

LOS ANGELES METRO RAIL PROJECT

PATRONAGE IMPACT OF POSSIBLE  
FUTURE LINE EXTENSIONS

SUMMARY  
FINAL REPORT

Prepared Under Contract to the  
Southern California Rapid Transit District  
Planning Department

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In Association With  
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1.

INTRODUCTION

This report presents a consolidated summary of the interim (or baseline) patronage forecasts prepared in support of the Los Angeles Metro Rail project. The overall work effort was conducted in three separate phases in order to provide preliminary design information prior to the development of more detailed forecasts as the preliminary engineering design phase proceeded.

The purpose of the analysis was to provide preliminary information on:

1. Estimates of starter line travel demand including forecasts for the basic line (i.e., Locally Preferred Alternative) with both alignment and station location variations.



2. The station design impacts of possible future extensions, including the provision of preliminary information on incremental staging strategies.
3. The impacts of selected key variables, including user costs, on passenger demand.

Prior to the formal initiation of Preliminary Engineering the district determined that an update of starter-line travel demand (as originally estimated in the Draft Environmental Impact Statement/Alternative Analysis Document) was required to evaluate the various alignment and station location alternatives already being considered. Such investigations included the consideration of a minimum operational segment (Wilshire and Fairfax), analysis of patronage levels without the Crenshaw station, and a direct connection from the Fairfax alignment through to Universal City. It was felt that this information would be important in judging the various tradeoffs among the physical design alternatives.

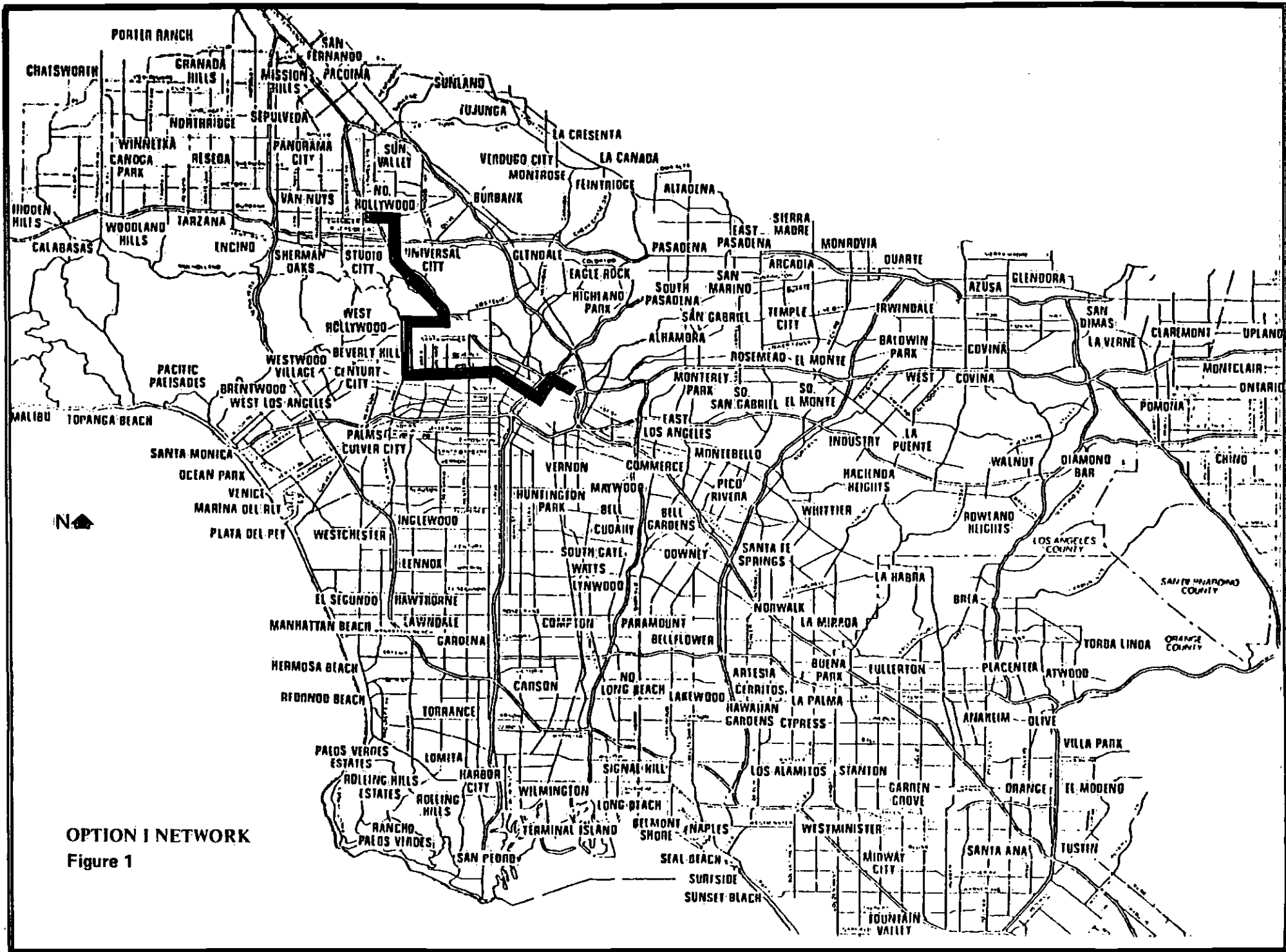
The analysis of possible future extensions provided the basis to judge the longer range adequacy of the station designs and provided an initial look at the implications of logical and incremental additions to the starter line system ultimately reaching a nine corridor, 150 mile system.

And finally, the analysis of key variables offered a limited risk analysis in order to determine the likely variability of forecast results to modifications in some of the key assumptions particularly with respect to user costs.

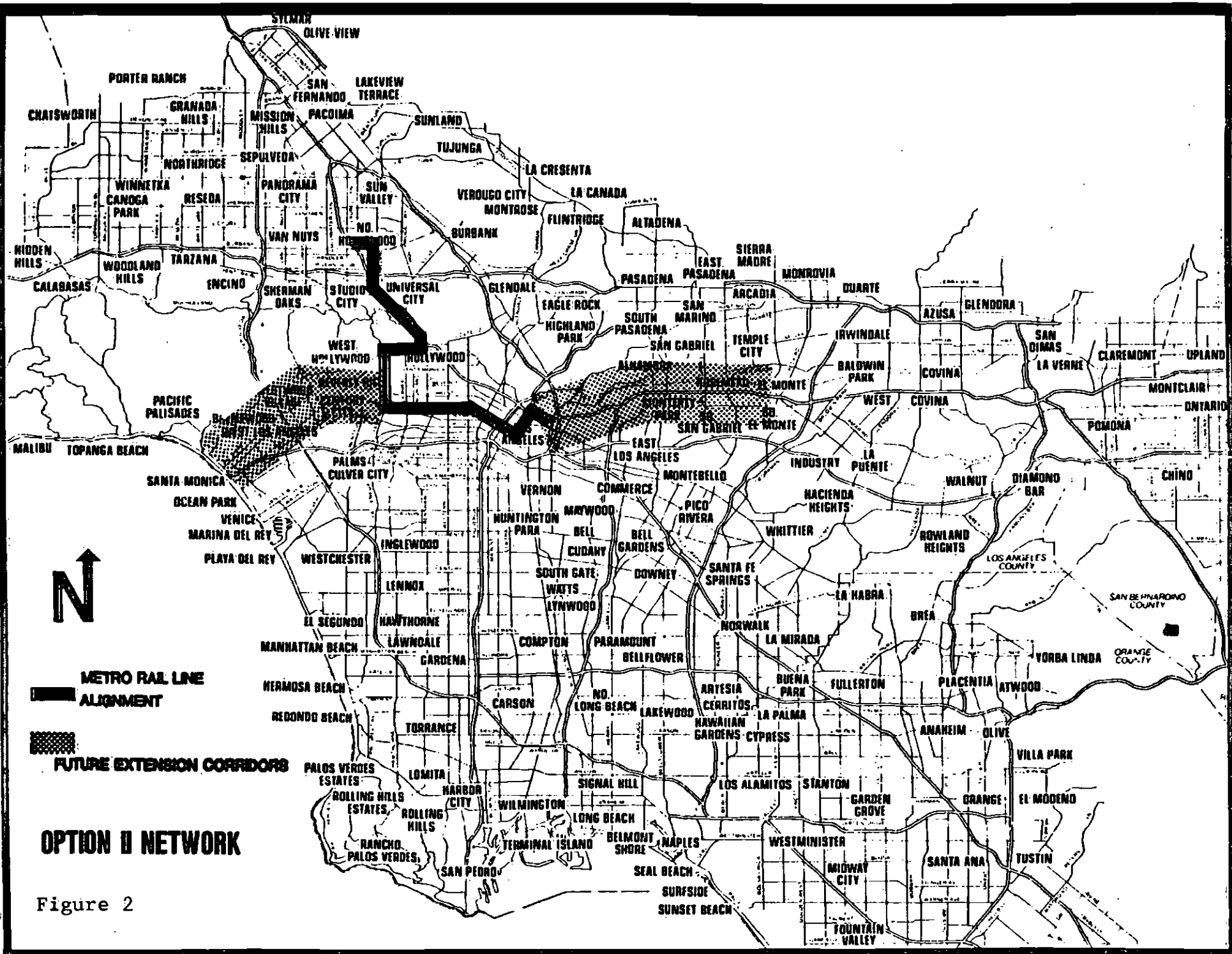
## **ANALYSIS ORGANIZATION AND SEQUENCE**

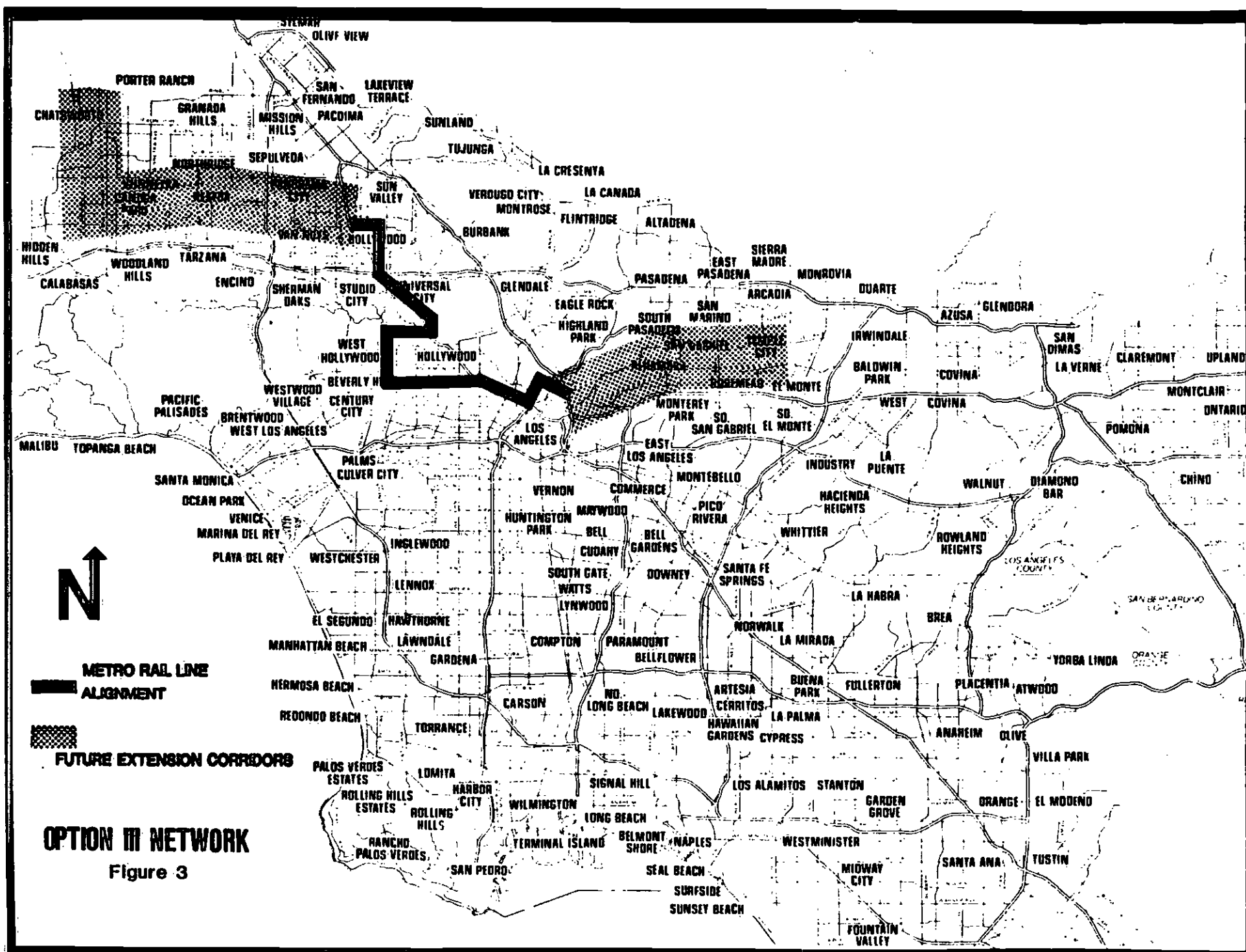
Fifteen rail option networks were defined in the course of the three phase study to provide the above information together with a no-option network designed primarily for comparative purposes. Ten of the options focused on the basic starter line with selected alignment and station variations. Five of the options (options 2-6) examined the impact of future extensions on the individual station designs. Figures 1-6 present both the basic starter line and each of these future extension options depicting both their general alignment and extent. Table 1 defines for each of the starter line system option alternatives their individual station content. The ICTS system referenced in that table is depicted in Figure 7. It was intended as an "Intermediate Capacity Transit System" providing service to the Hollywood area when the basic starter line system was realigned to provide a direct connection from Fairfax to Universal City. And finally, Table 2 defines for each of the extension options, in tabular form, the inclusion of individual corridors for each option.

It should be cautioned that the route alignments, rail operating plans, and station locations for the extensions to the Metro Rail starter line (options 2-6) considered in this project were for study purposes only and are not to be interpreted as final. To determine the specific alignments and station locations for any future extension, detailed analysis will be performed and public hearings held in accordance with local and federal requirements for all proposed rapid rail projects. However, for initial study purposes they were considered to be at an adequate level of detail for baseline patronage estimates. Furthermore, any changes to these initial project alignments and/or station locations which would be adopted within a particular corridor would not have an appreciable affect on the result in station volumes on the Metro Rail starter line.



