

CITY OF LOS ANGELES

Recommended Program for Improvement of Transportation and Traffic Facilities in the Metropolitan Area

DE LEUW, CATHER & COMPANY

HAROLD M. LEWIS

JOE R. ONG

DECEMBER, 1945

HE
310
.L7
C59
Archives

S.C.R.T.D. LIBRARY

1945

CITY OF LOS ANGELES
RECOMMENDED PROGRAM for IMPROVEMENT
of
TRANSPORTATION and TRAFFIC FACILITIES

Submitted to the
MAYOR AND CITY COUNCIL

By

CONSULTANTS

De Leuw, Cather & Company
CHICAGO, ILL.

Harold M. Lewis
NEW YORK, N. Y.

Joe R. Ong
CINCINNATI, OHIO

DECEMBER, 1945

CITY OF LOS ANGELES

FLETCHER BOWRON, MAYOR

THE CITY COUNCIL OF THE CITY OF LOS ANGELES

GEORGE H. MOORE, *President*

COUNCILMEN

| | |
|-------------------------------------|--------------|
| LELAND S. WARBURTON | 1st DISTRICT |
| LLOYD G. DAVIES | 2nd “ |
| J. WIN AUSTIN | 3rd “ |
| HAROLD A. HENRY | 4th “ |
| GEORGE P. CRONK | 5th “ |
| L. E. TIMBERLAKE | 6th “ |
| CARL C. RASMUSSEN | 7th “ |
| CHARLES A. ALLEN | 8th “ |
| PARLEY PARKER CHRISTENSEN | 9th “ |
| G. VERNON BENNETT | 10th “ |
| HAROLD HARBY | 11th “ |
| ED. J. DAVENPORT | 12th “ |
| MEADE McCLANAHAN | 13th “ |
| JOHN C. HOLLAND | 14th “ |
| GEORGE H. MOORE | 15th “ |

BOARD OF PUBLIC UTILITIES AND TRANSPORTATION

DAVID BLUMBERG, *President*

COMMISSIONERS

HENRY M. BURGESSON

ALFRED E. DREW

FRANK SIMPSON, JR.

ROSS WELCH

K CHARLES BEAN, *General Manager and Chief Engineer*

STANLEY M. LANHAM, *Assistant Chief Engineer*

TABLE OF CONTENTS

| | PAGE |
|---|------|
| FOREWORD | 9 |
| CHAPTER I | |
| THE LOS ANGELES PROBLEM | 11 |
| Purpose of Clinic | 11 |
| Basic Information | 11 |
| Population | 12 |
| Traffic and Transportation Data | 13 |
| Street Traffic | 14 |
| Need for Public Transportation | 14 |
| Parkways and Rapid Transit | 14 |
| CHAPTER II | |
| RAPID TRANSIT DEVELOPMENT | 16 |
| Assumptions | 16 |
| Rapid Transit Traffic | 17 |
| Bus Operations on Parkways | 18 |
| Parkway Capacity | 19 |
| Estimated Parkway Traffic | 19 |
| All-Bus Operation Impracticable | 19 |
| RAIL RAPID TRANSIT | 19 |
| Hill Street Station | 19 |
| Sixth and Main Terminal | 20 |
| The Broadway Subway | 20 |
| Equipment | 20 |
| Operation | 20 |
| EXPRESS BUS OPERATION | 21 |
| Recommended Express Bus Routes | 21 |
| BENEFITS | 21 |
| Time Saving | 22 |
| OTHER IMPROVEMENTS | 23 |
| Grade Separations | 23 |
| Pedestrian Concourse | 23 |
| Sidewalk Widening | 23 |
| Parking Prohibition | 23 |
| Loop Bus Service | 23 |

TABLE OF CONTENTS (Continued)

| | PAGE |
|--|------|
| CHAPTER II (Continued) | |
| FINANCING | 23 |
| RECOMMENDATION FOR IMMEDIATE ACTION | 24 |
| CHAPTER III | |
| Special Characteristics of Los Angeles District | 25 |
| Cordon Counts | 25 |
| Requirements of Expressway System | 26 |
| Functions of Individual Routes | 26 |
| Recommended Classification | 27 |
| Studies of Expressway Design | 27 |
| Connections With Central Business District | 28 |
| Movement Within the Downtown District | 30 |
| Effect of Loop Expressways on Street Capacity | 30 |
| Terminal Problem | 31 |
| Planning Procedures | 32 |
| General Conclusions | 32 |
| CHAPTER IV | |
| LOCAL SURFACE TRANSPORTATION IN LOS ANGELES | 33 |
| Streetcars | 33 |
| Trolley Coaches | 33 |
| Motor Buses | 34 |
| Downtown Traffic Congestion | 34 |
| Underground Delivery Terminal for Streetcar and Trolley Coaches | 35 |
| One-way Streets and Rerouting of Lines | 37 |
| Summary | 38 |

TABLE OF CONTENTS (Continued)

| | |
|--|---------|
| APPENDIX | PAGE 39 |
| Expressway Program, City of Los Angeles | FIG. 1 |
| Recommended Rapid Transit System | " 2 |
| Recommended Rapid Transit System Terminals in the Central Business District | " 3 |
| Suggested Expressway Transit Stations at Bridges | " 4 |
| Relation of Rapid Transit System to Ultimate Population Distribution | " 5 |
| Relation of Rapid Transit System to Estimated Population Growth | " 6 |
| Expressways With Separate Rights-of-Way for Mass Transportation | " 7 |
| Expressways for Private Passenger Cars Only | " 8 |
| Expressways for Buses and Private Passenger Cars | " 9 |
| Expressways for Passenger Cars, Trucks, and Buses | " 10 |
| Estimated Distribution of Passenger Vehicles Entering and By-Passing the Central Business District Shown as Percentages of Total Entering by Parkways With Present Distribution of Population | " 11 |
| Capacity of Streets Crossing Business District | " 12 |
| Alternative Proposals for Ramps to Hollywood Parkway from Central Business District | " 13 |
| Routes of Los Angeles Transit Lines | " 14 |
| Recommended Streetcar Underground Terminals in the Central Business District | " 15 |

FOREWORD

This book contains the recommendations of three consultants employed by the City of Los Angeles, upon the recommendation of Mayor Fletcher Bowron, to review the traffic and transportation problems of the Los Angeles Metropolitan area.

These reports were submitted at a clinic held at the City Council Chamber in Los Angeles on December 17, 18 and 19, 1945. Delegates to the clinic included representatives of all State, County and City agencies dealing with traffic and transportation matters, representatives of neighboring cities, of civic and business organizations, of major transit companies and of each councilmanic district of the City of Los Angeles.

In addition to the reports here contained, Mr. D. Grant Mickle, traffic engineer of the Automotive Safety Council, submitted his recommendations as to steps which could be taken immediately to improve traffic movement and control.

Mayor Devin of Seattle discussed traffic and transit problems of that city and the methods being used to solve its problems, largely by substitution of the electric trolley coach for other types of vehicles.

Senator Randolph Collier, Chairman of the California Legislature's Joint Fact-Finding Committee on Highways, Streets and Bridges, reviewed the problem of financing special highway facilities. Mrs. Dorothy Lee McCullough, Commissioner of Public Utilities, of the City of Portland, Oregon, outlined traffic and transportation problems in that City.

On page twelve acknowledgement is made to members of the advisory committee whose assistance was most valuable to the consultants. Special recognition is due, and is gratefully made to Judge Marshall F. McComb, who so ably served as Chairman of the clinic, to Mr. Glen B. Eastburn who was alternate chairman and who presented a clear and concise summary of the proceedings, and to Mr. Stanley M. Lanham, Assistant Chief Engineer of the City's Department of Public Utilities and Transportation, without whose able and energetic assistance it would not have been possible to collect and analyze the mass of data upon which the recommendations of the consultants are predicated.

It will be noted that the consultants recommend that provision be made for rapid transit by rail as well as by motor coach; that modernization of equipment on local transit lines be made promptly; that off-street parking facilities be augmented and improved; and that unification of operation and of the fare structure be accomplished. Immediate action can and should be taken to effect some of the suggested improvements.

Immediate planning for a complete program of public transit, properly coordinated with highway facilities, is imperative if this community is to be relieved of an almost insurmountable obstacle to its proper development.

K CHARLES BEAN

Chief Engineer and General Manager
Department of Public Utilities and Transportation

CHAPTER I

THE LOS ANGELES PROBLEM

This report has been prepared to summarize the most significant developments of the December Transportation Clinic for use of the various agencies concerned with proper solution of the matters considered. The opinions and recommendations are those of the three consultants.

PURPOSE OF CLINIC

The problem confronting Los Angeles was concisely stated by Mayor Fletcher Bowron in his message to the City Council of July 7, 1945, in which he recommended the employment of consultants, as noted in the following excerpts:

"The transportation problem of the City of Los Angeles is unique, difficult and complicated. The proper development of the city during the next twenty-five years will depend very largely upon decisions that we make within the next year. We cannot afford to make mistakes. It is essential that our conclusions be right so far as possible, by weighing all of the facts and evaluating all of the factors. Our transit system for the mass transportation of people must be planned with proper vehicular traffic control and regulation, and both our mass transportation and flow of vehicular traffic must be adjusted to the use of freeways, just as soon as a system of freeways can be financed and constructed."

"A certain portion of our contemplated freeway system is assured through the acquisition by the State of rights-of-way, and definite and assured plans for the connecting of Cahuenga Pass with Aliso Street and the extension of the Arroyo Seco Parkway to or beyond the downtown area. While engineering work on these projects is going forward, not enough consideration has been given to the effect the use of these freeways will have on local vehicular traffic in certain sections of the city, particularly in the downtown and Hollywood areas, and so far as I know no adequate study has been made to determine what effect the freeways will have on local transportation, either as to the number of passengers carried or as to those routes where the passenger

traffic will be increased or diminished. All of this should involve other considerations such as on- and off-street parking of automobiles in congested areas, the advisability of one-way traffic on certain streets, particularly on some of the cross streets in the downtown area, and also to promoting the freer flow of traffic to certain other sections of the city."

"These are just some of the matters that should be taken into consideration, weighed and carefully considered in working out an adequate plan for freeways or expressways, a mass transportation system and automotive traffic control and regulation. The matter is so important, it is so essential that our decisions should be as free from error as possible, that I recommend the employment of some of the best experts obtainable . . . who . . . will examine our needs, consider the facts and make recommendations on the basis of which final decisions may be based."

BASIC INFORMATION

The consultants were requested to come to Los Angeles in time to review and analyze all data collected by various public and private agencies relating in any way to the movement of vehicles and persons in Los Angeles and to make field studies of physical conditions and traffic movements, as a basis for concrete recommendations as to the principles to be adopted in modernizing and improving public transportation. There is a surprisingly voluminous collection of counts, statistical studies and reports which are evidence of the enormous public interest in the problem. Certain of these data have resulted from painstaking field surveys and provide a first-class factual base for the projection of long-range transit plans.

During the course of our preliminary studies we had the advantage of several meetings with the Advisory Group on the Transportation Survey appointed by the Mayor. This body consisted of representatives of the major public and private agencies concerned as follows:

General Chairman—Mayor Fletcher Bowron

Alternate Chairman—K Charles Bean

| | |
|---|------------------|
| California Railroad Commission..... | W. H. Gorman |
| County Regional Planning Commission..... | A. H. Adams |
| Los Angeles Chamber of Commerce..... | Glen B. Eastburn |
| Downtown Business Men's Association..... | Carl Bush |
| Automobile Club of Southern California..... | E. E. East |
| Los Angeles Traffic Association..... | F. L. Mowder |
| Central Business District Association..... | Stuart M. Bate |
| Greater Los Angeles Safety Council..... | Col. F. C. Lynch |
| Board of Public Works, City of Los Angeles..... | Frank Gillelen |
| Planning Department, City of Los Angeles..... | Chas. B. Bennett |

Los Angeles Police Department:

| | |
|----------------------------|----------------------|
| City Traffic Engineer..... | R. T. Dorsey |
| Traffic Control..... | Chief R. B. Caldwell |

Department of Public Utilities and Transportation,

| | |
|--|----------------------------------|
| City of Los Angeles..... | S. M. Lanham |
| Pacific Electric Railway..... | Fred Spencer |
| Los Angeles Transit Lines..... | E. Sam Davis |
| Asbury Rapid Transit Lines..... | Bart Wade |
| Highway Department, State of California..... | { S. V. Cortelyou N. W. Reese |

The advice and criticism given by this group was invaluable in the formulation of our plans. The meetings were held under the direction of Col. K Charles Bean, Chief Engineer, Board of Public Utilities and Transportation, acting in behalf of the Mayor. The consultants acknowledge their indebtedness to Col. Bean, his staff, and the Advisory Group for assistance heartily and helpfully rendered.

POPULATION

The spectacular population increase of Los Angeles County from 2,785,643 in 1940 to 3,400,000 in 1945 indicated the need for careful study to determine a population base on which to project transportation and highway plans.

Los Angeles is such a young city that it has a decentralized development toward which other large cities are now straining. The Metropolitan District has had plenty of space in which to grow. Los Angeles County is the largest county in the country and the city has the greatest land area of any in continental United States. The business

center is located about 14 miles east of the ocean at Santa Monica, 16 miles north of the ocean at Long Beach and San Pedro, and about 10 miles south of the San Gabriel Mountains. Extensive use of the private automobile has resulted in density of population far below that of the average large city.

It is possible to predict with some confidence that both urban and suburban commercial and residential centers will continue to increase in importance and in size. It also appears likely that each community will have its own local zone of influence on transportation planning. It is apparent that industry will continue to develop in suitable locations throughout the metropolitan area, and that it will become a much larger factor in the economy of the region than it has been in the past.

Because of the remarkable development of Los Angeles, there has been an unusual interest in population studies culminating in numerous reports and voluminous statistical material of all kinds relating to population and other significant data on the

3400000
2785643

6144357

development of the metropolitan area. The material which was supplied and analyzed by the consultants is as follows:

Los Angeles: Its People and Its Homes—1944
Earl Hanson and Paul Beckett, The Haynes Foundation.

Census Tracts, County of Los Angeles—January, 1940
Regional Planning Commission

Census Tracts, Los Angeles County—May, 1939
Los Angeles Chamber of Commerce

Dwelling Units and Population, Quarterly Statements
Regional Planning Commission

Comparison of Population in each Census Tract, Census of 1940 and 1930
Los Angeles Railway Corporation

Density of Population, Area in Acres and People per Acre in each Census Tract in County of Los Angeles, Census of 1940, and 1930
Los Angeles Railway Corporation

Population and Average Number of People Per Acre, by Statistical Areas for 1930, 1940, 1944 and Ultimate
Board of Public Utilities and Transportation

Population by Age Groups and Calculated Changes by Decades 1900-1970
City Planning Commission

San Fernando Valley—Population and Land Use—Present and Future
City Planning Commission

Population by Census Tracts for 1930, 1940, 1944 and Ultimate
Regional Planning Commission

1940 Population served by rail and coach lines by Census Tracts
Los Angeles Railway Corporation

Population Spot Maps
City Planning Commission
Regional Planning Commission
Transportation Engineering Board

These data were discussed with the Advisory Group with the result that there was agreement that an ultimate population of 6,000,000 persons should be assumed for Los Angeles County of which approximately 50 per cent would be located

within the existing corporate limits of the City of Los Angeles. There was further agreement that the ultimate distribution of population to be assumed for the purpose of this study should generally conform to the forecasts made by the Regional Planning Commission covering each of the 578 census tracts into which the metropolitan area is divided. The consultants felt, however, that the intermediate areas between the downtown business center and outlying communities may experience a somewhat greater relative growth than these estimates indicated.

TRAFFIC AND TRANSPORTATION DATA

The factual survey supervised by the Transportation Engineering Board of the City of Los Angeles in 1938 and 1939 provided comprehensive data for the pre-war period covering

traffic on existing public transportation facilities,
origin and destination of transit passengers by census tracts throughout the metropolitan area,
traffic on and characteristics of the several transit routes,
transfer volumes,
movements of passengers within the central business district, and
travel times.

Data on automobile ownership and use were collected in the 1938-39 survey including distribution of automobile ownership, traffic volumes, origins of motor vehicle passengers and other related data. Work sheets from this voluminous survey were available to the consultants and were of major importance in the conduct of their studies. While no single survey collected all of the data required for the estimates of probable use of various sections of the highway system, it was possible to collate data from several surveys to provide the necessary factual basis for projections of estimates. The distribution of industrial employees collected in 1941 by the California Railroad Commission was of importance in this work as well as the distribution of 110,000 vehicles parked in the Central Business District shown by residential areas from a pre-war study.

Distribution of shoppers and employees of the Long Beach, Westwood, Pomona commercial centers and the Los Angeles Central Business District as studied by the Regional Planning Commission was of assistance in this connection. Voluminous data of all kinds relating to ownership and use of automobiles in the metropolitan area collected prior to 1938 by various public and private agencies, as well as reports containing conclusions therefrom, were available and were studied in detail for the purpose of establishing trends, determining characteristics and establishing probable ultimate developments.

STREET TRAFFIC

A combination of wide-spread use of automobiles and stagnation in local transit has produced the present situation in which peak-hour traffic has reached the reasonable capacity of the street system in the downtown area as well as in certain outlying centers. This is despite numerous excellent traffic control measures effected during recent years. Los Angeles County now has a splendid arterial highway and street system, the cost of which is estimated at more than \$600,000,000, perhaps half of which has been spent during the last 25 years. During that same period approximately \$16,000,000 has been spent for transit improvements which amount would hardly offset depreciation of the physical property.

The population per registered passenger vehicle in Los Angeles in 1941 was 2.9, being among the lowest in the country and comparing with the average for cities above 100,000 population of 4.6.

Topographical obstructions and offsets in alignment limit the number of streets available for traffic to and from the downtown area as well as across that area. Certain existing streets are too narrow for the load imposed upon them. Many downtown sidewalks are entirely inadequate. Extensive and costly street widening programs have been carried out during the past two decades. Further efforts along this line seem entirely infeasible in downtown Los Angeles. The only practical way to gain additional street space in the most congested area appears to be through the construction of new express traffic lanes above or below surface level.

NEED FOR PUBLIC TRANSPORTATION

Use of public transportation by the average citizen in Los Angeles had dropped to the lowest level for any city of comparable size in the country prior to the war. This condition can be attributed largely to the difficulties of rendering attractive transit service for such a dispersed population, to the confused status of a two-company service with complicated fare and transfer arrangements, and to the attractive climate and excellent highway facilities encouraging the use of private automobiles. The annual number of transit rides prior to the war approached the impressive total of one-quarter billion, nevertheless, and is presently about 60 per cent above the pre-war level. Riding should stabilize at a relatively high level with increased population and improved service.

PARKWAYS AND RAPID TRANSIT

For background material on parkway development, including plans for physical developments and proposals for their usage to supply rapid transit facilities, the consultants reviewed the following reports:

Parkway Transit Lines in Los Angeles Central Business District, 1945

Central Business District Association

Downtown Los Angeles Parking Study, 1945

Downtown Business Men's Association

Transit Study, Los Angeles Metropolitan Area, 1944

Central Business District Association

Business Districts, 1944

Regional Planning Commission

Freeways for the Region, 1943

Regional Planning Commission

Mass Transit Facilities and The Master Plan of Parkways, 1942

City Planning Commission

A Parkway Plan for the City of Los Angeles and the Metropolitan Area, 1941

City Planning Commission

Report on Urban Mass Passenger Transportation Facilities and Requirements of Los Angeles, 1940

California Railroad Commission

Reports on Transportation Survey of Hill Street, Main Street, etc., 1940 and 1942

Stuart M. Bate, Central Business District Association

A Transit Program for the Los Angeles Metropolitan Area, 1939

Transportation Engineering Board of the City of Los Angeles

Report of Traffic and Transportation Survey, 1938-1939

Transportation Engineering Board
W. P. A.

