

THE SANTA MONICA FREEWAY DIAMOND LANES:  
EVALUATION OVERVIEW

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The Santa Monica Freeway Diamond Lanes, a pair of concurrent-flow preferential lanes for buses and carpools linking the City of Santa Monica, California with the Los Angeles Central Business District (CBD), opened on March 16, 1976 and operated amid much controversy for 21 weeks until the U.S. District Court halted the project. The Diamond Lane project marked the first time preferential lanes had been created by taking busy freeway lanes out of existing service and dedicating them to the exclusive use of high-occupancy vehicles. Although the Diamond Lanes entailed no major physical modifications or construction on the freeway itself, they caused significant physical and emotional dislocation among freeway drivers, public officials and other residents of Los Angeles, and generated considerable controversy regarding the reported and actual impacts of the project. This paper summarizes the findings of the official, objective, independent evaluation of the project sponsored by the U.S. Department of Transportation as part of the UMTA Service and Methods Demonstration Program. The paper addresses a broad range of project impacts in the following major areas: traffic speeds and travel times; traffic volumes and carpool formation; bus operations and ridership; safety and enforcement; energy and air quality; and public attitudes and response. Analysis shows that the project succeeded in increasing carpool ridership by 65% and the increased bus service accompanying the Diamond Lanes caused bus ridership to more than triple. Nonetheless, energy savings and air quality improvements were insignificant, freeway accidents increased significantly, non-carpoolers lost far more time than carpoolers gained, and a heated public outcry developed which has delayed the implementation of other preferential treatment projects in Southern California and given planners and public officials in other areas ample cause for reflection before attempting to implement similar projects.

The Santa Monica Freeway, which connects the City of Santa Monica and downtown Los Angeles, is one of the most heavily traveled freeways in the world, and is served by a variety of sophisticated traffic control devices, including metered on-ramps with preferential entry provisions at selected locations, a computerized

surveillance system, and centrally-controlled electronic displays. On March 15, 1976, the California Department of Transportation (CALTRANS), acting in conjunction with the California Highway Patrol (CHP) and local bus operators, reserved the median lane in each direction of a 12-mile, eight-lane segment of the Santa Monica Freeway for the exclusive use of buses and carpools carrying three or more occupants. The reserved lanes, known locally as the Diamond Lanes, operated in each direction during the peak hours of traffic flow. No barriers separated these lanes from the remaining flow of freeway traffic. Implementation of the Diamond Lanes was accompanied by the introduction of a variety of express bus services and the opening of three new Park-and-Ride lots in Western Los Angeles.

The project neither started nor ended as scheduled. The original starting date was delayed by a combination of concerns including operational readiness, financial problems, a local dispute over the implications of nationwide labor protective agreements, and the Southern California rainy season. When the Diamond Lanes finally opened, the first day of operations was disastrous, featuring bumper-to-bumper traffic, long queues at on-ramps, a malfunctioning ramp meter, many accidents, outraged drivers, poor press notices, and derisive news commentary. As the project progressed, freeway performance improved somewhat and both bus and carpool ridership increased, but accidents remained a serious problem as the climate of public opinion and the media reaction grew more hostile. The preferential lanes operated amid much controversy for 21 weeks until August 9, 1976, when Judge Matthew Byrne of the U.S. District Court in Los Angeles halted the project and ordered additional environmental studies prior to its continuation.

Much of the controversy surrounding the Diamond Lanes consisted of conflicting claims regarding the ability of the project to accomplish its stated objectives of conserving energy, improving air quality, and expanding effective freeway capacity by increasing the occupancy of buses and automobiles using the freeway. An independent analysis of the vast quantities of data assembled by both friends and foes of the project reveals that, although some of the stated objectives had been attained by the close of the demonstration, the cost in accidents, driver delay, and public outrage was far greater than anyone had anticipated. Major findings of the analysis are

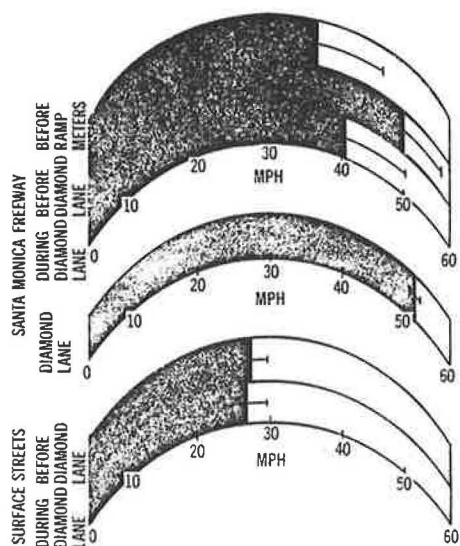
summarized below.

### Traffic Speeds and Travel Times

#### Vehicle Speeds

The dedication of the Diamond Lanes to the exclusive use of buses and high-occupancy vehicles, and the accompanying changes in ramp metering rates, had a marked impact on vehicle speeds on the Santa Monica Freeway. *The speeds of vehicles using the Diamond Lanes were significantly faster and steadier than the speeds of vehicles in the remaining non-preferential lanes, which were generally slower and less predictable than pre-project speeds.* Although the speeds of non-carpoolers improved as the demonstration progressed, they never returned to meter-controlled, pre-project levels. Average freeway driving times for non-carpoolers traveling the full length of the project over the last seven weeks of the demonstration were slightly more than one minute longer than pre-project levels in the westbound direction during the evening and more than four minutes longer in the eastbound direction during the morning.

