MTI Report 01-11

Norman Y. Mineta
International Institute for
Surface Transportation Policy Studies
Created by Congress in 1991

Non-Pricing Methods to Optimize High Occupancy Vehicle Lane Usage

Mineta Transportation Institute
San José State University
San Jose, CA 95192-0219

MTI Report 01- 11

Non-Pricing Methods to Optimize High Occupancy Vehicle Lane Usage

George E. Gray, Principal Investigator
Stuart Harvey, Research Associate
Norman Kelley, Research Associate

September 2001

a publication of the
Mineta Transportation Institute
College of Business
San José State University
San Jose, CA 95192 - 0219
Created by Congress in 1991

Technical Report Documentation Page

1. Report No. FHJWA/CA/OR-2001/21	2. Government Accession No.	3. Recipients Catalog No.	
4. Title and Subtitle Non-Pricing Methods to Optimize High Occupancy Vehicle Lane Usage		5. Report Date September 2001	
		6. Performing Organization Code	
7. Authors George E. Gray, Stuart Harvey, Norman Kelley		8. Performing Organization Report No. 01-11	
9. Performing Organization Name and Address Norman Y. Mineta International Institute for Surface Transportation Policy Studies College of Business, San José State University San Jose, CA 95129-0219		10. Work Unit No.	
		11. Contract or Grant No. 65W136	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Research and Special Programs Administration 400 7th Street, SW Washington, D.C. 20590-0001 California Department of Transportation Office of Research MS42 P.O. Box 942873 Sacramento, CA 94273-0001		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	

15. Supplementary Notes
This research project was financially sponsored by the U.S. Department of Transportation's Research and Special Programs Administration (U.S. DOT RSPA) and by the California Department of Transportation (Caltrans)

16. Abstract: The Mineta Transportation Institute) at San José State University conducted this study to review the issues and implications involved in the project in question. Twenty-four potential HOV facility user groups were identified. Through a ranking process, seven of these groups were selected for further study in phase one. The project team made the following preliminary conclusions as to the suitability of each group to use HOV facilities and recommended whether each group should be included in the phase two study to refine these findings and develop implementation strategies.

1. As the result of 1998 legislation, which includes sunset provisions, electric vehicles and other ILEVs, ULEVs, and SULEVs have recently been included in users of HOV facilities. This legislation should be reviewed in phase two to determine if the sunset provisions should be extended.
2. The identified negatives for including light delivery trucks outweigh any identified positives. Unless new evidence surfaces, this group should be dropped from the study.
3. Radio dispatched vehicles are strong candidates, inclusion should result in improved public transportation services. Phase two study of possible enabling legislation should consider sunset provisions to encourage future fleet conversion to vehicles using alternative fuels.
4. Inclusion of EPA certified high mileage vehicles and vehicles using alternative fuels could encourage use of these vehicles with beneficial impacts on air quality and fuel consumption. Possible significant problems of capacity, identification of users, and police monitoring and enforcement should be studied in phase two.
5. Deadheading transit and charter buses appear to be worthy candidates and should be studied further. School buses, because of inherent problems, should not be considered unless significant warrants surface.
6. There does not appear to be any advantage in including light service trucks (utility, maintenance, etc.).
7. There is no compelling reason to change existing conditions regarding enforcement and emergency vehicles..

17. Key Words high occupancy vehicle lanes, utilization, single occupant vehicles, highway capacity, policy, feasibility, public opinion, urban highways, literature surveys	18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified	20. Security Classifi (of this page) Unclassified	21. No. of Pages 72	22. Price $15.00

Form DOT F 1700.7 (8-72)

Library of Congress No. 2001094830

To order this publication, please contact the following:

Mineta Transportation Institute
College of Business, BT550
San José State University
San Jose, CA 95192-0219
Tel (408) 924-7560
Fax (408) 924-7565
E-mail: mti@mti.sjsu.edu
http://transweb.sjsu.edu

ACKNOWLEDGEMENTS

The study team wishes to thank the many people who contributed to the study for their substantial assistance. This phase one report was limited in time and funds, but engendered a high level of interest among those involved.

The participation of the following organizations was particularly significant.

· California Department of Transportation (Caltrans) Headquarters and Districts 4, 7, 8, 11, and 12
· San Diego Association of Governments (SANDAG)
· Metropolitan Transit Development Board (MTDB)
· MTDB Taxicab Committee
· California Highway Patrol (CHP)
· California Air Resources Board (CARB)
· California Energy Commission (CEC)
· Taxi and Paratransit Association of California
· Valley Transportation Authority (Santa Clara County)
· Alameda-Contra Costa Transit District
· Golden State Transportation
· Laidlaw Transit Services
· San Mateo County Transit District
· Diversified Paratransit, Inc.
· United Parcel Service (UPS)
· Urban Systems Associates

We would also like to thank the Mineta Transportation Institute staff including Research Director Trixie Johnson, Research Publications Assistant Sonya Cardenas, Graphic Designer Ben Corrales, Student Editorial Associate Catherine Frazier, Editorial Associates Joan Pearson, Susan Sylvia and Jeanne Dittmat for editing and publishing assistance.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This study was undertaken as a potential two-phase effort to examine the feasibility of broadening the pool of HOV users on a no-cost basis for high occupancy vehicle (HOV) facilities where such inclusion would not create a capacity problem.

HOV preferential facilities have been steadily increasing in the United States since their introduction in the late 1960s. There is often unused capacity in various HOV installations. In many instances this occurs at the same time that there is congestion in the adjacent mixed-flow freeway lanes. This situation often leads to pressure to abandon the HOV facility. Such pressure is usually based on lack of information or understanding of the intents and purposes of the HOV program. One recent strategy to use this available early excess capacity is to develop congestion pricing projects by allowing single-occupant vehicles (SOV) access for a variable fee. This may not be the best use of such excess capacity. This phase one study is to identify various potential non-pricing methods to optimize use of HOV facilities. The intent, on completion of this phase, is to refine the study findings and develop implementation strategies in phase two.

Some of the present HOV lanes are heavily used and have little or no excess capacity during peak traffic hours. However, in many cases there is, at present, excess capacity even during peak traffic hours. Nonetheless, over time, it is expected that use will increase, especially as the economies of car-and vanpooling are recognized by the commuting public.

The first study task was to produce a bibliography of current literature. The subsequent tasks focus on the two major justifications for HOV lane—to improve air quality and reduce fuel consumption-although, other factors are identified and given consideration. A large variety of potential non-pricing user groups are identified, evaluated, and consolidated using the following attributes: air quality, fuel savings, enforcement, safety, system efficiency, cost effectiveness, and capacity, with capacity treated as a potential fatal flaw.

The original potential identified user groups were reduced to seven candidates, which were further appraised considering input from a variety of external sources. Based on the outreach finding and the previously cited criteria, the following conclusions and recommendations are presented.

1. ELECTRIC VEHICLES AND OTHER LOW EMISSION VEHICLES

Conclusion

These vehicles have recently been included in those authorized to use HOV facilities as the result of 1998 legislation, which includes sunset provisions.

Recommendation

The phase two study should review this recent legislation and possibly recommend that the present sunset provisions be extended.

2. LIGHT DELIVERY TRUCKS

Conclusion

After preliminary review, the identified negatives for including this group of users appears to outweigh any identified positives.

Recommendation

Unless new evidence surfaces during the phase two study, this group should not be considered further.

3. RADIO DISPATCHED PASSENGER VEHICLES

Conclusion

This candidate group is a strong candidate for inclusion in the HOV program as an SOV. The resulting improved service of these vehicles should result in improved public transportation services and the magnitude of added HOV users would be minor.

Recommendation

This candidate group should be included in the phase two study. Proposed legislation, if any, should consider sunset provisions that could encourage future fleet conversion to vehicles using alternative fuels in order to retain their ability to continue to qualify to use HOV facilities.

4. EPA CERTIFIED HIGH MILEAGE VEHICLES AND VEHICLES USING ALTERNATIVE FUELS

Conclusions

Inclusion of this group of potential users could encourage use of these vehicles, which would have beneficial impacts on air quality and fuel consumption. However, inclusion must be closely monitored to ensure that HOV facilities remain free flowing. Identification of users and adequate police monitoring and enforcement may be significant problems.

Recommendation

Include this group in phase two study.

5. DEADHEADING TRANSIT, SCHOOL, AND CHARTER BUSES

Conclusions

Conclusions for these three groups varied. Transit and charter buses appear to be worthy candidates, but there are problems with including school buses that appear to warrant their rejection.

Recommendations

Include transit and charter buses in the subsequent study, but only give further consideration to school buses if added significant warrants are evidenced.

6. LIGHT SERVICE TRUCKS (UTILITY, MAINTENANCE, ETC.)

Conclusion

There does not appear to be any advantages to including this group.

Recommendation

Do not include this group in phase two study.

7. ENFORCEMENT AND EMERGENCY VEHICLES

Conclusion

There is no compelling reason to change existing conditions regarding the group's use of HOV facilities in the SOV mode.

Recommendation

Do not include this group in the phase two study.

1. STUDY ORIGINS

INTRODUCTION

The California Department of Transportation (Caltrans) requested that the Mineta Transportation Institute examine the feasibility of non-pricing strategies to utilize unused capacity of high occupancy vehicle (HOV) lanes. Subsequently, this effort was funded by Caltrans and the U.S. Department of Transportation, Research and Special Programs Administration (U.S. DOT–RSPA). The funded study is a proposed phase one effort that was developed to identify various single-occupant traffic elements that may reasonably be considered for inclusion on HOV facilities that have excess capacity. If such elements are identified, it is proposed that a phase two study to fully develop a program for such inclusion would be undertaken.

BACKGROUND

HOV preferential facilities have been steadily increasing since their introduction in the late 1960s. There is, however, often unused capacity in various HOV installations. In many instances this occurs at the same time that there is congestion in the adjacent mixed-flow freeway lanes. This situation often leads to pressure to abandon the HOV facility. Such pressure is usually based on lack of information or understanding of the intents and purposes of the HOV program. One recent strategy to use this available excess capacity is to develop congestion pricing projects by allowing single-occupant vehicles (SOV) access for a variable fee. This may not be the best use of such excess capacity. This phase one study is to identify various potential non-pricing methods to optimize use of HOV facilities. The intent, on completion of this phase, is to refine the study findings and develop implementation strategies in phase two.

The rationale for establishing HOV facilities in California, as identified by Caltrans Policy and Procedure for Bus and Carpool (HOV) Lanes is

1. increase the people-moving capacity of the freeway system,
2. reduce overall vehicular congestion and motorist delay by encouraging greater HOV use,
3. provide time and commute cost savings to the users of HOV lanes,
4. increase overall efficiency of the system by allowing HOVs to bypass congestion on lanes designed for their use, and
5. improve air quality by decreasing vehicular emissions.[1]

This directive is included in this report as appendix D. It covers not only the

policy and procedures for HOV facilities, but also the authority for their establishment in California, as well as attachments from the California Transportation Commission (CTC) and Federal Highway Administration (FHWA) policies on the same subject. These latter two documents are also included in appendix D.

There are, presently, a wide variety of HOV facilities on the California state highway system. They range from ramp meter bypass lanes to the I-15 reversible-lane HOV facility in the City of San Diego, which is currently being operated as a value pricing demonstration project that allows SOVs to use the existing HOV facility for a fee. Although most of the HOV mileage in the state is part of the state highway system, there are some installations on city streets and county roads. Some of the HOV facilities on the state highway system are operated by the private sector under franchise. A few HOV facilities involve direct connections at major freeway-to-freeway interchanges. Several are totally or partially separated by barriers from the mixed-flow lanes, but most are separated by striping only. Because of this diversity, it is recognized that any efforts to increase HOV lane utilization must receive specific study for the facility involved.

Some of the present HOV lanes are heavily used and have little or no excess capacity during peak traffic hours. However, in many cases there is, at present, excess capacity even during peak traffic hours. Nonetheless, over time, it is expected that use will increase, especially as the economies of car- and vanpooling are recognized by the commuting public.

PURPOSE

This phase one study is to identify various single-occupant traffic vehicles that may reasonably be considered for inclusion on HOV facilities at no monetary cost and that have excess capacity. After a broad look at potential users, the study identifies several user groups that should be given consideration in phase two of this study for inclusion on underutilized HOV facilities.

SCOPE

The scope of the study was established by several factors, including recognition that HOV lane capacity is the major control in allowing any non-HOV use.

It is recognized that mixed-flow lanes of urban freeways can usually carry a maximum of 2,000 vehicles per hour. Assuming a generous 1.2 average

[1] California Department of Transportation. “Policy & Procedure, Bus and Carpool (HOV Lanes, (P89-01, 16 Mar 1989).

occupancy per vehicle for mixed-flow lanes gives a carrying capacity of 2,400 persons per lane. Using a conservative two persons per lane for HOV facilities that are at the minimum of two persons per vehicle equates to 1,200 vehicles per hour to match the mixed-flow lane productivity. HOV facilities with a moderate number of buses are usually designed on the basis of a minimum of 800 vehicles per hour (or about 2,000 persons per hour). It is suggested that HOV operating limits be set at 1,600 vehicles per hour given normal freeway geometrics for a 70 mph design speed. Volumes for HOV operations on lesser facilities should be lower, depending on such variables as geometrics, signal spacing, and roadside interference. This lower figure is to ensure their free flow.