Traffic Survey, Los Angeles Metropolitan Area, 1937

Automobile Club of Southern California

Report of a Highway Traffic Survey in the County of Los Angeles, 1937

Regional Planning Commission

Report on the Local Public Transportation Requirements of Los Angeles, 1935

California Railroad Commission

A Rapid Transit System for Los Angeles, California, 1933

Donald M. Baker, Report to Central Business District Assoc.

Conference on the Rapid Transit Question, 1930

Board of City Planning Commissioners

Report on a Comprehensive Rapid Transit Plan for the City and County of Los Angeles, 1925

Kelker, DeLeuw and Company

California showed its progressiveness by adopting, in 1939, enabling legislation which authorized the State Highway Department to design and construct "freeways" and giving similar powers to cities and counties. Such facilities are also commonly called parkways, expressways or limited ac-

cess highways. Comprehensive plans have been made for a system of such routes in Los Angeles County. There has been general agreement reached on the number and locations of the routes that will be required. The total cost of this program is estimated at \$400,000,000 within the city and \$582,000,000 for the entire county.

Two sections of parkways have been built, and construction on the first section of a third route is to be undertaken shortly. These splendid facilities providing the maximum in speed, comfort and safety are worthwhile from every point of view. On their completion a substantial volume of travel will be removed from the local street system in intermediate areas, the accident toll will be greatly reduced, and splendid thoroughfares will be available for travel through all parts of the metropolitan area.

The characteristic of parkways is that they carry highway traffic at reasonable speeds with a high degree of safety. Access is limited to carefully selected and designed locations, and all cross interferences are eliminated. They are constructed above or below surface grade or are isolated from abutting property in other ways. They occupy broad rights-of-way with side slopes landscaped with trees and bushes, which presents particularly interesting possibilities in Southern California. The roadways for the two directions of traffic are divided by a center mall which may be widened when desired to permit the operation of rail rapid transit vehicles completely segregated from the express roadways.

CHAPTER II

RAPID TRANSIT DEVELOPMENT

By De Leuw, Cather and Company

The reports dealing with transit and parkway development, made by various public and private agencies during recent years, were studied with special interest. Two of these dealt specifically with the development of a transit program: the 1939 report of the Transportation Engineering Board and the 1944 transit study of the Central Business District Association. We find ourselves in almost complete agreement with the 1939 findings as generally confirmed in 1944. These may be summarized as follows:

There is need for vastly improved transit, and this should be brought about by

modernization of equipment;

the development of a limited number of rapid transit trunk lines;

the use of sections of the parkway system for transit; and finally

the gradual reduction of radial local lines accompanied by the installation of additional crosstown service to provide a comprehensive network of transit lines serving the several important outlying commercial centers and also functioning as feeders to the rapid transit trunk lines.

The 1939 and numerous previous reports found that unification of all transit facilities is necessary to

eliminate wasteful duplication of services;
reduce operating expenses;

provide convenient interchange of passengers and improve the existing cumbersome transfer system; and

simplify and rationalize the fare system.

The pattern of transit development heretofore recommended and with which we agree involves

the operation of rapid transit facilities on most of the radial and certain of the crosstown parkways;

the operation of buses, cars or trains within or along such parkways with express stops at the intersections with crosstown feeder routes;

specially designed transfer facilities for both rail and bus rapid transit which provide for the movement of passengers from local to express services without interference with the free flow of vehicles on the express roadways proper; and finally

the strengthening of the gridiron of crosstown routes throughout the built-up sections of the urban area to provide convenient transfer of long distance passengers to the express services.

ASSUMPTIONS

The preliminary rapid transit plans here recommended have been developed on the assumptions that:

urban and suburban commercial and residential centers will continue to increase in importance and size;

each community will have its own local influence on transportation planning;

industry will continue to develop in suitable locations well distributed throughout the metropolitan area and to depend largely upon the automobile for employee transportation;

the rapid transit system should tie centers of concentration to form a strong network of trunk lines;

suitable feeder routes will extend the benefits of rapid transit to most of the areas;

co-ordinated transit operation eventually will be accomplished to provide the much needed universal transfer and simplification of fare structure; and

there will be adequate facilities for distribution of passengers in the central terminal area.

RAPID TRANSIT TRAFFIC

Out of the numerous studies which have been made in recent years, three were utilized to provide an authentic factual basis for the projection of estimates of probable traffic volumes on parkways. The origin and destination of public transit passengers for each of the 578 census tracts in metropolitan Los Angeles was determined in 1939. These figures were used to compute the total number of persons travelling to or through the central business district in transit vehicles on a typical weekday.

In the same survey, the origins of 10 per cent of the automobiles entering the central business district were determined in the same detail and covering the same 578 census tracts. Factors were then developed based on the actual 1940 census population in each tract for

the number of persons riding into or through the central business district in transit vehicles;

the number of automobile passengers riding to and through the central business district; and

the total number of persons travelling to or through the central business district.

These factors were used in estimating probable future traffic of each type.

The Los Angeles Regional Planning Commission studies show 1945 distribution and estimates of ultimate* population in each of the 578 census

tracts. These were used as a base for extending the 1939 figures. Estimates of 1945 traffic to and through the central business district along each of the parkways, therefore, were determined by arithmetical projections. There are certain artificial conditions prevailing today, more or less temporary, which result in an abnormally high transit riding habit. The estimates as determined on a straight projection of the traffic figures during the 1941-45 period have been reduced by approximately 13 per cent to produce a figure deemed fairly representative of normal conditions in the immediate post-war period.

The number of passengers from each census tract who would patronize a rapid transit system has been estimated, giving consideration to reductions in travel time and other factors affecting the convenience of passengers. In these computations no allowance was made for passengers originating within four miles of the center of the downtown district. Increments of traffic from 1945 to the ultimate have been projected on a straight line basis assuming but little change in riding habit. The figures as thus produced are extremely conservative as compared with actual experience in other large metropolitan centers where there has been a definite upward trend in riding habit as the metropolitan area increased in size and complexity.

The normal weekday one-way transit traffic on the rapid transit arteries shown in Figure 2, as thus determined, is as follows:

| ROUTE | 1945 | Ultimate |
|---|---------------|----------------|
| Santa Monica Parkway (west of Hollywood Parkway) | 30,600 | 39,300 |
| Hollywood Parkway (northwest of Santa Monica Parkway) .. | 16,700 | 25,600 |
| Glendale Rapid Transit (north of Hollywood Parkway) | 15,300 | 21,700 |
| Total | 62,600 | 86,600 |
| Olympic Parkway (west of Harbor Parkway) | 31,400 | 40,500 |
| Inglewood Parkway (southwest of Harbor Parkway) | 31,900 | 48,100 |
| Harbor Parkway (south of Inglewood Parkway) | 19,900 | 31,300 |
| Total | 83,200 | 119,900 |
| Long Beach-San Pedro Rapid Transit | 8,830 | 13,980 |
| Pasadena | 5,650 | 8,840 |
| Glendora | 5,440 | 12,730 |
| Covina | 6,650 | 13,230 |
| Total | 26,570 | 48,780 |

*The word "ultimate" as used throughout this section of the report is intended to imply that period when the Los Angeles metropolitan area has attained a population of 6,000,000 and construction of the system of freeways and the system of rapid transit routes has been completed.

The greatest strain on all highway and transit facilities comes during the morning and evening rush hour periods when most people are going to

and returning from work. The rush hour traffic on all of the radial trunk line transit arteries shown on the map has been determined, based on an analysis of the ratio of rush hour loads to total all-day traffic on the present transit systems. Hav-

ing reached this final figure, the number of buses or cars required to handle such traffic volumes on each line during rush hours was determined on the basis of average loadings of 60 passengers in buses and 100 in cars, as follows:

NUMBER OF BUSES AND CARS—MAXIMUM HOUR

| Route | 1945 | | Ultimate | |
|---------------------------|------------|------------|------------|------------|
| | Buses | Cars | Buses | Cars |
| Glendale | 52 | 31 | 72 | 43 |
| Hollywood | 55 | 33 | 85 | 51 |
| Santa Monica | 102 | 61 | 132 | 79 |
| Total | <u>209</u> | <u>125</u> | <u>289</u> | <u>173</u> |
| Olympic | 105 | 63 | 135 | 81 |
| Inglewood | 105 | 63 | 161 | 96 |
| Harbor | 67 | 40 | 105 | 63 |
| Total | <u>277</u> | <u>166</u> | <u>401</u> | <u>240</u> |
| Long Beach | 30 | 18 | 47 | 28 |
| Santa Ana | 4 | 2 | 7 | 4 |
| Covina | 22 | 13 | 43 | 26 |
| Glendora | 18 | 11 | 42 | 25 |
| Pasadena | 18 | 11 | 30 | 18 |
| Total | <u>92</u> | <u>55</u> | <u>169</u> | <u>101</u> |
| Total—All Divisions | <u>578</u> | <u>346</u> | <u>859</u> | <u>514</u> |

The number of buses estimated to utilize the express roadways is impressive enough at present day travel levels, but will reach formidable figures when Los Angeles approaches its ultimate development. This calls for consideration of the practicable capacity of parkways for bus operation.

BUS OPERATIONS ON PARKWAYS

A good example of fairly intensive use of parkways for bus operation is on the Outer Drive in Chicago where 60 buses are operated during the maximum hour on a non-stop run with no serious interference to free movement of automobiles nor with any substantial reduction in the use of the outer lane by motor cars.

Just how many buses may be operated on a parkway without substantial interference is a matter of judgment. It is our opinion that the number may be increased to as many as 100 buses per hour without any serious interference with free movement of other vehicles. It is physically possible to operate even a greater number so far as the expressway operation is concerned. Such operation, however, would present real difficulties in handling the buses at intermediate stops. Problems in the

terminal areas, also, would become critical, if not insoluble.

The figures show that bus operation would be possible at present day traffic levels throughout the intermediate and outer sections of the radial trunk line routes. These parkway routes merge as they approach the central district, however, with the result that 157 buses in one hour would converge from the parkways serving Santa Monica, Hollywood and San Fernando Valley sections and operate over a single parkway. The ultimate traffic would require the operation of 217 buses during the maximum hour.

Traffic on the Olympic Parkway is estimated at 105 buses per hour. On the Harbor Parkway north of Vernon Avenue, where the combined traffic from Inglewood and Harbor Parkways is carried, 172 buses would be required during the maximum hour. These figures are based on present traffic levels. If they are projected to the ultimate population basis they would increase to 135 buses on the Olympic Parkway and 266 on the Harbor Parkway for the combined Inglewood and Harbor lines. Bus operations of this intensity would be impractical.

PARKWAY CAPACITY

While a rate as high as 2000 automobiles per hour per lane has been sustained for 5-minute periods on congested expressways, such concentrations make for uncomfortable as well as unsafe driving. There has been general agreement by experienced engineers on a figure of 1500 automobiles per hour per lane as representing the *maximum* volume for safe and efficient use. Inner lanes may be estimated at 1500 vehicles per hour each. Merging traffic at interchanges and ramps, however, reduces the capacity on the outer lane to approximately 1000 vehicles, so that the total capacity of a six-lane parkway may be estimated at a maximum of 4000 vehicles per hour in a single direction.

ESTIMATED PARKWAY TRAFFIC

Probable automobile traffic over the Santa Monica and Hollywood Parkways was estimated to see what, if any, excess capacity would be available for buses after private passenger vehicles were accommodated. These figures were based on the 1939 traffic level and the figures projected by using the same technique as developed for estimating future traffic on rapid transit lines.

Maximum hour traffic on the Santa Monica Parkway as thus estimated totals 3600 vehicles during the maximum hour and on the Hollywood Parkway approximately 2000. The sum of these two traffic streams which would be joined on the Hollywood Parkway east of Vermont Avenue totals 5600 vehicles per hour. It appears that the

number of motorists who would wish to use the Hollywood, Santa Monica and San Fernando Valley sections of the freeways would be in excess of the number who could be accommodated safely and comfortably on the easterly section of the Hollywood Parkway even at present day levels. It seems clear that this parkway section will be saturated during rush hour periods without *any* bus operation. Rail rapid transit is indicated on this route even if judged solely from the viewpoint of the motorist.

ALL-BUS OPERATION IMPRACTICABLE

It may be concluded that trunk line express bus operation is impracticable on the more important radial parkways, even in the intermediate districts. To find further proof of the utter futility of such operation in Los Angeles, we need only consider the problem which would be presented in the central district. Initially, rapid transit passengers alone would require 578 buses to and from the central business district during the maximum hour. An additional 400 street cars and buses would be required at present levels for the passengers on local lines entering the central area, so that there would be a total of 978 surface vehicles in and out of the central area during a single hour. This would be an increase of 29 per cent above the present total of 760. If we consider ultimate transit traffic, the total number on the streets would be increased to approximately 1300 street cars and buses. Los Angeles needs to reduce transit operation on downtown streets rather than to increase it.

RAIL RAPID TRANSIT

For all of these reasons we recommend rail rapid transit on the Hollywood, Santa Monica, Olympic, Inglewood and Harbor Parkways as shown in Figure 2. Continuation of existing railroad operation on private rights-of-way, now partially grade-separated, is recommended on the Long Beach, Pasadena, Glendora and Covina routes to the southeast, northeast and east, as well as on the Glendale route to the north.

This operation of the proposed rapid transit system would permit all trunk line rapid transit traffic to be routed to three off-street terminals in the central area. Two of these exist today and the third would be supplied by the construction of the recommended Broadway subway.

HILL STREET STATION

Trains from Glendale, Hollywood and the San Fernando valley and also from the Santa Monica Parkway would be routed through the existing tunnel into the Hill Street Station. At present, peak traffic could be handled with 40 trains per hour averaging three cars in length. Increases in capacity could be effected from time to time by adding to the length of the trains operated, which ultimately would reach four to five cars. Additional capacity could be provided at moderate cost by installation of a loop track. Escalators at this terminal should also be considered for the convenience of passengers arriving at the subway level platforms.

SIXTH AND MAIN TERMINAL

All of the services now operated by the Pacific Electric to the south and to the east are proposed to be routed to the Sixth and Main Terminal. Present traffic would be accommodated by the operation of 26 trains in the maximum hour averaging three cars in length. Increments in traffic could be provided for by operation of 30 trains up to four cars in length.

The handling of this number of trains would require some rearrangement of the terminal. The present plan for increasing its capacity should be carried out at an early date. This improvement will provide adequately for future needs.

THE BROADWAY SUBWAY

All trains from the Olympic, Inglewood and Harbor Parkways would operate to a proposed underground terminal as shown in Figure 3. Not only would it provide admirably for the distribution of passengers originating to the south and southwest, but it would also provide an excellent facility for distribution of passengers arriving at other terminals.

Initial traffic on these routes is estimated to require the operation of 40 trains during the rush hour averaging about $4\frac{1}{2}$ cars in length, increasing ultimately to an average of 6 cars. The subway as proposed would have capacity for the movement of 40,000 people per hour per track.

The two-track subway proposed could be built either at high level by cut and cover methods or at low level by tunneling. Trains would be served by either side platforms or center island platforms. Detailed engineering studies are required to determine methods of construction and details of layout. Platforms at station stops would be connected with a mezzanine level above by escalators. Mezzanines would be spaced at about one-quarter mile intervals and would be as close to the sidewalk as practicable in view of the necessity for maintenance of existing underground utility structures. The mezzanines would be connected to the sidewalks with stairways. Mezzanines would function so as to permit convenient movement of passengers to and from subway trains and also to permit passengers to reach both platforms from either the east or west sidewalk on Broadway.

The congestion on the narrow sidewalks along certain sections of downtown Broadway indicates

the advantage of locating stairways through easements in private property in areas of most intensive development. The owners of stores and office buildings should be permitted to provide separate entrances into their basement levels. Such entrances would constitute an improvement to these properties and also be a convenience to subway patrons.

The cost of this project complete with connections to the rail lines proposed in the center malls of the Harbor and Olympic Parkways is estimated at \$15,000,000. This expenditure would provide for a subway structure of the finest type. Stations would be attractively finished with structural glass, bronze, stainless steel and aluminum. Modern fluorescent lighting, providing an intensity from 5 to 6 foot-candles on platforms and floors, would be included. Ventilating facilities would be installed to insure a minimum of six changes of air per hour. Noise would be controlled through the liberal use of acoustical finishes on inconspicuous portions of the station and the adjacent subway structure.

EQUIPMENT

Rapid transit cars of the most modern type would be operated in trains throughout the entire rapid transit network. Cars 10 feet in width, and made for car-floor-level platforms, could be utilized in the new Broadway Subway and its branches. Clearances in the existing Pacific Electric tunnel may limit the width of the cars operated to Hollywood and Santa Monica to 9 feet. On the several rapid transit branches served by the Sixth and Main Street terminal, cars similar to those now operated in the Glendale service are contemplated.

All of this equipment would be provided with modern lighting, ventilating, power and braking equipment, and with wide doors to permit quick loading and unloading. They should be of modern, light-weight construction with a maximum of rubber cushioning to control noise. In general they would have the operating features of the modern P.C.C.-type street cars now used on three lines of the Los Angeles Transit System.

OPERATION

Stations on the transit system at the intersections of all important crosstown feeder routes would be designed so as to facilitate the transfer

of passengers between trains and buses. Figure 4* shows a delineation of such a transfer station. Crosstown buses would deliver passengers to the sidewalk immediately adjacent to the station and movement from sidewalk level to rapid transit platform level would be by stairways and escalators.

Trains operating through the Broadway Subway on headways of 90 seconds would provide admira-

*From DETROIT EXPRESSWAY AND TRANSIT SYSTEM
—W. Earle Andrews, DeLeuw, Cather & Company, and Ladislav Segoe—1945.

EXPRESS BUS OPERATION

Rapid transit rail operation has been recommended for a limited number of radial routes where the estimated traffic would become burdensome if added to the vehicular traffic on the express roadways. There are a few radial and several crosstown freeway routes, however, which should be planned for express bus operation.

The type of bus operation recommended is one in which the buses operate on the express roadways only at the designed speed of 40 or 45 miles per hour. The ramp layout of the parkway permitting, buses should take a ramp up to the normal street level, coming to a stop at the intersecting arterial roadway. After making the passenger stop, the bus would proceed along the service drive and down a ramp to resume operation on the express roadway.

Where ramp connections do not permit such operation, the recommended design is a special turnout at depressed grade to a bus station entirely segregated from the express roadway and located under the bridge at the intersecting street. Bus passengers would transfer from such a station to local buses by means of stairways at the sides of the bridge. In no case should buses be allowed to stop on express roadways nor should any bus passengers be permitted on or near these roads.

BENEFITS

The benefits which will flow to Los Angeles through the orderly development of the rapid transit system recommended will be of major significance in the city's development. Important

general benefits will be accorded both the outlying commercial and industrial centers and also the central business district through the provision of convenient, commodious and speedy public transit

bly for distribution of passengers through the central business district. A terminal loop providing delivery of passengers to the Civic Center and the Union Station would be especially useful. There are excellent opportunities for off-street bus terminals and parking facilities near the north and south ends of the district in such manner as to provide convenient transfer to the Broadway Subway. Congestion on downtown streets would be reduced in direct proportion to the development and use of such terminals.

