# FINAL REPORT

# I-80 High Occupancy Toll Lane Feasibility Review

**Prepared for:**

**Sacramento Area Council of Governments,**
**Placer County Transportation Planning Agency, and**
**The California Department of Transportation**

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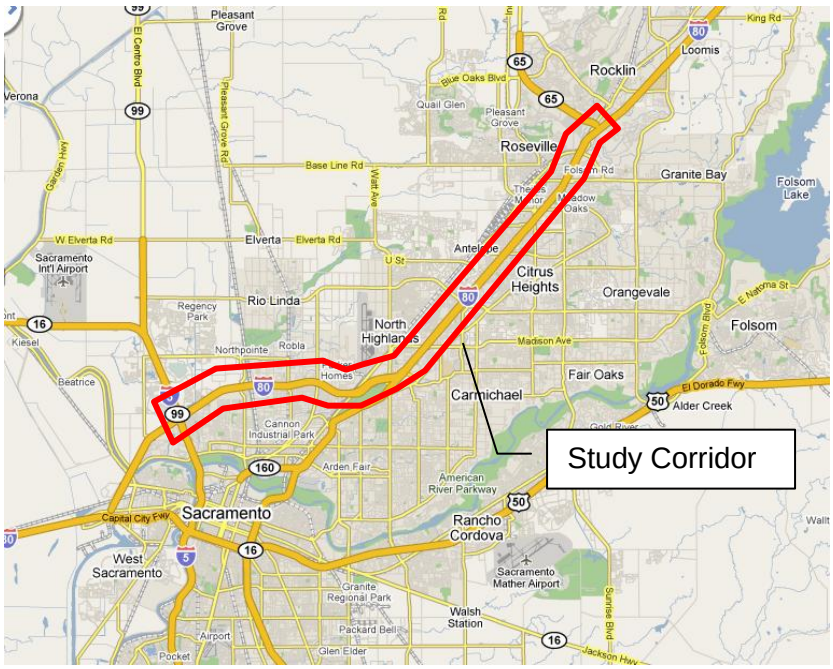
# 1.0 Executive Summary

The Sacramento Area Council of Governments (SACOG) and the Placer County Transportation Planning Agency (PCTPA) in coordination with Caltrans considered the potential for a high occupancy toll (HOT) lane in each direction on Interstate 80 (I-80) from I-5 in Sacramento County to SR 65 in Placer County, shown in Figure 1. A HOT lane is a high occupancy vehicle lane that allows, in addition to carpools, vanpools, and buses, usage by drivers who choose to pay a toll. The potential benefits of HOT lanes include improving mobility, managing congestion, and providing revenue for transportation-related uses.

HOT lanes are in use in eight metropolitan areas around the United States including State Route 91 (SR 91) in Orange County and Interstate 15 (I-15) in San Diego County and Interstate 680 (I-680) in Alameda County. In addition, they will soon be deployed on I-580 in Alameda County, California.

For the I-80 corridor, it was assumed that the existing and planned high occupancy vehicle lanes would be modified to allow tolled vehicles to enter, use, and exit the lane in a manner similar to that utilized in other HOT lanes and in those planned for the San Francisco Bay Area. Typically, carpools, vanpools, buses, and tolled vehicles can only enter or exit a HOT lane every three to four miles (as opposed to the continuous entry and exit design of existing HOV lanes in the Sacramento region). Electronic signs advise travelers of the toll they would pay if they were to use the lane. Tolls are typically collected via an electronic "reader" device at the lane entry point that communicates with a transponder in the vehicle (as used in the FasTrak system for the Bay Area bridges). Other methods may be used but electronic toll collection is the most common.

**Figure 1: I-80 Corridor with HOT Lanes Evaluated from I-5 to SR 65-80**




A HOT lane is typically slightly wider than an HOV lane and has a larger buffer between it and the freeway's general purpose lanes. A longer transitional area is provided for merging at the ingress and egress points than is common for HOV lanes.

The review of the I-80 HOT lane was guided by a Policy Advisory Committee (PAC) with the following members:

- Steve Cohn, Councilmember, City of Sacramento;
- Gina Garbolino, Mayor, City of Roseville;
- Jim Holmes, Supervisor, Placer County;
- Jody Jones, Director, Caltrans District 3;
- Susan Peters, Supervisor, Sacramento County; and
- James Shelby (former) Councilmember, City of Citrus Heights.

A Technical Advisory Committee (TAC) composed of local, metropolitan, state, and federal agency representatives provided guidance and review, as well.

In considering the potential for a HOT lane on I-80, the project's PAC recommended that the following three critical policies be applied:

1. The purposes of a HOT lane should be to improve mobility for all, reduce congestion, and provide revenue;
2. A HOT lane should be considered on I-80 only if it generates sufficient revenue to cover its costs and not divert funds from other transportation investments needed in the region; and
3. If determined to be feasible and meets the policies noted above, the concept must be better understood across the region prior to deploying.

The study team used long-range travel forecasts prepared by SACOG and a toll revenue estimating model known as Policy Options Evaluation Tool for Managed Lanes (POET-ML) developed for the Federal Highway Administration (FHWA) for planning-level HOT and HOV applications such as this. POET-ML is developed for and available through the FHWA. It incorporates the tolling, travel, and revenue experience of other HOT lanes around the United States and provides an estimate of HOT lane usage under different assumptions and conditions.

In order to estimate costs associated with capital, operations and maintenance, and centralized services, the team applied unit costs developed for and by the San Francisco Bay Area Metropolitan Transportation Commission (MTC), which has been studying HOT lanes and developing a regional program over the past six years. These unit costs were also reviewed with the TAC prior to their application.

A range of estimated revenues was developed in 10-year increments between 2015 and 2035. The range reflects the use of capacity-constrained and unconstrained traffic volumes as well as varying values for the "value of time" a driver would save by using the HOT Lane. The estimated ranges of annual gross revenue for the 19.2 mile corridor are:

- $0.1 to $2.1 million for 2015
- $1 to $2.8 million for 2025
- $1 to $3.4 million for 2035

Operations and maintenance costs (including centralized services such as toll collection, financial management, and system administration) for the corridor are estimated to be approximately $2.7 million per year. Assuming gross revenues estimated at the upper end of the range, there would be little funding available to cover the capital costs of the HOT lane

additions. Those could range from $11 million, with no widening or structure modifications, to $31 million, with more typical improvements. If the freeway requires extensive widening and structure modifications, the capital costs could exceed $300 million although this extent of modification has not typically been required in other HOT lane projects.

Table 1 below summarizes the I-80 HOT lane costs and revenues for 2015 and 10-year increments through 2035 under three capital improvement alternatives and assuming an HOV requirement of 2+ (meaning that carpools with two or more people could use the lane). When considering gross revenue relative to required operations and maintenance, centralized services, capital investments, and, if required, financing costs associated with HOT lanes, the study has concluded that the projected levels of gross revenue would not cover the costs of developing and operating the lanes through 2035.

**Table 1: Summary of HOT Lane Costs and Revenues**

| **Estimation of Cash Flow (HOV 2+)** | **2015** | | **2016 to 2025** | | **2026 to 2035** | |
|---|---|---|---|---|---|---|
| | Low Range | High Range | Low Range | High Range | Low Range | High Range |
| **Gross Revenue** | $0.1M | $2.1M | $10.3M | $24.7M | $10.3M | $30.9M |
| **Operating Expenses** | $2.8M | $2.9M | $27.0M | $27.1M | $27.1M | $27.3M |
| **Net Revenue** *[Before Financing and Capital Costs]* | ($2.7M) | ($0.8M) | ($16.7M) | ($2.4M) | ($16.8M) | $3.6M |
| | | | | | | |
| Low Range Capital Cost | $11.3 M | | | | | |
| Mid Range Capital Cost | $43.3 M | | | | | |
| High Range Capital Cost | $394.5 M | | | | | |

Source: HNTB, March 2010

**Notes:**

Gross and net revenues are expressed in a range. Low range revenue reflects a conservative (lowest) traffic volume within the corridor as well as a lower estimate of travelers' value of time, and the high range revenue is based on a higher estimate of traffic and a higher travelers' value of time. Financing costs are not estimated in this table.

A key consideration in the review of HOT lane feasibility is the anticipated volume of carpool traffic in the HOV lane. Over time, the HOV lane is expected to become more heavily utilized by carpools, vanpools, and buses. As the lane fills, there will be less space for tolled vehicles which has the effect of limiting vehicle usage while also increasing the value, and therefore the associated toll rates, for tolled vehicles. Toll revenues can be expected to increase until the lane fills with high occupancy vehicles and little space remains for the tolled vehicles, when as a result, toll revenues will decrease substantially. The partner organizations (particularly Caltrans) can decide to increase the vehicle occupancy requirement from 2+ to 3+ to keep the HOV lane functioning for HOV purposes. When the occupancy requirement is changed to 3+, there would be more space in the lane for tolled vehicles and toll revenue would then be expected to increase significantly.

Traffic estimates provided through SACOG indicate that the I-80 HOV lanes could become full with carpools, vanpools, and buses in the 2030 to 2035 period. By that time, the region would

need to determine what actions to take to keep the HOV lanes functioning even if tolling was not being considered. The HOV lanes would not be full enough to go to 3+ until close to 2035.

Telephone surveys and in-person interviews of stakeholders revealed that although HOV (carpool) lanes are well supported, the concept of HOT lanes draws mixed reactions. In interviews, although there were many questions, stakeholders were supportive of continuing to investigate HOT lanes for I-80. A telephone survey of the general public showed that 45% support or somewhat support I-80 HOT lanes and 51% oppose or somewhat oppose them. Although roughly a third of those surveyed definitely oppose the pricing of a highway lane, some of the moderate opposition is most likely due to the complex nature of the HOT lanes concept, and particularly dynamic pricing. If the region moves forward with implementation of HOT lanes on I-80 or other corridors at any point in the future, basic concerns about how it operates, who benefits, and who pays must be addressed through policies and with an educational campaign. It will also help general public and stakeholder understanding that HOT lanes will soon to be operational in the San Francisco Bay Area and Sacramento area residents will be able to observe how the lanes work.

This feasibility assessment concludes that revenue from a HOT lane on I-80 between I-5 and SR 65 will not cover its own total capital and operations and maintenance costs through the 2035 period. HOT lanes on I-80 in this study segment could cover its own operations and maintenance costs beginning prior to 2035, but this would be important only if the region placed primary value on use of a HOT lane for congestion management purposes and could finance the capital costs through other means. As previously discussed the PAC urged that HOT lane revenues cover all of its costs and not use funds that could otherwise support needed investments in the region.

It is likely that if and when the I-80 HOV lane changes from a 2+ to a 3+ requirement, toll revenues will increase significantly as the number of HOVs decreases and capacity on the HOT lane becomes available to “sell”. Under this scenario HOT lane revenue should cover all costs as well as provide for increased mobility, reduced congestion, and availability of net revenue for other transportation-related investments. Thus, the region should not foreclose this option. To protect the possibility of HOT lanes in the future it is important to maintain right-of-way space for required HOT lane features such as merging locations, signs, toll reader sites, etc.

# 2.0 Introduction and Background

HOT lanes are HOV lanes that allow vehicles paying a toll to use the lane. Commonly, a HOT lane's toll rate (the amount of money charged to a driver for use of the lane) varies by the level of congestion in the general purpose lanes, the space available in the HOT lane, and occasionally other factors. The intent is typically to keep the HOT lane traffic volumes from causing stop and go conditions and to keep the lane functioning so that carpools, vanpools, and buses continue to receive travel time advantages. The toll rate is an important factor in the HOT lane user's decision to use the lane or not. As the lane becomes more crowded the toll will increase. This would limit the number of HOT lane users, maintaining the priority and time advantage for carpools, vanpools, and buses.

SACOG and PCTPA along with the California Department of Transportation (Caltrans) initiated an assessment of the feasibility of a HOT lane on I-80 from I-5 in Natomas to SR 65 in Roseville. Reasons identified for conducting a feasibility review of a HOT lane on this portion of I-80 include the need to: (1) understand the potential project costs and revenues, (2) determine if a HOT lane in each direction is physically feasible, and (3) explore any implementation issues that could be associated with the project.

SACOG and PCTPA focused on the feasibility portion while Caltrans focused on public awareness issues. However, both components were considered to be one integral project. The consultants working on each component operated as one team and the results of the effort are documented in this report.

In addition, two committees were formed to help drive the process:

1. A Policy Advisory Committee (PAC) composed of elected officials in the I-80 corridor and nearby areas and the Caltrans District Director provided oversight and guidance for the review. The PAC established the overall direction for the review discussed in more detail in the Executive Summary. In essence, the PAC's direction was that a HOT lane should provide benefits to all travelers, pay for itself, and not take funding away from other projects in the region. The members of the PAC are listed in Appendix A.
2. A Technical Advisory Committee (TAC) composed of agency representatives with interests and involvement in the corridor provided guidance and reviews as the assessment developed. The members of the TAC are also listed in Appendix A.

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# 3.0 HOT Lanes in California in the United States

While toll roads are not a new concept in the United States or elsewhere in the world, the concept of HOT lanes is relatively new. SR 91 in Orange County, California is generally regarded as the first in the United States.

Toll roads in the U.S. were common in the 1700s and 1800s. The Pennsylvania Turnpike, New Jersey Turnpike, Illinois Tollway, and many others have long histories and are well accepted by the public. Toll bridges are also commonly accepted, as exemplified by the San Francisco-Oakland Bay Bridge and the Golden Gate Bridge in northern California. Both bridges charge tolls but provide reduced tolls for carpools with three or more occupants, similar to the HOT lane concept.

As of July 2010[1] the following nine HOT lanes were operating in the United States:

1. SR 91 in Orange County, California
2. I-15 in San Diego County, California
3. I-95 in the Miami Florida area
4. I-25 in the Denver Colorado area
5. I-394 in the Minneapolis, Minnesota area
6. US 290 in the Houston Texas area
7. I-10 Katy Freeway in the Houston, Texas area
8. I-15 in the Salt Lake City metropolitan area
9. SR 167 in the Seattle Washington metropolitan area

Table 2 beginning on page 9 summarizes the lane characteristics and operational policies for the HOT lanes listed above.

Caltrans is currently developing an HOV Express Lane Business Plan intended to provide statewide guidance on the planning, development, and operation of high occupancy vehicle lanes and high occupancy toll lanes. The effort to date has produced preliminary guidance and a plan for development of the physical, financial, and managerial approaches that Caltrans will apply statewide.[2]

The critical action schedule from the draft business plan features the following summary (quoted from page 29 of the draft):

*California has already hit the ground running with several ongoing initiatives that are addressed within the list of identified critical actions to support the implementation of this Business Plan. Partners should continue to make progress and build upon these substantial efforts and consider the topics addressed in this Business Plan in doing so.*

*The following are the critical actions from the list in* ***Section 5.2*** *that are already ongoing in California.*

[1] The Alameda County Congestion Management Agency, Caltrans, and the Bay Area Toll Authority will open a HOT lane on I-680 in the Sunol Grade area in late 2010

[2] The "*California HOV/Express Lane Business Plan*," March 31, 2009, can be found at http://www.dot.ca.gov/hq/traffops/systemops/hov/Express_Lane/files/Caltrans%20HOV-ExpressLaneBizPlan%202009.pdf

***A4: Utilize better tools to collect, aggregate, and report corridor-wide data****.* The Freeway Performance Measurement System (PeMS) *is already being evaluated for areas of improvement related to HOV and express lane reporting.*

***A5: Assess active HOV lane management via pilot project(s) and ongoing monitoring.*** *There are currently projects that are attempting changes to minimum occupancy requirements, changes to HOV access from limited to continuous.*

***B1: Develop an ongoing coordinating committee for HOV/express lanes and other tolling topics.*** *There are currently many existing partnerships and committees that collaborate on projects across the state. This action proposes to formalize and to continue these efforts.*

***B4: Share lessons learned on financing options and operations and maintenance cost expectations.*** *Especially as it relates to express lanes, Orange County Transportation Authority (OCTA) and San Diego Association of Governments (SANDAG) have been monumental in providing supportive data and input to partner agencies as they define their own express lane projects.*

***C2: Support enabling legislation for more widespread tolling authority.*** *There are current activities that would provide for blanket tolling authority, reducing the overall effort in the state to gain tolling authority on a project-by-project basis.*

***C5: Research automated enforcement technology and implement as available.*** *SANDAG is currently conducting an evaluation of technologies for this purpose and that may provide insights to this topic in the near future.*

***D1: Educate the public on benefits of HOV and express lanes in a common way.*** *Many efforts are currently underway to communicate with the public for current and upcoming projects – these efforts will continue and should consider doing so in a coordinated manner.*

The Federal Highway Administration (FHWA) has also developed guidance on HOT lanes. Three primary FHWA publications, listed below, review the purposes, history, design guidance, operations and maintenance practices, tolling principles, and implementation issues associated with HOT lanes. These are:

- "Considerations for High Occupancy Vehicle (HOV) Lane to High Occupancy Toll (HOT) Lane Conversions Guidebook", June 2007[3]. As described in the guidebook, the objective of the guidebook, which explores the planning, design, implementation and ongoing operations and maintenance of HOT lane facilities converted from existing HOV lanes, is to provide: (1) technical guidance that will assist the state and local transportation planners in determining the conditions where conversion from HOV to HOT lanes is feasible and advisable and (2) a comprehensive list of activities to be performed in the planning, implementation and operation of an HOT lane facility. Special attention is paid to institutional, system design and operational challenges that typically present themselves in the course of a conversion to HOT lane.
- "*Managed Lanes: A Cross-Cutting Study*", November 2004[4]
- *"*Managed Lanes: A Primer"[5]

[3] *Considerations for High Occupancy Vehicle (HOV) Lane to High Occupancy Toll (HOT) Lane Conversions Guidebook*", June 2007 can be found at http://ops.fhwa.dot.gov/publications/fhwahop08034/index.htm

[4] *Managed Lanes: A Cross-Cutting Study* can be found at http://ops.fhwa.dot.gov/freewaymgmt/publications/managed_lanes/crosscuttingstudy/final3_05.pdf

[5] *Managed Lanes: A Primer* can be found at http://ops.fhwa.dot.gov/publications/managelanes_primer/