OPTION I NETWORK  
Figure 1

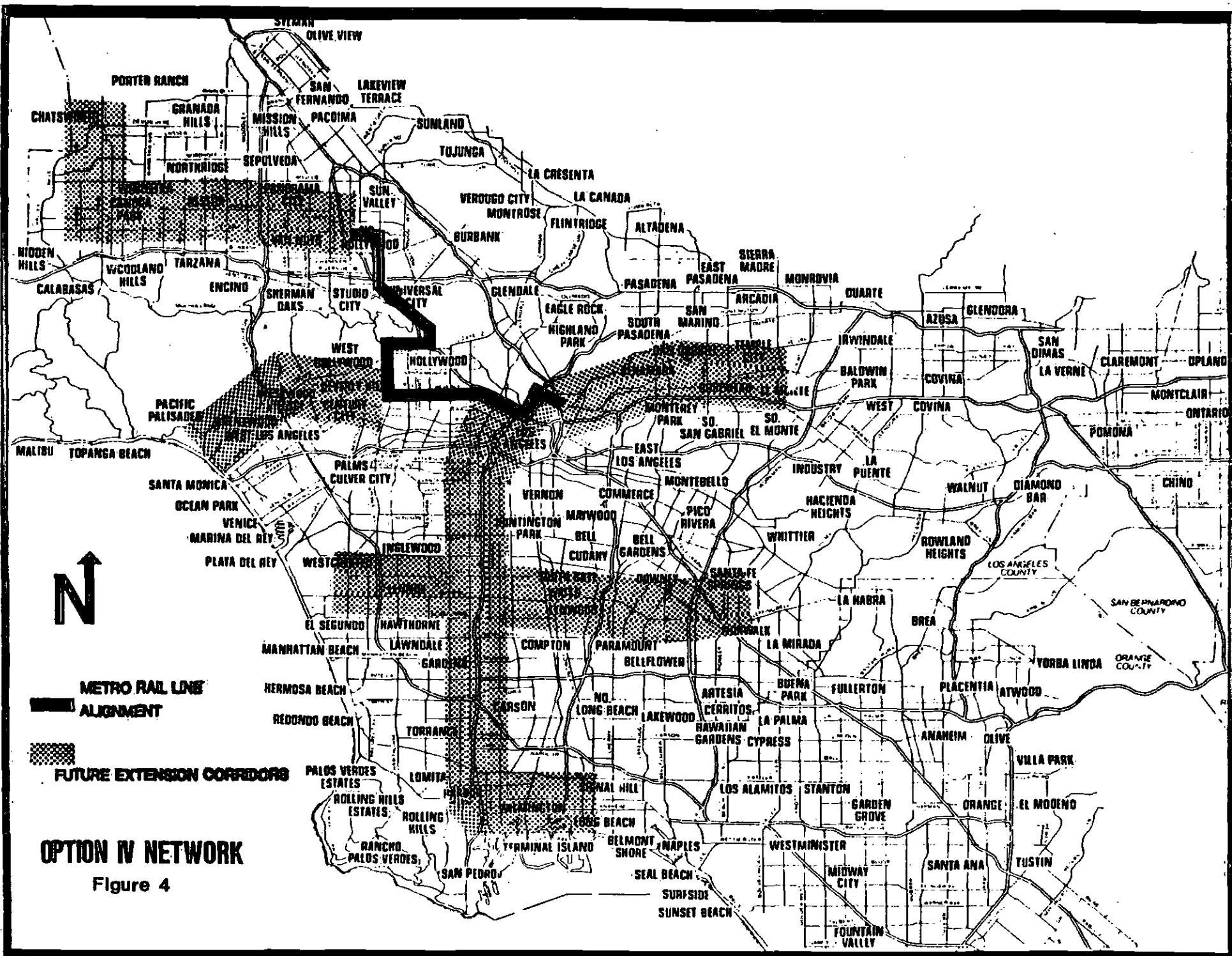




**METRO RAIL LINE  
ALIGNMENT**

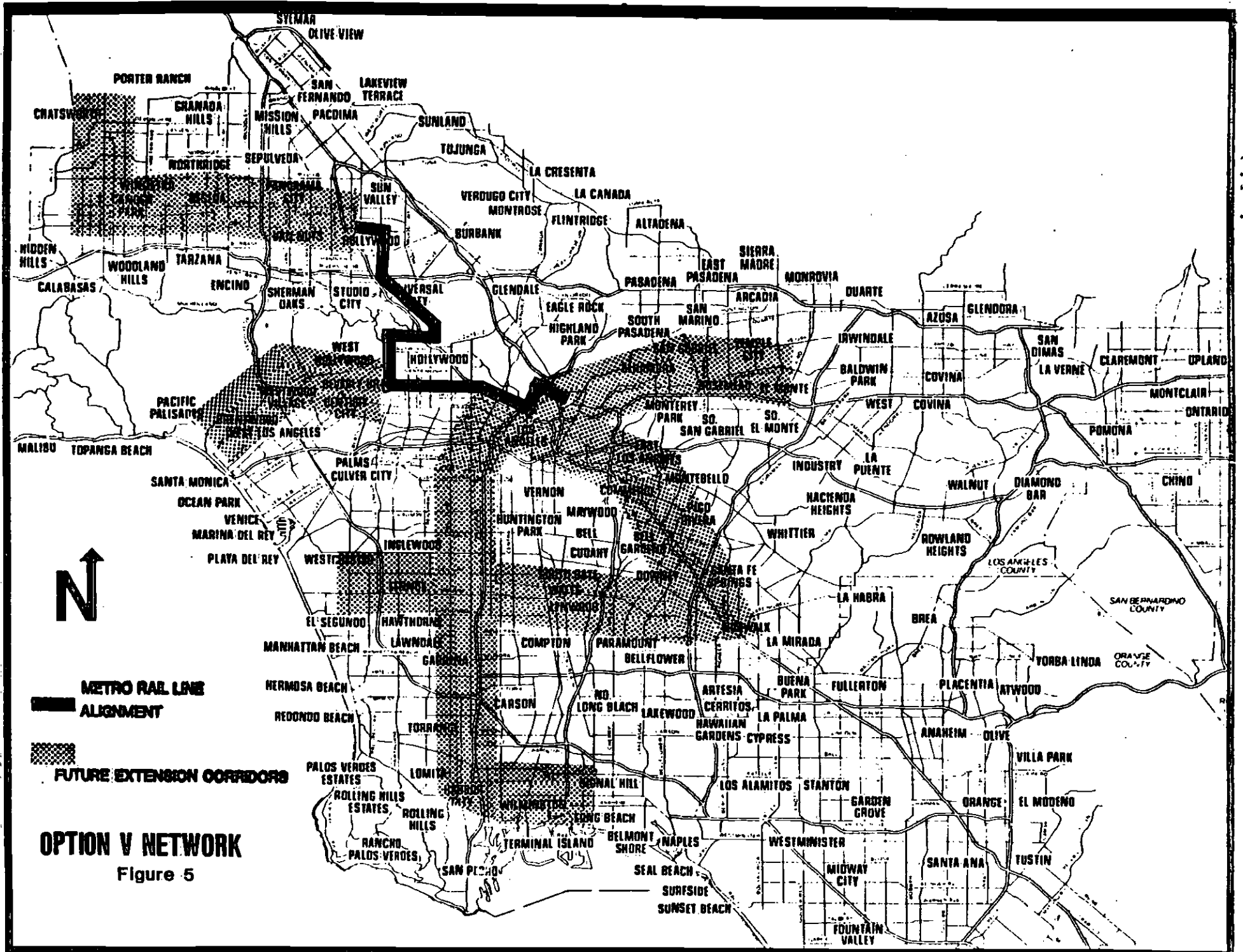
**FUTURE EXTENSION CORRIDORS**

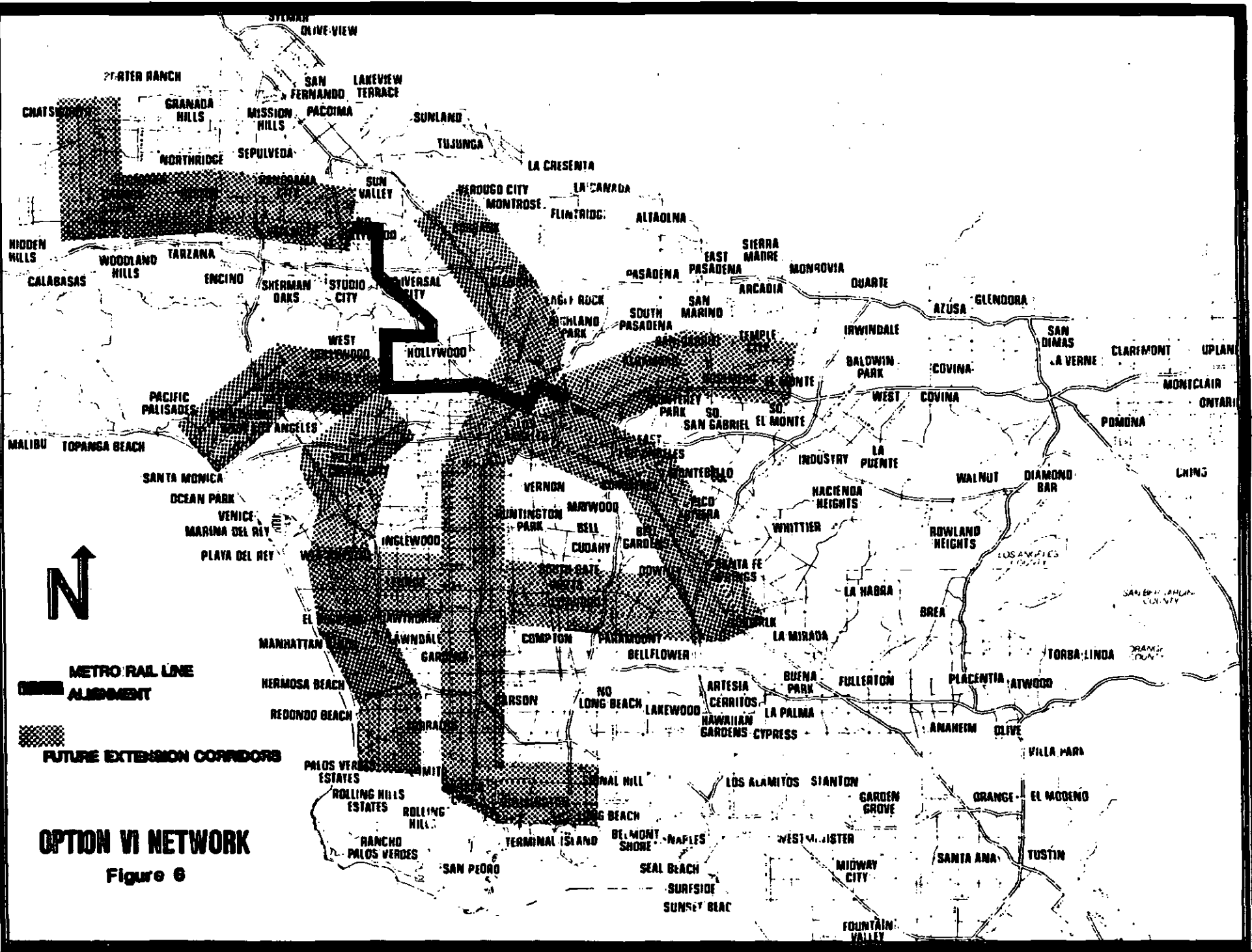
**OPTION III NETWORK**  
Figure 3



**OPTION IV NETWORK**

Figure 4







**TABLE 1**  
**STARTER LINE OPTION/STATION CORRESPONDENCE**

Station	Starter Line System Option									
	I	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
Union Station	X	X	X	X	X	X	X	X	X	X
1st & Broadway	X	X	X	X	X	X	X		X	X
1st & Hill								X		
5th & Broadway	X	X	X	X	X	X	X		X	X
5th & Hill								X		
7th & Flower	X	X	X	X	X	X	X	X	X	X
Wilshire & Alvarado	X	X	X	X	X	X	X	X	X	X
Wilshire & Vermont	X	X	X	X	X	X	X	X	X	X
Wilshire & Normandie	X	X	X	X	X	X	X	X	X	X
Wilshire & Western	X	X	X	X	X	X	X	X	X	X
Wilshire & Crenshaw	X	X	X				X			
Wilshire & La Brea	X	X	X	X	X	X	X	X	X	X
Wilshire & Fairfax	X	X	X	X	X	X	X	X	X	X
Fairfax & Beverly	X		X	X	X	X	X		X	X
Fairfax & Santa Monica	X		X	X	X	X	X		X	X
Fairfax & Sunset			X							
Sunset & La Brea				X		X	X			
Hollywood & Cahuenga	X			X			X			
Hollywood Bowl	X									
Universal City	X		X	X	X	X	X		X	X
Lankershim & Chandler	X		X	X	X	X	X		X	X
Chandler & Laurel Canyon							X			
ICTS (Wilshire/Vermont)									X	
ICTS (Sunset/Gower)					X	X				X

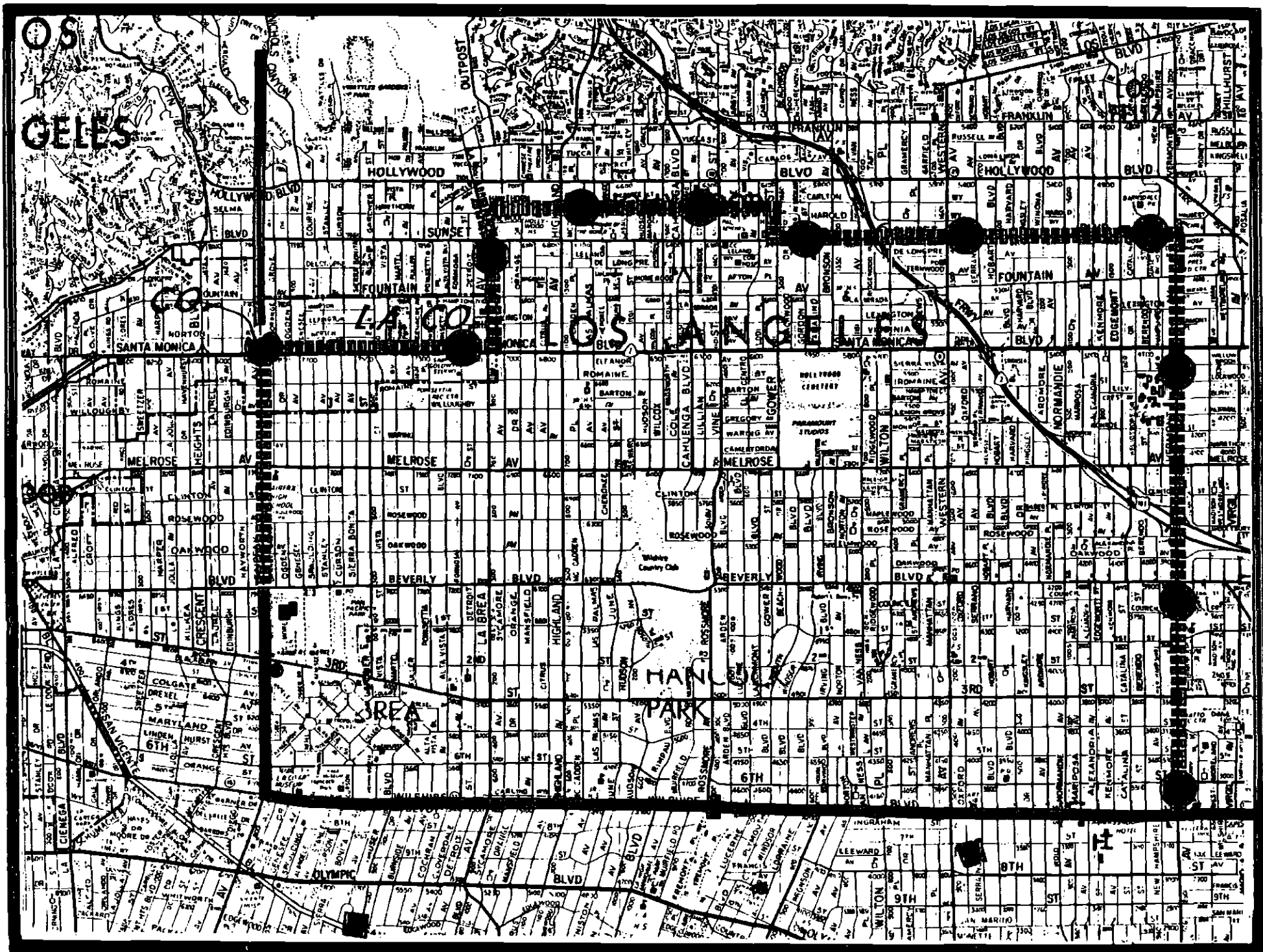


FIGURE 7 INTERMEDIATE CAPACITY TRANSIT SYSTEM

**TABLE 2**  
**CORRIDOR/OPTION CORRESPONDENCE**

Corridor*	I	II	III	IV	V	VI
Starter Line	X	X	X	X	X	X
West Los Angeles (A)		X		X	X	X
El Monte (B)		X	X	X	X	X
San Fernando Valley (C)			X	X	X	X
South Los Angeles (D)				X	X	X
Century Freeway (E)				X	X	X
Santa Ana Freeway (F)					X	X
Los Angeles International Airport (G)						X
Eagle Rock (H)						X

