



**AN EXECUTIVE SUMMARY  
OF THE  
COMPREHENSIVE PLAN FOR  
THE DEVELOPMENT  
AND OPERATION OF  
PREFERENTIAL FACILITIES FOR  
HIGH OCCUPANCY VEHICLES**

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**FOR SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT**

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I. Background and Purpose of the Plan

In the fall of 1973, the legislature was desirous of obtaining an objective examination of the potential for moving high occupancy vehicles over preferential facilities on streets and freeways. Logically, the legislature selected the area having the most congested streets and freeways - viz., Los Angeles - as the subject area for the study.

II. Administration of the Study

In any event, SB 1221 was signed into law by the Governor on October 2, 1973. This legislation imposed two primary duties upon the District. The first such duty was the preparation of comprehensive plan for the development and operation of preferential facilities for high occupancy vehicles in its service area. The second duty was that of holding a public hearing on the plan.

In response to the first obligation, the District, on December 4th, sent out RFP's to 20 distinguished consulting firms throughout the nation. It enlisted the assistance of the City of Los Angeles Traffic Engineer and CALTRANS for purposes of reviewing the

responses and finalizing the selection. At the end of the review, the firm of Wilbur Smith & Associates was unanimously selected by this group to perform the work.

At the outset, the District stressed the need for innovation. The consultant was instructed that it was to have complete freedom in making findings and recommendations subject only to the overriding . . . considerations of the safety of the public.

The District's staff was cognizant of the desirability of involving local and regional agencies whose work might be affected by the plan. To accomplish this, a series of four meetings were held at which appropriate representatives of the Los Angeles City Traffic Engineer, the Los Angeles County Road Department, CALTRANS, and SCAG were present. Each was requested to listen to a report on work progress and to constructively criticize it. A number of valuable suggestions were obtained in this manner.

### III. Rationale for Selection of Freeways and Arterials to Receive Preferential Treatment.

A multi-phased elimination process was used to determine which corridors (freeways or arterials) were to receive preferential facilities. An examination of trip interchanges, peak hour volumes on both freeways and arterials, speed and delay on both, and the potential for growth in travel along each corridor was made. In the first elimination, only those which exhibited a high degree of congestion were retained.

Next each of the high density employment areas and regional centers were depicted on maps along with the corridors retained in the first elimination. Illustrative of this group were Westwood, LAX, North Long Beach, Hollywood, Commerce, Vernon, Irvine, and Wilshire. In the second elimination, only those corridors located near a high density employment center were retained.

To be retained through the final elimination process, a corridor had to have two characteristics. First the corridor had to have a significant number of trips of more than five miles in length to a high density

employment area or a regional center.

Unless trip makers could travel at least this distance on preferential facilities, it was assumed that the travel time savings would not be great enough to induce such travelers to use these facilities.

The second requisite characteristic was that the corridor had to be located near at least one residential area of sufficient density to support line haul bus service.

#### IV. Findings and Recommendations

##### A. Generic Types of Treatment on Freeways, Their Justification, and the Characteristics of Each

Preferential facilities on freeways can be treated as consisting of two types. The first is a preferential facility in normal flow direction. The second is a contra flow facility. Space for a preferential lane can be provided by either taking an existing lane or by constructing the additional lane on the shoulders.

With a normal flow direction preferential facility, buses and car pools travel in the same direction as do all other vehicles moving on the same side of the freeway. The preferred vehicles occupy the innermost lane.

If an existing lane is taken for this purpose, travel time saved on the preferential lane should be at least equal to the travel time lost by the general public in giving up this space. In this circumstance, the increased capacity, which should be realized through encouragement of high load factors, will be a sufficient justification for utilization of the lane.

It is expected that this type of arrangement would be utilized largely during peak hours.

Entry and exit from the lane may be gained at any location.

Fixed signs and flashers warn motorists of special lane usage.

On the other hand, contra flow facilities are positioned on the wrong side of the freeway with buses moving opposite to the flow of vehicles on the same side of the freeway. The facilities are situated in the innermost lane of the freeway. They are ordinarily justified only where traffic flows in opposite directions are imbalanced and buses operate on the side bearing the smallest volumes.

Median barriers are removed to permit buses to move to and from the contra flow lanes.

This treatment has suffered from the potential disadvantage that disabled vehicles become difficult to remove from the contra flow lane.

In general, the travel time savings to the contra flow bus users should equal the travel time lost by traffic in the opposite direction.

In order to get buses safely into the contra flow lane, it is necessary to create a transition lane one half mile up stream from the break in

the median barrier. This treatment also requires both overhead signs, flexible traffic posts, and pavement marking to inform all vehicles of the purpose of the lane.