**Table 2: Summary of Existing HOT Lanes**

| Facility | | SR 91, Orange County, CA | I-15, San Diego County, CA | I-95 Miami, FL | I-25, Denver, CO |
|---|---|---|---|---|---|
| Operating Agency | | Orange County Transportation Authority (OCTA) | San Diego Association of Governments (SANDAG) | Florida DOT (Districts 4 & 6) | CDOT, CO Tolling Enterprise |
| Design Characteristics | Number of Lanes | 4 (2 in each direction) | Northern 8 miles has 4 lanes with one reversible lane each (3x1 or 1x3) and 2 reversible lanes in the Southern 8 miles. | 4 (2 in each direction) | 2 reversible lanes. |
| | Distance | 10 miles | 16 miles, will expand to 20 miles in 2012. | 10 miles | 7 miles |
| | Access Control | No intermediate access points, Pylons separates the HOT and general purpose lanes | Access at ends and intermediate locations | Separated by flexible plastic poles, access and egress at designate points (NB – 2 entries and 3 exits, SB – 3 entries and 2 exits) | Access at ends, SOV users enter HOT lane through separate path |
| | Tolling Technology/ Methodology | Open toll/fully automated | Open toll/fully automated<br>Gantries located en route | Open toll/fully automated | Open toll/fully automated |
| | Payment Method | Transponder (pre paid) All vehicles have to have a transponder. | Transponder (pre paid). Only SOV needs to have a transponder. | Transponder (pre paid) | Transponder (pre paid) |
| Operational Policies | Hours of Operation | 24 hours, 7 days a week | The northern 8 miles - 24 hours, 7 days a week in both directions.<br>Typical hours of operation for the Southern section<br>Mondays – Thursdays<br>SB: 5:30 AM – 12 PM, NB: 1 – 7 p.m.<br>Fridays<br>SB: 5:30AM – 12 PM, NB: 1 PM - Mon 4:30 AM<br>Holidays - NB direction only | 24 hours, 7 days a week | Closed for maintenance between 3am to 5am and 10am to noon. |
| | Toll ($) | $1.30 to $9.80 (as of July 1, 2010) | Typical range - 50¢ to $4.00<br>(Max $8.00) | 25¢ to $3.50. It could go as high as $7.10 under extreme condition. (as of July 2010) | $0.50 to $3.50 (as of January 2009) |
| | Toll Adjustment | Varies by time, direction, days of the week and level of congestion, but not dynamically priced | Dynamic toll based on traffic density. Toll based on the distance traveled in the lanes and a rate per mile for their entry location. | Dynamic tolling | Variable pricing based on time-of-day but not dynamic pricing |
| | Eligibility for free or discounted use | HOV 3+, low emission vehicles, motorcycles and disabled plates drive free most hours, Pay 50% of toll 4-6 PM in eastbound direction | HOV 2+, motorcycles and Clean Air vehicles with decals drive free | Registered HOV 3+, motorcycles and registered low emission vehicles exempted. | HOV 2+ toll free |
| Enforcement | | License plate camera record violators. $20 plus amount of the toll per toll violation<br>First toll evasion $100, $150 for second toll evasion, $200 for each additional evasion within a year | CHP enforces the law in the Express Lanes for vehicle occupancy, toll evasion, and other motor vehicle requirements. Carpool violations carry a minimum fine of $341 for the first offense. | Toll violators are photographed via automatic violation enforcement system. Enforcement beacons on the gantry structures will alert Highway Patrol troopers monitoring the lanes when a vehicle without a transponder passes underneath. | License plate camera record violators<br>$70 for toll violation |
| Other Requirements/Considerations | | No trucks are allowed. | Commercial trucks with more than two axles, trailers, and boats are not allowed. HOT lane use may be restricted to HOVs only. | Trucks with 3 or more axles are not allowed unless they are designated as emergency vehicles to specific incidents | NA |
| Annual Gross Revenue | | $ 46,236,247 in operating revenue (FY 09) | NA | NA | $2,155,869 in toll rev + $239,478 in fees and fines from violation (FY 09) |
| Source | | 91 Express Lanes 2009 Annual Report http://www.91expresslanes.com/generalinfo/91annualreport.pdf | I-15 FasTrak Progress Report (April-June 2009), I-15 Express Lane Website (http://fastrak.5111.sd.com) | I-95 Express Lane Website http://www.95express.com/home/tolling.shtm | I-25 Express Lanes Monthly Progress Report http://www.coloradodot.info/travel/tolling/i-25-hov-express-lanes/Reports |

**Table 2 (continued): Summary of Existing HOT Lanes (Continued)**

| Facility | | I-394, Minneapolis, MN | US 290 Quick Ride, Houston, TX | I-10 Katy Freeway, Houston, TX | I-15, Salt Lake City, UT Express Lanes | SR 167, King County, WA Pilot Project through 4/2012 |
|---|---|---|---|---|---|---|
| Agency | | Minnesota DOT | Houston Metro | Harris County Toll Road | Utah DOT | Washington DOT |
| Design Characteristics | Number of Lanes | 1 lane in each direction, eastern section provides 2 reversible lanes | 2 reversible lanes | 2 lanes in each direction | 1 lane | 2 lanes (1 in each direction) |
| | Distance | 11 miles | 15 miles | 12 miles | 44 miles | 9 miles |
| | Access Control | Separated by pylons, access at ends and four intermediate locations | SOV users enter a HOT lane through a separate path. | SOV users enter a HOT lane through a separate path. | Access at ends and 19 intermediate locations, Striped buffer | Access at ends and 19 intermediate locations, Striped buffer |
| | Tolling Technology/ Methodology | Open toll/fully automated | Open toll/fully automated | Open toll/fully automated | n/a | Open toll/fully automated |
| | Toll Collection | Transponder (pre paid) | Transponder (pre paid) | Transponder (pre paid) | Transponder (pre paid) | Transponder (pre paid) |
| Operational Policies | Hours of Operation | Non-reversible lanes: 6 AM to 10 AM, 2 PM to 7 PM<br>Open to general traffic the rest of each week day and on weekends<br>Reversible lanes: 6 AM - 1 PM in EB direction, 2 PM - 5 AM in WB direction | 6:45 AM – 8:00 AM | Mon – Fri, 5am to 11am and 2pm to 8p | n/a | 5 AM – 7PM<br>Open to general traffic between 7 PM and 5 AM |
| | Toll ($) | $1.00 to $4.00 (maximum of $8.00 in extreme conditions) | $2 (fixed toll) | $0.30 to $1.60 | 25 cents to $1 per zone<br>The corridor is divided into 4 zones. | $0.50 to $9.00 |
| | Toll Adjustment | Dynamic pricing (tolls vary based on time of day, days of week, and level of congestion) | None | Varies by time and direction, but not dynamically priced | Dynamic pricing to start on July 20, 2010 | Dynamic pricing |
| | Eligibility for free or discounted use | HOV 2+, transit buses, and motorcyclists are exempted. | HOV 3+ toll free | HOV2+ and motorcyclists free during peak periods. Tolls for HOV and motorcyclists same as SOV during non-peak periods. | HOV 2+ and Hybrids toll free | HOV 2+ and motorcycles toll free |
| Enforcement | | Enforcement by Highway Patrol (HP) carrying portable readers and conducting visual HOV enforcement | License plate camera record violators | License plate camera record violators<br>3+Axel pays $7 per toll plaza | Enforcement by Highway Patrol (HP) conducting visual HOV enforcement | Enforcement beacons on the gantry structures will alert Highway Patrol troopers monitoring the lanes when a vehicle without a transponder passes underneath. |
| Other Requirements/Considerations | | NA | NA | NA | NA | |
| Annual Gross Revenue | | $600,000 (1st year of operation in 2005-2006)<br>Approx. $1 million (2007) | NA | NA | NA | $316,600 (5/3/2008 – 4/30/2009) |
| Reference | | I-394 MnPass Toll Lanes High Occupancy Lanes, Planning & Operational Issues and Outcomes (http://www.tollroadnews.com/node/3296), Minnesota to do second toll express lanes after I-394 success (www.mnpass.org) | http://www.ridemetro.org/services/HOV/QuickRide.aspx | https://www.hctra.org.katymanagedlanes | http://www.udot.utah.gov/expresslanes | SR 167 HOT Lanes Pilot Report 1st Annual Performance Summary, May 2008 – April 2009<br>http://www.wsdot.wa.gov/NR/rdonlyres/31FB3D24-79CC-4332-82F7-EBECEBE1CA71/0/HOTLanesAnnualReport2009.pdf |

A common topic in these publications is the importance of focusing early on the purpose and objective of the HOT lane being studied. While this may sound overly simple, it is critical because different project objectives can lead to different lane designs and, more importantly, different tolling principles. If the objective of the HOT lane is to maximize revenues, the allowed capacity and tolling rates would be very different from those that would be applied if the primary objective is to maximize travel time savings for all travelers.

Other key guidance discussed in these publications includes involving a wide range of stakeholders and interested parties early in the review process. When studying HOT lanes in an area unfamiliar with them, it is important to review the experiences with projects elsewhere and to allow time for consideration of possible benefits and impacts.

The public awareness component of the I-80 HOT lane review concluded the same need to increase stakeholder awareness regarding how existing HOT lanes have been developed and how they operate. The issues raised through this review identify topics the greater Sacramento region needs to explore.

A key lesson learned during this review is that no two HOT lane projects are the same. The purposes of the lanes, the lists of what costs are included in uses of gross and net revenues, and the governance structures are different from project to project and region to region. It is important to provide sufficient time for decision-makers to learn from other projects and develop their own understandings of the key concepts.

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# 4.0 Public Awareness and Attitudes

The preliminary assessment of stakeholder and public opinion regarding the concept of HOT lanes in the study corridor is an important component of this study. Caltrans, one of the project's sponsoring partners, engaged the consulting firm of Moore Iacofano Goltsman, Inc. (MIG) to conduct a number of outreach activities. MIG coordinated closely with the prime consultants, HNTB, throughout the project and the following outreach goals were identified:

- Improve and increase stakeholder understanding of HOT lanes
- Improve and increase Caltrans, PCTPA, and SACOG understanding of stakeholder issues, concerns and perceptions of HOT lanes
- Document the results of advisory committee meetings
- Enhance the feasibility review process by identifying issues early in the process

The methods used during public and stakeholder outreach and detailed issues and concerns that arose during the outreach process are discussed in this section.

A primary conclusion that can be drawn from the outreach process is that although HOV lanes are well supported, the concept of HOT lanes draws mixed reactions. In interviews, although there were many questions, stakeholders were supportive of continuing to investigate HOT lanes for I-80. A telephone survey of the general public showed that 45% support or somewhat support I-80 HOT lanes and 51% oppose or somewhat oppose them. Although roughly a third of those surveyed definitely opposed the pricing of a highway lane, some of the moderate opposition is most likely due to the complex nature of the HOT lanes concept, and particularly dynamic pricing. If the region moves forward with implementation of HOT lanes on I-80 or other corridors at any point in the future, basic concerns about how it operates, who benefits, and who pays must be addressed through policies and with an educational campaign. It also help general public and stakeholder understanding as HOT lanes just became operational in late 2010 in the San Francisco Bay Area and Sacramento area residents are able to observe how the lanes work.

## *4.1 Outreach Methods*

The following methods were used to reach the public and stakeholders:

**Stakeholder Interviews**. MIG worked with the Management Team consisting of SACOG, PCTPA, Caltrans and HNTB team to develop a list of interviewees. This list included stakeholders and each of the six members of the PAC.

**Public Telephone Survey.** MIG hired a subconsultant, Godbe Research, to conduct a phone survey of 400 residents in the vicinity of the corridor who frequently drive the corridor. Survey results can be found in Appendix C.

**Technical Advisory Committee Meetings**. The TAC was composed of staff from agencies potentially affected by HOT lanes in this corridor, including regional transportation agencies, two counties, three cities, Caltrans, and the Federal Highway Administration. In total, four meetings were held (September 17, 2009, November 19, 2009, January 28, 2010, and March 25, 2010). A list of TAC members is provided in Appendix A.

**Policy Advisory Committee Meetings.** The PAC was composed of six officials from the PCTPA and SACOG Boards of Directors in whose jurisdictions the corridor lies. The PAC members are listed in Appendix A. The PAC held two meetings (November 5, 2009 and June 3, 2010).

At the November 5, 2009 meeting, after an educational presentation, the PAC provided guidance for the study. Specifically, the PAC recommended as a guiding principle that in order for HOT lanes to be feasible, they must pay for themselves (i.e. development of a HOT lane must not cause the region to invest funds intended for other projects). PAC members also agreed that the purpose of the lanes should be, in order of importance: (1) congestion relief, (2) benefits to drivers in all lanes, and (3) revenue generation (in excess of costs).

At the June 3, 2010 meeting, PAC members were presented with all of the consultant findings on the technical feasibility and public acceptance of HOT lanes in the corridor, including the finding that these lanes would not be able to generate enough revenue to cover the operating costs until almost 2035. The PAC recommended unanimously that the I-80 HOT lane project should not go forward at this time because it is unlikely to generate sufficient revenues to cover its own costs through 2035 and the region would need a greater understanding of the concept before proceeding with implementation. They further recommended that the region remain open to the HOT lane concept and the I-80 corridor's future improvements not preclude development of these lanes. Also, air quality improvement was added as an objective for the HOT lanes in addition to congestion relief, benefits to all drivers in all lanes, and revenue generation.

**Informational Materials.** MIG wrote and designed a one-page fact sheet, shown in Appendix B, that summarizes the concept of HOT lanes, explains the variations that are possible for tolling, vehicle occupancy requirements, possible uses for excess revenue, and provides examples where HOT lanes have been implemented. The fact sheets were given to interviewees and the PAC and TAC members. Originally, there were to be two more fact sheets and a project Web page; however, the Management Team decided these were not needed. Other informational materials include the PowerPoint presentations that were used at each of the TAC and PAC meetings.

All materials from the outreach effort, including meeting agendas and summaries, interview transcripts, the fact sheet, PowerPoint presentations, and the survey report including all appendices have been provided to study's sponsoring agencies.

## *4.2 Stakeholder/Policy Advisory Committee Interviews*

Between October 2009 and January 2010, stakeholder and PAC interviews were conducted by Tad Widby and/or Jeff Damon of HNTB and Nancy Kays of MIG with the following individuals and groups, in addition to the members of the PAC:

**User Groups**

- SACOG's Transportation Demand Management Task Force which is comprised of: Marilyn Bryant, Sacramento Transportation Management Association; Becky Heieck, North Natomas Transportation Management Association; Sue Schooley, City of Roseville; Solvi Sabol, PCTPA, and AJ Tendick, SACOG
- Transit operators who use the I-80 Corridor represented by: Mike Wixon, Roseville Transit; Will Garner, Placer County Transit; Mike Wiley, Sacramento Regional Transit; Kwai Reitz and Janice Phillips, Yolo County Transit District

**Social Equity Groups**

- Greater Sacramento Urban League represented by David DeLuz

- Placer Independent Resource Services and Best Steps Collaborative represented by Tink Miller

**Environmental Groups/Agencies**

- Environmental Council of Sacramento represented by: Jonathan Ellison, Richard Seyman, and Eric Davis
- Sacramento Metropolitan Air Quality Management District represented by: Larry Greene, Chris Morfas, and Paul Philley

**Business Groups**

- Sacramento Metropolitan Chamber of Commerce represented by: Matt Mahood and Michael Faust
- Roseville Chamber of Commerce represented by: Wendy Gerig

For each interview, a short PowerPoint presentation on HOT lanes was shown and the interviewers posed the following questions:

1. What experiences have you had with tolling?
2. What have you heard about HOT lanes, or other tolling schemes? What do you know about these?
3. What do you have questions about? What would you like to know about HOT lanes?
4. What opportunities do you think HOT lanes offer?
5. What concerns do you have about them?
6. What are your observations about HOT lanes or tolling?
7. In this region, who will need to weigh in on this idea? (groups or individuals) What will be important to them?

In addition, interviewees were informed of the guiding principal the PAC members outlined on November 5, 2009, which was that HOT lanes need to pay for themselves (i.e. a HOT lane must not cause the region to invest funds intended for other uses) along with three additional guidelines, listed in order of importance: (1) congestion relief, (2) benefits to users in all lanes, and (3) revenue generation (in excess of costs).

<u>Interview Results</u>

Overall, the interviews show that there is a cautious interest in HOT lanes along the I-80 Corridor as a concept that should be investigated further. The majority expressed that HOT lanes are potentially a creative and proactive approach to relief congestion, utilize excess capacity in freeway lanes, and generate revenue. No group or individual was philosophically against tolling, and all believed that electronic tolling would be the best way to toll. Dynamic pricing was seen as an efficient way to manage the lanes. While some raised concern about social equity, a number of ideas to mitigate any inequity were brought forward and no interviewee suggested that it was a barrier to considering HOT lanes.

<u>Common Questions and Concerns among the Interviewees</u>

The questions below were commonly expressed during the interviews and many of the questions were either preliminarily answered with information provided in this report, or were

policy and governance questions that will be addressed if HOT lanes move forward in the Sacramento region.

- Is traffic bad enough to warrant HOT lanes?
- Who would benefit? Who would lose?
- Who would govern the lanes and make policy?
- What are the potential impacts to:
  - Carpooling and transit
  - Induced travel
  - Single occupant vehicle (SOV) trips and trip length
  - Overall number of vehicle trips
  - Congestion
  - Lower-income highway users
  - Land use
  - Air quality (ozone, greenhouse gas)
  - Trucking
- How can socioeconomic equity best be addressed?
- What will the net revenue generated from the HOT lanes be used for? Where can they be used?
- How can these local revenues be protected from the state?

Common Themes of the Interviews

The following list summarizes the common themes or messages heard in the interviews:

- I-80 Existing Conditions
  - HOV lanes are currently perceived as underutilized.
  - With the current budget situation and recession, paying for public improvements through user charges is a necessary evil.
  - Placer County is conservative; many will see tolling as taxation of a previously free commodity.
- Success Factors
  - HOT lanes must produce tangible benefits.
  - Enforcement is critical for perception of success.
  - Private contractors/operators should not have control.
  - HOT lanes need to be easy to understand and use.
  - General funds must not be used to build or operate the lanes.
- HOV Impacts
  - Use of the lanes by carpoolers and buses must not be degraded; a balance must be achieved.
  - HOT lanes could potentially undermine carpooling if not managed correctly.
- Socioeconomic Equity
  - There is a public perception that HOT lanes are inequitable.
  - As mitigation, net revenue could support more public transit in the corridor, discounts for lower-income users, or improvement of local streets.

- Air Quality
  - Air quality improvement should be added as an objective for the lanes.
- Opportunities Offered by HOT Lanes:
  - Reduce congestion and make better use of highway space
  - Fund transportation improvements
  - Shorten users travel times and increase travel time reliability

Themes Specific to Particular Interviewees

The following list summarizes the themes heard that were specific to particular interviewees:

- Net revenues should be used for
  - Transportation demand management;
  - Increased/improved transit in the corridor;
  - Air quality impact mitigation; and
  - Operation and maintenance of the lanes.
- Conversion of existing mixed-use lanes to HOT lanes should be examined.
- Environmentalists may be more open to HOT lanes than they are to HOV lanes.
- Extend the HOT concept to other freeways/highways.
- Be more specific about the revenue generation goal.
- Revenue generation should be the top goal since highway maintenance is underfunded.
- Caltrans and the California Transportation Commission (CTC) will need to control the revenues since they own and operate the highway system.

## *4.3 Public Telephone Survey*

In October 2009, Godbe Research conducted a telephone survey of residents living in the vicinity of the corridor. The objective was to gather general knowledge and/or initial perceptions regarding:

- Traffic congestion on I-80 and other Sacramento area freeways
- HOV lanes in general
- Tolling in general (i.e. bridges)
- FasTrak or other automatic tolling systems
- Concept of HOT lanes
- Concept of dynamic (or congestion) pricing
- Use of revenues
- Pros and cons of HOT lanes
- Whether the respondent would use HOT lanes on I-80
- Perceived personal benefits or costs
- Whether HOT lanes will improve congestion on I-80

Overall, 400 voters from Sacramento and Placer Counties, living within about four miles of the I-80 corridor under study, completed the survey. The sample represents the approximately 1.3 million adult residents in both counties. The study parameters resulted in a margin of error of plus or minus 4.9 percent. To be included in the survey, respondents needed to be licensed drivers and have had used the I-80 corridor at least three times in the last month. Interviews were conducted between October 7 and October 15, 2009, and the average interview took approximately 15 minutes. An extract from the final report on the public telephone survey can be found in Appendix C.