\* It should be cautioned that the route alignments, rail operating plans, and station locations for the extensions to the Metro Rail Starter line considered in this report are for study purposes only, and are not to be interpreted as final. To determine the specific alignments and station locations for all future extensions, detailed analyses will be performed and public hearings held in accordance with the "Alternatives Analysis" process that the Federal Urban Mass Transportation Administration (UMTA) requires for all proposed rail rapid transit projects. However, for initial study purposes, they are considered to be at an adequate level of accuracy for baseline patronage estimates. Furthermore, any changes to these initial project alignments and/or station locations which would be adopted within a particular corridor would not have an appreciable effect on the resultant station volumes of the Starter Line.

## **ANALYSIS SEQUENCE**

The technical analysis of each of these system options was divided into three major steps. First was the design of each system concept including specifications of a rail operating plan and definition of the background feeder bus and auto access interfaces. This route and service level definition was developed in concert with the DISTRICT planning department staff in order to integrate the sector improvement program concept with the rail system, continue to offer local service where appropriate, and provide the maximum level of feeder service to each rail system station.

The second major step in the analysis sequence was to generate regional travel demand volumes for each of the system options through execution of the LARTS travel demand model sequence. In particular, it was the LARTS model choice model which was executed for each rail system option using, as basic input, the distribution of person-trip travel for each of the individual trip purposes. By assuming a constant person-trip distribution for each rail option network, the difference in system wide patronage, particularly in rail system use, was directly related to the presence and level of rail service provided.

The third and final step in the analysis sequence was to develop preliminary mode of arrival estimates for each of the starter line stations. Formal parking opportunities were limited, however, to five major starter line stations: North Hollywood, Universal City, Fairfax/Beverly, Wilshire/Fairfax and Union Station. Implicit in the mode of arrival projections was the assumption that kiss-and-ride could occur at all other stations except the three central business district stations (First and Fifth/Broadway and Seventh/Flower). Although the mode of arrival estimates are preliminary, the model structure and inputs can be used to iteratively

recycle the model to balance the level of bus service with passenger demand and simultaneously analyze the impact of alternative station designs and parking space limitations on the magnitude and behavior of individual station arrivals and departures.

#### **REPORT ORGANIZATION**

The remainder of this summary report is presented in four chapters. Chapter 2 documents the overall findings of the forecasting analysis, providing information on total daily station usage for each of the basic starter line options followed by the system extension options. A comparison of individual station impacts and maximum load point volumes for the extension options are also provided. Chapter 3 continues with a tabular presentation of preliminary design volumes and mode of arrival estimates for each of the starter line stations. Chapter 4 provides a description of the overall travel demand forecasting methodology used in generating the travel demand forecasts including a brief discussion of each key model component (including the modal choice and mode of arrival models). Chapter 5 concludes with a discussion of the design of each optional network outlining the assumptions and operating characteristics included in each system option.

2.

STARTER LINE TRAVEL DEMAND RESULTS

Travel demand forecasts were prepared for sixteen network options in total including the null. Nine options examined various alignment and station location alternatives for the starter line, while six options investigated the impact of future extensions on starter line volumes. The analysis of starter line volumes were all prepared for the year 2000 with the exception of options of 1, 7, and 8 for which 1995 forecasts were also prepared. The impact of future extensions on the Metro Rail starter line system was conducted in Phase I and were all prepared using 1995 as the forecast year.

## **STARTER LINE ALTERNATIVES**

These alternative networks (option 1 and 7 through 15) investigated:

1. Various alignment alternatives, including the Locally Preferred Alignment, a straight through alignment connecting Fairfax directly with Universal City, a La Brea "bend" including a station at Sunset/La Brea, and a CBD alignment under Hill Street rather than Broadway.
2. System extent, including a minimum operable segment terminating at Wilshire/Fairfax and an extension to Chandler and Laurel Canyon Boulevards.
3. The presence of an auxiliary support system or an "intermediate capacity transit system" serving Hollywood in support of the straight through alignment to Universal City.
4. Selected station additions and deletions focusing primarily on Crenshaw and the Hollywood Bowl stations.

The basic starter line alternatives ranged from 16.2 miles with the straight-through alternative to 19.8 miles with the inclusion of the Laurel Canyon station. Daily ridership ranged from 326,000 to 376,000 as shown in Table 3. The maximum end of that range represents the full extent of the Metrorail system with all stations including Crenshaw while the minimum represents the straight-through alignment with the intermediate capacity transit system serving the Hollywood area. All the year 2000 forecasts shown in Table 3, were based upon the SCAG 82B forecasts and are generally 15 percent higher than the corresponding 1995 forecasts. The two minimum

**TABLE 3**  
**REGIONAL TRIP SUMMARY -- YEAR 2000**

	Option									
	I	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
Rail Passenger Trips	363,650	262,143	328,928	362,488	333,423	352,581	376,262	253,209	326,929	327,165
Boardings	363,650	262,143	328,928	362,488	333,423	352,581	376,262	253,209	326,929	327,165
Maximum Load Point	193,000	162,000	181,000	192,000	183,000	191,000	196,000	158,000	178,000	177,000



operable segment alternatives (options 7 and 13) generated a ridership of 253,000 to 262,000 which was a 20 percent increase over 1995 ridership. The maximum load point volumes are also shown in that table and parallel the overall ridership changes. Table 4 presents the peak bus requirements for each of these alternatives and calculates the reduction in bus requirements relative to the null option.

#### **STARTER LINE EXTENSION ALTERNATIVES**

As indicated earlier, the travel demand forecasts for each of the possible future extension options, were developed for the year 1995. Table 5 presents the summary of rail passenger boardings and maximum load point volumes for each of the future extension alternatives. These alternatives, which were depicted in Figures 1 through 6, incrementally extend the starter system to a full nine corridor, 150 mile system. The increase in rail passenger trips and boardings from options 1 through option 6 show a steady increase in regional rail ridership with each succeeding increment. Beyond the initial extension, however, the maximum load point, located within the starter line corridor, does not change appreciably. Table 6 summarizes the peak bus requirements, in 1995, for each of these alternatives and again compares them to the requirements of the null option.

#### **STATION PARKING DEMANDS**

As indicated earlier, for each of the starter line system alternatives the mode of arrival model was used to estimate the maximum accumulation of park-and-ride vehicles at each of five stations. Table 7 reports these values for each of those starter line alternatives. As indicated in that table, four of the stations, Union Station, Wilshire/Fairfax, Universal City and

**TABLE 4**  
**PEAK BUS REQUIREMENTS — YEAR 2000**

Option	Coded Headways	Nominal Headways	Reduction in Bus Requirements Relative to Null Option	
			Coded	Nominal
Null	2,435	2,666	—	—
IX	2,237	2,422	198	244
X	2,241	2,447	194	219
XI	2,235	2,429	200	237
XII	2,236	2,427	199	239
XIII	2,290	2,574	145	92
XIV	2,234	2,811	201	(145)
XV	2,241	2,826	194	(160)

**TABLE 5**  
**REGIONAL TRIP SUMMARY — 1995**

	Option							
	I	II	III	IV	V	VI	VII	VIII
Rail Passenger Trips	315,000	421,862	390,448	617,778	644,037	747,236	215,810	285,588
Boardings	315,000	437,290	392,140	752,919	807,539	993,813	215,810	285,588
Maximum Load Point	167,504	183,482	176,068	191,058	197,078	191,852	133,138	157,004

**TABLE 6**  
**PEAK BUS REQUIREMENTS — 1995**

Option	Coded Headways	Nominal Headways	Reduction in Bus Requirements Relative to Null Option	
			Coded	Nominal
Null	2,435	2,666	—	—
I	2,232	2,375	203	291
II	2,154	2,113	281	553
III	2,185	2,235	250	431
IV	2,119	2,115	316	551
V	2,117	2,168	318	498
VI	2,062	2,039	373	627
VII	2,291	2,389	144	277
VIII	2,239	2,431	196	235

**TABLE 7**  
**MAXIMUM STATION PARKING ACCUMULATION**

	Maximum Accumulation									
	<u>I</u>	<u>VII</u>	<u>VIII</u>	<u>IX</u>	<u>X</u>	<u>XI</u>	<u>XII</u>	<u>XIII</u>	<u>XIV</u>	<u>XV</u>
Union Station	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Wilshire & Fairfax	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fairfax & Beverly	778	—	628	790	727	769	790	—	641	638
Universal City	2,446	—	2,500	2,500	2,500	2,500	2,073	—	2,500	2,500
North Hollywood	2,500	—	2,500	2,500	2,500	2,500	1,816	—	2,500	2,500

North Hollywood, reach the maximum amount of space availability for nearly all of the alternatives. The exception is Fairfax/Beverly which reaches a maximum accumulation of 790 vehicles in both alternatives 9 and 12. It can be inferred from this information that parking demand at each of the other four stations is greater than the amount of available supply.

#### PEAK HOUR AND PEAK 20-MINUTE MAXIMUM LOAD POINT VOLUMES

Table 8 summarizes for the basic starter line (option 1), the minimum operable segment (option 7), and each of the possible future extension alternatives both the peak hour and peak 20-minute, peak direction, volumes on the starter line. For the peak hour they range between 12,000 for the minimal operable segment to nearly 18,000 for the full extent rail system. These values indicate that the system requirements under any of these alternatives remains fairly stable for the starter line.

**TABLE 8**  
**1995 STARTER LINE PEAK-HOUR AND PEAK 20-MINUTE VOLUME ESTIMATES**

Option	24-Hour Maximum Load Point	Peak Hour Value	Peak 30-Min. Value
I	164,348	14,791	5,620
II	183,482	16,513	6,275
III	176,068	15,846	6,021
IV	191,508	17,236	6,550
V	197,078	17,737	6,740
VI	191,852	17,267	6,561
VII	133,138	11,982	4,553

3.

MODE OF ARRIVAL MODEL RESULTS

In Phase III of the project, a detailed mode-of-arrival model (described in Chapter 4) was used to develop arrival and departure statistics for each Metrorail station for each of the basic starter line alternatives (options 1,7 and 8 through 15). The output from this model provided information by individual station and time period. The model predicts station arrivals and departures stratified by:

1. Walk trips
2. Feeder bus trips
3. Kiss and ride
4. Park and ride vehicles
5. Park and ride vehicle passengers



Tables 9-38 summarize these arrivals and departures by station for each of the options for the 24 hour, AM, and PM peak hour periods. Passenger movement volumes produced by the mode of arrival model were essential in the early planning and design of individual station facilities and in the development of an operating plan for the Metro Rail system.

**Table 9**  
**Option I**  
**24-Hour Passenger Volumes (2000)**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	1076	28737	1772	3391	339	35315	1076	28737	1772	3391	339	35315
2. 1st & Broadway	6474	9238	0	0	0	15712	6474	9238	0	0	0	15712
3. 5th & Broadway	16957	19594	0	0	0	36551	16957	19594	0	0	0	36551
4. 7th & Flower	10884	25048	0	0	0	35932	10884	25048	0	0	0	35932
5. Wilshire & Alvarado	12246	9028	935	0	0	22209	12246	9028	935	0	0	22209
6. Wilshire & Vermont	10997	21220	586	0	0	32803	10997	21220	586	0	0	32803
7. Wilshire & Normandie	9523	8531	904	0	0	18958	9523	8531	904	0	0	18958
8. Wilshire & Western	5049	15622	520	0	0	21191	5049	15622	520	0	0	21191
9. Wilshire & Crenshaw	3594	9246	327	0	0	13167	3594	9246	327	0	0	13167
10. Wilshire & La Brea	1984	11721	387	0	0	14092	1984	11721	387	0	0	14092
11. Wilshire & Fairfax	973	33767	753	1940	194	37627	973	33767	753	1940	194	37627
12. Fairfax & Beverly	1923	5135	661	1488	149	9356	1923	5135	661	1488	149	9356
13. Fairfax & Santa Monica	647	12967	509	0	0	14123	647	12967	509	0	0	14123
14. Hollywood & Cahuenga	11378	1114	1821	0	0	24313	11378	1114	1821	0	0	24313
15. Hollywood Bowl	0	1315	298	0	0	1613	0	1315	298	0	0	1613
16. Universal City	807	7747	676	4835	483	14548	807	7747	676	4835	483	14548
17. Lankershim & Chandler	506	7887	2248	4999	500	16140	506	7887	2248	4999	500	16140
	95018	227917	12397	16653	1665	363650	197421	227917	12397	16653	1665	363650

Table 10  
Option I  
Constrained Demand for A.M. Peak Hour

Station Number	Mode of Arrival					Mode of Departure						
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	97	4677	305	498	50	5627	127	814	13	8	1	963
2. 1st & Broadway	46	1278	0	0	0	1324	1411	622	0	0	0	2033
3. 5th & Broadway	122	1623	0	0	0	1745	3418	2268	0	0	0	5686
4. 7th & Flower	84	2915	0	0	0	2999	2204	1986	0	0	0	4190
5. Wilshire & Alvarado	648	1167	183	0	0	1998	1844	672	7	0	0	2523
6. Wilshire & Vermont	556	2548	121	0	0	3225	1744	1814	4	0	0	3562
7. Wilshire & Normandie	802	831	182	0	0	1815	1220	967	7	0	0	2194
8. Wilshire & Western	36	1920	105	0	0	2061	1040	1294	4	0	0	2338
9. Wilshire & Crenshaw	231	1377	66	0	0	1674	532	508	2	0	0	1042
10. Wilshire & La Brea	14	1295	79	0	0	1388	394	1072	3	0	0	1469
11. Wilshire & Fairfax	7	2398	132	463	46	3046	202	4421	6	14	1	4644
12. Fairfax & Beverly	32	339	144	294	29	838	352	700	5	11	1	1069
13. Fairfax & Santa Monica	5	1554	110	0	0	1669	120	1153	4	0	0	1277
14. Hollywood & Cahuenga	737	1194	372	0	0	2303	1645	1113	13	0	0	2771
15. Hollywood Bowl	0	161	61	0	0	222	0	105	2	0	0	107
16. Universal City	160	974	141	914	91	2280	11	527	5	35	4	582
17. Lankershim & Chandler	55	1011	381	1145	115	2707	44	548	17	36	4	649
	3632	27235	2382	3314	331	36921	16308	20584	92	104	11	37099