Figure 1. A.M. Eastbound Travel Speeds



Average statistics do not provide a complete picture of travel times in adjacent lanes, since these times varied considerably during the morning and evening hours of operation. The non-carpooler entering the eastbound freeway at 6:30 A.M. found his travel time to Los Angeles increased by roughly one minute during the demonstration. By 8:00 A.M., however, the additional delays in freeway travel time approached nine minutes per trip. The difference between the average travel time measured over the full span of Diamond Lane operating hours and the actual travel times experienced by motorists during specific peak travel periods, coupled with the greater uncertainty associated with travel during Diamond Lane operations, helps to explain some of the skepticism reported in the press while the project was still in progress.

Speeds recorded by carpoolers in the Diamond Lanes were both faster and more consistent than pre-demon-

stration speeds. Carpoolers traveling the full length of the Diamond Lanes were able to save 2 to 3 minutes over pre-project travel times in other lanes.

Aggregate travel speeds on the surface streets paralleling the freeway slowed slightly during the demonstration, dropping by about 4.5% as former freeway users transferred to surface streets.

#### Entry Ramp Conditions

Over a period of two years prior to the Diamond Lane demonstration, traffic signals were installed on the Santa Monica Freeway on-ramps to control the number and spacing of cars entering the freeway during the peak hours. Before these ramp meters were installed, general vehicle speeds on the freeway were slightly slower than the speeds attained by non-carpoolers during the Diamond Lane demonstration. The installation of these ramp meters greatly improved traffic speeds on the freeway by limiting entering vehicles to a fixed rate of flow. Although vehicles entering the freeway spent an average of two minutes waiting at the ramp meters, this delay was more than offset by the time saved in traveling in the improved traffic conditions on the freeway itself.

Metering rates on most freeway access ramps were adjusted during the week preceding the opening of the Diamond Lanes. In some instances, these adjustments represented severe departures from pre-project conditions. The adjustments were designed to alleviate anticipated freeway congestion and, in most cases, increased the length of time motorists were required to wait in queues before entering the freeway. As the project continued, metering rates were readjusted in response to actual traffic conditions, but these attempts to fine-tune the system did not match the sweeping changes made before opening day in either the magnitude of the adjustments or the number of ramps affected.

Once the confusion and adjustments of the first week were past, few changes in ramp delays were observed during the peak hours of travel. *Average delays at the metered ramps carrying the bulk of entering traffic increased between one and five minutes per car during the project.*

At 12 of the 30 metered entry ramps, preferential access lanes permitted buses and vehicles with two or more occupants to bypass the metered system. The bypass lanes at these selected ramps saved buses and two-person carpools between two and seven minutes per trip during the Diamond Lane demonstration.

The average increase in queue lengths at freeway on-ramps were not so pronounced as the increases in ramp waiting times. There were relatively few instances in which the Diamond Lane metering changes caused vehicle queues to extend dramatically beyond the ramp storage capacity, and speed measurements showed that the queue increases did not appear to cause additional interference with traffic on north-south feeder roads.

#### Total Trip Times

Measured Freeway Trip Times. Considering both ramp delays and slower freeway speeds, measured increases in average trip times for non-carpoolers traveling eastbound on the freeway in the morning were as high as six to seven minutes per trip for those drivers starting at one end of the project and traveling to the other. Drivers entering the freeway about midway along the length of the project experienced negligible increases in total travel times.

At each of the entry ramps with a bypass lane for buses and two-person carpools, the amount of time saved by using the ramp bypass exceeded the

amount of time saved by traveling in the Diamond Lane to the lane's end. *That is, the relative delays imposed on single-occupant automobiles at preferential on-ramps were greater than those imposed by the Diamond Lane itself.*

**Perceived Trip Times.** The changes on freeway travel times encountered during the Diamond Lane demonstration may also be viewed in the light of the total door-to-door commuting times perceived by drivers in the freeway corridor. The average door-to-door trip reported by a sampling of 2,800 corridor drivers was 21 minutes long, and took 37.4 minutes in the morning and 43.2 minutes in the evening. Diamond Lane carpoolers responding to a survey questionnaire reported an average savings of 1.5 minutes over pre-project travel times. Non-carpoolers reported an increase in trip times of 8.3 minutes in the morning and 9.4 minutes in the evening. These perceived increases are slightly higher than freeway measurements indicate are likely, and include a number of impossibly high reports (greater than 30 minutes) of average trip delays. Not unexpectedly, non-carpoolers appear to have overestimated the average delays accompanying the Diamond Lane demonstration. Given the increased uncertainty accompanying travel in the non-preferential lanes, however, delays on any single day could have been much higher than the average measured increase of six to seven minutes.

Traffic Volumes

Freeway Traffic Volumes

The changes in travel speeds experienced during the demonstration were accompanied by significant shifts in traffic patterns. The total number of vehicles and people using the Santa Monica Freeway dropped markedly during the early weeks of the demonstration, and then rose steadily. The early decline in freeway traffic reflected a combination of carpool formation, growing bus ridership, and defection to surface streets by non-carpoolers. *By the close of the demonstration, the number of people using the easternmost segments of the freeway was within 2% of pre-project levels, while vehicle volumes had declined by 10%.* Summary Table 1 provides more detail on changes before, during and after the project as measured at observation points near the Los Angeles CBD.