RECOMMENDED EXPRESS BUS ROUTES

The routes on which traffic would be sufficient to warrant express operation at the time of the completion of the parkway are shown by the solid green lines on Figure 2. These include the following:

- Allesandro Parkway
- Crenshaw Parkway
- Glendale Parkway
- Normandie Parkway
- Santa Ana Parkway
- Slauson Parkway
- Whitnall Parkway

As the population increases and additional lands are developed, there will be need for further crosstown service to articulate several outlying commercial centers and to provide convenient means of rapid transit in the outlying sections. These are shown in Figure 2 in dotted green on the following:

- Artesia Parkway
- Coast Parkway
- Colorado Parkway
- Harbor Parkway
- Marina Parkway
- River Parkway
- San Fernando Parkway
- Sepulveda Parkway
- Venice Parkway
- Whitnall Parkway

general benefits will be accorded both the outlying commercial and industrial centers and also the central business district through the provision of convenient, commodious and speedy public transit

facilities. During the amazing development of outlying commercial centers in Los Angeles, the central business district has been more or less static. Decentralization of numerous commercial activities is a healthy trend which has been evidenced to a lesser degree in all other large metropolitan centers. Every metropolitan center, however, will continue to have a central core in which banks, transportation terminals, civic buildings, general offices, and other similar institutions will be located. In this center, all of the individuals who do business with these large organizations will locate their offices for convenience. Substantial commercial development will also remain in the central district.

The importance of sound central development to the community as a whole is indicated by reference to New York City. In that metropolitan center, approximately one-third of the workers are employed in business management of one type or another. During the 18-year period, 1925 to 1943, the gross office space on Manhattan Island increased from 21,000,000 to 54,000,000 square feet or 157 per cent. The possibilities for business management offices of large corporations doing business in the western section of the United States are important. Attractive public transportation would encourage the establishment of such offices in Los Angeles.

Substantial benefits will come from the transfer of large volumes of traffic, both automobiles and transit vehicles, from the major thoroughfares to the parkways or to off-street rapid transit routes. Relieved of through traffic, such thoroughfares can function more efficiently for the movement of local vehicles serving people having business to transact in outlying commercial districts.

Similar advantages will flow to the property owners along major thoroughfares, irrespective of whether property is utilized for commercial or residential purposes. In most cases, large volumes of public and private through traffic do not enhance property values, and may even destroy values.

TIME SAVING

The group which will receive the outstanding advantages from the development of rapid transit will be the patrons. They will enjoy the comforts and convenience of modern buses and cars, and also delivery to the central district in improved terminal facilities. By far the greatest benefits, however, will be the substantial time savings made possible by rapid transit.

The following tabulation shows the travel time between typical points in intermediate and outlying areas and the central business district based on present scheduled running time and estimated running time, giving effect to the completion of the proposed rapid transit system:

| Location | Present Scheduled Running Time | Rapid Transit Running Time | Saving | |
|----------------------------------|---|-------------------------------------|---------|----------|
| | | | Minutes | Per Cent |
| Watts at 103rd | 35 | 23 | 12 | 34 |
| Firestone-Atlantic | 55 | 35 | 20 | 36 |
| Slauson-Soto | 32 | 22 | 10 | 31 |
| Olympic-Indiana | 22 | 10 | 12 | 54 |
| Pasadena | 42 | 32 | 10 | 24 |
| Broadway-Brand in Glendale | 32 | 25 | 7 | 22 |
| Vermont-Los Feliz | 54 | 23 | 31 | 57 |
| Hollywood-Vine | 29 | 22 | 7 | 24 |
| Sunset-Fairfax | 53 | 30 | 23 | 43 |
| Chandler-Vineland | 58 | 28 | 30 | 52 |
| Beverly-LaBrea | 33 | 16 | 17 | 51 |
| Santa Monica-Beverly | 39 | 25 | 14 | 36 |
| Culver City | 45 | 22 | 23 | 51 |
| Jefferson-Grand | 15 | 8 | 7 | 47 |
| Slauson-Western | 35 | 15 | 20 | 57 |
| Municipal Airport | 50 | 26 | 24 | 48 |
| Crenshaw-Manchester | 57 | 28 | 29 | 51 |
| South Broadway-Century | 46 | 22 | 24 | 52 |
| Florence-San Pedro | 39 | 23 | 16 | 41 |

The recommended ultimate rapid transit system, with both rail and bus operation, would completely serve the present as well as ultimate population of the Los Angeles metropolitan area. The relationship of the rapid transit system to the ultimate population distribution is shown in Figure 5.

While some of the recommended routes would pass through presently undeveloped areas, Figure 6 shows that major increases in population in these areas are predicted by the Regional Planning Commission.

OTHER IMPROVEMENTS

GRADE SEPARATIONS

Certain existing routes of the Pacific Electric Railway are recommended as a permanent part of the rapid transit system. Almost all of these routes have substantial sections of private right-of-way, portions of which have been completely separated from the grade of intersecting thoroughfares. Truly satisfactory rapid transit service on these routes will never be possible until complete grade separation is effected. Substantial sums are available to California through the current federal post-war highway appropriations for grade separations. It is recommended that an orderly program be prepared for eventually accomplishing a complete segregation of rapid transit operation on these routes from all street traffic. Such grade separation is particularly important on the routes to Glendale, Burbank, Pasadena and Long Beach.

PEDESTRIAN CONCOURSE

There are worthwhile possibilities for improvements to convenience for transit passengers in the central area. A connection from the existing Hill Street terminal to the proposed Broadway Subway can be accomplished by the construction of a pedestrian concourse, and this is recommended as a part of the initial subway project. It is reasonable to assume that a similar pedestrian passageway may eventually be provided between the Sixth and Main Terminal and the Broadway Subway.

SIDEWALK WIDENING

As densely travelled thoroughfares in the central business district are gradually relieved of street car traffic, there will be a noticeable improvement in the flow of all vehicles. Shifting of passengers from street car loading zones to side-

walks, however, will create an additional burden on these already congested walks. As a part of general improvement for all traffic, it is suggested that a study be made of the possibilities of widening sidewalks at these locations. This could be done on most of the north and south streets without any sacrifice of roadway capacity.

PARKING PROHIBITION

Traffic will flow more freely when parking is prohibited on the more heavily travelled thoroughfares in the downtown and other congested centers. Merchants in other cities have long since recognized the fact that the number of persons who can park automobiles in front of their establishments represents only an extremely small percentage of their customers. Experience elsewhere has proven also that elimination of parking makes all establishments in the area more accessible and results in a greater volume of business. Likewise, elimination of left-turn movements and, at certain intersections with heavy pedestrian traffic, of right-turn movements will provide further betterments in traffic.

LOOP BUS SERVICE

With the development of proposed by-pass parkway routes, there will be an opportunity for building large commodious garage and parking facilities on the periphery of the central business district at locations convenient to access ramps but removed from more heavily congested streets in the center of the business district. The operation of a downtown loop bus service similar to that in Cleveland and elsewhere would be a valuable adjunct to such development.

FINANCING

The recommended plan calls for rail operation on the following parkways: Hollywood, Santa Monica, Olympic, Inglewood, Harbor and the east

by-pass. Increasing the width of a parkway so as to provide space for rail rapid transit in the center mall may be estimated to add approximately

one-sixth to the cost. This additional cost includes not only the greater width of right-of-way but also additional excavation and increase in length of bridge structures. Based on policies adopted on similar projects elsewhere it may be assumed that all costs over and above those involved in development of parkways of the normal type must be financed out of funds other than those supplied by the State Highway Department or the Federal Public Roads Administration. The total cost of widening all of the parkways proposed for rail rapid transit as thus estimated amounts to approximately \$23,000,000.

There is also a substantial investment required for rapid transit stations and for fixed transit equipment including track, signal, power and other facilities required for a high speed rail operation. For the entire system recommended herein, it is estimated that these facilities would require an investment of approximately \$30,000,000. The underground terminal proposed under Broadway is estimated to cost an additional \$15,000,000 so that the entire capital investment required to complete the rail rapid transit system amounts to approximately \$68,000,000.

The benefits which will accrue to the city at large through the development of an efficient rapid transit system are so great as to warrant the as-

sumption of a portion of this investment by the city out of its general funds. The application of the funds to be received from the transit companies annually under their franchises would provide a substantial portion of the investment required for widening the parkways. The remainder of the cost of parkway widening might be financed through the issuance of revenue bonds to be retired through rentals to be paid by the operating company for the use of these valuable facilities.

Operating expenses of the rapid transit system would be substantially reduced due to the increase in speeds over the entire system. It is estimated that savings on the entire system will amount to approximately \$700,000 per annum for platform labor alone.

Upon the completion of the system, annual traffic will total more than 100,000,000 passengers per annum. A small increase in fare, which in our opinion the passengers would be willing to assume in return for the improved service, would permit the assumption of all of the investment required for transit equipment by the operating company. A similar arrangement was made in connection with the operation of the Key System trains over the San Francisco Bay Bridge in connection with the greatly improved transit service between San Francisco and the Bay Cities.

RECOMMENDATION FOR IMMEDIATE ACTION

The over-all plans which have been recommended are long range in scope. Of necessity, they will be co-ordinated with the development of parkways throughout the region. While certain parkways are planned for immediate construction, the full scale parkway program and the rapid transit plan herein recommended will not be completed for a number of years.

There are certain steps, however, which could and should be taken immediately, as follows:

1. Purchase and operation of modern equipment on the entire transit system regardless of present ownership,
2. Development of a master plan for rapid transit as required by the City Charter,
3. Preparation of plans for the development of transit facilities from time to time to keep pace with planning of parkways,
4. The planning and negotiation of an agreement for transit unification,
5. Preparation of a specific plan for financing rapid transit and other necessary transportation improvements, and
6. Planning and zoning new residential, commercial and industrial developments throughout the area so as to provide adequate facilities for transit, for parking, for delivery and shipment of goods, and for free movement of private passenger vehicles.

CHAPTER III

By Harold M. Lewis

Taking advantage of the "freeway" legislation adopted in 1939 by the State Legislature of California, the City and County of Los Angeles have made an excellent start toward solving their problem of moving automobiles rapidly and safely through the metropolitan area. Elaborate plans already in hand established a sound starting point for the present studies and discussions.

The group of consultants was asked particularly to study the relationship of these expressways to the needs of the Los Angeles Area for the movement of passengers in public vehicles; that is, by mass transportation. We have each of us reviewed the numerous reports which have been made over the past twenty years on the general subject of transportation in the City and County. I have approached the problem from the point of view of a City Planner, which has involved consideration of

a future pattern of urban growth, not only as indicated by the present trends but as it might be influenced and bettered by comprehensive planning.

While the proposed new system of highways we are discussing are officially referred to as "parkways," I prefer to use the term "expressways," as being a broader term which can be broken down into various kinds of express routes so far as their use is concerned.

To give a simple picture of the proposed system and its probable sequence of construction, the expressway routes included in the ten-year program suggested in 1915 by official agencies are shown in a series of five maps, Figure 1. These give the resulting system as it would exist at the end of successive two-year periods. A sixth map in the series includes other routes mapped at that time, but for which construction was unscheduled.

SPECIAL CHARACTERISTICS OF LOS ANGELES DISTRICT

Before submitting specific recommendations, I would like to point out a few of the characteristics of the Los Angeles district, the needs of which can be met by a system of expressways and the principles and standards to which I believe such a system should conform.

Unlike many of our eastern cities, Los Angeles is still growing rapidly. My studies, like those of the other consultants, are based on an acceptance of a future population of about six million people in the County and three million in the City. I don't think the city and County are to be congratulated on the prospects of this additional growth, because I believe that it is more important to plan for *better* than for *bigger* communities.

On the other hand, I am convinced that this growth is likely to occur, and this makes all the more important the necessity for sound planning at the present time.

Spurred on by the extensive use of the automobile, the growth of the metropolitan district has been widely distributed in all directions and has spread out not only to the ocean and the mountains but well up into the foothills. The western part of the San Fernando Valley, most of which was annexed to the City in 1915, offers the best opportunity for the extension of medium and high-grade residential development in combination with agriculture, small estates and ranches, as well as local industry.

CORDON COUNTS

In analyzing the demands which will be made on the principal routes, particularly in the vicinity of the downtown area, cordon counts made in 1939 by the Transportation Engineering Board

and in 1941 by the Regional Planning Commission have been used. The 1939 counts show about 259,000 motor vehicles entering and 258,000 leaving the downtown business district bounded by

Figueroa and Los Angeles Streets and Pico and Sunset Boulevards during the 12-hour period from 7 a.m. to 7 p.m. on a typical business day. The 1941 counts covered a 16-hour period. They showed about 273,000 motor vehicles entering during the 12 hours from 7 a.m. to 7 p.m. It was

concluded as a result of the 1939 survey that approximately 35% of the passenger vehicles which entered the district were through traffic which was destined to points on the other side of the district and entered it only because there was no convenient way to go around it.

REQUIREMENTS OF EXPRESSWAY SYSTEM

A system of expressways for the district should fulfill the following objectives:

1. Complete separation of grades at intersections of expressways with main highways, and no connections with minor streets.
2. Separation of through traffic from local traffic.
3. Substantial savings in time of travel both to and from the central business district and between sub-centers, and provision for bypassing such centers, both central and suburban.
4. Retention of open belts between separate communities and neighborhoods. These would be landscaped, park-like strips of land permanently free from buildings, providing natural neighborhood boundaries, assuring greater light and air and guaranteeing against the monotony of continuous building development.
5. Maintenance of an efficient and prosperous main center of offices, government, wholesale business and retail business, recognizing that only the last of these is subject to extensive decentralization.

The proposed system of expressways will provide directly the first three of these objectives and serve indirectly the last two. If properly designed, they should free the downtown streets of the present serious congestion in the peak hours and be of tremendous benefit to through traffic now delayed by this congestion.

In determining the sequence of construction, the following three principles should be kept in mind:

First, those radial elements should first be provided which lead in the direction of maximum vehicular movement, that is, between downtown Los Angeles and points northwest, west and south thereof. From this point of view, the Hollywood Freeway is a logical next step.

Second, it is more urgent to provide routes around the edges of the central business district, to serve both through and access traffic, and from these edges outward about three miles to points beyond the most congested areas, than to provide similar mileage in long radial routes.

Third, where sections of proposed routes parallel existing wide thoroughfares, their construction is less urgent than routes which will provide new thoroughfares where none now exist.

FUNCTIONS OF INDIVIDUAL ROUTES

Before trying to split up the expressway system into separate classifications, it is well to set down some of the functions which the separate routes can perform, as follows:

1. Wherever they by-pass a business center, they should also provide easy surface connections thereto over existing streets.
2. The system should connect downtown Los Angeles with:
 - a. Main residential suburbs which have many commuters to the downtown area;
 - b. Airports;
 - c. Outlying recreational areas;
 - d. The port of Los Angeles;
 - e. Satellite communities such as Hollywood and Pasadena;
 - f. Inter-regional State Highways at points near the edges of the metropolitan district.
3. They would provide routes for trucks between manufacturing districts and local freight terminals and inter-regional State Highways, thus keeping such trucking out of the downtown district.

4. They would provide for heavy week-end passenger car traffic to mountain and beach resort areas, and to such special points as the Coliseum and Rose Bowl.
5. They would, as mentioned above, relieve thoroughfares now congested by long-haul traffic by providing a separation of through traffic (diverted to expressways) and local business or short-haul traffic (remaining on present streets).
6. In general, they will have little effect on abutting property except where they intersect, and provide transfer to, local transit lines. At such points business areas with retail stores, offices and parking facilities will develop. Such points might well form a common center for a group of residential neighborhoods bounded by expressways.

RECOMMENDED CLASSIFICATION

In order that each of these various functions may be properly provided for, I would recommend that the system be classified into four types of routes. I have made a tentative classification of this kind for those routes which have been included in the proposed ten-year construction program. I have made no attempt to classify the remaining unscheduled routes, as I believe this might well wait until after the construction program is under way and there has been a demonstration of the actual demand for various types of service. Only one of the proposed classifications seriously affects the physical design of the route; the other three are primarily controlled by regulation and routes classified therein could later be changed into another one of these three groups, if that became desirable.

The principal groups are as follows, and maps are submitted (Figs. 7 to 10, incl.) showing what would be included therein:

1. Routes on which express rights-of-way should be provided for mass transportation vehicles, either on rails or on roadways reserved for buses or trackless trolleys (Fig. 7). In this classification I have placed the Hollywood Parkway to North Hollywood, Santa Monica Parkway west of its connection with Hollywood Parkway, Olympic Parkway to Culver City, and Venice Parkway from there to the ocean front at Venice, a connection to the Municipal Airport via parts of Harbor, Inglewood and Sepulveda Parkways, a section of Harbor Parkway leading south from Inglewood Parkway, and sections of the East By-Pass and Ramona Parkway.
2. Routes which would be reserved for the use of private passenger cars (Fig. 8). These, in general, would be those which pass through high-grade residential districts, over scenic routes with relatively high grades, or to and from resort areas. In this group are placed Riverside, Normandie, Ocean, Marina, Arroyo Seco, Allesandro, River and parts of Sepulveda and Colorado Parkways.
3. On other routes essentially needed for private passenger cars, a limited number of express buses should be permitted to use the same roadways (Fig. 9). Typical of such routes are the Santa Monica Parkway west of Beverly Hills, Crenshaw Parkway, Harbor Parkway along the west side of the central business district, and parts of the Santa Ana, Ramona and Olympic Parkways. It is also suggested that buses be permitted to use the parkway roadways in certain sections of routes in the first classification, notably the inner sections of Hollywood and Santa Monica Parkways.
4. Routes for mixed traffic, including passenger cars, buses and motor trucks (Fig. 10). In this group would come such routes as the East By-Pass, Harbor Parkway south of its connection with the East By-Pass, Inglewood, Slauson, Long Beach, Seaside and San Fernando Parkways, and parts of Santa Ana and Sepulveda Parkways.

STUDIES OF EXPRESSWAY DESIGN

The next step after determining the number and location of routes is to plan for their capacity and for connections with the street system. Certain

standards of design have already been established by the State and the City in their plans for the Hollywood Parkway.

I am suggesting certain design standards which would give Los Angeles a parkway system on which driving would be both comfortable and safe. My figures for lane capacities are lower than those which will actually occur for short intervals of time and under extreme pressure of traffic. I believe they represent a standard which would be a desirable objective.

Connections to the street system should in general be not closer than one to two miles (varying with the topography and the importance of intersecting highways) in suburban and rural areas, and one-half mile, or approximately 2600 feet, in intensively developed urban areas. Maximum grades, in general, should not exceed 4% upgrade and 5% downgrade on main roadways, but these figures might be increased by 1% where only passenger vehicles would be accommodated. Ramp connections should, in general, have grades not exceeding 5% to 6% on upgrades and 8% on downgrades.

The minimum radius of curvature should be 1500 feet on main roadways and 200 feet on connections with the street system. With difficult topography an absolute minimum of a 40-foot radius along the inside curb could be used on a connecting ramp where a complete stop is required before entering such a connection.

Traffic lanes should be 12 feet wide on two-lane roadways; on wider roadways they should be 11 feet wide on inner lanes and 13 feet wide on outer lanes. This would require a 37-foot roadway for three lanes and a 48-foot roadway for four lanes.

Traffic should enter on expressway through a one-lane throat 14 feet wide unless the number of lanes on the expressway increases at that point, in which case a two-lane entrance is feasible.

Connecting roadways should be 24 feet wide where buses or trucks will use them and 22 feet wide if only private passenger cars will use them. With light traffic a 16-foot roadway (providing for an emergency two lanes) is sufficient.

Acceleration lanes should be provided at expressway entrances and deceleration lanes at expressway exits; these should be from 200 feet to 300 feet in length.

The capacities of main roadways may be assumed as follows:

Two-lane roadway of parkway type, 1200 vehicles per lane per hour (total 2,400).

Three-lane roadway of parkway type, 1000 vehicles per lane per hour (total 3,000).

Four-lane roadway of parkway type, 900 vehicles per lane per hour (total 3,600).

Two-lane roadway of freeway type with buses permitted, reduce outer lane to 1,000 vehicles per lane per hour (total 2,200).

Three-lane roadway of freeway type with buses and/or trucks permitted, reduce outer lane to 800 vehicles per lane per hour (total 2,800).

Four-lane roadway of freeway type with buses and/or trucks permitted, reduce outer lane to 800 vehicles per lane per hour (total 3,500).