For this phase one study, HOV ramp meter bypass and bus-only facilities are not given separate consideration. In general, it is recognized that HOV facilities can work to the detriment of bus exclusive services. Dr. Vukan Vuchic summarizes the potential HOV impacts as compared to exclusive bus facilities as presenting both positive and negative factors. Positive HOV facility impacts are both the reduced travel time for travelers in high occupancy autos and the decreased congestion on parallel regular lanes or roadways with some reduction of travel time for auto users in those lanes or roadways, together resulting in increased productive capacity of the entire facility.

Negative impacts from HOV facilities as compared to bus-only facilities are

- Decreased performance (reduced speed, reliability, safety) of buses due to increased traffic volume and nonuniform vehicle flow composition on the HOV facilities;
- A loss of the distinct advantage of public transport (buses) in performance and level of service, which full separation gives it over private transport (autos);
- Some diversion of passengers back to autos, particularly to vanpools and carpools, as a consequence of the preceding two factors;
- Additional loss of passengers due to their “stealing” by auto drivers from bus stops to form ad hoc carpools (direct loss of bus revenue); and
- A requirement for a wider roadway (minimum of two lanes per direction).[2]

[2] Vukan R. Vuchic, *Urban Public Transportation Systems and Technology* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1981) 260.

When considering potential user groups for entry onto HOV facilities, a number of other factors were explored, which affect the scope. These will be discussed further in this report.

METHODOLOGY

General Considerations

As pointed out, the scope of the study does not include consideration of user groups that would lead to a change in the basic principles that currently justify HOV facilities. The study team also recognized that inclusion of some groups, even though they met the general criteria, might engender a negative reaction by the general public or constitute such a volume of users as to cause the HOV facility to be of no value. The team also recognized that operating characteristics and enforcement difficulties should be given high priority in identification of potential user groups.

Study Approach

The project prospectus called for the following tasks: First, literature review, second, identify non-pricing methods, and third, phase one final report. These tasks were carried out by the study team augmented by a working group, which met three times during this phase one study. Considerable e-mail, fax, telephone, and U.S. mail communication was involved, especially in obtaining input from potential user groups.

STUDY ORGANIZATION

The study team was composed of the Mineta Transportation Institute Research Associates George Gray (team leader), Stuart Harvey, and Norman Kelley with valuable input from a panel of experts: Joel Haven, Deputy District 11 Director–Traffic; Andrew Schlaefli, Vice President of Urban Systems Associates, Inc.; and Dr. Edward Sullivan of California Polytechnic University at San Luis Obispo.

The following contributed substantially to the study, although they are not responsible for the contents of this report.

California Department of Transportation, District 11

- Rick Hopkins, Deputy District Director–Design
- Chris Thomas, Deputy District Director–Advance Planning
- Carl West, Deputy District Director–Planning (now retired)
- Ross Cather, Traffic–Special Studies
- Lawrence Emerson, Traffic–Advance Systems Planning
- Larry Carr, Program Management

- Benita Gray, Volunteer Librarian

San Diego Association of Governments

- Eric C. Pahlke, Director of Transportation

Numerous user group representatives and experts on existing HOV system, research, and utilization.

- Carlos Daganzo, University of California, Berkeley (UCB)
- Patrick DeCorla-Souza, Federal Highway Administration (FHWA)
- John Duve, SANDAG
- Carol Harbaugh, FHWA
- Jennay Harrison, SANDAG
- Jean Hart, Alameda County Congestion Management Agency
- Pete Hathaway, California Transportation Commission (staff)
- R. Ian Kingham, GMK Transportation Planning and Engineering, LTD
- Jon Obenburger, FHWA
- Ken Orski, Urban Mobility Corporation
- Jerry Pfeiffer, Kiewit
- Richard Pratt, Richard H. Pratt Consultant, Inc.
- Theresa Smith, FHWA

2. CURRENT CONDITIONS

A review of existing California legislation and policies identified the following universe of vehicles allowed on HOV facilities:

- Vehicles with a designated minimum (usually two) occupants
  (Note: legislation does not differentiate between automobiles and trucks);
- Chartered and scheduled buses
  (Note: this does not consider any operating limitations);
- Motorcycles;
- Beginning 1 July 2000, vehicles that meet California's ultra low-emission vehicle (ULEV) standards (see appendix E); and
- To begin in 2002, hybrid high-efficiency vehicles (see appendix E) (Note: this authorizing legislation contains sunset provisions).

Legislators and special interest groups are actively considering other special categories. A great deal of attention is also being given to simply selling unused capacity with the generated income often dedicated to improve transit service. Therefore, as the inclusion of non-pricing strategies is considered, it must be remembered that the utilization of HOV lanes is not a static condition, and to a substantial degree the initiative is currently with the legislature.

Additionally, it is necessary to be sensitive to the need for operationally practical strategies that allow for appropriate enforcement and clear understanding by the public. Finally, a critical concern is the perceived equity in the way these special lanes are operated. If the ultimate population allowed on HOV lanes is not accepted by the public or capable of being analytically justified, then public criticism will result in negating the changes and, more importantly, will assist those forces seeking the elimination of HOV lanes.

Currently HOV facilities in California, with a few notable exceptions, tend to be stand alone. They are planned to be greatly expanded, however, resulting in significant urban area systems by 2020. This program of developing HOV systems is a major component of Governor Davis' program to reduce congestion on California's highways.

In performing task one, a literature search, a substantial amount of material was obtained via a search of the Transportation Research Information Services (TRIS) and personal contacts. On review, however, this resource material, did not relate to the study purposes in most cases and was disappointing overall. Evidently this topic has not yet reached the stage of large-scale interest or awareness. It was found that no past or current studies focus directly on non-

pricing techniques except those few advocating the elimination of HOV lanes or challenging their creation. A few sources document current studies to evaluate broadening the allowed users by "buy in." See Appendix B for the annotated bibliography of appropriate source material resulting from this search and subsequent findings.

3. IDENTIFICATION OF POTENTIAL NON-PRICING METHODS

GAINING INPUT

In addressing most public policy issues, the appropriate technique for gaining input is through public hearings/meetings. The lead time required for such meetings, which, in the case of this study, would have to be held on a statewide basis, could not be accommodated within the time and resources allocated. In considering an equitable and efficient alternative, it was found that almost every group (individuals and/or vehicle groups) that might be considered for inclusion in an expanded non-pricing (or pricing) strategy was professionally represented by clubs, associations, public agencies, and other organizations. Therefore, the approach for gaining input in a prompt, efficient manner was to communicate with these groups, making the assumption that the group generally reflects the views of its constituent members. Further, it was determined that it would be appropriate to cast the net rather broadly so as to gain significant input, profiting from a wide variety of vantage points, positions, and philosophies, even though, in many cases, the chance of finding an appropriate additive to the HOV population was low within the current principles underlying the justification of HOV lanes.

EVALUATING INPUT

Caltrans has expanded the air quality and fuel efficiency goals for HOV lanes in recent studies to the following:

- Increase the people moving capacity of the freeway system;
- Reduce overall vehicle congestion and motorist delay by encouraging greater HOV use;
- Provide time and commute cost savings to the users of HOV lanes;
- Increase overall efficiency of the system by allowing HOVs to bypass congestion on lanes designed for their use; and
- Improve air quality by decreasing vehicular emissions.

An additional factor, overriding public interest issues, was added for this study. This factor was provided to allow evaluation of suggestions that could be so compelling as to indicate a possible change in the current Caltrans goals. As an example, currently a variety of SOV emergency vehicles are not legally permitted on HOV lanes except as directed by policing authorities. Most such vehicles are not SOVs, though, and while SOV emergency vehicles are

generally aligned with public health issues, they would probably not rank high based on present Caltrans goals. Some of these vehicles, however, may introduce such common-sense benefits that a change in the Caltrans goals, while not envisaged as being central to the study, may be logical.

Twenty-four specific potential candidate groups were identified for inclusion in those groups allowed to use HOV facilities. The candidates were placed on a rating form that identified six attributes and a fatal flaw pass/fail factor based on adequate capacity to accommodate the candidate group. For this study, a ranking system of one to ten was adopted based on Caltrans' expanded, specific goals for HOV lanes, with a ten ranking being most aligned with the goals and a one ranking being the least aligned. Appendix C includes the ranking sheet. A short explanation of the candidate groups and the attributes follows.

The candidate groups as included on the ranking sheet were:

a. **Electric**: certain low emission vehicles complying with California requirements as established by state legislation as a demonstration program (Vehicle Code, Chap. 330);

b. **ULEV & SULEV** (ultra low emission vehicle and super ultra low emission vehicle): vehicles complying with federal requirements as established by the Environmental Protection Agency (EPA);

c. **Handicapped–licensed**: vehicles with a state license designating handicapped;

d. **Handicapped–placard**: vehicles displaying a state-issued handicapped placard;

e. **Veterans**: including all honorably discharged veterans of U.S. armed forces (may be redesignated to be restricted to a smaller market such as Pearl Harbor or Purple Heart veterans with appropriate license plates);

f. **Light delivery truck**: two-axle trucks involved in multidelivery services, such as UPS, Avery, and Federal Express;

g. **U.S. mail–light delivery truck**: two-axle U.S. Postal Service vehicles used in delivery of U.S. mail;

h. **Radio dispatched**: vehicles involved in paratransit type service responding to prearranged passenger pickup;

I. **Police**: including city, county, state, and federal police units on duty status;

j. **Tow trucks–CHP**: trucks responding to call of CHP;

k. **Tow trucks**: trucks responding to service call such as AAA member and Caltrans contracted roving units;

L. **Emergency**: fire, ambulance, and paramedic units (would usually

have two or more occupants anyway);

m. **U.S. military–licensed**: U.S. military vehicles with U.S. license plates or in convoy;

n. **U.S. military–on active duty**: civilian vehicles carrying active duty U.S. military personnel;

o. **Certified high mileage per gallon**: vehicles certified by the EPA as obtaining high mileage (actual mileage figure not set at this stage);

p. **Multidriver**: vehicles involved in programs that provide for several unrelated drivers to use the same vehicle during a single day, for example, the San Francisco Bay area program involving BART, Caltrans, and MTC;

q. **Rental**: vehicles rented as an SOV for short-term use (does not include leased vehicles);

r. **SOV even/odd license numbers**: permitting SOVs with even license numbers on even numbered dates and those with odd license numbers on odd numbered dates;

s. **Medical personnel**: responding to call to duty;

t. **Teachers**: going to/from assigned teaching location;

u. **Non-home-owners**: self explanatory;

v. **Antique–licensed**: vehicles licensed as antique;

w. **Deadheading transit, school, etc.**: SOVs deadheading between assignments or en route to or from storage area; and

x. **Two-axle service (utilities, etc.)**: such as SOVs of city utility units, PG&E, cable services, etc.

Attributes used on this ranking form were:

- **Air Quality**: a normal vehicle meeting California fleet standards would be ranked as five;
- **Fuel Savings**: a normal vehicle meeting fleet standards would be ranked as five;
- **Enforcement**: a subjective ranking covering ease of enforcement with five being the average vehicle;
- **Safety**: a subjective ranking based on driving expertise and vehicle characteristics, with a five being average;
- **System Efficiency**: a subjective ranking based on reducing overall vehicle miles of travel;
- **Cost Effective**: a subjective ranking based on costs to serve the particular user group, the lower the cost the higher the ranking; and

- **Capacity**: a measure of the ability to accommodate the candidate user group being ranked. This is the fatal flaw factor. As an example, for the large majority of existing HOV facilities in California, allowing SOVs to use the facilities on an odd/even license plate number basis would overfill existing capacity. Therefore, this user element is ranked accordingly with an F (for fail).

The candidate groups were ranked on a 10 point system by the study team and the panel of experts. These rankings were performed individually. See Appendix C for the results.

REFINING EVALUATIONS

The study team then met and further refined the groups based on the rankings, dropping some candidates that clearly fell out of a candidacy for inclusion on HOV lanes and combining others.

As shown on the ranking results chart (appendix C), the following potential user groups were dropped from consideration on the basis that each of them constitutes a large enough proportion of the users of the mixed-flow lanes that their inclusion as users of the HOV lanes would, in most cases, bog down the desired free-flowing HOV facility and they have no significant attributes in reducing fuel use and improving air quality: (e) **Veterans**, (n) **U.S. military–on active duty**, (q) **Rental**; (r**) SOV even/odd license numbers**; (t) **Teachers**; and (u) **Non-home-owners**.

Next, the study team considered elimination of the lower ranking user groups. This resulted in the following eliminations:

- (c) **Handicapped–licensed** and (d) **Handicapped–placard** were eliminated on the basis of their low safety ranking;
- (m) **U.S. military–licensed** was eliminated from further consideration on the basis that its inclusion does not further the goals of the HOV program, although, when responding to emergency situations, this group would be included with the other emergency users;
- (p) **Multidriver** may have potential to improve air quality and provide fuel savings, but at present this is unproven and further consideration at this time is not warranted; and
- (v) **Antique–licensed** was eliminated largely because of low air quality and safety ratings due to the operating characteristics of these vehicles.

The groups (f) **Light delivery truck** and (g) **U.S. mail–light delivery truck** were combined. Providing HOV lane access to light delivery vehicles,

including U.S. mail units, appeared to have positive results and no reason to consider the two groups separately was in evidence.

Groups (i) **Police**, (j) **Tow trucks–CHP**, (k) **Tow trucks**, (l) **Emergency**, and (s) **Medical personnel** were combined for further consideration under the general topic **Enforcement and emergency** services.

