTBOUND (PM)



IH 45N North Freeway Mainlanes -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
FM 1960 to Aldine Bender	7.00	6.36	66.0	7.38	57.1	6.29	66.8	6.83	61.5	6.40	65.6	6.40	65.6	7.29	57.6	7.59	55.3
Aldine Bender to Shepherd	3.60	5.11	42.3	5.98	36.1	5.21	41.5	5.19	41.6	6.13	35.2	4.71	45.9	8.16	26.5	5.77	37.4
Shepherd to Crosstimbers	4.60	9.58	28.8	5.74	48.1	8.97	30.8	5.02	55.0	9.21	30.0	4.94	55.9	12.58	21.9	5.20	53.1
Crosstimbers to I-10	2.52	4.47	33.8	2.58	58.6	4.17	36.3	2.53	59.8	3.94	38.4	2.43	62.2	5.05	29.9	2.42	62.5
OUTBOUND																	
I-10 to Crosstimbers	2.52	2.41	62.7	3.82	39.6	2.32	65.2	3.89	38.9	2.11	71.7	3.86	39.2	2.33	64.9	4.80	31.5
Crosstimbers to Shepherd	4.60	4.38	63.0	9.39	29.4	4.73	58.4	8.30	33.3	4.95	55.8	8.13	33.9	4.54	60.8	9.94	27.8
Shepherd to Aldine Bender	3.60	3.51	61.5	4.42	48.9	3.44	62.8	4.19	51.6	3.46	62.4	4.12	52.4	3.47	62.2	4.38	49.3
Aldine Bender to FM 1960	7.00	6.14	68.4	9.09	46.2	6.12	68.6	7.00	60.0	6.02	69.8	6.44	65.2	6.41	65.5	7.18	58.5
Inbound (Southbound) Average		*25.52*	*41.7*	*21.66*	*49.1*	*24.64*	*43.1*	*19.57*	*54.3*	*25.68*	*41.4*	*18.48*	*57.5*	*33.08*	*32.1*	*20.98*	*50.7*
Outbound (Northbound) Average		*16.44*	*64.7*	*26.72*	*39.8*	*16.61*	*64.0*	*23.38*	*45.5*	*16.54*	*64.3*	*22.55*	*47.1*	*16.75*	*63.5*	*26.30*	*40.4*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
FM 1960 to Aldine Bender	7.00	6.91	60.8	7.74	54.3	7.66	54.8	7.06	59.5	7.22	58.2	9.54	44.0				
FM 1960 to Kuykendahl	5.10													6.45	47.4	4.62	66.2
Kuykendahl to Aldine Bender	1.90													2.98	38.3	2.47	46.2
Aldine Bender to Shepherd	3.60	5.87	36.8	5.80	37.2	5.85	36.9	5.06	42.7	6.38	33.9	5.08	42.5	9.11	23.7	5.69	38.0
Shepherd to Crosstimbers	4.60	9.89	27.9	5.94	46.5	8.81	31.3	5.13	53.8	8.84	31.2	5.09	54.2	11.99	23.0	5.33	51.8
Crosstimbers to I-10	2.52	4.12	36.7	2.63	57.5	3.86	39.2	2.53	59.8	3.56	42.5	2.40	63.0	4.79	31.6	2.54	59.5
OUTBOUND																	
I-10 to Crosstimbers	2.52	2.52	60.0	5.27	28.7	2.43	62.2	4.72	32.0	2.37	63.8	5.11	29.6	2.43	62.2	4.91	30.8
Crosstimbers to Shepherd	4.60	4.65	59.4	10.70	25.8	4.62	59.7	9.03	30.6	4.32	63.9	10.69	25.8	5.10	54.1	10.48	26.3
Shepherd to Aldine Bender	3.60	3.50	61.7	4.57	47.3	3.69	58.5	4.60	47.0	3.46	62.4	4.75	45.5	3.87	55.8	4.45	48.5
Aldine Bender to Kuykendahl	1.90													1.62	70.4	1.94	58.8
Kuykendahl to FM 1960	5.10													4.47	68.5	6.72	45.5
Aldine Bender to FM 1960	7.00	6.17	68.1	8.10	51.9	6.23	67.4	8.79	47.8	6.72	62.5	8.24	51.0				
Inbound (Southbound) Average		*26.79*	*39.7*	*22.11*	*48.1*	*26.18*	*40.6*	*19.78*	*53.8*	*26.00*	*40.9*	*22.11*	*48.1*	*35.32*	*30.1*	*20.65*	*51.5*
Outbound (Northbound) Average		*16.84*	*63.1*	*28.64*	*37.1*	*16.97*	*62.7*	*27.14*	*39.2*	*16.87*	*63.0*	*28.79*	*36.9*	*17.49*	*60.8*	*28.50*	*37.3*

Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.
7. Added Kuykendahl Freeway station Summer 2006.

IH 45N North Freeway HOV Lane -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
FM 1960 to Aldine Bender	7.00	6.10	68.9	n/a	n/a	6.13	68.5	n/a	n/a	6.23	67.4	n/a	n/a	6.25	67.2	n/a	n/a
Aldine Bender to Shepherd	3.60	3.71	58.2	n/a	n/a	3.68	58.7	n/a	n/a	3.61	59.8	n/a	n/a	5.37	40.2	n/a	n/a
Shepherd to Crosstimbers	4.60	5.79	47.7	n/a	n/a	5.32	51.9	n/a	n/a	5.13	53.8	n/a	n/a	6.65	41.5	n/a	n/a
Crosstimbers to I-10	3.35	3.66	54.9	n/a	n/a	3.61	55.7	n/a	n/a	3.66	54.9	n/a	n/a	3.91	51.4	n/a	n/a
OUTBOUND																	
I-10 to Crosstimbers	3.35	n/a	n/a	3.88	51.8	n/a	n/a	3.70	54.3	n/a	n/a	3.81	52.8	n/a	n/a	3.66	54.9
Crosstimbers to Shepherd	4.60	n/a	n/a	5.53	49.9	n/a	n/a	5.05	54.7	n/a	n/a	5.51	50.1	n/a	n/a	5.43	50.8
Shepherd to Aldine Bender	3.60	n/a	n/a	3.57	60.5	n/a	n/a	3.44	62.8	n/a	n/a	3.65	59.2	n/a	n/a	3.40	63.5
Aldine Bender to FM 1960	7.00	n/a	n/a	6.56	64.0	n/a	n/a	6.32	66.5	n/a	n/a	6.40	65.6	n/a	n/a	6.59	63.7
Inbound [Southbound] Average		*19.26*	*57.6*	*n/a*	*n/a*	*18.74*	*59.4*	*n/a*	*n/a*	*18.63*	*59.7*	*n/a*	*n/a*	*22.18*	*50.2*	*n/a*	*n/a*
Outbound [Northbound] Average		*n/a*	*n/a*	*19.54*	*57.0*	*n/a*	*n/a*	*18.51*	*60.1*	*n/a*	*n/a*	*19.37*	*57.5*	*n/a*	*n/a*	*19.08*	*58.3*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
FM 1960 to Aldine Bender	7.00	6.27	67.0	n/a	n/a	6.25	67.2	n/a	n/a	6.29	66.8	n/a	n/a	6.77	62.0	n/a	n/a
Aldine Bender to Shepherd	3.60	4.21	51.3	n/a	n/a	4.12	52.4	n/a	n/a	3.52	61.4	n/a	n/a	6.95	31.1	n/a	n/a
Shepherd to Crosstimbers	4.60	5.97	46.2	n/a	n/a	5.80	47.6	n/a	n/a	5.29	52.2	n/a	n/a	7.19	38.4	n/a	n/a
Crosstimbers to I-10	3.35	3.86	52.1	n/a	n/a	3.64	55.2	n/a	n/a	3.83	52.5	n/a	n/a	n/a	n/a	n/a	n/a
OUTBOUND																	
I-10 to Crosstimbers	3.35	n/a	n/a	4.34	46.3	n/a	n/a	3.79	53.0	n/a	n/a	3.67	54.8	n/a	n/a	n/a	n/a
Crosstimbers to Shepherd	4.60	n/a	n/a	6.16	44.8	n/a	n/a	5.54	49.8	n/a	n/a	5.65	48.8	n/a	n/a	6.01	45.9
Shepherd to Aldine Bender	3.60	n/a	n/a	3.55	60.8	n/a	n/a	3.43	63.0	n/a	n/a	3.43	63.0	n/a	n/a	3.58	60.3
Aldine Bender to FM 1960	7.00	n/a	n/a	6.88	61.0	n/a	n/a	6.47	64.9	n/a	n/a	6.61	63.5	n/a	n/a	6.46	65.0
Inbound [Southbound] Average		*20.31*	*54.8*	*n/a*	*n/a*	*19.81*	*56.2*	*n/a*	*n/a*	*18.93*	*58.8*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
Outbound [Northbound] Average		*n/a*	*n/a*	*20.93*	*53.2*	*n/a*	*n/a*	*19.23*	*57.9*	*n/a*	*n/a*	*19.36*	*57.5*	*n/a*	*n/a*	*n/a*	*n/a*

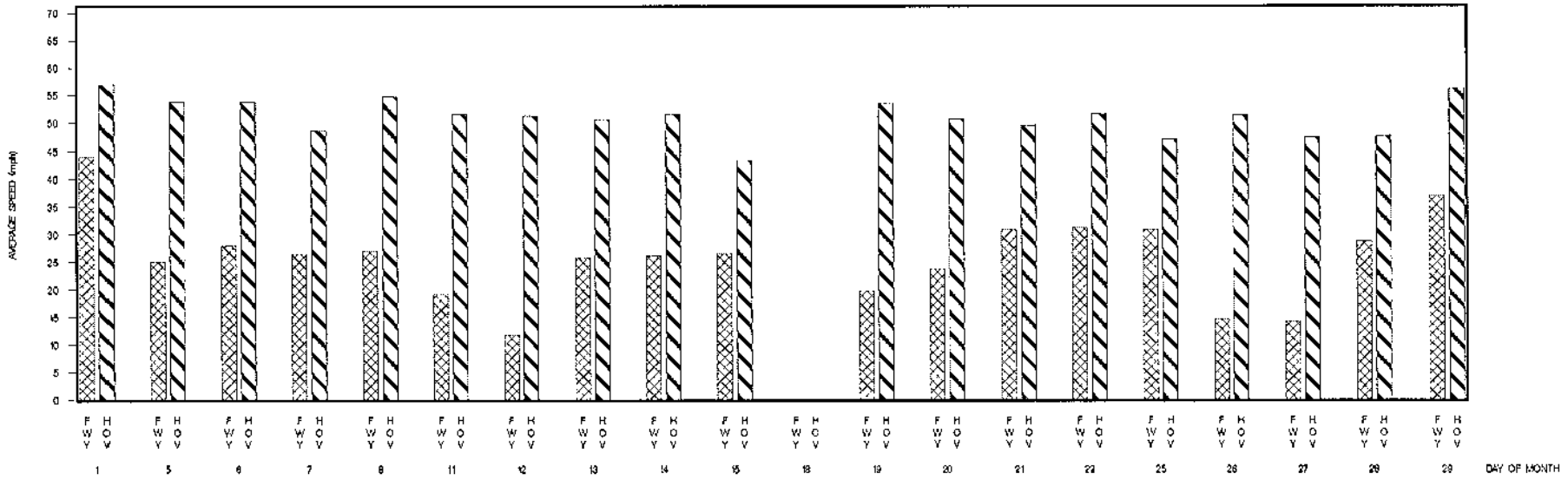
Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.
7. No data for I-10 to Crosstimbers for September 2006.

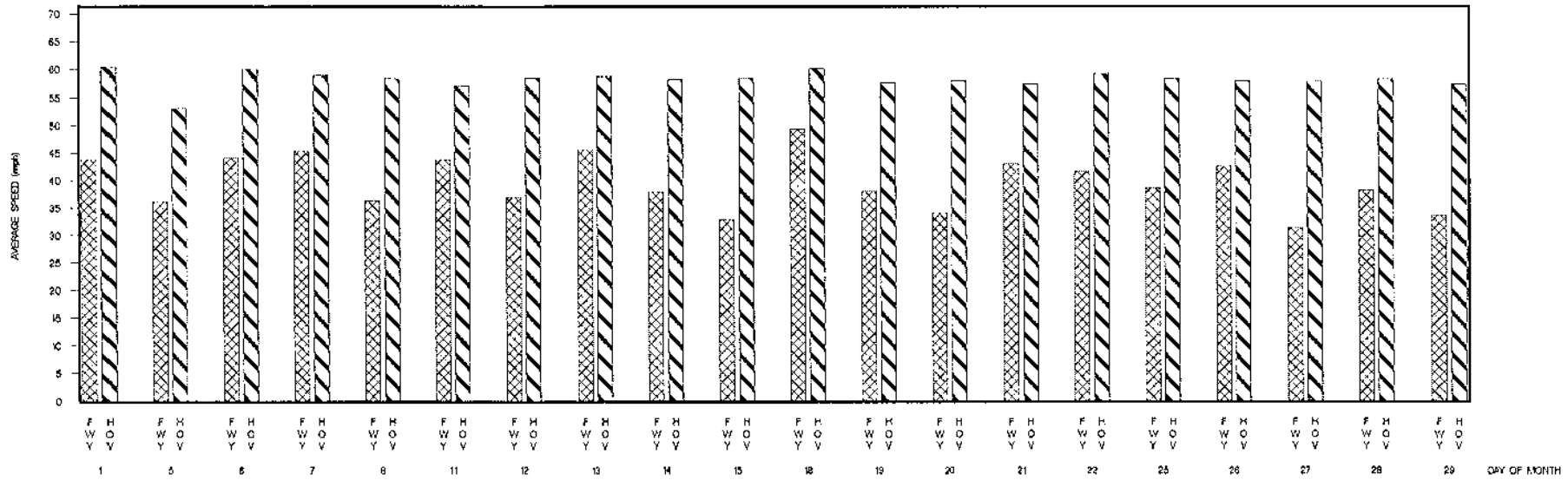
IH 45S GULF FREEWAY AND HOV LANE OPERATING SPEEDS (September 2006)

(HOV Limits: Fuqua to Scott; FWY Limits: Fuqua to Scott)

DIRECTION= INBOUND (AM)



DIRECTION= OUTBOUND (PM)



IH 45S Gulf Freeway Mainlanes -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Fuqua to Edgebrook	1.65	n/a	n/a	n/a	n/a	1.76	56.3	1.49	66.4	1.65	60.0	1.47	67.3	2.04	48.6	1.45	68.3
Edgebrook to Monroe	2.50	n/a	n/a	n/a	n/a	5.10	29.4	2.31	64.9	5.33	28.1	2.28	65.8	7.65	19.6	2.22	67.6
Monroe to Broadway	2.20	5.02	26.3	3.20	41.3	4.52	29.2	3.07	43.0	5.12	25.8	2.47	53.4	6.30	21.0	2.48	53.2
Broadway to Woodridge	1.30	2.33	33.5	1.49	52.3	1.48	52.7	1.63	47.9	1.82	42.9	1.33	58.6	2.17	35.9	1.37	56.9
Woodridge to Wayside	1.60	2.91	33.0	1.59	60.4	2.01	47.8	1.68	57.1	2.51	38.2	1.51	63.6	2.82	34.0	1.68	57.1
Wayside to Scott	2.55	4.88	31.4	3.83	39.9	3.84	39.8	3.53	43.3	4.38	34.9	2.83	54.1	5.10	30.0	4.74	32.3
OUTBOUND																	
Scott to Wayside	2.55	2.44	62.7	3.83	39.9	2.46	62.2	3.83	39.9	2.46	62.2	4.36	35.1	2.52	60.7	3.40	45.0
Wayside to Woodridge	1.60	1.49	64.4	3.41	28.2	1.44	66.7	3.46	27.7	1.46	65.8	3.77	25.5	1.48	64.9	3.77	25.5
Woodridge to Broadway	1.30	1.24	62.9	3.23	24.1	1.23	63.4	3.05	25.6	1.31	59.5	3.22	24.2	1.26	61.9	3.40	22.9
Broadway to Monroe	2.20	1.98	66.7	2.39	55.2	1.98	66.7	2.28	57.9	1.96	67.3	2.33	56.7	2.00	66.0	2.27	58.1
Monroe to Edgebrook	2.50	n/a	n/a	n/a	n/a	2.21	67.9	2.33	64.4	2.22	67.6	2.32	64.7	2.25	66.7	2.33	64.4
Edgebrook to Fuqua	1.65	n/a	n/a	n/a	n/a	1.50	66.0	1.67	59.3	1.53	64.7	1.63	60.7	1.55	63.9	1.59	62.3
Inbound [Northbound] Average		*n/a*	*n/a*	*n/a*	*n/a*	*18.71*	*37.8*	*13.71*	*51.6*	*20.81*	*34.0*	*11.89*	*59.5*	*26.08*	*27.1*	*13.94*	*50.8*
Outbound [Southbound] Average		*n/a*	*n/a*	*n/a*	*n/a*	*10.82*	*65.4*	*16.62*	*42.8*	*10.94*	*64.7*	*17.63*	*40.2*	*11.06*	*64.0*	*16.76*	*42.2*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Fuqua to Edgebrook	1.65	1.45	68.3	1.48	66.9	1.72	57.6	1.52	65.1	1.56	63.5	1.47	67.3	2.07	47.8	1.47	67.3
Edgebrook to Monroe	2.50	3.73	40.2	2.38	63.0	5.53	27.1	2.86	52.4	4.52	33.2	2.21	67.9	7.45	20.1	2.32	64.7
Monroe to Broadway	2.20	4.61	28.6	3.02	43.7	5.25	25.1	3.83	34.5	4.89	27.0	2.46	53.7	6.50	20.3	2.93	45.1
Broadway to Woodridge	1.30	1.46	53.4	1.40	55.7	1.85	42.2	1.38	56.5	1.80	43.3	1.42	54.9	2.68	29.1	1.41	55.3
Woodridge to Wayside	1.60	1.94	49.5	1.60	60.0	2.27	42.3	1.65	61.9	2.26	42.5	1.61	59.6	2.75	34.9	1.52	63.2
Wayside to Scott	2.55	3.36	45.5	3.45	44.3	3.98	38.4	3.73	41.0	3.37	45.4	2.99	51.2	3.87	39.5	3.65	41.9
OUTBOUND																	
Scott to Wayside	2.55	2.49	61.4	3.61	42.4	2.48	61.7	3.76	40.7	2.47	61.9	3.68	41.6	2.46	62.2	3.21	47.7
Wayside to Woodridge	1.60	1.45	66.2	3.83	25.1	1.47	65.3	3.91	24.6	1.45	66.2	3.68	26.1	1.52	63.2	3.98	24.1
Woodridge to Broadway	1.30	1.24	62.9	3.45	22.6	1.27	61.4	3.38	23.1	1.26	61.9	3.51	22.2	1.21	64.5	3.55	22.0
Broadway to Monroe	2.20	1.94	68.0	2.34	56.4	1.98	66.7	2.30	57.4	1.97	67.0	2.58	51.2	1.98	66.7	2.33	56.7
Monroe to Edgebrook	2.50	2.20	68.2	2.36	63.6	2.23	67.3	2.33	64.4	2.21	67.9	2.52	59.5	2.23	67.3	2.32	64.7
Edgebrook to Fuqua	1.65	1.52	65.1	2.06	48.1	1.52	65.1	1.61	61.5	1.51	65.6	1.55	63.9	1.51	65.6	1.66	59.6
Inbound [Northbound] Average		*16.55*	*42.8*	*13.33*	*53.1*	*20.60*	*34.4*	*14.87*	*47.6*	*18.40*	*38.5*	*12.16*	*58.2*	*25.32*	*28.0*	*13.30*	*53.2*
Outbound [Southbound] Average		*10.84*	*65.3*	*17.65*	*40.1*	*10.95*	*64.7*	*17.29*	*40.9*	*10.87*	*65.1*	*17.52*	*40.4*	*10.91*	*64.9*	*17.05*	*41.5*

Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.