Whenever metered on-ramps are utilized, to control of the flow of vehicles on the freeway, it is necessary - regardless of which treatment is used - to provide bus and car pool bypasses.

Contra flow lanes on freeways would ordinarily be operated only during peak periods.

The treatment preferred was the one which produced maximum benefit to users with minimum impact to non users.

On the basis of the foregoing - after examining the justification for preferential facilities and the criteria just specified - some parts of the following freeways were selected for inclusion within the plan:

<u>Freeway</u>	<u>From</u>	<u>To</u>	<u>Type of Treatment Recommended</u>	
			Normal Flow	Take Lanes
San Diego	Ventura Fwy.	Beach Blvd.	"	"
Hollywood/so. bound	Roscoe Blvd.	Alvarado St.	"	"
no. bound	Alameda St.	Sunset	"	"
Ventura/east bound	S. Diego Fwy.	Colfax Ave.	"	"
w. bound	Colfax Ave.	Van Nuys Blvd.	"	"
San Bernardino	Orange Ave.	El Monte Station	"	"
Pasadena	no. end of Pasadena Fwy.	Hill St.	Contra Flow	"
Santa Monica	Lincoln Blvd.	Vermont	Normal Flow	Build Lanes
Long Beach	Artesia Fwy.	San Bernardino Fwy.	"	"
Harbor	Artesia Blvd.	Jefferson Blvd.	"	Take Lanes
Artesia	Beach Blvd.	Long Beach Fwy.	"	Build Lanes

NOTE: "Build Lanes" means construction of lanes not now in existence.

B. Generic Types of Treatment on Arterials, Their Justification, and the Characteristics of Each

On arterials, in the normal direction of flow, it is possible to reserve the curb lane only or

that lane plus the adjacent lane for priority vehicles.

If only the curb lane is reserved then only buses and autos making right turns are permitted to use the preferred lane. Where pedestrian crossings are heavy, right turns by autos are often prohibited.

If both the curb and the adjacent lane are reserved, it is ordinarily done only in the peak direction of flow. This is sometimes identified as "reversible lanes treatment." In this variation, the curb lane is used by buses which stop to pick up or discharge passengers and by autos making curb stops.

There must be at least two other moving lanes in the same direction. This is accomplished by placing cones in appropriate locations depending upon the time of day.

On six lane streets, four lanes can be designated in the heavy flow direction, with either one or

two lanes reserved for buses.

Bus lanes can be delineated by solid white lines, by traffic cones, and by overhead lane use signals.

To justify this treatment, the number of potential bus users must equal the number of passengers carried by autos in the reserved lane prior to its conversion.

Contra flow bus lanes are also both possible and desirable on some arterials.

When they are used, it is customary to separate them from the normal direction of travel by paint or physical channalization. The latter are sometimes called median islands.

Buses using these facilities operate on the "wrong side of the street." Users may board and leave the buses from the median islands.

Left turn lanes by autos are frequently prohibited.

These lanes may be used by emergency vehicles and by taxis if bus volumes are less than 60 per hour.

Buses may exit from the lane via right turns or directly onto the arterial itself where the lane terminates.

The contra-flow lanes are particularly useful in moving express or limited stop traffic.

Justification for this use of an arterial lane is that it maximizes the person carrying capacity of the lane.

Using these criteria, some parts of those arterials shown below are selected for inclusion within the plan:

<u>Arterial</u>	<u>From</u>	<u>To</u>	<u>Type of Treatment Recommended</u>
La Brea Ave.	Hollywood Blvd.	Wilshire	Reversible Lanes
N. Broadway	L. A. River	Macy St.	" "
Wilshire Blvd.	Rexford Dr.	Westmoreland Ave.	Contra flow
Flower St.	Exposition Blvd.	Seventh St.	Reversible
Whittier Blvd.	Long Beach Fwy.	Alameda St.	"
Pico Blvd.	Rimpaw Blvd.	Figueroa St.	"

C. Park and Ride Facilities

Outlying parking facilities are needed wherever a multi-modal trip to a high density employment center is cheaper and faster than a trip by auto. They must be located at least five and preferably eight miles from the high density employment center to achieve the necessary savings in travel times to justify riders using them.

Expected patronage must be such that bus service into park and ride facilities should operate at frequencies of at least six buses per hour during the peak periods.

Ideally access to the lots ought to be just upstream from points of freeway convergence or interchanges since such points tend to become congested during peak periods. Lots should have direct access to major streets. Under optimum conditions, such lots would border a freeway and be visible from it.

The area of the lot should be such as will accommodate up to 400 spaces containing four

autos. This feature, in turn, justifies six buses per hour discussed above.