Table 1. Average Daily Vehicle and Passenger Statistics, Santa Monica Freeway at Crenshaw Boulevard.

(Seven-Hour Peak Periods, Both Directions of Travel)

Statistic	Before Project	DURING DIAMOND LANE PROJECT			After Project
		First Seven Weeks	Second Seven Weeks	Final Seven Weeks	
Total Vehicles	113,135	76,738	97,197	101,678	112,059
	---	(-32%)*	(-14%)*	(-10%)*	(-1%)*
Total People	138,873	101,643	128,180	136,471	140,507
	---	(-27%)*	(-8%)*	(-2%)*	1%*
Bus Ridership	1,171	3,092	3,569	3,810	2,916
	---	164%*	205%*	225%*	149%*
Passengers/Vehicle	1.23	1.32	1.32	1.34	1.25
	---	8%*	7%*	9%*	2%*
Three-Person Carpools	3,479	4,345	4,923	5,749	3,652
	---	25%*	42%*	65%*	5%*

\* Number % Increase (Decrease)

Measurements made at different points along the freeway reflect the same general pattern of usage depicted in Summary Table 1, although shifts in vehicle and passenger movement were less pronounced at locations farther removed from the CBD. Although directional trends on the Santa Monica Freeway are less pronounced than on most major freeways, the greatest changes in vehicle and passenger movement during the demonstration occurred in the peak directions of travel (eastbound in the morning and westbound in the evening), where congestion was greatest in the non-preferential lanes. By the last seven weeks of the demonstration, the freeway carried an average of 9% fewer people in 17% fewer vehicles in the peak directions of travel.

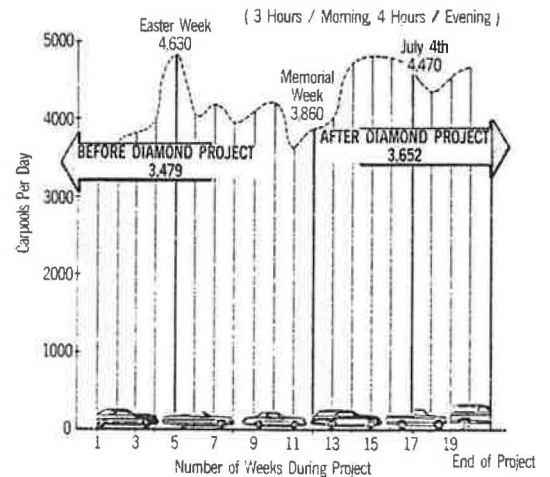
Vehicle volumes at all measuring points increased over pre-project volumes during the midday hours when the Diamond Lanes were not operational. The extent of the increase on vehicle volumes between the hours of 10:00 A.M. and 3:00 P.M. ranged between 2% and 6% over pre-project levels, indicating that drivers who had some flexibility in their choice of travel times elected to travel during the midday lull rather than face the much-publicized freeway congestion during Diamond Lane operating hours.

Prior to the project, each lane of the Santa Monica Freeway carried approximately 1,800 vehicles per hour during peak periods of flow. During the project, the Diamond Lanes carried an average of 300 vehicles per hour in the peak eastbound direction and 500 vehicles per hour in the peak westbound direction. Thus, the preferential lanes operated at between 20 and 30% of their vehicular capacity, and appeared relatively empty when compared with the heavily congested adjacent lanes. Even so, the number of people carried by the Diamond Lanes approached the number carried by the remaining lanes by the end of the project, and the unused capacity in each preferential lane supplied the Santa Monica Freeway with at least as much reserve capacity as two additional lanes operating at pre-project occupancy rates.

Carpool Formation

*The number of carpools carrying three or more people on the Santa Monica Freeway increased significantly during the demonstration, rising 65% above pre-project levels by the last seven weeks of the project.* The growth of carpool usage was relatively steady throughout the project, with pronounced peaks

Figure 2. Daily Diamond Lane Carpool Volumes Counted at Western Avenue.



during vacation periods. Afternoon traffic in the eastbound Diamond Lane increased markedly during the Easter holiday week, and rose steadily following Memorial Day, suggesting that much of the increased Diamond Lane usage during these vacation periods may be attributed to groups of vacationing beachgoers returning from the ocean. Although no formal data were assembled to support this observation, Diamond Lane observers noted a number of surfboard sightings during the periods in question.

The average size of the carpools using the Diamond Lanes was 3.4 people. The primary incentive for forming a carpool mentioned by most of the carpools surveyed (63%) was to save money. Only 25% of the carpools responding to the survey were initially formed during the Diamond Lane demonstration period, and only 30% of these carpools identified the Lanes as the primary incentive behind their decision to carpool. With the disappearance of the Diamond Lanes, the number of cars on the freeway dropped to within 5% of pre-project levels, suggesting that the Lanes themselves were more of an incentive to those carpools formed during the demonstration than the survey responses indicated.

#### Surface Street Volumes

Traffic volumes on surface streets parallel to the freeway rose between 10% and 15% shortly after the demonstration began, then appeared to subside somewhat during the summer months. Surface street vehicle occupancy rates did not change significantly during the demonstration.