IH 45S Gulf Freeway HOV Lane -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Fuqua to Edgebrook	1.65	n/a	n/a	n/a	n/a	1.59	62.3	n/a	n/a	1.57	63.1	n/a	n/a	1.70	58.2	n/a	n/a
Edgebrook to Monroe	2.50	n/a	n/a	n/a	n/a	2.75	54.5	n/a	n/a	2.53	59.3	n/a	n/a	3.98	37.7	n/a	n/a
Monroe to Broadway	2.20	2.67	49.4	n/a	n/a	2.48	53.2	n/a	n/a	2.41	54.8	n/a	n/a	3.11	42.4	n/a	n/a
Broadway to Woodridge	1.30	1.72	45.3	n/a	n/a	1.47	53.1	n/a	n/a	1.49	52.3	n/a	n/a	1.60	48.8	n/a	n/a
Woodridge to Wayside	1.60	2.11	45.5	n/a	n/a	1.68	57.1	n/a	n/a	1.70	56.5	n/a	n/a	1.80	53.3	n/a	n/a
Wayside to Scott	2.55	2.99	51.2	n/a	n/a	2.64	58.0	n/a	n/a	2.67	57.3	n/a	n/a	2.75	55.6	n/a	n/a
OUTBOUND																	
Scott to Wayside	2.55	n/a	n/a	2.72	56.3	n/a	n/a	2.73	56.0	n/a	n/a	2.67	57.3	n/a	n/a	2.65	57.7
Wayside to Woodridge	1.60	n/a	n/a	1.73	55.5	n/a	n/a	1.65	58.2	n/a	n/a	1.60	60.0	n/a	n/a	1.64	58.5
Woodridge to Broadway	1.30	n/a	n/a	1.54	50.6	n/a	n/a	1.54	50.6	n/a	n/a	1.49	52.3	n/a	n/a	1.50	52.0
Broadway to Monroe	2.20	n/a	n/a	2.24	58.9	n/a	n/a	2.24	58.9	n/a	n/a	2.16	61.1	n/a	n/a	2.18	60.6
Monroe to Edgebrook	2.50	n/a	n/a	n/a	n/a	n/a	n/a	2.43	61.7	n/a	n/a	2.43	61.7	n/a	n/a	2.46	61.0
Edgebrook to Fuqua	1.65	n/a	n/a	n/a	n/a	n/a	n/a	1.62	61.1	n/a	n/a	1.62	61.1	n/a	n/a	1.66	59.6
Inbound [Northbound] Average		*n/a*	*n/a*	*n/a*	*n/a*	*12.61*	*56.1*	*n/a*	*n/a*	*12.37*	*57.2*	*n/a*	*n/a*	*14.94*	*47.4*	*n/a*	*n/a*
Outbound [Southbound] Average		*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*12.21*	*58.0*	*n/a*	*n/a*	*11.97*	*59.1*	*n/a*	*n/a*	*12.09*	*58.6*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Fuqua to Edgebrook	1.65	1.55	63.9	n/a	n/a	1.60	61.9	n/a	n/a	1.67	59.3	n/a	n/a	1.77	55.9	n/a	n/a
Edgebrook to Monroe	2.50	2.75	54.5	n/a	n/a	2.98	50.3	n/a	n/a	2.51	59.8	n/a	n/a	3.24	46.3	n/a	n/a
Monroe to Broadway	2.20	2.60	50.8	n/a	n/a	2.68	49.3	n/a	n/a	2.34	56.4	n/a	n/a	2.91	45.4	n/a	n/a
Broadway to Woodridge	1.30	1.45	53.8	n/a	n/a	1.46	53.4	n/a	n/a	1.45	53.8	n/a	n/a	1.56	50.0	n/a	n/a
Woodridge to Wayside	1.60	1.67	57.5	n/a	n/a	1.70	56.5	n/a	n/a	1.68	57.1	n/a	n/a	1.73	55.5	n/a	n/a
Wayside to Scott	2.55	2.65	57.7	n/a	n/a	2.66	57.5	n/a	n/a	2.63	58.2	n/a	n/a	2.76	55.4	n/a	n/a
OUTBOUND																	
Scott to Wayside	2.55	n/a	n/a	2.73	56.0	n/a	n/a	2.67	57.3	n/a	n/a	2.66	57.5	n/a	n/a	2.65	57.7
Wayside to Woodridge	1.60	n/a	n/a	1.68	57.1	n/a	n/a	1.68	57.1	n/a	n/a	1.61	59.6	n/a	n/a	1.70	56.5
Woodridge to Broadway	1.30	n/a	n/a	1.53	51.0	n/a	n/a	1.49	52.3	n/a	n/a	1.49	52.3	n/a	n/a	1.49	52.3
Broadway to Monroe	2.20	n/a	n/a	2.24	58.9	n/a	n/a	2.17	60.8	n/a	n/a	2.19	60.3	n/a	n/a	2.25	58.7
Monroe to Edgebrook	2.50	n/a	n/a	2.49	60.2	n/a	n/a	2.43	61.7	n/a	n/a	2.44	61.5	n/a	n/a	2.45	61.2
Edgebrook to Fuqua	1.65	n/a	n/a	1.70	58.2	n/a	n/a	1.61	61.5	n/a	n/a	1.61	61.5	n/a	n/a	1.63	60.7
Inbound [Northbound] Average		*12.67*	*55.9*	*n/a*	*n/a*	*13.08*	*54.1*	*n/a*	*n/a*	*12.28*	*57.7*	*n/a*	*n/a*	*13.97*	*50.7*	*n/a*	*n/a*
Outbound [Southbound] Average		*n/a*	*n/a*	*12.37*	*57.2*	*n/a*	*n/a*	*12.05*	*58.8*	*n/a*	*n/a*	*12.00*	*59.0*	*n/a*	*n/a*	*12.17*	*58.2*

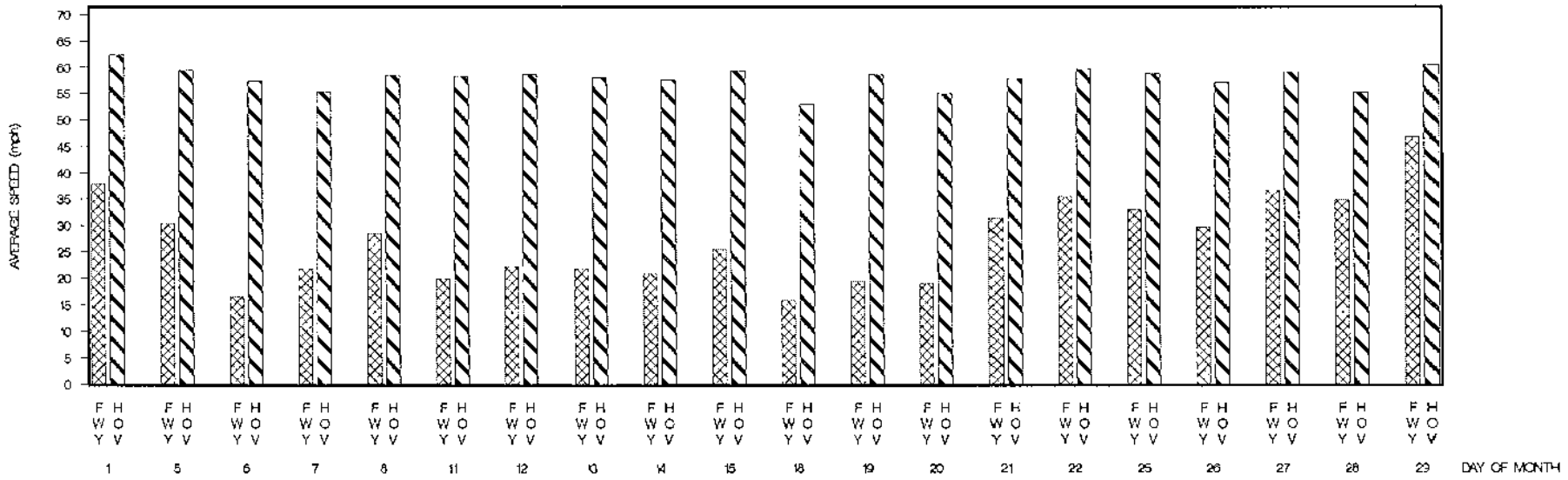
Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.

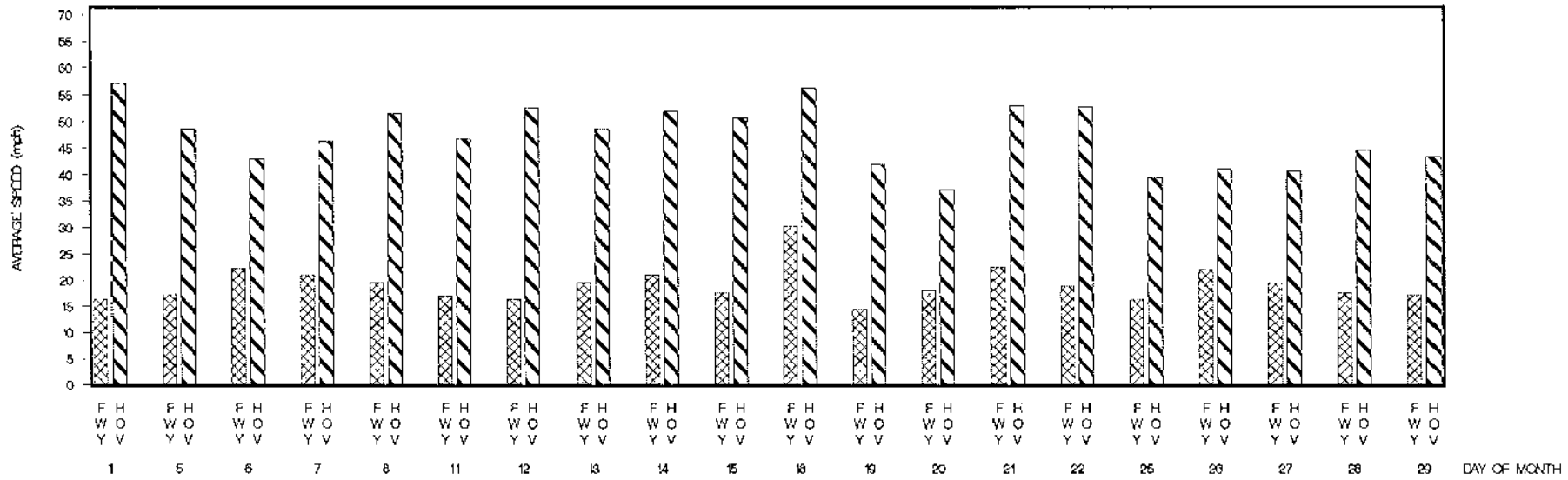
US 290 NORTHWEST FREEWAY AND HOV LANE OPERATING SPEEDS (September 2006)

(HOV Limits West Rd to Dacoma; FWY Limits FM 1960 to Dacoma)

DIRECTION= INBOUND (AM)



DIRECTION= OUTBOUND (PM)



US 290 Northwest Freeway Mainlanes -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
FM 1960 to Sam Houston	5.10	10.06	30.4	4.54	67.4	10.63	28.8	4.39	69.7	10.12	30.2	4.45	68.8	12.23	25.0	4.48	68.3
Sam Houston to Fairbanks-N. Houston	1.55	3.65	25.5	1.93	48.2	4.78	19.5	1.90	48.9	5.54	16.8	2.11	44.1	5.76	16.1	1.83	50.8
Fairbanks-N. Houston to Pinemont	2.90	3.84	45.3	3.23	53.9	4.22	41.2	3.27	53.2	4.76	36.6	3.60	48.3	6.33	27.5	3.43	50.7
Pinemont to W. 34th	2.45	3.08	47.7	3.04	48.4	4.08	36.0	3.40	43.2	4.89	30.1	3.65	40.3	6.03	24.4	3.55	41.4
W. 34th to Dacoma	1.10	2.21	29.9	2.20	30.0	3.20	20.6	2.55	25.9	4.03	16.4	2.52	26.2	3.88	17.0	2.70	24.4
OUTBOUND																	
Dacoma to W. 34th	1.10	1.00	66.0	1.88	35.1	0.99	66.7	2.34	28.2	1.02	64.7	2.16	30.6	1.31	50.4	1.80	36.7
W. 34th to Pinemont	2.45	2.29	64.2	8.19	17.9	2.17	67.7	8.37	17.6	2.22	66.2	9.49	15.5	2.26	65.0	8.24	17.8
Pinemont to Fairbanks-N. Houston	2.90	3.53	49.3	8.55	20.4	2.69	64.7	8.11	21.5	2.68	64.9	9.26	18.8	2.88	60.4	8.57	20.3
Fairbanks-N. Houston to Sam Houston	1.55	1.59	58.5	3.89	23.9	1.40	66.4	3.71	25.1	1.39	66.9	3.93	23.7	1.54	60.4	4.62	20.1
Sam Houston to FM 1960	4.25	3.70	68.9	7.97	32.0	3.69	69.1	8.47	30.1	3.69	69.1	8.68	29.4	3.69	69.1	9.92	25.7
Inbound [Eastbound] Average		*22.84*	*34.4*	*14.94*	*52.6*	*26.91*	*29.2*	*15.51*	*50.7*	*29.34*	*20.8*	*16.33*	*48.1*	*34.23*	*23.0*	*15.99*	*49.2*
Outbound [Westbound] Average		*12.11*	*60.7*	*30.48*	*24.1*	*10.94*	*67.2*	*31.00*	*23.7*	*11.00*	*66.8*	*33.52*	*21.9*	*11.68*	*62.9*	*33.15*	*22.2*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
FM 1960 to Sam Houston	5.10	10.30	29.7	4.79	63.9	9.86	31.0	4.40	69.5	8.97	34.1	4.46	68.6	11.54	26.5	4.45	68.8
Sam Houston to Fairbanks-N. Houston	1.55	5.40	17.2	2.05	45.4	4.76	19.5	1.94	47.9	4.40	21.1	2.13	43.7	5.20	17.9	1.81	51.4
Fairbanks-N. Houston to Pinemont	2.90	4.99	34.9	3.53	49.3	4.17	41.7	3.08	56.9	4.55	38.2	3.66	47.5	5.20	33.5	2.92	59.6
Pinemont to W. 34th	2.45	4.40	33.4	4.25	34.6	3.73	39.4	2.79	52.7	4.98	29.5	3.48	42.2	5.47	26.9	3.06	48.0
W. 34th to Dacoma	1.10	3.24	20.4	4.04	16.3	2.74	24.1	1.95	33.8	3.60	18.3	2.63	25.1	3.84	17.2	2.56	25.9
OUTBOUND																	
Dacoma to W. 34th	1.10	1.01	65.3	3.31	19.9	1.09	60.6	2.42	27.3	1.12	58.9	2.43	27.2	1.07	61.7	3.49	18.9
W. 34th to Pinemont	2.45	2.26	65.0	9.34	15.7	2.57	57.2	7.97	18.4	2.55	57.6	7.97	18.4	2.49	59.0	9.84	14.9
Pinemont to Fairbanks-N. Houston	2.90	2.68	64.9	7.89	22.1	3.64	47.8	7.97	21.8	2.88	60.4	7.88	22.1	2.85	61.1	9.62	18.1
Fairbanks-N. Houston to Sam Houston	1.55	1.39	66.9	4.12	22.6	1.70	54.7	4.36	21.3	1.41	66.0	4.18	22.2	1.45	64.1	5.23	17.8
Sam Houston to FM 1960	4.25	3.65	69.9	9.01	28.3	4.17	61.2	9.77	26.1	3.70	68.9	10.25	24.9	3.71	68.7	11.03	23.1
Inbound [Eastbound] Average		*28.33*	*27.7*	*18.66*	*42.1*	*25.26*	*31.1*	*14.14*	*55.6*	*26.50*	*29.7*	*16.36*	*48.0*	*31.25*	*25.2*	*14.79*	*53.1*
Outbound [Westbound] Average		*10.99*	*66.9*	*33.67*	*21.8*	*13.17*	*55.8*	*32.49*	*22.6*	*11.66*	*63.0*	*32.71*	*22.5*	*11.57*	*63.5*	*39.21*	*18.7*

Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.

US 290 Northwest HOV Lane -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
West Road to Sam Houston	2.95	2.89	61.2	n/a	n/a	2.90	61.0	n/a	n/a	2.94	60.2	n/a	n/a	3.39	52.2	n/a	n/a
Sam Houston to Fairbanks-N. Houston	1.55	1.72	54.1	n/a	n/a	1.60	58.1	n/a	n/a	1.67	55.7	n/a	n/a	1.79	52.0	n/a	n/a
Fairbanks-N. Houston to Pinemont	2.85	2.78	61.5	n/a	n/a	2.75	62.2	n/a	n/a	2.85	60.0	n/a	n/a	2.94	58.2	n/a	n/a
Pinemont to W. 34th	2.45	2.39	61.5	n/a	n/a	2.49	59.0	n/a	n/a	2.49	59.0	n/a	n/a	2.81	52.3	n/a	n/a
W. 34th to Dacoma	1.00	1.01	59.4	n/a	n/a	1.04	57.7	n/a	n/a	1.04	57.7	n/a	n/a	1.13	53.1	n/a	n/a
Dacoma to Old Katy Road	1.55	1.66	56.0	n/a	n/a	1.63	57.1	n/a	n/a	1.68	55.4	n/a	n/a	1.70	54.7	n/a	n/a
OUTBOUND																	
Old Katy Road to Dacoma	1.55	n/a	n/a	1.82	51.1	n/a	n/a	1.70	54.7	n/a	n/a	1.82	51.1	n/a	n/a	1.78	52.2
Dacoma to W. 34th	1.00	n/a	n/a	1.36	44.1	n/a	n/a	1.18	50.8	n/a	n/a	1.22	49.2	n/a	n/a	1.24	48.4
W. 34th to Pinemont	2.45	n/a	n/a	3.06	48.0	n/a	n/a	2.81	52.3	n/a	n/a	3.00	49.0	n/a	n/a	2.98	49.3
Pinemont to Fairbanks-N. Houston	2.85	n/a	n/a	3.24	52.8	n/a	n/a	3.09	55.3	n/a	n/a	3.69	46.3	n/a	n/a	3.26	52.5
Fairbanks-N. Houston to Sam Houston	1.55	n/a	n/a	1.87	49.7	n/a	n/a	1.77	52.5	n/a	n/a	1.89	49.2	n/a	n/a	1.80	51.7
Sam Houston to West Road	2.95	n/a	n/a	3.03	58.4	n/a	n/a	2.95	60.0	n/a	n/a	2.98	59.4	n/a	n/a	3.04	58.2
Inbound [Eastbound] Average		*12.45*	*59.5*	*n/a*	*n/a*	*12.41*	*59.7*	*n/a*	*n/a*	*12.67*	*58.5*	*n/a*	*n/a*	*13.76*	*53.9*	*n/a*	*n/a*
Outbound [Westbound] Average		*n/a*	*n/a*	*14.38*	*51.5*	*n/a*	*n/a*	*13.50*	*54.9*	*n/a*	*n/a*	*14.60*	*50.8*	*n/a*	*n/a*	*14.10*	*52.6*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
West Road to Sam Houston	2.95	3.00	59.0	n/a	n/a	3.24	54.6	n/a	n/a	2.98	59.4	n/a	n/a	3.14	56.4	n/a	n/a
Sam Houston to Fairbanks-N. Houston	1.55	1.66	56.0	n/a	n/a	1.69	55.0	n/a	n/a	2.18	42.7	n/a	n/a	1.69	55.0	n/a	n/a
Fairbanks-N. Houston to Pinemont	2.85	2.87	59.6	n/a	n/a	2.78	61.5	n/a	n/a	2.77	61.7	n/a	n/a	2.89	59.2	n/a	n/a
Pinemont to W. 34th	2.45	2.55	57.6	n/a	n/a	2.44	60.2	n/a	n/a	2.46	59.8	n/a	n/a	2.52	58.3	n/a	n/a
W. 34th to Dacoma	1.00	1.06	56.6	n/a	n/a	1.00	60.0	n/a	n/a	1.00	60.0	n/a	n/a	1.07	56.1	n/a	n/a
Dacoma to Old Katy Road	1.55	1.60	58.1	n/a	n/a	1.66	56.0	n/a	n/a	1.66	56.0	n/a	n/a	1.67	55.7	n/a	n/a
OUTBOUND																	
Old Katy Road to Dacoma	1.55	n/a	n/a	2.22	41.9	n/a	n/a	1.66	56.0	n/a	n/a	1.81	51.4	n/a	n/a	2.10	44.3
Dacoma to W. 34th	1.00	n/a	n/a	1.55	38.7	n/a	n/a	1.19	50.8	n/a	n/a	1.49	40.3	n/a	n/a	1.43	42.0
W. 34th to Pinemont	2.45	n/a	n/a	3.54	41.5	n/a	n/a	2.83	51.9	n/a	n/a	3.63	40.5	n/a	n/a	3.74	39.3
Pinemont to Fairbanks-N. Houston	2.85	n/a	n/a	3.75	45.6	n/a	n/a	3.25	52.6	n/a	n/a	4.51	37.9	n/a	n/a	3.63	47.1
Fairbanks-N. Houston to Sam Houston	1.55	n/a	n/a	2.21	42.1	n/a	n/a	1.82	51.1	n/a	n/a	2.74	33.9	n/a	n/a	2.06	45.1
Sam Houston to West Road	2.95	n/a	n/a	3.14	56.4	n/a	n/a	3.00	59.0	n/a	n/a	3.59	49.3	n/a	n/a	3.13	56.5
Inbound [Eastbound] Average		*12.74*	*58.2*	*n/a*	*n/a*	*12.81*	*57.8*	*n/a*	*n/a*	*13.05*	*56.8*	*n/a*	*n/a*	*12.98*	*57.1*	*n/a*	*n/a*
Outbound [Westbound] Average		*n/a*	*n/a*	*16.41*	*45.2*	*n/a*	*n/a*	*13.74*	*53.9*	*n/a*	*n/a*	*17.77*	*41.7*	*n/a*	*n/a*	*16.09*	*46.1*

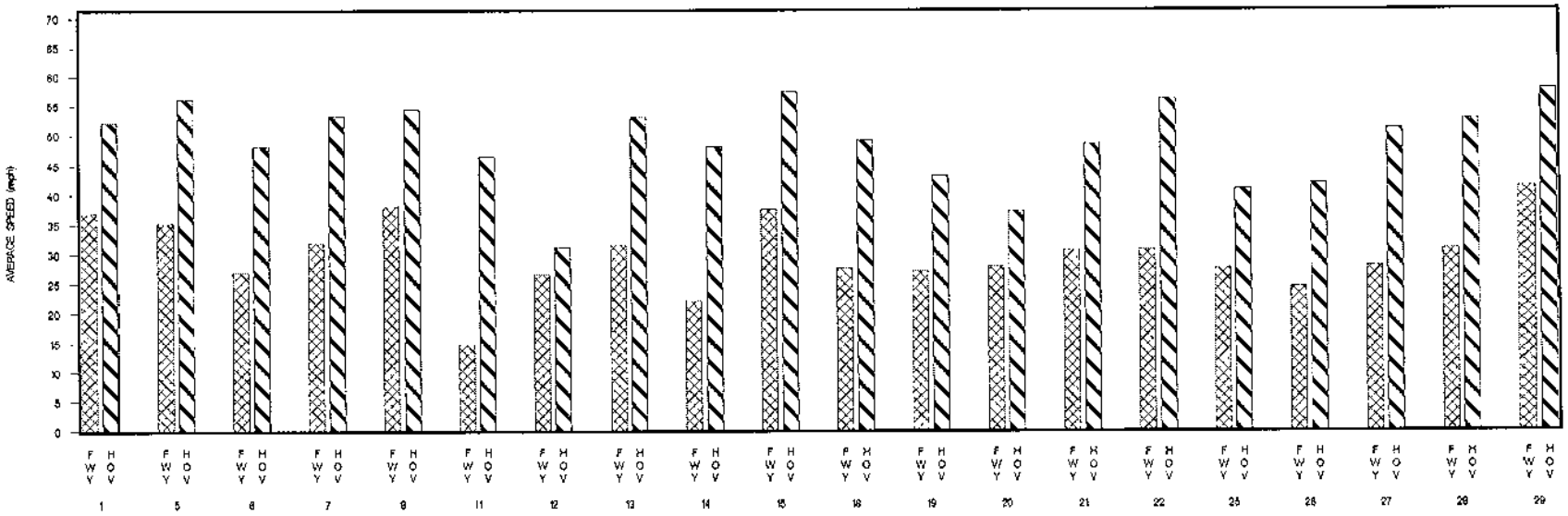
Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.