Using the foregoing criteria, the 28 lots shown in the table which follows were selected:

PARK-AND-RIDE FACILITIES--POTENTIAL SITES

	<u>AREA</u>	<u>POTENTIAL SITE</u>	<u>EXISTING LAND USAGE</u>	<u>AVAILABLE SIZE (Acres)</u>
1.	Woodland Hills	Topanga Plaza or Northridge	Shopping Center Parking	7
2.	Sherman Oaks	Sepulveda Basin	Parking	10
3.	North Hollywood	Laurel Plaza	Shopping Center Parking	6+
4.	Burbank	Pickwick Drive-In	Drive-In Theatre	5+
5.	Pacoima	To be determined	---	--
6.	Santa Monica	McDonnell-Douglas	Parking	60+
7.	Westwood	Veteran's Center	Parking	--
8.	Hawthorne	Mattel Parking Lot	Parking	4+
9.	Torrance	Municipal Airport	Parking	--
10.	Gardena	Ascot Park	Parking	4+
11.	L.A.--Century	CALTRANS Excess Parcel	Vacant	3
12.	Long Beach	To be determined	--	--
13.	Inglewood	Los Angeles International Airport Property	Vacant	17+
14.	Compton	To be determined	--	--
15.	South Gate	Trojan Raceway	Parking	--
16.	El Monte	Existing SCRTD Station	--	--
17.	West Covina	West Covina Fashion Park	Shopping Center Parking	--
18.	Glendora			
19.	Pomona			
20.	Pasadena	To be determined	--	--
21.	Walnut-San Dimas	Cal Poly University	--	--
22.	Cerritos	Artesia Blvd.	Vacant-Zoned Ind.	6+
23.	Norwalk	Firestone/Studebaker/River	Vacant-Zoned Comml.	3+

PARK-AND-RIDE FACILITIES  
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<u>AREA</u>	<u>POTENTIAL SITE</u>	<u>EXISTING LAND USAGE</u>	<u>AVAILABLE SIZE (Acres)</u>
24. Placentia	Kraemer/La Palma/ Rockwell	Parking & Vacant	3+
25. Orange	Cinedome 20/21, 600 cars	Indoor Theatre Parking	8+
26. Fullerton	Magnolia/Orange- thorpe	Under construction	10+
27. Huntington Beach	McFadden/San Diego Freeway	Vacant-CALTRANS Excess	10+
28. Costa Mesa	Orange County Fairgrounds	Paved-Parking	10+

D. Synopsis of Recommended Treatments by Freeway  
and Arterial

Each type of preferential treatment was applied to each freeway and arterial to determine a resulting benefit. In this examination, the consultant determined for each variation the following:

- o the diversion of riders to transit,
- o the reduction in vehicle miles of travel,
- o the reduction in person minutes of travel.

These benefits were weighed against the resulting loss in "level of service" to those motorists forced to continue to use non-preferential lanes on freeways and arterials.

The higher the resulting benefit, the greater the priority given to a particular treatment on a freeway or arterial. Once this determination was made, a sufficient number of park and ride facilities were assigned to each priority to develop the requisite patronage on the preferred facility.

The table entitled "Program Priorities" depicts the four stages or priorities suggested by the consultant along with their cost of implementation. Those in the first priority or stage produce the greatest benefit; those in the second priority produce the next greatest benefit, etc. In those instances discussed below, there were overriding considerations which dictated an even lower priority. Pico Boulevard appears in the third priority because of sewer construction which is likely to impede traffic for two years.

The Pasadena Freeway appears in the fourth priority because it has geometric problems somewhat more difficult to remedy than some of the others.

La Brea Avenue appears in the third priority because it is felt it should not be implemented until the preferred lane on the Hollywood Freeway was implemented.