SELECTING FINAL CANDIDATE USER GROUPS

The selection process resulted, then, in the following groups for inclusion in task three deliberations:

1. Electric vehicles and other ULEV and SULEV;
2. Light delivery trucks;
3. Radio dispatched passenger vehicles;
4. Certified high mileage per gallon vehicles;
5. Deadheading transit, school, and charter buses;
6. Light service trucks (utility maintenance, etc.); and
7. Enforcement and emergency vehicles.

EXPANDED INPUT

At this stage the study team contacted a variety of potential users and their organization as well as the CHP and the CARB. Input from these contacts was reviewed and grouped at the last meeting of the study team and working group. The synthesized results of this input and the conclusions they engendered are reported in the next two chapters.

4. AGENCY COMMENTS

Responding to team inquiries, three agencies submitted information summarized as follows.

- SANDAG, by letter of 2 August 2000, agreed with the study purpose, but urged concentration on strategies to "get people out of their single occupant vehicles." It strongly supported value pricing approaches and incentives for carpooling, vanpooling, and transit use. SANDAG's letter is in Appendix F.

- California Air Resources Board, by letter of 19 September 2000 (see appendix G), supported better utilization of "HOV lane capacity in a way that will reduce emissions from motor vehicle operation and promotes fuel efficiency." Further, the board cautions "that vehicles with high fuel efficiency are not necessarily low emitting vehicles, and vice versa."

- California Highway Patrol, by letter of 28 September 2000, comments on two specific issues: First, legislation recognizing emergency vehicle HOV use currently authorizes CHP officers to direct traffic in emergencies so "additional statutory provisions are not required," and second, use of transponders or similar on-board electronic devices to identify legitimate HOV users "is currently not feasible for a number of reasons." Further, the CHP finds that the present practice of using distinctive decals to identify specific low-emission vehicles allowed to utilize HOV facilities is "more than adequate for enforcement purposes of the CHP." This letter is found in Appendix H.

5. POTENTIAL USER COMMENTS

General comments regarding the suitability of further consideration of each of the seven groups of potential users of HOV facilities resulting from the last meeting of the study team and working group follow.

1. ELECTRIC VEHICLES AND OTHER LOW EMISSION VEHICLES

These vehicles are currently allowed access as the result of recent legislation (See Appendix E). However, this legislation contains sunset requirements and phase two of this non-pricing study should include investigation into changing these sunset stipulations.

2. LIGHT DELIVERY TRUCKS

The case for allowing light delivery vehicles on HOV lanes is founded on the premise that statistically, each delivery vehicle may eliminate 50 to 100 individual trips to and from home or business to delivery centers were such services not available. At first glance, this becomes a good candidate for conservation of fuel and an improvement in air quality through the reduction of individual trips.

The problem with this alternative is in equity and implementation concerns.

- Attention is generally directed to such main-line companies as the U.S. Postal Service, United Parcel Service, Federal Express, DHL, etc. But in fact, there are a plethora of delivery services that would be difficult to constrain or, indeed, even identify. These include Meals on Wheels, private and public courier services, intercity semitrailers carrying parcels, etc. In fact, the amount of commerce included in this general grouping cannot be quantified, and once approved, may be unmanageable.
- The bulk of business-to-home delivery services is neighborhood oriented, and the use of HOV lanes would be a marginal benefit. Indeed, specific queries were formally solicited from UPS, DHL, and Federal Express and no responses were forthcoming. This would seem to indicate that the use of HOV lanes is not a high priority or an economic benefit to these firms.
- It would be difficult to classify the various kinds of vehicles used by these delivery companies-agencies. Some are intercity, some provide neighborhood services, and others are regional in nature. This would create a constant struggle as to which vehicles are allowed and which are not.
- Inclusion of this group may work against efforts to convert such delivery vehicles from diesel or gasoline power to alternative fuels that could allow their use of HOV lanes.

- Perhaps most problematical is attempting to identify the public policy purpose of allowing these vehicles on HOV lanes. For instance, would inclusion of these vehicles increase the use of these services? Would the services offered by these companies-agencies even be influenced by inclusion on HOV lanes? These would be highly speculative projections or estimates, bringing into question the clear justification of including these kinds of delivery vehicles on publicly financed HOV lanes.

Considering these concerns, it is suggested that further study of light delivery trucks as a potential user group be pursued only if solid reasons for inclusion surface in phase two of the study.

3. RADIO DISPATCHED PASSENGER VEHICLES

The concept behind inclusion of this group of potential HOV users is to improve their efficiency and, therefore, the attractiveness of their use compared to the single-occupant vehicle (SOV). Once a radio dispatched vehicle obtains a passenger, its qualification for access to the usual two-occupant-limit HOV facilities is fulfilled. However, when a radio dispatched taxi, airport limousine, or similar passenger vehicle is responding to a request for service as an SOV, it is unable to utilize HOV facilities. The reliability of obtaining timely service is a major requirement of quality response for transit and paratransit services. Since use of HOV facilities should, especially during peak commute hours, improve response time, it should enhance the competitiveness of such vehicles compared to SOVs.

The response that the team obtained from the service providers of this potential user group was, without exception, positive. The Taxicab Paratransit Association of California (TPAC) points out that “providing such access we believe would maximize the utility of the units in service at any given point in time, and it is generally accepted that a vehicle operating at optimum speeds is more fuel efficient and produces less air pollutants than a vehicle idling or accelerating/decelerating in a heavy traffic situation.”[3]

This user group is a strong candidate for SOV HOV facility inclusion in the phase two study. Legislation for its inclusion should consider possible sunset provisions.

One possible negative to including radio-dispatched vehicles in the users of HOV facilities is that it may constitute a disincentive to converting such

[3] E-mail from Lee Adler, Executive Director TPAC, to George Gray, Team Leader, 22 September 2000.

vehicles to alternative fuels. If, however, any legislation to allow these gasoline powered vehicles to use HOV facilities has a sunset provision, it could provide an incentive for conversion of such vehicles to alternative fuels so they can continue their SOV operation after the sunset goes into effect.

4. EPA CERTIFIED HIGH MILEAGE VEHICLES AND VEHICLES USING ALTERNATIVE FUEL

This group, formerly entitled simply, "Certified High Mileage Per Gallon Vehicles," has been retitled for greater specificity.

High Mileage Vehicles

A compelling case can be made for allowing high mileage (high miles per gallon) vehicles to utilize unused capacity on HOV lanes. The U.S. Environmental Protection Agency (EPA) annually establishes mileage data for all vehicles that are manufactured in or imported into the United States, and this data is tabulated into a readable brochure that is available over the Internet and at most automobile dealerships. The State Energy Commission and the California Air Resources Board (CARB) (See appendix D) accept these data.

By definition, currently manufactured vehicles meet air quality standards in order that they may be sold in California. Those vehicles with the highest miles per gallon (mpg) rating enhance statewide fuel efficiency objectives. Together, this meets study criteria for improving air quality and for conserving energy.

In the context of this study, vehicles could be allowed onto HOV lanes by simply descending down the EPA list until the designated available capacity on a given facility is exhausted. Obviously, there are different capacity constraints between facilities and between regions. Granting permission to use these various facilities is simply a matter of matching vehicles and capacity for each facility. (HOV lanes must continue to be free flowing to be effective and meet intent. A designated available capacity should be established with free flow in mind.)

The Energy Commission and the ARB support this concept, provided that an unusually high unused capacity on a particular facility does not permit unusually low mileage vehicles to use the HOV lanes. For discussion purposes, a limit of 27.5 mpg would form the floor for this proposal, which approximates the industry-wide required mpg (combined average fleet economy or CAFE).

In their support of this proposal, the CARB reminds us that high mileage vehicles are not necessarily the cleanest burning vehicles. In practical terms, this brings into question certain diesel powered Volkswagens, which are among the highest in the mpg category, but generate more particulates than high mileage, gasoline-burning vehicles. However, upon further discussion

with the CARB and the Energy Commission, we understand that by the year 2006, diesels are expected to be as clean as gasoline-fueled vehicles. For purposes of this phase one study, accepting diesel powered vehicles until 2006 is not recommended due to their energy efficiency advantages and commitments to produce clean vehicles in the immediate future.

Vehicles Using Alternative Fuels

Certain other vehicles fit into the general parameters of this alternative, but not strictly on the basis of miles per gallon. Examples are vehicles powered by propane, liquefied natural gas (LNG), and ethanol. State policy encourages the use of these alternative powered vehicles, and they can easily fit into the array of permitted vehicles. Similarly, electric powered vehicles (already allowed on HOV lanes) and hybrid vehicles (electric/gas) may be placed into this general category. In practice, the overall alternative could be implemented in California as follows:

- Category 1: electric powered vehicles (already allowed by legislation).
- Category 2: electric/gas (hybrid) powered vehicles, and vehicles. powered by liquefied natural gas (LNG), propane, and ethanol.
- Category 3: vehicles with the highest EPA mileage certification, starting with the highest achieved mileage and descending to as low as 27.5 mpg or the limit of designated available capacity, whichever is first satisfied.

Enforcement

The California Highway Patrol (CHP) believes that simple visual identification through the use of a bumper decal is adequate for enforcement purposes. The question has been raised over the existence of several HOV facilities within a single regional area, each having different capacity limitations. The concern here is that a regional permit may oversubscribe a particular HOV facility. Therefore, this proposal would be facility specific, and identifying bumper decals could be color-coded or otherwise identified with a specific HOV facility. In practice, this concern is unlikely to be a realistic problem since commute patterns are well defined and travel habits are unlikely to be altered significantly simply to take advantage of a distant HOV facility.

Issues Requiring Further Study

EPA mileage data correlates to current year of manufacture. A question remains as to how far (historically) the EPA data should be utilized for purpose of HOV access. That is, should 1995 through 2001 lists be merged? The primary question here is the issue of incentive vs. reward. If HOV access were intended to act as an incentive, then current or near current data would be used.

On the other hand, if access to HOV lanes were a reward for owning a fuel-efficient vehicle, then some limited historical merging of the lists would be in order. Generally speaking, the latter policy (historical merging of lists) appears at this phase to be the most reasonable approach and is the most consistent with the principles used for carpools on HOV lanes. Carpools were in existence before the advent of HOV lanes and were "grandfathered" onto HOV lanes, while at the same time, HOV lanes were used as an incentive to form additional carpools. The primary issue here is the time period for merging these lists. All motor vehicles become less efficient as they age, and a high mileage vehicle in 1995 may not be nearly as efficient in 2001. It is proposed to study this issue further with the CARB in phase two of the study.

5. DEADHEADING TRANSIT, SCHOOL, AND CHARTER BUSES

The concept for this potential user group is to allow SOV buses access to HOV lanes. Industry response to this possibility was mixed and will be considered according to each of the following three groups.

Transit Buses

Several transit organizations strongly supported their inclusion in phase two of the study. The Santa Clara County Valley Transportation Authority suggested that transit support vehicles also be included. San Mateo County Transit District pointed out that as congestion has increased in their operating area, work assignments near peak commute hours have required more deadhead time in order to reach their start location. This is an added operating cost that is eventually charged to the public.

AC Transit, which operates considerable service across the San Francisco–Oakland Bay Bridge, stated that they already deadhead on HOV facilities.

The consensus is that inclusion of transit buses in those allowed access to HOV facilities is warranted. With the few exceptions of steep HOV grades, there appear to be no operating problems with their inclusion.

School Buses

The largest school bus operator in the state, Laidlaw, has stated that since school bus services are often on the shoulder or edges of peak period traffic, especially when deadheading, they have limited opportunities to utilize HOV lanes effectively when deadheading. Also, they have many units that are unable to operate at HOV facility speeds. Therefore, they are not pressing for such inclusion. However, if allowed, they may find favorable instances where savings of time may occur, especially when there is an HOV ramp meter bypass or a similar facility. With these considerations, possible school bus inclusion needs further study.

Charter Bus Services

Most charter bus service operates with passengers and deadheading is comparatively minimal. However, there are notable exceptions. Golden State Transportation points out "the fact that occasionally a bus may travel the HOV lane with only the driver on board does not preclude the intended purpose of that HOV lane."[4] This user segment should be included in the phase two study.

6. LIGHT SERVICE TRUCKS (UTILITY, MAINTENANCE, ETC.)

A number of agencies that operate such light service trucks were contacted. Their reaction was that access to HOV facilities is not significantly important to their usual day-to-day operations because their service areas primarily utilize surface streets and HOV facilities are not a measurable factor in their efficient operations. Therefore, this group will not be recommended for phase two consideration.

7. ENFORCEMENT AND EMERGENCY VEHICLES

The California Highway Patrol (CHP) has gone on record that they see no need for changes in this sector. In addition, representatives of the tow truck industry have indicated that they see no value in any changes to existing practices. Further, formalizing existing practices through legislation may result in unforeseen complications. Hence, it is recommended that this possible user group not be considered further on the basis of if it isn't broken don't try to fix it.

[4] E-mail from Edwin Patterson, General Manager of Golden State Transportation, to George Gray, Team Leader.

6. CONCLUSIONS AND RECOMMENDATIONS

Of the wide variety of possible groups that might rationally be included in those authorized to use HOV facilities, the seven most promising were given cursory review. This review resulted in the following conclusions and recommendations for the seven candidate groups.

1. ELECTRIC VEHICLES AND OTHER LOW EMISSION VEHICLES

Conclusion

These vehicles have recently been included in those authorized to use HOV facilities as the result of 1998 legislation, which includes sunset provisions.

Recommendation

The phase two study should review this recent legislation and possibly recommend that the present sunset provisions be extended.