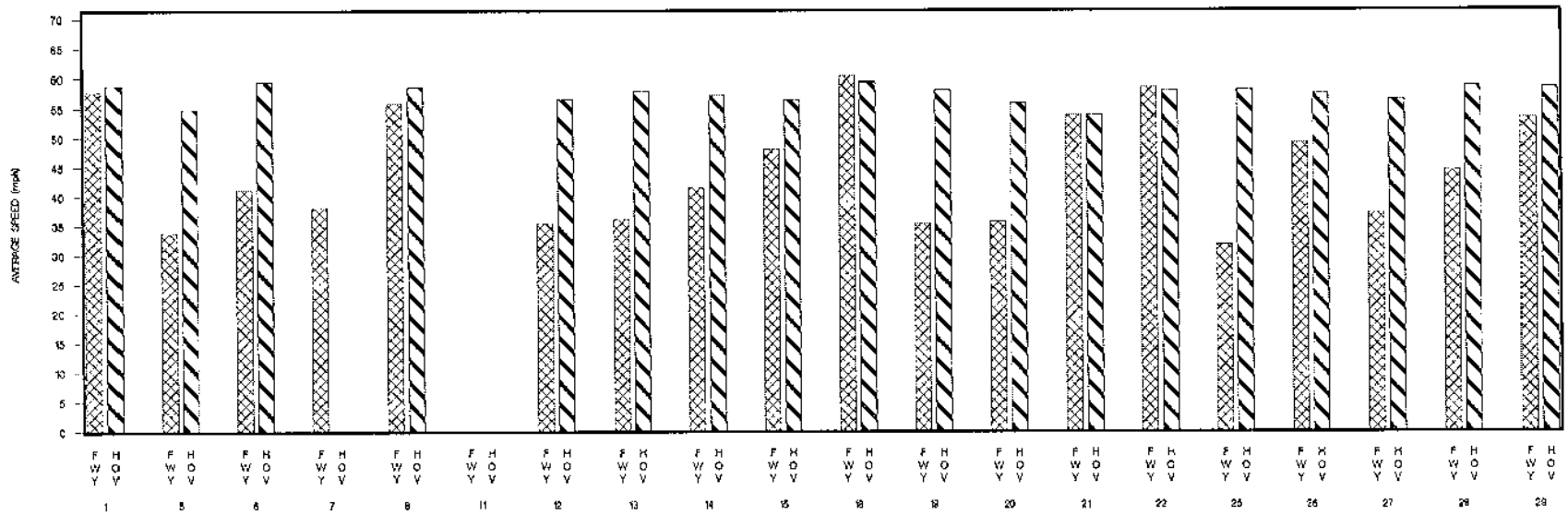
US 59S SOUTHWEST FREEWAY AND HOV LANE OPERATING SPEEDS (September 2006)

(HOV Limits Bissonnet to I−610; FWY Limits Bissonnet to I−610)

DIRECTION= INBOUND (AM)



DIRECTION= OUTBOUND (PM)



US 59S Southwest Freeway Mainlanes -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Bissonnet to Hillcroft	5.10	5.63	54.4	4.68	65.4	6.48	47.2	4.53	67.5	6.11	50.1	4.53	67.5	7.24	42.3	4.54	67.4
Hillcroft to I-610	1.60	2.59	37.1	2.16	44.4	2.99	32.1	1.74	55.2	2.48	38.7	1.63	58.9	2.74	35.0	1.58	60.8
I-610 to Newcastle	1.35	1.49	54.4	1.47	55.1	1.56	51.9	1.38	58.7	1.49	54.4	1.42	57.0	1.58	51.3	1.31	61.8
OUTBOUND																	
Newcastle to I-610	1.35	1.26	64.3	2.67	30.3	1.27	63.8	1.97	41.1	1.67	48.5	2.22	36.5	1.28	63.3	2.41	33.6
I-610 to Hilcroft	1.60	1.42	67.6	2.09	45.9	1.42	67.6	1.98	48.5	1.49	64.4	2.16	44.4	1.48	64.9	1.91	50.3
Hillcroft to Bissonnet	5.10	4.53	67.5	6.73	45.5	4.52	67.7	6.03	50.7	4.49	68.2	6.53	46.9	4.53	67.5	6.28	48.7
Inbound [Eastbound] Average		*9.71*	*49.7*	*8.31*	*58.1*	*11.03*	*43.8*	*7.65*	*63.1*	*10.08*	*47.9*	*7.58*	*63.7*	*11.56*	*41.8*	*7.43*	*65.0*
Outbound [Westbound] Average		*7.21*	*67.0*	*11.49*	*42.0*	*7.21*	*67.0*	*9.98*	*48.4*	*7.65*	*63.1*	*10.91*	*44.3*	*7.29*	*66.3*	*10.60*	*45.6*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Bissonnet to Hillcroft	5.10	5.47	55.9	4.64	65.9	6.13	49.9	4.66	65.7	6.32	48.4	4.91	62.3	9.46	32.3	4.80	63.8
Hillcroft to I-610	1.60	1.81	53.0	1.69	56.8	2.05	46.8	1.52	63.2	2.12	45.3	1.60	60.0	2.89	33.2	1.62	59.3
I-610 to Newcastle	1.35	1.34	60.4	1.34	60.4	1.45	55.9	1.30	62.3	1.46	55.5	1.33	60.9	1.44	56.3	1.32	61.4
OUTBOUND																	
Newcastle to I-610	1.35	1.25	64.8	2.65	30.6	1.28	63.3	2.74	29.6	1.28	63.3	2.73	29.7	1.27	63.8	2.74	29.6
I-610 to Hilcroft	1.60	1.46	65.8	1.97	48.7	1.50	64.0	2.00	48.0	1.54	62.3	2.06	46.6	1.46	65.8	1.93	49.7
Hillcroft to Bissonnet	5.10	4.60	66.5	6.89	44.4	4.56	67.1	6.23	49.1	4.69	65.2	5.91	51.8	4.59	66.7	6.72	45.5
Inbound [Eastbound] Average		*8.62*	*56.0*	*7.67*	*63.0*	*9.63*	*50.2*	*7.48*	*64.6*	*9.90*	*48.8*	*7.84*	*61.6*	*13.79*	*35.0*	*7.74*	*62.4*
Outbound [Westbound] Average		*7.31*	*66.1*	*11.51*	*42.0*	*7.34*	*65.8*	*10.97*	*44.0*	*7.51*	*64.3*	*10.70*	*45.1*	*7.32*	*66.0*	*11.39*	*42.4*

Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Average of weekdays only for December 1-17, 2004.
5. No data included for September 21-27, 2005 due to Hurricane Rita.
6. Average of weekdays only for December 1-16, 2005.

US 59S Southwest HOV Lane -- Summary of AVI Speeds for AM and PM Peak Periods

AVI Segment	Distance	December 2004				March 2005				June 2005				September 2005			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Bissonnet to Hillcroft	5.10	5.10	60.0	n/a	n/a	5.04	60.7	n/a	n/a	4.99	61.3	n/a	n/a	5.35	57.2	n/a	n/a
Hillcroft to I-610	1.60	1.78	53.9	n/a	n/a	1.87	51.3	n/a	n/a	1.73	55.5	n/a	n/a	1.92	50.0	n/a	n/a
I-610 to Newcastle	1.35	1.60	50.6	n/a	n/a	1.56	51.9	n/a	n/a	1.58	51.3	n/a	n/a	n/a	n/a	n/a	n/a
OUTBOUND																	
Newcastle to I-610	1.35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I-610 to Hillcroft	1.60	n/a	n/a	1.79	53.6	n/a	n/a	1.73	55.5	n/a	n/a	1.75	54.9	n/a	n/a	1.67	57.5
Hillcroft to Bissonnet	5.10	n/a	n/a	5.28	58.0	n/a	n/a	5.13	59.6	n/a	n/a	5.12	59.8	n/a	n/a	5.12	59.8
Inbound [Eastbound] Average		*8.48*	*57.0*	*n/a*	*n/a*	*8.47*	*57.0*	*n/a*	*n/a*	*8.30*	*58.2*	*n/a*	*n/a*	*7.27*	*55.3*	*n/a*	*n/a*
Outbound [Westbound] Average		*n/a*	*n/a*	*7.07*	*56.9*	*n/a*	*n/a*	*6.86*	*58.6*	*n/a*	*n/a*	*6.87*	*58.5*	*n/a*	*n/a*	*6.79*	*59.2*

AVI Segment	Distance	December 2005				March 2006				June 2006				September 2006			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd	T-Time	AvgSpd
INBOUND																	
Bissonnet to Hillcroft	5.10	4.98	61.4	n/a	n/a	5.02	61.0	n/a	n/a	5.04	60.7	n/a	n/a	6.12	50.0	n/a	n/a
Hillcroft to I-610	1.60	1.71	56.1	n/a	n/a	1.69	56.8	n/a	n/a	1.70	56.5	n/a	n/a	2.30	41.7	n/a	n/a
I-610 to Newcastle	1.35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OUTBOUND																	
Newcastle to I-610	1.35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I-610 to Hillcroft	1.60	n/a	n/a	1.68	57.1	n/a	n/a	1.75	54.9	n/a	n/a	1.73	55.5	n/a	n/a	1.76	54.5
Hillcroft to Bissonnet	5.10	n/a	n/a	5.24	58.4	n/a	n/a	5.03	60.8	n/a	n/a	5.20	58.8	n/a	n/a	5.25	58.3
Inbound [Eastbound] Average		*6.69*	*60.1*	*n/a*	*n/a*	*6.71*	*59.9*	*n/a*	*n/a*	*6.74*	*59.6*	*n/a*	*n/a*	*8.42*	*47.7*	*n/a*	*n/a*
Outbound [Westbound] Average		*n/a*	*n/a*	*6.92*	*58.1*	*n/a*	*n/a*	*6.78*	*59.3*	*n/a*	*n/a*	*6.93*	*58.0*	*n/a*	*n/a*	*7.01*	*57.3*

Notes:

1. Source of data is TxDOT AVI based Real-Time traffic map maintained by TTI.
2. AM Peak: 6:30 am - 8:30 am
3. PM Peak: 4:30 pm - 6:30 pm
4. Limited data available for EB HOV I-610 to Newcastle in December 2003.
5. No data available for WB HOV Newcastle to I-610.
6. Average of weekdays only for December 1-17, 2004.
7. No data included for September 21-27, 2005 due to Hurricane Rita.
8. Average of weekdays only for December 1-16, 2005.

PARK-AND-RIDE/PARK-AND-POOL LOT UTILIZATION SUMMARY
HOV LANE CORRIDOR SUMMARY
SEPTEMBER 2006

CORRIDOR P-N-R/P-N-P LOT	LOT CAPACITY (Spaces)	NUMBER OF PARKED VEHICLES/DAY	PERCENT OF LOT CAPACITY	ANNUAL DAILY AVERAGE PARKED VEHICLES	PERCENT CHANGE FROM ANNUAL DAILY AVERAGE
KATY FREEWAY (IH-10W)					
Kingsland P-N-R	2,247	1,954	87.0	1,793	9.0
Mason Road P-N-P	386	52	13.5	32	65.1
Fry Road P-N-P	374	111	29.7	131	-15.3
Barker-Cypress P-N-P*	409	21	5.1	23	-7.7
Addicks P-N-R	2,428	2,300	94.7	2,022	13.8
Corridor Totals	5,844	4,438	75.9	4,000	11.0
NORTH FREEWAY (IH-45N)					
Woodlands P-N-R	990	565	57.1	553	2.1
Spring P-N-R	1,263	966	76.5	962	0.4
Kuykendahl P-N-R	2,171	1,596	73.5	1,627	-1.9
Seton Lake P-N-R	1,286	651	50.6	668	-2.5
North Shepherd P-N-R	1,603	348	21.7	340	2.4
Corridor Totals	7,313	4,126	56.4	4,150	-0.6
GULF FREEWAY (IH-45S)					
Bay Area P-N-R	1,155	797	69.0	706	12.8
Bay Area P-N-P	208	283	136.1	321	-11.7
Fuqua P-N-R	938	979	104.4	903	8.4
South Point P-N-R	376	385	102.4	411	-6.3
Monroe P-N-R	904	319	35.3	298	7.0
Corridor Totals	3,581	2,763	77.2	2,639	4.7
NORTHWEST FREEWAY (US-290)					
Northwest Station P-N-R	2,361	2,449	103.7	2,384	2.7
Little York P-N-R	1,102	446	40.5	521	-14.3
Pinemont P-N-R	938	198	21.1	193	2.6
Northwest TC P-N-R	195	145	74.4	149	-2.8
Corridor Totals	4,596	3,238	70.5	3,247	-0.3
SOUTHWEST FREEWAY (US-59S)					
Missouri City P-N-R	415	164	39.5	139	18.4
West Bellfort P-N-R	779	157	20.2	167	-6.1
Mission Bend P-N-R	1,468	244	16.6	158	54.4
Westwood P-N-R	862	81	9.4	76	7.3
Gessner P-N-R	826	647	78.3	661	-2.2
Hillcroft TC P-N-R	* 922	290	31.5	305	-4.8
West Loop P-N-R	1,416	1,235	87.2	1,102	12.1
Westchase P-N-R	772	293	38.0	316	-7.1
Corridor Totals	7,460	3,111	41.7	2,922	6.5
EASTEX FREEWAY (US-59N)					
Kingwood P-N-R	1,034	771	74.6	683	12.8
Townsen P-N-R	996	774	77.7	639	21.1
Eastex P-N-R	877	382	43.6	339	12.6
Tidwell TC P-N-R	809	17	2.1	18	-5.6
Corridor Totals	3,716	1,944	52.3	1,680	15.7
TOTAL PARK-AND-RIDE	31,133	19,153	61.5	18,131	5.6
TOTAL PARK-AND POOL	1,377	467	33.9	506	-7.7
TOTAL ALL FACILITIES	32,510	19,620	60.4	18,636	5.3

Annual average is based on previous year.

Source: Texas Transportation Institute

PARK-AND-RIDE LOT UTILIZATION SUMMARY
NON-HOV LANE CORRIDOR SUMMARY
SEPTEMBER 2006

CORRIDOR P-N-R LOT	LOT CAPACITY (Spaces)	NUMBER OF PARKED VEHICLES/DAY	PERCENT OF LOT CAPACITY	ANNUAL DAILY AVERAGE PARKED VEHICLES	PERCENT CHANGE FROM ANNUAL DAILY AVERAGE
EAST FREEWAY (IH-10E)					
Maxey Road P-N-R	1,129	304	26.9	318	-4.4
TOTAL ALL FACILITIES	1,129	304	26.9	318	-4.4

Annual average is based on previous year.

Source: Texas Transportation Institute

PARK-AND-RIDE/PARK-AND-POOL LOT UTILIZATION
PRE-HOV LANE AND HOV LANE COMPARISON
SEPTEMBER 2006

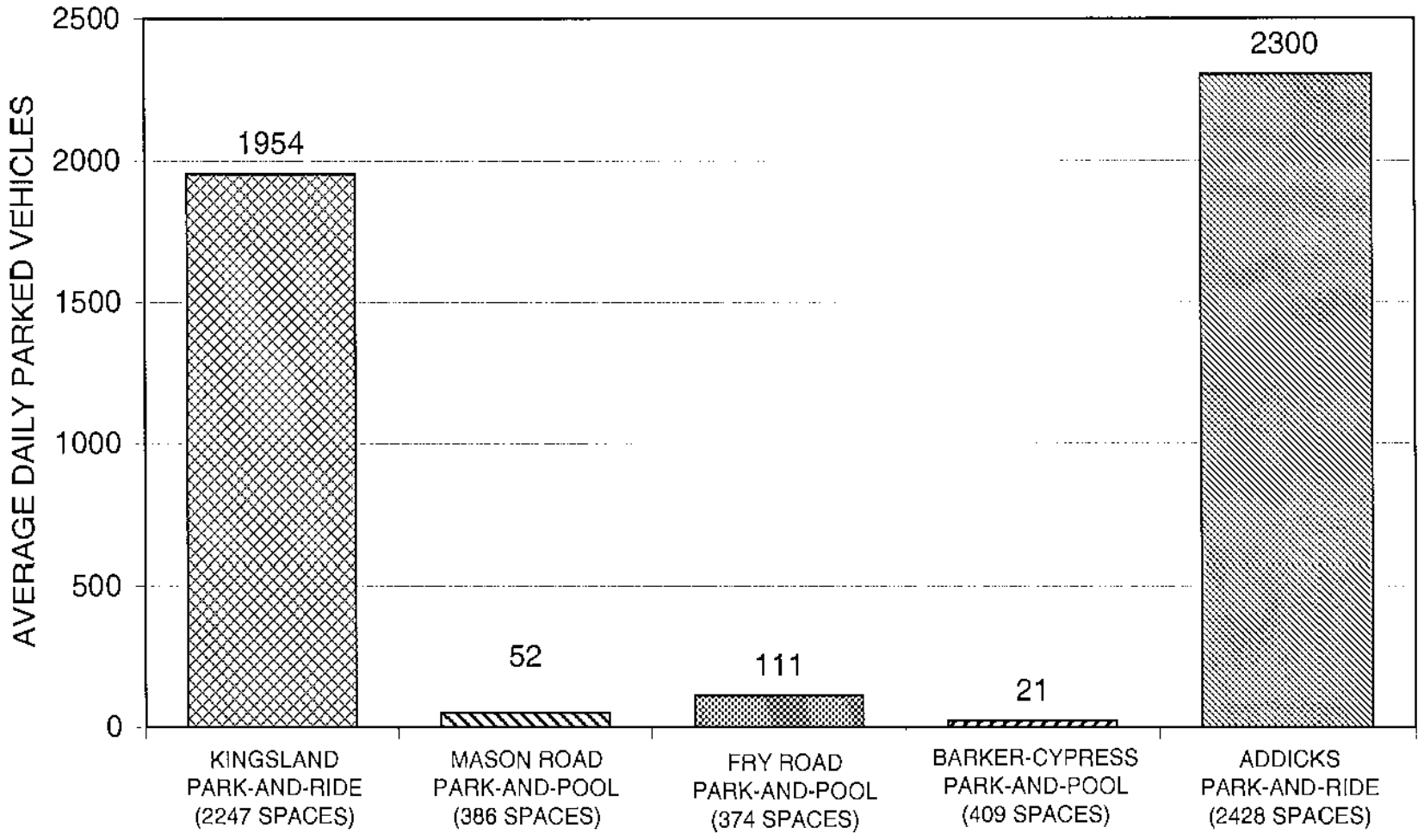
CORRIDOR	FACILITY	LOT CAPACITY (Spaces)	PRE-HOV LANE		CURRENT SAMPLE	
			Parked Vehicles	Percent of Capacity	Parked Vehicles	Percent of Capacity
KATY FREEWAY (IH-10W)						
	Kingsland P-N-R	2,247	217	9.7	1,954	87.0
	Mason Road P-N-P	386	+	+	52	13.5
	Fry Road P-N-P	374	+	+	111	29.7
	Barker-Cypress P-N-P	409	+	+	21	5.1
	Addicks P-N-R	2,428	358	14.7	2,300	94.7
NORTH FREEWAY (IH-45N)						
	Woodlands P-N-R	990	+	+	565	57.1
	Spring P-N-R	1,263	+	+	966	76.5
	Kuykendahl P-N-R	2,171	+	+	1,596	73.5
	Seton Lake P-N-R	1,286	+	+	651	50.6
	North Shepherd P-N-R	1,603	+	+	348	21.7
GULF FREEWAY (IH-45S)						
	Bay Area P-N-R	1,155	516	44.7	797	69.0
	Bay Area P-N-P	208	+	+	283	136.1
	Fuqua P-N-R	938	+	+	979	104.4
	South Point P-N-R	376	+	+	385	102.4
	Monroe P-N-R	904	+	+	319	35.3
NORTHWEST FREEWAY (US-290)						
	Northwest Station P-N-R	2,361	401	17.0	2,449	103.7
	Little York P-N-R	1,102	44	4.0	446	40.5
	Pinemont P-N-R	938	+	+	198	21.1
	Northwest TC P-N-R	195	+	+	145	74.4
SOUTHWEST FREEWAY (US-59S)						
	Missouri City P-N-R	415	78	18.8	164	39.5
	West Bellfort P-N-R	779	283	36.3	157	20.2
	Mission Bend P-N-R	1,468	+	+	244	16.6
	Westwood P-N-R	862	72	8.4	81	9.4
	Gessner P-N-R	826	464	56.2	647	78.3
	Hillcroft TC P-N-R	922	+	+	290	31.5
	West Loop P-N-R	1,416	+	+	1,235	87.2
	Westchase P-N-R	772	358	46.4	293	38.0
EASTEX FREEWAY (US-59N)						
	Kingwood P-N-R	1,034	780	75.4	771	74.6
	Townsen P-N-R	996	+	+	774	77.7
	Eastex P-N-R	877	297	33.9	382	43.6
	Tidwell TC P-N-R	809	27	3.3	17	2.1

+ Facilities not in operation prior to HOV treatment.