PROGRAM PRIORITIES

PRIORITY GROUP	PREFERENTIAL LANE SECTIONS			PARK-AND-RIDE FACILITIES NECESSARY		
	Route	Capital Cost	Annual Operating Cost	Location	Capital Cost	Annual Operating Cost
<u>FIRST:</u>	El Monte-Los Angeles Busway	7 miles completed with 4 miles under construction		El Monte Station	Completed and open to use.	
	Hollywood Freeway	\$ 460,000	\$ 81,000	Fullerton No. 1	Under construction	
	North Broadway	165,000	25,000	Sherman Oaks	\$ 320,000	\$ 70,000
	Wilshire Boulevard	\$ 1,192,000	\$ 144,000	North Hollywood	260,000	42,000
				Burbank	220,000	70,000
				Pacoima	360,000	42,000
				Woodland Hills	140,000	49,000
		\$ 1,817,000	\$ 250,000		\$ 1,300,000	\$ 273,000
<u>SECOND:</u>	Long Beach Freeway	3,204,000	562,000	Cerritos	300,000	35,000
	Artesia Freeway	2,164,000	311,000	Huntington Beach	1,200,000	40,000
	San Diego Freeway (South of I-10)	11,988,000	2,103,000	Long Beach	960,000	112,000
	Flower Street	393,000	56,000	Hawthorne	220,000	77,000
				Gardena	690,500	81,000
				Costa Mesa	120,000	42,000
				Orange	60,000	21,000
				South Gate	90,000	11,000
				Compton	54,000	7,000
	SUB-TOTAL	\$17,749,000	\$3,032,000		\$3,694,000	\$ 526,000

PROGRAM PRIORITIES (Continued)

PRIORITY GROUP	PREFERENTIAL LANE SECTIONS			PARK-AND-RIDE FACILITIES NECESSARY		
	Route	Capital Cost	Annual Operating Cost	Location	Capital Cost	Annual Operating Cost
<u>THIRD:</u>						
	Santa Monica Freeway	\$ 2,045,000	\$ 376,000	Santa Monica	\$ 230,000	\$ 81,000
	San Bernardino Freeway	993,000	113,000	Westwood	140,000	49,000
	Ventura Freeway	290,000	86,000	Walnut	110,000	39,000
	San Diego Freeway (North of I-10)	3,010,000	530,000	West Covina	300,000	105,000
	La Brea Avenue	325,000	57,000	Glendora	306,000	36,000
	Pico Boulevard	620,000	75,000	Pomona	168,000	20,000
	Whittier Boulevard	435,000	65,000	Inglewood	600,000	100,000
				Placentia	60,000	21,000
				Torrance	56,000	20,000
	SUB-TOTAL	\$ 7,718,000	\$1,302,000		\$1,970,000	\$ 441,000
<u>FOURTH:</u>						
	Pasadena Freeway	590,000	710,000	Pasadena	600,000	70,000
	Harbor Freeway	400,000	99,000	L. A. Century	450,000	53,000
	Long Beach Fwy. Busway	--	--	Fullerton No. 2	300,000	35,000
				Norwalk	240,000	28,000
	SUB-TOTAL	\$ 990,000	\$ 809,000		\$1,590,000	\$ 186,000
TOTAL	TOTAL	\$28,274,000	\$5,393,000		\$8,554,000	\$1,426,000

As shown in the table above, annual costs to SCRTD will vary depending upon how many priorities are implemented. Regardless of the decision made on this issue, it is imperative that a new source of revenues be provided to meet these costs prior to any implementation.

A second problem is that ordinances enacted by the Cities of Pasadena, South Pasadena and Los Angeles pursuant to Section 36501, et. seq. of the California Vehicle Code prohibiting the use of SCRTD buses on the Pasadena Freeway.

Assuming the geometric difficulties on that freeway can be remedied, it may be necessary to enact legislation to allow the District's buses to use this facility.

A third problem is that the ordering of implementation priorities may have to be varied slightly due to factors outside the District's control. CALTRANS has expressed a preference to implement the Santa Monica Freeway preferred

lane initially. This decision has to do with ease of implementation from CALTRANS' standpoint. It is included here solely to call it to the legislature's attention.

V. Problems for the District Should the Plan Be Implemented

Public transit is a very unusual business. While its costs are very sensitive to inflationary pressures, its revenues tend to be fixed. Indeed the District hasn't raised its fares since 1967, and, is even now engaged in an experiment to test the effect of lowering fares on a county-wide basis. Consequently, District management must of necessity be particularly attentive to costs.

Annual costs to the District consist of three components. The first is the cost of acquiring 485 new buses. A second component is the cost of new maintenance and repair facilities. At least two additional ones would be required at a cost of \$10 million each.

The third and last component is the cost of operating the 485 additional buses needed to provide this service. The table entitled "SGRTD Operating and Capital Costs by Priority" depicts these costs.

In terms of what is presented, however, it can be observed that to implement the total program it would be necessary to acquire 485 buses at an estimated local cost of \$5,335,000.