A two-lane ramp with a 14-foot entrance or exit and with acceleration and deceleration lanes, with light control at its intersection with the connecting highway, can accommodate from 1,200 to 2,000 vehicles per hour, depending upon the traffic conditions on the local streets.

CONNECTIONS WITH CENTRAL BUSINESS DISTRICT

A study has been made of the need of connections with the central business district from the loop expressways which will be provided by sections of the Hollywood, Santa Ana, Harbor and Olympic Parkways and the East By-Pass. Within the loop formed by these parkways lies the main business, retail and governmental centers, each of which should be stabilized there.

Too many connections with this district will interfere with movement along the expressways. Too few would provide excessive concentration at

some points. I would recommend that there be four connections on both the east and west sides of the loop at approximately the following locations:

Second and Third Streets
Fifth and Sixth Streets
Eighth Street
Olympic and Pico Blvds.

On both the north and south sides of the loop, connections should be concentrated at two principal points. On the south side, one of these might serve

both Flower and Figueroa Streets and the other might connect with Main, Broadway and Hill Streets. On the north, due to the interference of Bunker Hill, connections must be crowded into the northeast corner where one would serve Broadway and Spring Streets and the other Main and Los Angeles Streets.

A few additional connections might be provided to and from roadways on the inner sides of the loop where no left-turn grade separations would be involved. In this classification is the proposed on-north to Harbor Parkway at First Street.

I believe there is a serious defect in the layout of the Hollywood-Santa Ana Parkway connections north of the Civic Center. There will be a substantial amount of traffic which will wish to turn left onto the Hollywood Freeway in the afternoon rush hours. The only connection provided for such westbound traffic is by a ramp connecting with the northerly service street at the west side of Broadway. To reach this, vehicles from the south must pass over the parkway and make a left turn in Broadway or follow a similar route on Spring or Main Streets, use the north service road and cross at grade Broadway, if coming from Spring Street, and both Spring Street and Broadway if coming from Main Street.

I think provision should be made for making this left turn movement off grade. Studies have been made for such a solution at Broadway and Spring Street (See Fig. 13). They involve widening one block of each of these streets and placing in the center a ramp which would go over the southbound roadway at its intersection with the southerly service street and descend to the parkway roadway to join the westbound roadway at its left-hand edge. As the latter roadway would increase in capacity from three lanes to four lanes at this point, such an entrance would be feasible.

These two ramps are suggested as alternatives. The one at Broadway would be less noticeable as there will be a steep bank north of the parkway where it cuts back into Bunker Hill. The one at Spring Street involves a somewhat steeper down grade to get beneath Broadway and would be more difficult to treat architecturally, but I believe it could be made attractive in appearance.

Another way of eliminating this left-turn would be to have traffic cross the parkway and enter the

westbound roadway by a quarter of a clover leaf turn. From the traffic point of view, I do not believe this would be as satisfactory a solution as the ramps proposed.

From the cordon counts made for the district bounded by Figueroa and Los Angeles Streets, Pico and Sunset Boulevards, I have prepared a map (Fig. 11) showing an estimated distribution of passenger vehicles which might enter this district by the expressways included in the tentative ten-year program, expressed as percentages of the total of such traffic. This was based on the assumption that the geographical distribution of points of origin would continue to be about the same as was found in the 1939 survey.

This analysis indicated that the percentages approaching by the various parkway routes may be as follows:

| | |
|---|-------|
| Hollywood Parkway | 22 % |
| Riverside Parkway | 7 % |
| Arroyo Seco Parkway | 13 % |
| Santa Ana Parkway | 10½ % |
| (including some coming from Long Beach and Ramona Parkways) | |
| West on Olympic Parkway | 13½ % |
| Harbor Parkway | 15 % |
| East on Olympic Parkway | 17 % |
| Direct from Long Beach Parkway | 2 % |

On the same map has been shown an estimate of the percentages which would approach their destinations by each of the main exits recommended above.

A similar analysis has been made for that through traffic which now enters the local street system of the central business district, practically all of which might be diverted therefrom by such a loop system of expressways. These have been plotted so that the total width of the bands represents 86% of the total width of the bands for traffic with destinations within the district. This is the relative volume of parkway-through traffic to parkway-central-business-district traffic, if we assume 80% of the former and 50% of the latter will be diverted to the expressways. The diagram indicates that more through traffic will use the Olympic Parkway than the others and that almost as much will use the Hollywood-Santa Ana route

on the north edge of the district. More through traffic would use the East By-Pass than the Harbor Parkway.

There is another important destination district which would find the proposed express highways very useful as a means of access, that is, the manufacturing and wholesale district lying between Los Angeles Street and the Los Angeles River and

extending south from Pico Boulevard to Washington Boulevard. It is estimated that 75,000 passenger cars may have destinations in this district on a typical business day, as compared with the approximately 168,000 which have destinations in the central business district (assuming this was 65% of the total 259,000 which entered the latter district).

MOVEMENT WITHIN THE DOWNTOWN DISTRICT

Traffic movement within the downtown district will undoubtedly increase as the Los Angeles district grows, but not as rapidly. If we assume that the passenger vehicle registration in the entire area may double, it would be safe to assume that traffic on the principal downtown thoroughfares might increase by 50%. Eventually it would seem desirable to eliminate all rail transportation on the downtown streets bounded by Sunset Boulevard, Pico Boulevard, San Pedro Street and Figueroa Street. While this subject is in the field of the other consultants, I would like to state that some form of north-south subway such as Mr. DeLeuw has suggested seems to me an essential part of any plan for freeing the downtown streets

from hopeless traffic congestion.

If express buses are to use the radial parkways and enter the streets in the downtown district, I believe they should leave and enter the parkway routes by ramps beyond the downtown loop and should use off-street terminals within the loop.

The plan developed by the City Engineer's office for bus stations within the right-of-way of the Harbor Parkway bordering the business district where transfers could be made to local transit services seems to me a desirable one. Such parkway buses could preferably be routed from one radial route to another radial route, but some might be turned around by use of street connections lying outside of the loop area.

EFFECT OF LOOP EXPRESSWAYS ON STREET CAPACITY

An analysis has been made of the effect of the loop parkways on the capacity for vehicular movement across the central business district and these are shown on two diagrams (Fig. 12).

These show the bottleneck conditions on streets within the Central Business District, ignoring any use of the curb-side lanes as, even with no parking regulations on certain blocks, the essential stopping of cars to pick up or discharge passengers will prevent much utilization of these lanes. The hourly capacities assumed were as follows:

- 500 vehicles per lane on a street with trolley tracks;
- 700 vehicles per lane on a street without trolley tracks;
- 2 moving lanes on roadways from 33 to 50 feet in width;
- 4 moving lanes on roadways of 56 feet in width.

These capacity figures include vehicles of all types; that is, passenger cars, buses and trucks.

The diagram showing east-west movement indi-

cates that there are now fourteen streets running continuously across the district with a maximum hourly capacity totaling 20,400 vehicles over 36 traffic lanes. The Olympic Parkway, if built with eight traffic lanes, and the Hollywood-Santa Ana Parkway with its six continuous traffic lanes could accommodate an additional 12,600 vehicles. This means that these two parkways would increase the number of lanes by 39% but would increase the capacity by 63%.

On the diagram for north-south movement it is indicated that there are now six streets which are continuous throughout the area. These have a maximum hourly capacity of 11,200 vehicles on twenty lanes. Assuming that the Harbor Parkway and East By-Pass would be constructed as six lane routes, they would carry an additional 11,200 vehicles over twelve lanes. They would thus increase the number of lanes by 60% and increase the capacity by 100%.

Certainly there is no other way in which Los Angeles could increase its street capacity in the downtown area by any means which would not be too costly to consider. This additional capacity is not suggested to make it possible to bring that

many additional cars into the downtown area, but as a means of taking off the downtown streets traffic which now has no business there, and at the same time making provision for such increases in traffic as may occur.

TERMINAL PROBLEM

In analyzing the terminal problem it should be kept in mind that, as already stated, there may be a 50% increase in the total vehicular movement over the streets of the downtown section, including the movement of through traffic on the loop expressways around it.

I would like to stress the point that the planning of adequate terminals for vehicular traffic in both the downtown district and in other urban centers which would be served by the expressway system should be considered an essential part of the expressway program. It will involve such things as:

1. Off-street bus terminals;
2. A coordinated system of off-street parking facilities for passenger cars in garages and parking lots. In the downtown district the present facilities should be coordinated and expanded and placed under unified control as to standards of services, rates, etc. I understand that such procedure has already been given serious consideration;
3. Off-street parking space for tenants and customers for certain types of office, business and retail buildings should be required. Excellent provisions of this type are included in the pending Revised Zoning Ordinance for the City of Los Angeles. Corresponding provisions might well be incorporated in other municipal zoning ordinances within the district;
4. Adequate off-street loading and unloading space for motor trucks should be required for certain types of business, storage and manufacturing buildings. Provisions of this kind are also included in the pending Revised Zoning Ordinance for the City of Los Angeles.

In providing for offstreet parking of passenger cars, it should be kept in mind that there are two kinds of customers: (1) the all-day parker, who will pay only a low fee and should be willing to walk up to one-quarter mile from a parking place to destination; (2) the shopper, or business visitor, who will pay a higher fee, but who will not want

to walk more than about 750 feet, equivalent to two blocks, and will not wish to cross more than one street.

Parking facilities should preferably be in units accommodating 200 to 400 cars each, although in key positions a unit with as large as 1,000-car capacity, or more, may be justified.

The East Bypass will serve places of employment or customer destination on both sides of its route, whereas the section of the Harbor Parkway adjoining the Central Business District, except at its southern end, will serve one side only. Therefore, parking lots should be provided on both sides of the East Bypass, but should preferably be on only the east side of Harbor Parkway.

The suggestion has been made that a parking garage, similar to the Union Square Garage in San Francisco, might be constructed beneath Pershing Square. I would recommend great caution in considering such a project. Pershing Square is now an oasis surrounded by buses. It would not seem advisable to bring a large number of additional passenger cars into its border streets. It would seem better to build some new parks in the business district on present parking lot sites and to put those parking lots underground than to build a garage beneath the only existing park in the business section.

In the matter of traffic regulation, I would suggest consideration of the following, supplementing the comprehensive program submitted by Mr. D. Grant Mickle:

1. Mark off, by painted lines, the curb-side lanes in those parts of the central business district where some loading or unloading by either passenger cars or trucks is essential. This will help to keep moving traffic in its proper lane, which is already greatly facilitated by the practice of marking the central lanes.
2. I would suggest the following pairs of one-way east-west streets as an initial experiment in one-way operation: 5th and 6th streets,

and 2nd and 3rd streets from San Pedro Street to Figueroa Street. The latter are suggested instead of 3rd and 4th streets, which others have suggested, as they both have good outlets to the east and west, whereas 4th Street has no good outlet in either direction; also because a 2nd Street and 3rd Street connection to the East Bypass and Harbor Parkway would provide a better spacing of such connections than the use of 3rd and 4th streets. Why not widen the 3rd Street Tunnel instead of building an additional tunnel at 4th Street?

3. Consideration should be given to the elimination of left turns on the above pairs of streets at their intersection with Spring Street, Broadway and Main Street.

An essential part of solving the terminal problem in outlying business centers as well as in the central business district is an educational program to acquaint the general public with the types of regulations proposed, their need and justification and complete information as to where offstreet parking facilities will be available.

PLANNING PROCEDURES

I would like to submit the following three recommendations for incorporation in planning procedures for Los Angeles, the County and other municipalities:

1. The rights-of-way of expressways in congested areas, including particularly the downtown loop routes and the radial routes extending out for two or three miles, should be determined promptly and incorporated in official maps. Many other states have in their state planning laws provisions whereby large and permanent buildings may be kept out of the beds of such mapped streets, with provisions for such temporary use of such properties as will prevent undue hardship to their owners. I am convinced that the adop-

tion and use of such legislation applicable to Los Angeles County and its municipalities would be very helpful in insuring the realization of its excellent plans for expressways.

2. The City and other municipalities should study the possibility of developing local parks and playgrounds adjoining expressway rights-of-way, looking toward their acquisition at the same time that expressway rights-of-way are acquired.
3. At certain strategical locations airplane landing strips might well be established on the edges of population centers used by either private planes or taxi planes connecting with main airports.

GENERAL CONCLUSIONS

My conclusions and recommendations may be briefly summarized as follows:

1. The proposed parkway system is well planned and a start in its construction is urgently needed.
2. Parts of the system should be designed to serve, within the same rights-of-way, public transportation. A part of the Hollywood Freeway obviously falls in this classification.
3. The construction program should give priorities to those routes which will relieve the pressure on the downtown district and provide connections through the belt of intensive development which surrounds it.
4. Through traffic between and around communities and to main centers will benefit directly from the proposed routes, and local business and residential areas will benefit indirectly through the reduction of congestion on existing streets.

5. Expressways should be designed for moderate lane capacities which represent comfortable and safe driving conditions, rather than for such maximum capacities as may occur under extreme pressures.
6. The construction of the proposed loops around the central business district will double the vehicular capacity of routes now extending from north to south and add 63% to the capacity of those running from east to west. Additional capacity would be created by removal of trolley tracks.
7. The terminal problem is part of the expressway problem and must be planned with it.
8. Parks and playgrounds and air landing strips might advantageously be located along expressway rights-of-way.
9. Adoption and use of official map legislation to keep large buildings out of rights-of-way or urban routes will do much to insure the realization of expressway plans.

CHAPTER IV

LOCAL SURFACE TRANSPORTATION IN LOS ANGELES

By Joe R. Ong

The transportation system in Los Angeles, as in other cities, was developed to funnel most of the traffic into the central business district. This will be clear from the accompanying map showing local transit lines, designated by route numbers or letters (Fig. 14). Some of these are specifically referred to elsewhere in this report.

There are those who seem to be alarmed at the decentralization of retail business, feeling that this is merely a manifestation of the ultimate drying up and dispersal of the central business district. This view is not consistent with that of Los Angeles as a big city. I believe that the central business district will remain exactly what the name implies and that fundamentally traffic will continue to funnel into it. Mr. Lewis, in discussing the use of freeways, has made a similar declaration. The rapid transit plan, as outlined by Mr.

DeLeuw, certainly makes that basic assumption.

We are, therefore, planning for surface transportation lines to continue their function of bringing people from residential areas into the central business district. As has been pointed out in connection with the rapid transit lines, the introduction of feeders to the rapid transit system will siphon off much of the longhaul traffic from the nearby surface lines but there will be a large amount of traffic within the four or five-mile zone that will still depend upon these same local surface transportation lines.

We are called upon to consider the various plans advanced for the development of public transit and to indicate the direction this development should take. This does not involve details of design or operation although some specific examples may be given or definite recommendations made.

STREET CARS

One question presented for consideration by the consultants was the type surface transportation which should be provided. Based upon the records of passengers carried and estimated population by individual census tracts within the areas served, it is my considered opinion that the volume of traffic on many lines justifies their continued operation by the use of street cars rather than by a wholesale conversion to motor buses. By street cars I mean the modern P.C.C. type vehicle like those now used on Routes J, 3 and P. Any plan for the continued use of rail lines contemplates the operation of this modern street car rather than the out-

moded type of rolling stock which has been used on the Los Angeles Transit Lines for so many years.

One of the unusual factors in the case of the existing Los Angeles Transit and Pacific Electric rail lines, which favors their retention, is the large amount of open track in private rights of way. These are usually located at grade between public roadways so that they are not comparable to freeways; yet they permit a higher average speed than would be the case if automobile traffic were using the same space.

TROLLEY COACHES

There are other rail lines which ought to be replaced by motor bus or trolley coach. The choice between the latter two is influenced by several

factors, one of which is the volume of traffic which determines the frequency of service. The less frequent service falls in the field of the gas or

diesel bus, while the heavier lines, lying in the range between the street car line and the gas bus line, are in the field of the trolley coach where the cost of the fixed structures (the overhead wires and power conversion equipment) can be spread over a sufficient number of units to justify its use. Experience on other large transit properties, having comparable frequent-stop urban service, indicates that the trolley coach has a lower operating cost than the diesel bus, even considering the maintenance and carrying charges on the fixed structures. Trolley coaches have usually a higher availability and a higher accelerating rate and better hill-climbing

ability due to an unlimited outside source of electric power.

Furthermore, from a passenger standpoint, trolley coaches are more pleasing in that they are odorless, quiet, and usually have better lighting. On the other hand, they lack the maneuverability of the gas or diesel bus; but, if we may judge by the experience of many operating companies, this disadvantage is not at all a serious matter. In determining the applications of street car, trolley coach or motor bus for any line, an economic study is usually required which I would recommend be undertaken in each specific case.

MOTOR BUSES

Motor buses have been used extensively in the expansion of the transportation service in the Los Angeles area. There are lines with relatively frequent service and the concentration of several of those lines in a terminal around Pershing Square introduces a traffic problem in rush hours. If an underground garage is to be located here, the problem will be even more critical. If all rail lines were converted to motor bus operation, it would produce intolerable traffic conditions in the downtown area long before the ultimate population densities are reached.

Recognition is due the advantage inherent in motor bus operation permitting mixed local, limited and express operation over the same route. The limitation in capacity, however, is clearly set

forth in that section of the report on rapid transit which shows how inadequate buses would be to carry the loads on the freeways when the ultimate population for the area is reached.

Motor bus operation has a definite place in the transportation plan in Los Angeles. It is particularly suitable in the development of feeder and crosstown service as experience has already shown. More feeder and crosstown service will be needed as the area develops. Indeed, there are undoubtedly many cases where extensions are now justified; for example, a crosstown line on Washington Boulevard from Vermont to Soto, an extension of crosstown Line 18 to Santa Fe Avenue, and some others in the south or southwest sections.

DOWNTOWN TRAFFIC CONGESTION

Our first obligation is to explore the possible means of relief of the present traffic congestion in the central business district. Certainly, advantage should be taken of the best traffic engineering practices in using the present street space.

Several excellent recommendations, some of which can be applied immediately, were made at this clinic by Mr. D. Grant Mickle but, excellent as they are, they must be recognized as palliatives and not a cure for the problem before us. Another fact which needs emphasis is that the public transit vehicle is the most efficient user of street space *per passenger*. Too often the emphasis is placed

on the number of vehicles rather than on the number of people to receive benefits from any proposed development or regulation.

Too often the statement is made that if the street cars and buses were taken off the streets it would relieve the delays to automobile traffic, but it is equally true that if all the automobiles and trucks were taken off the downtown streets much faster and more regular street car and bus service could be provided. A trip up and down Broadway at 8 A.M. on Sunday compared with 8 A.M. or 5 P.M. on weekdays would be a sufficient demonstration of this fact.

Additional capacity for traffic movement in the central business district is urgently needed. The most desirable way to secure this is by the construction of additional traffic lanes below the surface. The traffic to be assigned to these new lanes on the lower level will be that which can be wholly controlled—namely, the public transit lines.

UNDERGROUND DELIVERY TERMINAL FOR STREET CARS AND TROLLEY COACHES

I definitely recommend the north-south street car subway through the central business district for immediate construction because this will afford the quickest positive relief for public transit users. It is not contingent upon the availability of extensive funds from one or more governmental agencies needed to assure the construction of the network of freeways, which are an essential part of the rapid transit plan heretofore referred to. If there is any occasion for it, the street car subway can be paved and trolley coaches operated therein, but the ventilation problem now appears to be too severe a handicap to consider the operation of motor buses, either gas or diesel, in a downtown subway.

This new facility might properly be referred to as an underground delivery terminal rather than a subway in the usual sense of the word. However, for convenience in discussing the subject, let us refer to it as the street car subway to distinguish it from the type subway referred to for the use of rapid transit trains in connection with the operation of rail lines on freeways.