Source: Texas Transportation Institute

KATY FREEWAY (IH 10W) HOV LANE
CORRIDOR PARK-AND-RIDE / PARK-AND-POOL LOT UTILIZATION

3RD QUARTER - 2006

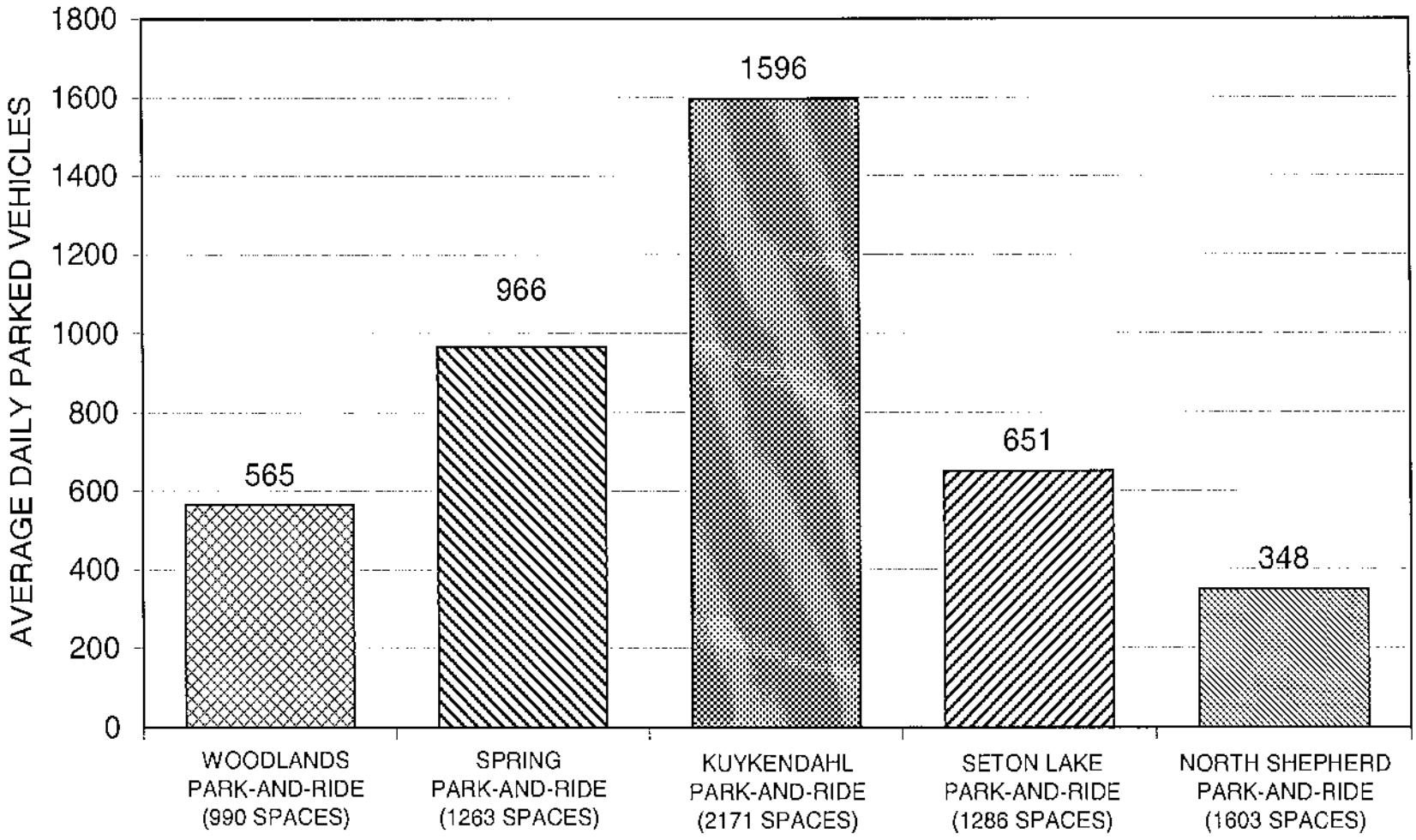


SOURCE: TEXAS TRANSPORTATION INSTITUTE

PARKING CAPACITY FOR CORRIDOR = 7019 SPACES

NORTH FREEWAY (IH 45N) HOV LANE
CORRIDOR PARK-AND-RIDE LOT UTILIZATION

3RD QUARTER - 2006

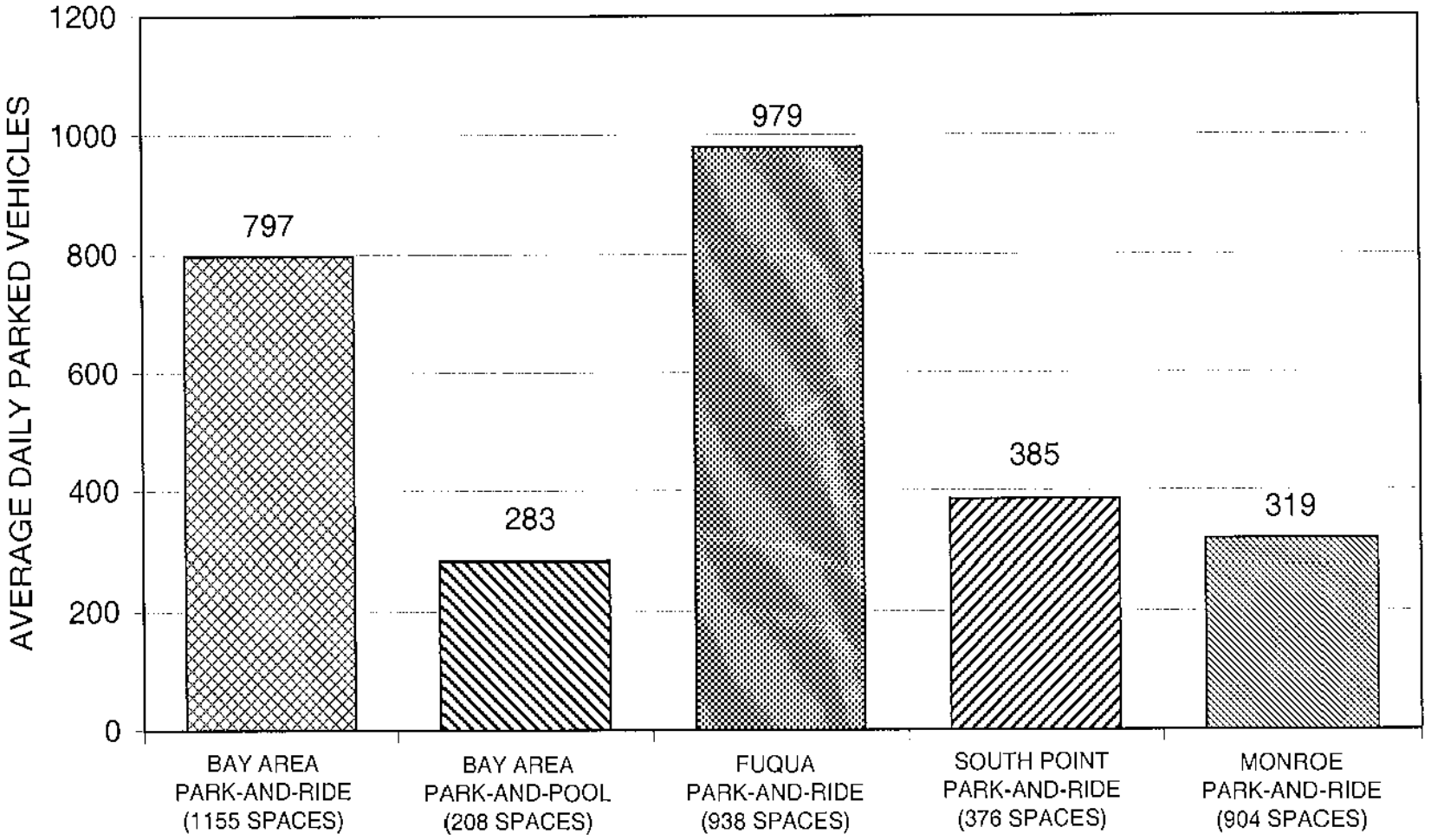


SOURCE: TEXAS TRANSPORTATION INSTITUTE

PARKING CAPACITY FOR CORRIDOR = 7313 SPACES

GULF FREEWAY (IH 45S) HOV LANE
CORRIDOR PARK-AND-RIDE / PARK-AND-POOL
LOT UTILIZATION

3RD QUARTER - 2006

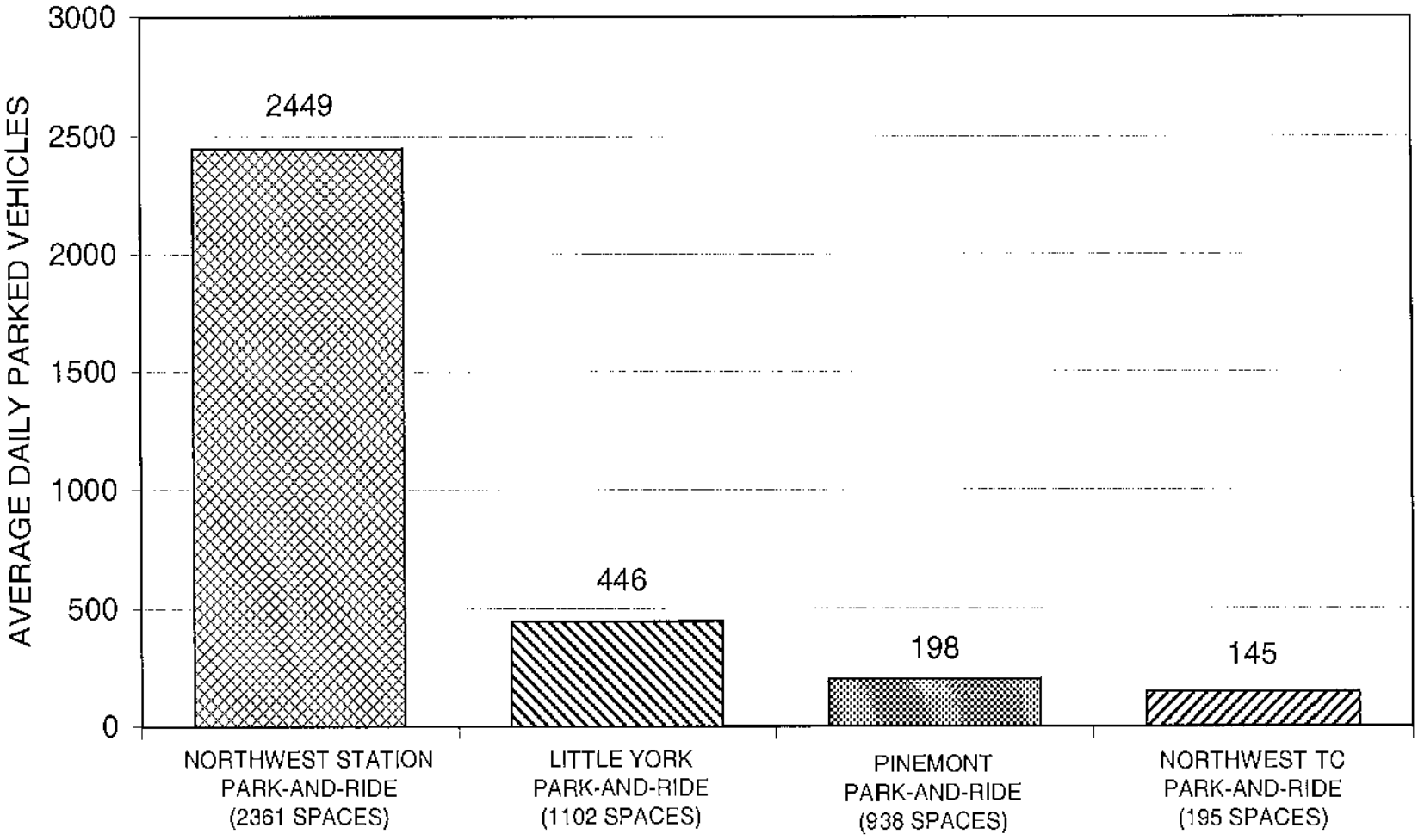


SOURCE: TEXAS TRANSPORTATION INSTITUTE

PARKING CAPACITY FOR CORRIDOR = 3581 SPACES

NORTHWEST FREEWAY (US 290) HOV LANE
CORRIDOR PARK-AND-RIDE LOT UTILIZATION

3RD QUARTER - 2006

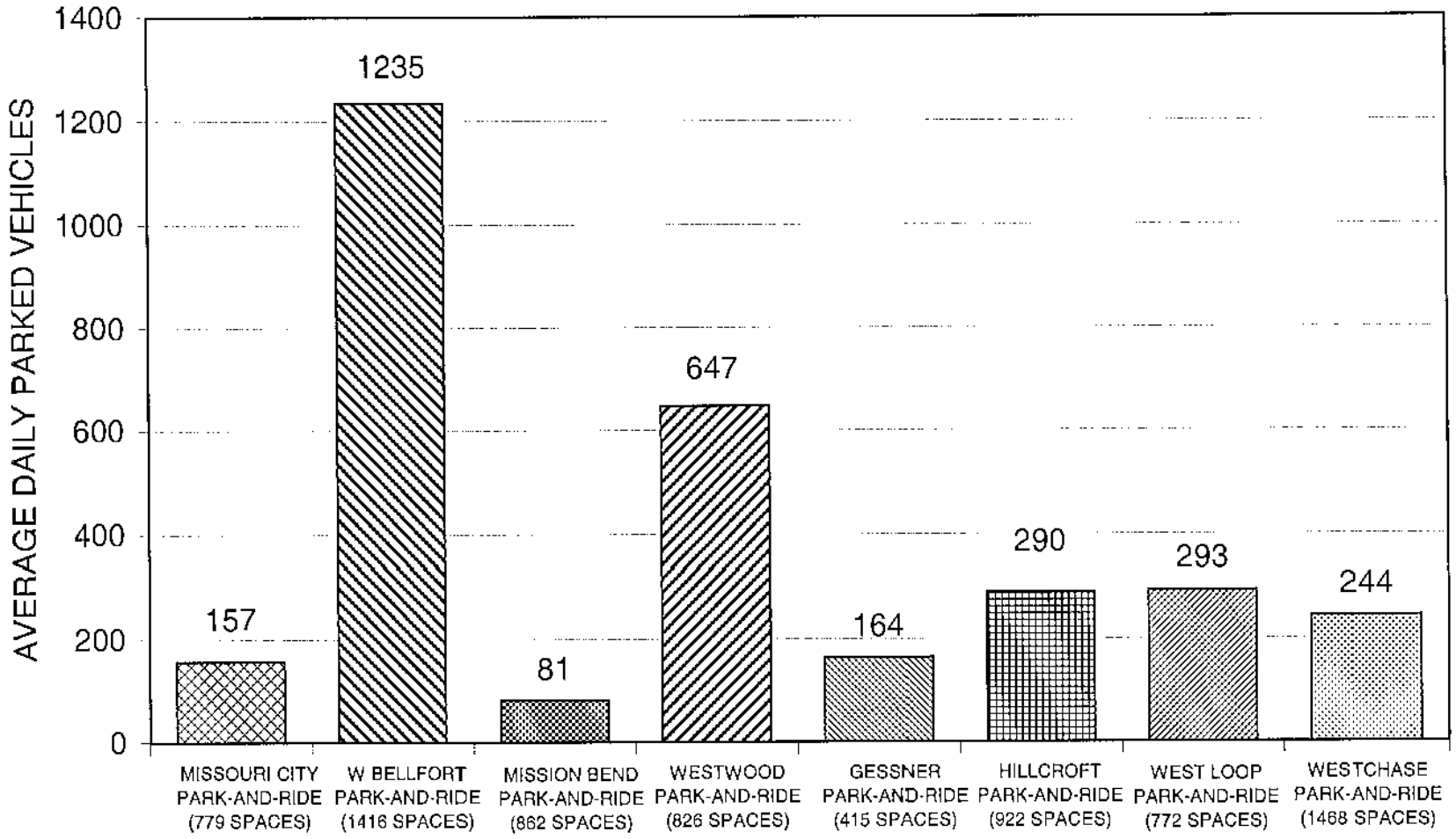


SOURCE: TEXAS TRANSPORTATION INSTITUTE

PARKING CAPACITY FOR CORRIDOR = 4596 SPACES

SOUTHWEST FREEWAY (US 59S) HOV LANE
CORRIDOR PARK-AND-RIDE LOT UTILIZATION

3RD QUARTER - 2006

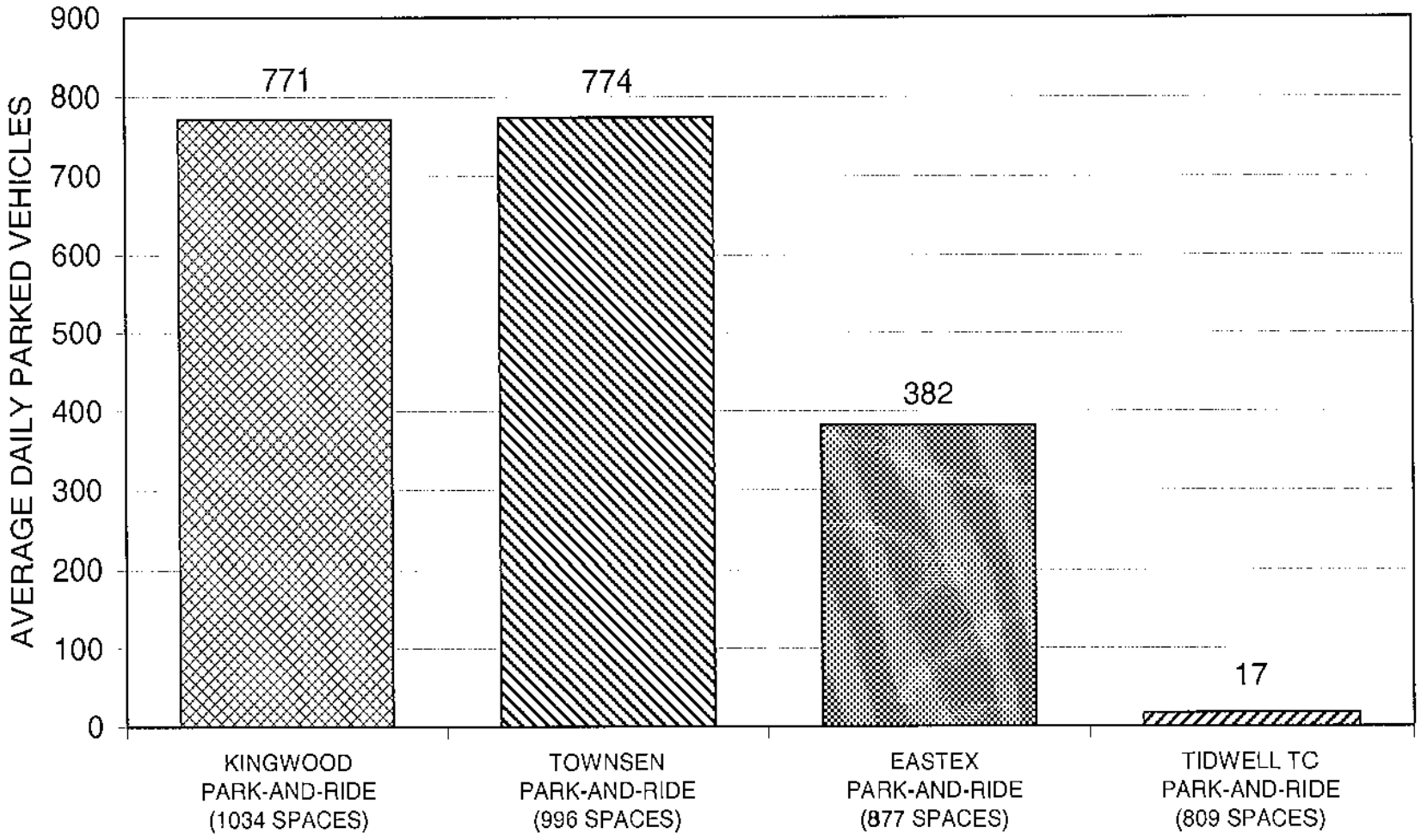


SOURCE: TEXAS TRANSPORTATION INSTITUTE

PARKING CAPACITY FOR CORRIDOR = 7460 SPACES

EASTEX FREEWAY (US 59N) HOV LANE
CORRIDOR PARK-AND-RIDE LOT UTILIZATION

3RD QUARTER - 2006



SOURCE: TEXAS TRANSPORTATION INSTITUTE

PARKING CAPACITY FOR CORRIDOR = 3716 SPACES

ACCIDENT RATE BY CORRIDOR
QUARTER ENDING SEPTEMBER 2006

Corridor	Number of Accidents for Current Quarter	Number of Daily Weekday Vehicle Trips	Number of Weekdays Open in Current Quarter	Number of Daily Weekend Vehicle Trips	Number of Weekend Days in Current Quarter*	Total Number of Vehicle Trips in Current Quarter	Accident Rate (Number of Accidents per 100,000 Vehicle Trips)
Katy	6	9,737	63	2,543	27	682,092	0.88
North	8	9,231	63	0	27	581,553	1.38
Gulf	1	6,486	63	0	27	408,618	0.24
Northwest	3	8,212	63	0	27	517,356	0.58
Southwest	7	8,179	63	0	27	515,277	1.36
Eastex	2	3,234	63	0	27	203,742	0.98

* Includes number of weekday holidays where the HOV lane operates one direction all day like weekend operations.

$$\text{Accident Rate} = \frac{\text{Number of Collisions} \times 100{,}000}{(\text{Daily Weekday Trips} \times \text{Number of Weekdays}) + (\text{Daily Weekend Trips} \times \text{Number of Weekend Days})}$$

APPENDIX E

TTI: 2-10-85-484-3

FUHS

IMPACTS OF CARPOOL UTILIZATION ON THE KATY FREEWAY AUTHORIZED VEHICLE LANE 12-MONTH "AFTER" EVALUATION

RESEARCH REPORT 484-3

TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

METROPOLITAN TRANSIT AUTHORITY
OF HARRIS COUNTY

in cooperation with the
Department of Transportation
Federal Highway Administration

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-87/17+484-3		

4. Title and Subtitle	5. Report Date
Impacts of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane 12-Month "After" Evaluation	August 1986
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Dennis L. Christiansen and William R. McCasland	Research Report 484-3

9. Performing Organization Name and Address	10. Work Unit No.
Texas Transportation Institute The Texas A&M University System College Station, Texas 77843	11. Contract or Grant No. Study No. 2-10-85-484
	13. Type of Report and Period Covered Interim - September 1984 August 1986
12. Sponsoring Agency Name and Address Texas State Department of Highways and Public Transportation; Transportation Planning Division P. O. Box 5051 and Metropolitan Transit Austin, Texas 78763 Authority - co-Sponsors	14. Sponsoring Agency Code

15. Supplementary Notes
Research performed in cooperation with DOT, FHWA.
Research Study Title: An Evaluation of the Impact of Permitting Carpools to Use the Katy Freeway

16. Abstract A major commitment has been made in the Houston area to develop physically separated authorized vehicle lanes in the medians of freeways. The lanes are reserved for specially authorized high-occupancy vehicles.