2. LIGHT DELIVERY TRUCKS

Conclusion

After preliminary review, the identified negatives for including this group of users appears to outweigh any identified positives.

Recommendation

Unless new evidence surfaces during the phase two study, this group should not be considered further.

3. RADIO DISPATCHED PASSENGER VEHICLES

Conclusion

This candidate group is a strong candidate for inclusion in the HOV program as an SOV. The resulting improved service of these vehicles should result in improved public transportation services and the magnitude of added HOV users would be minor.

Recommendation

This candidate group should be included in the phase two study. Proposed legislation, if any, should consider sunset provisions that could encourage future fleet conversion to vehicles using alternative fuels in order to retain their ability to continue to qualify to use HOV facilities.

4. EPA CERTIFIED HIGH MILEAGE VEHICLES AND VEHICLES USING ALTERNATIVE FUELS

Conclusions

Inclusion of this group of potential users could encourage use of these vehicles, which would have beneficial impacts on air quality and fuel consumption.

However, inclusion must be closely monitored to ensure that HOV facilities remain free flowing. Identification of users and adequate police monitoring and enforcement may be significant problems.

Recommendation
Include this group in phase two study.

5. DEADHEADING TRANSIT, SCHOOL, AND CHARTER BUSES

Conclusions
Conclusions for these three groups varied. Transit and charter buses appear to be worthy candidates, but there are problems with including school buses that appear to warrant their rejection.

Recommendations
Include transit and charter buses in the subsequent study, but only give further consideration to school buses if added significant warrants are evidenced.

6. LIGHT SERVICE TRUCKS (UTILITY, MAINTENANCE, ETC.)

Conclusion
There does not appear to be any advantages to including this group.

Recommendation
Do not include this group in phase two study.

7. ENFORCEMENT AND EMERGENCY VEHICLES

Conclusion
There is no compelling reason to change existing conditions regarding the group's use of HOV facilities in the SOV mode.

Recommendation
Do not include this group in the phase two study.

APPENDIX A: ABBREVIATIONS AND ACRONYMS

(Terms Related to HOV Facilities and Operations)

AB	Assembly Bill
ACCMA	Alameda County Congestion Management Agency
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management Systems
ATMS	Advanced Transportation Management System
AVI	Automatic Vehicle Identification
AVL	Automatic Vehicle Locator
AVO	Average Vehicle Occupancy
BR	Regional Share of Bridge Program (also RSBR)
CAAA	Clean Air Act Amendments
Caltrans	California Department of Transportation
CAD	Computer Assisted Dispatch
CAFE	Combined Average Fleet Economy
CARB	Californian Air Resources Board
CCTV	Closed Circuit Television
CHP	California Highway Patrol
CMA	Congestion Management Agency
CMAQ	Congestion Mitigation & Air Quality Improvement
CMS	Changeable Message Sign
CMS	Congestion Management System
CORBA	Common Object Request Broker Architecture

CPTC	California Private Transportation Company
CTC	California Transportation Commission
CTS	County Transit System
CTV	California Transportation Ventures
CVEF	Commercial Vehicle Enforcement Facility
CVIBOS	Commercial Vehicle and International Border Operations System
CVMS	Commercial Vehicle Management System
EDF	Environmental Defense Fund
EPA	Environmental Protection Agency
ERP	Electronic Road Pricing
ETC	Electronic Toll Collection
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FSP	Freeway Service Patrol
FTA	Federal Transit Administration
FVD	Floating Vehicle Data
GPS	Global Positioning Satellite
HAR	Highway Advisory Radio
HICOMP	Highway Congestion Monitoring Program
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
ICD	Interface Control Document

IDAS	ITS Deployment Analysis System
ILEV	Inherently Low Emission Vehicle
IMTMS	Intermodal Transportation Management System
IRMS	Incident Response Management System
ISP	Information Service Provider
ISTEA	Intermodal Surface Transportation Efficiency Act
ITE	Institute of Transportation Engineers
ITIP	Inter-Regional Transportation Improvement Plan
ITS	Institute of Transportation Studies (also UCITS)
ITS	Intelligent Transportation Systems
IWS	Integrated Work Station
LACMTA	Los Angeles County Metropolitan Transportation Authority
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MTC	Metropolitan Transportation Commission
MTC	Metropolitan Transportation Commission (San Francisco Bay Area)
MTDB	Metropolitan Transportation Development Board (San Diego)
NCTD	North County Transit District
RAMS	Regional Arterial Management System
RSBR	Regional Share of Bridge Program (also BR)
RSTP	Regional Share of Surface Transportation Program
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan

RTPA	Regional Transportation Planning Agency
SANDAG	San Diego Association of Governments
SANTAC	San Diego Traffic Advisory Committee
SANTEC	San Diego Traffic Engineers Council
SB	Senate Bill
SCAG	Southern California Association of Governments
SCPC	Southern California Priority Corridor
SHOPP	State Highway Operations and Protection Program
SIP	State Implementation Plan
SOV	Single Occupancy Vehicle
STP	Surface Transportation Program
SULEV	Super Ultra Low Emission Vehicle
SWARM	System Wide Adaptive Ramp Metering
TASAS	Traffic Accident Surveillance and Analysis System
T/BL	Truck/Bus Lane
TCM	Transportation Control Measures
TDM	Transportation Demand Management
TI	Traveler Information
TEA-21	Transportation Equity Act for the 21st Century
TMC	Traffic Management Center
TMS	Traffic Monitoring System
TMT	Traffic Management Team
TOPS	Traffic Operation Strategies
TPAC	Taxicab Paratransit Association of California

TRB	Transportation Research Board
TRIS	Transportation Research Information Services
TrMS	Transit Management System
UCB	University of California, Berkeley
UCI	University of California, Irvine
UCITS	University of California Institute of Transportation Studies (also ITS)
UCSD	University of California, San Diego
ULEV	Ultra Low Emission Vehicle
VDS	Vehicle Detection System
VMT	Vehicle Miles of Travel

APPENDIX B: ANNOTATED BIBLIOGRAPHY

Alameda County Congestion Management Agency. "I-880 Value Pricing Study: Scope of Work." Oakland, Calif.: ACCMA, 9 September 1999.
Abstract: The scope of work covers a study to determine potential demand for commercial subscription service on existing I-880 HOV lanes by light-duty commercial vehicles. HOV lane capacity by time horizon, special operational and enforcement issues, and revenue generation/use are components of the study.

Alexiadis, V., and others. *Predicting the Demand for High Occupancy Vehicle Lanes: Final Report*. Report No: FHWA-SA-96-073. Oakland, Calif.: Dowling Associates, 1 June 1996.
Abstract: This report presents the results of the FHWA Project #42-10-4172, "Predicting the Demand for High Occupancy Lanes." The report provides the following: A review of the available literature and experiences of public agencies with current methods for predicting the demand for HOV lanes; the recommended new methodology for predicting the demand for HOV lanes; and the data on existing HOV lane projects in the United States that was used to calibrate and validate the new HOV lane demand estimation technology.

Baxter, J. "Overview of Statewide HOV Programs and Issues." *Transportation Research Circular: 7th National Conference on High-Occupancy Vehicle Systems. Part 1: Plenary Sessions*, 442 (July 1995): 13-14.
Abstract: The history of high occupancy vehicle (HOV) facilities development in California is summarized. The use of HOV facilities in California started in 1970 with HOV bypass lanes at the toll plazas on the Oakland Bay Bridge in the San Francisco area. Milestones include the opening of the El Monte Busway in 1973, the infamous diamond lane on the Santa Monica Freeway in 1976, a resurgence of HOV development between 1985 and 1990, and the adoption of the Urban Freeway concept in 1993. Current projections are that the ultimate California HOV lane system may reach 500 miles. A major effort now is to ensure that the necessary support facilities and services are in place. These include park-and-ride lots, transit services, ridesharing programs, direct connectors, access ramps, enforcement, and other elements.

Best, M. E. *Implementation Elements for Conversion of a General Purpose Freeway Lane into a High Occupancy Vehicle (HOV) Lane.* Report No: SWUTC/96/72840-00003-1. College Station, Tex.: Texas A&M University, August 1996.

Abstract: Conversion of a general-purpose freeway lane into a High Occupancy Vehicle (HOV) lane can be an alternative to infrastructure addition for HOV system implementation. Research indicates that lane conversion is technically feasible if sufficient HOV usage and minimal main lane congestion occur from the first day of operation forward. The purpose of this research is to determine what elements are required for inclusion in an implementation plan for a lane conversion to HOV once technical feasibility has been determined. It is concluded that the following elements should be included in an implementation plan for lane conversion to HOV: technical feasibility; early public outreach; strong institution arrangements; inclusion of law enforcement agencies; open relationships with the media; and project opening timing.

Best, M. E. "Implementation Elements for Conversion of General-Purpose Freeway Lane into High-Occupancy-Vehicle Lane." *Transportation Research Record*, 1603 (1997): 57-63.

Abstract: Conversion of a general-purpose freeway into a high-occupancy-vehicle (HOV) lane is an alternative to infrastructure addition for HOV system implementation. Research indicates that lane conversion is feasible technically if sufficient HOV usage and minimal main lane congestion occur from the first day of operation. The elements required for inclusion in an implementation plan for lane conversion to HOV after technical feasibility has been determined are presented. HOV-lane marketing is meant to heighten public awareness of the purpose and operation of HOV facilities while encouraging their use. The general public, local decision makers, and the local media are important elements to include in a marketing campaign for successful HOV implementation. These elements also apply to the successful implementation of lane conversion to HOV. Four HOV lane-conversion projects are investigated: (a) Santa Monica Freeway, Los Angeles, California; (b) Dulles Toll Road, Northern Virginia; (c) Interstate 90, Seattle, Washington; and (d) Interstate 80, northern New Jersey. The Santa Monica and Dulles projects are considered failures, whereas the Interstate 80 and 90 projects are considered successful. From these case studies and the literature review, implementation elements were identified: (a) technical feasibility, (b) early public outreach, (c) strong institutional arrangements, (d) inclusion of law enforcement agencies, (e) open relationships with the media, and (f) project opening timing.

Blume, K. L. *Implementation of a Dynamic HOV Lane*. College Station, TX: Texas A&M University, August 1998.

Abstract: The research reported in this paper is an investigation of the implementation of a dynamic HOV lane. A dynamic HOV lane is an HOV lane that is converted to other uses at different times of the day or under special circumstances using ITS technologies and real-time data in order to make more efficient use of HOV facilities and improve the safety of motorists, incident responders, and HOV lane operations personnel. The development of the concept included a literature review of HOV system planning and operations, incident management, and ITS research, as well as detailed interviews with agencies that oversee HOV lane operations in cities across the United States. Information from the literature and agency interviews was synthesized and analyzed to identify barriers to implementation and critical issues. Then a hypothetical dynamic HOV lane was designed to illustrate how the HOV lane and ITS components fit together and how the barriers might be overcome to preserve the benefits associated with a dynamic HOV lane. The barriers identified were justifying the need for a dynamic HOV lane, ensuring motorists' safety, technical reliability, adequacy of data, implementation costs, public perceptions, legality, and the wide variety of contributing factors. These barriers might be overcome by investigating potential applications carefully to ensure that there is a practical problem to solve, building a reliance on HOV system technologies, proper design and placement of system components, extensive public education, maximizing technical reliability with backup systems and good maintenance, archiving data for analysis and system improvements, using dynamic HOV lane technologies for other ATMS applications, and developing policies and laws to support dynamic HOV lanes. Research findings showed a reluctance to depend on advanced technology for the accurate and safe operation of a dynamic HOV lane as described in this report. Because the fundamental difference between a dynamic HOV lane and a “normal” HOV lane is reliance upon a coordinated system of ITS technologies, it was therefore concluded that a dynamic HOV lane cannot be implemented until the dependability of its component technologies is successfully demonstrated.

Brown, W. W, and E. L. Jacobson. *HOV Evaluation and Monitoring - Phase III*. Annual Data Report,WA-RD 414.1. Washington, D.C.: FHWA, August 1996.

Abstract: This report presents and summarizes the data collected in fulfillment of the requirements for the Washington State Department of Transportation grant “HOV Lane Evaluation and Monitoring.” This report

provides the information necessary to analyze HOV lane performance and development. Data collection results and analysis are presented, followed by conclusions and recommendations. The data collection methodology is described in the final report, "HOV Monitoring and Evaluation Tool." Included in this report are the following primary and secondary measures of HOV lane performance: (1) average vehicle occupancy data, (2) travel time data, (3) public opinion survey results, and (4) enforcement, compliance, and adjudication data.

California Department of Transportation, District 11. *1999 HOV Annual Report, Executive Summary.* San Diego, Calif.: Caltrans, [2000].
Abstract: This report contains information concerning the High Occupancy Vehicle (HOV) lanes on the San Diego Area freeway system. Traffic volumes, vehicle occupancies, and violation rates are included. Volumes and occupancy data for HOV preferential lanes at metered freeway on-ramps are not included in this annual report.