Once collected, the sample of respondents was compared with the actual population of adult residents in each county to identify any differences between the demographics of the respondent samples and the actual population universe in each county. The data were weighted to address differences, and the results presented are representative of the adult population characteristics in terms of gender, age, and ethnicity.

In order to identify any differing attitudes and travel behavior associated with different parts of the study area, the sample of 400 respondents was divided into five groups based on the resident zip codes. Due to likely travel characteristics Regions 4 and 5 were under-sampled, while Regions 1 to 3 were over-sampled, especially Region 1.[6] Other methodological considerations are described in Appendix C.

Public Telephone Survey Results

The phone survey found mixed support for the HOT lane concept and respondents expressed a lack of compelling reasons for it. The survey also found a lack of support for the idea of dynamic (or congestion) pricing, and concerns about potential drawbacks of implementing HOT lanes.

Approximately 24% of the respondents are strong supporters of the HOT lane concept, while 36% show strong opposition. These two groups expressed firm opinions for or against the HOT lanes concept and would unlikely change their minds. The remaining 40% of the respondents are inclined to support HOT lanes. Concerted efforts to educate them further about the concept and its benefits are important to solidify their support.

The issue of dynamic pricing appears to be controversial and when this method for pricing was explained in more detail, initial support for the HOT lane concept dropped.

The following summarizes the specific findings of the telephone survey:

- As shown in Figure 2, reducing traffic and greenhouse gas emissions were less important issues to the average resident of the study area, compared to other issues such as maintaining public education, reducing crime and improving the local economy.
- The majority of the respondents, 62%, thought I-80 has become more crowded over the last few years, while 28% thought it has about the same, and 4% thought it was less crowded.
- Although awareness of FasTrak was high at 82% of the respondents, only 6% of the residents surveyed had a FasTrak account.

[6] Region 1 is composed of four zip codes in the easternmost part of the corridor; Region 2 contains seven zip codes further west, but still in Placer County; Region 3 is eight zip codes in easternmost Sacramento County; Region 4 is ten zip codes to the west of Region 3 in Sacramento County; and Region 5 is 14 zip codes at the westernmost end of the corridor, including downtown Sacramento, all within Sacramento County.

- Approximately 60% of the non-FasTrak users reported using a toll bridge or highway during the past three months.
- In general, awareness and use of, as well as support for, carpool lanes were overwhelmingly high.
- Nine of every ten respondents have used a carpool lane.
- Sixty-three percent have used carpool lanes on I-80 between Watt Avenue and Riverside Avenue in Roseville.

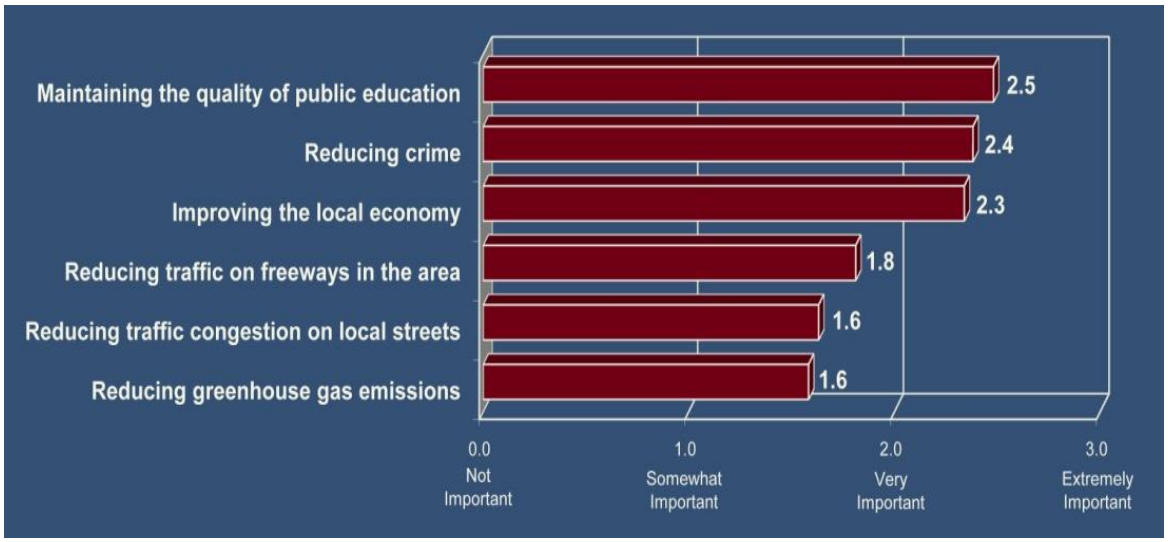


**Figure 2: Summary of Public Telephone Survey - Importance of Public Policy Issues**

- As shown in Figure 3, the initial test of relatively uninformed support was at 57% (26% strongly and 31% somewhat support). After a brief introduction of the HOT lanes concept, including what it is, high level benefits with traffic flow, convenience of automatic payment, and generation of toll revenue to fund public transit and road improvements, support dropped significantly to 45% (20% strongly and 25% somewhat support) and opposition increased to 51% (35% strongly and 16% somewhat oppose), with the introduction of the variable toll idea, with traffic moving at 45 miles per hour or more.
- As shown in Figure 3, the test of simulated informed support, the second test, was at 50% (25% each strongly and somewhat support), after respondents heard more about dynamic pricing, as well as some of the pros and cons of the HOT lanes concept.
- The chart shown in Figure 4 depicts the levels of support for dynamic pricing. Approximately 49% of the HOT lane supporters said they would use the lane a few times a month if one were in operation on the I-80 corridor today, while 40% would use it at least once a week.

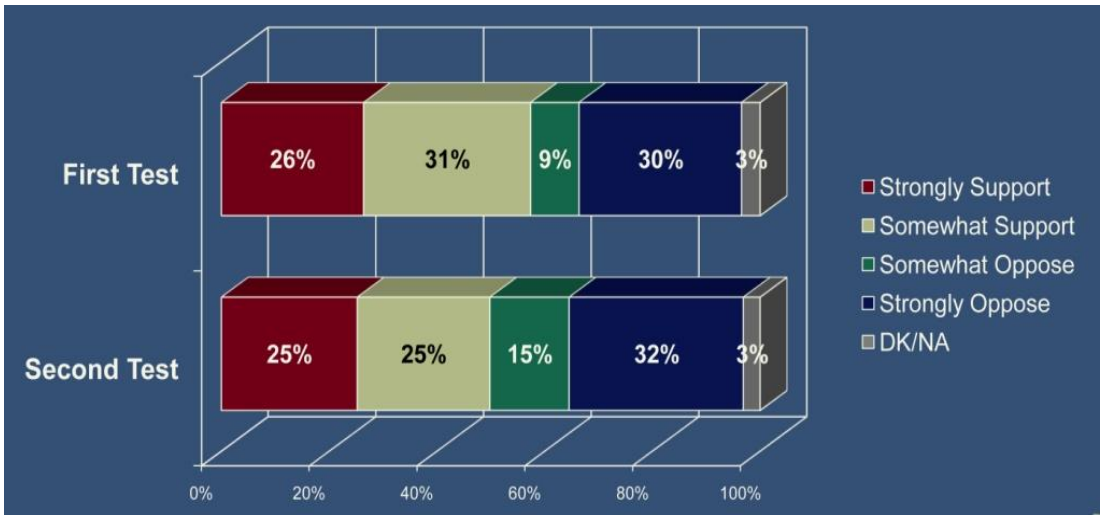


**Figure 3: Public Telephone Survey - Results of First and Second Tests of Support for HOT Lanes**

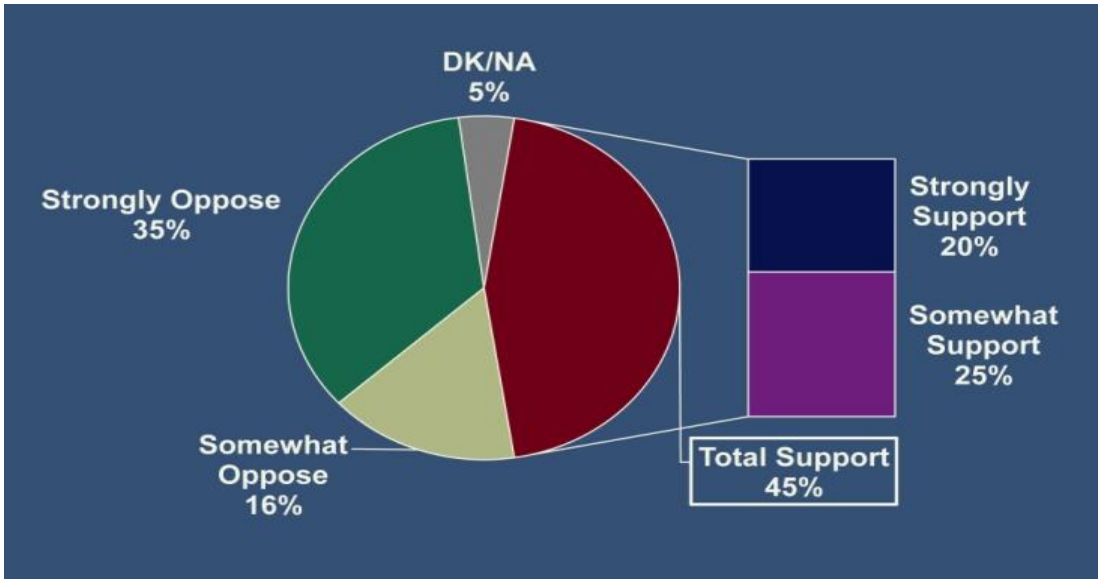


**Figure 4: Public Telephone Survey - Degree of Support for Dynamic Pricing**

- The survey did not reveal an enthusiastic response to the HOT lanes concept, even after presenting some of the potential benefits. In particular, 43% to 67% stated that the tested benefits had no effect on their likely support for the HOT lanes idea. Otherwise, the relatively influential messages included the following:
    - Revenue from the toll lanes would be used to pay for improvements to the corridor
    - Air pollution would be reduced
    - Carpools would continue to use the lanes for free

- Before entering the HOT lane, signs would inform drivers what it would cost them to use the lane
- Tolls would be collected electronically, with no toll booths and no stopping
- Only HOT lane users would pay for it, while making the regular lanes less congested and improving travel times for all

- However, tested potential concerns of the HOT lanes concept made between 32% and 52% of the residents surveyed more likely to oppose the concept. The following concerns particularly resonated with the respondents:

  - If you have an electronic toll paying device and you want to use the carpool lane because you have a passenger, you would have to remove or cover the device.
  - People cut in and out of carpool lanes, and this is hard to enforce.
  - The HOT lanes discriminate against those who cannot afford to pay.
  - The purpose of having HOV lanes is to discourage solo driving; HOT lanes encourage solo driving.
  - The government should build another regular lane, but should not convert an HOV lane built by taxpayers into a toll lane to benefit those who can pay.

- The survey revealed the following top priorities, shown in Figure 5, for using the toll revenue from HOT lanes, beyond paying for the tolling operations:

  - Other physical freeway improvements
  - Capital costs of adding the lane to the freeway
  - Public transit

- "HOT Lane" and "Carpool and FasTrak Lane" were the top names that 24% of the respondents felt best captured and communicated the concept of these toll lanes.

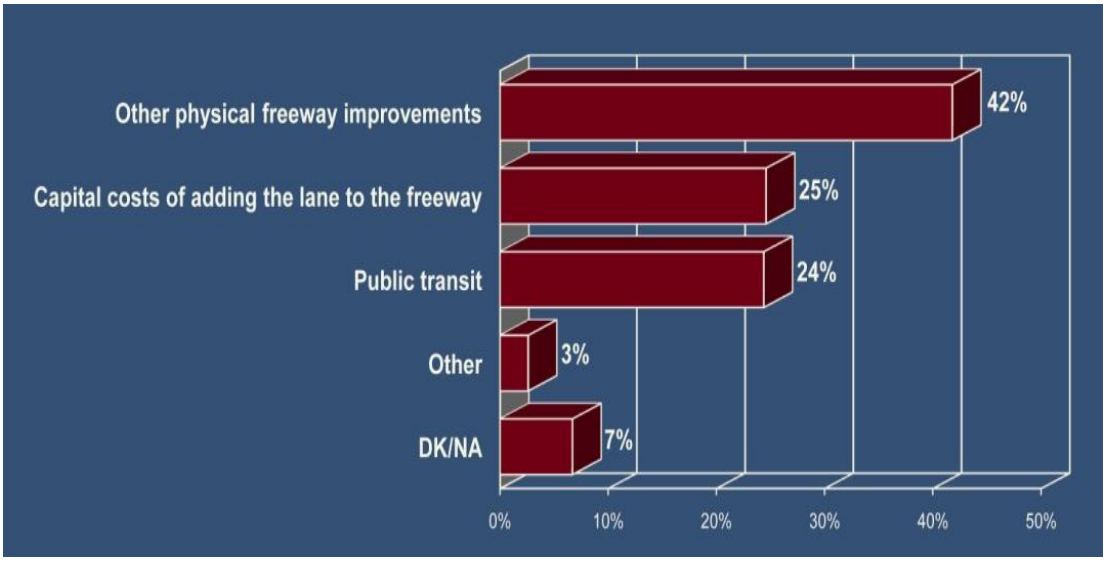


**Figure 5: Public Telephone Survey - Preferences for Use of Toll Revenues**

# 5.0 I-80 Corridor-Existing and Future Conditions

The I-80 Corridor under study for HOT Lanes extends from the SR65/I-80 interchange on the east to the I-5/I-80 interchange on the west. This is a distance of approximately 19.2 miles and crosses portions of both Placer County (approximately four miles) and Sacramento County (approximately 15 miles). The corridor serves as both a regional and national thoroughfare, while also accommodating shorter, local trips. The following section describes the corridor in more detail and discusses the existing and forecast travel patterns, as well as programmed improvements.

The existing lane configuration of I-80 in the study segment is illustrated in Figure 6. Proceeding from the east in the westbound direction, the following lane configurations exist (excluding lane closures associated with on-going construction in the corridor):

- From the SR65 interchange to approximately Riverside Avenue (a distance of approximately four miles), I-80 operates with three through lanes in each direction plus auxiliary lanes in selected locations.
- From approximately Riverside Avenue to the Capitol City Freeway interchange (a distance of approximately 6.8 miles), a fourth through lane and a fifth HOV lane are in operation.
- The HOV lane and three through lanes extend west another mile to approximately the Watt Avenue interchange and end (or begin in the eastbound direction) while the three through lanes continue west (and in the eastbound direction) another seven miles to I-5. In this segment, auxiliary lanes are provided in a few locations between interchanges.

A number of improvements in the I-80 corridor are planned or under construction and are depicted on Figure 7. The planned projects and year of completion are noted below:

- I-80 Widening in Roseville (2011)
- I-80 Across the Top Auxiliary Lanes (2012)
- I-80/Northgate Boulevard Interchange (2017)
- I-80 Across the Top Widening (2018)
- I-5/I-80 Interchange (2025)

Existing (2005) traffic volumes in the study corridor vary depending upon location. In the westbound direction, the daily volumes range from a low of approximately 16,000 vehicles between Northgate Boulevard and Truxel Road to a high of 42,000 between Antelope Road and Greenback Lane. In the eastbound direction, the daily volumes range from a low of approximately 18,000 vehicles per average weekday between Truxel Road and Northgate Boulevard to a high of 43,350 vehicles per average weekday. Between Madison Avenue and Greenback Lane with volumes to the east as far as Riverside Avenue less than 5% of this amount and drop to about 50% of this amount by SR 65.

Future traffic volumes in the corridor were developed for the 2035 horizon year. The 2035 SACSIM model developed for the SACOG 2035 Metropolitan Transporation Plan (MTP) was used as the basis for the forecasts. These forecasts assume a significant future investment in transportation facilities that are parallel to Interstate 80, such as the Placer Parkway project, as well as a local roadway system designed to serve planned development in south Placer County. The capacity provided by these planned improvements provide alternate travel routes. If the implementation of the improvements were delayed, higher volumes on I-80 would occur in the interim.