Phase 1 of the first completed authorized vehicle lane (AVL) opened on the Katy Freeway (I-10) in October 1984. Since that is the first of many such lanes, in some respects it is being used as a laboratory to determine desirable approaches for operating the AVL facilities.

To increase potential utilization, in addition to buses and vanpools, a decision was made to permit authorized carpools to begin using the AVL on a test basis in April 1985. This research study, funded jointly by the Metropolitan Transit Authority of Harris County and the Texas State Department of Highways and Public Transportation, was initiated to undertake a comprehensive analysis of the effects of permitting carpool utilization.

This report documents the data collected in April through June 1986, one year after carpool utilization of the AVL was permitted. Comprehensive traffic data, both on the AVL and the freeway, were collected. In addition, surveys of transit users on the AVL, vanpool drivers on the AVL, vanpool passengers on the AVL, carpool drivers on the AVL, carpool passengers on the AVL, and motorists not using the AVL were undertaken. In this report, these data are compared to similar data collected before carpool utilization was permitted to identfy the impacts of permitting carpools to use the AVL.

17. Key Words	18. Distribution Statement
High-Occupancy Vehicle Lanes, Transitways, Busways, Carpools, HOV Facilities, Authorized Vehicle Lanes.	No restrictions. This document is available to the public through the National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

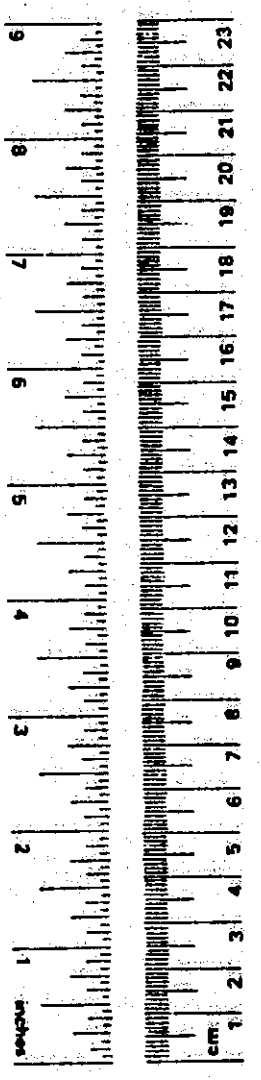
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	58	

Form DOT F 1700.7 (8-69)

METRIC CONVERSION FACTORS

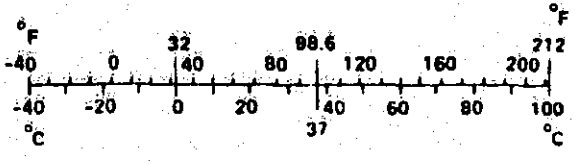
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

THE IMPACTS OF CARPOOL UTILIZATION ON THE KATY FREEWAY AUTHORIZED VEHICLE LANE
12-MONTH "AFTER" EVALUATION

by

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Research Engineer
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Research Report 484-3

An Evaluation of the Impact of Permitting Carpools to Use
The Katy Transitway
Research Study Number 2-10-85-484

Sponsored By
Metropolitan Transit Authority of Harris County
and
State Department of Highways and Public Transportation
in cooperation with the
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Texas Transportation Institute
The Texas A&M University System
College Station, Texas 77843

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ABSTRACT

A major commitment has been made in the Houston area to develop physically separated authorized vehicle lanes in the medians of freeways. The lanes are reserved for specially authorized high-occupancy vehicles.

Phase 1 of the first completed authorized vehicle lane (AVL) opened on the Katy Freeway (I-10) in October 1984. Since that is the first of many such lanes, in some respects it is being used as a laboratory to determine desirable approaches for operating the AVL facilities.

To increase potential utilization, in addition to buses and vanpools, a decision was made to permit authorized carpools to begin using the AVL on a test basis in April 1985. This research study, funded jointly by the Metropolitan Transit Authority of Harris County and the Texas State Department of Highways and Public Transportation, was initiated to undertake a comprehensive analysis of the effects of permitting carpool utilization.

This report documents the data collected in April through June 1986, one year after carpool utilization of the AVL was permitted. Comprehensive traffic data, both on the AVL and the freeway, were collected. In addition, surveys of transit users on the AVL, vanpool drivers on the AVL, vanpool passengers on the AVL, carpool drivers on the AVL, carpool passengers on the AVL, and motorists not using the AVL were undertaken. In this report, these data are compared to similar data collected before carpool utilization was permitted to identify the impacts of permitting carpools to use the AVL.

This is the third of a series of reports to be prepared as part of this research effort. Previous reports were:

"The Impact of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane, 'Before' Data, December 1985, Research Report 484-1.

"The Impacts of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane, Initial Carpool Surveys," December 1985, Research Report 484-2.

Key Words: High-Occupancy Vehicle Lanes, Transitways, Busways, Carpools, HOV Facilities, Authorized Vehicle Lanes.

SUMMARY

The Katy Transitway was opened to authorized buses and vanpools in October 1984. Authorized 4+ carpools were allowed to use the authorized vehicle lane (AVL) in April 1985. To generate additional carpool utilization, authorized 3+ carpools were permitted to use the AVL in September 1985. This report evaluates the impacts of permitting carpools to use the Katy Transitway.

Trends in Transitway Utilization

In April 1986, just less than 6,200 persons used the transitway on a daily basis. Since opening, person trips on the Katy AVL have increased by 49%; vehicle trips have increased by 112%. Carpools represent approximately 40% of total vehicles using the AVL; the carpools transport 11% to 12% of total persons moved on the priority facility.

Katy AVL Utilization Relative to Other Freeway HOV Projects

A review of carpooling on other freeway HOV lanes leads to the following observations.

1. The Katy AVL, with 50 to 75 carpools per peak hour, is operating at a significantly lower volume than other freeway HOV facilities.

2. A consensus exists among the agencies operating freeway HOV lanes that, to maintain a reliable high-speed lane, per lane capacity is in the range of 1,000 to 1,500 vehicles per hour. Access/egress on the Katy AVL may somewhat limit capacity. However, capacities are considerably greater than existing volumes.

3. On several HOV facilities, carpools and vanpools move 50% or more of total person volume. On the Katy AVL, carpools and vanpools move approximately 30% of total volume.

4. Most freeway HOV lanes have resulted in substantial increases (non-weighted average of 288%) in carpooling. To date, the Katy AVL has generated little or no increase in total carpooling.

5. Relative to other projects, growth in person movement has been slow. The average annual growth rate for the first two years on the Katy AVL has been 22%. For the first two years on other HOV projects, the average was 67% on the Shirley Highway, 68% on the El Monte busway, and 89% on the North Freeway contraflow.

Most of the other HOV facilities referred to above are at least 10 miles in length. While volumes are currently relatively low on the Katy AVL, the above data suggest that there is reason to expect significant increases in utilization once Phase 2 of the AVL opens in early 1987; this is expected to occur since the Phase 2 extension will provide significant additional travel time savings, particularly to users of the Addicks park-and-ride facility located at SH 6 and Katy Freeway.

Criteria for Judging the Success of the Carpool Experiment

Prior to allowing carpools onto the AVL, both the State Department of Highways and Public Transportation and the Metropolitan Transit Authority agreed upon a set of criteria to use in evaluating the success of the carpool experiment. Each criterion is addressed in this report. Table 10 in the main report presents the criteria and the basis for evaluation; each criterion can be rated "highly successful", "successful", "somewhat unsuccessful", and "highly unsuccessful". In the overall evaluation, a numerical rating is assigned; "highly successful" is considered to be a 4, with "highly unsuccessful" considered to be a 1.

Criterion 1. Change in Person Movement on the AVL Directly Attributable to Carpooling

Relative Weighting. 25%

Relevant Findings. April 1986 data suggest that carpools increased person movement in the a.m. peak period by 13% and by 12% in the p.m. peak period. However, 14% of the carpoolers previously used the AVL in either a bus (7%) or a van (7%). Thus, carpools have effectively increased person movement by approximately 10%.

Conclusion. In regard to this criterion, the experiment is considered a "success".

Criterion 2. Non-User Perception of Katy AVL Utilization

Relative Weighting. 30%

Relevant Findings. While the perception of the users of the AVL is that it is sufficiently utilized, over 90% of the non users feel the AVL is not sufficiently utilized. It is recognized there may be some, and possibly a considerable amount of bias among non users regarding any priority facility not operating at the same speed and volume as the mixed-flow lanes. Due to the heavy weighting given this criterion, this is a concern that will be addressed in the future as part of this research effort.

Conclusion. In regard to this criterion, the experiment is considered "highly unsuccessful".

Criterion 3. Change in Travel Time on the AVL

Relative Weighting. 20%

Relevant Findings. If anything, average speeds on the AVL have increased slightly since carpools began using the facility.

Conclusion. In regard to this criterion, the experiment is considered "highly successful".

Criterion 4. Change in Person Delay to Mixed-Flow Traffic

Relative Weighting. 15%

Relevant Findings. No change in mixed-flow traffic operations are identified that can be attributed to the AVL. Other factors influencing mixed-flow traffic are more significant than the AVL.

Conclusion. In regard to this criterion, the experiment is considered "highly successful".

Criterion 5. Increase in Frequency of Breakdowns on the AVL

Relative Weighting. 5%

Relevant Findings. Total AVL breakdowns have increased by about 14% due to carpools. However, the absolute number of carpool breakdowns has been small, and none of the breakdowns have blocked the AVL.

Conclusion. In regard to this criterion, the experiment is considered "successful".

Criterion 6. Increase in Authorization and Enforcement Costs

Relative Weighting. 5%

Relevant Findings. The marginal increase in costs due to carpooling has been small, and no significant problems have been encountered.

Conclusion. In regard to this criterion, the experiment is considered "successful".

Conclusion

The overall evaluation is summarized in Table S-1. Based on that evaluation, as of April 1986 the carpool experiment is judged to be between "somewhat unsuccessful" and "successful". If numerical values are assigned to the possible outcomes (with "highly successful" = 4; "successful" = 3; "somewhat unsuccessful" = 2; and "highly unsuccessful" = 1), the weighted value for the carpool experiment is 2.62. A value of 2.5 is midway between "successful" and "somewhat unsuccessful".

However, in terms of the most heavily weighted criterion -- non-user perception of Katy AVL utilization -- the carpool experiment is judged to be "highly unsuccessful". If AVL volumes increase sufficiently to alter the non-user perception, it is reasonable to assume that other evaluation criteria will be adversely impacted by that volume increase. Further monitoring of the experiment will identify such impacts. Surveys to be conducted in 1987 will identify, now that the transitway is essentially operating at vehicular capacity, to what extent the non user perception of transitway utilization can be adjusted upward.

Table S-1. Overall Evaluation of Katy AVL Carpool Experiment 12 Months After Carpools Were Allowed Onto the AVL

Criterion	Relative Weighting	Conclusion Pertaining to Experiment	Relevant Data
1. Change in Person Movement on the AVL Directly Attributable to Carpooling	25%	Between "Successful" and "Somewhat Unsuccessful"	• AVL person movement increased by 10% due to carpooling
2. Non-User Perception of Katy AVL Utilization	30%	"Highly Unsuccessful"	• Over 90% of non-users feel the AVL is not sufficiently utilized.
3. Change in Travel Time on the AVL	20%	"Highly Successful"	• If anything, average speeds on the AVL have increased.
4. Change in Delay to Mixed-Flow Traffic	15%	"Highly Successful"	• No change was detected.
5. Increase in Frequency of AVL Breakdowns	5%	"Successful	• Breakdowns increased by 14% due to carpooling; the number of breakdowns was small and none blocked the AVL
6. Increase in Authorization and Enforcement Costs	5%	"Successful"	• Marginal increase in costs due to carpools has not been substantial.
TOTAL	100%	Between "Somewhat Unsuccessful" and "Successful"	

Note: If numerical ratings are assigned to the possible outcomes ("Highly Successful" 4; "Successful" = 3; "Somewhat Unsuccessful" = 2; "Highly Unsuccessful" = 1), the experiment has a weighted rating value of 2.62. A rating of 2.5 is midway between "Highly Successful" and "Highly Unsuccessful".

IMPLEMENTATION STATEMENT

Since there is relatively little experience with operating exclusive, reversible high-occupancy vehicle lanes, many of the operating procedures and approaches to be used in Houston will be developed through experience. A key operating issue involves the type of vehicles that will be allowed to utilize the special lanes.

This study was specifically undertaken to assist the Metropolitan Transit Authority and State Department of Highways and Public Transportation in the implementation and operation of the authorized vehicle lanes. The study, through analysis and comparison of both "before" and "after" data, assesses the impacts of permitting authorized carpools to utilize the special high-occupancy vehicle lanes.

DISCLAIMER

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

I. INTRODUCTION

In October 1984, Phase 1 of the Katy Freeway authorized vehicle lane (AVL) became operational. Detailed descriptions of that project are included in other reports.[1]

At the time the AVL opened, only buses and vanpools authorized by the Metropolitan Transit Authority (Metro) were allowed to utilize the AVL. However, in order to address a perception that the AVL was underutilized, authorized carpools were allowed to begin using the priority lane in April 1985. While allowing carpools onto the priority lane represented a means to increase the volume of vehicles operating on the AVL, the following concerns were associated with such an action: 1) carpools might simply attract riders away from buses or vans, thereby moving no more people but requiring more vehicles; 2) introduction of carpools might exceed the capacity of the AVL, thereby adversely impacting the level-of-service that is so important to AVL operation; 3) if carpool volumes were restricted sufficiently to assure a high level-of-service on the AVL, the increase in vehicles using the AVL might not be great enough to change the perception that the AVL is underutilized; 4) the increased carpool volumes might result in increases in vehicle breakdowns on the AVL, thereby reducing the travel time reliability attribute of the transitways; and 5) other safety related concerns might develop.

Since the Katy AVL is the first of several such facilities being developed in Houston, this study was sponsored by both the Metropolitan Transit Authority of Harris County and the State Department of Highways and

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[1]"The Katy Freeway Authorized Vehicle Lane: Evaluation of the First Year of Operation". Texas Transportation Institute Research Report 339-6, February 1986. "The Impact of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane, 'Before' Data." Texas Transportation Institute Research Report 484-1, December 1985.

Public Transportation to assess in detail the impacts of allowing carpools to use the AVL. To undertake this assessment, this report compares data collected in April through July 1986, one year after carpools were allowed onto the AVL, with data collected in March 1985 before carpools were permitted to use the AVL.

Previous Research Reports

This report is the third report prepared as part of this research effort. Previous reports are listed below.

"The Impact of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane, 'Before' Data", Texas Transportation Institute Research Report 484-1, December 1985.

"The Impact of Carpool Utilization on the Katy Freeway Authorized Vehicle Lane, Initial Carpool Surveys", Texas Transportation Institute Research Report 484-2, December 1985.

The first report presents a state-of-the-art overview, identifies criteria for evaluating the "success" of the Katy AVL carpool experiment, and presents traffic data as well as AVL user and non user surveys that identify the operating condition of the freeway and the AVL prior to allowing carpool utilization. The second report documents a survey of AVL carpool users undertaken in October 1985.

No attempt is made in this report to include all the relevant material presented in previous reports. Pertinent data included in Research Reports 484-1 and 484-2 are used in this report to draw conclusions concerning the impacts of allowing carpools onto the AVL.

Organization of the Report

Following this introductory section is a section (Section II) describing trends in utilization on the Katy Authorized Vehicle Lane. Section III restates the criteria to be used in evaluating the success of the AVL carpool experiment. Each criterion is addressed individually in Sections IV through IX. Conclusions are presented in Section X. A series of appendices to this report have been prepared as a separate document (Research Report 484-4). The appendices document data collection procedures as well as details of the data collected. In essence, the appendices provide further documentation and substantiation of the material presented in this report.

II. KATY AVL UTILIZATION

The Katy Freeway authorized vehicle lane opened October 29, 1984. At the time it opened, buses and vanpools were the only authorized users. In order to increase the volume of vehicles using the AVL and to address the perception that the AVL was underutilized, a decision was made by Metro and the State Department of Highways and Public Transportation to begin, on a trial basis, to allow carpools to use the AVL beginning April 1, 1985.

Background on Katy AVL Carpool Utilization

Transitway carpool utilization was initially restricted to authorized automobiles carrying four or more persons. In order to become authorized, carpools had to have: 1) certified drivers; 2) valid Texas vehicle inspection stickers no more than 6 months old; 3) the minimum state insurance coverage; 4) some familiarity with the transitway geometrics before actually driving in the facility; and 5) pass a visual inspection of the vehicle by Metro. If an authorized carpool had fewer than four persons on any day due to a carpool member's work schedule, travel, illness, or vacation, it was not permitted onto the transitway that day. This carpool definition was structured to ensure maximum passenger occupancy of vehicles travelling within the Katy Transitway. The concern that a 3+ carpool designation could possibly generate a sufficient vehicular volume to exceed the capacity of the transitway and create unacceptable operating conditions also contributed to the decision to initially restrict authorization to 4+ carpools.

Approximately 30 carpools were authorized to use the transitway in April 1985. However, of these 30 carpools, an average of only 5 carpools actually chose to use the lane during a typical peak period. By July 1985, the number of carpools observed using the transitway had doubled, but absolute demand levels remained low. Consequently, effective July 29, 1985, carpools were permitted to enter the transitway with a minimum of three passengers, although four or more registered passengers were still required to obtain

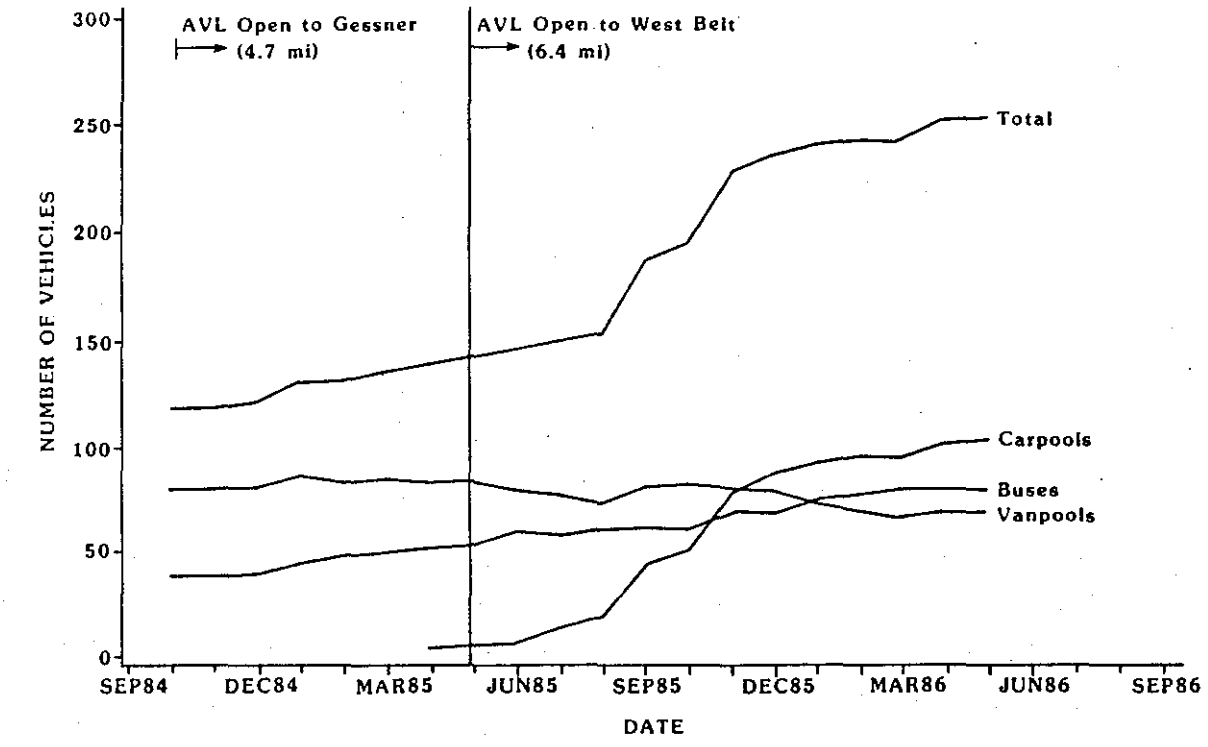
authorization. Less than a month after occupancy requirements were reduced for carpools, carpool volumes increased by more than 30%. However, in absolute numbers, the increase was not substantial; only nine more carpool trips were being made on the transitway each day. Consequently, further consideration was given to reducing the authorization requirement to a minimum of only three registered occupants. Officially, the authorization of 3+ carpools was not to commence until November 4, 1985. However, as early as September, 1985, 3+ carpools had begun to be authorized by Metro and were allowed to travel through the Katy Transitway.