Carson, J., and others. *The Potential for Freight Productivity Improvements Along Urban Corridors*. Report No: Final Research Report,WA-RD 415.1. Washington, D.C.: FHWA, December 1996.
Abstract: The impacts that would result from providing "reserved capacity" for trucks rather than restricting trucks are considered in this study. In the extreme case, trucks would be allowed to travel in a dedicated or exclusive lane. A more moderate approach would be to provide a "cooperative" dedicated lane in which vehicles such as trucks and buses could share a common lane and yet be separated from general traffic. The study determined the following. Reserved-capacity strategies for trucks would offer (1) nearly $10 million in annual travel time savings for the trucking industry, (2) a savings of about 2.5 minutes per average truck trip (less than 8 percent savings in trip travel time), and (3) almost $30 million in annual travel time savings for single-occupancy vehicles in the Seattle region. The difference in travel times between the reserved-capacity strategy that would add trucks to the existing high occupancy vehicle (HOV) lanes and the one that would add an exclusive truck lane would be insignificant, providing little justification for the construction of an exclusive truck lane. In all likelihood, the impact of reserved-capacity strategies on safety would be small, depending on the particular reserved capacity strategy. Reserved capacity strategies for trucks would accelerate pavement deterioration in the reserved lanes, but the reduction in the pavement deterioration rates of the general-purpose lanes might help to balance future reconstruction costs. It is the recommendation of this study that the idea of reserved-capacity strategies for trucks continue to be presented to the trucking industry, to the

public, and to other impacted agencies for discussion and consideration. The study showed that the adverse impacts of such strategies are easily manageable and there is at least potential for freight-productivity improvements.

Daniels, G. "Are HOV Lanes Cost-Effective Improvements?" *ITE Journal*, 68, no. 9 (September 1998): 1-17.
Abstract: As part of an ongoing research effort to evaluate high occupancy vehicle (HOV) lanes in Texas, an assessment of HOV-lane cost effectiveness was conducted using MicroBENCOST, a planning-level, economic-analysis tool developed under National Cooperative Highway Research Program Project 7-12. Extensive traffic and construction cost data collected from barrier-separated HOV lanes in Texas were used in the analysis to obtain the most reliable results. In all cases, the barrier-separated HOV lanes operating in Texas produced benefits outweighing the costs over a 20-year life. Resulting benefit-to-cost ratio (B/C) values ranged from 8 to 78. The HOV lane improvement also resulted in an equal or higher B/C than the general-purpose-lane alternative for all facilities.

Federal Highway Administration. "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes." FAX of Memorandum and guidelines from FHWA Web pages, on internal FHWA Web site, wysiwyg://5/http://www.fhwa.dot.gov/operations/hovguide.htm, 18 April 2000.
Abstract: This memorandum and attached guidelines identify the review process and actions that may be required to significantly change the operation of HOV lanes. Three general sections are presented:

1. background federal position re HOV and identification of when federal review to change the operation of HOV lanes is needed;
2. federal review and applicable requirements and regulations; and
3. list of definitions.

Federal Highway Administration. "Value Pricing Pilot Program: Program Information." FHWA Discretionary Programs Web pages, FHWA Web site, http://www.fhwa.dot.gov/discretionary/pi_value.htm, 14 July 2000.
Abstract: This Web site provides information on the Value Pricing Pilot Program as authorized by TEA-21 (section 1216(a)(4&5)). Subheadings include the following: Background, Statutory References, Funding, Federal Share, Obligation Limitation, Eligibility, Selection Criteria, Solicitation Procedure, and Submission Requirements.

"High-Occupancy/Toll (HOT) Lanes and Value Pricing: A Preliminary Assessment." *ITE Journal*, 68, no. 6 (June 1998): 1-5.

Abstract: The term HOT lanes, which stands for High-Occupancy/Toll lanes, refers to high-occupancy vehicle (HOV) facilities that are open to lower-occupancy (including single-occupancy) vehicles upon payment of a fee or toll. Value pricing describes a system of optional fees paid by drivers of lower-occupancy vehicles to gain access to dedicated road facilities providing a superior level of service and offering time savings compared with the parallel free facilities. Four current projects illustrate concepts and possibilities of HOT lanes and value pricing: SR 91 in Orange County, California; I-15 in San Diego, California; I-10 West in Harston, Texas; and I-93 in Boston, Massachusetts. Based on the examination of these experiences, the following issues appear important in the consideration of HOT lane and value pricing projects: current and future utilization of the HOV facility, toll structure, use of revenues, and public reaction.

Hultgren, L., and Kawada, K. "San Diego's Interstate 15 High-Occupancy/Toll Lane Facility Using Value Pricing." *ITE Journal*, 69, no. 6 (June 1999): 22-27.

Abstract: The Interstate 15 (I-15) Value Pricing Project is a federally funded, $9.95 million, 3-year demonstration program that allows single-occupant vehicles (SOVs) to use the existing high-occupancy vehicle (HOV) lanes on I-15 for a fee. I-15 is a major north-south freeway in the inland San Diego, California region. The project began in December 1996 and is generating revenue for transit-service improvements in the I-15 corridor. This feature provides an overview of the project, including background, phasing, and a summary of observations to date. Throughout Phase I (Interim Operations), HOV lane traffic remained free flowing. Usage of the HOV lanes increased by 27 percent, from a daily average of 9,215 vehicles in October 1996 (preproject) to 11,700 vehicles in March 1998. However, the additional vehicles on the HOV lanes were primarily carpools and not SOVs. Actual ExpressPass customer use was less than expected. As of March 1998, ExpressPass customers represented 10 percent of total traffic on the HOV lanes. The violation rate was relatively low throughout Phase I. During the first eight months of full implementation (Phase II), the price varied between $0.50 and $4.00, and level of service (LOS) C was rarely exceeded. By the end of February 1999, more than 7,000 transponders had been distributed to more than 5,200 account holders. Most FasTrak customers are occasional users. Monthly transponder usage data for April-September 1998 indicated that 53 percent of transponders were used 1-5 times, 18 percent were used 6-10

times, 11% were used 11-15 times, and the remaining 19 percent were used 16-40 times per month. There has been good customer acceptance of dynamic pricing.

Jernigan, J. D. and C. W. Lynn. *The Effect of Motorcycle Travel on the Safety and Operations of HOV Facilities in Virginia: Final Report.* Report no. FHWA/VA-95-R26, HS-042 512, VTRC 95-R26. Washington, D.C.: FHWA, June 1995.

Abstract: The Intermodal Surface Transportation Efficiency Act of 1991 mandated that motorcycles be permitted to travel on federally funded high-occupancy vehicle (HOV) facilities unless they created a safety hazard or adversely affected HOV operations. Although motorcycles had previously been banned from traveling on Virginia's HOV lanes, the Commonwealth Transportation Board (CTB) authorized motorcycle travel on HOV facilities in Virginia as of September 21, 1992, for a two-year trial period. However, out of concern over whether this policy should continue, the CTB resolved that the Virginia Department of Transportation (VDOT) conduct a study to determine whether motorcycles presented a safety risk on HOV lanes. This study found that motorcycles account for as much as 3% of the annual traffic on some HOV lanes. However, in the two years after the CTB authorized their travel, there were only five motorcycle crashes on HOV lanes. The study recommends that the CTB allow motorcycles to continue to travel on HOV lanes and that VDOT continue to monitor their travel and crashes.

Kail, A. “The New Debate on HOV Lanes: How Should We Use Them?” *TDM Review*, 7, no. 2 (May 1999): 1-3.

Abstract: HOV lanes and their usefulness to alleviate traffic congestion and improve air quality have been debated for years. This article looks at the reasons for successful utilization of HOV lanes and identifies some of the factors necessary for their success: meticulous planning, integration with transit, adequate access, adequate park and ride facilities. Today's question under debate, how to best utilize lanes for maximum benefit and commuter satisfaction, is then discussed. Suggestions such as allowing trucks to use HOV lanes for certain periods of the day, establishing a fee program for two-person vehicles, or setting up a sticker program for alternate day use are considered.

Kim, S-G, and others. “Statistical Assessment of Public Opinion Toward Conversion of General-Purpose Lanes to High-Occupancy Vehicle Lanes.” *Transportation Research Record*, 1485 (1995): 168-176.

Abstract: Converting general-purpose lanes to high-occupancy vehicle (HOV) lanes is a policy that has been meticulously avoided since the

public outcry opposing the lane conversion projects of the 1970s. Now that HOV lanes are firmly established in many metropolitan areas one has to wonder if public sentiments toward such lane conversions have changed. Public opinion of an HOV lane conversion recently completed in the Seattle metropolitan area is assessed. `The results show that although lane conversions are still strongly opposed by a substantial portion of the population, the intense public resistance encountered in the 1970s appears to be waning. Most of the survey respondents were either neutral or in favor of lane conversion projects.

Legislative Analysts Office (LAO). "HOV Lanes in California: Are They Achieving Their Goals?" Sacramento, Calif.: LAO, January 7, 2000.

Abstract: High occupancy vehicle (HOV) lanes are one of the primary tools used to reduce traffic congestion on the state highway system and improve air quality. However, in recent years, HOV lanes' effectiveness in achieving these goals has come into question. Based on review of available data, it is concluded that the performance of HOV lanes is mixed:

- On average, California's HOV lanes carry 2,518 persons per hour during peak hours—substantially more people than a congested mixed-flow lane and roughly the same number of people as a typical mixed-flow lane operating at *maximum* capacity.
- In terms of vehicles carried, however, California's HOV lanes are operating at only two-thirds of their capacity.
- Regional data indicate that HOV lanes do induce people to carpool, but the statewide impact on carpooling is unknown due to lack of data.
- The exact impact of HOV lanes on air quality is unknown.

LAO recommendations are:

- Caltrans should improve its HOV data collection efforts, conduct periodic statewide surveys to determine the impact of HOV lanes on carpooling, and report on lanes that fail Caltrans' minimum criteria of carrying 800 vehicles per hour.
- Caltrans and regional transportation planning agencies (RTPAs) should be more flexible in adjusting the hours of operation of HOV lanes.
- The legislature should create more high occupancy toll lanes on HOV lanes that have unused capacity and are adjacent to congested mixed-flow lanes.
- Caltrans should work with RTPAs to:
  - Develop a statewide plan to promote carpool lane usage.
  - Compile a set of performance measures and most cost-effective practices to increase carpool lane usage.

- Consider converting underutilized HOV lanes to mixed-flow where congestion *is not* present in mixed-flow lanes.

Lomax, T. "Tour de HOV - An Overview of Recent HOV Milestones." *Transportation Research Circular: 7th National Conference on High-Occupancy Vehicle Systems. Part 1: Plenary Sessions*, 442 (July 1995): 7-8.

Abstract: A brief tour guide overview of high occupancy vehicle (HOV) facilities is given. Included in the discussion are events that have occurred in HOV facilities and issues since the last HOV conference—both aspects that have changed and those that have not. For example, an aspect that has not changed is the growth rate of HOV projects, while an aspect that has changed is the number of new HOV lanes. Also discussed are the issues related to HOV facilities that need to be addressed, such as air quality impacts.

Metropolitan Transportation Commission. *1997 High-Occupancy Vehicle (HOV) Lane Master Plan Update for the San Francisco Bay Area.* Oakland, Calif.: MTC, November 1997.

Abstract: This report is intended to revisit the recommendations in the 1990 HOV Plan in light of performance of HOV lanes currently in operation in the Bay Area, revised funding projections, and more recent information concerning new HOV lane proposals. Each existing and proposed HOV lane is evaluated in the context of specific corridor travel patterns and mobility issues. Each HOV lane also is considered in the context of an overall corridor Metropolitan Transportation System (MTS) Management Strategy. These assessments lead to the conclusion that in some corridors HOV lanes provide needed future person carrying capacity that may not otherwise be accommodated by constructing mixed-flow lanes. In other corridors, existing or proposed HOV lanes may not be the most effective traffic management strategy, and other strategies, such as ramp metering and providing HOV lane ramp bypasses, where feasible, may be more preferable. The report contains recommendations for study or implementation of existing or new HOV lanes or other operational strategies in each corridor.

Metropolitan Transportation Commission and others. *Interstate 80 High Occupancy Vehicle (HOV) Lane Evaluation Report.* Oakland, Calif.: MTC, 22 July 1998.

Abstract: This report evaluates the seventeen-mile HOV between the San Francisco Bay Bridge and State Route 4 at Hercules. This HOV facility requires three or more persons per vehicle with certain exceptions. The evaluation is a good example of this type of document and covers a variety

of factors, including evaluation measures, enforcement and safety assessment, transit operations, possible toll lane, violation rates, and travel times.

Orski, C. K., and Poole, R. W. *Building a Case for HOT lanes: A New Approach to Reducing Urban Highway Congestion.* Los Angeles, Calif.: Reason Foundation, April 1999.

Abstract: Increasingly, high-occupancy (HOV) lanes are being called into question. Transportation researchers find them to be of limited value in relieving congestion, and elected officials are under increasing pressure to convert these limited-access lanes into general-purpose lanes. A number of metro areas are experimenting with a different alternative: opening up these limited-access lanes to paying customers. The new approach is called high-occupancy/toll (HOT) lanes. As of early 1999, two such projects are in operation in California and another in Texas. Because they give motorists a choice between (1) continuing to use general-purpose lanes at no direct charge and (2) using express lanes at a specific, direct price, HOT lanes are an example of "value pricing" (charging a price only for a higher level of service).

Paiewonsky, L. A "New Approach to HOV Entry Requirements: MassHighway's 3+/Limited 2+ Sticker Program." *Transportation Research Record*, 1634 (1998), 70-77.