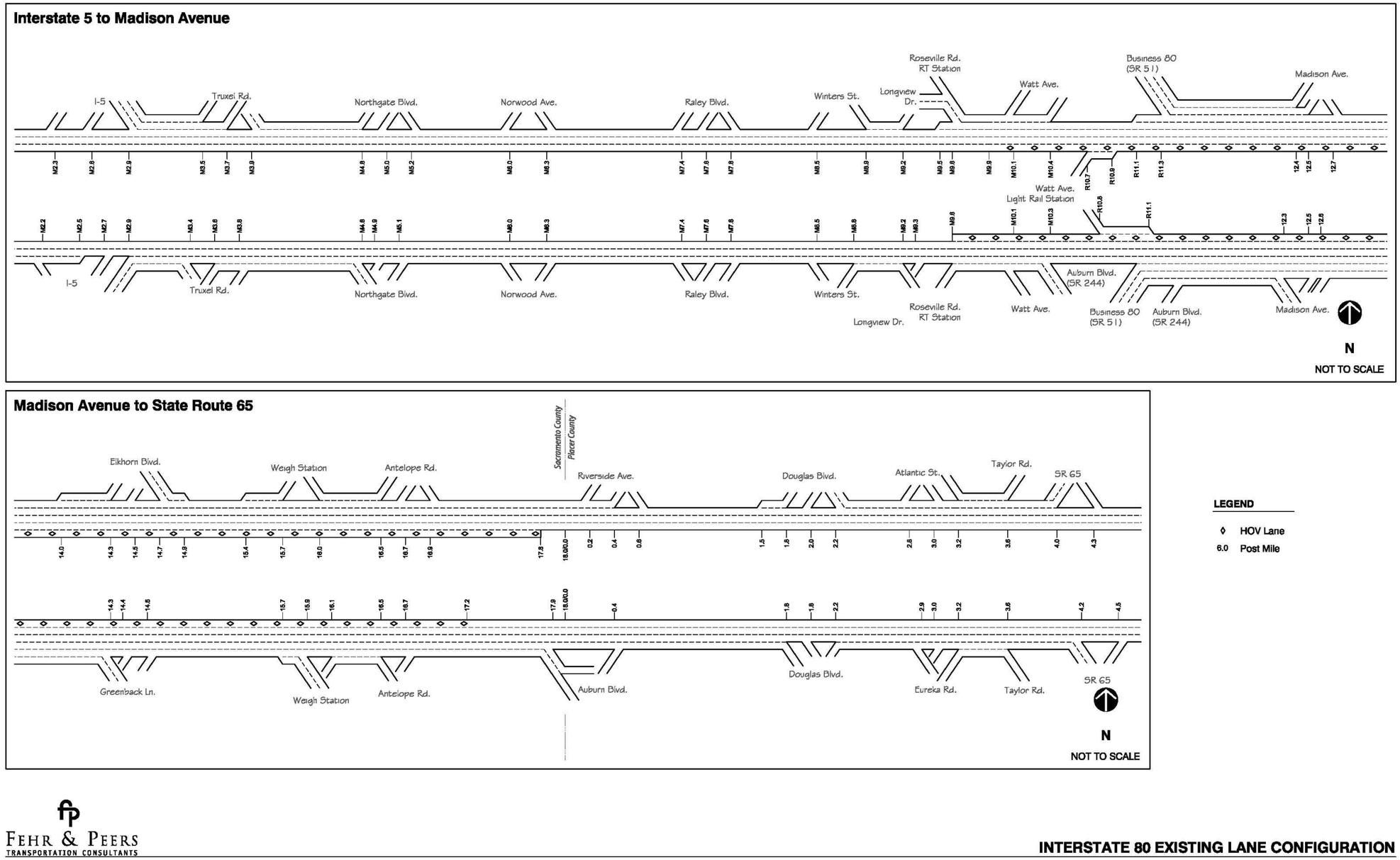


**Figure 6: Existing I-80 Lane Configuration**

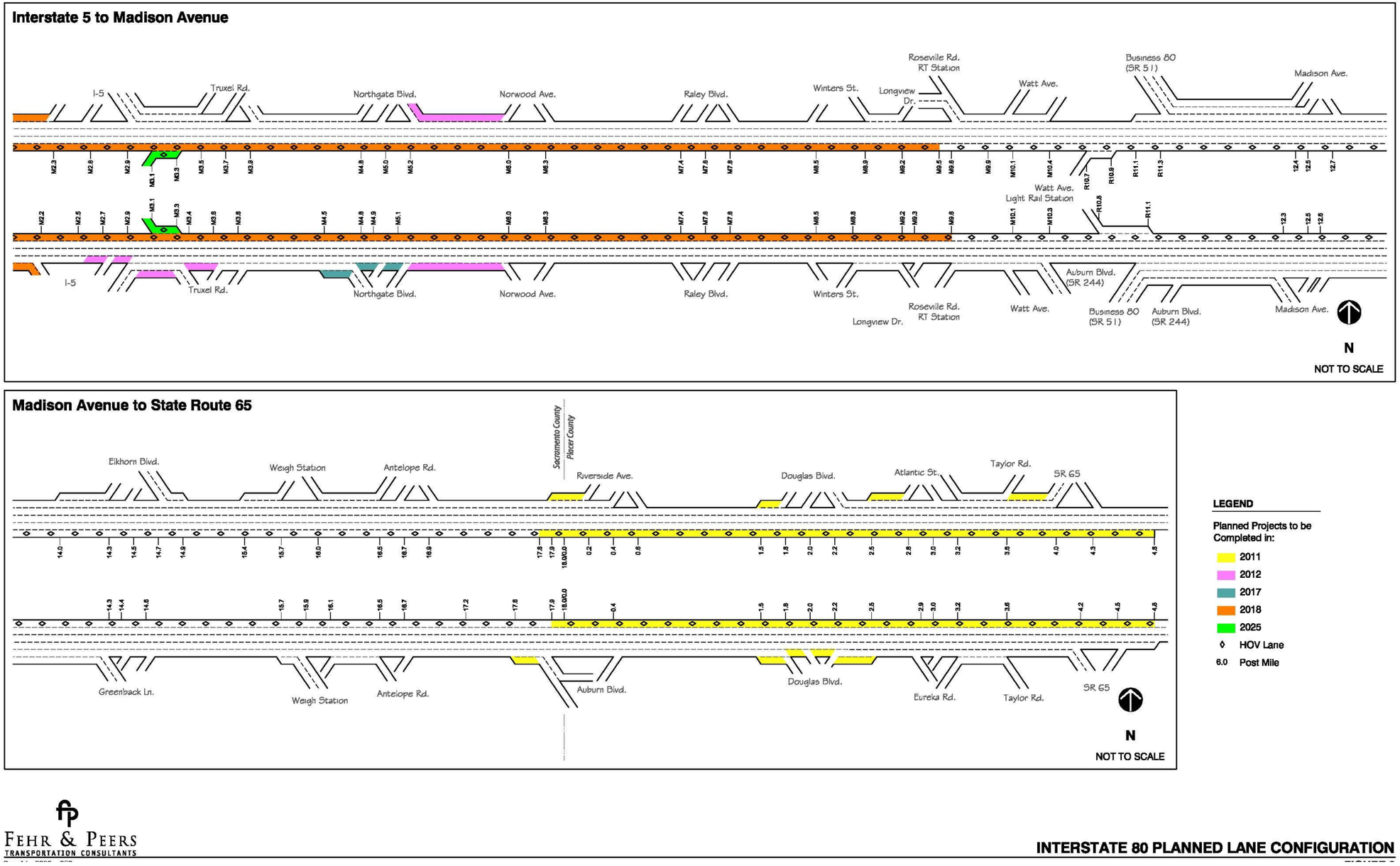


**Figure 7: Future I-80 Lane Configuration**

To reflect the unique nature of different portions of the 19 mile corridor, the study area was broken into six different segments as shown in Table 3. Travel forecasts were prepared for each of the six segments and are summarized in Appendix D.

**Table 3: Study Segments in the SR65 to I-5 Corridor**

| Segment Number | From | To | Distance (mi) |
|---|---|---|---|
| 1 | I-5 | Steelhead Creek | 2.7 |
| 2 | Steelhead Creek | Capitol City Freeway (SR 51) | 5.7 |
| 3 | Capitol City Freeway (SR 51) | Madison Avenue | 1.2 |
| 4 | Madison Avenue | Greenback Lane | 2.0 |
| 5 | Greenback Lane | Riverside Avenue | 3.6 |
| 6 | Riverside Avenue | SR 65 | 4.0 |
| **Total** | | | **19.2** |

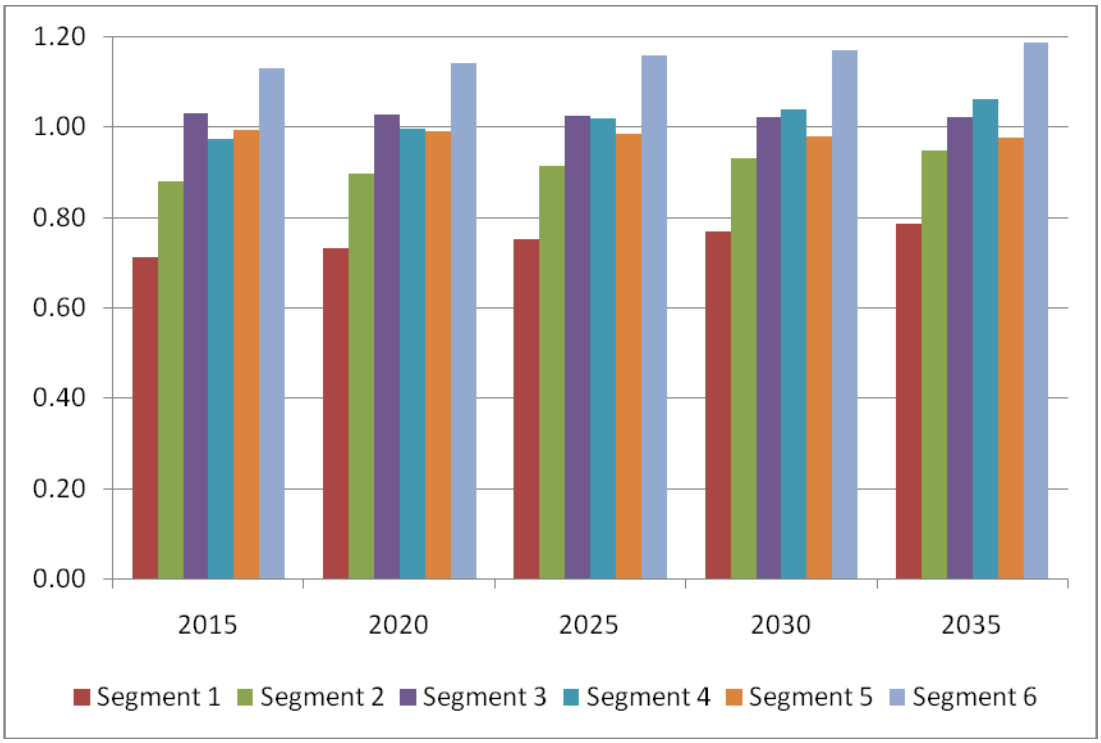


**Figure 8: Westbound Morning Peak Hour V/C Ratio by Segment**

While the higher-volume segments (i.e., Segments 3 and 4) showed increases of 5% to 10% to as much as 20% in the daily volumes between 2005 and 2035, the lower volume segments are forecast to have increases in traffic of more than 100% in the 30-year period (e.g., Northgate Boulevard to Truxel Road is forecasted to have an approximate 134% increase in daily traffic volumes between 2005 and 2035).

Given the range of forecast growth in travel in the corridor, as well as the already programmed improvements, the volume-to-capacity (v/c) ratios for segments of the corridor change over time as illustrated in Figure 8 depicting the 2005 and 2035 time period.

As illustrated in Figure 8, the segments from the eastern end (Segment 6, west of SR65) to the center of the corridor (Segment 2, Capitol City Freeway to Steelhead Creek) are projected to have v/c ratios at or exceeding the capacity of the roadway in the AM peak hour.

Where information is available (based on traffic counts), the existing (2005) peak hour percentage of all vehicles that are high occupancy vehicles (2+) is estimated to range between approximately 3% and 10.5% of the total peak hour volume representing 300 to 1,000 vehicles, respectively.

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# 6.0 HOT Lane Implementation Concepts

No two HOT lanes have been designed, implemented, and operated in precisely the same way. The consistency lies in allowing high occupancy vehicles to use the lane for no charge and allowing other vehicles to use the lane for a toll or fee. Key HOT lane design, implementation, and operation features are reviewed in this section.

Eligibility to use a HOT lane: There are three key types of users to consider: (1) high occupancy vehicles; (2) toll-paying users; and (3) users other than HOVs and toll paying users (e.g., motorcycles, clean air vehicles). These users are discussed below. In addition, large trucks are typically prohibited from using HOT lanes.

- *High occupancy vehicles* – Because most HOT lanes have been converted from HOV lanes, it has been important to maintain usage of the lane by high occupancy vehicles. These include carpools, vanpools, and buses. The key factor has been the occupancy requirement. Most require two or more occupants (referred to as "2+") in a vehicle to be classified as a high occupancy vehicle. When the HOV lane becomes, or is likely to become, congested at a 2+ level the owner/operator of the HOV lane must take some actions to keep the HOV lane functioning and not let it become congested. The most common approaches include increasing the occupancy requirement to three or more occupants ("3+") or adding a second HOV lane in each direction. In either case, the principle of encouraging carpool, vanpool, and transit usage is maintained.
- *Toll-paying vehicles* – Drivers who are willing to pay a toll and find that the time saving from using the lane is worth the price are allowed to use a HOT lane. The key considerations include how the toll will be paid and how toll will be enforced. The current trend for HOT lanes is electronic toll collection using a transponder in the vehicle capable of sending a signal to a toll reading device enabling the user's account to be charged for the trip. When a HOT lane is in a separate right-of-way it is easier to determine whether the vehicles entering the lane have paid their toll. It is also easier to determine whether the HOVs have the requisite number of occupants. It is important to understand that a HOT lane that has only painted lines as the boundaries will have a higher toll evasion rate and enforcement will be more challenging.
- *Users other than HOVs and toll-paying users* – Motorcycles and some hybrid vehicles have been authorized to use HOV lanes and, presumably, will continue to be allowed to use a lane when it is converted to a HOT lane. Consideration of such usage is important when estimating how much space is available in a HOT lane for toll-paying vehicles. If one thinks of a HOT lane as continuous strip of pavement, there are a limited number of spaces available for vehicles within each mile. Only those spaces not occupied by HOVs, motorcycles, and hybrids can be made available for toll paying vehicles and there is an implication to revenue generation created by non-HOV, non-toll paying vehicles. This is a public policy issue that must be considered by HOT lane owner/operator over time.

HOT lane configuration: The configuration or layout of a HOT lane affects usage, enforcement, safety, effectiveness, maintainability, and revenue generation. For the purposes of this early review, the important considerations, described below, are as follows: (1) how the HOT lane is separated from the general purpose (GP) lanes; (2) lane width and how much buffer is provided, both in the median and between the HOT lane and the GP lanes; (3) how ingress to and egress from the lane are configured, and (4) how enforcement is be provided.

- *HOT lane separation from the GP lanes* – The separation can range from a painted buffer (e.g. I-394 in Minneapolis) to separation by a physical barrier (e.g. I-15 in San

Diego). SR 91 uses a combination of paint and bendable pylons to separate the HOT lanes from other traffic. A painted separation is the least expensive but also the least effective at keeping non-HOV, non-paying vehicles from using the HOT lane.

- *Lane width and buffer space* – The width of a HOT lane depend on whether it is physically separated from general traffic lanes and how much buffer space is provided. The Metropolitan Transportation Commission (MTC) has generally held a principle that the ideal median shoulder width is 14 feet and the ideal buffer width is four feet wide. However, these widths cannot be accomplished in all locations. One of the original reasons for the 14-foot-median shoulder was to provide for an enforcement space. However, the California Highway Patrol (CHP) has concluded that it should not use median space for enforcement and should, instead, move violating vehicles to the far right shoulder or other safer place. This policy has the effect of reducing the need for a continuously wide median shoulder.
- *Ingress and egress* – Three approaches typically have been considered: (1) only one entrance and one exit point; (2) periodic ingress and egress locations with appropriate merging distances; and, (3) continuous ingress and egress. SR 91 has one entry and one exit in each direction. For a corridor like I-80 with several trip origins and destinations along the route, periodic ingress and egress seems most useful. Continuous ingress and egress make toll collection difficult and would lead to a higher rate of toll evasion.
- *Enforcement* – Typical enforcement is provided by a visual inspection to determine whether the HOVs have the required number of occupants. Photo enforcement is increasingly being used to determine whether toll paying vehicles have actually paid their tolls. With a photo enforcement system, if a vehicle does not have a transponder or if the transponder does not signal properly, a picture of the vehicles license plate is taken and a bill is sent to the vehicle owner. The CHP has concluded that it should not be a toll collection enforcement organization. The CHP generally focuses on enforcement of the vehicle code with particular attention to HOV compliance, speed, safety of merges, and vehicle equipment.

<u>Tolling principles:</u> Different approaches to tolling will generate different levels of HOT lane usage and different levels of gross revenues. For example, Utah initially used a flat monthly fixed toll rate on I-15 (requiring toll-paying vehicles to have a toll sticker affixed in a visible place. This has no effect on keeping the lane functioning without congestion.

Among the tolling approaches that need to be considered are:

- Whether tolling rates will be static or dynamic – Static tolls do not change by time of day, level of congestion, or other factors. These do not manage facility usage. Dynamic tolls can vary with the level of usage and, as the lane becomes more crowded, can increase thus discouraging further users. This allows the owner/operator to keep the lane from becoming congested and ineffective. However, it is also a concept not commonly applied to public facilities. The experience with SR 91 demonstrates that there can be public acceptance of dynamic tolling if the users and those affected by the lane believe the result is acceptable.

Whether tolls will be collected manually or electronically – Electronic tolling costs less to operate than staffed toll booths but requires an investment in infrastructure, such as toll readers, transponders, photo enforcement, and other features.

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# 7.0 Revenue and Cost Estimation

Revenue and cost estimates were developed for the 19.2-mile reach of I-80 between SR 65 and I-5 in Placer and Sacramento Counties. The revenue estimates utilized a planning level estimation tool developed by the FHWA. The cost estimates were developed based on planning level capital cost estimations, as well as operational estimates derived from other projects with similar operating parameters.

## *7.1 Revenue Estimates*

Revenue estimates were developed for the project corridor. The *Policy Options Evaluation Tool for Managed Lanes (POET-ML)* was employed to develop these estimates. POET-ML was developed under the direction of the FHWA and released for public use in late 2008 and is appropriate for testing HOV/HOT policy changes, or combinations of HOV/HOT policy changes, to best align with a region's system goals and performance objectives over the long term. It should be noted that as with any analytic tool, there are some limitations with POET-ML, for example:

- The same toll rates are applied for all tolled trip types and no discount rates are considered in the calculation for certain users, trip types or user types;
- Dynamic pricing, as occurs on SR 91 in Orange County, California, resulting in occupancy level changes;
- Policy changes may only be tested on an individual corridor (in this case I-80) and system-wide interactions or shifts between corridors that may occur with policy or pricing changes are not reflected.

As a result, POET-ML is not intended to replace system-wide regional travel model estimates due to system-wide impacts of policy changes nor is it intended to be an investment grade revenue forecasting tool. POET-ML is a high-level sketch planning tool best used to evaluate various policy options including the implementation of HOT lanes within a specific corridor. POET-ML produces various operational outputs (as discussed in Chapter 8), as well as revenue estimations for each scenario tested. More detailed travel forecasts, an investment grade financial forecast and more detailed technical analysis are recommended prior to implementation of a HOT lane policy strategy in this or any other corridor.

There were a number of assumptions made during development of the revenue estimates. The key assumptions are as follows:

- The HOT lane would be for SOVs who are willing to buy access to utilize the available capacity by paying a toll. The HOV2+ policy allows vehicles with 2 or more people to be exempt from paying the toll and these vehicles can use the HOT lane if desired for free. With an HOV3+ policy, vehicles with three or more people per vehicle would be exempt from the toll while SOVs and HOV2 (vehicle with two occupants) would have to pay a toll.
- The HOV or HOT lane is assumed to have a maximum throughput volume of 1,650 vehicles per hour per lane (vphpl). This reflects 75% of a maximum HOV/HOT lane capacity of 2,200 vphpl and a travel speed of 47 mph or higher.
- Alternatively, the GP lanes are responsive to the throughput volumes and may meet or exceed the capacity of the GP lanes[7] with a travel speed of 10 mph or less. The

[7] A GP lane capacity is assumed to be 2,000 vphpl.

difference between the HOV/HOT and GP capacities is that the GP lanes include trucks and significant weaving movement, both of which reduce the capacity, while the HOT lanes are designed to have limited access, reduced weaving and trucks are not allowed by federal law.

- The difference in travel times between the GP lanes and the HOT lanes is a key incentive for using the HOT lanes. This travel time savings is reflected in the revenue estimates by calculating a value of time (VOT) for the average user and calculating anticipated revenue based on a user's willingness to pay to save the time.
- A range of VOT was employed in this analysis reflecting the different VOTs assumed for Sacramento and Placer Counties. This also results in a range of revenues which better reflects the potential of the corridor (as compared to showing only a single revenue number).
- Based on information developed by SACOG, a VOT of $11.20 per hour in Year 2000 dollars was identified and then adjusted per inflation rates published by the U.S. Bureau of Labor Statistics, the VOT was increased to $14.07 for Year 2009 reflecting the 25.63% rate of inflation between 2000 and 2009. This VOT is consistent with income levels across the entire SACOG region and in particular is generally consistent with Sacramento County.
- Because Placer County has a higher overall income level than Sacramento, a higher VOT of $17.59 per hour was also tested. This is 25% greater than the inflation adjusted VOT described above and is based on the average income levels in Placer County.
- POET-ML also generates annual revenue forecasts based on daily forecasts and an annualization factor. While POET uses a 9.75% peak hour factor to forecast daily and resulting annual revenues, the unconstrained forecasts reflect the potential for peak spreading. Thus, instead of a single discreet peak hour, it was assumed that the peak could extend to the shoulders and the daily revenue forecasts would then be increased by 10% in the horizon years where the peak period was estimated to extend to two hours in the AM or PM peak period and by 20% where the peak period was estimated to extend to three or more hours during the day.
- The study also assumed 10% toll leakage meaning tolls are not collected due to traffic or toll violations.