By taking into account Santa Monica Freeway users, surface street travelers, and former Santa Monica Freeway users traveling on different freeways or during less congested time periods, a rough comparison of vehicle and passenger movement across the entire Santa Monica Freeway corridor near the CBD indicates that *by the last seven weeks of the project, 1% more people were traveling in 5% fewer vehicles than were being used prior to the demonstration.*

#### Bus Operation and Ridership

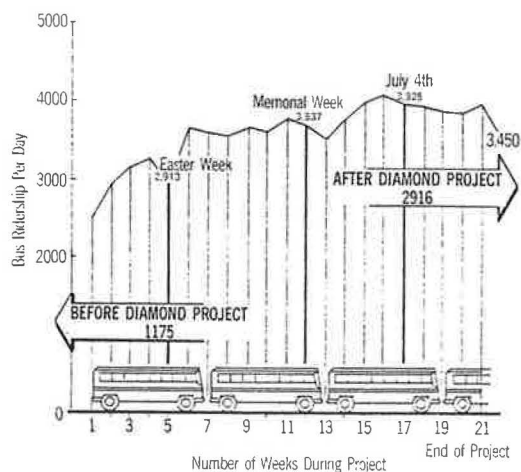
##### Operations

Two bus operators in the Los Angeles area participated directly in the Santa Monica Freeway Preferential Lane project by offering new services in conjunction with the opening of the Diamond Lanes: The Southern California Rapid Transit District (SCRTD), which operates 2,400 buses in the four-county Los Angeles area, and the Santa Monica Municipal Bus Lines (SMMBL), which operates about 100 buses in the Santa Monica area.

Bus service linking the Westside study area to the Los Angeles CBD improved significantly with the implementation of the demonstration. The addition of four new Diamond Lane feeder/express routes to the four already serving the Westside area more than doubled the number of Westside CBD workers living within walking distance of the express bus service. In addition, three new Park-and-Ride routes were introduced to serve those Westside residents who were not within walking distance of a feeder/express route.

*On the first day of the demonstration, 74 express bus trips were offered from the Westside area to the Los Angeles CBD during the morning peak, an increase of more than four times pre-project levels.* Even without the Diamond Lanes, therefore, the marked improvement in service significantly improved the travel time by bus from most sections of the study area to the CBD. In the initial stages of the demonstration, service

Figure 3. Average Daily Peak Period Bus Ridership on all Santa Monica Freeway Project Routes in the Peak Direction of Travel only.



headways on new routes were generally set so that buses were no more than 15 minutes apart. As the project progressed, headways were adjusted to reflect ridership.

The introduction of the Diamond Lanes significantly improved the on-time performance of those SCRTD routes in existence prior to project implementation, cutting two minutes off the freeway travel time of the busiest line. Diamond Lane buses also generally exhibited better on-time performance than buses using other freeways without preferential treatment and buses using surface streets.

##### Ridership

*Daily bus ridership between the Westside study area and the Los Angeles CBD increased from 1,171 riders per day prior to the project to 3,793 riders per day during the last week of Diamond Lane operation.* Bus ridership rose rapidly during the first month following implementation, and continued to grow throughout the project. While the growth patterns were essentially the same for both SCRTD and SMMBL, SMMBL carried 26% of the combined average daily ridership with only 15% of the total daily bus trips. By the close of the project, most of SMMBL vehicles were fully occupied, and the average occupancy during the project was 41.1 riders per trip, an occupancy rate of 82 percent.

In the case of SCRTD, the average occupancy during the project was 19.2 riders per trip, or 38% of the available seating capacity. This figure was well below pre-project levels, and stemmed from the policy decision to provide as much service as possible early in the project to maximize the possibility of attracting ridership. While the policy appears to have had the desired effect, it also put a large number of near-empty buses in public view during the early stages of the project. As the project continued, unprofitable runs were eliminated and SCRTD occupancy rates improved markedly.

In general, both the new feeder/express routes and those routes existing prior to the demonstration succeeded in attracting patronage from the ranks of automobile drivers during the project, and an overwhelming majority of the bus riders surveyed expressed satisfaction with the service. *By the close of the project, the eight feeder/express routes had come*

close to meeting the aggregate long-term demand predictions for patronage on these routes, carrying nearly 30% of the CBD-destined trips projected to be within walking distance of a bus line. The three new Park-and-Ride routes, however, fell far short of expectations and were all discontinued by September 1.

After the close of the demonstration and a five-week SCRTD bus strike, ridership on those freeway routes remaining in service was 17% below the peak attained during Diamond Lane operations. Ridership declines were greatest on those routes reporting the longest door-to-door travel times. Ridership drops were lowest on the one SMMBL route which continued operating through the strike. By early 1977, however, none of the routes had succeeded in attaining the peak ridership levels attained during the demonstration.

Attempts to isolate the impact of the Diamond Lanes themselves on bus ridership are frustrated by the short, uncertain life of the project, seasonal patronage variations, the media blitz, frequent and major changes in bus service frequency, fare increases, and the five-week strike of SCRTD workers which followed the closing of the demonstration. Recognizing these uncertainties, it can be argued that the extent of the Diamond Lanes' influence can at least be bounded by surviving ridership levels. If, in the light of service cutbacks, fare increases and a five-week strike, subsequent ridership levels still managed to rise to within 17% of their peak during Diamond Lane operations, it would seem that this 17% figure represents a fair estimate of the maximum drawing power of the Diamond Lanes alone. This aggregate figure varies from line to line, and might have been greater had the life of the lanes not been continually threatened. *Nonetheless, although the Diamond Lanes and the attendant publicity helped increase bus ridership, it appears that improvements in bus system coverage and service frequency were responsible for the bulk of the observed patronage increases.*

### Police Deployment, Enforcement and Violations

#### Police Deployment

Highway patrol deployment doubled during the first weeks of the project, and gradually returned to normal (76 man-hours daily during the project operating hours) by the thirteenth project week. For the most part, the additional manpower used early in the project consisted in motorcycle units diverted from other freeways.