Abstract: The Massachusetts Highway Department opened the I-93 Southeast Expressway high occupancy vehicle (HOV) lane in November 1995, under a three-person, or 3+, entry requirement. A 2+ rule was not implemented because studies indicated that the high number of existing two-person carpools would overload the narrow lane, causing it to fail. While the lane was an operational success, with general public support, the agency fielded continuing complaints about underutilization. In response, the Massachusetts Legislature and MassHighway designed a program to allow a limited number of two-person vehicles into the lane. MassHighway examined the results of the sticker program on incidents, lane violation rates, and HOV volumes. The program's impact on incidents was negligible, and the rate actually declined slightly in the months following its opening. The program had no impact on the HOV lane's already low violation rate, which was due to its barrier-protected, limited-access design. HOV volumes rose 29 percent on average following the opening of the sticker program. Surprisingly, given the high demand for stickers, relatively few recipients use the lane on a regular basis. A MassHighway survey of sticker recipients revealed some of the reasons for this phenomenon and confirmed several operational aspects about the HOV

lane in general. The sticker program represents a new solution to an old problem among HOV practitioners—how to balance the need for a congestion-free facility while meeting the need for public acceptance and perception of adequate utilization. The sticker program went a long way toward diffusing public criticism of the HOV lane while keeping vehicle volumes to a manageable level. The Southeast Expressway HOV sticker program represents one alternative for successfully metering 2+ demand.

Richard H. Pratt, Consultant, Inc., and others. *Traveler Response to Transportation System Changes: Interim Handbook*. TCRP Web Document 12 (Project B-12). Garrett Park, Md.: Pratt, March 2000.

Abstract: This interim handbook reports on seven chapters of the planned seventeen to be in the final handbook. Chapter 2, HOV Facilities, is of special interest to this study. The chapter includes the following:

- Objectives of HOV facilities,
- Types of HOV facilities and treatments,
- Analytical considerations,
- Traveler response summary,
- Traveler response to type of HOV application,
- Underlying traveler response factors,
- Related information and impacts,
- Additional resources,
- Case studies, and
- References.

San Diego Association of Governments. *Report to the California Legislature: San Diego's Interstate 15 Congestion Pricing & Transit Development Demonstration Program as Required by Section 149.1(g) of the Street & Highways Code*. San Diego, Calif.: SANDAG, December 1999.

Abstract: The Interstate 15 Congestion Pricing & Transit Development Demonstration Program, more commonly referred to as the I-15 Value Pricing Project, is a federally funded, $9.95 million demonstration program that allows single-occupant vehicles (SOVs) to use the existing high occupancy vehicle (HOV) lanes on Interstate 15 (I-15) for a fee. The project, which is managed by the San Diego Association of Governments (SANDAG), began in December 1996 and is generating revenue for transit service improvements in the I-15 corridor.

In September 1993, the State added §149.1 of the *Streets & Highways Code* authorizing the program. Senate Bill 252 (SB 252; Chapter 481 of the Statutes of 1999) extends the sunset date for the three-year pricing demonstration to 1 January 2002 and required SANDAG to submit a report

to the California Legislature on its findings, conclusions, and recommendations concerning the demonstration program on or before 1 January 2000. This report provides an overview of the project, a summary of findings to date, and the conclusions and recommendations, as required by SB 252.

Schiller, P. L. “High Occupancy Vehicle (HOV) Lanes: Highway Expansions in Search of Meaning.” *World Transport Policy & Practice*, 4, no. 2 (1998): 1-32.

Abstract: High occupancy vehicle lanes have been widely promoted and constructed in the U.S.A. in a belief that the provision of such facilities would improve transit performance, stimulate car and vanpool formation, and improve land use and air quality in urban areas. Critics, especially among environmentalists and alternative transportation advocates, assert that HOV lanes are merely highway expansions that promote more driving, weaken transit, increase air pollution, and facilitate suburban sprawl. This article demonstrates that, generally, HOV lanes are effective only to the extent that they are designed to fill transit and formal carpool program needs. Questions are also raised about the efficacy ideological and political considerations, rather than by careful analysis and planning.

West, C. “San Diego's HOV Operations and Plans.” *Transportation Research Circular: 7th National Conference on High-Occupancy Vehicle Systems. Part 1: Plenary Sessions*, 442 (July 1995): 18-19.

Abstract: High occupancy vehicle (HOV) planning activities currently underway in the San Diego area are discussed and the area's HOV operating facilities are described. A 140-mile HOV system plan is proposed for the San Diego region. In the development of the plan, both congestion levels and adequate median width were considered. The Regional Transportation Plan includes other policies addressing HOV facilities and supporting services. There is an extensive system of freeway entrance ramp meters in the county. HOV bypass lanes are being implemented at many of these ramps. The park-and-ride lot system is also being expanded and coordinated with the HOV facilities. Recently an HOV lane was opened at the San Ysidro border crossing. There is an HOV lane on the Coronado Toll Bridge. A bypass for buses leaving downtown San Diego is in operation in the Balboa Park area. Located on I-15 is a two-lane, reversible, barrier separated HOV facility. It is managed by an off-site traffic management center. The signs and barriers are operated electronically. The I-15 HOV lanes have been used for research and development activities associated with advanced technology projects. The potential of congestion pricing or HOV "buy in" is being considered for the

I-15 HOV facility with the excess revenue being used to support transit services in the corridor.

Williams, A. “Fast Times in the HOV Lane: Making a Case to Why HOV Lanes Are Good.” *TDM Review*, 7, no. 2 (May 1999): 11-12.

Abstract: The article discusses the controversy over whether High Occupancy Vehicle lanes (HOV) efficiently decrease peak hour congestion, increase traffic flow, improve air quality, and increase vehicle occupancy. Provided is a summary of some of the successes HOV lanes have had in the United States. In California, the San Francisco Bay Bridge provides a successful example in managing peak hour congestion: the four HOV lanes carry half of the people crossing the bridge during the peak hour while the remaining 14 mixed flow lanes carry the other half. A positive environmental impact can also be credited to the HOV facilities. The Texas Transportation Institute study has shown that the HOV lane produces a 12 perecent reduction in fuel consumed and a 59 percent reduction in carbon monoxide emissions compared to a general-purpose lane alternative.

APPENDIX C: RANKING SHEET AND RESULTS

APPENDIX C

HOV POTENTIAL NONPAYING USER RANKING FORM

↓ User Vehicles / Impact→	Air Quality	Fuel Savings	Enforcement	Safety	System Efficiency	Cost Effective	Capacity	Total Impact Points
a) Electric								
b) ULEV & SULEV								
c) Handicapped – licensed								
d) Handicapped – placard								
e) Veterans								
f) Light delivery truck								
g) U.S. Mail – light delivery truck								
h) Radio dispatched								
i) Police								
j) Tow trucks – CHP								
k) Tow trucks								
l) Emergency								
m) U.S. military – licensed								
n) U.S. military – on active duty								
o) Certified high mileage per gallon								
p) Multidriver								
q) Rental								
r) SOV even/odd license numbers								
s) Medical personnel								
t) Teachers								
u) Non-home-owners								
v) Antique - licensed								
w) Deadheading transit, school, etc.								
x) Two-axle service (utilities, etc.)								

Notes: See expanded listing for user vehicle descriptions. Rank 10 as highest favorable impact and 1 as lowest positive impact (negative impact).
Capacity is ranked P (pass) or F (fail) for ability to accommodate candidate users.

(Aug. 9, 2000 ed.)

APPENDIX C

HOV POTENTIAL NONPAYING USER RANKINGS

IMPACT→ / ↓ USER VEHICLES	Air Quality	Fuel Savings	Enforcement	Safety	System Efficiency	Cost Effective	Capacity	Total Impact Points
a) Electric	10	10	8	5	7	4	P	44
b) ULEV & SULEV	10	9	8	5	7	4	P	43
c) Handicapped – licensed	5	5	8	2	7	5	P	32
d) Handicapped – placard	5	5	5	3	7	5	P	30
e) Veterans	5	5	4	5	5	5	F	—
f) Light delivery truck	5	5	6	6	7	5	P	33
g) U.S. Mail – light delivery truck	6	6	7	7	7	6	P	39
h) Radio dispatched	6	6	6	7	7	6	P	38
i) Police	5	5	10	9	8	7	P	44
j) Tow trucks – CHP	6	6	10	9	8	7	P	46
k) Tow trucks	6	6	9	9	8	7	P	45
l) Emergency	6	6	10	9	8	7	P	46
m) U.S. military – licensed	4	4	9	9	6	5	P	37
n) U.S. military – on active duty	5	5	7	5	5	5	F	—
o) Certified high mileage per gallon	8	8	7	5	6	5	P	39
p) Multidriver	7	7	5	5	5	5	P	34
q) Rental	5	5	4	5	5	5	F	—
r) SOV even/odd license numbers	5	5	4	5	5	5	F	—
s) Medical personnel	5	5	4	5	6	6	P	31
t) Teachers	5	5	4	5	5	5	F	—
u) Non-home-owners	5	5	4	5	5	5	F	—
v) Antique - licensed	3	4	7	2	3	4	P	23
w) Deadheading transit, school, etc.	4	4	9	6	5	5	P	33
x) Two-axle service (utilities, etc.)	5	5	6	5	5	6	P	33

Notes: See expanded listing for user vehicle descriptions. Rank 10 as highest favorable impact and 1 as lowest positive impact (negative impact).
Capacity is ranked P (pass) or F (fail) for ability to accommodate candidate users.

[Aug. 9, 2000 ed.]

APPENDIX D: CALTRANS POLICY AND PROCEDURE FOR BUS AND CARPOOL (HOV) LANES

DEPARTMENT OF TRANSPORTATION

policy&procedure TPP89-01

SUBJECT: BUS AND CARPOOL (HOV) LANES	APPROVED BY: J. T. MALONEY	DATE: 3/16/89
		PAGE 1 OF 4
SUPERSEDES: HOV LANES	ORIGINATING UNIT: Division of Traffic Operations	
DISTRIBUTION:	DISTRIBUTION: Division and Districts through Office Chiefs	

I. BACKGROUND

Congestion and motorist delay on California's metropolitan freeways are increasing rapidly. Building new freeways or expanding existing facilities are often constrained by cost, right of way, environmental, and other factors. In such areas, high occupancy vehicle (HOV) lanes for ridesharing and transit vehicles can be an effective strategy to make the existing corridor more efficient. The objectives of properly designed, free flowing HOV lanes are as follows:

1. Increase the people-moving capacity of the freeway system.

2. Reduce overall vehicular congestion and motorist delay by encouraging greater HOV use.

3. Provide time and commute cost savings to the users of HOV lanes.

4. Increase overall efficiency of the system by allowing HOVs to bypass congestion on lanes designed for their use.

5. Improve air quality by decreasing vehicular emissions.

The authority for establishing HOV lanes is given in Section 25485 of the Public Resources Code, in Section 149 of the Streets and Highways Code, and in Section 21655.6 of the Vehicle Code. Requirements for approval of HOV lane projects by the regional transportation planning agencies or county transportation commissions are included in Section 21655.6 of the Vehicle Code.

Resolution G-87-8 passed by the California Transportation Commission (CTC) on July 23, 1987, and the Federal Highway Administration (FHWA), California Division, policy dated December 15, 1987, require the Department to consider the HOV lane alternative whenever capacity is added to existing metropolitan freeways. The CTC also requires the consideration of HOV lane alternatives for new metropolitan freeways, the development of regionwide HOV lane systems, and the inclusion of these systems in

A-1

the regional transportation plans. These policies describe the processes for the planning and the project development of HOV lanes.

II. POLICY

A. The Department will consider an HOV lane alternative for all capacity additions to metropolitan freeways or new metropolitan freeways.

B. The Department will work with regional transportation planning agencies in the conceptual planning phase to develop regionwide HOV lane system plans in metropolitan areas and to include these systems in the regional transportation plans.

C. The Department will recommend the programming of HOV lane projects which meet established criteria and are included in the regional transportation plans.

D. The Department will recommend HOV preferential lanes at ramp meters where appropriate.

III. PROCEDURE

A. Each of the Districts with major metropolitan areas (Districts 3, 4, 6, 7, 8, 10, 11 and 12) will work with the appropriate regional transportation planning agencies to develop regionwide HOV lane system plans for the metropolitan areas.

HOV lanes included in the system plans should conform to the following criteria:

1. One or more through lanes is being constructed by either a new freeway or adding capacity to an existing freeway.

2. The concept of an HOV facility is supported by the public and by local and regional agencies and officials.

3. The existing corridor is congested or will become congested within ten years from the finish of construction.

4. The HOV lane users would realize a significant savings in travel time.

5. The HOV lanes would be cost-effective based on an analysis of traffic projections including modal shift to HOVs.

6. There would be sufficient numbers of vehicles in the HOV lane to use the facility effectively.

7. The HOV lane contributes to the continuity of the planned regionwide HOV lane system and is not an isolated segment.

B. A range of HOV applications may be appropriate for a given freeway segment. The specific design and operational features will be based on such factors as transportation demand, timing, costs, safety, maintenance, enforcement needs, funding availability, environmental considerations, and community support. Specific applications include the following:

1. The goal is to optimize the people-moving capability of the HOV lanes. Because of greater capacity potential, bus transit of the several ridesharing modes shall be given preference in project planning with vanpooling and carpooling following.

2. Proposals for lane additions or new facilities will be analyzed for mixed-flow and HOV operation. The HOV lane alternative should:

   a. Ultimately result in less overall person delay or increased person-carrying capacity due to a modal shift to HOVs.

   b. Result in less delay to the HOVs because they bypass congestion, thereby encouraging modal shift.

3. Separate roadways for HOVs should be proposed when travel demand, cost-effectiveness and operational needs justify those facilities.