The natural location for one subway in Los Angeles would be under Broadway. If the rapid transit subway is to be under Broadway, then the street car subway would probably be located under Spring Street. The initial construction should extend from a point south of Eleventh Street to a point north of the Civic Center with a suitable turn-back loop at the north end and suitable portals for the routes scheduled to use the subway, including a possible connection for service to the Union Station in case the rapid transit subway is not built to reach the station. An exhibit, Figure 15, shows this tentative location together with connections.

It does not follow that the public transit lines should assume more than a nominal share of the cost of such a project, because the benefits are widespread and not limited to the owners or the users of the transit vehicles. It should be looked upon as a civic enterprise and a general community development.

Certain rail lines now on Broadway, Spring and Main Streets should be routed into this street car subway between the points indicated. Specifically, I recommend that Route 5, the Eagle Rock-Inglewood-Hawthorne Line, be operated with street cars. This is one of the lines on both ends of which there is a large amount of private right-of-way and P.C.C. cars would make very attractive service on this line.

The Washington Boulevard and Highland Park, Line W, should be continued as a rail line with modern cars. The York Boulevard branch probably should be retained for rail service while the North Figueroa leg of the line could become part of a bus line coming in over North Figueroa Street replacing Bus Route 64, possibly being rerouted in such a way as to cover a part of the Griffin Avenue Line (present Route 9).

Until the Harbor Parkway is built and Rapid Transit service established thereon, the Broadway Line, Route 7, will continue as a heavy carrier from the south central area and should be retained as a rail line going through the central business district in the street car subway. In a similar way Route F should be continued on lower Vermont as a rail line. A study should be made of the need for duplicate service on Vermont Avenue and on Hoover Street between Florence Avenue and 48th Street or Santa Barbara Avenue. This might result in elimination of service on Hoover Street after the Harbor Freeway Rapid Transit line is in operation and might involve a curtailment of Route U.

Route 8 on 54th Street, using much track jointly with other lines over most of its route downtown, could be continued as a rail line using the street car subway. The same would apply to Route 9

on 48th Street, although when the rapid transit line is established on the Harbor Parkway, the 48th Street line may be converted to a motor bus feeder if there is enough rail service on other lines to provide the service needed for the large volume of passengers originating in the four-mile zone just outside the central business district. The north ends of Route 9 may be absorbed by the North Figueroa bus line and Route O as rerouted.

Route P, Pico Boulevard and East First Street, one of the heaviest lines of the Los Angeles Transit Lines, should go into the subway even though this requires a special portal at First Street. This can be developed artistically in keeping with the expansion of the Civic Center.

It will be obvious that since, initially, we have Routes 5, W, 7, 8, 9, F and P running into the street car subway at the south end and only Routes 5, W and P running into it from the north end, provision should be made for a terminal loop in the Civic Center area and possibly for service to the Union Station.

Since the rapid transit subway as planned would be used only by trains from the Inglewood, Harbor, and Olympic Freeways there would be no occasion to build it until one or more of these Freeways is constructed. During this interim period, the street car subway will be used as the one downtown distributor, turning back a considerable portion of the service at a loop north of the central business district.

When the Inglewood and Harbor Freeways are built, or any part of them sufficient to justify the establishment of rapid transit subway operation, then most of the traffic generated on the *outer* sections of Routes 5, 7, 8, 9 and possibly F, will use these lines as feeders to the Rapid Transit. There will always be a number of people who prefer not to transfer and a number of intercommunity riders who will stay on the surface cars. To this will be added not only the present amount but also the increased volume of shorthaul traffic within the four-mile zone which will justify continued rail operation and use of the street car subway. We are planning for a growing city with an increased population and while there will undoubtedly be a transition from local surface lines to rapid transit lines for longhaul rides, there will

also be increments of traffic increases on the surface lines running into the street car subway.

The Olympic Freeway, if finally located as now projected, is so close to the Pico Boulevard Line that much of its traffic in the outer section will undoubtedly go to the rapid transit line in that Freeway. At that time the East First Street end of this line will be so much heavier than the Pico Boulevard end of the line that part of the east end service from Route P can be through routed to one of the other lines on the south side; but turnback facilities north of the Civic Center will still be needed, and the Union Station connection may still be desirable even though the rapid transit system has a Union Station stop on its Civic Center loop.

With respect to other north-south lines through the business district, I recommend a study of the Main Street Line, Route O, and the Brooklyn Avenue-Hooper Avenue, Route B, to determine whether they should be converted to motor bus or trolley coach. It has already been determined that Route A, the Adams-Temple Line, should be changed over to motor buses. I believe trolley coaches should have been more seriously considered for this operation and I recommend that the poles and overhead lines be not removed pending further study of this operation, even though diesel bus service has been authorized thereon.

If Routes A, B and O are trolley coach lines, they can be routed through the street car subway and thus remove from all north-south streets all present Los Angeles Transit lines. Pacific-Electric lines on Hill Street (Echo Park Avenue and the Hollywood Boulevard-San Vicente lines) could also be directed to the street car subway if double gage tracks are laid therein. This would serve to build up the volume in the street car subway when the rapid transit subway drains off the longhaul, through traffic to the downtown area from the Harbor, Inglewood and Olympic Freeway areas.

When this point is reached, and assuming that the rapid transit developments on the east side of the central business area have cleared Main Street of all rail service, the north and south streets can be arranged for one-way traffic.

It is possible to provide relief for the east-west lines using Seventh Street by the construction of a short subway across the central business district.

In this case the J, R and S lines would use this tube, together with Lines 3 and N as rerouted. The west portal would be west of Figueroa Street and a portal in Grand Avenue south of Seventh Street would be required for Lines J and N.

This again is a question of when or whether the City of Los Angeles is prepared to free this important east-west artery by an expansion of the

street area through the process of providing for the movement of public transit vehicles on the lower level. Attention is directed to the Boston plan of progressively extending the subways used by surface-type cars as conditions warrant. This type program might well be considered in connection with an east-west subway on Seventh Street, as well as for the north-south street car subway.

ONE-WAY STREETS AND REROUTING OF LINES

In order to provide for one-way traffic on the cross streets in the downtown area, Fifth and Sixth Streets can be made available as one-way traffic arteries by removal of rail car operation from these streets and conversion of public transit operation on them to trolley coach. The rerouting of lines recommended so that these steps may be taken in the interest of general traffic flow includes:

(a) The Melrose car line, Route H, should be rerouted east of Alvarado and converted to a trolley coach line running east on Sixth Street and west on Fifth Street, through the central business district. This line should run south on Central Avenue on the east side of the city, replacing Route U. As a trolley coach line it should be routed on city streets to avoid the accident hazards of blind corners along the present private right-of-way east of Vermont Avenue.

(b) Similarly, the D car line should be converted to trolley coach operation following its present route except for the use of the one-way streets to be created on Fifth and Sixth Streets. The D line in reality provides a short line service on the new route H between Alvarado and the proposed south terminus at Central and Slauson.

(c) The portion of the U line extending west and south of the central business district, via Figueroa Street, should be converted from rail to trolley coach operation with some rerouting on the south end of the line. After crossing on Fifth and Sixth Streets, this line should turn north on one of the streets east of the business district and then continue east on Fourth Street, replacing the present rail Route F to Fourth and Fresno, to be extended eastward if traffic justifies it.

(d) Rail Route 3, which now operates over West Sixth Street and on Fifth Street through the business district, should be rerouted at Alvarado Street to Seventh Street, and continue east through the business district.

(e) Pacific-Electric Railway lines on Sixth Street are used only for mail, express, utility and special cars and while this is a convenient connection between their east side and west side lines, such limited use should not stand in the way of a generally useful plan for traffic relief.

The provision for one-way operation across Fifth and Sixth Streets fits in with plans of the City Traffic Engineer, Mr. Ralph T. Dorsey, for providing additional freedom of movement by the four one-way streets, travel to be eastbound on Fourth and Sixth Streets and westbound on Third and Fifth Streets. However, this cannot be fully accomplished until the Fourth Street tunnel is completed.

Route N, the West Eighth Street Line, should be continued as a car line to Union Station until the Subway loop is built to take care of that service. Then the N Line can be turned north on Grand Avenue and east on Seventh Street, turning back on the east side of the business district.

It is understood that some extensive changes in street grades are contemplated on Vernon Avenue which would require extensive track work if rail service is to be continued. I believe that the V Line service on Vernon and Vermont could be satisfactorily handled by trolley coach operation and I so recommend.

As conversions are made step by step, it is taken for granted that the older two-man cars will be retired first and the present one-man cars used to

replace them. For example, on the V line which is to be finally converted to trolley coach, an intermediate step would be to replace the present two-man cars with one-man cars of 1200 to 1500 class. All lines recommended for long term rail operation should have new cars. All new cars should be P.C.C. cars even though they will require new loop terminal facilities on most lines.

If and when the Santa Monica Freeway is built and rapid transit service installed, it may be found unnecessary to continue the present rail service on Western Avenue north of Third Street, permitting this feeder service to be handled by a bus line. Similar comment may be made with regard to the west end of Line 3 in the vicinity of the Santa Monica Freeway.

It is recommended that the south end of Line H on Maple Avenue and Wall Street be abandoned and that the McKinley Avenue-Griffith Avenue Shuttle, Route G, be abandoned.

When the underground delivery terminals, either the street car subway or the rapid transit subway, or both, are in operation, the motor coach lines moving into the downtown area can be rerouted, probably over one-way streets, to transfer passengers at the subway stations, thus shortening their loops and eliminating duplication of mileage and congestion in long north-south loops. In some cases, for example the Wilshire Boulevard line,

it may be possible to develop a suitable off-street terminal on one or two levels that will adequately serve its patrons, shorten its route and avoid much street congestion. There are operating economies to offset the cost of such a plan.

Perhaps a series of low-fare, no-transfer, downtown loop bus lines can be developed to serve freeway-using patrons of off-street auto-parking areas projected on the perimeter of the central business district in the vicinity of the East By-Pass and the West By-Pass. The rapid transit plan will call for an extensive revision of feeder service. We are not attempting to forecast the exact location of the crosstown or feeder bus lines but this matter can very properly be worked out between the Companies and the City Department of Public Utilities and Transportation.

Our assignment has been to review and point out the general direction transit development should take rather than to work out details of operation or design. In this connection, I would like to point out that I have been very favorably impressed by the thinking and methods pursued by the engineering staff of the Board of Public Utilities and Transportation. They study these problems with unusual care and understanding. If this policy is continued, I believe very careful consideration should be given their recommendations.

SUMMARY

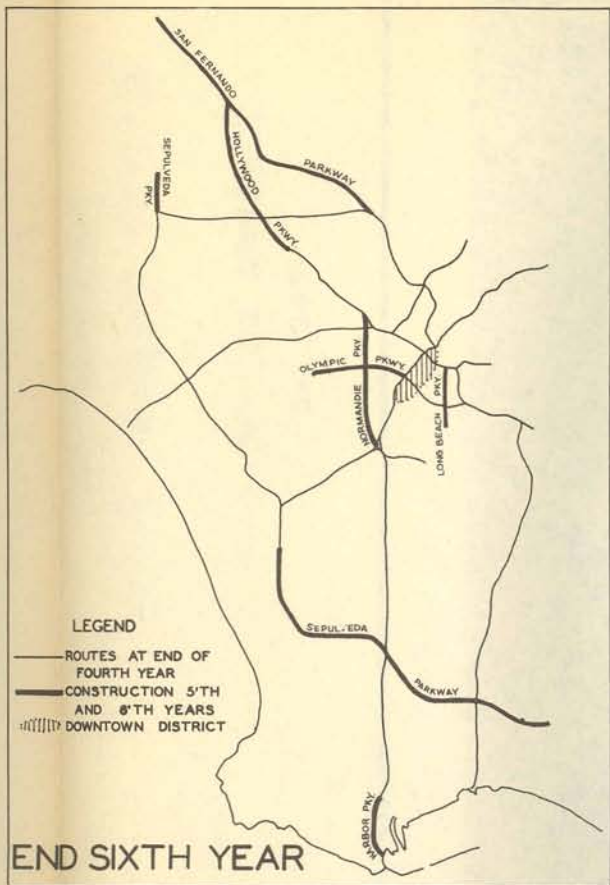
In Los Angeles there is a definite need and a definite place for all three types of local transit vehicles—the street car, the trolley coach and the motor bus. The task is to coordinate them into an effective system where each can perform to its best advantage, and to provide them with adequate street space so that proper schedules can be maintained. Because of the congestion in downtown Los Angeles, it is necessary that additional traffic lanes be secured through the use of an underground street car delivery terminal. There are, of course, other measures such as the re-

striction of turning movements, elimination of street parking, offset lanes, the development of a series of one-way streets, etc., which may be adopted but they are largely expedients and can by no means entirely solve the downtown traffic problem. Moreover, the value of any corrective measure should be determined by the number of *people* benefitted rather than by the number of *vehicles* involved. If Los Angeles is to be a big city and do big things, it must be prepared to spend big money.

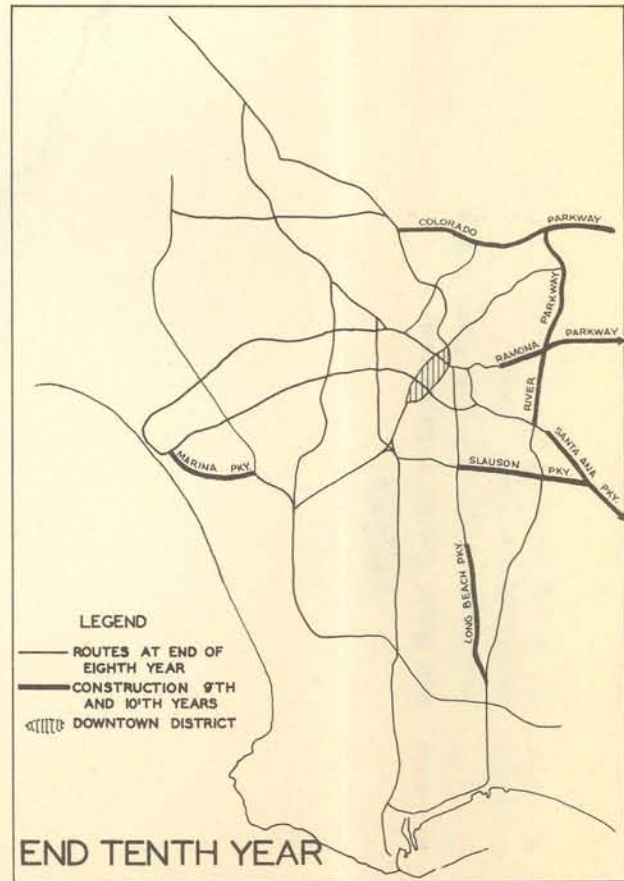
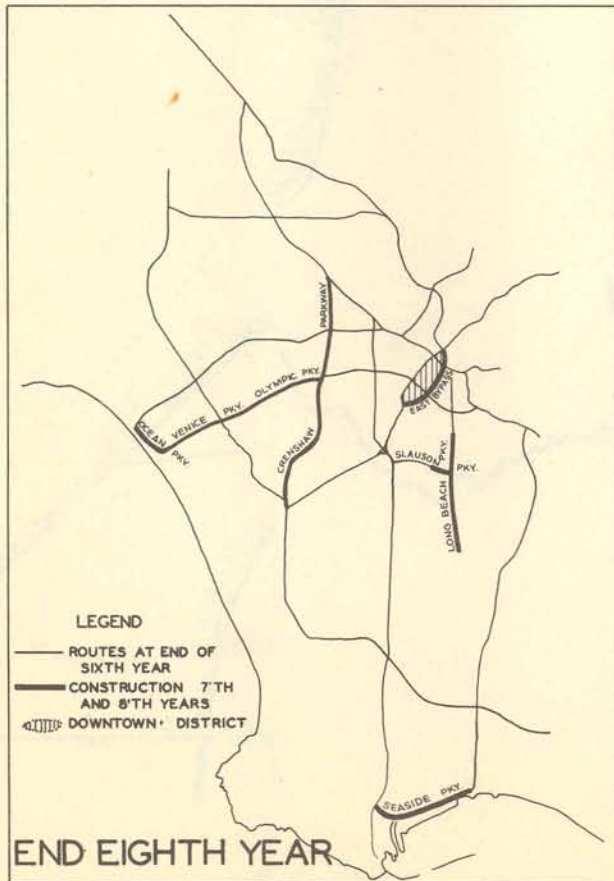
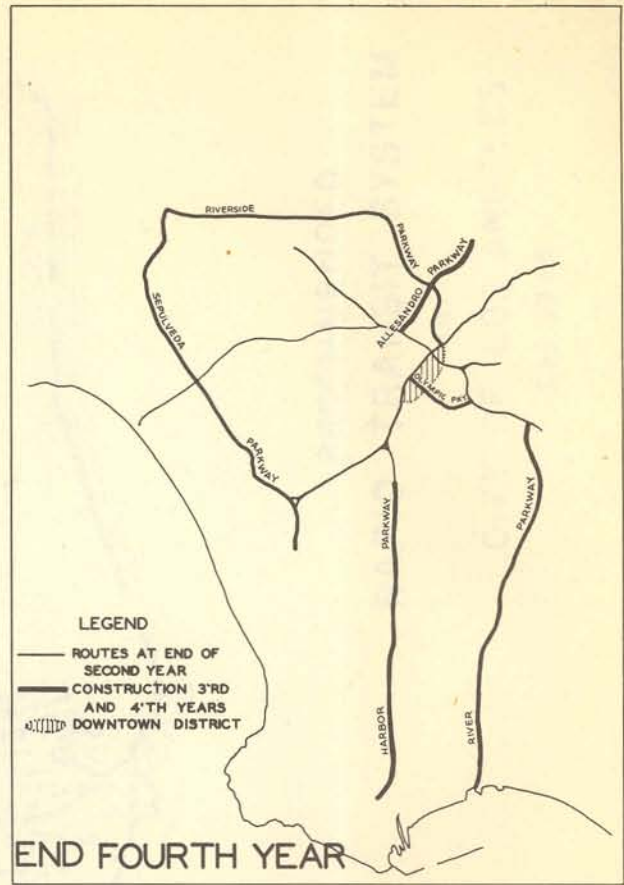
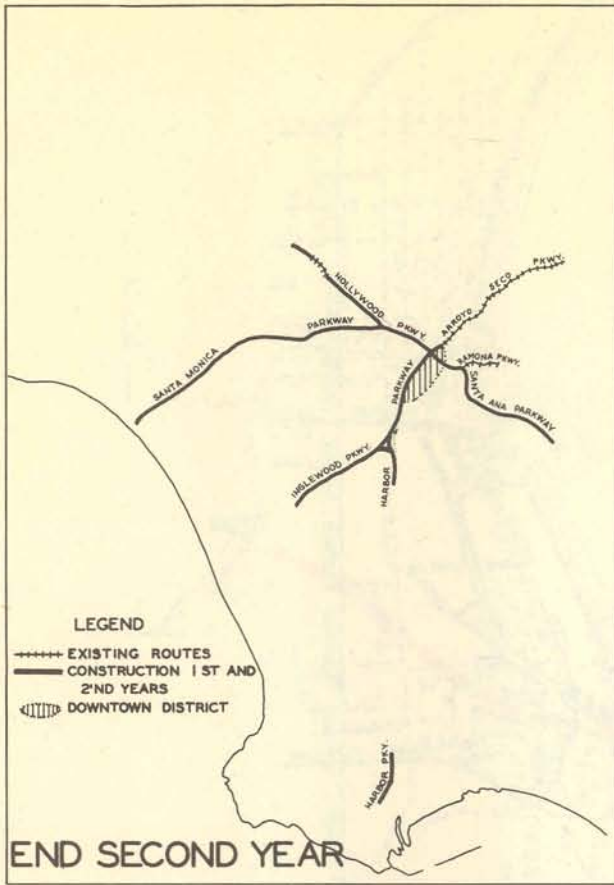
APPENDIX