#### Enforcement

Although levels of police deployment returned to normal midway through the demonstration, enforcement activities remained considerably higher than normal throughout the life of the project. An average of 151 warnings and citations were issued daily, more than four times the estimated pre-project levels.

Enforcement of the Diamond Lane provisions was facilitated by the existence of a median strip where violators could be cited without being escorted across three or four lanes of traffic to the right shoulder of the roadway. Helicopter and roadside observers soon noted, however, that the use of the median for enforcement also interfered with the flow of traffic in other lanes. The use of the median for enforcement led to gawking and traffic slowdowns, particularly in the Number 2 lane adjacent to the Diamond Lane.

#### Violations

The Diamond Lane violation rate, defined as the ratio of vehicles with fewer than three occupants to the total number of vehicles in the lane, was high on the first day of the project and dropped immediately

thereafter. On the opening day, 40% of all vehicles using the preferential lanes did so illegally. The violation rate then dropped rapidly, and fluctuated between 10% and 20% for the duration of the project. Most of the observed violations occurred at the fringes of the Diamond Lane operating hours.

### Safety

#### Freeway Accident Patterns

One of the most disturbing aspects of the Diamond Lane project was the high incidence of freeway accidents accompanying the operation of the preferential lanes. Accidents increased markedly in the first week of the project, when 59 accidents were reported during Diamond Lane operating hours. Accident levels subsequently declined, dropping to an average of 18 accidents per week during the last month of the project, but they remained substantially higher than pre-project levels throughout the demonstration. During the 21 weeks of the demonstration, 527 accidents were reported during peak operating hours, an average of 25 accidents per week and roughly 2.5 times the pre-project average. A significant proportion of the overall increase in accidents was concentrated in the Number 2 lane adjacent to the Diamond Lane, reflecting an increase in stop-and-go conditions in this lane. Accidents in this lane increased from under 2 accidents per week to 14.8 accidents per week during the project.

#### Probable Causes of Freeway Accidents

A number of potential accident causes were postulated and analyzed in an attempt to account for the observed increase in accident levels. Results of accumulated accident data identify a number of these causes as minor contributing factors, including increased CHP ticketing; increased congestion due to the removal of the Diamond Lanes from general use; and the confusion, distraction and aggravation accompanying the novelty of the Diamond Lane concept. A more detailed analysis of potential accident causes is discussed in an accompanying TRB paper. (3.)

The single factor that appears to account for the largest share of the accident increase is: *The pronounced speed differential between the free-flowing traffic in the sparsely occupied preferential lane and the stop-and-go traffic in congested adjacent lanes, coupled with the frequent lane changes resulting from the variety of possible origins and destinations along the length of the project.* Motorists attempting to enter the Diamond Lane had to enter a faster traffic stream from a slower starting speed, while motorists attempting to leave the lane had to slow and attempt to find an opening in stop-and-go traffic. This problem was exacerbated by the large variety of trip origins and destinations in the Los Angeles area, which led carpoolers to enter and leave the Diamond Lanes at many points along the freeway. Regular and occasional carpoolers responding to the driver survey cited problems merging with slower traffic in leaving the Diamond Lanes as the greatest single difficulty encountered in using the lanes, and regular carpoolers felt that the discomfort of traveling faster than vehicles in the other lanes was just as disturbing as the difficulty of merging with these vehicles. As the speed differential increased, moreover, the ability to save time by using the Diamond Lanes attracted a few violators who dodged in and out of the Lane unsafely, attempting to stay one jump ahead of the CHP.

## Implications of the Accident Picture

Since the ability to travel faster in a preferential lane is the chief inducement for attracting carpoolers and bus users to that lane, the fact that this ability increased accident levels significantly on the Santa Monica Freeway raises serious questions regarding the feasibility of the barrier-free preferential lane in certain settings. These questions appear to exist whether the lane is created by reserving an existing lane, as was done on the Santa Monica Freeway, or by creating an entirely new lane, as was originally contemplated on the San Diego Freeway in Los Angeles. Conceivably, the addition of a new barrier-free preferential lane to an existing freeway could also result in increased accidents if stop-and-go traffic conditions exist in the non-preferential lane, a significant speed differential is maintained between these lanes and an underutilized preferential lane, and destinations are scattered so that carpoolers enter and exit at many points along the lane.

If the usage of a preferential lane increases with time, either because more carpools are formed or because enforcement is relaxed, the speed differential will decrease and accident levels can be expected to drop. As the speed differential drops, however, the inducement to use a preferential lane drops as well. In theory, the number of carpools should grow over time until the marginal amount of time saved by switching to a carpool exactly balances the perceived inconvenience of making the switch. In practice, the level of accidents occurring before this equilibrium point is reached may be unacceptable to society, or the equilibrium point itself may result in an unacceptable accident rate.