4. Subject to specified conditions, Section 162 of the Streets and Highways Code requires accommodation of rail in the design of HOV lanes on new alignment or on new structures. When warranted under these conditions, Caltrans shall provide for rail along with HOV lane projects on the freeway system when approved by local agencies.

IV. RESPONSIBILITY

A. The District Directors of Transportation are responsible for the following:

1. Implementing this policy.

2. Constructing HOV projects programmed in the STIP.

3. Coordinating with the CHP.

4. Seeking support from local legislators, the public and local governments for HOV projects identified in the regional transportation plans.

5. Coordinating with regional agencies in the regional transportation planning process.

B. The Chief, Division of Traffic Operations, is responsible for the following:

1. Establishing procedures and criteria to ensure policy implementation and propose policy revisions as necessary to address changing conditions.

2. Reviewing and evaluating policy implementation by the Districts and providing follow-up action as appropriate.

Attachment

Attachment to P89-01, 3/16/89

July 23, 1987

CALIFORNIA TRANSPORTATION COMMISSION
Bus and Carpool Lane Facilities
Resolution G-87-8

WHEREAS, Fiscal and environmental resources necessary for the continuing development of freeway facilities are increasingly constrained; and

WHEREAS, The costs of owning and operating a private passenger vehicle are generally out-pacing the consumer price index; and

WHEREAS, In most of California's metropolitan areas, occupancy of private passenger vehicles averages no more than 1.2 persons; and

WHEREAS, Bus and carpool lanes offer demonstrated benefit in time and cost savings to those individuals already choosing to use transit, carpools, or vanpools for home-to-work commute trips; and

WHEREAS, Bus and carpool lanes also offer an incentive to individuals to commence use of these modes, and maximum incentive results with effective operation and enforcement; and

WHEREAS, Vehicles eligible to use bus and carpool lanes often result in reduced emissions per person trip, reduced fuel consumption per person trip, and more efficient use of publicly financed capital facilities;

NOW, THEREFORE, BE IT RESOLVED, That in the planning of any new freeway facility or freeway capacity addition in and around a metropolitan area, the Department of Transportation and/or the regional transportation planning agency shall examine and report to the California Transportation Commission on the feasibility and potential benefits -- both short term and long term of the new project's operation -- of designating bus and carpool lane operation within that project, for at least peak, week-day commute hours; and

BE IT FURTHER RESOLVED, That such examinations should consider the possible extension of bus and carpool lane operation into existing, adjacent facilities to determine their contribution to the feasibility and beneficial operation of the bus and carpool lane facility within the new project; and

BE IT FURTHER RESOLVED, That in considering the approval of such projects, the California Transportation Commission shall also consider the aforementioned bus and carpool lane facility reports; and

A-5

Attachment to P 89-01, 3/16/89

BE IT FURTHER RESOLVED, That the Commission shall give serious consideration to the inclusion of at least a commute hour bus and carpool facility in every new freeway facility or freeway capacity addition in and around a metropolitan area when it is demonstrated to be both feasible and of likely benefit within either the short or long term; and

BE IT FURTHER RESOLVED, That the Commission shall also give serious consideration to extending such a bus and carpool facility to existing adjacent facilities when it is demonstrated to be feasible and of likely benefit and to contribute to the operation of the bus and carpool facility within the new project.

BE IT FURTHER RESOLVED, That in the metropolitan Districts the Department of Transportation shall work with the regional transportation agencies to plan region-wide bus and carpool lane systems and to include these systems in the regional transportation plans.

BE IT FURTHER RESOLVED, That the Commission shall continue to consider the inclusion of bus and carpool facilities in new metropolitan freeway construction and in metropolitan freeway capacity additions on a case by case basis until such time as acceptable bus and carpool lane systems for all major metropolitan areas are incorporated in regional transportation plans; thereafter, the Commission shall only determine whether such proposed urban freeway projects are included in the regional plans.

BE IT FURTHER RESOLVED, That it is the intent of the Commission to pursue all reasonable opportunities to support the concept of bus and carpool lanes and bus and carpool lane projects in general and particularly when meeting with elected officials, representatives of public and private organizations and the general public.

A-6

Attachment to P 89-01, 3/16/89

FEDERAL HIGHWAY ADMINISTRATION
CALIFORNIA DIVISION OFFICE
PROCEDURE MEMORANDUM

SUBJECT:	
Urban Freeway Reconstruction and HOV Projects	06103
	Dec. 15, 1987

BACKGROUND

As our freeway systems mature, traffic increase has caused a continued reduction in the level of service. Professional transportation planners and engineers have found that there is no practical way to provide sufficient freeways to accommodate demand. In most urbanized areas, no new freeway corridors are proposed or available, except at extremely high cost. The existing freeway system, therefore, must be operated as efficiently as possible considering the collective publics. One method of increasing existing freeway people-carrying capacity is to increase vehicle occupancy rate. More people can be moved with less energy and less air pollution while saving overall trip time. HOV lanes on urban freeways increase occupancy rates, and can move the equivalent person-trips of at least 3 conventional traffic lanes in peak hours thus often relieving overall congestion on the freeway.

As freeways are reconstructed, opportunities often exist to cost effectively add HOV lanes and thus substantially add people-carrying capacity to the reconstructed freeways. These opportunities should be fully considered in the planning and project development processes.

POLICY

- Regional Transportation Planning Agencies (RTPA) should develop in concert with Caltrans and local agencies, route specific region-wide HOV system plans as a part of the regional transportation plan in metropolitan areas. The RTPA shall have the opportunity to comment on projects which deviate from the HOV system plan.

- An HOV lane shall be an essential alternative for evaluation in the project development process when considering an additional lane by restriping and/or reconstruction or widening on freeways with three or more lanes in one direction.

- Support by the public is an essential factor for a successful HOV facility. It is therefore desirable that a public relations program be incorporated into the project development process for all HOV facilities. This public relations program is necessary to create public awareness and acceptance of the positive attributes of the HOV option in reducing congestion and air pollution.

- Freeway lanes, including HOV lanes, which are added by restriping and/or reconstruction or widening, and all other adjacent lanes and shoulders, shall be

Attachment to P 89-01, 3/16/89

constructed to full AASHTO geometric standards except as outlined below under Design Standards.

- There is a minimum vehicle occupancy criterion of 3 persons per vehicle for HOV facilities. Exceptions to this criterion require FHWA approval.

NOTE: See policy change on Page A-9.

DESIGN STANDARDS

The AASHTO publication "Guide for the Design of High Occupancy Vehicle and Public Transfer Facilities" gives guidance for design of HOV lanes. In general, lane width should be 12 feet. A 10-foot inside shoulder is desirable. Additional width within the median is encouraged at locations designated for enforcement.

Configurations which use less than full standard lane and shoulder widths require design exceptions. HOV facilities requiring design exceptions are considered staged development and serve as an interim means to relieve existing traffic congestion. When demonstrated effective, plans should be made to provide a standard cross-section to enhance safety and operational characteristics.

When a lane is added, either by restriping and/or reconstruction or widening, to a freeway with 3 or more lanes in one direction, exceptions to the AASHTO geometric standards will be considered in, but not limited to, the following situations:

- The new lane proposed is an HOV lane.
- The regional transportation plan includes an HOV system element favorably reviewed by Caltrans and FHWA and the proposed project is consistent with the HOV system element.
- The regional transportation plan does not yet include a region-wide HOV system; the new lane could be a mixed-flow lane if five years after opening, at the peak commute hour and operating as an HOV lane, the lane would carry fewer person-trips than a mixed-flow lane.

Bruce E. Cannon
Division Administrator

A-8

US Department of Transportation
Federal Highway Administration

Memorandum

Washington, D.C. 20590

Subject: Criteria for Use of High Occupancy Vehicle (HOV) Facilities

Date: SEP 22 1988

From: Director, Office of Engineering

Reply to Attn of: HNG-14
HTO-34

To: Regional Federal Highway Administrators
Direct Federal Program Administrator

Our February 4, 1985, and March 2, 1987, memorandums provided guidance on FHWA's policy regarding minimum vehicle occupancy criteria for HOV facilities constructed with Federal-aid funds.

We have reviewed our policy requiring a minimum of three persons per vehicle, with the means for exceptions to be granted by either Headquarters or regional offices, and have determined that it is no longer needed. While we continue to support the highest vehicle occupancy needed to ensure the success of an HOV facility, that determination should evolve through the normal project development phase.

The approval of HOV occupancy requirements will now be part of the normal process of FHWA review of proposed projects. The Office of Engineering and the Office of Traffic Operations will continue to provide technical assistance on HOV design and HOV operations, respectively.

Thomas O. Willett

A-9

APPENDIX E: CALIFORNIA 1998 LEGISLATION ON HOV LANES AND LOW EMISSION VEHICLES

BILL NUMBER: AB 71 CHAPTERED
BILL TEXT

CHAPTER 330
FILED WITH SECRETARY OF STATE SEPTEMBER 7, 1999
APPROVED BY GOVERNOR SEPTEMBER 7, 1999
PASSED THE ASSEMBLY AUGUST 26, 1999
PASSED THE SENATE AUGUST 24, 1999
AMENDED IN SENATE JULY 14, 1999
AMENDED IN SENATE JUNE 28, 1999
AMENDED IN ASSEMBLY APRIL 26, 1999
AMENDED IN ASSEMBLY FEBRUARY 3, 1999

INTRODUCED BY Assembly Members Cunneen and Margett
(Principal coauthor: Assembly Member Knox)
(Coauthors: Assembly Members Leach, Leonard, and Scott)

DECEMBER 7, 1998

An act to amend, repeal, and add Section 40000.13 of, and to add and repeal Sections 5205.5 and 21655.9 of, the Vehicle Code, relating to vehicles.

LEGISLATIVE COUNSEL'S DIGEST

AB 71, Cunneen. High-occupancy vehicle lanes: low-emission vehicles.

(1) Existing law authorizes the Department of Transportation, with respect to highways under its jurisdiction, to authorize or permit the exclusive or preferential use of highway lanes for high-occupancy vehicles.

This bill would require the Department of Transportation whenever it authorizes or permits exclusive or preferential use of highway lanes or highway access ramps for high-occupancy vehicles, to also extend the use of those lanes or ramps to vehicles that have been issued distinctive decals, labels, or other identifiers because the vehicles meet (1) California's ultra low-emission vehicle (ULEV) standards beginning July 1, 2000, and through December 31, 2003, or (2) California's super ultra-low emission vehicle (SULEV) standards on and after January 1, 2004, and through December 31, 2007, for exhaust emissions, as specified, and (3) the federal inherently low-emission vehicle (ILEV) evaporative standard, as defined in federal regulations, regardless of vehicle occupancy or ownership.

In addition, for the purpose of implementing these provisions, the bill would require the Department of Motor Vehicles to make available for issuance distinctive decals, labels, or other identifiers for vehicles described above that clearly distinguishes them from other vehicles. The Department of the California Highway Patrol would be required to specify the placement and design of the decals, labels, or other identifiers. The bill would require the Department of Motor Vehicles to include a summary of the provisions relating to the distinctive decals, labels, or other identifiers on each motor vehicle registration renewal notice or on a separate insert, as specified.

(2) The bill would prohibit any person from operating or owning a vehicle that displays a decal, label, or other identifier if that identifier was not issued to that vehicle. Because a violation of this prohibition would be a crime, the bill would impose a state-mandated local program.

(3) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

(4) The bill would provide that its provisions shall remain in effect only until January 1, 2008, and as of that date are repealed, unless a later enacted statute deletes or extends that date.

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. The Legislature hereby finds and declares all of the following:

(a) The federal Clean Air Act Amendments of 1990 (Public Law 101-549) sought to accelerate the deployment of inherently low emission vehicles (ILEVs) through the use of nonmonetary incentives in areas that do not meet federal ambient air quality standards.

(b) Federal regulations to implement these federal Clean Air Act Amendments were adopted by the United States Environmental Protection Agency in 1993, and are set forth in Part 88 (commencing with Section 88.101-94) of Title 40 of the Code of Federal Regulations. These federal regulations direct states to exempt federally certified and labeled ILEVs in fleets from high-occupancy vehicle (HOV) restrictions for single-occupant vehicles (Sec. 88.313-93, Title 40, C.F.R.). Five years later, California has not yet conformed to those federal regulations.

(c) In addition to these federal requirements pertaining to ILEVs in fleets the Transportation Equity Act for the 21st Century (Public Law 105-178), commonly known as TEA-21, encourages and permits states to extend the HOV lane access exemption to nonfleet owners of ILEVs.

(d) In most instances, existing HOV lanes in California are uncongested and underutilized, resulting in less than optimal traffic flow. Traffic flow efficiency and air quality would, therefore, be improved by an exemption for ILEVs from the HOV lane access restrictions in these uncongested HOV lanes.

(e) The federal regulations provide a mechanism for California and other states to remove congested HOV lanes, or portions thereof, from having access by single-occupant ILEVs, thus guaranteeing that ILEVs cannot be a cause of congestion in HOV lanes.

(f) The federal regulations affirm a state's authority to establish ILEV identification requirements, in addition to the EPA requirements, that are necessary and appropriate to facilitate enforcement.

(g) California's urban air quality is the worst of any state in the United States, with over 80 percent of our population living in areas that do not meet federal or state ambient air quality standards, and approximately 75 percent of our urban smog coming from mobile sources, primarily light-duty cars and trucks.

(h) The people of California want and need healthful air quality, and are well served by incentive-based approaches to encourage early deployment of cleaner vehicles at little or no cost to the state.