**Table 11**  
**Option I**  
**Constrained Demand for P.M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	177	2414	117	382	38	3128	150	6125	402	1178	118	7973
2. 1st & Broadway	1644	1091	0	0	0	2735	366	1707	0	0	0	2073
3. 5th & Broadway	4142	3224	0	0	0	7366	1015	2656	0	0	0	3671
4. 7th & Flower	2662	3283	0	0	0	5945	654	4205	0	0	0	4859
5. Wilshire & Alvarado	2422	1130	57	0	0	3609	1276	1597	225	0	0	3098
6. Wilshire & Vermont	2240	2875	35	0	0	5150	1106	3551	45	0	0	4802
7. Wilshire & Normandie	1652	1364	54	0	0	3070	1258	1237	221	0	0	2716
8. Wilshire & Western	1246	2078	31	0	0	3355	298	2654	127	0	0	3079
9. Wilshire & Crenshaw	691	990	20	0	0	1701	407	1805	80	0	0	2292
10. Wilshire & La Brea	481	1668	23	0	0	2172	120	1865	95	0	0	2080
11. Wilshire & Fairfax	241	6065	49	152	15	6522	57	4112	172	599	60	5000
12. Fairfax & Beverly	442	949	37	90	9	1527	136	600	168	360	36	1300
13. Fairfax & Santa Monica	152	1789	29	0	0	1970	41	2154	129	0	0	2324
14. Hollywood & Cahuenga	2163	1650	108	0	0	3921	1300	1725	448	0	0	3473
15. Hollywood Bowl	0	174	18	0	0	192	0	223	74	0	0	297
16. Universal City	53	956	40	302	30	1381	194	1354	168	1145	114	2975
17. Lankershim & Chandler	71	972	149	405	41	1638	80	1392	506	1517	152	3647
	20479	32672	767	1331	133	55382	8458	38962	2860	4799	480	55659

**Table 12**  
**Option VII**  
**Constrained Daily Demand**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	1004	26135	1687	3309	331	32466	1004	26135	1687	3309	331	32466
2. 1st & Broadway	5269	8632	0	0	0	13901	5269	8632	0	0	0	13901
3. 5th & Broadway	13939	18507	0	0	0	32446	13939	18507	0	0	0	32446
4. 7th & Flower	9568	19174	0	0	0	28742	9568	19174	0	0	0	28742
5. Wilshire & Alvarado	12444	8566	2527	0	0	23537	12444	8566	2527	0	0	23537
6. Wilshire & Vermont	10908	19881	572	0	0	31361	10908	19881	572	0	0	31361
7. Wilshire & Normandie	7576	7998	844	0	0	16418	7576	7998	844	0	0	16418
8. Wilshire & Western	4757	14466	533	0	0	19756	4757	14466	533	0	0	19756
9. Wilshire & Crenshaw	2586	10652	430	0	0	13668	2586	10652	430	0	0	13668
10. Wilshire & La Brea	1251	12375	73	0	0	14099	1251	12375	73	0	0	14099
11. Wilshire & Fairfax	700	32257	617	1977	198	35749	700	32257	617	1977	198	35749
13. Fairfax & Santa Monica	0	61	0	0	0	61	0	61	0	0	0	61
15. Hollywood Bowl	0	7	0	0	0	7	0	7	0	0	0	7
17. Lankershim & Chandler	0	9	0	0	0	9	0	9	0	0	0	9
	70607	178720	7683	5615	529	262220	70002	178720	7683	5901	745	262220

Table 13  
Option VII  
Constrained Demand for A.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	87	4374	294	498	50	5303	123	697	12	8	1	841
2. 1st & Broadway	46	1245	0	0	0	1291	1123	527	0	0	0	1650
3. 5th & Broadway	100	1640	0	0	0	1740	2799	2027	0	0	0	4826
4. 7th & Flower	74	2334	0	0	0	2408	1937	1503	0	0	0	3440
5. Wilshire & Alvarado	798	1185	500	0	0	2483	1737	551	18	0	0	2306
6. Wilshire & Vermont	558	2419	118	0	0	3095	1721	1684	4	0	0	3409
7. Wilshire & Normandie	697	807	170	0	0	1674	915	880	6	0	0	1801
8. Wilshire & Western	34	1857	108	0	0	1999	980	1110	4	0	0	2094
9. Wilshire & Crenshaw	219	1568	87	0	0	1874	326	610	3	0	0	939
10. Wilshire & La Brea	9	1446	97	0	0	1552	243	1060	3	0	0	1306
11. Wilshire & Fairfax	5	2445	115	437	44	3046	142	4007	4	16	2	4171
13. Fairfax & Santa Monica	0	0	0	0	0	0	0	10	0	0	0	0
15. Hollywood Bowl	0	0	0	0	0	0	0	1	0	0	0	1
17. Lankershim & Chandler	0	0	0	0	0	0	0	1	0	0	0	1
	2627	21320	1489	935	94	29753	12046	14688	54	24	3	26795

**Table 14**  
**Option VII**  
**Constrained Demand For P.M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	169	2136	110	383	38	2836	136	5659	385	1220	122	7522
2. 1st & Broadway	1320	969	0	0	0	2289	310	1644	0	0	0	1954
3. 5th & Broadway	3398	2938	0	0	0	6336	837	2612	0	0	0	3449
4. 7th & Flower	2340	2476	0	0	0	4816	575	3290	0	0	0	3865
5. Wilshire & Alvarado	2331	993	153	0	0	3477	1429	1591	612	0	0	3632
6. Wilshire & Vermont	2214	2675	34	0	0	4923	1104	3352	141	0	0	4597
7. Wilshire & Normandie	1260	1253	51	0	0	2564	1056	1186	206	0	0	2448
8. Wilshire & Western	1174	1844	32	0	0	3050	281	2534	131	0	0	2946
9. Wilshire & Crenshaw	445	1161	26	0	0	1632	343	2060	105	0	0	2508
10. Wilshire & La Brea	300	1692	28	0	0	2020	77	2040	116	0	0	2233
11. Wilshire & Fairfax	171	5616	39	135	13	5974	42	4082	145	536	54	4859
13. Fairfax & Santa Monica	0	14	0	0	0	14	0	4	0	0	0	4
15. Hollywood Bowl	0	2	0	0	0	2	0	0	0	0	0	0
17. Lankershim & Chandler	0	2	0	0	0	2	0	1	0	0	0	1
	15122	23771	473	518	51	39935	6190	30050	1841	1756	176	40018

**Table 15**  
**Option VIII**  
**Constrained Daily Demand**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps
1. Union Station	1124	26960	1629	3363	336	33412	1124	26960	1629	3363	336	33412
2. 1st & Broadway	6086	8612	0	0	0	14698	6086	8612	0	0	0	14698
3. 5th & Broadway	16195	20225	0	0	0	36420	16195	20225	0	0	0	36420
4. 7th & Flower	10783	21220	0	0	0	32012	10783	21229	0	0	0	32012
5. Wilshire & Alvarado	12040	9541	902	0	0	22483	12040	9541	902	0	0	22483
6. Wilshire & Vermont	10916	20851	547	0	0	32314	10916	20851	547	0	0	32314
7. Wilshire & Normandie	8747	8395	762	0	0	17904	8747	8395	762	0	0	17904
8. Wilshire & Western	4868	15441	505	0	0	20814	4868	15441	505	0	0	20814
9. Wilshire & Crenshaw	3405	9960	330	0	0	13695	3405	9960	330	0	0	13695
10. Wilshire & La Brea	1780	11091	385	0	0	13256	1780	11091	385	0	0	13256
11. Wilshire & Fairfax	933	32146	705	1925	193	35002	933	32146	705	1925	193	35002
12. Fairfax & Beverly	1864	5162	528	1199	120	8873	1864	5162	528	1199	120	8873
13. Fairfax & Santa Monica	523	9540	411	0	0	10474	523	9540	411	0	0	10474
16. Universal City	844	7838	833	5019	502	10536	844	7838	833	5019	502	15036
17. Lankershim & Chandler	440	7964	2424	5174	517	16519	440	7964	2424	5174	517	16519
18. Fairfax & Sunset	1842	3829	345	0	0	6016	1842	3829	345	0	0	6016
	82390	217875	10306	16836	1684	324428	82390	218784	10306	17295	1729	328928



Table 16  
Option VIII  
Constrained Demand For A.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	99	4379	279	498	50	5305	136	784	12	8	1	941
2. 1st & Broadway	43	1182	0	0	0	1225	1326	574	0	0	0	1900
3. 5th & Broadway	116	1738	0	0	0	1854	3265	2226	0	0	0	5491
4. 7th & Flower	83	2415	0	0	0	2498	2181	1779	0	0	0	3960
5. Wilshire & Alvarado	635	1266	177	0	0	2078	1819	672	7	0	0	2498
6. Wilshire & Vermont	554	2500	113	0	0	3167	1742	1803	4	0	0	3549
7. Wilshire & Normandie	734	863	155	0	0	1752	1125	930	5	0	0	2060
8. Wilshire & Western	35	1922	102	0	0	2059	1003	1249	4	0	0	2256
9. Wilshire & Crenshaw	223	1470	66	0	0	1759	503	557	2	0	0	1062
10. Wilshire & La Brea	13	1212	79	0	0	1304	351	1026	3	0	0	1380
11. Wilshire & Fairfax	7	2129	123	440	44	2743	195	4161	5	13	1	4375
12. Fairfax & Beverly	28	336	115	237	24	740	344	703	4	9	1	1061
13. Fairfax & Santa Monica	4	921	84	0	0	1009	91	1040	3	0	0	1134
16. Universal City	168	957	164	1014	101	2404	11	562	6	38	4	621
17. Lankershim & Chandler	54	999	432	1139	114	2738	33	575	18	38	4	668
18. Fairfax & Sunset	394	254	71	0	0	719	15	546	2	0	0	563
	3190	24543	1960	3328	333	32354	14140	19187	75	106	11	33519

Table 17  
Option VIII  
Constrained Demand for P.M. Peak Hour

Station Number	Mode of Arrival					Mode of Departure						
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	188	2282	107	382	38	2997	154	5733	369	1195	120	7571
2. 1st & Broadway	1545	1015	0	0	0	2560	344	1587	0	0	0	1931
3. 5th & Broadway	3956	3234	0	0	0	7190	970	2814	0	0	0	3784
4. 7th & Flower	2635	2860	0	0	0	5495	649	3502	0	0	0	4151
5. Wilshire & Alvarado	2387	1160	55	0	0	3602	1251	1720	217	0	0	3188
6. Wilshire & Vermont	2229	2839	32	0	0	5100	1098	3482	135	0	0	4715
7. Wilshire & Normandie	1520	1317	45	0	0	2882	1153	1252	187	0	0	2592
8. Wilshire & Western	1202	2027	30	0	0	3259	287	2648	124	0	0	3059
9. Wilshire & Crenshaw	653	1077	20	0	0	1750	388	1932	80	0	0	2400
10. Wilshire & La Brea	430	1590	23	0	0	2043	108	1752	95	0	0	1955
11. Wilshire & Fairfax	232	5658	46	143	14	6121	55	3724	161	564	56	4560
12. Fairfax & Beverly	431	955	30	73	7	1496	129	600	134	290	29	1182
13. Fairfax & Santa Monica	119	1505	24	0	0	1648	34	1384	101	0	0	1519
16. Universal City	55	994	51	329	33	1462	203	1344	201	1263	126	3137
17. Lankershim & Chandler	56	1003	157	433	43	1692	75	1384	558	1613	161	3791
18. Fairfax & Sunset	107	721	20	0	0	848	463	444	85	0	0	992
	17745	30237	640	1360	135	50145	7361	35302	2447	4925	492	50527

Table 18  
Option IX  
24-Hour Passenger Volumes

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	1104	28856	1770	3389	339	35458	1104	28856	1770	3389	339	35458
2. 1st & Broadway	6522	9240	0	0	0	15762	6522	9240	0	0	0	15762
3. 5th & Broadway	17053	19924	0	0	0	36977	17053	19924	0	0	0	36977
4. 7th & Flower	10787	25412	0	0	0	36199	10787	25412	0	0	0	36199
5. Wilshire & Alvarado	12612	8901	2563	0	0	24076	12612	8901	2563	0	0	24076
6. Wilshire & Vermont	11085	21518	622	0	0	33225	11085	21518	622	0	0	33225
7. Wilshire & Normandie	9205	8484	888	0	0	18577	9205	8484	888	0	0	18577
8. Wilshire & Western	6452	18043	1130	0	0	25625	6452	18043	1130	0	0	25625
10. Wilshire & La Brea	1996	13676	544	0	0	16216	1996	13676	544	0	0	16216
11. Wilshire & Fairfax	980	34561	787	1965	197	38490	980	34561	787	1965	197	38490
12. Fairfax & Beverly	1911	4800	668	1510	151	9040	1911	4800	668	1510	151	9040
13. Fairfax & Santa Monica	792	12715	416	0	0	13923	792	12715	416	0	0	13923
14. Hollywood & Cahuenga	10453	12666	1494	0	0	24613	10453	12666	1494	0	0	24613
16. Universal City	852	8049	731	4978	498	15108	852	8049	731	4978	498	15108
17. Lankershim & Chandler	511	8132	2325	5048	505	16521	511	8132	2325	5048	505	16521
19. Sunset & La Brea	181	1433	1058	0	0	2672	181	1433	1058	0	0	2672
	92496	229210	14996	16890	1690	362482	92496	226410	14996	16890	33519	359782

**Table 19**  
**Option IX**  
**Constrained Demand For A.M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	96	4681	305	498	50	5630	133	837	13	8	1	992
2. 1st & Broadway	46	1255	0	0	0	1301	1417	640	0	0	0	2057
3. 5th & Broadway	123	1636	0	0	0	1759	3439	2336	0	0	0	5775
4. 7th & Flower	83	2899	0	0	0	2982	2183	2073	0	0	0	4256
5. Wilshire & Alvarado	800	1149	506	0	0	2455	1767	659	18	0	0	2444
6. Wilshire & Vermont	557	2579	128	0	0	3264	1759	1845	4	0	0	3608
7. Wilshire & Normandie	781	831	179	0	0	1791	1174	958	6	0	0	2138
8. Wilshire & Western	46	2212	230	0	0	2488	1332	1485	8	0	0	2825
10. Wilshire & La Brea	14	1604	111	0	0	1729	397	1153	4	0	0	1554
11. Wilshire & Fairfax	7	2473	139	462	46	3127	204	4515	6	14	1	4740
12. Fairfax & Beverly	32	335	146	298	30	841	348	631	5	11	1	996
13. Fairfax & Santa Monica	6	1489	90	0	0	1585	145	1178	3	0	0	1326
14. Hollywood & Cahuenga	589	1393	305	0	0	2287	1601	1218	11	0	0	2830
16. Universal City	170	1025	151	948	95	2389	11	534	5	36	4	590
17. Lankershim & Chandler	56	1043	400	1144	114	2757	45	568	17	37	4	671
19. Sunset & La Brea	21	155	216	0	0	392	17	142	8	0	0	167
	3427	26759	2906	3350	335	36777	15932	20772	108	106	203968	36969