TABLE OF SCRTD OPERATING AND  
CAPITAL COSTS BY PRIORITY

<u>Priority</u>	<u>Buses</u>	<u>Local Share Of Capital Cost</u>	<u>Operating Cost</u>	<u>Total Costs</u>
One	144	\$ 1,584,000	\$ 5,713,632	\$ 7,297,632
Two	208	2,288,000	8,253,024	10,541,024
Three	85	935,000	3,372,630	4,307,630
Four	48	528,000	1,904,544	2,432,544
Sub-Totals:	485	\$ 5,335,000	\$19,243,830	\$24,578,830
2 Maintenance Divisions		4,000,000		
TOTAL:		\$ 9,335,000	\$19,243,830	\$28,578,830

Several comments are in order concerning the contents of the Table. The first is that costs differ from those shown in the full report. This is true because they are presented in a different format. The difference in annual operating costs is due to the fact that the full report doesn't include an appropriate wage escalation factor which District staff felt should be included.

Another comment about the contents of the Table is that capital costs are shown at 20 percent of the total. This reflects the fact that UMTA would pay the remainder.

Last, no time frame is presented. Instead it describes costs in terms of priorities rather than years.

Each increment of 250 buses to the fleet necessitates the construction of a maintenance facility in the generalized area of where those buses will provide service. The local share of the cost of maintenance facilities is about \$4,000,000.

The cost for operating the buses is shown by priority. If they were all acquired the yearly cost would approximate \$19,243,830.

Part of the costs not reflected in this paper is that of policing the parking areas used for park and ride facilities. This can in some cases be accomplished by fencing the park and ride lot and having it

attended. When this is done a small fee can be collected from users to defray the cost of providing this service.

From the foregoing one can conclude that a major problem for the District would be one of costs.

A second problem is that ordinances enacted by the Cities of Pasadena, South Pasadena and Los Angeles pursuant to Section 36501, et. seq. of the California Vehicle Code prohibit the use of SCRTD buses on the Pasadena Freeway.

Assuming the geometric difficulties on that freeway can be remedied, it may be necessary to enact legislation to allow the District's buses to use this facility.

A third problem is that the ordering of implementation priorities may have to be varied slightly due to factors outside the District's control. CALTRANS has expressed a preference to implement the Santa Monica Freeway preferred lane initially. This decision has to do with ease of implementation from CALTRANS standpoint. It is included here solely to call it to the legislature's attention.

F. Relationship to District's On-Going Transit Planning Activities

In addition to operating one of the largest bus fleets in the nation, the District is charged by its enabling legislation with the obligation of planning a rapid transit system for its service area.

District management believes that this task is not limited to planning facilities which require seven to ten years to build, but includes as well the planning of improved bus services which can be implemented almost immediately.

The District has not limited itself mostly to planning bus facilities. Sensing the importance of buses as a rapid transit mode, the District built and is now operating, one of the best busways in the nation. This reference is of course to the busway which extends from El Monte to Los Angeles, a distance of about 12 miles.

Fifteen months ago, the District staff instructed the consultants, carrying out its Alternate Corridors

Study, that one important facet of the long range program had to be the plan for an immediate bus improvement program. Pursuant to this charge, the District's consultants - quite apart from the SB 1221 study - have prepared a near term bus program, which includes a number of recommendations for preferential lane treatment.

In a recently published document entitled "A Public Transportation Program" dated March, 1974, the District's consultants have laid out a plan which contemplates an early attention to bus improvements. It is described on page 28 of that document as consisting of "grid bus networks, dial-a-ride systems, park and ride facilities, minibus circulation systems, and priority lanes on freeways and surface (arterial) streets."

Thus it appears that the District has shown and is showing much interest in the preferential facilities concept.

It is critical to the success of the near term bus improvement program, and this fact is being emphasized

in District contacts with public agencies -- most particularly CALTRANS and the City of Los Angeles -- who control the required rights-of-way.

V. Advantages and Disadvantages of Preferential Lane Facilities

The District wants to present a totally objective analysis of this subject matter. This suggests a need to at least point out any disadvantages which might accrue to the area from utilizing them.

One major disadvantage is that it could in some cases, take an existing lane or lanes from automobile traffic. This can, in some cases, cause another disadvantage, viz., removal of street parking in areas where merchants believe they need it.

Still another disadvantage is that the lanes may create some safety problems. They will induce numerous vehicle weaving movements by buses and high occupancy autos near the inside lanes of freeways. Until they are fully tested no one can say how much of a problem this could be.

Each of the foregoing must be weighed against some outstanding advantages. One such advantage is that, with sufficient funds, they can be implemented quickly. CALTRANS management is anxious to implement 6 to 10 preferential lanes in short order as is more fully discussed elsewhere in this paper.

Another advantage is that they take full advantage of existing highway resources.

Traffic authorities have long been concerned with the inefficient use of highway space characterized by autos carrying 1.2 persons. The preferential facility holds the potential for addressing this inefficiency in that it accommodates many more persons as opposed to vehicles in the reserved lane than was formerly the case.