## Surface Street Accidents

One of the potential side effects of the Diamond Lane project was the possibility that traffic diverted from the Santa Monica Freeway to surface streets might increase the number of accidents on those streets in the corridor surrounding the freeway. *Although surface street accident levels increased slightly (between 5% and 10%) during the demonstration, statistical evidence linking these increases with the Diamond Lane project is inconclusive.*

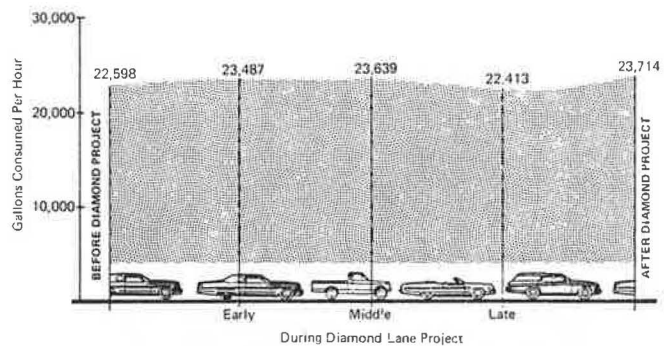
## Energy and Air Quality

### Fuel Consumption

Fuel consumption estimates based on vehicle mileage records indicate that, even allowing for increased idling time at on-ramps, gasoline consumption declined on the Santa Monica Freeway during the Diamond Lane demonstration. At the same time, fuel consumption actually increased on all parallel surface routes that were sampled. The net effect for the entire east-west corridor was a slight increase in fuel consumption of approximately 500 gallons per hour during the first fourteen weeks of the project. *By the last seven weeks of the project, the total energy consumption was 185 gallon per hour lower than the pre-project level of 22,958 gallons per hour, a savings of 0.8% over pre-project levels.*

Because of increased congestion and idling time, fuel consumption rates for non-carpoolers had increased by 6% by the close of the project. These increases were offset by the savings accompanying increases in carpool and bus usage. Each solo driver switching to a carpool or bus was estimated to save roughly eleven gallons of gasoline per week.

Figure 4. Average Energy Consumption per hour for the Santa Monica Freeway Corridor (gallons/hr).



## Air Quality

On the basis of vehicle mileage computations, corridor vehicle emissions rose early in the project and dropped to pre-project levels by the time the project closed. Measured air samples showed a decrease in carbon monoxide concentrations during the project. In view of the small sample sizes, seasonal changes, meteorological variations, and analytic uncertainties, however, it is impossible to make conclusive statements regarding the precise impact of the Diamond Lanes on air quality.

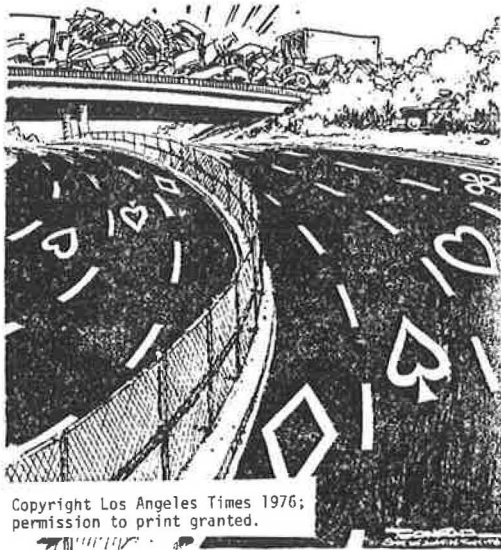
## What Happened Off The Freeway

Statistical summaries quoting freeway speeds, vehicle volumes, bus ridership and accident rates do not begin to convey the full picture of the Santa Monica Freeway Diamond Lane demonstration. The Diamond Lane experience was not confined between the guardrails of the Santa Monica Freeway. The demonstration quickly became a media event, generating reams of newsprint, radio and television coverage, vocal public reactions, political debate, lawsuits, banners, slogans, badges, cartoons, and at least one song. *From their implementation to their dissolution, the Diamond Lanes were never far from public view and, when in view, they were treated as an eyesore.*

## Media Coverage

During the 21 weeks of Diamond Lane operation, the three major daily newspapers covering the project--the morning Los Angeles Times, the afternoon Herald-Examiner, and the Santa Monica Evening Outlook--produced an average of nine articles and editorials per week on the Diamond Lanes. The predominant tone of the articles was negative, and the editorials were solidly against the project. Although the operations on the freeway improved following the disastrous opening day, when the newspapers carried banner headlines proclaiming "Freeway Chaos," newspaper coverage grew steadily more hostile as the demonstration progressed.

The Diamond Lanes were also a popular subject for radio and television coverage, and provided a platform for many public figures seeking public exposure. As in the case of the press, the general tenor of the coverage provided by local and national radio and television stations was hostile to the project. Perhaps the most hostile and least balanced of all media coverage was provided by the radio disk jock-



eyes, whose jibes ("you'll get home tonight if it takes all year") reached motorists while they were in the middle of their congested commuting period.