When assessing the revenue effects of a HOT Lane facility, it must be remembered that as the volume of traffic goes up, two phenomena occur which affect the revenues:

- First, congestion in the GP lanes will increase providing an incentive for SOVs and potentially HOV2, depending upon policy, to buy access to the HOT lane, thus, generating revenue; and
- Second, as the traffic increases and the number of HOV2 vehicles increase, if the HOT lane policy is to allow HOV2+ (as is the current policy in the I-80 HOV lane) to be exempt from paying a toll, the revenues will actually begin to decrease over time as the available space for toll-paying vehicles decreases. Under such conditions, it is not until a HOT lane policy of 3+ is implemented that additional space will become available for toll-paying SOVs and HOV2 vehicles.

Using the traffic forecasts discussed in Chapter 5, the POET-ML tool, and assumptions noted above; revenue analyses was conducted in 10 year increments from 2015 through 2035 for segments of I-80 between I-5 and SR 65.

To obtain an overall revenue forecast, three discrete segments of I-80 were identified as potential individual HOT lanes segments. These segments were identified based on the unique lane pattern within each segment, the existing and projected traffic volumes and the lengths provide sufficient distance for reasonable travel time savings. The three segments identified were 1) SR65 to Greenback Lane, 2) Greenback Lane to Capital City Freeway and 3) Capital City Freeway to I-5. The individual revenue forecasts were then summed to estimate an overall corridor and were tested as a full HOT lane corridor to produce an overall estimate of revenue. Table 4 presents the results of the annual revenue forecasts produced by the POET-ML model for three horizon years (2015, 2025 and 2035) for the I-80 corridor between SR 65 to I-5.

**Table 4: Summary of Annual Gross Revenues for HOT Lanes on I-80 (in $1,000)**

| Year | HOV 2+ Lowest Volume VOT $14.07 | HOV 2+ Highest Volume VOT $14.07 | HOV 2+ Lowest Volume VOT $17.59 | HOV 2+ Highest Volume VOT $17.59 |
|---|---|---|---|---|
| 2015 | $ 1,020 | $ 1,810 | $ 1,240 | $ 2,130 |
| 2025 | $ 1,040 | $ 2,350 | $ 1,260 | $ 2,750 |
| 2035 | $ 1,020 | $ 2,880 | $ 1,240 | $ 3,370 |

**Note:** Numbers above reflects addition of segment from SR65 to Greenback Lane, the segment from Greenback Lane to Capital City Freeway and the segment from Capital City Freeway to I-5.

As shown, the I-80 corridor is projected to generate annual revenues in the identified horizon years between $1 million and $3.3 million based on the assumptions identified and discussed earlier.

## *7.2 Capital Cost Estimates*

Cost estimates for capital and operating costs were prepared at a planning level for implementation of a HOT lane in the I-80 corridor in both directions. Because of the varying road conditions and the fact that the types of HOT lane systems in place around the nation range from simple to full barrier separation, three alternative capital costs (low, medium, and high) for HOT lane implementation were prepared.

Some of the HOT lane elements may be mixed and matched to fit the specific needs and functionality of this corridor, as well as the tradeoffs associated with future funding availability. The three alternative capital improvements and estimated costs as presented in Table 5 are considered sufficient for this planning level analysis and comparative purposes.

The average cost per mile developed for the low to high range is similar to those developed by MTC for a Bay Area-wide assessment with one exception. This study's high estimate assumes widening the corridor to accommodate a preferred HOT lane cross section.

The costs in Table 5 were compared to the estimated revenues with presented in Table 6.

**Table 5: Summary of Capital Improvement Alternatives and Summary Costs**

| | Low | Medium | High |
|---|---|---|---|
| Re-striping | Included (2' striped buffer separating GP and HOT lanes) | Included (4' striped buffer separating GP and HOT lanes) | Included (10' food shoulder on both sides) |
| Variable Message Sign | Included | Included | Included |
| Barrier | Not included | Not included | Included |
| Ingress/Egress Points | Every 2 miles | Every 2 miles | Every 2 miles |
| Widening (within existing ROW) | Not included | Included | Not included |
| Widening (outside of existing ROW | Not included | Included (only at ingress/egress points) | Included (entire corridor) |
| Reconstruction of structures | Not included | Not included | Included |
| Retaining walls | Not included | Not included | Included |
| Estimated Cost ($ in millions) | $11.3 | $43.3 | $394.5 |
| Avg. Cost per Mile ($ in millions) | $0.55 | $2.11 | $19.24 |

**Notes:** Medium and high cost alternatives assume a 1,000 foot weaving section at ingress/egress points. Low cost alternative would require design exception(s) of non-standard shoulder width of 8 feet. Right-of-way cost is not included in all alternatives.

## *7.3 Operating Cost Estimates*

HOT lanes have operating costs associated with maintenance of tolling equipment, enforcement, billing and collection of tolls and general administrative costs. The planning-level operating costs used in this effort were consistent with those developed by MTC for a Bay Area-wide assessment of operating costs. As with the capital costs, if and when a HOT lane project advances, more detailed assessments of the type of maintenance, level of enforcement, and tolling practices (including who administers the toll), refinements of these estimates will occur. The following were used to develop operating costs:

- A user fee of $0.17 per transaction, which includes administrative staffing, governance, license plate verification, and related overhead[8].
- A financing fee (bank charge on credit cards) of 2.2% per transaction[9].
- A transponder cost of $18 each initially and as a replacement every six (6) years. It was assumed that 60% of the daily users would require new or replaced transponders and the remaining 40% of the daily users already had a transponder.

[8] The Bay Area HOT Network Study (2008) used a 16-cent per transaction cost. The 17-cent per transaction cost is an updated estimate recommended by the MTC.

[9] With FastTrak, users pay with credit cards. Other potential payment approach could be considered in the future studies, and these may or may not cost more to service.

- Maintenance costs of $45,000 per HOT lane mile per year. This only includes the tolling equipment and does not include pavement maintenance. Maintenance of pavement and other infrastructures, such as bridges and guard rails, are assumed to be paid for from other funding sources.
- CHP's HOT lane enforcement cost of $25,000 per lane mile per year.
- No estimation of funding costs associated with borrowing funds to cover capital or operations costs. If the concept is further developed, financing costs will need to be considered.

## *7.4 Estimated Net Revenues*

A cash flow assessment was undertaken and assessed the forecast annual revenues and compared them to the estimated operating costs to determine the net revenue that might be generated by the HOT lane. Table 6 presents the results of this assessment in 10-year increments.

**Table 6: Summary of HOT Lane Costs and Revenues**

| **Estimation of Cash Flow (HOV 2+)** | **2015** | | **2016 to 2025** | | **2026 to 2035** | |
|---|---|---|---|---|---|---|
| | Low Vol Low VOT | High Vol High VOT | Low Vol Low VOT | High Vol High VOT | Low Vol Low VOT | High Vol High VOT |
| **Gross Revenue** | $0.1M | $2.1M | $10.3M | $24.7M | $10.3M | $30.9M |
| **Operating Expenses** | $2.8M | $2.9M | $27.0M | $27.1M | $27.1M | $27.3M |
| **Net Revenue** *[Before Financing]* | ($2.7M) | ($0.8M) | ($16.7M) | ($2.4M) | ($16.8M) | $3.6M |
| | | | | | | |
| Low Range Capital Cost | $11.3 M | | | | | |
| Mid Range Capital Cost | $43.3 M | | | | | |
| High Range Capital Cost | $394.5 M | | | | | |

**Source:** HNTB, March 2010
**Notes:** 1) Gross and net revenues are expressed in a range. A lower revenue reflects a conservative (lowest) traffic volume within the corridor, and a higher revenue uses the highest link volume as a representative traffic volume of the corridor. 2) "VOT" refers to the "value of time" for which a potential HOT lane user weighs their choice to wait in congestion versus use a more-free-flowing HOT lane. The "Low VOT" reflects the Sacramento County value and the "High VOT" reflects the Placer County value as the average income levels on the western side of Placer County are higher than Sacramento County on average. 3) The estimates assume an HOV2+ policy for the HOT lane do not pay a toll.

From a net revenue perspective, a number of conclusions can be drawn.

- Revenue generation is a function of the forecast of traffic volumes, the estimated VOT, and the estimated user travel time savings (see Chapter 8 for the travel time discussion).
- For the low volume range scenario, the implementation of the HOT Lane by 2015 with an HOV2+ requirement does not generate a surplus in revenue (excluding consideration of financing costs) through 2035, while the high volume/high value of time range scenario generates a surplus before 2035 (prior to accounting for capital costs and financing costs).

- Utilization of a “2+” HOT lane entry level does not generate sufficient revenues to cover the operational costs of the HOT Lane and would not cover any capital costs. In some segments of the corridor, there is sufficient demand to fully utilize the entire capacity of the HOT Lane with HOV2+ vehicles. Hence, there is very limited additional capacity for toll-generating vehicles (SOVs). In the western end of the corridor, the projected level of congestion is not severe enough to generate sufficient travel time savings for HOT lane users. Thus, modest amount of tolls are generated from the less congested segments of the corridor in the western end.

Two additional scenarios are noted. While not analyzed, it is likely that gross revenues under an HOV 3+ requirement would be higher than for the HOV 2+ condition considered herein due to the fact that there would be significantly more available capacity for vehicles in the GP lanes (SOVs and HOV2) to choose to buy into the HOT lane and save travel time by paying a toll and generating additional revenue. And, while not analyzed, it is likely that gross revenues for the period after 2035 would be significantly higher than estimated for the time period through 2035 as the net revenue is positive and increasing. Thus, a combination of post-2035 and a 3+ HOT lane policy would generate the most revenue and likely cover the operating costs plus some or all of the amortized capital costs or become a source of funding for other transportation projects in the corridor (e.g., maintenance, transit expansion, etc.).

# 8.0 Traffic Operations

An important consideration in the assessment of the feasibility of high occupancy tolling lanes is the effect such lanes have on freeway traffic flow and operations. In general, allowing tolled vehicles to use an HOV lane tends to improve travel speeds in the general purpose lanes (as long as there is available capacity in the HOV lane). As the HOV lane fills with carpools, vanpools, and buses, it can approach a stop and go condition. For that reason, operators generally monitor the traffic flow in the HOV lane and seek to keep the lane functioning for HOV purposes by increasing the HOV occupancy requirement from 2+ to 3+, adding a second HOV lane, or taking other actions intended to keep the HOV lane functioning and flowing smoothly. Adding tolled vehicles to an HOV lane makes the monitoring and assessment function even more critical.

This review considers the anticipated 2015 and 2035 conditions on I-80 in the study corridor. Two future traffic levels are considered: a high and a low estimate. This allows consideration of a range of future conditions.

For the purposes of this review, a maximum number of vehicles per lane per hour were specified as the level beyond which no tolled vehicles should be allowed to use the HOT lane because a greater volume would be more likely to cause stop-and-go traffic conditions, thus eliminating the travel time advantage for both HOVs and tolled vehicles. The maximum number of vehicles was specified as 1,650 vphpl which is a level consistent with the planning assumptions made for HOT lane assessments in the San Francisco Bay Area. As a comparison, GP lanes are generally assumed to have a capacity of 2,000 to 2,200 vphpl.

Tables 7 and 8 provide performance indicators for the I-80 corridor between I-5 and SR-65 in the eastbound and westbound direction, respectively. With a general increase of congestion during the planning horizon, the delay in GP lanes will increase while the delay in HOT lanes will stay the same. Delays and travel speed in HOT lanes will stay the same because the lanes do not accept additional vehicles when it reaches to LOS C conditions or 1,650 vphpl.

From Tables 7 and 8, the following observations can be made:

- Speeds in the general purpose lanes can be expected to decrease by four to six miles per hour from 2015 to 2035 while speeds in the HOT lane should remain approximately 47 mph primarily because the volumes in the HOT lane were assumed to be limited. Thereby limiting HOT lane capacity preserves the free flow condition of the lane.
- In the eastbound direction, the HOT lane would provide a 1 to 4 minute travel time savings in 2015 and approximately 6 minute travel time savings in 2035.
- In the westbound direction, the HOT lane would provide a 5 to 8 minute travel time savings in 2015 and a7 to 12 minute travel time savings in 2035.
- Appendix D contains the detailed traffic information for the corridor on a segment-by-segment basis for the period 2005 through 2035 for every intervening fifth year.

**Table 7: Peak Hour Performance Indicators - Eastbound I-80**

| Indicators | Traffic Volume | Year | |
|---|---|---|---|
| | | 2015 | 2035 |
| General Purpose Lane Delay (vehicle hours of delay) | High | 892 | 1,546 |
| | Low | 1,207 | 1,604 |
| HOT Lane Delay (vehicle hours of delay) | High | 185 | 185 |
| | Low | 185 | 185 |
| Avg. General Purpose Lane Speed, Peak Hour (mph) | High | 43.5 | 37.4 |
| | Low | 41.3 | 37.4 |
| Avg. HOT Lane Speed, Peak Hour (mph) | High | 47.1 | 47.1 |
| | Low | 47.1 | 47.1 |
| Travel Time Saving/Vehicle (min) | High | 1.5 | 6.1 |
| | Low | 4.1 | 6.1 |
| Vehicle Miles Traveled | High | 154,000 | 164,000 |
| | Low | 159,000 | 169,000 |

**Source:** HNTB, July 2010.
**Notes:** 1) Two sets of traffic volumes (high and low) were used to estimate a potential range of performance indicators.

**Table 8: Peak Hour Performance Indicators - Westbound I-80**

| Indicators | Traffic Volume | Year | |
|---|---|---|---|
| | | 2015 | 2035 |
| General Purpose Lane Delay vehicle hours of delay) | High | 1,651 | 2,184 |
| | Low | 1,346 | 1,711 |
| HOT Lane Delay (vehicle hours of delay) | High | 185 | 185 |
| | Low | 178 | 185 |
| Avg. General Purpose Lane Speed, Peak Hour (mph) | High | 35.7 | 32.3 |
| | Low | 39.7 | 35.8 |
| Avg. HOT Lane Speed, Peak Hour (mph) | High | 47.1 | 47.1 |
| | Low | 47.4 | 47.1 |
| Travel Time Saving/Vehicle (min) | High | 7.9 | 11.7 |
| | Low | 5.3 | 6.8 |
| Vehicle Miles Traveled | High | 155,000 | 167,000 |
| | Low | 159,000 | 169,000 |

**Source:** HNTB, July 2010.
**Notes:** 1) Two sets of traffic volumes (high and low) were used to estimate a potential range of performance indicators.

A review of the traffic forecasts revealed the following operational considerations.

- The demand is forecasted to exceed capacity for all analysis years on westbound I-80 between Madison Avenue and Business 80 (Segment 3) during the AM peak hour. Queues from this bottleneck would likely constrain vehicles from reaching Segments 1 and 2. The queues would likely extend into Segments 4 and 5 also affecting their volume throughput.
- The demand is forecasted to exceed capacity for all analysis year on westbound I-80 between Douglas Boulevard and Riverside Avenue. The v/c ratio was calculated to be significantly higher than 1.0 (for example, 1.19 in 2035). As mentioned previously, the

forecast model included one additional lane in this segment than it is currently planned by Caltrans.

- The effective capacity of the mainline when bottlenecks occur is much less than the theoretical capacity. According to the Caltrans PeMS data, the throughput under congested conditions of westbound I-80 at Madison Avenue during the AM peak hour varies from 1,620 to 1,560 vphpl. At Riverside Avenue, the effective westbound throughput was 1,120 vphpl during the AM peak hour. These values suggest that mainline congestion could be much worse than indicated by v/c ratios alone and that more of the corridor will operate under congested conditions.
- Bottlenecks would occur in some segments and influence both upstream and downstream volumes and operations. Two anticipated bottlenecks would occur on the segments of westbound I-80 between Madison Avenue and Capital City Freeway and westbound I-80 between Douglas Boulevard and Riverside Avenue.
- Congestion in the corridor could be influenced by weaving movements associated with HOV/HOT lanes. Entry and exit locations would need to consider weaving movements carefully to avoid exacerbating congestion problems. If entry/exit locations are restricted to avoid worsening congested conditions, the HOT demand could be lower than forecasted in this process.

As noted above, it is likely that a more detailed operational analysis would indicate that future bottlenecks in key segments of the study corridor would result in higher levels of congestion. The extent to which this occurs would increase the attractiveness of a HOT lane to travelers in the I-80 corridor.

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# 9.0 Implementation Issues and Strategies

Key topics the region will need to examine if further consideration is given to HOT lanes in the I-80 corridor or elsewhere include the following:

- *Uses of gross revenues* – No two regions in the United States have adopted the same principles for use of gross revenues from HOT lanes. Some have focused on covering only operations and maintenance costs. Some (particularly SR 91) have focused on covering all associated costs and having net revenues usable for other investments. The region will need to determine the priority uses of HOT lane revenues. One possible approach would be to prioritize the uses for the revenue as follows:
    1. Operations and maintenance plus centralized services
    2. Capital costs
    3. Financing costs
    4. Other investments (such as corridor improvements, transit, parallel facilities, etc.)
- *Tolling principles* – As above, no two HOT lane projects have precisely the same tolling principles. These could be:
    1. Maximize the value of time saved for all travelers (including those in the general purpose lanes) – this can be accomplished by setting the capacity in the HOT lane to carry as much traffic as possible without causing a traffic breakdown condition. Toll rates are the main mechanism for balancing traffic in the HOT and general purpose lanes.
    2. Maximize revenues – this can be accomplished by restricting the volume of traffic in the HOT lane and causing it to run free flow with a high speed and, thereby, causing more traffic to stay in the general purpose lanes.
    3. Minimize travel time for HOVs and tolled vehicles – this can also be accomplished by restricting the volume of traffic in the HOT lane either through toll rates, metering, or other means.
- *Coordination with neighboring regions' tolling programs* – Both the Metropolitan Transportation Commission (and congestion management agencies in that region) and the San Joaquin Council of Governments are developing programs for HOT lanes. The Sacramento region should consider the plans of neighboring regions in further consideration of HOT lanes for topics including:
    1. Tolling principles;
    2. HOT lane configuration;
    3. Tolling administration;
    4. Toll collection methods;
    5. Enforcement; and
    6. Governance.
- *Toll administration* – At least two options for tolling administration should be considered if the HOT lane concept is considered further:
    1. Coordination with and use of the Bay Area Toll Authority (BATA) FasTrak system and toll collection process – BATA is willing to review extending its toll

administration beyond the Bay Area as long as regions adopt the tolling system and conventions BATA uses (e.g., electronic toll collection, payment processing means, finance charges, customer registration system, etc.); or

2. Development of a local toll administration organization and system.

- *Enforcement* – The CHP typically provide enforcement, and the costs are covered by toll revenues. The CHP considers its role to be traffic enforcement and not toll monitoring or collection. The CHP also has certain design and operational requirements/practices including no enforcement stops in the median (i.e., the CHP pulls vehicles over to the far right-side shoulder which would require HOT lane violators to crossing multiple GP traffic lanes.