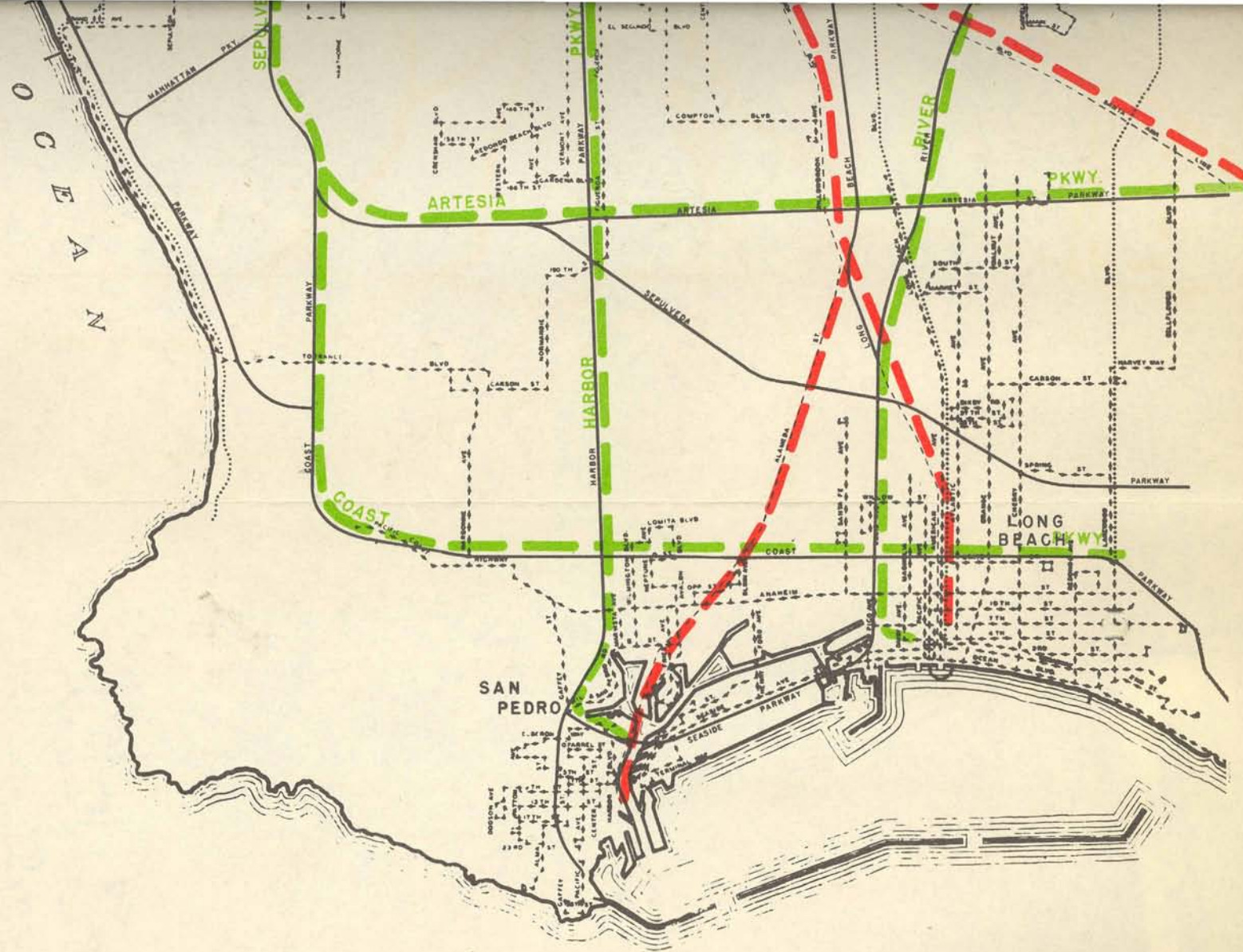
MAPS AND DIAGRAMS

(Figures 1 to 15)



EXPRESSWAY PROGRAM CITY OF LOS ANGELES



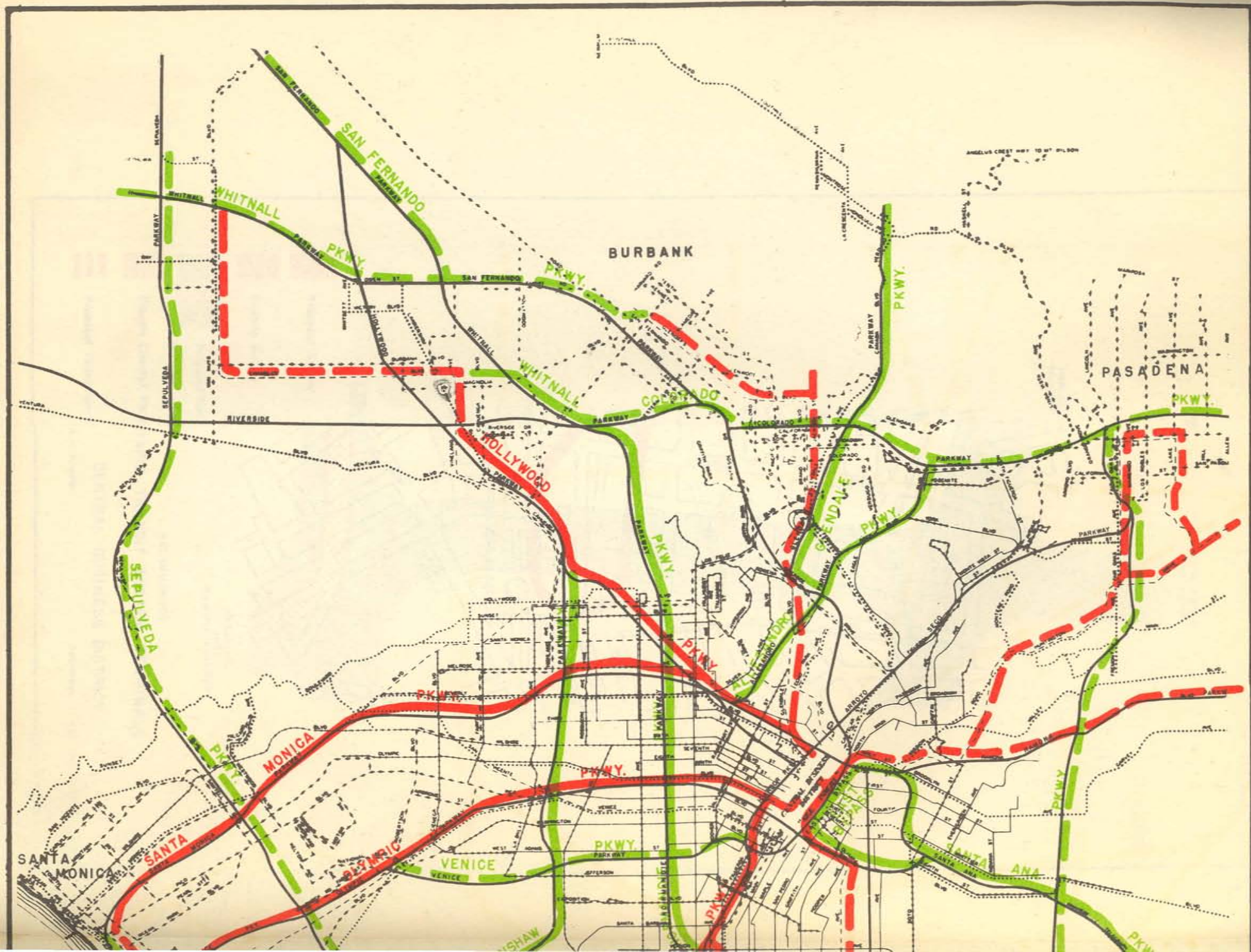


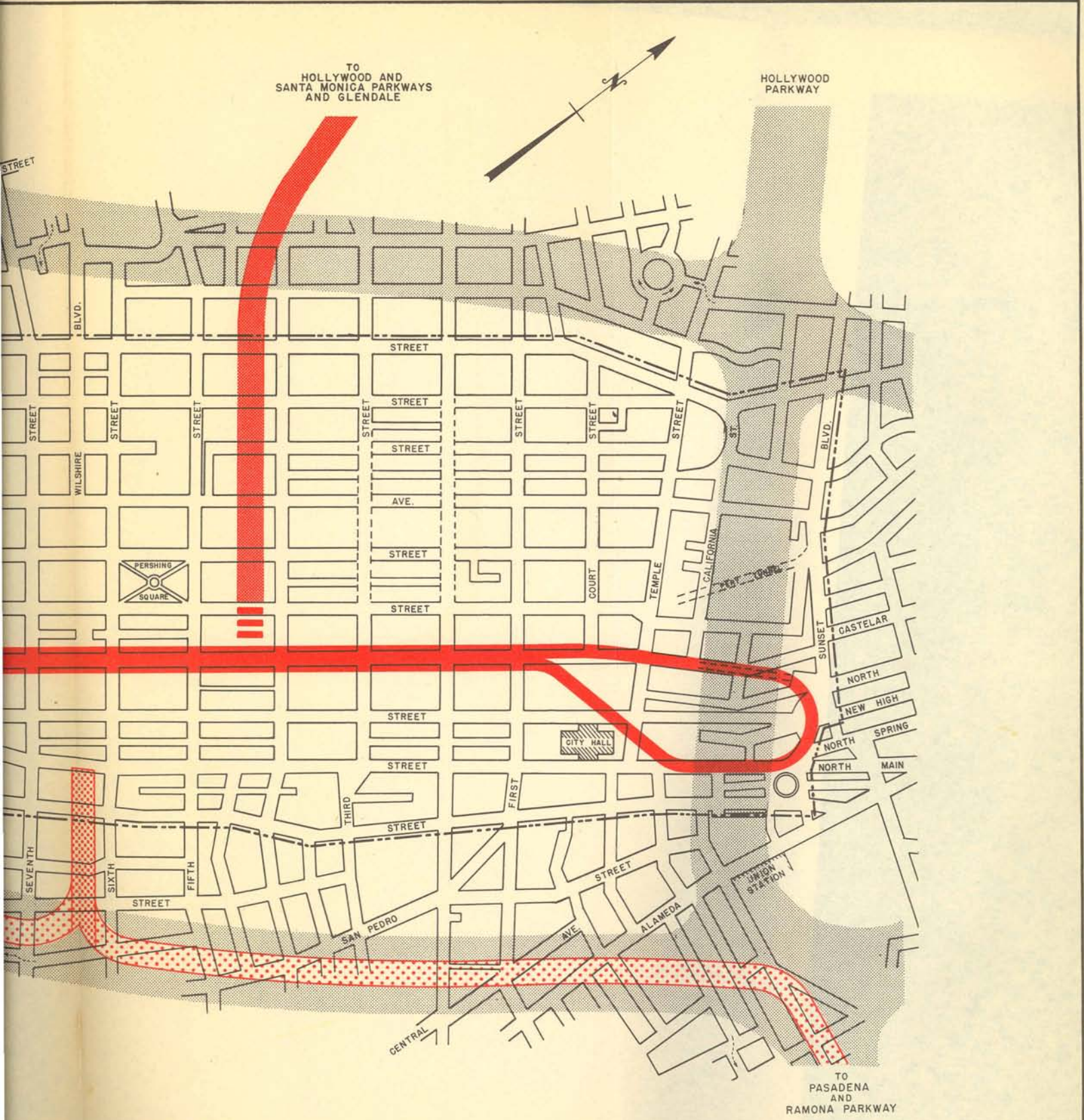
LEGEND

- Rail Rapid Transit in Expressway
- - - - Rail Rapid Transit in Private Right of Way
- Immediate Bus Rapid Transit
- - - - Future Bus Rapid Transit