This 3+ requirement has remained in effect. However, the carpool requirements will be changed to 2+ without authorization beginning August 11, 1986. This study will monitor the impacts of that 90-day demonstration.

Trends in Katy AVL Utilization

Trends in average peak-period AVL utilization are shown in Figure 1. Since the AVL opened, person trips per peak period have increased by 49%, vehicle trips per peak period have increased by 112%. In April 1986, on a daily basis, buses represented 32% of vehicles using the AVL and moved 70% of the people; vanpools were 28% of vehicles and moved 19% of the people; carpools were 40% of vehicles and moved 11% of the people.

Data pertaining to AVL utilization are summarized in Tables 1, 2, and 3. Since carpools were initially allowed onto the AVL, bus passenger volumes have increased by 21% and vanpool person volumes have decreased by 26%. The vanpool decline appears to be more a function of the downturn in the Houston economy than it is the introduction of carpools.



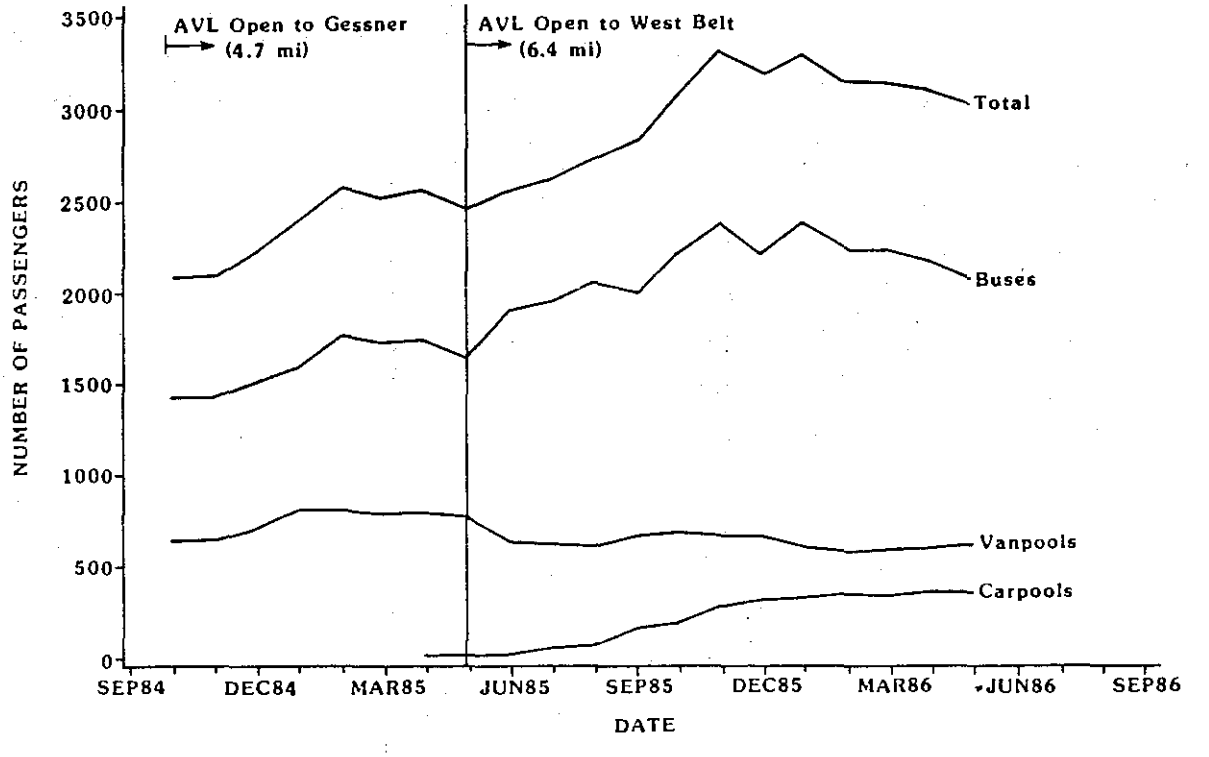


Figure 1. Trends in Average Peak-Period Utilization of the Katy Transitway

Table 1. Trends in Daily Utilization of the Katy AVL

Authorized Vehicle	Volume			Percent Change
	11/84	3/85	4/86	3/85 to 4/86
Buses				
Vehicles	78	100	160	+60%
Passengers	2860	3450	4302	+21%
Vanpools				
Vehicles	160	170	140	-18%
Passengers	1304	1596	1180	-26%
Carpools				
Vehicles	0	0	204	----
Passengers	0	0	706	----

Source: Texas Transportation Institute Counts.

Carpool Data, Katy AVL and Selected Other HOV Project

Trends in carpool utilization are shown in Figure 2. Carpool demand is somewhat higher in the a.m. This may be due to the fact that many of the carpools using the AVL are transporting children to school; thus, their afternoon travel may not coincide with the peak commuter period. In recent months, carpooling has begun to level off.

During an average peak period, carpools represent over 40% of total vehicles using the AVL (Figure 3). Those vehicles move just over 11% of the total persons moved on the AVL.

Table 2. Trends in Katy AVL Utilization, Vehicles

Month	Buses		Vanpools		Carpools		Total	
Peak Period	Peak Hr.	Peak Period	Peak Hr	Peak Period	Peak Hr	Peak Period	Peak Hr	Peak Period
11/84 a.m.	19	38	67	77	--	--	86	115
p.m.	19	40	57	83	--	--	76	123
12/84 a.m.	20	40	67	78	--	--	87	118
p.m.	19	41	59	84	--	--	78	125
1/85 a.m.	23	51	70	81	--	--	93	132
p.m.	18	39	63	91	--	--	81	130
2/85 a.m.	19	52	66	79	--	--	85	131
p.m.	20	45	56	87	--	--	76	132
3/85 a.m.	20	49	66	82	--	--	86	131
p.m.	23	52	55	88	--	--	78	140
4/85 a.m.	20	53	66	79	3	6	89	138
p.m.	19	51	51	87	3	4	73	142
5/85 a.m.	24	52	68	81	3	6	95	139
p.m.	20	54	53	87	1	6	74	147
6/85 a.m.	26	60	61	74	5	8	92	142
p.m.	28	61	35	84	3	5	66	150
7/85 a.m.	25	59	62	70	8	13	95	142
p.m.	29	57	52	83	7	15	88	155
8/85 a.m.	26	61	50	66	12	20	88	147
p.m.	27	61	51	79	8	17	86	157
9/85 a.m.	26	62	62	76	26	46	114	184
p.m.	25	62	53	85	20	42	98	189
10/85 a.m.	28	62	64	77	27	54	119	193
p.m.	24	59	50	86	22	48	96	193
11/85 a.m.	30	72	54	75	55	82	139	229
p.m.	27	68	55	85	30	73	112	226
12/85 a.m.	27	70	59	74	53	92	139	236
p.m.	30	67	39	83	34	83	103	233
1/86 a.m.	34	76	45	66	71	97	150	239
p.m.	34	73	35	79	30	88	99	240
2/86 a.m.	28	79	46	65	63	106	137	250
p.m.	37	78	30	73	35	93	102	244
3/86 a.m.	31	81	39	62	64	107	134	250
p.m.	34	78	31	72	38	83	103	233
4/86 a.m.	34	83	43	64	76	110	153	257
p.m.	33	77	45	76	49	94	127	247
5/86 a.m.	35	79	41	64	72	116	148	259
p.m.	39	79	34	76	41	91	114	246

Source: Texas Transportation Institute

Table 3. Trends in Katy AVL Utilization, Persons

Month	Buses		Vanpools		Carpools		Total	
Peak Period	Peak Hr.	Peak Period	Peak Hr	Peak Period	Peak Hr	Peak Period	Peak Hr	Peak Period
11/84 a.m.	720	1400	567	641	--	--	1287	2041
p.m.	750	1460	484	662	--	--	1234	2122
12/84 a.m.	800	1490	577	698	--	--	1377	2188
p.m.	710	1530	497	728	--	--	1207	2258
1/85 a.m.	790	1680	695	785	--	--	1485	2465
p.m.	700	1500	621	851	--	--	1321	2351
2/85 a.m.	710	1750	673	769	--	--	1383	2519
p.m.	780	1770	571	871	--	--	1351	2641
3/85 a.m.	780	1720	627	763	--	--	1407	2483
p.m.	840	1730	522	833	--	--	1362	2563
4/85 a.m.	760	1800	643	750	12	24	1415	2574
p.m.	680	1690	510	851	12	16	1202	2557
5/85 a.m.	800	1600	638	745	13	26	1451	2371
p.m.	700	1700	526	812	4	24	1230	2536
6/85 a.m.	990	1980	505	603	20	32	1515	2615
p.m.	950	1800	288	668	12	18	1250	2486
7/85 a.m.	970	2010	493	557	33	52	1496	2619
p.m.	1040	1870	425	679	29	59	1494	2608
8/85 a.m.	1020	2140	415	553	44	67	1479	2760
p.m.	950	1960	426	650	30	63	1406	2673
9/85 a.m.	950	2010	499	617	101	171	1550	2798
p.m.	940	1970	455	717	73	156	1468	2843
10/85 a.m.	1220	2385	521	634	96	203	1837	3222
p.m.	930	2025	427	733	77	167	1434	2925
11/85 a.m.	1145	2440	447	617	195	299	1787	3356
p.m.	990	2295	470	716	111	258	1571	3269
12/85 a.m.	960	2180	502	625	198	337	1660	3142
p.m.	1125	2210	339	706	113	295	1577	3211
1/86 a.m.	1235	2450	369	540	248	333	1852	3323
p.m.	1160	2275	295	668	103	313	1558	3256
2/86 a.m.	975	2250	392	541	217	366	1584	3157
p.m.	1185	2185	261	611	120	320	1566	3116
3/86 a.m.	1100	2300	351	553	231	380	1682	3233
p.m.	1130	2140	272	618	129	280	1531	3038
4/86 a.m.	980	2270	377	548	261	378	1618	3196
p.m.	670	2032	366	632	166	328	1202	2992
5/86 a.m.	1085	2230	360	553	243	387	1688	3170
p.m.	1040	1880	305	669	142	311	1487	2860

Source: Texas Transportation Institute

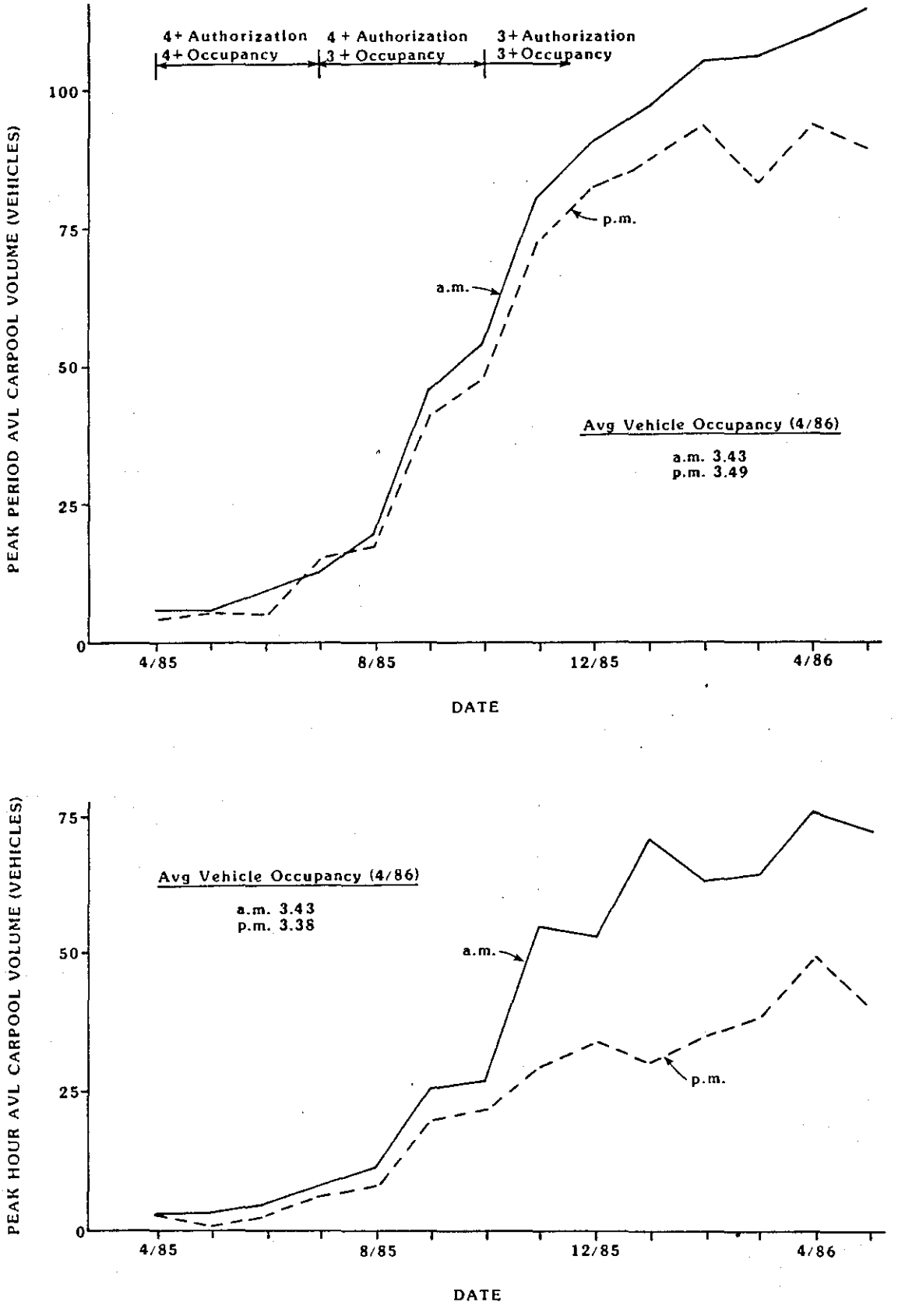


Figure 2. Trends in Peak-Period and Peak-Hour Carpool Utilization of the Katy Transitway

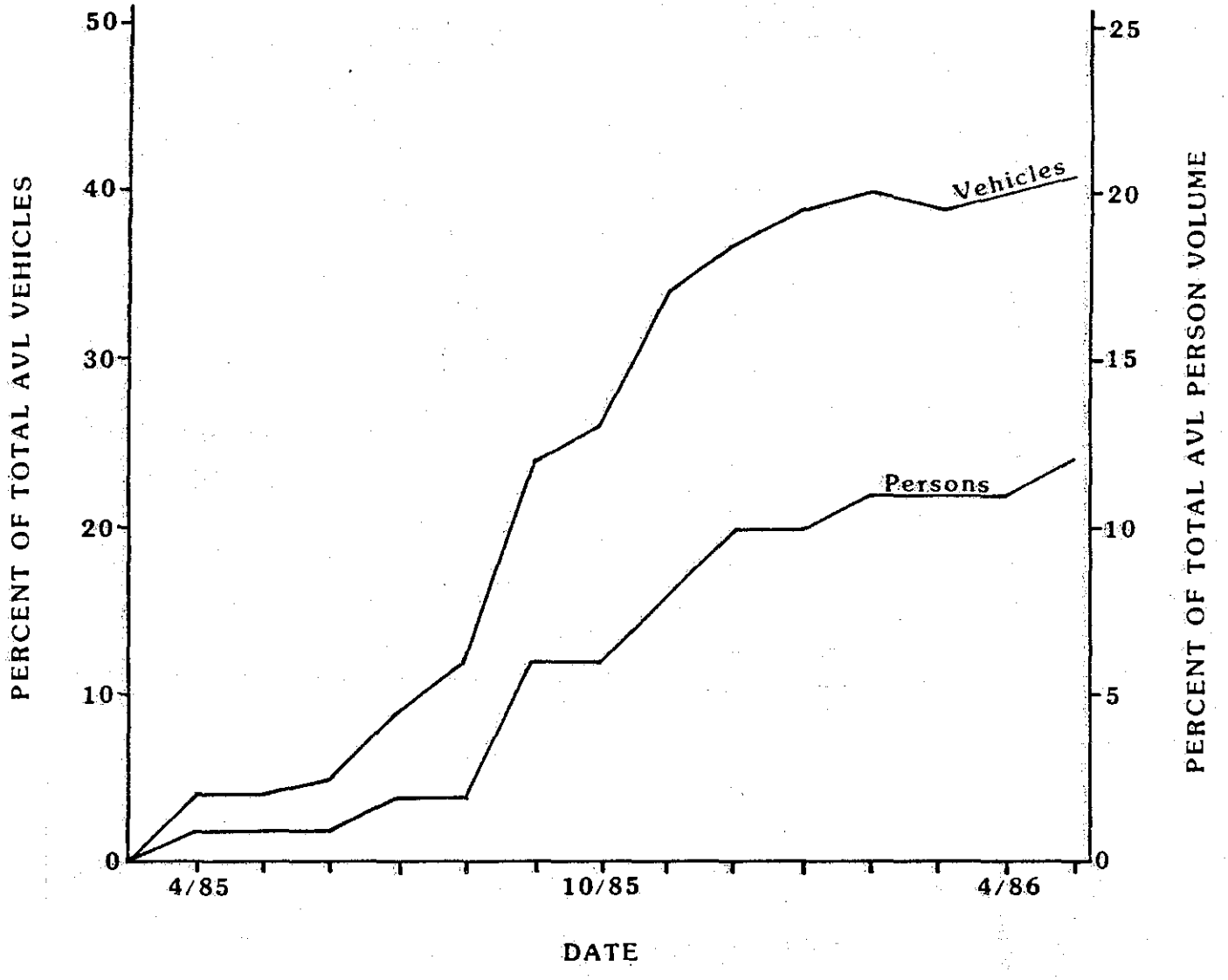


Figure 3. Carpool Volumes as a Percent of Total Katy AVL Volumes

Peak-Hour Carpool Volumes

For selected freeway HOV projects, Table 4 summarizes peak-hour carpool volumes. The Katy AVL, at approximately 50 to 75 carpools per peak hour, is, by far, the lowest carpool volume HOV facility shown in the table.

Table 4. Carpool Volumes on Freeway High-Occupancy Vehicle Lanes

Facility	Carpool Definition	Peak Hour Carpool Volume[1] (vph)
Katy AVL, Houston	3+	76 (a.m.) 49 (p.m.)
I-66, Washington, D.C. (2 lanes)	3+	2980
Shirley (I-395), Washington, D.C. (2 lanes)	4+	2165
Rte. 91, Los Angeles	2+	1370
I-95, Miami	2+	1370
Rte. 55, Orange County	2+	1250
El Monte, Los Angeles	3+	905
I-4, Orlando	2+	900
I-495, Lincoln Tunnel, N.Y.C.	buses only	740 buses
I-5, Seattle	3+	400
US 101, San Francisco	3+	360
SR 520, Seattle	3+	250

[1]Including autos in HOV lane in violation of HOV occupancy requirements.

Sources: TTI Analyses and 1985 ITE Survey of HOV Projects.

In reviewing the volume data, the "capacity" of the HOV lane becomes an issue. A consensus of the agencies involved in operating freeway HOV lanes is that the capacity of these lanes is somewhere in the range of 1000 to 1500 vph (Table 5). Given the access/egress characteristics of the Katy AVL, this may be a high estimate for the Katy HOV facility. Nevertheless, the Katy AVL is operating at relatively low vehicular volumes and is also operating below capacity.

Also, in comparison to other projects, relatively few persons are served by carpools and vanpools on the Katy AVL. While this can at least partially be attributed to the high-quality of bus service provided on the AVL, the fact remains that, of the HOV projects summarized in Table 6, the Katy AVL is serving an unusually low volume of total trips in carpools and vanpools.

Table 5. Estimated Maximum Hourly Volume on an HOV Lane, Responses From Agencies Operating HOV Lanes on Freeways

HOV Facility	Responding Agency	Max. Veh. Per Hr. Per Lane[1]	Current Peak Hour HOV Volume[2]	Does Current Vol. Result In		
				Under Utilization	Too Many Veh.	No Problem
El Monte, Los Angeles	Caltrans	1200	1090		X	
Shirley, Wash., D.C.	Va. Dept of Hwy & Trans	1500-1700	2165 (2 lanes)			X
I-66, Washington, D.C.	Va. Dept. of Hwy & Trans	Up to 2000	2980 (2 lanes)		X	
Moanalua, Hawaii	Hawaii DOT	1500+	1750			X
Rte. 91, Los Angeles	Caltrans	1500	1388			X
I-95, Miami	Fl. DOT	1200-1400	1370			X
Rte. 55, Orange Co.	Caltrans	1500	1400			X
I-4, Orlando	Fl. DOT	1200	900			X
US 101, San Francisco	Caltrans	1200-1400	440	X		
I-5, Seattle	Wash. DOT	1300	460			X
SR 520, Seattle	Wash. DOT	500[3]	330			X

[1]Estimated upper limit that can effectively be accommodated while maintaining reliable, high-speed operation in the HOV lane.