A second set of key topics for the region focuses on what would make a HOT lane or a network of HOT lanes successful. The points to consider in determining the success of a HOT Lane concept are the following:

- The *purpose* of instituting a HOT lane must be clear to the elected officials, stakeholders, and interested parties. If one party views the purpose as revenue generation and another views the purpose as congestion relief, there may not be agreement about how to carry out the program or use revenues.
- The HOV/HOT lane needs to be *managed* so that it operates reliably without breakdown to a stop and go condition. If a lane is not reliable, travelers will not see the value of using the lane and, therefore, will not be as willing to pay a toll.
- The *timing* for instituting a HOT lane needs to occur when there is likely to be increasing revenues and not just before the HOV eligibility requirement may need to change from 2+ to 3+. Otherwise, the purpose of instituting the lane may be assumed to be reduction of HOV usage and revenue generation. In addition, as the HOV lane becomes crowded at 2+ there would likely be relatively little gross revenue until such time as the requirement increases to 3+.
- The regional organizations and Caltrans will need to determine how a HOT lane should be designed. This review considered lane configurations ranging from a minimalist approach (i.e. fit the lane into the HOV lane space) to a much more extensive widening and structure replacement approach (assuring that a wide median, a wide lane, and a wide buffer are incorporated). Most HOT lanes are configured with design exceptions to standard federal and state freeway lane designs but that topic will need much further review. The capital cost implications of the design choices can be significant.
- If a network of HOT lanes is to be considered (e.g., I-80 along with I-5, US 50, SR 99, etc.), the means of transitioning from a HOT lane on one freeway to a HOT lane on another freeway must be examined in some detail. Freeway-to-freeway connectors providing a unique lane for tolled vehicles and HOVs can be very expensive ($50 million or more) and the costs of those can have a significant effect on use of gross tolling revenues.
- Prior to any HOT Lane implementation decision, refinements to the travel and revenue forecasts will be needed. The preliminary estimates used in this review are appropriate for the early review of a HOT lane. However, a more precise or narrower range of estimates will be needed before an investment decision should be made.
- A question faced by all regions considering HOT lanes is whether and how to make use of the private sector's capabilities. Some turn to the private sector to design, operate, and maintain HOT lanes. Some provide for a franchise in which a private entity commits

to develop and operate a HOT lane in exchange for a long-term revenue stream. In other cases, public entities provide almost all of those roles.

- Among the evaluation topics that should be considered as the region examines the HOT lane concept further are:
    1. Equity – How are different types of trips, different user groups, and different communities affected by HOT lanes?
    2. Should a take-a-lane approach be considered (i.e., converting a GP lane to an HOV and/or HOT lane)?
    3. What stakeholders have the principal responsibilities for making decisions about use of gross revenues?
    4. What principles should apply in considering how net revenues (funds remaining after covering necessary HOT lane-related costs) should be used?

Based on the planning-level analysis conducted for the I-80 HOT Lane project, HOT lanes in the near-term do not appear to generate sufficient revenue to cover the costs of implementing and operating them. This is a function of both the volume of traffic and the number of 2+ HOVs projected to be in the system and thus not allowing capacity for revenue-generating vehicles to buy access into the HOT lane. Approaching 2035, the volume of projected traffic begins to be high enough to generate significantly greater volumes of revenue as the overall congestion increases and the value of using the HOT lane increases significantly for those travelers willing to "buy into" the HOT lane. Should the region move from an HOV 2+ threshold to an HOV 3+ threshold for vehicles, (while not explicitly tested in this analysis) experience elsewhere in the nation[10] has demonstrated that the now-available HOT Lane capacity can generate significant levels of new revenue from travelers willing to buy into the HOT lane.

Although the Sacramento Region does not appear to have sufficient congestion to warrant an immediate focus on implementing HOT lanes, the region should not preclude the strategy in the future as a congestion management and/or revenue generation tool. Further consideration of the issues identified herein is recommended as the basis for beginning an on-going policy dialogue as part of the MTP updates over the next decade.

Finally, among the issues noted, it is important for decision-makers to understand that an investment-grade travel and revenue forecast will be required prior to making a decision on moving forward with implementing HOT lanes. This is especially critical with any concurrent involvement of the private sector in the financing and/or management of HOT lanes, should that become a component of the implementation strategy.

[10] The HOV 3+ requirement for SR 91 demonstrates, at least in that case, that a HOT lane can generate significant toll revenues at the higher occupancy requirement. This depends greatly on the traffic volumes, the number of HOV users, the travelers' values of time, and other factors. No two corridors will have exactly the same characteristics.

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# Appendices

A: I-80 HOT Lane Policy Advisory Committee and Technical Advisory Committee Members

B: I-80 HOT Lane Fact Sheet

C: I-80 Phone Survey Background – Summary of Public Telephone Survey Concerning HOT Lanes

D: I-80 Corridor Traffic Forecasts

# Appendix A

## I-80 HOT Lane Policy Advisory Committee Members and Technical Advisory Committee Members

The Policy Advisory Committee composed of elected officials in the I-80 corridor and nearby areas and the Caltrans District Director, provided oversight and guidance for the review. The members of the PAC are:

- Steve Cohn, Councilmember, City of Sacramento
- Gina Garbolino, Mayor, City of Roseville
- Jim Holmes, Supervisor, Placer County
- Jody Jones, Director, Caltrans District 3
- Susan Peters, Supervisor, County of Sacramento
- James Shelby, Councilmember, City of Citrus Heights

The Technical Advisory Committee members who provided guidance and review for the I-80 HOT lane review are:

Caltrans District 3
Rick Helman
Jim Calkins
William Davis
Jeff Pulverman
Andrew Brandt

Placer County Transportation Planning Agency
Celia McAdam
Scott Aaron

Sacramento Area Council of Governments
Matt Carpenter
Samson Okhade
Mark Heiman
Bruce Griesenbeck

Placer County
Ken Grehm
Richard Moorehead

Sacramento County
Dean Blank

City of Roseville
Rhon Herndon
Rob Jensen

City of Citrus Heights
Stu Hodgkins

City of Sacramento
Azadeh Doherty
Jesse Gothan

Placer County Transit
Will Garner

Sacramento Regional Transit District
Don Smith

Sacramento Air Quality Management District
J.J. Hurley
Paul Philley

Sacramento Transportation Authority
Norman Hom

Federal Highway Administration
Steve Pyburn

# Appendix B
## I-80 HOT Lane Fact Sheet

# HIGH OCCUPANCY TOLL (HOT) LANES

Three agencies in the Sacramento Region (Placer County Transportation Planning Agency, Sacramento Area Council of Governments, and Caltrans District 3) are sponsoring a study of the concept of High Occupancy Toll (HOT) lanes on I-80, between I-5 and SR 65 (approximately 20 miles). There are currently High Occupancy Vehicle (HOV, or carpool) lanes in this corridor between Watt and Riverside.

## GENERAL DESCRIPTION

High Occupancy Toll (HOT) lanes, similarly to carpool lanes, operate alongside regular lanes on the freeway – in median (or "fast") lane - and are available for buses, carpools, motorcycles, qualified hybrids, and emergency vehicles. The difference is that HOT lanes are also available for solo drivers who choose to pay a toll to use the lanes. HOT lanes are separated from the general purpose lanes by barriers or striped buffers, with specified entrances and exits usually spaced several miles apart.

## WHY CONSIDER HOT LANES?

- HOV (carpool) lanes may be underutilized and have the capacity to accommodate more vehicles. By charging solo drivers to pay for access, more efficient use can be made of roadway capacity and improvements in travel time are experienced by drivers in all lanes.
- HOV/HOT lanes provide the option of a reliable trip time for drivers in corridors that experience periodic congestion.
- Revenue generation is another purpose, but has not been the primary purpose for implementing HOT lanes where they currently operate.

## DYNAMIC PRICING

- With dynamic pricing, toll rates change according to level of congestion in the lane – lower rates for less congestion, higher rates for more congestion – maintaining a minimum rate of speed for all vehicles in the lane (for example 45 miles per hour).
- There is commonly a maximum and minimum toll rate, set by policy.
- How often the rate changes varies, but is typically every 5-15 minutes.
- Corridor drivers see the current toll rate on a dynamic message sign placed well ahead of the start of the lane ("look ahead pricing").
- The price doesn't change once a vehicle has entered the lane.

## TOLL COLLECTION

- If dynamic pricing is used, toll collection is done with an electronic system (for example, FasTrak ™ used on Bay Area bridges).
- Electronic collection requires each user to place a transponder on their windshield and maintain a pre-paid toll account. When the lane is entered, the user is detected by an overhead receiver and hears a beep. There are no toll booths and slowing down is not necessary.
- Some HOT lanes use electronic toll collection but do not use dynamic pricing.
- For other HOT lanes, users set up a pre-paid account, are charged a flat monthly fee for unlimited use, and put a sticker on their cars.

## OTHER VARIABLE FEATURES

- Eligibility requirements for carpool occupancy can be 2+, 3+, or more. In some examples, 2-person carpools pay a discounted toll, and 3+ or higher are free.
- Tolling can be operational 24/7 or only during peak hours.
- The lanes can be configured in different ways – 1-2 lanes in each direction, or reversible if barrier separated.

## CAPITAL COSTS AND FUNDING

- Capital costs could include construction of additional lanes to the freeway where there are no existing HOV lanes, conversion of existing HOV lanes to HOT, and the electronic tolling system. Funding could come from bonding of anticipated toll revenue, federal, state, or local transportation funding, or a combination.
- Operating costs could include tolling operations, lane maintenance, and enforcement. Operating costs could be paid for by tolls.

## REVENUE GENERATION AND USE OF REVENUE

- Revenues could be used to pay for any capital costs that are not covered by other funding, operations, and maintenance of the lanes.
- Beyond paying for the lanes' capital, operating, and enforcement costs, excess revenue is commonly assumed to go for "corridor improvements." Typically excess revenues are used for other highway or public transit improvements, but they could also be used for transportation demand management, intelligent transportation systems, or other improvements to corridor travel.

## ENFORCEMENT

- Enforcement can be automated where there is an electronic toll collection system, but is also enforced by the California Highway Patrol using visual means and electronic devices.

## EQUITY

- A Cal Poly San Luis Obispo study of the SR 91 express (HOT) lanes in Orange County found use to be more closely tied to current travel conditions and trip needs than to income.
- Generally, users tend to be only slightly more affluent on average than non-users.

## GOVERNANCE

- There are numerous ways to establish governance and decision-making, from joint powers authorities to separate agencies, to public-private partnerships.

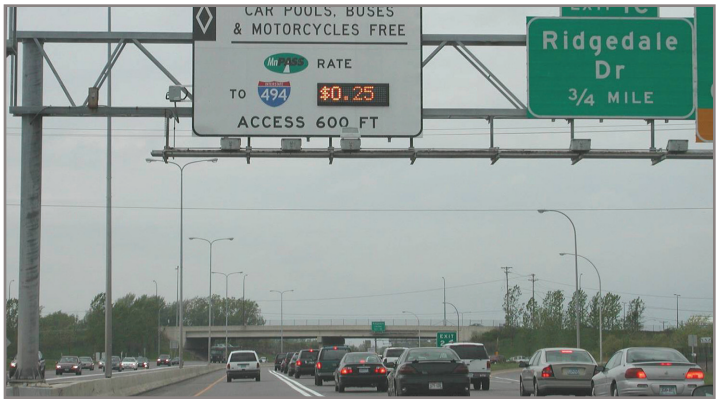
## EXAMPLES

There are eight HOT lanes currently in operation in the U.S.:

- California: State Route 91 in Orange County and I-15 in San Diego
- Washington: SR 167 southeast of Seattle
- Utah: I-15 in Salt Lake City
- Minnesota: I-394 in Minneapolis
- Texas: Katy and Northwest Freeways in Houston
- Florida: Tampa and Miami

Nine others are in the process of implementation, four proposals are under consideration, and 16 feasibility studies are underway (including Sacramento). In the Bay Area, AB 744 (Torrico) authorized a Bay Area Express Lane Network that is currently in implementation. The first project will be on southbound I-680 between SR 84 and SR 237.

*California: State Route 91 in Orange County*




*Minnesota: I-394 in Minneapolis*

# Appendix C
## I-80 Phone Survey Background

# MIG/Caltrans

# 2009 I-80 HOT Lanes Survey

November 2009

# Overview and Research Objectives

GODBE RESEARCH
Gain Insight

Through a sub-contract under MIG on behalf of Caltrans, Godbe Research conducted a survey of voters in Sacramento and Placer counties, living within about 4 miles of Interstate 80 (I-80), to gather feedback on the concept of "High Occupancy Toll Lanes" (HOT Lanes) on I-80, between Interstate 5 in Sacramento County and State Route 65 in Placer County.

The main objectives of the survey were to gather general knowledge and/or initial perceptions regarding:

- Traffic congestion on I-80 and other Sacramento area freeways
- HOV lanes in general, and specifically those on I-80 between Watt and Riverside
- Tolling in general (i.e. bridges)
- FasTrak or other automatic tolling systems
- Concept of HOT lanes
- Concept of dynamic (or congestion) pricing
- Use of revenues
- Pros and cons of HOT lanes
- Whether the respondent would use HOT lanes on I-80
- Perceived personal benefits or costs
- Whether HOT lanes will improve congestion on I-80

# Methodology Overview I

GODBE RESEARCH
Gain Insight

| | |
|---|---|
| Data Collection | Telephone Interviewing |
| Universe | Approximately 1,299,080 adult residents in Sacramento and Placer Counties |
| Fielding Dates | October 7 to 15, 2009 |
| Interview Length | 15 minutes |
| Sample Size | 400 |
| Margin of Error | ± 4.9% |

# Methodology Overview II

GODBE RESEARCH
Gain Insight

In order to identify potentially different attitudes and travel behavior associated with different parts of the study area, the sample of 400 respondents was divided into five groups based on their zip codes of residence (see maps of zip code groupings on the following pages). Due to likely travel characteristics, Regions 4 and 5 were under-sampled, while Regions 1 to 3 were over-sampled, especially Region 1. The following table illustrates the assigned quotas for each region, and their weighted proportions in the sample, the latter of which reflect the actual percentages of population residing in each of those five regions of the study area. For instance, an estimated six percent of the population in the study area lives in Region 1. The 100 surveyed in that region, or 25 percent of the completes, represented an oversampling of residents in that region. When looking at the results at the overall level with all 400 completes, weighted data were used. When comparing results across the 5 regions, the un-weighted data were used to maximize statistical power in the comparisons.

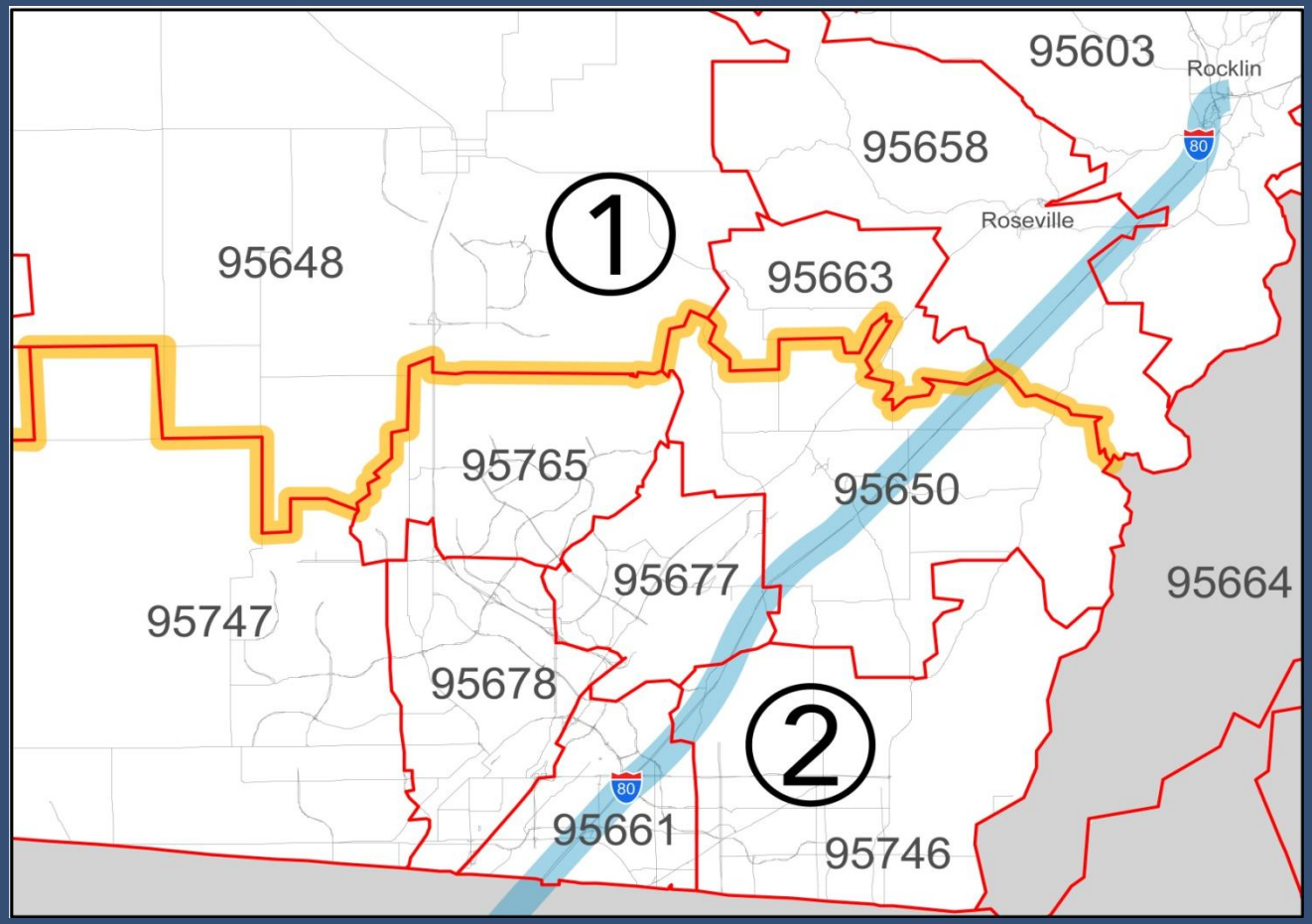
| | Sample Quota | Un-weighted Percentage | Weighted Percentage |
|---|---|---|---|
| **Region 1** | 100 | 25% | 6% |
| **Region 2** | 100 | 25% | 23% |
| **Region 3** | 100 | 25% | 22% |
| **Region 4** | 50 | 13% | 27% |
| **Region 5** | 50 | 13% | 22% |

Zip code groupings:
Region 1: Zip codes 95648, 95658 and 95663
Region 2: Zip codes 95747, 95678, 95661, 95746, 95765, 95677 and 95650
Region 3: Zip codes 95843, 95660, 95841, 95621, 95610 and 95628
Region 4: Zip codes 95673, 95652, 95838, 95815, 95864, 95821, 95608, 95670 and 95825
Region 5: Zip codes 95834, 95833, 95811, 95810, 95818, 95820, 95822, 95824, 95826 and 95814

# Study Area in Placer County

GODBE RESEARCH
Gain Insight

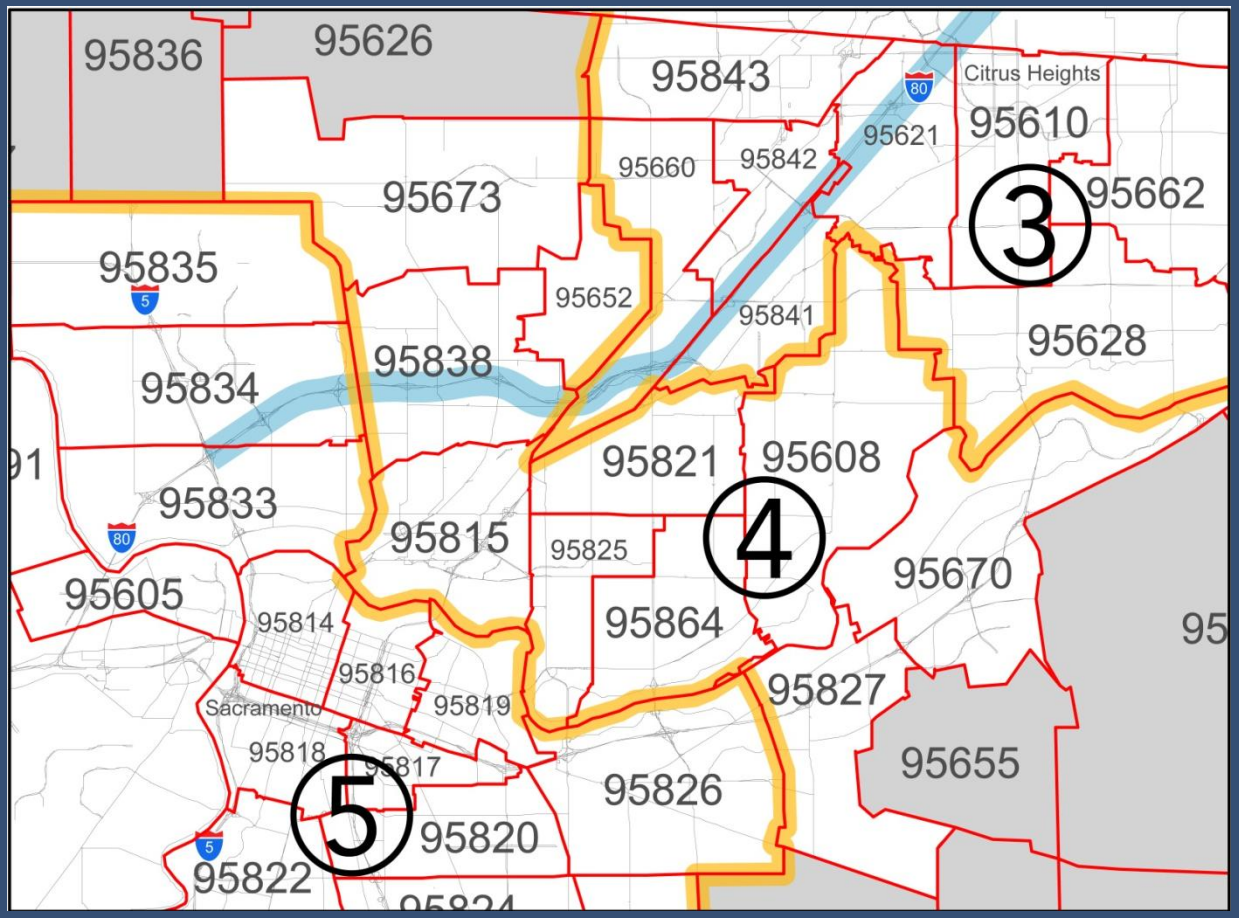
Illustrated below is a map of the select areas in Placer County that were grouped to form Regions 1 and 2.