**RECOMMENDED
RAPID TRANSIT SYSTEM
for
CITY OF LOS ANGELES**

Dec. 1945





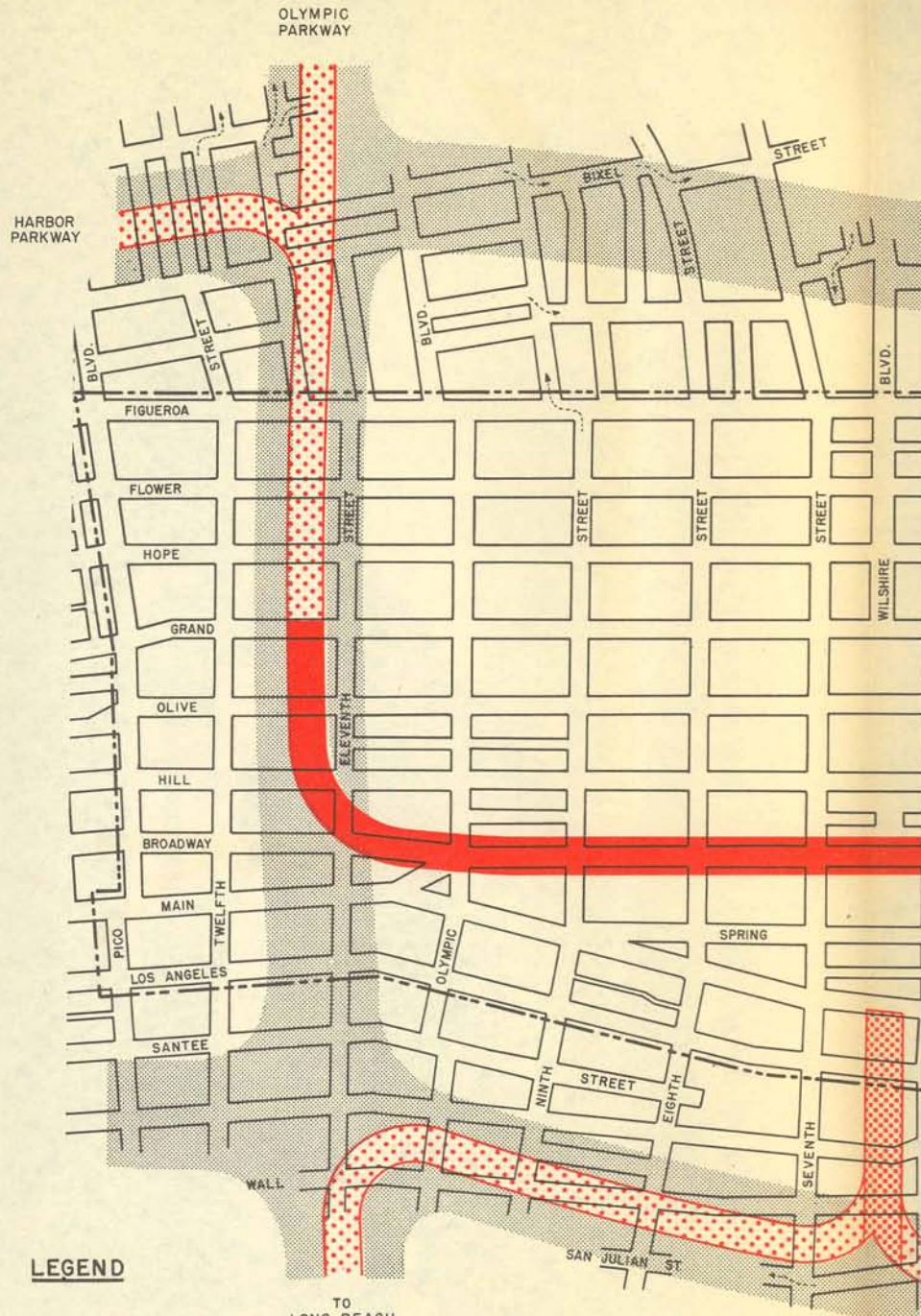
SCALE IN FEET








RECOMMENDED
 RAPID TRANSIT SYSTEM TERMINALS
 in the
 CENTRAL BUSINESS DISTRICT

Los Angeles

December 1945

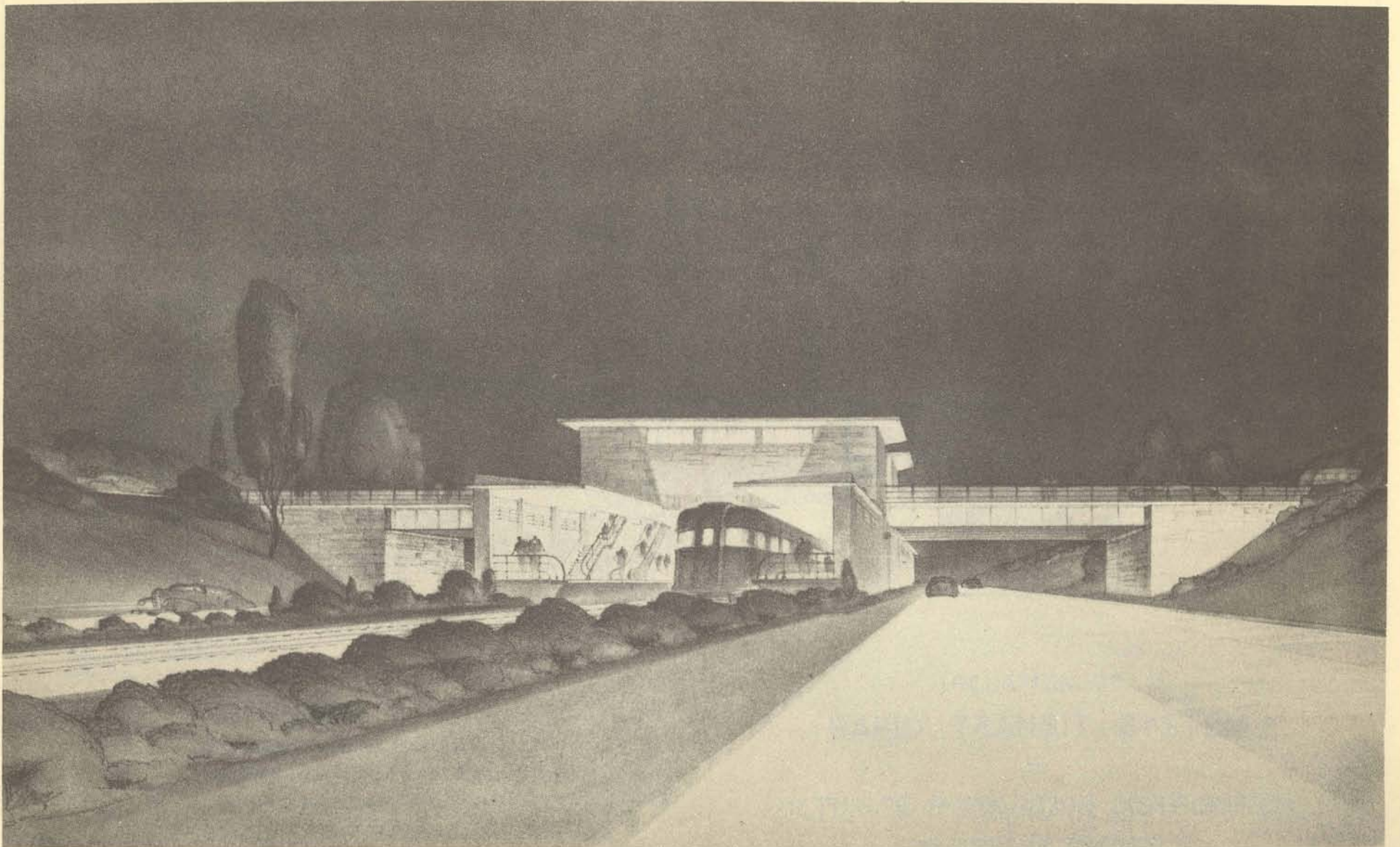


LEGEND

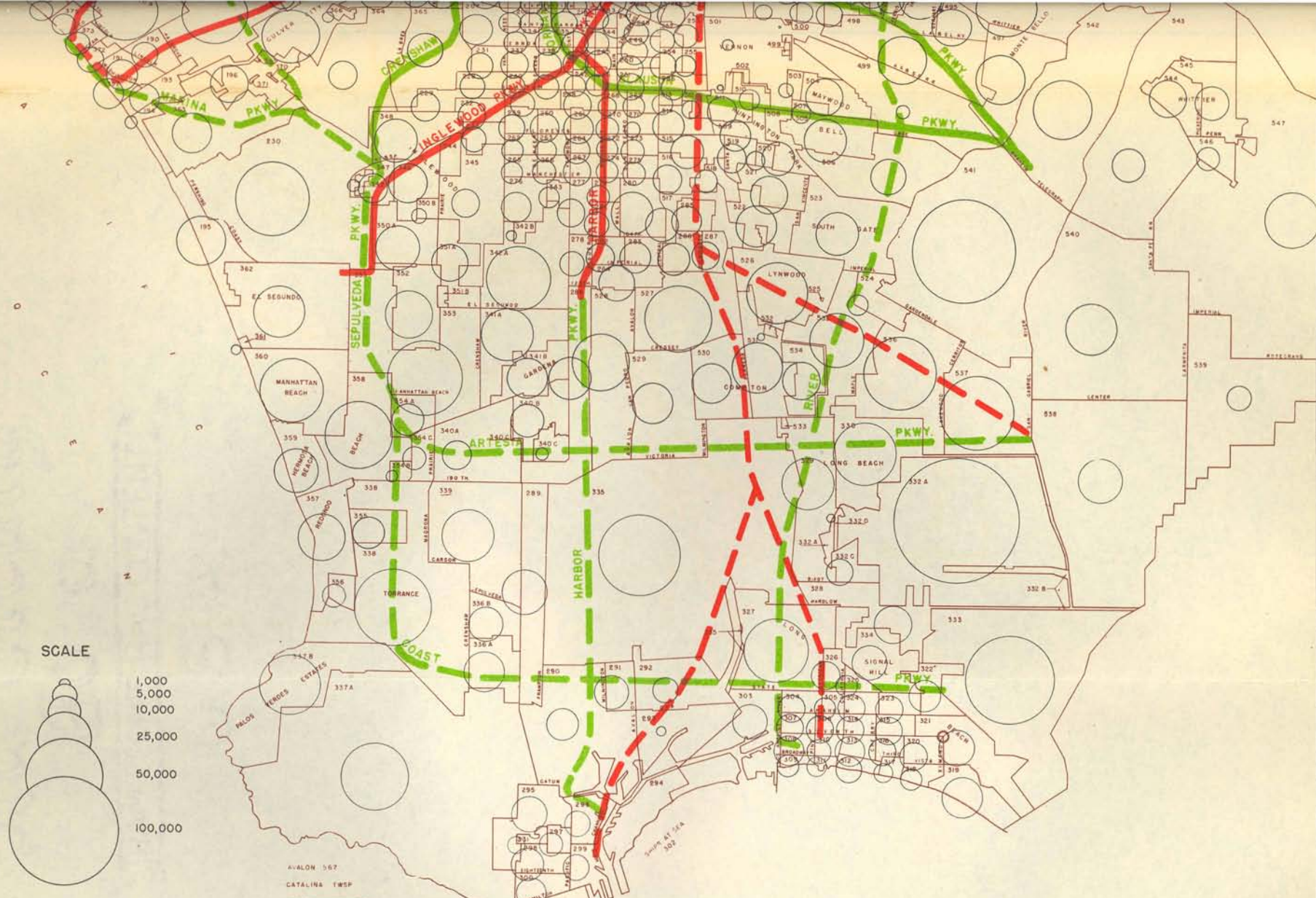
-  Proposed Subway
-  Existing Subway
-  Proposed Rail Rapid Transit in Expressway
-  Present Elevated Structure
-  Proposed Pedestrian Passageway

TO
LONG BEACH
AND
SAN PEDRO

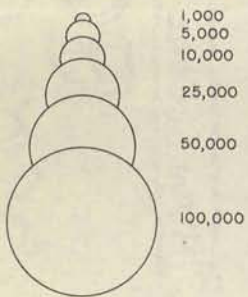




THE EXPRESSWAY TRANSIT STATIONS AT STEEL BRIDGES WOULD HARMONIZE WITH THE ARCHITECTURE OF THESE SPANS



SCALE



NOTE- Area of circle is proportional to the estimated future population in each census tract.

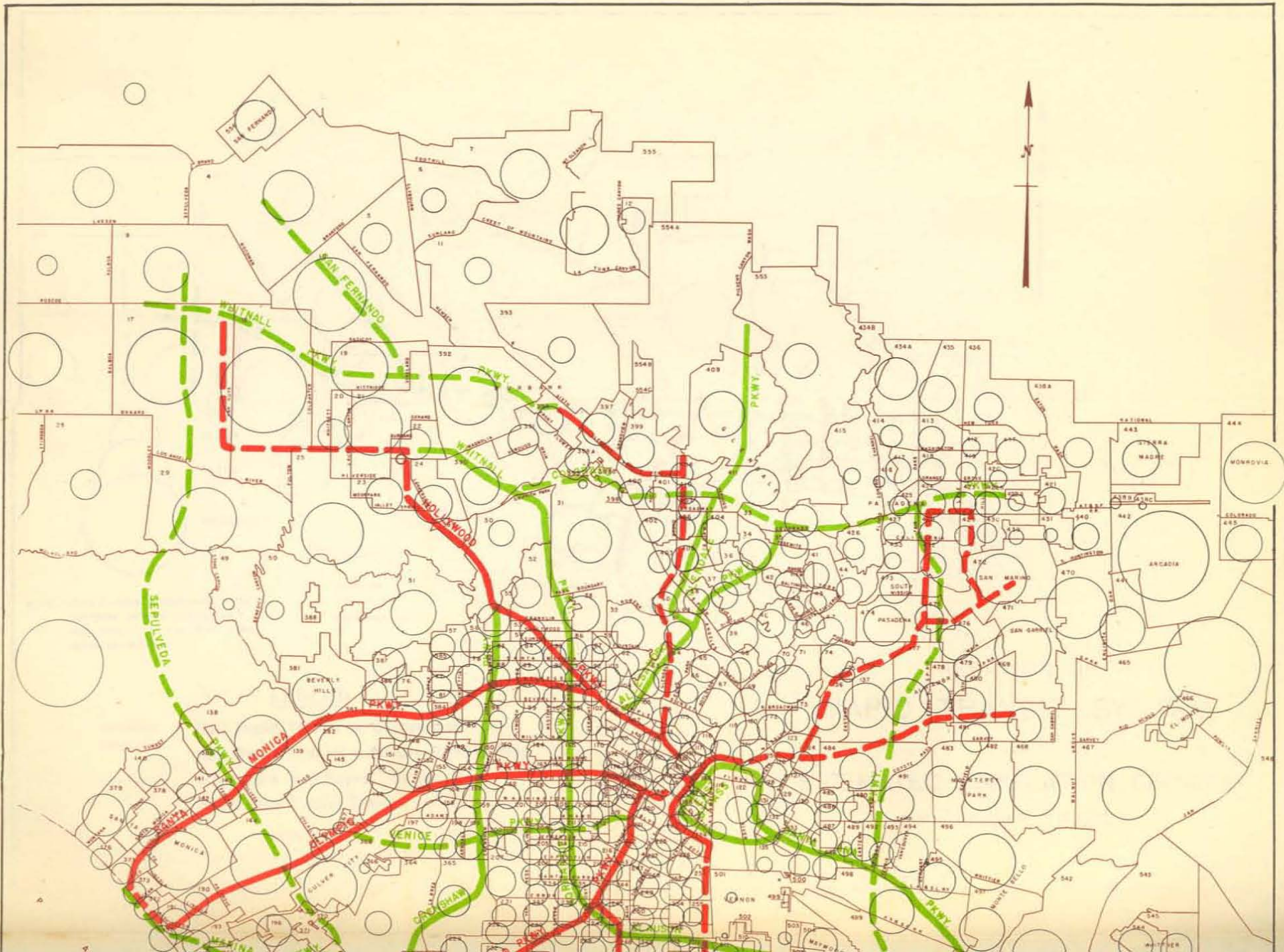
LEGEND

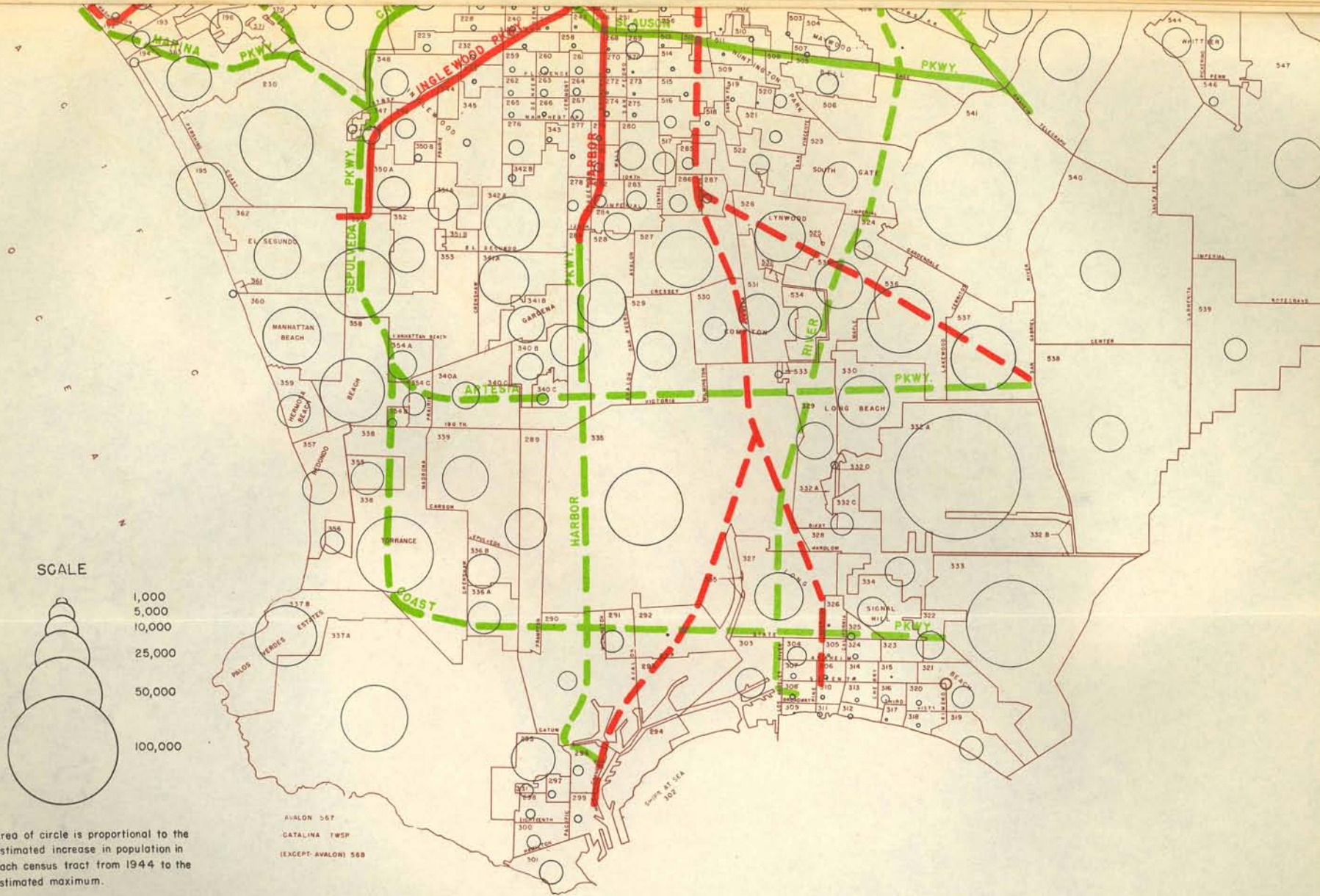
- Rail Rapid Transit in Expressway
- Rail Rapid Transit in Private Right of Way
- Immediate Bus Rapid Transit
- Future Bus Rapid Transit

SCALE IN MILES



RELATION OF
RAPID TRANSIT SYSTEM
 to
ULTIMATE POPULATION DISTRIBUTION
 BY CENSUS TRACTS





LEGEND

- Rail Rapid Transit in Expressway
- Rail Rapid Transit in Private Right of Way
- Immediate Bus Rapid Transit
- Future Bus Rapid Transit

SCALE IN MILES



RELATION OF
RAPID TRANSIT SYSTEM
to
ESTIMATED POPULATION GROWTH
BY CENSUS TRACTS

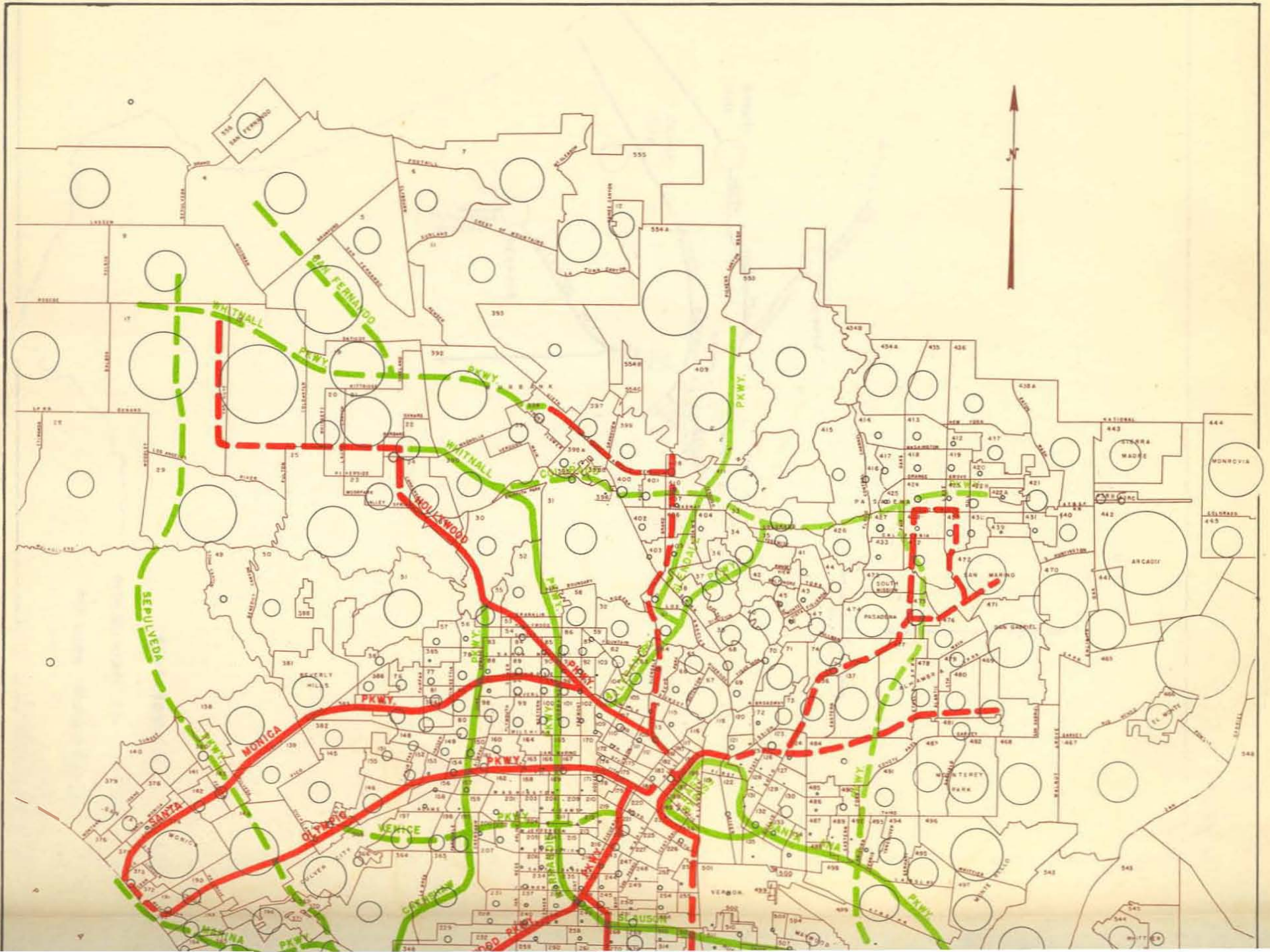
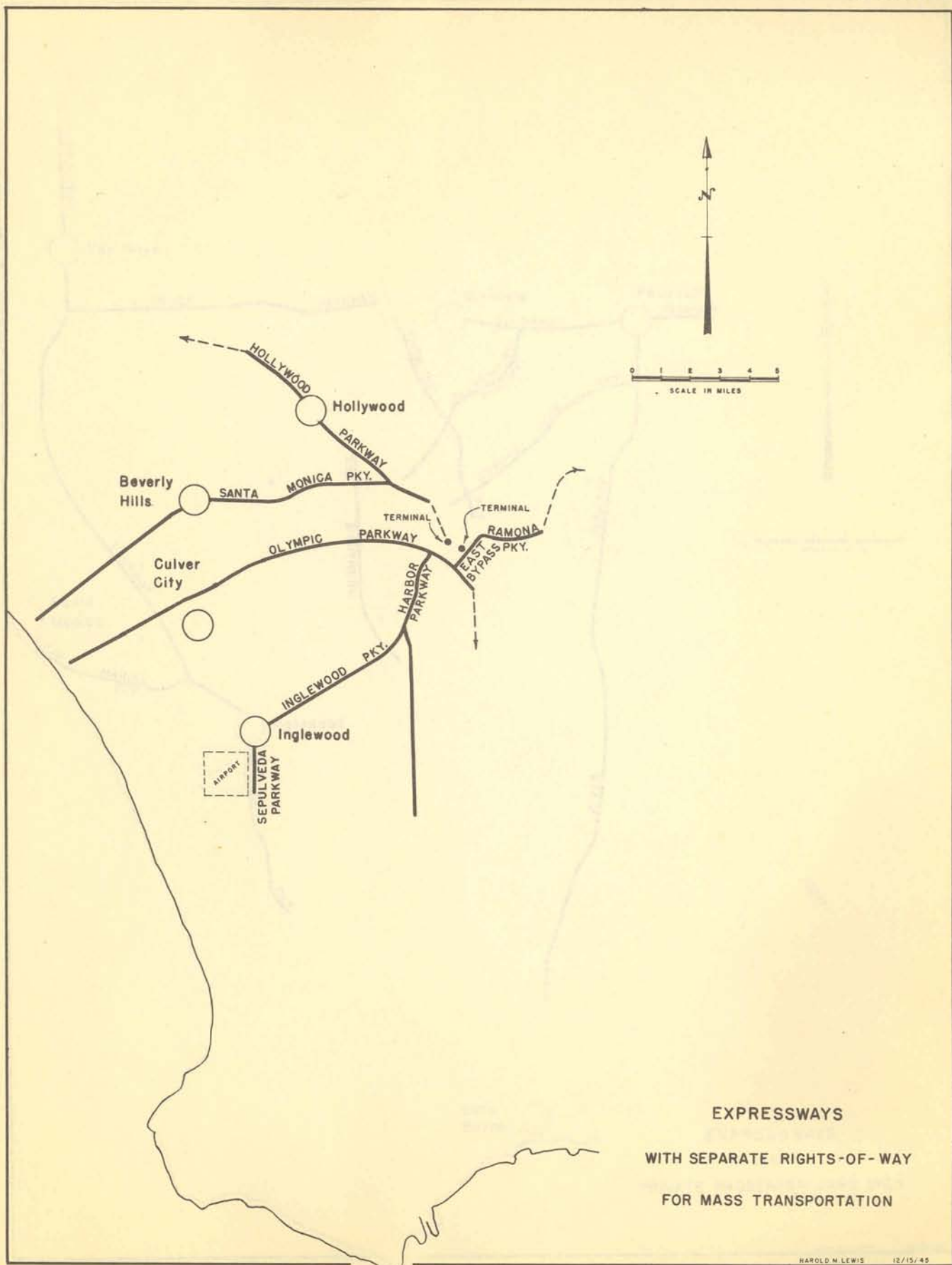
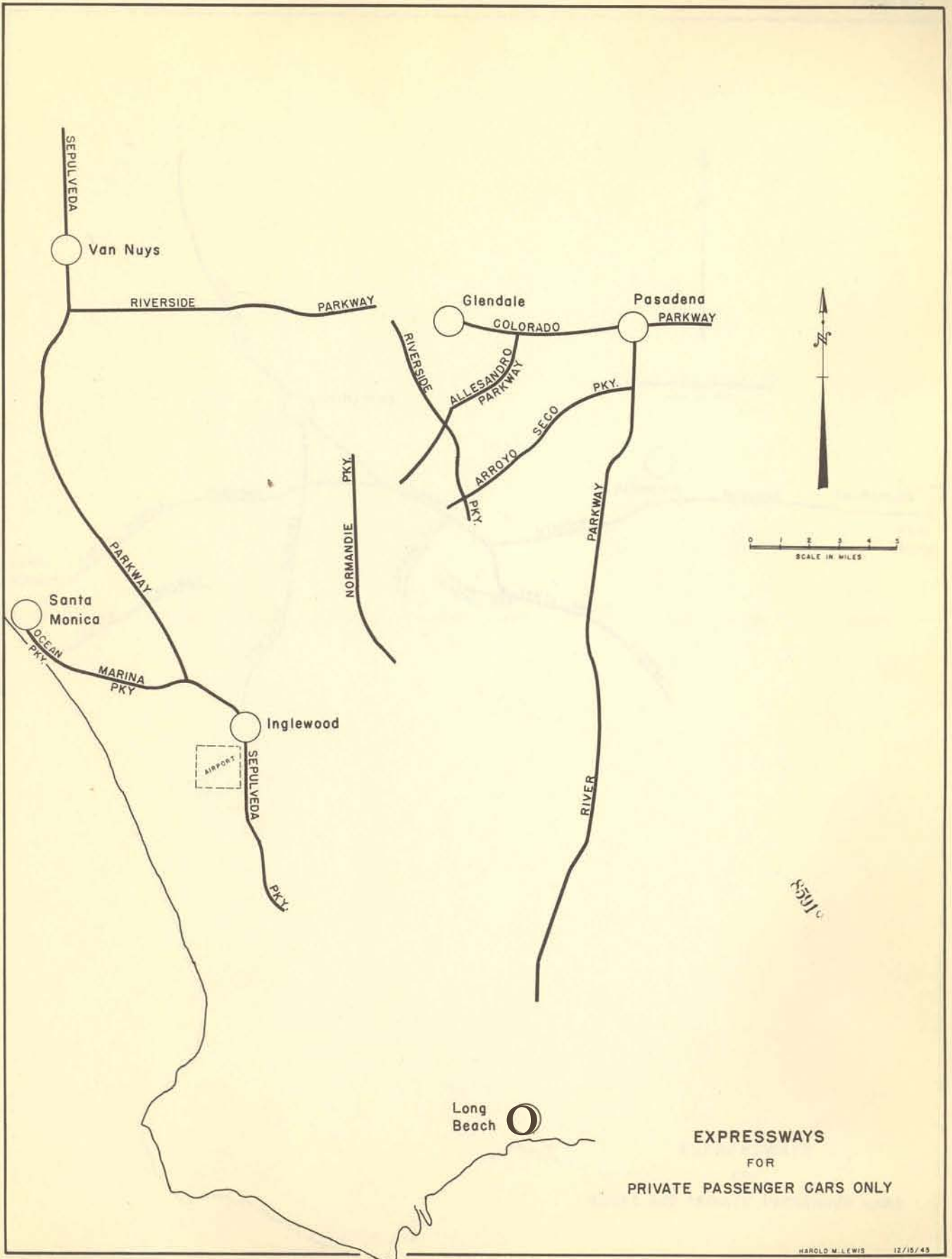