Table 20  
Option IX  
Constrained Demand for P.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	184	2442	116	382	38	3162	151	6134	401	1183	118	7987
2. 1st & Broadway	1654	1109	0	0	0	2763	370	1687	0	0	0	2057
3. 5th & Broadway	4166	3302	0	0	0	7468	1021	2684	0	0	0	3705
4. 7th & Flower	2637	3385	0	0	0	6022	649	4211	0	0	0	4860
5. Wilshire & Alvarado	2370	1112	156	0	0	3638	1440	1575	620	0	0	3635
6. Wilshire & Vermont	2260	2921	37	0	0	5218	1113	3596	153	0	0	4862
7. Wilshire & Normandie	1590	1353	53	0	0	2996	1222	1234	217	0	0	2673
8. Wilshire & Western	1594	2395	67	0	0	4056	380	3065	277	0	0	3722
10. Wilshire & La Brea	484	1856	32	0	0	2372	121	2264	133	0	0	2518
11. Wilshire & Fairfax	243	6196	51	156	16	6662	57	4224	181	615	61	5138
12. Fairfax & Beverly	438	866	38	92	9	1443	136	579	170	365	37	1287
13. Fairfax & Santa Monica	185	1795	24	0	0	2004	50	2076	105	0	0	2231
14. Hollywood & Cahuenga	2071	1839	89	0	0	3999	1111	2000	367	0	0	3478
16. Universal City	55	981	43	313	31	1423	205	1418	181	1187	119	3110
17. Lankershim & Chandler	72	1005	153	413	41	1684	81	1433	527	1548	155	3744
19. Sunset & La Brea	25	211	63	0	0	299	30	224	260	0	0	514
	20028	32768	922	1356	135	55209	8137	38404	3592	4898	490	55521

**Table 21**  
**Option X**  
**Constrained Daily Demand**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	1134	27155	1661	3370	337	33657	1134	27155	1661	3370	337	33657
2. 1st & Broadway	6087	8607	0	0	0	14685	6078	8607	0	0	0	14685
3. 5th & Broadway	16532	20813	0	0	0	37345	16532	20813	0	0	0	37345
4. 7th & Flower	10807	21952	0	0	0	32759	10807	21952	0	0	0	32759
5. Wilshire & Alvarado	12433	9589	2545	0	0	24567	12433	9589	2545	0	0	24567
6. Wilshire & Vermont	10948	21461	583	0	0	32992	10948	21461	583	0	0	32992
7. Wilshire & Normandie	8716	8299	858	0	0	17873	8716	8299	858	0	0	17873
8. Wilshire & Western	6168	17649	1120	0	0	24937	6168	17649	1120	0	0	24937
10. Wilshire & La Brea	1837	12985	537	0	0	15359	1837	12985	537	0	0	15359
11. Wilshire & Fairfax	964	31815	1065	2186	219	36249	964	31815	1065	2186	219	36249
12. Fairfax & Beverly	1868	5107	615	1388	139	9117	1868	5107	615	1388	139	9117
13. Fairfax & Santa Monica	559	19227	687	0	0	20473	559	19227	687	0	0	20473
16. Universal City	890	8575	1061	5045	504	16075	890	8575	1061	5045	504	16075
17. Lankershim & Chandler	466	8572	2525	5247	525	17335	466	8572	2525	5247	525	17335
	79409	221806	13257	17236	1724	333423	79400	221806	13257	17236	1724	333423

**Table 22**  
**Option X**  
**Constrained Demand For A.M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	101	4399	285	498	50	5333	137	796	12	8	1	954
2. 1st & Broadway	43	1174	0	0	0	1217	1323	579	0	0	0	1902
3. 5th & Broadway	119	1785	0	0	0	1904	3334	2312	0	0	0	5646
4. 7th & Flower	84	2437	0	0	0	2521	2186	1897	0	0	0	4083
5. Wilshire & Alvarado	788	1274	502	0	0	2564	1743	677	18	0	0	2438
6. Wilshire & Vermont	555	2561	120	0	0	3236	1730	1856	4	0	0	3590
7. Wilshire & Normandie	742	820	173	0	0	1735	1110	929	6	0	0	2045
8. Wilshire & Western	44	2212	228	0	0	2484	1274	1403	8	0	0	2685
10. Wilshire & La Brea	13	1500	109	0	0	1622	363	1121	4	0	0	1488
11. Wilshire & Fairfax	7	2155	199	454	45	2860	200	4274	8	16	2	4498
12. Fairfax & Beverly	31	340	135	275	27	808	342	687	4	10	1	1044
13. Fairfax & Santa Monica	4	1884	140	0	0	2028	99	2109	5	0	0	2213
16. Universal City	177	1069	195	1103	110	2654	11	594	8	42	4	659
17. Lankershim & Chandler	55	1069	459	1136	114	2833	37	612	18	38	4	709
	2763	24679	2545	3466	346	33799	13889	19846	95	114	12	33954

**Table 23**  
**Option X**  
**Constrained Demand For P.M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	189	2305	110	383	38	3025	156	5766	376	1192	119	7609
2. 1st & Broadway	1542	1021	0	0	0	2563	344	1579	0	0	0	1923
3. 5th & Broadway	4039	3342	0	0	0	7381	989	2889	0	0	0	3878
4. 7th & Flower	2641	3013	0	0	0	5654	651	3564	0	0	0	4215
5. Wilshire & Alvarado	2337	1166	155	0	0	3658	1419	1730	615	0	0	3764
6. Wilshire & Vermont	2225	2926	34	0	0	5185	1104	3575	144	0	0	4823
7. Wilshire & Normandie	1504	1316	51	0	0	2871	1159	1215	209	0	0	2583
8. Wilshire & Western	1525	2296	67	0	0	3888	363	3044	275	0	0	3682
10. Wilshire & La Brea	445	1786	32	0	0	2263	111	2127	132	0	0	2370
11. Wilshire & Fairfax	239	5819	67	192	19	6336	56	3771	251	756	76	4910
12. Fairfax & Beverly	430	937	35	84	8	1494	132	601	157	336	34	1260
13. Fairfax & Santa Monica	128	3034	41	0	0	3203	36	2805	169	0	0	3010
16. Universal City	57	1065	67	357	36	1582	214	1492	248	1372	137	3463
17. Lankershim & Chandler	62	1076	161	445	45	1789	78	1488	587	1661	166	3980
	17363	31102	1150	1461	146	50892	6812	35646	3163	5317	532	51470



Table 24  
Option XI  
Constrained Daily Demand

Station Number	Mode of Arrival					Total Trps	Mode of Departure					Total Trps
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass		Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	
1. Union Station	111	28772	1780	3387	339	35389	111	28772	1780	3387	339	35389
2. 1st & Broadway	6586	9171	0	0	0	15757	6586	9171	0	0	0	15757
3. 5th & Broadway	17139	19992	0	0	0	37131	17139	19992	0	0	0	37131
4. 7th & Flower	10913	25448	0	0	0	36361	10913	25448	0	0	0	36361
5. Wilshire & Alvarado	12573	9015	2541	0	0	24129	12573	9015	2541	0	0	24129
6. Wilshire & Vermont	11154	21655	618	0	0	33427	11154	21655	618	0	0	33427
7. Wilshire & Normandie	8827	8503	862	0	0	18192	8827	8503	862	0	0	18192
8. Wilshire & Western	6340	17785	1121	0	0	25246	6340	17785	1121	0	0	25246
10. Wilshire & La Brea	1897	13362	538	0	0	15797	1897	13362	538	0	0	15797
11. Wilshire & Fairfax	974	33958	766	1944	194	37836	974	33958	766	1944	194	37836
12. Fairfax & Beverly	1911	4839	651	1471	147	9019	1911	4839	651	1471	147	9019
13. Fairfax & Santa Monica	780	12205	426	0	0	13411	780	12205	426	0	0	13411
16. Universal City	850	8382	794	5033	503	15562	850	8382	794	5033	503	15562
17. Lankershim & Chandler	525	8657	2405	5124	512	17223	525	8657	2405	5124	512	17223
19. Sunset & La Brea	4212	11774	2115	0	0	18101	4212	11774	2115	0	0	18101
	84792	233518	14617	16959	1695	352581	84792	233518	14617	16959	1695	352581

Table 25  
Option XI  
Constrained Demand For A.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	96	4646	308	498	50	5598	135	843	13	8	1	1000
2. 1st & Broadway	47	1239	0	0	0	1286	1431	637	0	0	0	2068
3. 5th & Broadway	123	1634	0	0	0	1757	3456	2353	0	0	0	5809
4. 7th & Flower	84	2887	0	0	0	2971	2210	2089	0	0	0	4299
5. Wilshire & Alvarado	797	1167	501	0	0	2465	1766	662	18	0	0	2446
6. Wilshire & Vermont	557	2585	127	0	0	3269	1787	1884	4	0	0	3675
7. Wilshire & Normandie	742	872	173	0	0	1787	1134	945	6	0	0	2085
8. Wilshire & Western	45	2187	227	0	0	2459	1309	1450	8	0	0	2767
10. Wilshire & La Brea	14	1548	110	0	0	1672	376	1143	4	0	0	1523
11. Wilshire & Fairfax	7	2403	133	462	46	3051	203	4444	6	14	1	4668
12. Fairfax & Beverly	31	334	142	291	29	827	349	636	5	11	1	1002
13. Fairfax & Santa Monica	6	1403	88	0	0	1497	142	1140	3	0	0	1285
16. Universal City	169	1056	160	995	99	2479	11	570	6	38	4	629
17. Lankershim & Chandler	56	1096	422	1141	114	2829	46	614	18	37	4	719
19. Sunset & La Brea	300	1066	431	0	0	1797	569	1369	15	0	0	1953
	3074	26123	2822	3387	338	35744	14924	20779	106	108	11	35928

Table 26  
Option XI  
Constrained Demand For P.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	186	2446	117	382	38	3169	151	6099	404	1178	118	7950
2. 1st & Broadway	1670	1104	0	0	0	2774	374	1669	0	0	0	2043
3. 5th & Broadway	4187	3321	0	0	0	7508	1026	2684	0	0	0	3710
4. 7th & Flower	2669	3403	0	0	0	6072	656	4202	0	0	0	4858
5. Wilshire & Alvarado	2365	1122	154	0	0	3641	1434	1598	614	0	0	3646
6. Wilshire & Vermont	2285	2960	36	0	0	5281	113	3605	153	0	0	4871
7. Wilshire & Normandie	1533	1336	52	0	0	2921	1165	1266	210	0	0	2641
8. Wilshire & Western	1567	2350	67	0	0	3984	373	3029	275	0	0	3677
10. Wilshire & La Brea	459	1829	32	0	0	2320	115	2195	132	0	0	2442
11. Wilshire & Fairfax	242	6101	50	152	15	6560	57	4130	174	599	60	5020
12. Fairfax & Beverly	439	875	37	89	9	1449	135	581	165	356	36	1273
13. Fairfax & Santa Monica	181	1736	25	0	0	1942	50	1974	105	0	0	2129
16. Universal City	55	1032	48	325	33	1493	204	1467	194	1242	124	3231
17. Lankershim & Chandler	74	1081	157	425	43	1780	83	1513	550	1592	159	3897
19. Sunset & La Brea	767	1932	126	0	0	2825	510	1639	520	0	0	2669
	18679	32628	901	1373	138	53719	6446	37651	3496	4967	497	54057

Table 27  
Option XII  
Constrained Daily Demand

Station Number	Mode of Arrival					Total Trps	Mode of Departure					Total Trps
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass		Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	
1. Union Station	1116	28980	1824	3392	339	35651	1116	28980	1824	3392	339	35651
2. 1st & Broadway	6838	9448	0	0	0	16286	6838	9448	0	0	0	16286
3. 5th & Broadway	17674	20200	0	0	0	37874	17674	20200	0	0	0	37874
4. 7th & Flower	1112	25539	0	0	0	36661	1112	25539	0	0	0	36661
5. Wilshire & Alvarado	12884	9149	2588	0	0	24621	12884	9149	2588	0	0	24621
6. Wilshire & Vermont	11292	21421	619	0	0	33332	11292	21421	619	0	0	33332
7. Wilshire & Normandie	9671	8605	904	0	0	19180	9671	8605	904	0	0	19180
8. Wilshire & Western	5150	15901	572	0	0	21623	5150	15901	572	0	0	21623
9. Wilshire & Crenshaw	4231	9616	440	0	0	14287	4231	9616	440	0	0	14287
10. Wilshire & La Brea	1993	11825	465	0	0	14283	1993	11825	465	0	0	14283
11. Wilshire & Fairfax	1008	34385	770	1956	196	38315	1008	34385	770	1956	196	38315
12. Fairfax & Beverly	1952	4884	669	1512	151	9168	1952	4884	669	1512	151	9168
13. Fairfax & Santa Monica	795	12315	416	0	0	13526	795	12315	416	0	0	13526
14. Hollywood & Cahuenga	10488	12643	1461	0	0	24592	10488	12643	1461	0	0	24592
16. Universal City	946	8505	629	4084	408	14572	946	8505	629	4084	408	14572
17. Lankershim & Chandler	349	2022	900	3650	365	7286	349	2022	900	3650	365	7286
19. Sunset & La Brea	177	1519	1039	0	0	2735	177	1519	1039	0	0	2735
30. Laurel Canyon & Chandler	1011	10360	899	0	0	12270	1011	10360	899	0	0	12270
	87676	236957	13296	14594	1459	363992	97686	236957	13296	14594	1459	363992

**Table 28**  
**Option XII**  
**Constrained Demand For A. M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	97	4682	315	498	50	5642	135	854	13	8	1	1011
2. 1st & Broadway	48	1275	0	0	0	1323	1486	663	0	0	0	2149
3. 5th & Broadway	127	1644	0	0	0	1771	3564	2381	0	0	0	5945
4. 7th & Flower	86	2883	0	0	0	2969	2254	2113	0	0	0	4367
5. Wilshire & Alvarado	806	1164	510	0	0	2480	1820	692	19	0	0	2531
6. Wilshire & Vermont	558	2530	127	0	0	3215	1802	1878	4	0	0	3684
7. Wilshire & Normandie	802	833	182	0	0	1817	1253	982	7	0	0	2242
8. Wilshire & Western	37	1931	116	0	0	2084	1060	1336	4	0	0	2400
9. Wilshire & Crenshaw	359	1432	89	0	0	1880	539	528	3	0	0	1070
10. Wilshire & La Brea	14	1292	95	0	0	1401	396	1092	3	0	0	1491
11. Wilshire & Fairfax	7	2396	136	462	46	3047	210	4562	6	14	1	4793
12. Fairfax & Beverly	33	335	146	298	30	842	356	646	5	11	1	1019
13. Fairfax & Santa Monica	6	1441	90	0	0	1537	145	1141	3	0	0	1289
14. Hollywood & Cahuenga	571	1371	298	0	0	2240	1625	1248	10	0	0	2883
16. Universal City	189	1125	131	776	78	2299	12	540	4	30	3	589
17. Lankershim Boulevard	34	249	186	676	68	1213	33	172	6	27	3	241
19. Sunset & La Brea	20	162	212	0	0	394	17	152	7	0	0	176
30. Laurel Canyon & Chandler	157	1652	167	0	0	1976	44	448	7	0	0	499
	3794	26745	2633	3062	272	36154	16707	20980	94	90	9	37880