[2]All vehicles operating in the HOV lane.

[3]Special situation due to HOV lane being located on the outside shoulder; HOV traffic merges with normal freeway exit and entrance ramp operations.

Sources: TTI Analyses and ITE 1985 Survey of Operating HOV Projects.

Increase in Carpooling Due to AVL

Typically, allowing carpools to use an HOV lane increases the total volume of carpools on the freeway. To what extent if any, this has occurred on the Katy Freeway is difficult to establish with a high degree of accuracy.

Extensive "before" data have been collected on the Katy Freeway since 1983. These data are summarized in Figure 4. While the data were collected

Table 6. Estimated Carpool and Vanpool Utilization of HOV Lanes

Facility and Time Period	Bus Passengers		Vanpool and Carpool Passengers		Total Passengers
	No.	%	No.	%	
Katy AVL, Houston (buses, vanpools, carpools) 6-9 a.m.	2,270	71%	926[1]	29%	3,196
Houston, I-45N (buses, vanpools) 6-8:30 a.m.	5,100	63%	3,000	37%	8,100
Shirley Highway, Washington, D.C. (buses and 4+ carpools)					
7-8:00 a.m.	11,800	52%	11,000	48%	22,800
6-9:30 a.m.	23,700	55%	19,700	45%	43,400
El Monte Busway, Los Angeles (buses and 3+ carpools)					
6-10:00 a.m.	8,470	54%	7,330	46%	15,800
peak-hour	3,450	53%	3,040	47%	6,490
I-66, Washington, D.C. (buses and 3+ carpools) a.m. peak-hour	2,600	29%	6,500[2]	71%	9,100
I-95 Miami Concurrent Flow a.m. peak-hour	640	23%	2,200[2]	77%	2,840
U.S. 101 Marin County a.m. peak-hour	3,700	79%	980	21%	4,680
Santa Monica, Los Angeles peak period	3,810	20%	15,289	80%	19,099
Banfield, I-80, Portland (buses and 2+ carpools) a.m. peak hour	300	12%	2,100	88%	2,400
Average, non-weighted (not incl. Katy)	-----	44%	-----	56%	-----

[1]378 (12%) in carpools, 548 in vanpools.
[2]Includes illegal vehicles in the priority lane.

Source: Texas Transportation Institute. Year of data not necessarily consistent with data in previous tables.

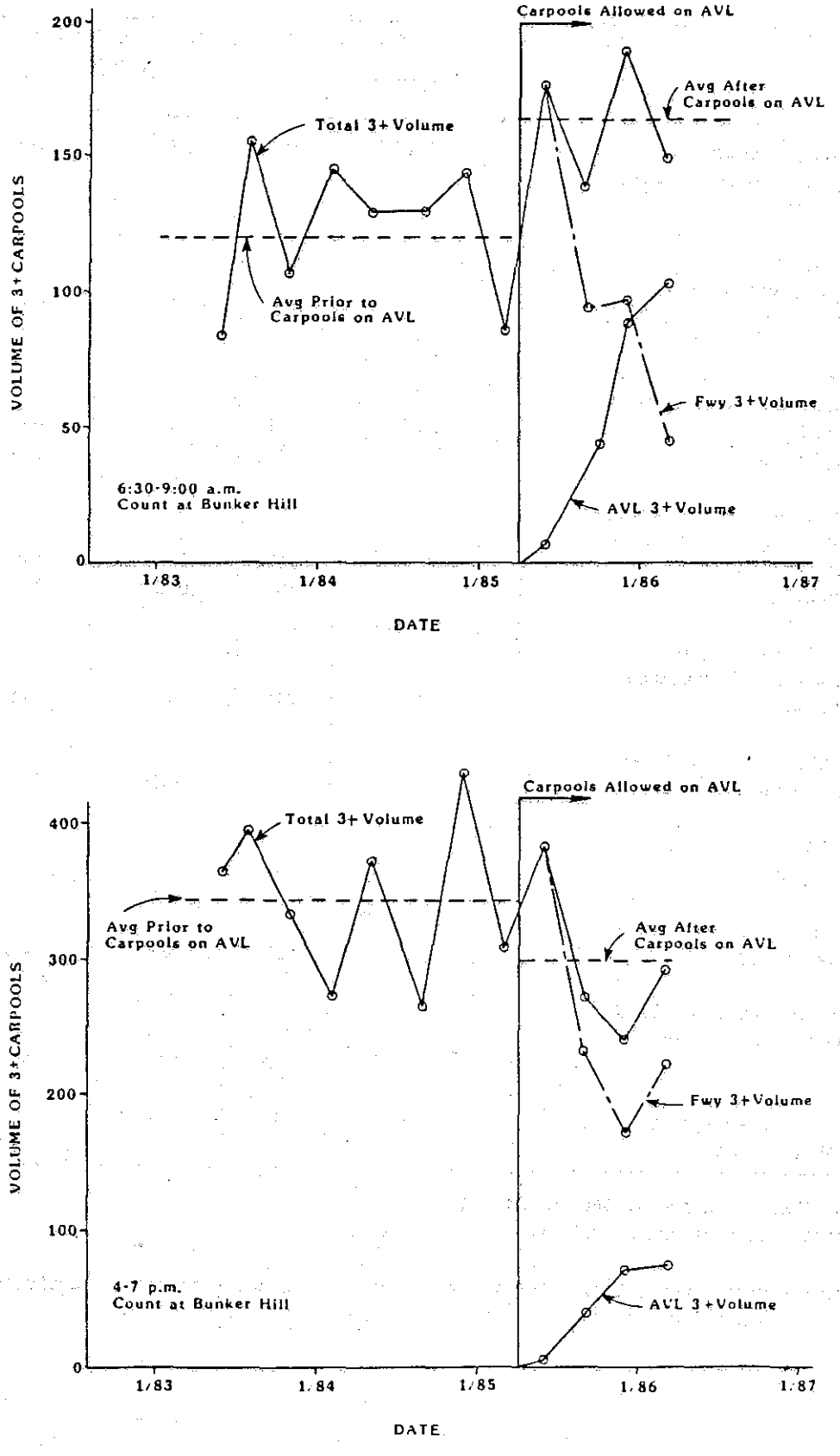


Figure 4. Peak-Period 3+ Carpool Volumes, "Before" and "After" Carpool Utilization of the Katy Freeway and AVL

on the same day of the week, seasonal and other normal traffic variations make it difficult to establish definitive trend lines. The "before" data for the a.m. peak period ranged from a high of 156 3+ carpools to a low of 62 carpools; in the p.m., this volume ranged from a high of 439 carpools to a low of 274 carpools. For purposes of this analysis, the average of the "before" counts is used.

Based on this assumption, in the a.m. peak period, implementation of the AVL increased total 3+ carpools by 37%. However, in the p.m., since carpools were allowed on the AVL, total 3+ carpooling has decreased by 14%. Since the total p.m. carpool volumes (freeway + AVL) are substantially higher than the corresponding a.m. volumes, the average daily increase in 3+ carpools since AVL implementation is effectively zero (Table 7).

The increase in carpools on the Katy, relative to other HOV projects, would be expected to be lower in that: 1) vanpooling has been allowed on the Katy since the AVL opened and the vanpooling mode no doubt serves a portion of potential carpool demand; 2) the Katy AVL is not yet complete, and its 6.4-mile length is less than that for most HOV projects; 3) excellent bus service is offered in the corridor which may also reduce the demand for carpooling; and 4) carpools have only been allowed to use the AVL for a year.

Nonetheless, the Katy AVL has not resulted in the significant carpooling increases experienced on other projects. And, in spite of the lack of consistency in the data base, if carpooling on the Katy had increased by over 100%, such an increase would have been detectable.

AVL Volume Relative to Freeway Volume

In the peak hour of AVL operation, the Katy AVL is typically moving 20% to 25% of total person movement in 2% to 3% of total vehicles (Table 8). The freeway count location may understate freeway volumes; counts of 1600 to 1700 vph per lane have been made at other locations on the Katy Freeway.

Table 7. Estimated Increases in Carpool Volumes Due to HOV Lane Implementation

Facility	Carpool Volume Before HOV	Carpool Volume After HOV[1]	Percent Change
Katy AVL, Houston (1983-1986)			
a.m. peak period (6:30-9:00)	119	163	+ 37%
p.m. peak period (4:00-7:00)	345	297	- 14%
"average" peak period	232	230	0
El Monte, Los Angeles (1976-1985)	670	2166	+323%
a.m. peak period			
Rte 91, Los Angeles (4 mo. in 1985)	1000	1350	+ 35%
p.m. peak hour			
Rte. 55, Orange Co. (1984-6)			
a.m. peak period	1341	1916	+ 43%
p.m. peak period	1925	2473	+ 28%
I-95, Miami (1976-1984)	2185	2714	+ 24%
a.m. peak period			
Shirley Highway, Washington D.C.	272	3723	+1269%
a.m. peak period (1974-1985)			
I-93, Boston (1974-1980)	315	1224	289%
a.m. peak period			
Banfield Fwy., Portland, Ore.	106	518	+389%
a.m. peak period			
Moanalua Fwy. (1974-1982)	600	1750	+192%
a.m. peak period			

[1]Freeway plus HOV lane volume.

Sources: TTI Analyses, ITE 1985 Survey of Operating HOV Projects, and "Study of Current and Planned High-Occupancy Vehicle Lane Use: Performance and Prospects", by Frank Southworth and Fred Westbrook, 1985.

Table 8. Trends In Peak-Hour Freeway and AVL Person Volumes, Katy Freeway

Date	Freeway		AVL		Total	
Peak Hour	Vehicles	Persons	Vehicles	Persons	Vehicles	Persons
12/84 a.m.	3258 (97%)	3628 (72%)	86 (3%)	1377 (28%)	3344	5005
p.m.	4077 (98%)	4702 (80%)	76 (2%)	1207 (20%)	4153	5909
3/85 a.m.	3880 (98%)	4282 (75%)	86 (2%)	1407 (25%)	3966	5689
p.m.	4374 (98%)	5313 (80%)	78 (2%)	1362 (20%)	4452	6675
6/85 a.m.	4410 (98%)	5124 (77%)	92 (2%)	1515 (23%)	4502	6639
p.m.	4025 (98%)	4878 (80%)	66 (2%)	1250 (20%)	4091	6128
9/85 a.m.	4468 (98%)	4914 (76%)	114 (2%)	1550 (24%)	4582	6464
p.m.	4327 (98%)	5140 (78%)	98 (2%)	1468 (22%)	4425	6608
12/85 a.m.	4663 (97%)	4988 (75%)	139 (3%)	1660 (25%)	4802	6648
p.m.	3997 (97%)	4620 (75%)	103 (3%)	1577 (25%)	4100	6197
3/86 a.m.	4319 (97%)	4784 (74%)	134 (3%)	1682 (26%)	4453	6466
p.m.	4136 (98%)	4867 (76%)	103 (2%)	1531 (24%)	4239	6398

Notes: Freeway count location at Bunker Hill (3 lanes), a.m. 6:30-7:30, p.m. 4:30-5:30 based on peak AVL hour which does not necessarily correspond to peak freeway hour.

Source: Texas Transportation Institute counts.

Growth in Total AVL Volume

Relative to other selected major HOV projects, the increase in total AVL person movement since AVL inception has been relatively low on the Katy AVL (Table 9). This would appear to be due, at least in part, to the length of the AVL and the fact that the Houston economy has been depressed during the initial years of AVL operation. Research has demonstrated that the length of HOV lane (which can be a proxy variable for travel time savings) affects HOV ridership. The Katy AVL is less than two-thirds the length of the other projects shown in Table 9.

Table 9. Estimated Annual Growth Rates in Person Volumes on Selected Transitway Projects

Year	Shirley Highway (11 mi.) Washington, D.C. 6-9:30 a.m.		El Monte Busway (11 mi.) Los Angeles 6-10 a.m.		I-45 N Contraflow/AVL (9.6 mi.) Houston both 2.5-hr. peak periods		Katy AVL (6.4 mi.) Houston both 3 hr. peak periods	
	Volume	% Increase (decrease)	Volume	% Increase (decrease)	Volume	% Increase (decrease)	Volume	% Increase
1970	4,500	----						
1971	9,000	+100%						
1972	12,000	+ 33%						
1973	13,500	+ 12%	1,700	----				
1974	20,000[1]	+ 48%	3,500	+105%				
1975	24,000	+ 20%	4,600	+ 31%				
1976	29,000	+ 21%	8,000[1]	+ 74%				
1977	34,000	+ 17%	9,200	+ 15%				
1978	37,000	+ 9%	10,000	+ 9%				
1979	43,000	+ 16%	13,000	+ 30%	4,324	----		
1980	43,500	+ 1%	13,700	+ 5%	9,746	+125%		
1981	43,500	0%	14,700	+ 7%	14,808	+ 52%		
1982	41,900(est)	(4%)	13,100	(11%)	14,870	+ 1%		
1983	40,300	(4%)	14,500	+ 11%	15,890	+ 7%		
1984	34,300[2]	(15%)	15,900	+ 10%	16,640	+ 5%	4163	----
1985	28,400[2]	(17%)	15,800	(1%)	15,260	(8%)	5131[1]	23%
1986	----	-----	----	---	13,791	(10%)	6188	21%
Average, non-weighted		16%		24%		25%		22%
Average, 1st 2 years		67%		68%		89%		22%
Average, 1st 5 years		43%		47%		38%		----

[1]Carpools introduced onto project.
[2]Decrease partially the result of opening I-66. Operating hours also reduced to 6-9 a.m.

The average of the annual growth rates for the first two years of HOV operation was 67% on the Shirley, 68% on the El Monte, 89% on the North, and only 22% on the Katy.

Another point should be noted from Table 9. In the year carpools were allowed to use the Shirley (1974), total HOV utilization increased 48%. In the year carpools were allowed to use the El Monte (1976), total HOV utilization increased 74%. In the year carpools were allowed to use the Katy (1985), total HOV utilization only increased by 23%.

All these data suggest that, once Phase 2 of the Katy opens, an increase in AVL utilization can be expected to occur. This is anticipated to occur since the Phase 2 improvement will generate additional time savings, particularly for users of the Addicks park-and-ride facility located in the vicinity of SH 6. A direct, grade-separated connection is being provided from that park-and-ride lot to the transitway.

III. CRITERIA FOR EVALUATING THE SUCCESS OF THE AVL CARPOOL EXPERIMENT

Carpools were permitted to use the Katy AVL as an experiment. Prior to allowing carpools on the AVL, Metro and the State identified the general criteria that would be used to evaluate the success of the carpool experiment. Those criteria were presented in Research Report 484-1 and are also shown in Table 10. These criteria are addressed individually in subsequent sections of this report.

Table 10. Criteria for Judging the Success of the Katy AVL Carpool Experiment

Proposed Evaluation Factor	Proposed Relative Weighing	Resulting Impact
1. Change in person movement on the the Katy AVL directly attributable to carpooling.	25	**Highway Successful:** Total AVL person movement increases by at least 20% due to carpooling. **Successful:** Person movement increases by between 5% and 20%. **Somewhat Unsuccessful:** Person movement essentially unchanged (0% to 5% increase) **Highly Unsuccessful:** Person movement decreases.
2. Non-User Perception of Katy AVL Utilization	30	**Highly Successful:** At least 70% of non-users respond that AVL is sufficiently utilized. **Successful:** Between 50% and 70% of non-users respond that AVL is sufficiently utilized. **Somewhat Unsuccessful:** Between 50% and 70% of non-users respond that AVL is not sufficiently utilized. **Highly Unsuccessful:** More than 70% of non-users respond that AVL is not sufficiently utilized.
3. Change in average travel time on the AVL.	20	**Highly Successful:** No change. **Successful:** Average travel speed decreases by no more than 3 mph. **Somewhat Unsuccessful:** Average travel speed decreases by between 3 mph and 6 mph. **Highly Unsuccessful:** Average travel speed decreases by more than 6 mph.
4. Change in person delay to mixed-flow traffic	15	**Highly Successful:** No change or a decrease in total delay. **Successful:** Delay increases by less than 5%. **Somewhat Unsuccessful:** Delay increases by 5% to 10%. **Highly Unsuccessful:** Delay increases by more than 10%.
5. Increase in frequency of breakdowns on the AVL	5	**Highly Successful:** None. **Successful:** Less than 5%. **Somewhat Unsuccessful:** Increase by between 5% and 15%. **Highly Unsuccessful:** Increases by more than 15%.
6. Increase in authorization and enforcement costs.	5	Values developed by Metro.

In this matrix, items #1, 3 and 4 indirectly address change in total corridor delay. In this matrix, item 5 indirectly addresses trip reliability.

IV. PERSON MOVEMENT IMPACTS OF CARPOOLING

A desired impact of permitting carpools onto the AVL is to increase the volume of persons moved on the facility. As shown previously (Table 6), the percent of total person movement in vanpools and carpools on the Katy AVL is low relative to many other freeway HOV projects.

Carpool Component

Of total peak-period persons moved on the AVL in April 1986, approximately 12% were in carpools (Table 11).

Table 11. Person Movement on the Katy AVL, April 1986

Time Period	Bus		Vanpool		Carpool		Total
	Volume	%	Volume	%	Volume	%	
A.M. EB							
Peak Hour	980	61%	377	23%	261	16%	1618
Peak Period	2270	71%	548	17%	378	12%	3196
P.M. WB							
Peak Hour	670	56%	366	30%	166	14%	1202
Peak Period	2032	68%	632	21%	328	11%	2992

Source: TTI counts, Table 3.

These data could lead to the conclusion that allowing carpools on the AVL has increased person movement in the a.m. peak period by 13% (378/(3196-378)) and by 12% (328/(2992-328)) in the p.m. peak period. However, such a conclusion ignores the fact that some of these carpoolers used other AVL modes prior to carpooling (Table 12).

Table 12. Prior Use of AVL By Carpoolers

Did You Use AVL Before Carpooling	Carpool Survey Date	
	10/85 (n=90)	4/86 (n=197)
Yes, Bus	3%	7.1%
Yes, Van	2%	7.1%
No	95%	85.8%

This suggests that slightly over 14% of those carpooling were drawn from other vehicles using the AVL and, thus, does not represent an effective increase in AVL ridership due to carpooling. This indicates that carpooling has effectively increased AVL utilization by 10% to 11%. Since it is possible that, if carpoolers were not allowed on the AVL, some of the carpoolers would choose to ride a bus or vanpool, this should represent a high estimate of the effective increase in AVL utilization due to carpooling. It should also be noted that the percent of carpoolers who previously used other modes on the AVL increased from 5% in October 1985 to 14% in April 1986.

Other issues should be emphasized. First, allowing carpools to use the Katy AVL did not result in the substantial increases in total AVL utilization that were realized when carpools were allowed onto the Shirley and El Monte HOV facilities. Allowing carpools onto those projects increased total HOV utilization by 48% and 74%, respectively (Table 9). Second, the Katy AVL has not generated the significant increase in carpools typically associated with HOV projects (Table 7). And, since the total utilization of the Katy AVL is less than what might be expected (Table 9), the carpool component is being compared to a relatively low base; this could overemphasize the impact of carpools on effective AVL utilization.

For purposes of this analysis, it is assumed that allowing carpools onto the AVL has increased effective peak-period AVL person movement by approximately 10%.

Conclusion Pertaining to Evaluation Criterion

The increase in AVL person movement resulting from carpool utilization is a criterion for evaluating the success of the carpool experiment. Table 13 summarizes this criterion.

Table 13. Person Movement Impacts of Carpooling, Criterion for Assessing the Success of the Katy AVL Carpool Experiment

Rating[1]	Associated Impact
4. Highly Successful	Total AVL person movement increases by at least 20% due to carpooling
3. Successful[2]	Person movement increases by between 5% and 20%
2. Somewhat Unsuccessful	Person movement increases by between 0% and 5%
1. Highly Unsuccessful	Person movement decreases

[1]Of the 6 criteria used to rate the success of the carpool experiment, this criterion is given the second heaviest total rating (25% of total).

[2]The April 1986 data fall into this category.

Based on the data presented, it could be concluded that, in regard to this criterion, the experiment has been a success. However, due to the number of qualifying factors referred to previously, it is assumed for this analysis that, in terms of the person movement impact, the carpool experiment is midway between "successful" and "somewhat unsuccessful."

V. PERCEPTION OF AVL UTILIZATION

A major purpose for allowing carpools to use the AVL was to make the AVL appear more utilized to the general public. The carpooling has increased the volume of vehicles using the AVL. In March 1985, 135 vehicles used the AVL during a typical peak period; in April 1986, 252 vehicles were using the AVL in the peak period, an 87% increase over the March 1985 volumes.

The effect of this increased volume on the perception of AVL utilization is considerably different between the users and the non users of the AVL. For all AVL user groups, a higher percentage of users feel the AVL is sufficiently utilized in comparison to responses to previous surveys. Given that transit represents approximately 70% of AVL users, a majority of the AVL users believe the AVL is sufficiently utilized. It should be realized that, due to the sharp peaking characteristics typical of the AVL, most of the AVL users see the AVL only during the time period in which it is most intensively utilized.

While the increased volume of AVL traffic has had a positive impact on the perception of utilization by the users of the AVL, the same is not true of the non users of the AVL. This group, in spite of an 87% increase in AVL vehicle utilization, perceives the AVL to still be significantly underutilized. While the negative expression in the April 1986 surveys may be somewhat overstated in that the non AVL users are also being inconvenienced by the Phase 2 AVL construction, the conclusion has to be that allowing carpools to utilize the AVL has not altered the opinion on the part of non AVL users that the priority lane is badly underutilized. The percentage of non users feeling the AVL is a good improvement has also declined over the last year.