# Study Area in Sacramento County

GODBE RESEARCH
Gain Insight

Illustrated below is a map of the select areas in Sacramento County that were grouped to form Regions 3, 4 and 5.



# Executive Summary

# Executive Summary: Local Issues and Traffic

GODBE RESEARCH
Gain Insight

- Overall, reducing traffic and greenhouse gas emissions were less important issues to the average resident in the study area, compared to other issues like maintaining public education, reducing crime and improving the local economy.
  - Reducing traffic on freeways was rated as “Extremely” or “Very Important” by 62 percent of the respondents, while reducing traffic on local streets was at least very, if not extremely, important to 54 percent.
    - Compared to Region 2, the average resident from Region 1 considered reducing traffic on freeways to be more important.
  - Reducing greenhouse gas emissions was rated as at least “Very Important” by 52 percent of the respondents.
- Majority (62%) thought I-80 has become more crowded over the last few years, while 28 percent thought it has stayed about the same, and four percent less crowded.
  - Significantly higher percentages of the respondents ages 25 to 34 and commuters reported that I-80 traffic has stayed about the same, whereas proportionately more of those ages 35 and older thought that I-80 has become more crowded.

# Executive Summary: FasTrak and Bridge Toll

GODBE RESEARCH
Gain Insight

- Although awareness of FasTrak was high at 82 percent, only six percent of the residents surveyed had a FasTrak account.
  - Proportionately more Region 1 (than Region 3) residents and those who thought I-80 traffic has stayed about the same (than less crowded) over the past few years were aware non-users of FasTrak.
  - Unawareness of FasTrak was higher among those ages 18 to 24, Region 3 (vs. Region 1) residents, and those who thought I-80 has become less crowded over the last few years (rather than staying about the same).
- Some 60 percent of the non-users of FasTrak (n = 377) reported using a toll bridge or highway during the past three months.
  - Especially those ages 25 to 34 and 45 to 54.
  - Anecdotally, two-thirds of the FasTrak users (n = 23) reported using their accounts to pay for tolls during the past three months. Overall experience of crossing a bridge using FasTrak was positive, with 97 percent reporting that it was significantly (87%) or somewhat (10%) faster than paying cash.*

* Due the small sample size, Godbe Research advises against over-generalizing this set of findings about FasTrak usage in the study area.

# Executive Summary: Carpool Lanes

GODBE RESEARCH
Gain Insight

- In general, awareness and use of, as well as support for, carpool lanes were overwhelmingly high.
  - Almost every respondent was aware of carpool lanes, with only one percent who have never heard of them.
  - Some 91 percent reported strong (68%) or somewhat support (23%) for carpool lanes, especially those ages 25 to 34.
- Nine out of every ten respondents have used a carpool lane before.
  - Previous experience is especially high among those 18 to 54, commuters and those perceiving I-80 traffic to have stayed about the same (vs. more crowded) over the last few years.
- Sixty-three percent have used carpool lanes on I-80 between Watt Avenue and Riverside Avenue in Roseville.
  - Reported usage is significantly higher among the 18- to 44-year-olds, commuters and those living in Regions 1 and 2 (vs. Region 4).

# Executive Summary: Support for HOT Lanes I

GODBE RESEARCH
Gain Insight

- There is mixed support for the HOT lanes concept as described in the survey, with a lack of compelling reasons for it, a lack of support for the idea of dynamic congestion pricing, and concerns about potential drawbacks of implementing HOT lanes.
- Initial test of relatively uninformed support was at 57 percent (26% strongly and 31% somewhat support), after a brief introduction of the HOT lanes concept – what it is, high level benefits with traffic flow, convenience of automatic payment and generation of toll revenue to fund public transit and road improvements.
- Support dropped significantly to 45 percent (20% strongly and 25% somewhat support) and opposition increased to 51 (35% strongly and 16% somewhat oppose), with the introduction of the variable toll idea, with traffic moving at 45 miles per hour or more.
  - Some 55 percent were opposed to paying toll ranging from $1 in off-peak times to $5 or more during rush hour, while 73 percent were opposed to paying as high as $10, if the freeway is very congested.
  - More of those ages 35 to 44, 55 and older, compared to the 18- to 24-year-olds were strongly opposed to dynamic congestion pricing.

# Executive Summary: Support for HOT Lanes II

GODBE RESEARCH
Gain Insight

- Test of simulated informed support (second test) was at 50 percent (25% each strongly and somewhat support), after respondents heard more about dynamic pricing, as well as some of the pros and cons of the HOT lanes concept.
  - Strong support was significantly higher in Region 5 (than Region 2), and soft support higher in Region 3 (than Region 5) and among commuters, while strong opposition was higher among those 55 and older and non-commuters.
  - Reported support was consistently stronger across the sequence of HOT lanes support questions among those perceiving I-80 to be less crowded over the last few years.
- Some 49 percent of the HOT lane supporters said they would use the lane a few times a month, if one were in operation in the I-80 corridor today, while 40 percent would use it at least once a week.
  - More Region 5 residents said they would use the HOT lane every workday, if one were available, more Region 4 residents reported three or four times a week. Meanwhile, more residents from Regions 1 and 2, compared to Region 3, said they would use the lane a few times a month.
  - More commuters would use the HOT lane three or four times a week, while more non-commuters reported a few times a month.

# Executive Summary: Potential Benefits

GODBE RESEARCH
Gain Insight

- Survey did not reveal an enthusiastic response to the HOT lanes concept, even after presenting some of their potential benefits. In particular, 43 to 67 percent stated that the tested benefits had "No Effect" on their likely support for the HOT lanes idea. Otherwise, the relatively influential messages included the following:
  - Revenue from the toll lane would be used to pay for improvements to the I-80 corridor, including public transit (55% more likely to support HOT lanes concept);
  - Air pollution would be reduced because drivers would spend less time on the road getting to their destinations (49% more likely to support HOT lanes concept);
  - Carpools of two or more people, buses, motorcycles, and hybrid vehicles would continue to use the carpool lane for free (47% more likely to support concept);
  - Before entering the HOT lane, signs would tell drivers what it would cost them to use the lane (47%);
  - Tolls will be collected electronically, using an automatic system with a transponder mounted on a car's windshield, such as FasTrak. There would be no toll booths and no stopping to pay tolls to slow down traffic (46%); and
  - Only users of the HOT lane will pay for it, while making the regular lanes less congested for all other drivers. This would improve overall traffic flow and travel time for all users of the I-80 corridor, not just the HOT lane users (46%).

# Executive Summary: Potential Concerns

GODBE RESEARCH
Gain Insight

- On the other hand, tested potential concerns of the HOT lanes concept made between 32 to 52 percent of the residents surveyed more likely to oppose the concept. The following concerns particularly resonated with the respondents:
  - If you have a FasTrak device, but want to use the carpool lane without paying because you have a passenger with you, you would have to remove the device from your windshield, or cover it to avoid being charged the toll (52% more likely to oppose the HOT lanes concept);
  - People cut in and out of carpool lanes. It will be too hard to enforce the toll lane against cheaters (44% more likely to oppose the HOT lanes concept);
  - The HOT lane creates a two-class system that discriminates against people who can't afford to pay a toll. This is a lane for the rich (43%);
  - The whole point of having a carpool lane is to discourage driving alone and reduce the number of cars during peak traffic times. HOT lanes encourage solo driving, and would increase, not decrease, traffic (43%); and
  - If the goal is to reduce traffic, the government should build another regular lane, not convert a carpool lane funded by taxpayers into a toll lane to benefit those who want to pay for their convenience (43%).

# Executive Summary: Other Implications for Public Outreach

GODBE RESEARCH
Gain Insight

- Analysis of responses to the sequence of HOT lanes support questions shows that:
  - Some 24 percent are strong supporters of the concept, while 36 percent represents the strong opposition group. These two groups expressed firm opinions about the HOT lanes concept, and would unlikely change their minds.
  - For the 40 percent potential supporters, they are inclined to support HOT lanes. Concerted efforts to educate them further about the concept and its benefits would be important to solidify their support.
- Survey revealed the following top priorities for using the toll revenue from HOT lanes, beyond paying for the tolling operations:
  - Other physical freeway improvements (42%)
    - Especially to those perceiving I-80 to be less crowded than in the last few years
  - Capital costs of adding the lane to the freeway (25%)
    - Especially to those ages 35 to 44 (vs. those 65 and older)
  - Public transit (24%)
- "HOT lane" and "Carpool and FasTrak lane" were the top names that 24 percent of the respondents each thought best capture and communicate the concept of toll lane.
  - With just minutes of talking about the concept as "HOT lane" in the survey, this label registered as strongly as "FasTrak," a well recognized name.

# Appendix D
## I-80 Corridor Traffic Forecasts

## I-80 HOT LANES - TRANSPORTATION ANALYSIS DATA NEEDS
## Segment 1 (I-5 to Steelhead Creek)

**Westbound AM** — **Critical Segment: Northgate Boulevard to Truxel Road**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 |
| No. of HOV Lanes Per Direction | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Peak Hour HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 1,000 | 1,090 | 1,180 | 1,280 |
| Peak Period HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 2,710 | 2,960 | 3,230 | 3,290 |
| Daily HOV Lane Volume | n/a | n/a | n/a | 12,670 | 14,130 | 15,680 | 20,560 |
| Peak Hour GP Lane Volume in Peak Direction | 6,010 | 6,230 | 6,450 | 5,670 | 5,810 | 5,930 | 6,060 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **6,010** | **6,230** | **6,450** | **5,670** | **5,810** | **5,930** | **6,060** |
| Peak Period GP Lane Volume in Peak Direction | 15,970 | 16,660 | 17,360 | 15,340 | 15,780 | 16,210 | 16,840 |
| Daily GP Lane Volume | 69,720 | 74,640 | 79,550 | 71,800 | 75,250 | 78,620 | 78,650 |
| **HOV Lane Peak Hour Percentage** | **-** | **-** | **-** | **15.0%** | **15.8%** | **16.6%** | **17.4%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.78** | **0.81** | **0.84** | **0.74** | **0.75** | **0.77** | **0.79** |
| **Peak Hour Total Lane Volume in Peak Direction** | **6,010** | **6,230** | **6,450** | **6,670** | **6,900** | **7,110** | **7,340** |
| **Peak Period Total Lane Volume in Peak Direction** | **6,010** | **6,230** | **6,450** | **8,380** | **8,770** | **9,160** | **9,350** |
| **Daily Total Lane Volume** | **15,970** | **16,660** | **17,360** | **28,010** | **29,910** | **31,890** | **37,400** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 6 | 10 | 10 | 10 | 10 | 10 | 10 |
| Peak Period Public Transportation Vehicles in Peak Direction | 13 | 25 | 25 | 25 | 25 | 25 | 25 |
| Daily Public Transportation Vehicles | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.4% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.3% | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% |

**Eastbound PM** — **Critical Segment: Northgate Boulevard to Steelhead Creek**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 |
| No. of HOV Lanes Per Direction | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 3 | 3 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Peak Hour HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 970 | 1,050 | 1,130 | 1,220 |
| Peak Period HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 2,810 | 3,060 | 3,310 | 3,490 |
| Daily HOV Lane Volume | n/a | n/a | n/a | 12,570 | 13,900 | 15,300 | 20,920 |
| Peak Hour GP Lane Volume in Peak Direction | 6,290 | 6,500 | 6,710 | 5,950 | 6,080 | 6,210 | 6,330 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **6,290** | **6,500** | **6,710** | **5,950** | **6,080** | **6,210** | **6,330** |
| Peak Period GP Lane Volume in Peak Direction | 18,100 | 18,770 | 19,440 | 17,290 | 17,720 | 18,130 | 18,620 |
| Daily GP Lane Volume | 75,840 | 80,490 | 85,150 | 77,230 | 80,550 | 83,810 | 82,840 |
| **HOV Lane Peak Hour Percentage** | **-** | **-** | **-** | **14.0%** | **14.7%** | **15.4%** | **16.2%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.95** | **0.98** | **0.87** | **0.77** | **0.79** | **0.81** | **0.82** |
| **Peak Hour Total Lane Volume in Peak Direction** | **6,290** | **6,500** | **6,710** | **6,920** | **7,130** | **7,340** | **7,550** |
| **Peak Period Total Lane Volume in Peak Direction** | **6,290** | **6,500** | **6,710** | **8,760** | **9,140** | **9,520** | **9,820** |
| **Daily Total Lane Volume** | **18,100** | **18,770** | **19,440** | **29,860** | **31,620** | **33,430** | **39,540** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 4 | 10 | 10 | 10 | 10 | 10 | 10 |
| Peak Period Public Transportation Vehicles in Peak Direction | 16 | 25 | 25 | 25 | 25 | 25 | 25 |
| Daily Public Transportation Vehicles | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.3% | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% |

Notes:

- Input Required from Caltrans/SACOG
- Optional Input Required from Caltrans/SACOG
- Calculated values used for reasonableness checks

Red indicates a assumed value for 2005 conditions

Sources:

2005 - I-80 Across the Top Traffic Report 12/22/06, Figure 2B (2005 Count at Northgate-Truxel), Pk Period & Daily SACSIM 2005
2035 - SACSIM 2035

## I-80 HOT LANES - TRANSPORTATION ANALYSIS DATA NEEDS
## Segment 2 (Steelhead Creek to Capital City Fwy)

**Westbound AM** — **Critical Segment: Raley Boulevard to Norwood Avenue**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 |
| No. of HOV Lanes Per Direction | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Peak Hour HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 810 | 870 | 920 | 980 |
| Peak Period HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 2,210 | 2,370 | 2,530 | 2,520 |
| Daily HOV Lane Volume | n/a | n/a | n/a | 10,030 | 10,990 | 12,000 | 20,650 |
| Peak Hour GP Lane Volume in Peak Direction | 6,290 | 6,450 | 6,600 | 5,950 | 6,050 | 6,150 | 6,250 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **6,290** | **6,450** | **6,600** | **5,950** | **6,050** | **6,150** | **6,250** |
| Peak Period GP Lane Volume in Peak Direction | 16,990 | 17,470 | 17,950 | 16,220 | 16,550 | 16,870 | 17,360 |
| Daily GP Lane Volume | 70,920 | 75,140 | 79,360 | 73,550 | 76,800 | 80,020 | 75,580 |
| **HOV Lane Peak Hour Percentage** | **-** | **-** | **-** | **12.0%** | **12.6%** | **13.0%** | **13.6%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.95** | **0.98** | **1.00** | **0.90** | **0.92** | **0.93** | **0.95** |
| **Peak Hour Total Lane Volume in Peak Direction** | **6,290** | **6,450** | **6,600** | **6,760** | **6,920** | **7,070** | **7,230** |
| **Peak Period Total Lane Volume in Peak Direction** | **6,290** | **6,450** | **6,600** | **8,160** | **8,420** | **8,680** | **8,770** |
| **Daily Total Lane Volume** | **16,990** | **17,470** | **17,950** | **26,250** | **27,540** | **28,870** | **38,010** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 6 | 15 | 15 | 15 | 15 | 15 | 15 |
| Peak Period Public Transportation Vehicles in Peak Direction | 13 | 35 | 35 | 35 | 35 | 35 | 35 |
| Daily Public Transportation Vehicles | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.4% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.3% | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% |

**Eastbound PM** — **Critical Segment: Winters Street to Longview Drive**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 |
| No. of HOV Lanes Per Direction | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Peak Hour HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 1,010 | 1,110 | 1,210 | 1,310 |
| Peak Period HOV Lane Volume in Peak Direction | n/a | n/a | n/a | 2,920 | 3,210 | 3,520 | 3,750 |
| Daily HOV Lane Volume | n/a | n/a | n/a | 12,600 | 14,040 | 15,560 | 21,500 |
| Peak Hour GP Lane Volume in Peak Direction | 6,590 | 6,810 | 7,020 | 6,230 | 6,350 | 6,470 | 6,580 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **6,590** | **6,810** | **7,020** | **6,230** | **6,350** | **6,470** | **6,580** |
| Peak Period GP Lane Volume in Peak Direction | 18,620 | 19,370 | 20,110 | 17,940 | 18,390 | 18,830 | 19,340 |
| Daily GP Lane Volume | 76,620 | 81,070 | 85,520 | 77,370 | 80,380 | 83,310 | 81,820 |
| **HOV Lane Peak Hour Percentage** | **-** | **-** | **-** | **14.0%** | **14.9%** | **15.8%** | **16.6%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.86** | **0.88** | **0.91** | **0.81** | **0.82** | **0.84** | **0.85** |
| **Peak Hour Total Lane Volume in Peak Direction** | **6,590** | **6,810** | **7,020** | **7,240** | **7,460** | **7,680** | **7,890** |
| **Peak Period Total Lane Volume in Peak Direction** | **6,590** | **6,810** | **7,020** | **9,150** | **9,560** | **9,990** | **10,330** |
| **Daily Total Lane Volume** | **18,620** | **19,370** | **20,110** | **30,540** | **32,430** | **34,390** | **40,840** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 4 | 15 | 15 | 15 | 15 | 15 | 15 |
| Peak Period Public Transportation Vehicles in Peak Direction | 16 | 35 | 35 | 35 | 35 | 35 | 35 |
| Daily Public Transportation Vehicles | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.3% | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% |