Table 29  
Option XII  
Constrained Demand For P.M. Peak Hour

Station Number	Mode of Arrival					Mode of Departure						
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	187	2467	120	381	38	3193	152	6143	414	1177	118	8004
2. 1st & Broadway	1734	1142	0	0	0	2876	388	1717	0	0	0	2105
3. 5th & Broadway	4317	3361	0	0	0	7678	1058	2707	0	0	0	3765
4. 7th & Flower	2721	3431	0	0	0	6152	668	4202	0	0	0	4870
5. Wilshire & Alvarado	2433	1158	157	0	0	3748	1460	1603	625	0	0	3688
6. Wilshire & Vermont	2311	2946	37	0	0	5294	1124	3543	153	0	0	4820
7. Wilshire & Normandie	1690	1382	54	0	0	3126	1265	1242	221	0	0	2728
8. Wilshire & Western	1271	2134	34	0	0	3439	304	2681	140	0	0	3125
9. Wilshire & Crenshaw	731	1029	26	0	0	1786	561	1877	107	0	0	2545
10. Wilshire & La Brea	483	1694	28	0	0	2205	121	1868	114	0	0	2103
11. Wilshire & Fairfax	250	6229	50	154	15	6698	59	4140	177	608	61	5045
12. Fairfax & Beverly	448	886	38	92	9	1473	138	584	170	365	37	1294
13. Fairfax & Santa Monica	185	1740	24	0	0	1949	51	2009	105	0	0	2165
14. Hollywood & Cahuenga	2096	1863	87	0	0	4046	1096	1973	359	0	0	3428
16. Universal City	61	1008	37	254	25	1385	228	1535	156	969	97	2985
17. Lankershim & Chandler	52	275	53	231	23	634	52	339	222	856	86	1555
19. Sunset & La Brea	25	225	62	0	0	312	29	235	255	0	0	519
30. Laurel Canyon & Chandler	99	1000	57	0	0	1156	204	2126	211	0	0	2541
	20995	32970	807	1112	110	1385	8754	38398	3218	3975	399	54744

Table 30  
Option XIII  
Constrained Daily Demand

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	860	26047	1856	3347	335	32445	860	26047	1856	3347	335	32445
2. 1st & Broadway	4528	10100	0	0	0	14628	4528	10100	0	0	0	14628
3. 5th & Broadway	14638	15594	0	0	0	30232	14638	15594	0	0	0	30232
4. 7th & Flower	9092	21024	0	0	0	30116	9092	21024	0	0	0	30116
5. Wilshire & Alvarado	12060	8071	2479	0	0	22610	12060	8071	2479	0	0	22610
6. Wilshire & Vermont	10806	19775	569	0	0	31150	10806	19775	569	0	0	31150
7. Wilshire & Normandie	7082	7935	801	0	0	15818	7082	7935	801	0	0	15818
8. Wilshire & Western	5258	16292	1069	0	0	22619	5258	16292	1069	0	0	22619
10. Wilshire & La Brea	1301	15038	533	0	0	16872	1301	15038	533	0	0	16872
11. Wilshire & Fairfax	669	33139	777	1940	194	36719	669	33139	777	1940	194	36719
	66294	173015	8084	5287	529	253209	66294	173015	8084	5287	529	253209

**Table 31**  
**Option XIII**  
**Constrained Demand For A.M. Peak Hour**

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	73	4314	327	498	50	5262	106	703	14	8	1	832
2. 1st & Broadway	43	1459	0	0	0	1502	990	583	0	0	0	1537
3. 5th & Broadway	105	1391	0	0	0	1496	2943	1771	0	0	0	4714
4. 7th & Flower	70	2526	0	0	0	2596	1839	1627	0	0	0	3466
5. Wilshire & Alvarado	792	1147	490	0	0	2429	1669	494	18	0	0	2181
6. Wilshire & Vermont	561	2420	118	0	0	3099	1694	1665	4	0	0	3363
7. Wilshire & Normandie	660	811	161	0	0	1632	848	864	6	0	0	1718
8. Wilshire & Western	38	2122	217	0	0	2377	1081	1221	8	0	0	2310
10. Wilshire & La Brea	9	1858	109	0	0	976	254	1182	4	0	0	1440
11. Wilshire & Fairfax	5	2547	138	462	46	3198	136	4057	6	14	1	4214
	2356	20595	1560	960	96	24567	11560	14167	60	22	2	25775



Table 32  
Option XIII  
Constrained Demand For P.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	146	2146	121	381	38	2832	115	5608	426	1205	121	7475
2. 1st & Broadway	1143	1115	0	0	0	2263	264	1930	0	0	0	2194
3. 5th & Broadway	3571	2518	0	0	0	6089	878	2187	0	0	0	3065
4. 7th & Flower	2222	2705	0	0	0	4927	547	3595	0	0	0	4142
5. Wilshire & Alvarado	2244	910	150	0	0	3304	1401	1527	600	0	0	3528
6. Wilshire & Vermont	2184	2650	33	0	0	4867	1102	3346	141	0	0	4589
7. Wilshire & Normandie	1170	1234	48	0	0	2452	995	1186	196	0	0	2377
8. Wilshire & Western	1297	2049	64	0	0	3410	310	2882	262	0	0	3454
10. Wilshire & La Brea	313	1958	32	0	0	2303	80	2576	131	0	0	2787
11. Wilshire & Fairfax	164	5719	50	152	15	6100	40	4235	179	604	60	5118
	14454	23004	1858	533	53	38547	5660	29072	1935	1809	181	38729

Table 33  
Option XIV  
Constrained Daily Demand

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	1072	26818	1595	3361	336	33182	1072	26818	1595	3361	336	33182
2. 1st & Broadway	6156	8817	0	0	0	14973	6156	8817	0	0	0	14973
3. 5th & Broadway	16391	20515	0	0	0	36906	16391	20515	0	0	0	36906
4. 7th & Flower	10583	21477	0	0	0	32060	10583	21477	0	0	0	32060
5. Wilshire & Alvarado	12452	9394	2510	0	0	24356	12452	9394	2510	0	0	24356
6. Wilshire & Vermont	10985	21153	582	0	0	32720	10985	21153	582	0	0	32720
7. Wilshire & Normandie	8367	8157	838	0	0	17362	8367	8157	838	0	0	17362
8. Wilshire & Western	6151	18199	1116	0	0	25466	6151	18199	1116	0	0	25466
10. Wilshire & La Brea	1839	13140	524	0	0	15503	1839	13140	524	0	0	15503
11. Wilshire & Fairfax	948	32161	856	2114	211	36290	948	32161	856	2114	211	36290
12. Fairfax & Beverly	1849	5052	540	1224	122	8787	1849	5052	540	1224	122	8787
13. Fairfax & Santa Monica	570	15321	578	0	0	16469	570	15321	578	0	0	16469
16. Universal City	842	8296	1015	5035	503	15691	842	8296	1015	5035	503	15691
17. Lankershim & Chandler	458	8473	2483	5227	523	17164	458	8473	2483	5227	523	17164
	78663	216973	12637	16961	1695	326929	78663	216973	12637	16961	1695	326929

Table 34  
Option XIV  
Constrained Demand For A.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	88	4355	274	498	50	5265	136	781	12	8	1	938
2. 1st & Broadway	44	1194	0	0	0	1238	1338	598	0	0	0	1936
3. 5th & Broadway	118	1741	0	0	0	1859	3308	2288	0	0	0	5596
4. 7th & Flower	82	2387	0	0	0	2469	2141	1848	0	0	0	3989
5. Wilshire & Alvarado	788	1266	495	0	0	2549	1748	646	18	0	0	2412
6. Wilshire & Vermont	555	2502	120	0	0	3177	1738	1858	4	0	0	3600
7. Wilshire & Normandie	708	809	169	0	0	1686	1072	911	6	0	0	1989
8. Wilshire & Western	44	2267	227	0	0	2538	1269	1458	8	0	0	2735
10. Wilshire & La Brea	13	1521	107	0	0	1641	364	1129	4	0	0	1497
11. Wilshire & Fairfax	7	2153	158	457	46	2821	198	4331	6	15	2	4552
12. Fairfax & Beverly	28	335	118	242	24	747	340	680	4	9	1	1034
13. Fairfax & Santa Monica	4	1644	118	0	0	1766	101	1552	4	0	0	1657
16. Universal City	168	1026	189	1083	108	2574	10	580	7	41	4	642
17. Lankershim & Chandler	54	1054	448	1137	114	2807	36	608	18	38	4	704
	2701	24254	2423	3417	342	33137	13799	19268	91	111	12	33281

Table 35  
Option XIV  
Constrained Demand For P.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	185	2270	105	383	38	2981	142	5702	361	1195	119	7519
2. 1st & Broadway	1561	1051	0	0	0	2612	349	1611	0	0	0	1960
3. 5th & Broadway	4006	3306	0	0	0	7312	980	2832	0	0	0	3812
4. 7th & Flower	2587	2942	0	0	0	5529	637	3491	0	0	0	4128
5. Wilshire & Alvarado	2342	1126	152	0	0	3620	1419	1711	606	0	0	3736
6. Wilshire & Vermont	2235	2909	34	0	0	5178	1105	3501	144	0	0	4750
7. Wilshire & Normandie	1449	1291	50	0	0	2790	1108	1196	205	0	0	2509
8. Wilshire & Western	1520	2379	66	0	0	3965	362	3126	274	0	0	3762
10. Wilshire & La Brea	445	1803	31	0	0	2279	111	2156	129	0	0	2396
11. Wilshire & Fairfax	235	5897	54	180	18	6384	55	3793	200	705	71	4824
12. Fairfax & Beverly	427	927	30	74	7	1465	128	594	137	296	30	1185
13. Fairfax & Santa Monica	131	2292	34	0	0	2457	37	2366	142	0	0	2545
16. Universal City	54	1037	64	350	35	1540	203	1436	239	1348	135	3361
17. Lankershim & Chandler	61	1066	159	442	44	1772	76	1468	575	1647	165	3931
	17238	30296	779	1429	142	49884	6712	34983	3012	5191	420	50418

Table 36  
Option XV  
Constrained Daily Demand

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	185	2270	105	383	38	2981	142	5702	361	1195	119	7519
2. 1st & Broadway	1561	1051	0			2612	349	1611	0			1960
3. 5th & Broadway	4006	3306	0			7312	980	1832	0			3812
4. 7th & Flower	2587	2942	0			5529	637	3491	0			4128
5. Wilshire & Alvarado	2342	1126	152			3620	1419	1711	606			3736
6. Wilshire & Vermont	2235	2909	34			5178	1105	3501	144			4750
7. Wilshire & Normandie	1449	1291	50			2790	1108	1196	205			2509
8. Wilshire & Western	1520	2379	66			3965	362	3126	274			3762
10. Wilshire & La Brea	445	1803	31			2279	111	2156	129			2396
11. Wilshire & Fairfax	235	2897	54	180	18	6384	55	3793	200	705	71	4824
12. Fairfax & Beverly	427	927	30	74	7	1465	128	594	137	2966	30	1185
13. Fairfax & Santa Monica	131	2292	34	0	0	2457	37	2366	142	0	0	2545
16. Universal City	54	1037	64	350	35	1540	203	1436	239	1348	35	3361
17. Lankershim & Chandler	61	1066	159	442	44	1772	76	1468	575	1647	165	3931
	17238	27296	749	1429	142	49884	6712	33983	3012	7861	420	50418

Table 37  
Option XV  
Constrained Demand For A.M. Peak Hour

Station Number	Mode of Arrival					Mode of Departure						
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	99	4371	279	498	50	5297	137	785	12	8	1	943
2. 1st & Broadway	43	1175	0	0	0	1218	1323	590	0	0	0	1913
3. 5th & Broadway	118	1745	0	0	0	1863	3306	2299	0	0	0	5605
4. 7th & Flower	83	2382	0	0	0	2465	2162	1862	0	0	0	4024
5. Wilshire & Alvarado	788	1267	499	0	0	2554	1746	664	18	0	0	2428
6. Wilshire & Vermont	555	2550	120	0	0	3225	1760	1878	4	0	0	3642
7. Wilshire & Normandie	708	862	169	0	0	1739	1075	917	6	0	0	1998
8. Wilshire & Western	44	2241	227	0	0	2512	1268	1455	8	0	0	2731
10. Wilshire & La Brea	3	1520	106	0	0	1639	364	1129	4	0	0	1497
11. Wilshire & Fairfax	7	2146	158	457	46	2814	198	4298	6	15	2	4519
12. Fairfax & Beverly	28	335	117	241	24	745	340	682	4	9	1	1036
13. Fairfax & Santa Monica	4	1624	116	0	0	1744	101	1550	4	0	0	1655
16. Universal City	168	1030	188	1080	108	2574	11	580	7	41	4	643
17. Lankershim & Chandler	54	1046	445	1138	114	2797	36	609	18	38	4	705
	2712	24294	2424	3414	342	33186	13827	19298	91	111	12	33339

Table 38  
Option XV  
Constrained Demand For P.M. Peak Hour

Station Number	Mode of Arrival						Mode of Departure					
	Walk Trps	Bus Trps	K/R Trps	P/R Veh	Trps Pass	Total Trps	Walk Trps	Bus Trps	K/R Trps	P/R Vehs	Trps Pass	Total Trps
1. Union Station	188	2281	107	383	38	2997	154	5724	368	1196	120	7562
2. 1st & Broadway	1544	1034	0	0	0	2578	345	1584	0	0	0	1929
3. 5th & Broadway	4003	3321	0	0	0	7324	980	2840	0	0	0	3820
4. 7th & Flower	2612	2955	0	0	0	5567	644	3486	0	0	0	4130
5. Wilshire & Alvarado	2339	1149	153	0	0	3641	1418	1718	611	0	0	3747
6. Wilshire & Vermont	2252	2939	34	0	0	5225	1105	3559	143	0	0	4807
7. Wilshire & Normandie	1453	1301	50	0	0	2804	1109	1246	205	0	0	2560
8. Wilshire & Western	1517	2366	67	0	0	3950	361	3092	274	0	0	3727
10. Wilshire & La Brea	445	1802	31	0	0	2278	112	2155	128	0	0	2395
11. Wilshire & Fairfax	236	5859	54	180	18	6347	56	3779	201	706	71	4813
12. Fairfax & Beverly	427	929	30	74	7	1467	128	594	137	295	29	1183
13. Fairfax & Santa Monica	131	2285	33	0	0	2449	37	2343	139	0	0	2519
16. Universal City	54	1038	63	349	35	1539	203	1441	237	1343	134	3358
17. Lankershim & Chandler	61	1065	159	440	44	1769	76	1458	572	1638	164	3908
	17316	30324	781	1426	142	49935	6728	35019	3015	5178	518	50458

4.