SEC. 2. Section 5205.5 is added to the Vehicle Code, to read:

5205.5. (a) For the purposes of implementing Section 21655.9, beginning July 1, 2000, and through December 31, 2003, the department, in consultation with the Department of the California Highway Patrol, shall make available for issuance, for a fee determined by the department to be sufficient to reimburse the department for actual costs incurred pursuant to this section, distinctive decals, labels, or other identifiers for vehicles that

meet California's ultra-low emission vehicle (ULEV) standard for exhaust emissions and the federal ILEV evaporative emission standard, as defined in Part 88 (commencing with Section 88.101-94) of Title 40 of the Code of Federal Regulations, in a manner that clearly distinguishes them from other vehicles.

(b) For the purposes of implementing Section 21655.9, beginning January 1, 2004, and through December 31, 2007, the department shall make available for issuance, for a fee determined by the department to be sufficient to reimburse the department for actual costs incurred pursuant to this section, distinctive decals, labels, and other identifiers for vehicles that meet California's super ultra-low emission vehicle (SULEV) standard for exhaust emissions and the federal inherently low-emission vehicle (ILEV) evaporative emission standard, as defined in Part 88 (commencing with Section 88.101-94) of Title 40 of the Code of Federal Regulations, in a manner that clearly distinguishes them from other vehicles.

(c) The department shall include a summary of the provisions of this section on each motor vehicle registration renewal notice, or on a separate insert, if space is available and the summary can be included without incurring additional printing or postage costs.

(d) The Governor may remove individual high-occupancy vehicle (HOV) lanes, or portions of those lanes, during periods of peak congestion from the ILEV access provisions provided in subdivisions (a) and (b), following a finding by the Department of Transportation as follows:

(1) The lane, or portion thereof, exceeds a level of service C, as discussed in subdivision (b) of Section 65089 of the Government Code.

(2) The operation or projected operation of the vehicles described in subdivisions (a) and (b) in these lanes, or portions thereof, will significantly increase congestion.

The finding also shall demonstrate the infeasibility of alleviating the congestion by other means, including, but not limited to, reducing the use of the lane by noneligible vehicles, further increasing vehicle occupancy, or adding additional capacity.

(e) For purposes of subdivisions (a) and (b), the Department of the California Highway Patrol shall design and specify the placement of the decal, label, or other identifier on the vehicle. Each decal, label, or other identifier issued for a vehicle shall display a unique number, which number shall be printed on, or affixed to, the vehicle registration.

(f) This section shall remain in effect only until January 1, 2008, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2008, deletes or extends that date.

SEC. 3. Section 21655.9 is added to the Vehicle Code, to read:

21655.9. (a) Whenever the Department of Transportation authorizes or permits exclusive or preferential use of highway lanes or highway access ramps for high-occupancy vehicles pursuant to Section 21655.5, the use of those lanes or ramps shall also be extended to vehicles that are issued distinctive decals, labels, or other identifiers pursuant to Section 5205.5 regardless of vehicle occupancy or ownership.

(b) No person shall drive a vehicle described in subdivisions (a) and (b) of Section 5205.5 with a single occupant upon a high-occupancy vehicle lane pursuant to this section unless the decal, label, or other identifier issued pursuant to Section 5205.5 are properly displayed on the vehicle, and the vehicle registration described in Section 5205.5 is with the vehicle.

(c) No person shall operate or own a vehicle displaying a decal, label, or other identifier, as described in Section 5205.5, if that decal, label, or identifier was not issued for that vehicle pursuant to Section 5205.5. A violation of this subdivision is a misdemeanor.

(d) This section shall remain in effect only until January 1, 2008, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2008, deletes or extends that date.

SEC. 4. Section 40000.13 of the Vehicle Code is amended to read:

40000.13. A violation of any of the following provisions is a misdemeanor, and not an infraction:

(a) Section 16560, relating to interstate highway carriers.

(b) Sections 20002 and 20003, relating to duties at accidents.

(c) Section 21200.5, relating to riding a bicycle while under the influence of an alcoholic beverage or any drug.

(d) Section 21651, subdivision (b), relating to wrong-way driving on divided highways.

(e) Section 21655.9, subdivision (c), relating to illegal use of decals, labels, or other identifiers.

(f) Section 22520.5, a second or subsequent conviction of an offense relating to vending on or near freeways.

(g) Section 22520.6, a second or subsequent conviction of an offense relating to roadside rest areas and vista points.

(h) This section shall remain in effect only until January 1, 2008, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2008, deletes or extends that date.

SEC. 5. Section 40000.13 is added to the Vehicle Code, to read:

40000.13. A violation of any of the following provisions is a misdemeanor, and not an infraction:

(a) Section 16560, relating to interstate highway carriers.

(b) Sections 20002 and 20003, relating to duties at accidents.

(c) Section 21200.5, relating to riding a bicycle while under the influence of an alcoholic beverage or any drug.

(d) Section 21651, subdivision (b), relating to wrong-way driving on divided highways.

(e) Section 22520.5, a second or subsequent conviction of an offense relating to vending on or near freeways.

(f) Section 22520.6, a second or subsequent conviction of an offense relating to roadside rest areas and vista points.

(g) This section shall become operative on January 1, 2008.

SEC. 6. No reimbursement is required by this act pursuant to Section 6 of Article XIIIB of the California Constitution because the only costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIIIB of the California Constitution.

APPENDIX F: SANDAG LETTER

San Diego
ASSOCIATION OF
GOVERNMENTS

401 B Street, Suite 800
San Diego, CA 92101-4231
(619) 595-5300 Fax (619) 595-5305
www.sandag.cog.ca.us

August 2, 2000

Mr. George E. Gray
Research Associate
IISTPS
9720 Oviedo Street
San Diego, CA 92129

Dear Mr. Gray:

Thank you for the notice of the upcoming meeting to discuss the IISTPS Study entitled Non-Pricing Methods to Optimize High Occupancy Vehicle Lane Usage.

As you know, SANDAG has been an active participant in efforts to improve the usage of the excess capacity of high occupancy vehicle (HOV) lanes. The FasTrak project along I-15 is a model for similar efforts across the country.

HOV lanes are intended to relieve congestion in heavily traveled corridors as well as provide attendant air quality and energy benefits. Allowing single occupant electric and hybrid low emission vehicles to use these lanes would be consistent with the goals of the region's HOV program. There may also be some regional benefit to allowing in-service emergency vehicles (police, fire, ambulance, freeway service patrol truck, etc.) to use these lanes given the potential to relieve congestion in the corridor. Affording access for any of the other types of vehicles listed in your chart "HOV Potential Nonpaying User Ranking" seems contrary to the intent of the HOV program.

SANDAG would definitely agree with the study's purpose of increasing the utilization of HOV lanes. We would urge you to pursue alternatives that reinforce the long-range goals of the program to get people out of their single occupant vehicles. Besides the value pricing approach already in place along I-15, you may want to investigate any of a number of transportation demand management concepts including monetary incentives for carpooling, vanpooling, and transit.

Again, thank you for the notice of your upcoming meeting. We would appreciate being kept informed as you proceed with this study and would be happy to comment on any of your draft documents.

Sincerely,

ERIC C. PAHLKE
Director of Transportation

ECP/jdk

cc: Gary Gallegos, Caltrans District 11

APPENDIX G: CALIFORNIA AIR RESOURCES BOARD LETTER

Winston H. Hickox
Agency Secretary

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
2020 L Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Gray Davis
Governor

September 19, 2000

Mr. George E. Gray
Team Leader
IISTPS
9720 Oviedo Street
San Diego, California 92129

Dear Mr. Gray:

Thank you for your inquiry, dated September 1, 2000, regarding motor vehicle fuel economy data, and your request for comments regarding the Institute's study to improve usage of High Occupancy Vehicle (HOV) lanes.

I understand that the Air Resources Board (ARB) staff has already provided you via e-mail with on-line sources for fuel economy data from the United States Environmental Protection Agency, and the United States Department of Energy (www.epa.gov/omswww/mpg.htm, and www.fueleconomy.gov). This data is the same as that maintained in our motor vehicle certification files and is formatted for easy printing and / or analysis.

The ARB supports your effort to develop a proposal to better utilize HOV lane capacity in a way that will reduce emissions from motor vehicle operation and promotes fuel efficiency. As such, we are in basic agreement that operators of clean and fuel-efficient vehicles should be given priority in access to HOV lanes if it is decided that allowing more single occupant vehicles to use the lanes effectively reduces traffic congestion. This policy would promote greater use of clean, fuel-efficient vehicles. On a technical note, we would like to point out that vehicles with high fuel efficiency are not necessarily low emitting vehicles, and vice versa. Therefore, both factors would need to be considered to best achieve your stated goals.

Thank you again for your letter. If you have any questions or comments, please contact Mr. Tom Cackette, Chief Deputy Executive Officer, at (916) 322-2892.

Sincerely,

Alan C Lloyd

Alan C. Lloyd, Ph.D.
Chairman

APPENDIX H: CALIFORNIA HIGHWAY PATROL LETTER

State of California—Business, Transportation and Housing Agency GRAY DAVIS, Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL
2555 First Avenue
Sacramento, California 95818
(916) 657-7152
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

September 28, 2000

File No.: 1.A11494.052.iistpsltr

Mr. George E. Gray
IISTPS Team Leader
9720 Oviedo Street
San Diego, CA 92129

Dear Mr. Gray:

Thank you for the opportunity to comment on issues germane to the study of high occupancy vehicle (HOV) lanes being conducted by the Mineta International Institute for Surface Transportation Policy Studies on behalf of the California Department of Transportation. I will address the issues in the order presented by your letter dated September 1, 2000.

1. With regard to specific legislation recognizing emergency vehicles as legitimate HOV lane users, Section 2410 of the California Vehicle Code (CVC) currently authorizes officers of the California Highway Patrol (CHP), in the event of a fire or other emergency, to direct traffic as conditions may require. This provision of the CVC adequately serves the CHP's purposes for emergency vehicles operating in HOV lanes. Therefore, additional statutory provisions are not required.

   Any legislation to create a blanket type authority for emergency vehicles to use HOV lanes would be directed at single occupant vehicles and require some method of determining when the vehicles were being operated as emergency vehicles or as non-emergency vehicles. In this light, additional legislation recognizing emergency vehicles would only complicate the operation and management of HOV lanes.

2. The use of on-board electronic devices, transponders, to identify vehicles legitimately allowed in HOV lanes without regard to the number of occupants, typically single occupant vehicles, is in concept interesting but currently not feasible for a number of reasons. The number of specific low emission vehicles exempt from the HOV occupancy requirements is minuscule compared to the total number of vehicles operating in HOV lanes and does not justify the cost of the electronic equipment that would be required for this verification process. Adding more electronic gear to CHP vehicles and the attention it demands would only tend to degrade the operating environment of patrol officers. Additionally, limitations in the ability to identify which particular vehicle out of group of vehicles is emitting a transponder signal limits the usefulness of transponders for HOV lane enforcement.

Mr. George E. Gray
Page 2

September 28, 2000

The current practice of using distinctive decals to identify specific low emission vehicles exempt from HOV lane occupancy requirements has just begun. This method has been more than adequate for enforcement purposes of the CHP. The cost of the decals is extremely low compared to the cost of transponders for private vehicles and electronic devices for CHP vehicles. Also, transponders could easily be transferred to vehicles not eligible for HOV lane exemptions whereas the decals used to identify the low emission vehicles currently exempted from HOV requirements are manufactured to be nontransferable.

I trust this information will be of assistance to you. If you have any further questions or concerns, please feel free to contact Captain Karen A. Douglas in our Office of Special Projects at (916) 657-7222.

Sincerely,

D. O. HELMICK
Commissioner

ABOUT THE AUTHORS

GEORGE E. GRAY

Principal Investigator George E. Gray is a transportation consultant, and holds a BS degree in civil engineering from Stanford University, an MPA from California State University, San Diego, and an ME in Engineering from the University of California at Davis. He has worked on several MTI publications, including *Impacts of the North American Free Trade Agreement*, and *NAFTA II: California Border Zone Land Transportation Issues.* He is a member of the Transportation Research Board and is a life member of the American Society of Civil Engineers. Mr. Gray has been published in numerous periodicals, and has presented papers at many conferences and symposia.

STUART HARVEY

Research Associate Stuart Harvey is a registered Civil and Traffic Engineer. He holds a BS from San Diego State University, and had over 40 years of experience with the California Department of Transportation in planning, design, maintaining and operating transportation facilities. Mr. Harvey is a fellow in the Institute of Transportation Engineers, and retired from Caltrans in January 2000.

NORMAN KELLEY

Research Associate Norman Kelley holds a BS from the University of the State of New York, and postgraduate work at Pepperdine University. He has over 30 years of domestic and international executive experience, and was the Director of Transportation for the California Public Utilities Commission, and an Assistant Director at Caltrans.

PRE-PUBLICATION PEER REVIEW

San José State University, of the California State University System, and the Mineta Transportation Institute Board of Trustees have agreed upon a peer review process required for all research published by the Institute. The purpose of the review process is to ensure that the results presented are based upon a professionally acceptable research protocol.

Research projects begin with the approval of a scope of work by the sponsoring entities, with in-process reviews by the Mineta Transportation Institute Research Director and the project sponsor. Periodic progress reports are provided to the Research Director and the Research Associate Policy Oversight Committee (RAPOC). Review of the draft research product is conducted by the Research Committee of the Board of Trustees and may include invited critiques from other professionals in the subject field. The review is based on the professional propriety of the research methodology.