Notes:
- Input Required from Caltrans/SACOG
- Optional Input Required from Caltrans/SACOG
- Calculated values used for reasonableness checks

Red indicates a assumed value for 2005 conditions

Sources:
2005 - I-80 Across the Top Traffic Report 12/22/06, Figure 2B (2005 Count at Northgate-Truxel), Peak Period & Daily SACSIM 2005
2035 - SACSIM 2035

## I-80 HOT LANES - TRANSPORTATION ANALYSIS DATA NEEDS
## Segment 3 (Capital City Fwy to Madison Avenue)

### Westbound AM

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| No. of HOV Lanes Per Direction | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Peak Hour HOV Lane Volume in Peak Direction | 390 | 470 | 540 | 620 | 700 | 770 | 850 |
| Peak Period HOV Lane Volume in Peak Direction | 1,040 | 1,230 | 1,420 | 1,610 | 1,790 | 1,980 | 2,170 |
| Daily HOV Lane Volume | 10,540 | 11,650 | 12,750 | 13,860 | 14,960 | 16,070 | 17,170 |
| Peak Hour GP Lane Volume in Peak Direction | 11,360 | 11,340 | 11,320 | 11,300 | 11,270 | 11,250 | 11,230 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **11,000** | **11,000** | **11,000** | **11,000** | **11,000** | **11,000** | **11,000** |
| Peak Period GP Lane Volume in Peak Direction | 29,890 | 30,110 | 30,320 | 30,540 | 30,760 | 30,970 | 31,190 |
| Daily GP Lane Volume | 120,710 | 123,230 | 125,760 | 128,280 | 130,800 | 133,330 | 135,850 |
| **HOV Lane Peak Hour Percentage** | **3.3%** | **4.0%** | **4.6%** | **5.2%** | **5.8%** | **6.4%** | **7.0%** |
| **GP Peak Hour V/C (2200 vphpl)** | **1.03** | **1.03** | **1.03** | **1.03** | **1.02** | **1.02** | **1.02** |
| **Peak Hour Total Lane Volume in Peak Direction** | **11,750** | **11,810** | **11,860** | **11,920** | **11,970** | **12,020** | **12,080** |
| **Peak Period Total Lane Volume in Peak Direction** | **12,040** | **12,230** | **12,420** | **12,610** | **12,790** | **12,980** | **13,170** |
| **Daily Total Lane Volume** | **40,430** | **41,760** | **43,070** | **44,400** | **45,720** | **47,040** | **48,360** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Peak Period Public Transportation Vehicles in Peak Direction | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Daily Public Transportation Vehicles | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 1.0% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% |

### Eastbound PM

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| No. of HOV Lanes Per Direction | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 |
| Peak Hour HOV Lane Volume in Peak Direction | 470 | 550 | 620 | 700 | 780 | 850 | 930 |
| Peak Period HOV Lane Volume in Peak Direction | 1,350 | 1,570 | 1,780 | 2,000 | 2,220 | 2,430 | 2,650 |
| Daily HOV Lane Volume | 10,940 | 11,790 | 12,640 | 13,490 | 14,330 | 15,180 | 16,030 |
| Peak Hour GP Lane Volume in Peak Direction | 10,530 | 10,670 | 10,810 | 10,950 | 11,080 | 11,220 | 11,360 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **10,530** | **10,670** | **10,810** | **10,950** | **11,080** | **11,220** | **11,360** |
| Peak Period GP Lane Volume in Peak Direction | 30,080 | 30,640 | 31,190 | 31,750 | 32,310 | 32,860 | 33,420 |
| Daily GP Lane Volume | 119,600 | 122,980 | 126,360 | 129,750 | 133,130 | 136,510 | 139,890 |
| **HOV Lane Peak Hour Percentage** | **4.3%** | **4.9%** | **5.4%** | **6.0%** | **6.6%** | **7.0%** | **7.6%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.87** | **0.88** | **0.89** | **0.90** | **0.92** | **0.93** | **0.94** |
| **Peak Hour Total Lane Volume in Peak Direction** | **11,000** | **11,220** | **11,430** | **11,650** | **11,860** | **12,070** | **12,290** |
| **Peak Period Total Lane Volume in Peak Direction** | **11,880** | **12,240** | **12,590** | **12,950** | **13,300** | **13,650** | **14,010** |
| **Daily Total Lane Volume** | **41,020** | **42,430** | **43,830** | **45,240** | **46,640** | **48,040** | **49,450** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Peak Period Public Transportation Vehicles in Peak Direction | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Daily Public Transportation Vehicles | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.9% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.3% | 0.3% | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% |

Notes:
- Input Required from Caltrans/SACOG
- Optional Input Required from Caltrans/SACOG
- Calculated values used for reasonableness checks

Red indicates a assumed value for 2005 conditions

Sources:
2005 - SACSIM 2005
2035 - SACSIM 2035

## I-80 HOT LANES - TRANSPORTATION ANALYSIS DATA NEEDS
## Segment 4 (Madison Avenue to Greenback Lane)

**Westbound AM**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| No. of HOV Lanes Per Direction | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Peak Hour HOV Lane Volume in Peak Direction | 820 | 1,050 | 1,080 | 1,110 | 1,130 | 1,160 | 1,190 |
| Peak Period HOV Lane Volume in Peak Direction | 2,650 | 2,390 | 2,783 | 2,850 | 2,917 | 2,983 | 3,050 |
| Daily HOV Lane Volume | 19,220 | 19,710 | 20,190 | 20,680 | 21,160 | 21,650 | 22,130 |
| Peak Hour GP Lane Volume in Peak Direction | 8,190 | 7,650 | 8,570 | 8,770 | 8,960 | 9,150 | 9,340 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **8,190** | **7,650** | **8,570** | **8,770** | **8,800** | **8,800** | **8,800** |
| Peak Period GP Lane Volume in Peak Direction | 20,310 | 19,330 | 22,190 | 23,130 | 24,070 | 25,010 | 25,950 |
| Daily GP Lane Volume | 93,730 | 95,480 | 97,240 | 98,990 | 100,740 | 102,500 | 104,250 |
| **HOV Lane Peak Hour Percentage** | **9.1%** | **12.1%** | **11.2%** | **11.2%** | **11.2%** | **11.3%** | **11.3%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.93** | **0.87** | **0.97** | **1.00** | **1.02** | **1.04** | **1.06** |
| **Peak Hour Total Lane Volume in Peak Direction** | **9,010** | **8,700** | **9,650** | **9,880** | **10,090** | **10,310** | **10,530** |
| **Peak Period Total Lane Volume in Peak Direction** | **10,840** | **10,040** | **11,353** | **11,620** | **11,717** | **11,783** | **11,850** |
| **Daily Total Lane Volume** | **39,530** | **39,040** | **42,380** | **43,810** | **45,230** | **46,660** | **48,080** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 9 | 18 | 30 | 30 | 30 | 30 | 30 |
| Peak Period Public Transportation Vehicles in Peak Direction | 18 | 34 | 65 | 65 | 65 | 65 | 65 |
| Daily Public Transportation Vehicles | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 1.0% | 1.0% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% |

**Eastbound PM**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| No. of HOV Lanes Per Direction | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Peak Hour HOV Lane Volume in Peak Direction | 720 | 790 | 1,000 | 1,140 | 1,280 | 1,420 | 1,560 |
| Peak Period HOV Lane Volume in Peak Direction | 1,860 | 2,170 | 2,720 | 3,160 | 3,590 | 4,020 | 4,450 |
| Daily HOV Lane Volume | 18,770 | 19,390 | 20,010 | 20,640 | 21,260 | 21,880 | 22,500 |
| Peak Hour GP Lane Volume in Peak Direction | 8,670 | 7,900 | 8,720 | 8,740 | 8,760 | 8,790 | 8,810 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **8,670** | **7,900** | **8,720** | **8,740** | **8,760** | **8,790** | **8,810** |
| Peak Period GP Lane Volume in Peak Direction | 24,580 | 23,440 | 25,030 | 25,250 | 25,470 | 25,700 | 25,920 |
| Daily GP Lane Volume | 96,530 | 97,850 | 99,160 | 100,480 | 101,790 | 103,110 | 104,420 |
| **HOV Lane Peak Hour Percentage** | **7.7%** | **9.1%** | **10.3%** | **11.5%** | **12.7%** | **13.9%** | **15.0%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.88** | **0.80** | **0.88** | **0.88** | **0.88** | **0.89** | **0.89** |
| **Peak Hour Total Lane Volume in Peak Direction** | **9,390** | **8,690** | **9,720** | **9,880** | **10,040** | **10,210** | **10,370** |
| **Peak Period Total Lane Volume in Peak Direction** | **10,530** | **10,070** | **11,440** | **11,900** | **12,350** | **12,810** | **13,260** |
| **Daily Total Lane Volume** | **43,350** | **42,830** | **45,040** | **45,890** | **46,730** | **47,580** | **48,420** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 15 | 25 | 30 | 30 | 30 | 30 | 30 |
| Peak Period Public Transportation Vehicles in Peak Direction | 40 | 54 | 65 | 65 | 65 | 65 | 65 |
| Daily Public Transportation Vehicles | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.9% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.3% | 0.2% | 0.3% | 0.4% | 0.5% | 0.5% | 0.6% |

Notes:

Input Required from Caltrans/SACOG

Optional Input Required from Caltrans/SACOG

Calculated values used for reasonableness checks

Red indicates a assumed value for 2005 conditions

Sources:

2005 - 2006 HOV Counts at Foothill Farms POC, Daily SACSIM 2005

2010 - 2008 HOV Counts at Foothill Farms POC

2035 - SACSIM 2035

## I-80 HOT LANES - TRANSPORTATION ANALYSIS DATA NEEDS
## Segment 5 (Greenback Lane to Riverside Avenue)

**Westbound AM** — **Critical Segment: Antelope Road to Greenback Lane**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 |
| No. of HOV Lanes Per Direction | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Peak Hour HOV Lane Volume in Peak Direction | 710 | 760 | 810 | 860 | 910 | 960 | 1,010 |
| Peak Period HOV Lane Volume in Peak Direction | 1,870 | 1,990 | 2,110 | 2,230 | 2,350 | 2,470 | 2,590 |
| Daily HOV Lane Volume | 18,920 | 19,350 | 19,790 | 20,220 | 20,650 | 21,090 | 21,520 |
| Peak Hour GP Lane Volume in Peak Direction | 8,840 | 8,800 | 8,750 | 8,710 | 8,670 | 8,620 | 8,580 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **8,800** | **8,800** | **8,750** | **8,710** | **8,670** | **8,620** | **8,580** |
| Peak Period GP Lane Volume in Peak Direction | 23,250 | 23,350 | 23,450 | 23,550 | 23,640 | 23,740 | 23,840 |
| Daily GP Lane Volume | 85,460 | 87,720 | 89,980 | 92,240 | 94,490 | 96,750 | 99,010 |
| **HOV Lane Peak Hour Percentage** | **7.4%** | **7.9%** | **8.5%** | **9.0%** | **9.5%** | **10.0%** | **10.5%** |
| **GP Peak Hour V/C (2200 vphpl)** | **1.00** | **1.00** | **0.99** | **0.99** | **0.99** | **0.98** | **0.98** |
| **Peak Hour Total Lane Volume in Peak Direction** | **9,550** | **9,560** | **9,560** | **9,570** | **9,580** | **9,580** | **9,590** |
| **Peak Period Total Lane Volume in Peak Direction** | **10,670** | **10,790** | **10,860** | **10,940** | **11,020** | **11,090** | **11,170** |
| **Daily Total Lane Volume** | **42,170** | **42,700** | **43,240** | **43,770** | **44,290** | **44,830** | **45,360** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Peak Period Public Transportation Vehicles in Peak Direction | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Daily Public Transportation Vehicles | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% |

**Eastbound PM** — **Critical Segment: Greenback Lane to Antelope Road**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 |
| No. of HOV Lanes Per Direction | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Peak Hour HOV Lane Volume in Peak Direction | 980 | 1,050 | 1,110 | 1,180 | 1,250 | 1,310 | 1,380 |
| Peak Period HOV Lane Volume in Peak Direction | 2,800 | 2,990 | 3,180 | 3,370 | 3,550 | 3,740 | 3,930 |
| Daily HOV Lane Volume | 17,440 | 17,890 | 18,350 | 18,800 | 19,250 | 19,710 | 20,160 |
| Peak Hour GP Lane Volume in Peak Direction | 8,240 | 8,250 | 8,250 | 8,260 | 8,260 | 8,270 | 8,270 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **8,240** | **8,250** | **8,250** | **8,260** | **8,260** | **8,270** | **8,270** |
| Peak Period GP Lane Volume in Peak Direction | 23,537 | 23,670 | 23,800 | 23,930 | 24,060 | 24,190 | 24,320 |
| Daily GP Lane Volume | 88,033 | 90,160 | 92,290 | 94,420 | 96,540 | 98,670 | 100,800 |
| **HOV Lane Peak Hour Percentage** | **10.6%** | **11.3%** | **11.9%** | **12.5%** | **13.1%** | **13.7%** | **14.3%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.94** | **0.94** | **0.94** | **0.94** | **0.94** | **0.94** | **0.94** |
| **Peak Hour Total Lane Volume in Peak Direction** | **9,220** | **9,300** | **9,360** | **9,440** | **9,510** | **9,580** | **9,650** |
| **Peak Period Total Lane Volume in Peak Direction** | **11,040** | **11,240** | **11,430** | **11,630** | **11,810** | **12,010** | **12,200** |
| **Daily Total Lane Volume** | **40,977** | **41,560** | **42,150** | **42,730** | **43,310** | **43,900** | **44,480** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Peak Period Public Transportation Vehicles in Peak Direction | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Daily Public Transportation Vehicles | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% |

Notes:
- Input Required from Caltrans/SACOG
- Optional Input Required from Caltrans/SACOG
- Calculated values used for reasonableness checks

Red indicates a assumed value for 2005 conditions

Sources:
2005 - SACSIM 2005
2035 - SACSIM 2035

## I-80 HOT LANES - TRANSPORTATION ANALYSIS DATA NEEDS
## Segment 6 (Riverside Avenue to SR 65)

**Westbound AM** — **Critical Segment: Douglas Boulevard to Riverside Avenue**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| No. of HOV Lanes Per Direction | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Peak Hour HOV Lane Volume in Peak Direction | n/a | n/a | 650 | 680 | 710 | 740 | 770 |
| Peak Period HOV Lane Volume in Peak Direction | n/a | n/a | 1,710 | 1,810 | 1,910 | 2,010 | 1,980 |
| Daily HOV Lane Volume | n/a | n/a | 8,310 | 8,840 | 9,390 | 9,950 | 20,270 |
| Peak Hour GP Lane Volume in Peak Direction | 7,840 | 7,970 | 7,450 | 7,540 | 7,640 | 7,730 | 7,830 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **6,600** | **6,600** | **6,600** | **6,600** | **6,600** | **6,600** | **6,600** |
| Peak Period GP Lane Volume in Peak Direction | 20,110 | 20,710 | 19,610 | 20,110 | 20,610 | 21,100 | 21,740 |
| Daily GP Lane Volume | 96,960 | 100,400 | 95,530 | 98,440 | 101,330 | 104,210 | 97,330 |
| **HOV Lane Peak Hour Percentage** | **-** | **-** | **8.0%** | **8.3%** | **8.5%** | **8.7%** | **9.0%** |
| **GP Peak Hour V/C (2200 vphpl)** | **1.19** | **1.21** | **1.13** | **1.14** | **1.16** | **1.17** | **1.19** |
| **Peak Hour Total Lane Volume in Peak Direction** | **7,840** | **7,970** | **8,100** | **8,220** | **8,350** | **8,470** | **8,600** |
| **Peak Period Total Lane Volume in Peak Direction** | **6,600** | **6,600** | **8,310** | **8,410** | **8,510** | **8,610** | **8,580** |
| **Daily Total Lane Volume** | **20,110** | **20,710** | **27,920** | **28,950** | **30,000** | **31,050** | **42,010** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Peak Period Public Transportation Vehicles in Peak Direction | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Daily Public Transportation Vehicles | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% |

**Eastbound PM** — **Critical Segment: Taylor Road to SR 65**

| Data Category | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| Route Miles | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| No. of HOV Lanes Per Direction | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| No. of General Purpose (GP) Lanes per Direction | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Peak Hour HOV Lane Volume in Peak Direction | n/a | n/a | 520 | 560 | 600 | 640 | 680 |
| Peak Period HOV Lane Volume in Peak Direction | n/a | n/a | 1,770 | 1,830 | 1,880 | 1,940 | 1,950 |
| Daily HOV Lane Volume | n/a | n/a | 6,590 | 7,180 | 7,790 | 8,430 | 17,140 |
| Peak Hour GP Lane Volume in Peak Direction | 6,740 | 7,000 | 6,740 | 6,960 | 7,190 | 7,410 | 7,630 |
| **Peak Hour GP Lane Volume in Peak Direction (Constrained)** | **6,740** | **7,000** | **6,740** | **6,960** | **7,190** | **7,410** | **7,630** |
| Peak Period GP Lane Volume in Peak Direction | 24,670 | 24,620 | 22,800 | 22,700 | 22,590 | 22,490 | 22,430 |
| Daily GP Lane Volume | 81,680 | 86,590 | 84,910 | 89,230 | 93,530 | 97,800 | 94,000 |
| **HOV Lane Peak Hour Percentage** | **-** | **-** | **7.2%** | **7.4%** | **7.7%** | **8.0%** | **8.2%** |
| **GP Peak Hour V/C (2200 vphpl)** | **0.88** | **0.91** | **0.88** | **0.90** | **0.93** | **0.96** | **0.99** |
| **Peak Hour Total Lane Volume in Peak Direction** | **6,740** | **7,000** | **7,260** | **7,520** | **7,790** | **8,050** | **8,310** |
| **Peak Period Total Lane Volume in Peak Direction** | **6,740** | **7,000** | **8,510** | **8,790** | **9,070** | **9,350** | **9,580** |
| **Daily Total Lane Volume** | **24,670** | **24,620** | **29,390** | **29,880** | **30,380** | **30,920** | **39,570** |
| Peak Hour Public Transportation Vehicles in Peak Direction | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Peak Period Public Transportation Vehicles in Peak Direction | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Daily Public Transportation Vehicles | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Peak Hour Percentage of Motorcycles in Peak Direction | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% |
| Peak Hour Percent of Taxis in Peak Direction | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Peak Hour Percent of Low Emission Vehicles in Peak Direction | 0.4% | 0.4% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% |

Notes:
- Input Required from Caltrans/SACOG
- Optional Input Required from Caltrans/SACOG
- Calculated values used for reasonableness checks

Red indicates a assumed value for 2005 conditions

Sources:
2005 - AM: SACSIM 2005, PM: I-80/Eureka Rd IC (May 2007) & Daily SACSIM 2005
2035 - SACSIM 2035