TRAVEL DEMAND METHODOLOGY

**YEAR 2000 REGIONAL FORECAST**

Comparison of the travel demand model results presented in this report with other previous demand results (i.e., the Alternatives Analysis Study) must consider the underlying forecasting assumptions supporting each respective forecast.

The modeling process utilized in this study began with the modal choice model using as input the year 2000 person-trip distributions for the home-based work, home-based nonwork, and non-home-based trip purposes prepared previously by LARTS. These person-trip distributions reflect both the demographic and land-use conditions projected in the Los Angeles region for the year 2000 as well as the physical facility and level of service provided by the highway system. The key difference between these projections and those developed in previous studies is the updated edition (SCAG 82B) of the Southern California Association of Governments (SCAG) long-range socioeconomic and land-use forecasts. While this version reflects a



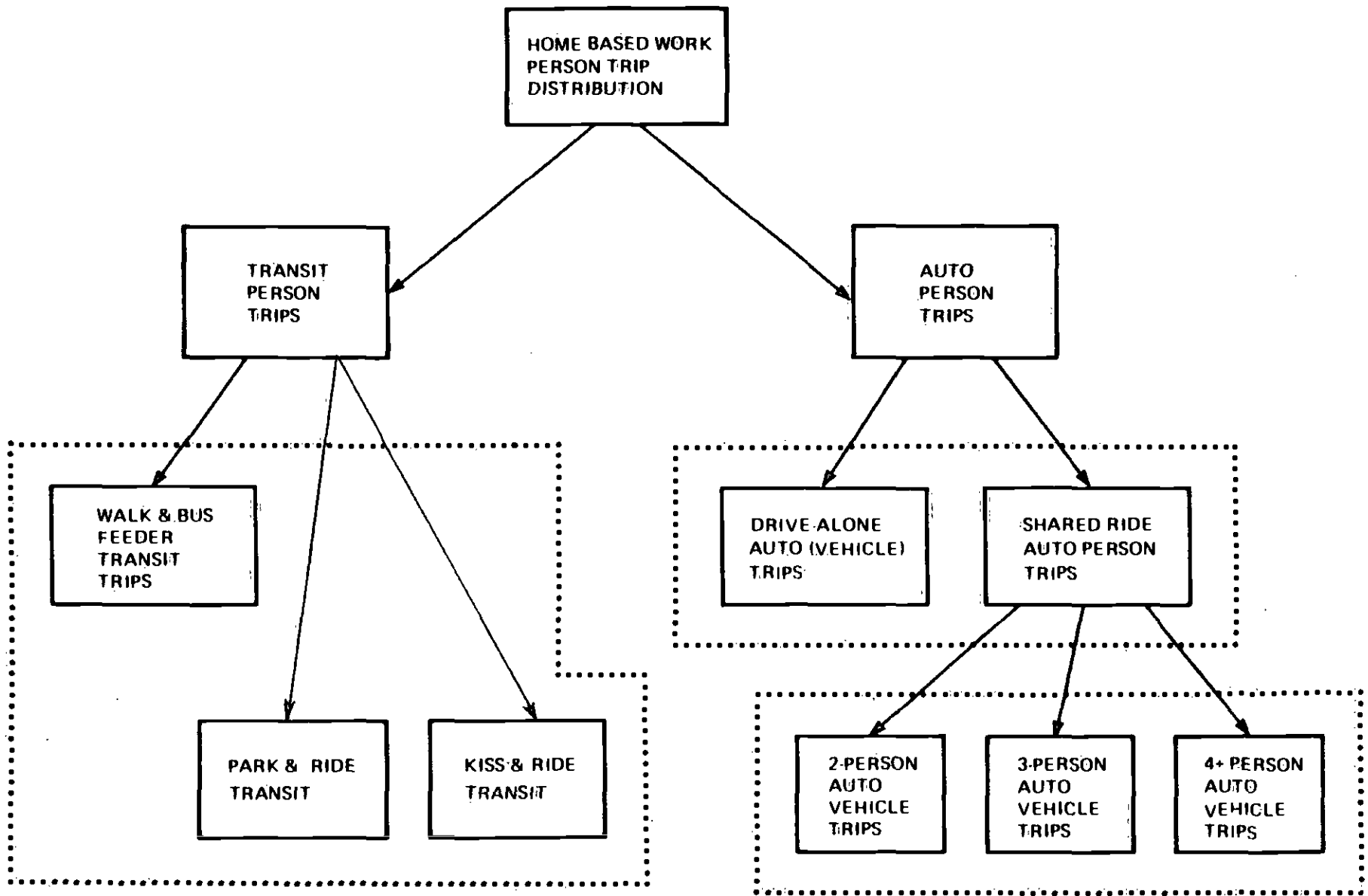
slightly lower population and economic growth for the region, the previous transit forecasts (i.e., Alternatives Analysis) were developed for the year 1990, whereas the projections described in this report are for the year 2000.

#### **MODE CHOICE MODEL STRUCTURE**

A series of revisions to the LARTS mode choice models have been implemented since development of the original marginal disutility model in 1972. That basic model, which was used as the primary mode choice model, and the more recent extensions to the model developed since that time, are shown in Figure 8. Three basic extensions or improvements were made to the marginal disutility model by SCAG and LARTS to provide the capability needed to address the emerging variety of planning issues.

While it was hoped that the multinominal work-trip mode-split model developed in 1976 could become the model used for primary mode-split analysis, its deficiencies relegated it to a model for disaggregating auto person-trips to drive-alone vehicle-trips and shared-ride auto person-trips. The mechanics of this application were based on a "pivot point" algorithm in which the model was used as a tool for estimating the relative change in mode shares given the introduction of shared-ride opportunities.

The second extension to the model structure occurred as part of the regional air quality planning effort. This extension utilized the Shirley Highway carpool model to disaggregate shared-ride auto person-trips generated by the combined logit model into three separate categories. It predicts the individual probabilities of two-person, three-person, and four or more person carpools.



**HOME-BASED WORK MODEL SPLIT STRUCTURE**  
 Figure 8

A mode of arrival model was also included to estimate the mode-of-arrival usage at each Starter Line station. All of these model extensions, which function basically as a series of submode models, build upon the initial estimate of transit and auto person-trips.

Perceived automobile operating cost-per-mile and the average transit passenger fares were two key inputs to the mode choice model. Because of the importance of these two variables, detailed analyses were conducted to ascertain appropriate values for use in the travel model runs. These technical analyses were documented in two technical memoranda during the course of the project.<sup>1</sup> The final value assumed for automobile operating cost was 5.51 cents per mile as approved by the Modeling Task Force. This value was slightly lower than the 5.80 cents per mile suggested in Technical Memorandum No. 3 prepared for this project, but was based upon a set of logical assumptions that assumed the fuel efficiency of autos to be slightly higher than the Technical Memorandum No. 3 analyses had suggested.

Specification of average transit passenger fares was based upon fiscal year 1980 and 1981 information that disaggregated passenger fares into an average base boarding fare, transfer fare, and an express fare increment. Table 39

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1

Technical Memorandum 3, Auto Operating cost Analysis, Barton-Aschman Associates, Inc., August, 1980. Technical Memorandum 4, Transit Fare Matrix Specification, Barton-Aschman Associates, Inc., and SCRTD Metro Rail Department, October, 1980.

Table 39  
AVERAGE TRANSIT PASSENGER VALUES

	(1980 Dollars)	
	FY 1980	FY 1981
Base Boarding Fare	\$0.35	\$0.43
Transfer Fare	\$0.02	\$0.10
Express Fare Increment	\$0.13	\$0.19

lists these fare values. The fiscal year 1981 values were used in the mode choice model analysis.

Other modal choice model inputs such as daily and hourly parking costs, highway terminal times, and path building parameters remained unchanged from the existing LARTS values.

#### **MODE-OF-ARRIVAL MODEL**

The mode of access and egress model consists of a set of algorithms linked to two travel demand models which together produce a set of reports and computer files which describe the mode of access and egress to each station by time of day. the model contains several unique features not generally found in other mode of arrival models. Some of these unique features are:

1. A capacity constraint technique: This feature insures that no parking lot will receive more vehicles than there are spaces. If the model determines that there is more demand than supply, the surplus trips are either shifted to feeder bus or kiss-n-ride, or are removed from the transit trip file.
2. A procedure to identify and follow transit trips which use satellite parking lots: This procedure will show the mode of arrival for the initial lot and also show bus arrivals at the proper rail station.
3. The model produces reports which show mode of arrival and departure by station for daily trips, A.M. and P.M. peak hours, and morning, mid-day, afternoon, and evening periods.

4. The model produces tables of peak-hour trips which can be assigned to the transit networks. These assignments can be used to analyze all transit routes, not just rapid rail routes.
5. The model produces a set of park-n-ride and kiss-n-ride vehicle trip tables. These trips can be assigned to the highway network in order to allow the analyst to estimate highway impacts near station locations and regional air pollutants.

As stated above, the mode of arrival models used in this procedure were developed and calibrated using Washington, D.C., and Seattle data. In general, the model system is a series of nested models which first split transit trips into walk and non-walk trips, then into transit and highway arrivals, and finally into park-n-ride and kiss-n-ride trips. This nested structure is shown in Figure 9. The walk/non-walk model is a simple set of diversion curves using, as an independent variable, the zone-to-station distance. This model is described in Table 40. The transit/highway model is described in Table 41. The transit/highway model is a binary logit choice model using the following basic model equations:

- Probability of choosing transit access =  $\frac{\text{EXP}(\text{feeder})}{1 + \text{EXP}(\text{feeder})}$
- Probability of choosing highway access = 1.0 - transit access probability

The term "feeder" is a linear utility equation described in Table 41. The park-n-ride/kiss-n-ride access model also is a logit model, and the calculation steps and coefficients are illustrated in Table 42. For access stations where no parking is available but drop-off trips are probable, the

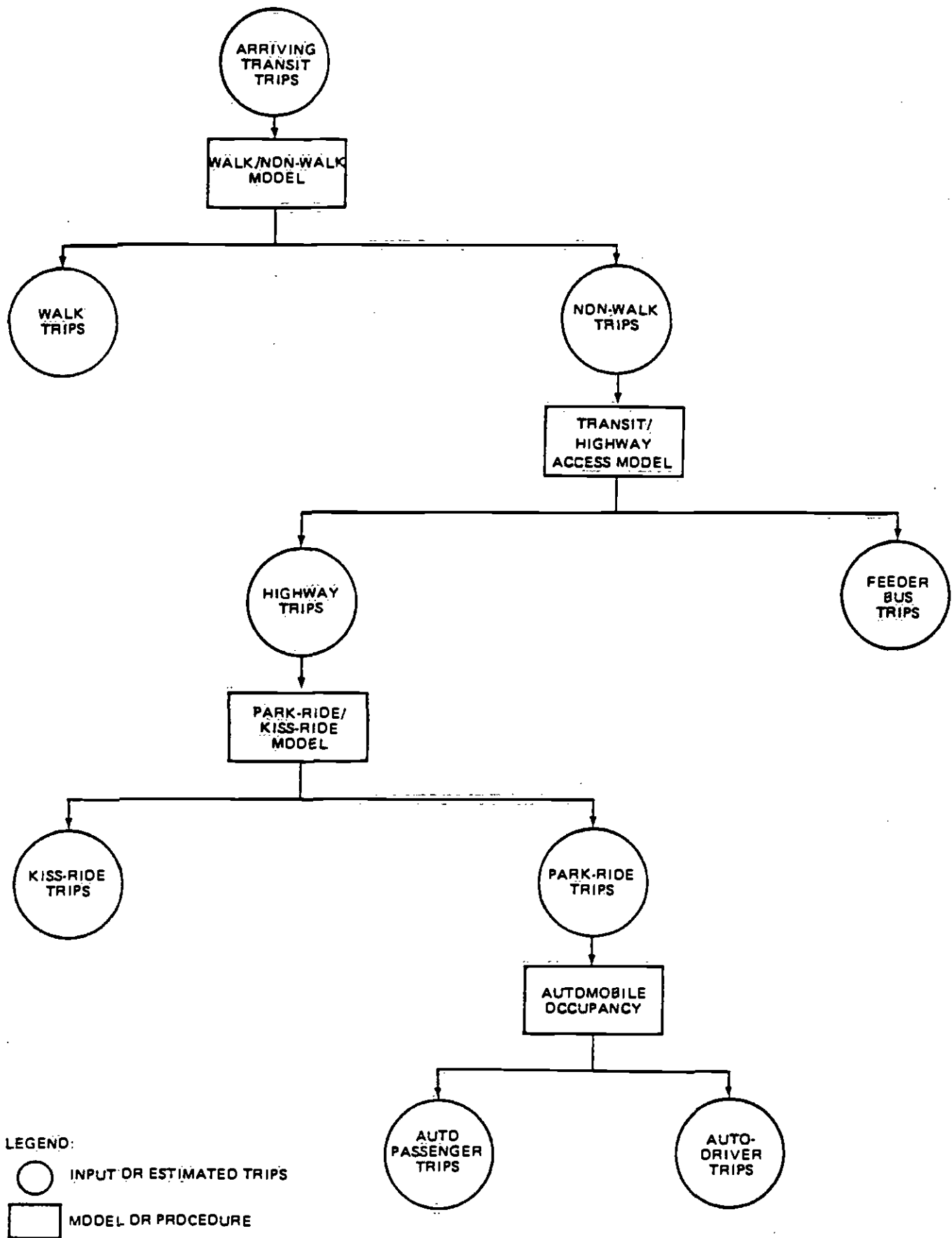


FIGURE 9  
 GENERAL FLOW DIAGRAM FOR MODE OF ARRIVAL  
 MODELING PROCEDURE

**Table 40**  
**WALK/NON-WALK MODEL DIVERSION**

Type of Station <sup>(1)</sup>	Proportion of Walk Trips for Each Zone-to-Station Distance (Miles)									
	<u>0.1</u>	<u>0.2</u>	<u>0.3</u>	<u>0.4</u>	<u>0.5</u>	<u>0.6</u>	<u>0.7</u>	<u>0.8</u>	<u>0.9</u>	<u>1.0</u>
1	1.0	1.0	1.0	1.0	0.73	0.30	0.01	0.0	0.0	0.0
2	1.0	1.0	0.95	0.86	0.75	0.57	0.36	0.08	0.05	0.0
3	1.0	1.0	0.95	0.86	0.75	0.57	0.36	0.08	0.05	0.0
4	0.95	0.85	0.69	0.56	0.42	0.31	0.22	0.13	0.07	0.04

(1) Type of Station definitions:

1. A station where no highway access of any type is anticipated, such as a station in the central business district.
2. A station where the only highway access anticipated is the drop-off mode (i.e., kiss-n-ride).
3. A station where the access is walk or bus, but potential Kiss-n-ride trips would go to another type 2 station.
4. A station where all types of highway access are anticipated and which has some parking facilities.