#### Project Promotion

Although the full extent of the public and media outcry was not anticipated by the project participants, it was recognized in advance that the Diamond Lane project was likely to generate adverse public reaction, and an extensive marketing campaign was developed with the joint aims of promoting buses and carpools and encouraging public acceptance through a program of information and education. Given the extent of the pre-project advertising campaign, which included television and radio announcements, newspaper advertisements, the use of the changeable message signs on the freeway itself, and brochures distributed at freeway on-ramps, it is unlikely that many regular users of the Santa Monica Freeway were unaware that March 15, 1976 marked the opening of the Diamond Lanes. Although the appearance of the lanes themselves should have come as no surprise, opening day commuters did have reason to be surprised by several of the unannounced last-minute adjustments, including the tightening of ramp meter rates and the barricading of a slip ramp at the interchange of the Harbor and Santa Monica Freeways near the CBD. These unannounced adjustments undoubtedly contributed to the opening day confusion, and helped make March 15 "Mad Monday."

Following Mad Monday, the advertising campaign was drowned out by the media outcry and the project's sponsors, placed on the defensive, were able to do little to counter the tide of adverse public reaction.

#### Public Response

Surveys, interviews, telephone calls, newspaper polls, public hearings, and letters to newspaper editors generated during and after the project all revealed an overwhelmingly negative public response to the Diamond Lanes. *In the most extensive survey undertaken, 86% of the corridor drivers surveyed--including the majority of carpools--felt that the Diamond Lanes were either harmful or of no benefit whatsoever.* But public response to the Diamond Lane project was not limited to such formal avenues as survey responses and letters to editors. Residents of Los Angeles managed to find unique ways of expressing their general distaste

for the Diamond Lanes. On opening days, nails were spilled in the lane by a disconsolate motorist, and a "baggy bomber" used paint-filled balloons to obliterate several of the painted diamonds in the lane. On June 3, the "Citizens Against the Diamond Lane" slowed Diamond Lane users by staging a mock funeral procession in the lanes, and they later attempted to hang anti-project signs from a freeway overpass. A smaller, less vocal group of "Citizens for the Diamond Lanes" was organized and developed a newsletter to champion their cause. Entrepreneurs sold bumper stickers and badges carrying comments on the lanes, while college students offered their services as riders for a fee to drivers wishing to qualify as carpools, and the media reported a brisk sale of mannequins designed to gull observers into believing one driver and two dummies constituted a three-person carpool.

Any attempt to lay the full blame for the hostile climate of public opinion on the media both oversimplifies and overstates the case. It is unlikely that the negative media reports alone could have generated such a hostile response if the reports were not reinforced by a negative impact on the lives of the public. In Los Angeles, the negative media image of the Diamond Lanes was reinforced daily for over 100,000 freeway users who found their daily commute trip lengthened by a project designed to benefit a perceptibly smaller proportion of the traveling public.

#### Institutional and Political Climate

Several factors contributed to the stormy political weather encountered during the Diamond Lane demonstration. These included:

1. The complexity of transportation planning, financing, and decision making in the Los Angeles area.
2. The changing philosophy, policies and personnel in the state transportation agency; and
3. The scheduling of the demonstration in an election year.

All of these factors combined in a setting where everyone talks about transportation conditions but few are able to do anything about them. Los Angeles's fragmentation of public power and authority meant that a large number of government agencies and elected officials had some purview over the Diamond Lane project. Each decisionmaker had his own concept of project goals, and the degree of involvement and commitment to the Diamond Lanes varied greatly from agency to agency. When the media spotlight turned on the project, the public saw not a united front but a number of public agencies and elected officials pointing accusing fingers at the lead agencies, while other officials remained prudently silent. The adversary role adopted by several public transportation agencies hindered both the free flow of project information and the coordination of project decisions.

CALTRANS, the lead agency responsible for project implementation, went from a state of flux immediately prior to the project to a state of siege during the demonstration. In the period immediately preceding the project, the agency was in a state of transition that included shifts in executive responsibility at the state level as well as sweeping layoffs locally. The shuffling of responsibilities, layoffs, and changes in management caused problems in both planning continuity and pre-project data collection. Once the project began, the new faces at CALTRANS were confronted with a new set of problems. Whereas the agency had become accustomed to public pressure over the building of freeways, the Diamond Lanes represented a new concept with a new set of

aims and enough adverse side effects to lead some within the agency to question whether CALTRANS was justified in defending the project. As CALTRANS struggled to assess the operations on the freeway, deal with the hostile press, and evaluate a number of complex issues involving the project's future, an impatient press and public blistered the agency for its apparent intransigence and insensitivity to the needs of the citizens.

Public reaction and the media din were exacerbated by the frequent and public opposition of several elected and appointed City and County officials. The level of opposition ranged from responsible criticism on the part of some officials who had worked with project personnel in an attempt to make the Diamond Lanes more acceptable to their constituents, to simple attempts on the part of other officials to align themselves publicly with the opposition to a clearly unpopular project. Responsible opposition and objective analysis had to clamor for a hearing alongside of simplistic arguments, emotional appeals, and self-serving jockeying. The Diamond Lanes even became a pawn in the election-year battle for the approval of funds for a rapid rail system in Los Angeles (STAMP OUT DIAMOND LANES: VOTE YES FOR RAPID TRANSIT). In the face of the opposing clamor from the media, public, and elected and appointed officials, those officials who might have favored the project found it prudent to remain silent, and little in the way of a constructive public dialogue emerged. There is little doubt that the continual public threats to the lanes' existence led many potential carpoolers to deter any commitments to shared riding until the opposition was silenced and the project achieved a more permanent status.