These data are summarized in Table 14.

At this time, the non user perception of the AVL is difficult to evaluate. It may be that, unless the AVL operates at speeds and volumes comparable to the mainlanes, a certain portion (and possibly a large portion)

of the non users may feel the AVL is underutilized. Similar surveys have been performed on the North Transitway where peak-hour transitway volumes are between 200 vph and 300 vph; in those surveys, approximately 75% of the non users felt the AVL was underutilized. Since, with 2+ unauthorized carpools allowed onto the Katy Transitway in August 1986, transitway volumes are now over 2000 vehicles per peak period. Surveys presently scheduled for Spring 1987 should give a better indication of how the non user perception of utilization is changed by significant increases in transitway demand. Due to the high weighting given to this evaluation criteria, this issue is a concern that should be resolved as part of the scheduled on-going research effort.

Table 14. Perception of the Utilization of the Katy AVL

Measure of Effectiveness	AVL Users								Non AVL Users	
	Transit		Vanpool		Carpool		Total[1]		Motorists	
	3/85	4/86	3/85	4/86	10/85	4/86	3/85	4/86	3/85	4/86
Is the AVL Sufficiently Utilized										
Yes	49%	66%	30%	41%	34%	45%	43%	59%	3%	3%
No	33%	14%	51%	34%	43%	32%	39%	20%	90%	92%
Not Sure	18%	20%	19%	25%	23%	23%	18%	21%	7%	5%
Is the AVL a Good Improvement										
Yes	---	---	---	---	---	---	---	---	41%	37%
No	---	---	---	---	---	---	---	---	35%	43%
Not Sure	---	---	---	---	---	---	---	---	24%	20%

[1]Weighted average for all AVL users (bus and vanpool in 3/85; bus, vanpool and carpool in 4/86).

Source: Texas Transportation Institute Surveys.

Conclusion Pertaining to Evaluation Criterion

In the criteria for evaluating the success of the carpool experiment, the non user perception of the AVL utilization was the single most important

criterion. Table 15 summarizes this criteria. In terms of this evaluation factor or measure of effectiveness, the carpool experiment is considered "highly unsuccessful."

Table 15. Non User Perception of Katy AVL Utilization, Criterion for Assessing the Success of the Katy AVL Carpool Experiment

Rating[1]	Associated Impact
4. Highly Successful	At least 70% of non-users respond that AVL is sufficiently utilized.
3. Successful	Between 50% and 70% of non-users respond that AVL is sufficiently utilized.
2. Somewhat Unsuccessful	Between 50% and 70% of non users respond that AVL is not sufficiently utilized.
1. Highly Unsuccessful[2]	More than 70% of non users respond that AVL is not sufficiently utilized.

[1]Of the 6 criteria used to rate the success of the carpool experiment, this criterion is given the heaviest relative weighting (30% of the total).

[2]The April 1986 data fall into this category.

VI. CHANGE IN AVERAGE TRAVEL TIME ON THE AVL

A concern associated with AVL carpool utilization was that the increase in AVL volumes would depress the speeds on the AVL. This, in turn, could reduce the attractiveness of the AVL. To investigate this concern, data have been collected relating to time mean speed, spot speeds, and vehicle headways on the AVL.

AVL Travel Time, Average Speeds, and Headways

Average Travel Speeds

Time mean speeds were measured for each vehicle on the Katy AVL. The times the vehicle entered and exited the AVL were recorded to the nearest second, and the travel time was divided into the length of the priority lane to calculate average travel speeds. Since the vehicles have to reduce speeds to enter and exit the AVL, the time mean speeds are less than the maximum operating speeds attained within the AVL.

Average speeds are shown in Table 16. No significant change has occurred in this average speed, even though total vehicular volume on the AVL increased by 87% between March 1985 and April 1986. The data also indicate a small range of speeds for all types of vehicles operating on the AVL.

Table 16. Time Mean Speeds on the Katy AVL

Average Speed (mph)	Bus		Vanpool		Carpool		Total	
	3/85	5/86	3/85	5/86	3/85	5/86	3/85	5/86
Average Travel Speed (mph)	52	56	56	57	---	56	55	56
Standard Deviation	8.7	3.3	3.3	3.2	---	3.6	3.5	3.4
Coefficient of Variation	0.17	0.06	0.06	0.06	---	0.06	0.06	0.06

Travel time data collected for specific sections of the AVL also confirm that average speed has not been adversely impacted (Table 17).

Table 17. Travel Times and Average Speeds, Katy AVL

AVL Section	Time Period	Avg. Travel Time (min)		Avg. Speed (mph)	
		3/85	4/86	3/85	4/86
West Belt to Gessner	6-9 a.m.	1.9	1.9	55	55
1.7 miles	6:30-8:30 a.m.	1.9	1.9	55	55
	3:15-6:15 p.m.	1.9	1.8	55	57
	4:15-6:15 p.m.	1.9	1.8	55	57
Gessner to Post Oak	6-9 a.m.	5.1	5.0	55	56
4.7 miles	6:30-8:30 a.m.	5.1	5.0	55	56
	3:15-6:15 p.m.	5.1	5.2	55	54
	4:15-6:15 p.m.	5.1	5.2	55	54

Spot Speed Studies

A set of vehicle detectors were used to collect spot speeds. This data collection technique is not as reliable as the time mean speed data. The value of this data is to confirm that speeds for the most part are not hindered by other vehicles and are in a narrow range around 55 mph. These data are summarized in Table 18.

Table 18. Spot Speed Surveys, Katy AVL

Date and Direction	Number of Vehicles			Speeds Missed	Less Than 45	Number of Vehicles With Speeds						Over 66	Average Speed (mph)
	Vans	Buses	Carpools			45-50	50-54	54-57	57-60	60-63	63-66		
March 1985													
EB am[1]	70	55	---	17	0	8	30	25	20	12	8	7	57
WB pm[1]	82	58	---	15	2	3	28	30	28	17	11	7	57
June 1986													
EB am	78	59	59	2	0	1	2	3	31	68	49	42	61
WB pm	66	65	65	17	0	7	26	54	44	32	19	14	58

[1]Average of data collected on 8 separate days. Refer to Research Report 484-1.

Headways

Although the average operating speeds on the AVL are very near the speed limit, a certain percentage of vehicles are restricted from travelling their desired speed due to slower travelling vehicles in the traffic stream.

Headway data provide an indication of the percent of AVL vehicles having their desired speed reduced due to the presence of other vehicles. As would be expected, with more vehicles operating on the AVL, this percentage has increased (Table 19). Operating conditions of AVL traffic are, for the most part, free flow. However, studies at the entrance and exit to the AVL indicate that speeds of 31% of the AVL traffic may be affected by other vehicles. This percentage has increased from the 15% found in the March 1985 survey. However, the average speed for all vehicles on the AVL has increased from 55 to 56 mph.

Table 19. Percent of AVL Vehicles Having Operating Speed Restricted Due to the Presence of Other AVL Vehicles

Date	Avg. AVL Peak-Hour Volume	Percent With Speed Restricted
March 1985, Before Carpools	82	15%
April 1986, After Carpools	140	31%

Conclusion Pertaining to Evaluation Criterion

Possible changes in AVL operating speed are a criterion for evaluating the success of the carpool experiment. Table 20 summarizes this criterion.

Table 20. Change in Average Travel Time on the AVL, Criterion for Assessing the Success of the Katy AVL Carpool Experiment

Rating[1]	Associated Impact
4. Highly Successful[2]	No change.
3. Successful	Average travel speed decreases by no more than 3 mph.
2. Somewhat Unsuccessful	Average travel speed decreases by between 3 mph and 6 mph.
1. Highly Unsuccessful	Average travel speed decreases by more than 6 mph.

[1]Of the 6 criteria used to rate the success of the carpool experiment, this criterion is given the third heaviest relative weighting (20% of total).

[2]The April and June 1986 data fall into this category.

If anything, average travel speed on the AVL has increased slightly. Thus, in terms of this measure, the carpool experiment is considered "highly successful".

VII. MIXED-FLOW TRAFFIC LANES

It is conceivable that allowing carpools onto the AVL could have either a positive or a negative impact on the mixed-flow lanes. If substantial carpool volumes use the AVL, mainlane volumes could be decreased which might improve operations. Conversely, the existing access/egress locations to the AVL are less than desirable. Large volumes entering or exiting the AVL, particularly at the p.m. exit locations, could deteriorate level-of-service on the mainlanes.

Due to natural variability in the traffic stream, it is difficult to precisely quantify changes in mainlane operating speeds. However, the data collected (Tables 21 and 22) suggest that, if anything, mainlane speeds have increased since carpools began to use the AVL. However, it does not appear that this change is a result of carpools using the AVL.

Table 21. Travel Time and Speeds, Freeway Mainlanes, SH 6 to S.P.R.R. (13.2 miles)

Traffic and Time Period	Avg. Travel Time (min).		Avg. Speed (mph)	
	3/85	7/86	3/85	7/86
A.M. Eastbound				
3-Hour Period, 6-9 a.m.	26.5	19.1	30	42
2-Hour Period, 6:30-8:30 a.m.	30.6	20.9	26	38
P.M. Westbound				
3-Hour Period, 3:15-6:15 p.m.	21.3	19.1	37	41
2-Hour Period, 4:15-6:15 p.m.	24.7	21.1	32	38

Table 22. Average Speeds on the Katy Freeway Mainlanes

Date, Direction, Time	Average Speed in MPH							
	Section 1		Section 2		Section 3		Section 4	
	3/85	7/86	3/85	7/86	3/85	7/86	3/85	7/86
Eastbound, A.M.								
6:00	54	54	55	51	55	59	55	55
6:15	46	56	49	51	50	55	54	60
6:30	31	51	33	42	39	51	49	55
6:45	26	43	26	35	34	43	54	53
7:00	22	42	22	30	28	55	54	--
7:15	20	36	16	28	22	30	54	53
7:30	18	32	18	18	21	25	52	55
7:45	18	36	17	20	22	28	54	51
8:00	33	48	28	23	26	30	54	55
8:15	30	54	21	36	26	31	56	57
8:30	39	55	30	51	28	34	55	57
8:45	53	55	37	56	33	46	56	53
Westbound, P.M.								
3:00	58	53	60	51	66	44	55	59
3:15	57	55	57	48	58	49	55	54
3:30	48	55	53	49	54	51	57	51
3:45	56	55	49	46	58	54	53	53
4:00	56	53	50	52	60	36	55	58
4:15	48	60	44	49	41	30	55	58
4:30	49	55	35	46	34	29	54	51
4:45	42	41	28	35	28	31	44	48
5:00	42	37	25	31	24	22	46	44
5:15	48	47	22	27	22	22	46	41
5:30	35	53	20	25	19	20	49	45
5:45	47	49	21	32	25	21	42	45
6:00	58	49	28	32	32	25	50	52

Note: Section 1 a.m. and Section 4 p.m. = SH 6 to West Belt AVL entrance.

Section 2 a.m. and Section 3 p.m. = West Belt AVL Entrance to Gessner AVL ent.

Section 3 a.m. and Section 2 p.m. = Gessner AVL entrance to Post Oak

Section 4 a.m. and Section 1 p.m. = Post Oak to S.P.R.R.

However, it should be noted in reviewing Tables 21 and 22 that travel time data collected in March 1985 are being compared to travel time data collected in July 1986. This inconsistency was the result of difficulties in scheduling the data collection effort.

The data do suggest that travel time savings on the AVL are less than they were in 1985. To further check this finding, additional travel time data were collected in September 1986, after 2+ carpools were allowed onto the transitway.

The differences in average speeds between AVL and non-AVL traffic are not as large as in the "before" study (March 1985). The poor economy and the construction projects are factors that contribute to a current reduction in peak-period traffic and resultant congestion. The survey taken in July 1986 had the added factors of reduced demands because of school and vacation traffic. The survey taken in September 1986 included the shift of approximately 1600 carpool vehicles in the three-hour peak from the mainlanes of the freeway to the AVL.

Even though transitway volumes in the a.m. in September are 175% greater than March 1985, travel time savings are only about 20% greater (Tables 23 and 24). This no doubt helps to explain the slower than expected growth in transitway volumes. However, projections continue to call for increases in freeway volumes in the future.

Conclusion Pertaining to Evaluation Criteria

Changes in freeway speeds and travel times are a criterion for evaluating the success of the carpool experiment. Table 25 summarizes this criterion.

Table 23. Eastbound AM Travel Time Savings for Katy AVL Users, May 1985 and September 1986

Time of Day	Time Saved by AVL (minutes)		AVL Person Volume		Travel Time Saved (person minutes)	
	5/85	9/86	5/85	9/86	5/85	9/86
6:00 a.m.	-1.8	-3.2	90	150	-162	-480
6:15	-0.9	-3.1	152	211	-137	-654
6:30	1.8	-2.9	66	508	119	-1,473
6:45	4.3	0.7	466	677	2,004	474
7:00	7.0	4.2	288	897	2,016	3,767
7:15	11.3	4.9	358	844	4,045	4,136
7:30	11.3	5.5	218	949	2,463	5,220
7:45	11.5	5.3	166	691	1,909	3,662
8:00	8.3	5.0	238	563	1,975	2,815
8:15	7.2	3.3	188	465	1,354	1,535
8:30	5.6	1.7	90	302	504	513
8:45	0.9	-0.1	60	302	54	-30
9:00	-0.1	-1.8	60	11	-6	-380
3 Hr. Total			2,380	6,559	16,138	19,485
2 Hr. Total			1,988	5,594	15,885	20,136

Table 24. Westbound PM Travel Time Savings for Katy AVL Users, May 1985 and September 1986

Time of Day	Time Saved by AVL (minutes)		AVL Person Volume		Travel Time Saved (person minutes)	
	5/85	9/86	5/85	9/86	5/85	9/86
3:00 p.m.	-1.7	-0.7	0	0	0	0
3:15	-0.9	-0.6	0	0	0	0
3:30	-1.0	0.5	120	138	-120	110
3:45	-0.8	-0.2	158	203	-126	-41
4:00	-2.0	-1.2	164	424	-328	-509
4:15	1.2	0.4	248	471	298	188
4:30	3.5	1.9	324	611	1,134	1,161
4:45	7.4	3.4	330	597	2,442	2,030
5:00	10.0	4.8	122	503	1,220	2,414
5:15	10.4	6.8	374	899	3,890	6,113
5:30	13.6	8.8	198	699	2,693	6,151
5:45	10.5	6.3	166	510	1,743	3,213
6:00	6.7	3.8	60	286	402	1,087
6:15	-0.3	3.0	120	395	-36	1,185
3 Hr. Total			2,384	5,312	13,212	23,102
2 Hr. Total			1,882	4,500	13,822	23,354

Table 25. Change in Person Delay to Mixed-Flow Traffic, Criterion for Assessing the Success of the Katy AVL Carpool Experiment

Rating[1]	Associated Impact
4. Highly Successful[2]	No change or a decrease in total delay
3. Successful	Delay increase by less than 5%
2. Somewhat Unsuccessful	Delay increases by 5% to 10%
1. Highly Unsuccessful	Delay increases by more than 10%

[1]Of the six criteria used to rate the success of the carpool, experiment, this criterion is given the fourth heaviest total rating (15%).

[2]The April-June 1986 data fall into this category.

In terms of this evaluation factor or measure of effectiveness, the carpool experiment is considered "highly successful". Factors other than the presence of the AVL, such as the downturn in the economy, are having a greater impact on mixed-flow traffic than is the presence of an AVL.

VIII. AVL BREAKDOWN DATA

A concern associated with allowing carpools onto the AVL has been that such an action would increase the frequency of breakdowns in the AVL; if those breakdowns blocked the lane, the reliability of service on the AVL would be adversely impacted.

Metro AVL operating data have been analyzed for the period from October 29, 1984 through May 21, 1986. These data are summarized in Table 26.

For the period since carpools began operating on the AVL, total vehicle breakdowns have been 14% greater (33 versus 29 disabled vehicles) than they would of had there been no carpool operation on the AVL. While carpools represent over 40% of total vehicles on the AVL, they constitute 12% of the total disabled vehicles that have occurred since the AVL was opened to carpools. At current carpool volumes and breakdown rates, one carpool breakdown would be expected to occur every 2 months. Interviews with Metro staff responsible for operating the AVL indicate that all disabled carpools have been able to pull to the side of the AVL and have not blocked through traffic.

Conclusion Pertaining to Evaluation Criterion

Increase in the frequency of breakdowns on the AVL was an evaluation criterion. The criterion was evaluated as follows: "Highly Successful", no increase; "Successful", less than a 5% increase; "Somewhat Unsuccessful", increase by 5% to 15%; "Highly Unsuccessful", increase by over 15%.

The data suggest that breakdowns have increased by 14% due to carpool utilization of the AVL; this equates to "somewhat unsuccessful". However, given the low frequency of carpool breakdowns and the fact that the breakdowns have not blocked the through lane, a "successful" conclusion is assumed for this criterion.

Table 26. Vehicle Breakdown Rates, Katy Freeway AVL

Vehicle Group	Time Period	
	10/29/84-5/21/86	4/1/85-5/21/86[2]
No. of Disabled Vehicles, Total	37	33
Buses	29	25
Vans	4	4
Carpools	4	4
No. of Towed Vehicles, Total[3]	9	9
Buses	6	6
Vans	0	0
Carpools	3	3
Vehicle Miles of Travel (VMT), Total	843,190	709,040
Buses	283,770	236,920
Vans	358,610	271,310
Carpools	200,810	200,810
VMT/Disabled Vehicles, Total	22,788	21,486
VMT/Disabled Bus	9,785	9,477
VMT/Disabled Van	89,652	67,827
VMT/Disabled Carpool	50,202	50,202
VMT/Towed Vehicle, Total	93,687	78,782
VMT/Towed Bus	47,295	39,486
VMT/Towed Van	----	----
VMT/Towed Carpool	66,936	66,936

[1]Operating period from inception of AVL.

[2]Operating period from when carpools allowed onto AVL.

[3]Towed vehicles are a subset of disabled vehicles.

IX. AUTHORIZATION AND ENFORCEMENT COSTS

Allowing carpools onto the AVL could increase costs for both enforcement and vehicle authorization. The Director of Transportation Programs at Metro was requested to address these concerns; her response is presented below.

Administrative Costs Incurred to Authorize Carpools

No additional staff has been necessary to maintain an efficient authorization system. Carpool and vanpool authorizations for both the Katy and North Transitways are handled by two information operators on the CarShare/VanShare staff. These operators spend about 20% of their time performing vehicle and driver authorizations. These tasks have become a part of the staff's job responsibilities.

The Metro computer system file format for vanpool information was easily adapted to carpool information. All carpool vehicle and driver information is on computer and is easily retrieved.

As carpools are authorized on other Metro transitways, an additional staff person may be necessary to authorize drivers and vehicles. This staff person will be necessary to handle the increased demand. Metro will not be projecting any additional staff for carpool/vanpool authorizations during FY 87.

Increase In Enforcement Costs

Currently, Metro does not have permanent enforcement stations on the Katy AVL or North AVL. The officers assigned to the lanes use a roving patrol or stationary enforcement mode as the situation dictates. Currently,

there is a minimum of one officer assigned to each lane which does not represent an increase or decrease in enforcement costs.

The introduction of carpools on the Katy AVL has resulted in an increase in traffic violations on the AVL resulting in changes in modes of enforcement; however, costs have not been affected at the present time. These violations have related to non-compliance to the three (3) person carpool rule, speeding and other vehicle violations.

Conclusion Pertaining to Evaluation Criterion

It appears that the marginal impact on authorization and enforcement due to AVL carpool utilization has been minimal. In regard to this criterion, the carpool experiment is judged to be "successful".

X. CONCLUSIONS

A summary of the evaluation of the individual criterion is shown in Table 27. Based on that evaluation, as of April 1986 the Katy carpool experiment is judged to be between "somewhat unsuccessful" and "successful". If numerical values are assigned to the possible outcomes (with "highly successful" = 4; "successful" = 3; "somewhat unsuccessful" = 2; and "highly unsuccessful" = 1), the weighted value for the carpool experiment is 2.62. A value of 2.5 is midway between "successful" and "somewhat unsuccessful".

All of the individual criterion, with the exception of the non-user perception of Katy AVL utilization, were rated as at least "successful". However, the non-user perception of utilization, which is the single most important criterion and the primary reason for allowing carpools onto the AVL, is judged to be "highly unsuccessful". If AVL volumes were to increase sufficiently to alter the non-user perception of underutilization, it is reasonable to assume that other evaluation criteria would be adversely impacted. Further monitoring of the Katy carpool experiment will identify impacts of increased AVL carpool volumes.

Table 27. Overall Evaluation of Katy AVL Carpool Experiment 12 Months After Carpools Were Allowed Onto the AVL

Criterion	Relative Weighting	Conclusion Pertaining to Experiment	Relevant Data
1. Change in Person Movement on the AVL Directly Attributable to Carpooling	25%	Between "Successful" and "Somewhat Unsuccessful"	• AVL person movement increased by 10% due to carpooling
2. Non-User Perception of Katy AVL Utilization	30%	"Highly Unsuccessful"	• Over 90% of non-users feel the AVL is not sufficiently utilized.
3. Change in Travel Time on the AVL	20%	"Highly Successful"	• If anything, average speeds on the AVL have increased.
4. Change in Delay to Mixed-Flow Traffic	15%	"Highly Successful"	• No change was detected.
5. Increase in Frequency of AVL Breakdowns	5%	"Successful	• Breakdowns increased by 14% due to carpooling; the number of breakdowns was small and none blocked the AVL
6. Increase in Authorization and Enforcement Costs	5%	"Successful"	• Marginal increase in costs due to carpools has not been substantial.
TOTAL	100%	Between "Somewhat Unsuccessful" and "Successful"	