**Note:** Model is applied to both choice and non-choice trips since calibration of this model used entire transit market.

**Source:** Mode of Access User's Guide, prepared by Peat, Marwick, Mitchell & Co. for the Metropolitan Washington Council of Governments.



Table 41  
TRANSIT/HIGHWAY ACCESS MODEL LINEAR EQUATION

$$\text{Feeder} = -0.0417 * (\text{IVTFBM}-\text{IVTHWM}) - 0.10425 * (\text{WAITFBM}-\text{WAITHWM}) \\
-0.7249 * (\text{XFERFBM}-\text{XFERHWM}) - 0.084 * \text{HWYDST} \\
-0.024611 * (\text{CSTFBM}-\text{CSTHWM}) - 0.164073 * \text{ACTHWM} + \text{INC (I)}$$

Where:

- IVTFBM: is the in-vehicle transit time for the transit access mode<sup>(1)</sup>
  - IVTHWM: is the in-vehicle transit time for the highway access mode
  - WAITFBM: is the total waiting time for the transit access mode
  - WAITHWM: is the total waiting time for the highway access mode<sup>(2)</sup>
  - XFERFBM: is the number of transfers for the transit access mode
  - XFERHWM: is the number of transfers for the highway access mode
  - HWYDST: is the total highway distance of the trip, measured over the highway network (miles)
  - CSTFBM: is the cost associated with the transit access mode
  - CSTHWM: is the cost associated with the highway mode
  - ACTHWM: is the highway access time (in-vehicle time) from the origin zone to the station
  - INC (I): are bias coefficients associated with each income level
- The values of these coefficients are as follows:

<u>INCOME QUARTILE</u>	<u>BIAS COEFFICIENT</u>
Low	2.94297
Low-Medium	2.58120
High-Medium	2.58120
High	1.12427

Notes: All travel times are in minutes, costs are in cents. Highway mode values are for park-n-ride mode.

(1) Unless otherwise specified, the value of the independent variables is for the entire interchange; i.e., from the origin zone to the destination zone.

(2) Includes the parking terminal time, i.e., the time to park a vehicle and walk to the station entrance.

Table 42

PARK-N-RIDE/KISS-N-RIDE ACCESS MODEL CALCULATION STEPS

For each income level (4)

Calculate Kiss-n-Ride Utile (KRUT)

$$KRUT = 5.0 * (\text{origin zone terminal time} + \text{station terminal time}) + 2.0 * \text{zone-to-station highway time} + 2.0 * \text{zone-to-station highway distance} * \text{highway cost/mile} * \text{income factor}$$

Calculate Park-n-Ride Utile (PRUT)

$$PRUT = 2.5 * (\text{origin zone terminal time} + \text{station terminal time}) + \text{zone-to-station highway time} + ((\text{highway distance} * \text{highway cost/mile}) + (0.5 * \text{station parking cost})) * \text{income factor/car occupancy}$$

Calculate difference in Utility (DELU)

$$DELU = KRUT - PRUT$$

Calculate Park-n-Ride market share for single-car households

$$(SCPAR) SCPAR = 1.0 / (1.0 + \text{EXP}(-0.05001 * (10.03 + DELU)))$$

Calculate Park-n-Ride market share for multi-car households

$$(MCPAR) MCPAR = 1.0 / (1.0 + \text{EXP}(-0.032929 * (35.01 + DELU)))$$

Calculate total Park-n-Ride market share for income level (PRMS)

$$PRMS = SCPAR * \text{proportion of single car households} + MCPAR * \text{proportion of multi-car households}$$

Calculate total Kiss-n-Ride market share for income level (KRMS)

$$KRMS = 1.0 - PRMS$$

Constants and Factors Used in Model

	Income Quartile			
	Low	Low-Medium	High-Medium	High
Income Factor	0.55866	0.330579	0.330579	0.18939
Proportion of Single-car Households	0.947	0.800	0.800	0.626

program uses a simple distance-related model to estimate the proportion of kiss-n-ride trips. These relationships are as follows:

1. For distances greater than 3.8 miles: kiss-n-ride proportion = 0.0.
2. For distances greater than 2.0 miles but less than 3.8 miles: kiss-n-ride proportion =  $0.218 - 0.0559 * \text{highway distance (miles)}$ .
3. For distances greater than 1.0 miles but less than 2.0 miles: kiss-n-ride proportion =  $0.464 - 0.170 * \text{highway distance (miles)}$ .
4. For distances less than 1.0 mile: kiss-n-ride proportion = 0.30.

5.

OPTION NETWORK DESIGN DESCRIPTION

This chapter documents the design and construction of the computerized networks for each of the system alternatives. The design process was focused on the background feeder bus system. In the design effort, applicable Sector Improvement Program (SIP) routes were carefully tailored to serve each of the rail system stations defined in each of the transportation corridors. In addition to the feeder bus system design, a rail operating plan was prepared (by SCRTD) for each option and, together with the system operating characteristics, was used to calculate Level-of-Service information for system route.

The network development process was initiated with a review and update of the 1995 LARTS low capital transit system. This refined low-capital network served as the departure point for preparation of the Option I Starter Line network.

The design and construction of each option network was performed in a modular fashion (i.e., by corridor) to insure coding accuracy and to provide the capability to define other alternative option concepts that could combine any number of the other eight regional corridors to form logical extension of the Starter Line system. The actual construction of network options was, therefore, a mechanical process of combining individual corridor designs to create a specific option.

#### **MODIFICATION OF THE 1995 LOW-CAPITAL TRANSIT NETWORK**

The basic underlying bus system in all option networks was SCRTD's Sector Improvement Program (SIP) as originally presented and approved by the board on February 27, 1979. Two subsequent revisions to those planned routes were reflected in the basic background system were the revisions approved on September 28, 1979, and the set of final revisions approved in June, 1980. These two SIP revisions exclude several routes shown in the initial version due to community objections or to various operating problems such as the unintended use of narrow streets or the lack of adequate layover space. The final revision (in June, 1980) also included several lines which were placed on a temporary hold status in order to reduce costs of the full plan. The decision at that time was to phase the full implementation plan over several years, starting with the initial service changes that were already in place by June, 1980. As a result of these revisions, the Sector improvement Program was considered a route-specific master plan. It did represent the latest thinking on bus route planning and was, therefore, the most appropriate information for projecting bus routes which, with minor modifications, would interface effectively with the planned rapid transit system.

All of the Sector Improvement Program routes included in the 1995 low-capital network were reviewed and adjusted where necessary, to be compatible with the latest SIP revisions as of June, 1980. In general, most of these revisions were minor and in only three cases were routes completely removed.

The final step in the detailed review of the 1995 low-capital transit network was to analyze the routes of each operator within Los Angeles county and to update those coded routes to reflect the most recent schedule revisions as published by each of the respective operators as of August, 1980. The changes for these non-SCRTD routes were generally more comprehensive than the Sector Improvement Route Modifications.

#### **BUS ON-FREEWAY CONCEPT**

CALTRANS (District 7) with technical assistance from SCRTD, had investigated the feasibility of constructing a high-occupancy vehicle lane for both express bus and carpool vehicles in the right-of-way of three freeway facilities:

- The Harbor,
- Century, and
- Santa Ana Freeways.

The freeway transit concept, like the Starter Line, represented one of four elements of the Regional Transportation Development Plan (RTDP). For this reason, it was given special attention in the refinement of the 1995 low-capital transit network. The design of the bus-on-freeway routes was subdivided into two separate components. The first was comprised of the Harbor and Century freeway corridors which operate in concert to provide a

high level of bus service to downtown Los Angeles; the second was the Santa Ana Freeway corridor which operates in a manner similar to the Harbor and Century, but is an operationally and physically separate facility.

The design and subsequent coding of these routes involved a substantial amount of interaction with the SCRID Bus Planning Department and the Transit Branch of CALTRANS' District 7 office. The conceptual definition of transit freeway service was first translated into a definition of specific station locations and physical access restrictions where full directional ramps were not considered feasible. Route configurations were defined in relation to the location and level of service to be provided from each service area and station location. The most crucial aspect of the freeway transit design was the service concept. Buses were routed to collect passengers along major arterial right-of-ways, accessing the high-occupancy vehicle lanes at specific guideway locations, and operate in the exclusive lane to the central business district, stopping at each intermediate station to both board and alight any transferring passengers.

The development of routes and service levels for both the Harbor and Century freeway corridors was based upon a SCRID technical memorandum of August 10, 1980 <sup>1</sup> and modified as a result of the joint work effort between the SCRID Bus Planning Department and CALTRANS' Transit Branch. As indicated earlier these two corridors were always considered to function in concert with direct connections available between the Harbor and Century freeway lanes at their intersection.

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<sup>1</sup> Harbor Freeway and I-105 Freeway Transitway Line Haul Service Concepts, August 10, 1978, SCRID Bus Planning Department

All 10 routes within these two corridors were oriented toward the central business district and were derived from existing Sector Improvement Program routes. Figure 10 graphically depicts these routes. As shown in that figure, the route coverage provided by these lines is rather comprehensive in nature and provides a high level of service entering the central business district. The Harbor Century routes were classified into one of three categories:

1. Routes that terminate at the Convention Center terminal.
2. Routes that interface the Convention Center terminal but continue.
3. Routes that completely bypass the terminal.

The Santa Ana Freeway express bus service, much simpler in concept and operation, consisted of three basic sector improvement program routes: the 757, 758, and the 800.

#### **PLANNING POLICY ASSUMPTIONS**

As indicated earlier, the Sector Improvement Program (SIP) formed the basic building block for the development of an integrated bus feeder/distribution system. The modification of SIP routes was based upon a set of planning and operating concepts described in more detail below.

#### **PROJECTED FREQUENCY OF SERVICE**

Several SIP routes were eliminated under the assumption that the Starter Line would divert a sufficient number of passengers to make it feasible to eliminate these lines.





The level of service assumed for the SiP bus network consisted of the peak period and off-peak headways (time interval between buses) as defined in November, 1979. This frequency of service amounts to a 10 to 20 percent increase in frequency of service over the (existing) June, 1980, service levels.

Some adjustments in service levels, both increases and decreases in frequency of service, were considered in subsequent analyses as a result of the rail station boarding and alighting volumes generated by the travel demand model forecasts. These bus schedule adjustments occurred in two categories.

1. Reductions in frequency of service for bus lines which parallel the rail line, and
2. Increases in frequency of service for bus routes which serve as feeder routes to rail service .

The manner in which certain lines received increased frequency of service was referred to as "shortline operation". This means that supplemental service would operate over the portion of a line having high ridership for feeder trips to and from the rail station. Assuming the feeder ridership

demand was limited to short distances on either side of a rail station, these supplemental bus trips will turn back at these points rather than operate to the regular end of the bus route.

#### SIP ROUTE MODIFICATIONS BY SERVICE AREA

In general, SIP route modifications were based on the following criteria: (1) eliminate bus lines duplicating rapid transit service, (2) provide the opportunity for operating cost savings, and (3) provide rider time savings where comparative paths between the rail line and parallel bus routes (taking into account transfer times between bus and rail) favor use of rail. The modifications were as follows:

1. San Fernando Valley local and express routes serving Hollywood and downtown Los Angeles.

- a. Local Lines: In most instances where local service terminated in Hollywood or downtown Los Angeles, the lines were rerouted to terminate at the North Hollywood or Universal City Station.

- b. Express Lines: All of these lines, mostly from the West San Fernando Valley area, currently terminate in downtown Los Angeles. They were rerouted into the North Hollywood or Universal City Stations. One express bus line was, however, retained on the Hollywood Freeway between downtown Los Angeles and Universal City. A frequency of 15 minutes between buses all day was assumed in order to provide convenient service to the existing three well-patronized

Hollywood Freeway bus stops at Alvarado, Vermont, and Western.

2. Local and limited lines serving stations in Hollywood and West

Hollywood. Most of these lines are major trunk routes between downtown Los Angeles and the west side.

- a. Local Lines: All of the Starter Line rail stations such as Hollywood/Hollywood Bowl, Hollywood/Cahuenga, Fairfax/Santa Monica, and Fairfax/Beverly are adjacent to major bus lines carrying significant numbers of daily riders. Very few route changes were made specifically to accommodate rapid transit. It was intended that some lines which interface with rapid transit stations would ultimately be modified to include supplementary short line service for short distances on either side of the station to accommodate feeder trips.

Several other lines terminating in Hollywood but not serving downtown Los Angeles were extended to either the Hollywood Bowl or Hollywood/Cahuenga Station.

- b. Limited Lines: Within the SIP, limited lines are those operating along standard city streets usually in conjunction with a companion local line stopping at only certain bus stops to allow passengers to board or alight. These stops usually are points where transfers can be made to other routes.

In the SIP, several limited lines were established in the West Hollywood-Mid-Wilshire area to provide faster service between those areas and downtown Los Angeles particularly during peak periods. With inauguration of rapid transit service, rider time savings on those routes would be eliminated. In several cases, the lines parallel to the rail

corridor were eliminated.

3. Local and Limited services along Wilshire Boulevard and intersecting thoroughfares between Fairfax and the Los Angeles Central Business District.
  - a. Major changes in this area reflect service reductions due to direct competition along North Fairfax Avenue and Wilshire boulevard between bus and rapid transit service. Also, on lines crossing Wilshire boulevard, it is intended that additional shortline service might be added to reflect increased ridership from persons traveling to their rapid transit line (i.e., feeder function).

Significant reductions in service were made in bus service on Fairfax Avenue and on Olympic boulevard. Half of the planned SIP service (every other trip) was eliminated north of Wilshire Boulevard along Fairfax Avenue. Similarly, in the case of Olympic Boulevard, half of the base service was eliminated east of Fairfax in order to route half of the trips north on Fairfax to terminate at the Fairfax Rail Station.

- b. Limited Service: With respect to the discussion of limited routes between Los Angeles and West Hollywood as detailed in the previous section, limited lines on Wilshire and Olympic were handled in the following manner:

Limited service from Santa Monica and Brentwood was terminated at the Wilshire/Fairfax Station.

#### **CORRIDOR/OPTION DESCRIPTIONS**

Based upon the planning policy criteria described above, modifications to Sector Improvement Program routes were developed for each corridor and alternative. With few exceptions, each Sector Improvement Program route was affected by only one corridor. Implicit within the option definition was the fact that the Sector Improvement Program route modifications made to a corridor are consistent within individual options in other words, if a route were modified to interface with a West Los Angeles station in Option II, it would operate in that manner for all options in which West Los Angeles was to function as a rail corridor.

One of the three possible actions was taken for each Sector Improvement Program route. No change was specified if the route should not logically or physically interface with the station. The route may have been deleted if it operates in parallel or direct competition with the rail line.

The route may have been modified slightly to interface with the station by either terminating it at the station point or rerouting it to serve the station and then continue on its existing route. A systematic coding process, along with some specifically developed programs for this purpose, was used to identify and summarize routes which had any possibility of interfacing or serving station locations within one or more rail corridors.

19.)

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