#### The Legal End

Although the life of the Diamond Lanes was continually being threatened by the media and the public, and State and local officials had drafted terminating legislation, the demonstration was eventually done in by what at the time seemed the least likely suspect, a lawsuit in the U.S. District Court of Appeals. The lawsuit only indirectly addressed the merits of the project, focusing instead on the alleged failure of CALTRANS and UMTA to comply with the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) by filing an Environmental Impact Report on the project. On Monday, August 9, 1976, Judge Matthew Byrne ruled that Environmental Impact Reports should have been filed under both state and national environmental laws, and ordered that the freeway be returned to pre-project status by Friday, August 13, 1976.

#### Observations and Implications

The Santa Monica Freeway preferential lane project succeeded to some degree in attracting riders to car-pools and transit, and increased the person-moving capacity of the freeway without requiring additional levels of police deployment. However, the project brought about a significant increase in freeway accidents, non-carpoolers lost far more time than carpoolers gained, and a heated public outcry developed which has halted the implementation of other preferential treatment projects in Southern California, giving planners and public officials in other areas ample cause for reflection before attempting to implement similar projects.

#### The Negative Impact of Lane Removal

Whereas other preferential lane projects have constructed additional lanes or converted lanes in off-



peak directions to preferential use, the Santa Monica Freeway Diamond Lane project marked the first time preferential lanes were created by taking busy freeway lanes out of existing service and dedicating them to the exclusive use of high-occupancy vehicles. This aspect of the project contributed to most of the negative impacts recorded during the demonstration. The removal of two lanes from general use contributed heavily to the congestion and confusion on opening day, was a slight but important factor in the increased accident rate, and appears to have been one of the chief sources of public dissatisfaction with the project. Many freeway users felt strongly that they had paid for the lanes with their gasoline taxes and were entitled to go on using them. The lane preemption and the resulting slowdown were viewed with hostility by most corridor drivers as a plot designed by meddling bureaucrats to inconvenience many for the sake of a few. Moreover, the number of project beneficiaries were perceived to be even fewer than their numbers indicated because they traveled three-to-a-car, or rode in buses that were often half-empty, and did not fill the Diamond Lanes to capacity.

#### The Effect of Geographic Sprawl

Because of the scattering of trip origins and destinations throughout Los Angeles, relatively few users of the Santa Monica Freeway are destined for the CBD. The lack of a focal point for trip destinations made carpool formation relatively difficult and decreased the pool of potential riders of the CBD-directed bus service. In practice, the scattering of origins and destinations also meant that drivers were likely to want to enter and leave the Diamond Lanes at points all along their 12.5-mile length, greatly increasing the possibility of accidents.

#### Accidents and the Absence of Barriers

Another factor in understanding the project's disappointing performance was the absence of barriers between the preferential lane and the conges-



ted adjacent lanes, Frequent vehicle shifts in and out of lanes operating at markedly different speeds contributed heavily to the increase in accidents. The problem of accidents in barrier-free operation is a serious one, and deserves further study. In other areas, and in Los Angeles itself, preferential treatment lanes separated from the general flow of traffic have been successful in improving carpool and bus ridership without increasing either accident rates or public acrimony.

#### The Success of Ramp Metering

One positive aspect of the Santa Monica Freeway experience which has been largely ignored was the performance of the ramp meters in alleviating freeway congestion and smoothing traffic flow before, during, and after the project. Prior to the project, the meters alone had so improved freeway traffic speeds that the Diamond Lanes suffered by comparison. The Diamond Lanes offered only a marginal one- or two-minute improvement over the meter-controlled speeds generally available to all traffic prior to the project. Conditions in the non-preferential lanes did not approach metered pre-project levels, although freeway speeds with both ramp meters and Diamond Lanes operating were faster than speeds where neither the meters nor the lanes were operational. Where available, moreover, carpool bypass lanes on the on-ramps offered more of a time savings to carpoolers than the Diamond Lanes themselves. *Thus, the ramp meter bypasses, which were safer and--surveys showed--less objectionable to the public than the Diamond Lanes, actually offered a greater time savings to carpoolers than the preferential freeway lanes, while the meters themselves improved freeway traffic flow.*

#### The Question of Credibility

One of the most serious controversies which emerged during the demonstration involved the question of data credibility. The sponsoring agencies were collecting data as the project progressed, and CALTRANS became the source for disseminating project statistics. As "CALTRANS' project" came under attack, so did the data it issued. Other agencies began drawing different conclusions from the CALTRANS data, and some local groups--including the press itself--began collecting and issuing their own data. The free-form use of different numbers and different reference bases during the demonstration made it difficult for the public to know who or what to believe, and led the press to question the credibility of project participants. The credibility of project foes was rarely questioned by the media.

Under the best of circumstances, there will always be some degree of ambiguity associated with traffic data. In many instances, statistics concerning the Diamond Lane project were produced under the worst of circumstances, having been hurriedly processed under rigid deadlines in the glare of publicity, and interpreted by agencies with a vested interest in attacking or defending the project. Problems encountered in the data collection and evaluation phases of the project ranged from simple human miscalculations to complex computer failures. In retrospect, the picture of the project that emerges from a more thorough examination of the data is somewhat different from that presented by both proponents and opponents of the project in the midst of the "battle of numbers" waged during the demonstration itself.

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