FIGURE 7



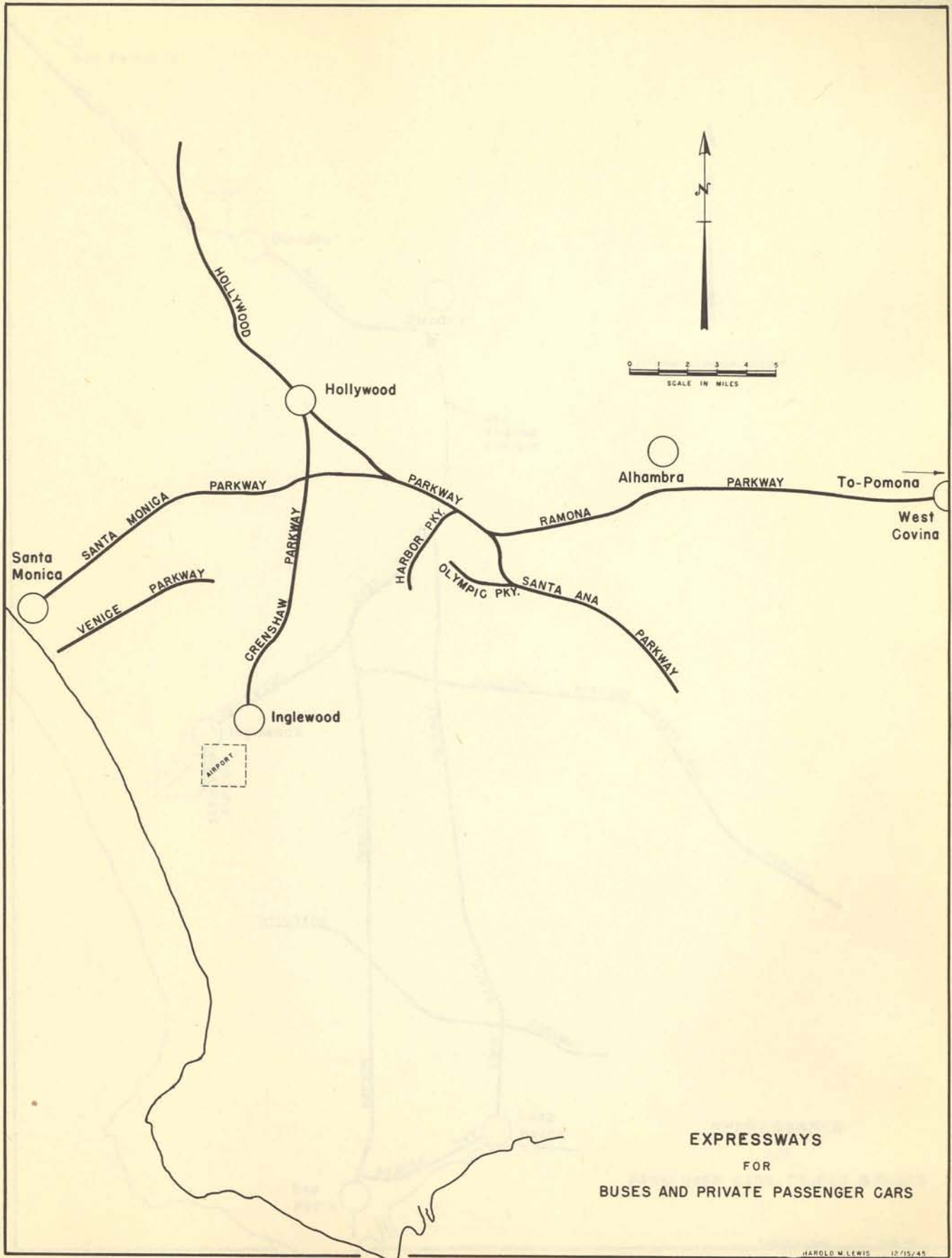
EXPRESSWAYS
WITH SEPARATE RIGHTS-OF-WAY
FOR MASS TRANSPORTATION

FIGURE 8



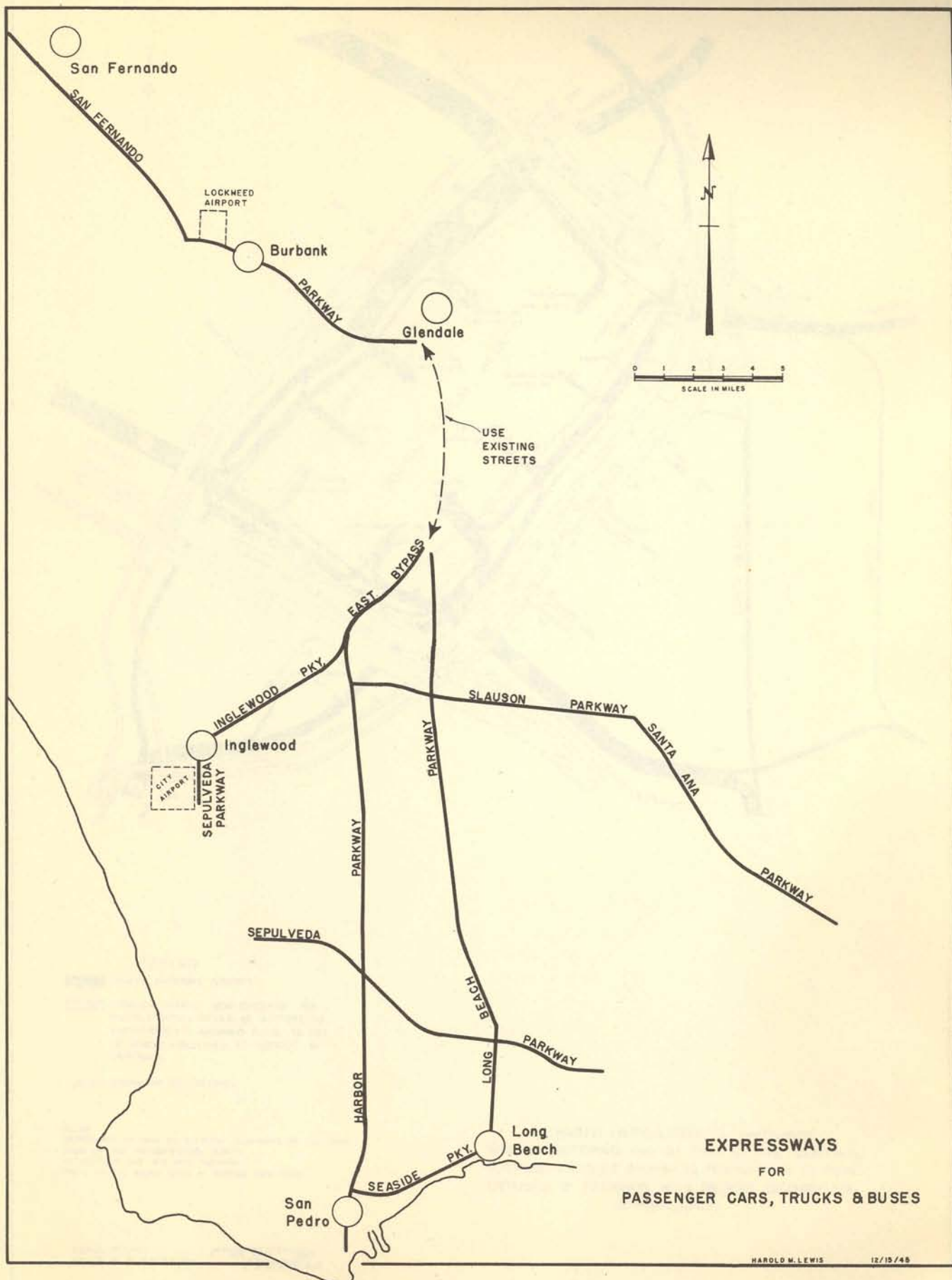
85011

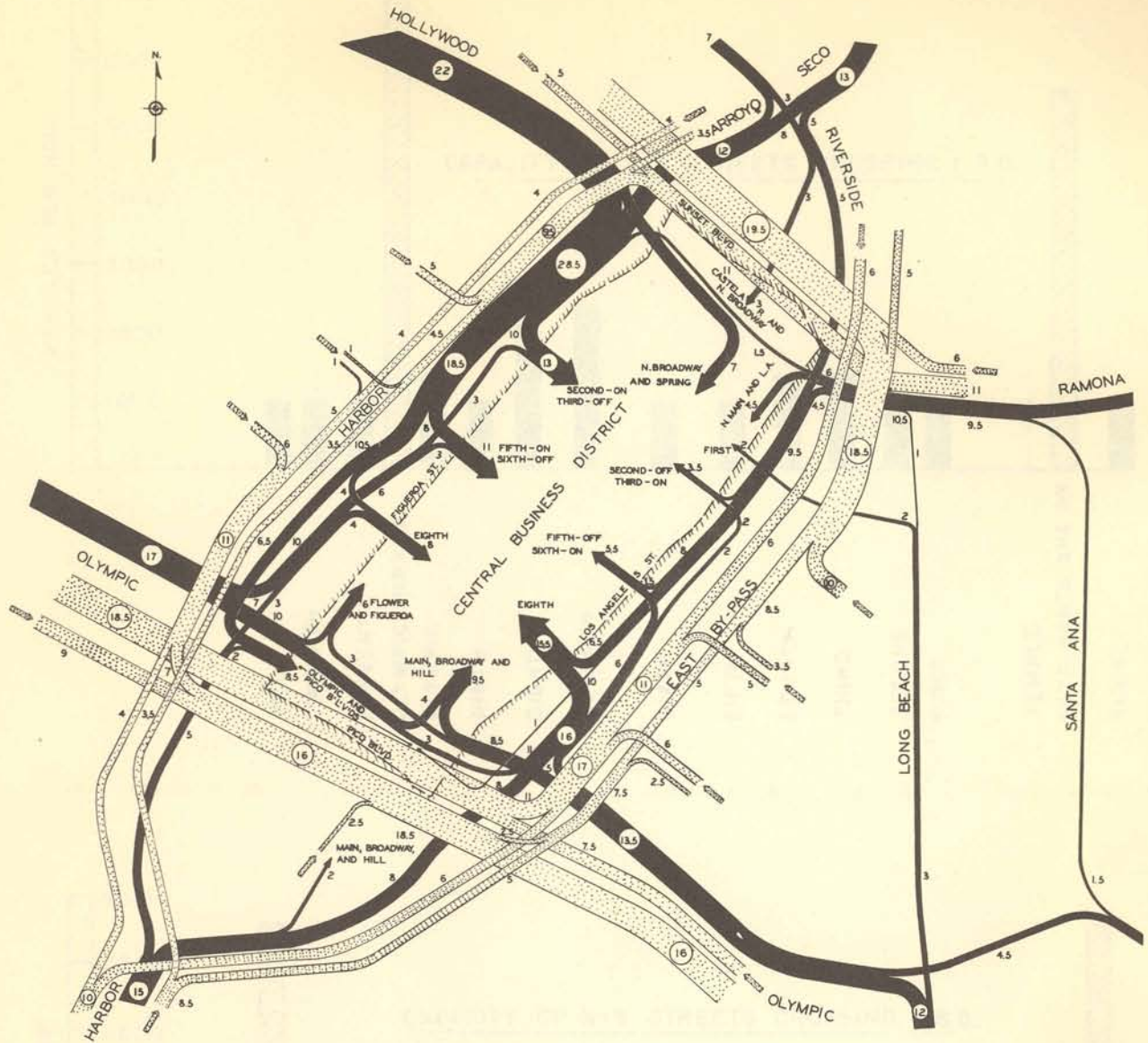
FIGURE 9



EXPRESSWAYS
FOR
BUSES AND PRIVATE PASSENGER CARS

FIGURE 10





LEGEND

- TRAFFIC ENTERING DISTRICT
- THROUGH TRAFFIC NOW ENTERING THE DISTRICT WHICH WOULD BE DIVERTED TO EXPRESSWAYS — ASSUMED EQUAL TO 86% OF VEHICLES DESTINED TO DISTRICT BY PARKWAYS.
- BOUNDARY OF DISTRICT.

NOTES
 DISTRIBUTION OF VEHICLES BETWEEN QUADRANTS OF THE AREA BASED ON 1939 TRANSPORTATION SURVEY. LOCATION OF ONS AND OFFS ASSUMED. EQUAL TRAFFIC WOULD MOVE IN REVERSE DIRECTIONS.

ESTIMATED DISTRIBUTION OF PASSENGER VEHICLES ENTERING AND BY-PASSING THE CENTRAL BUSINESS DISTRICT SHOWN AS PERCENTAGES OF TOTAL ENTERING BY PARKWAYS WITH PRESENT DISTRIBUTION OF POPULATION



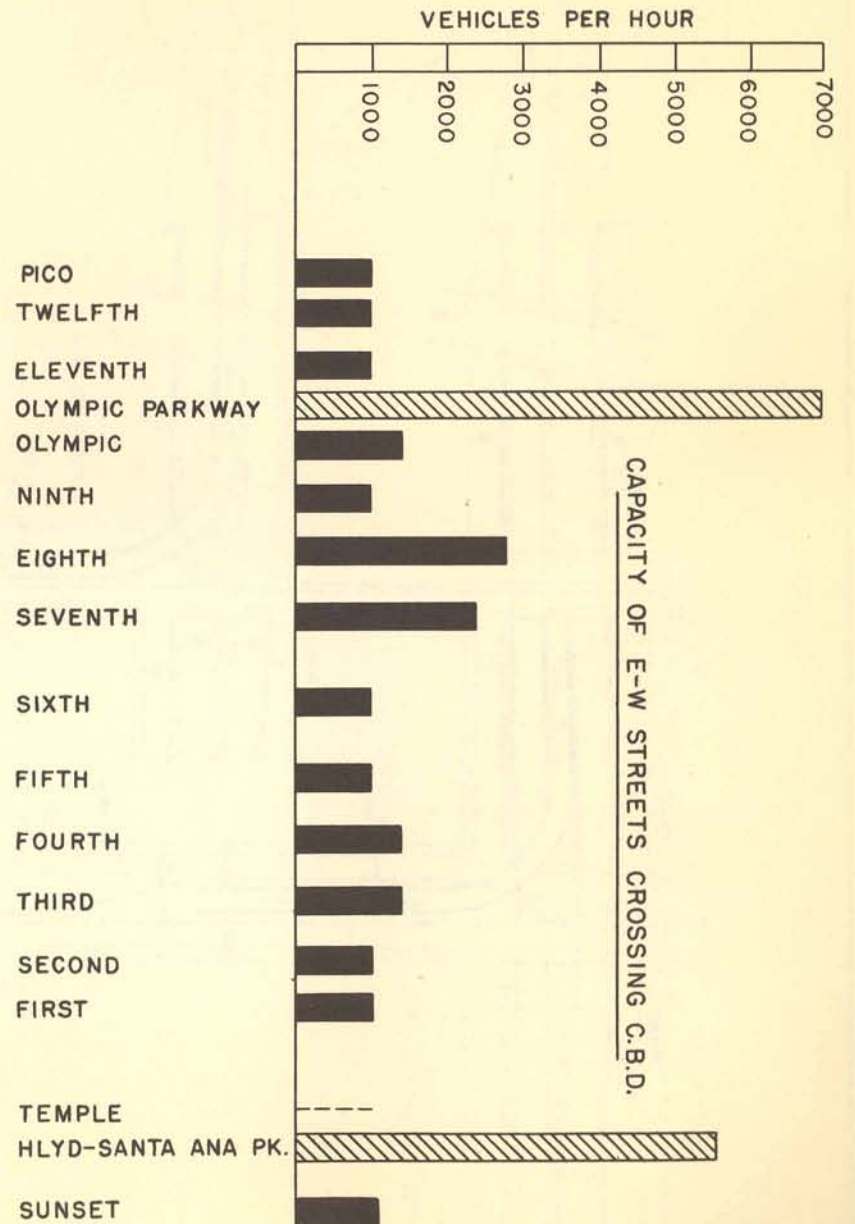
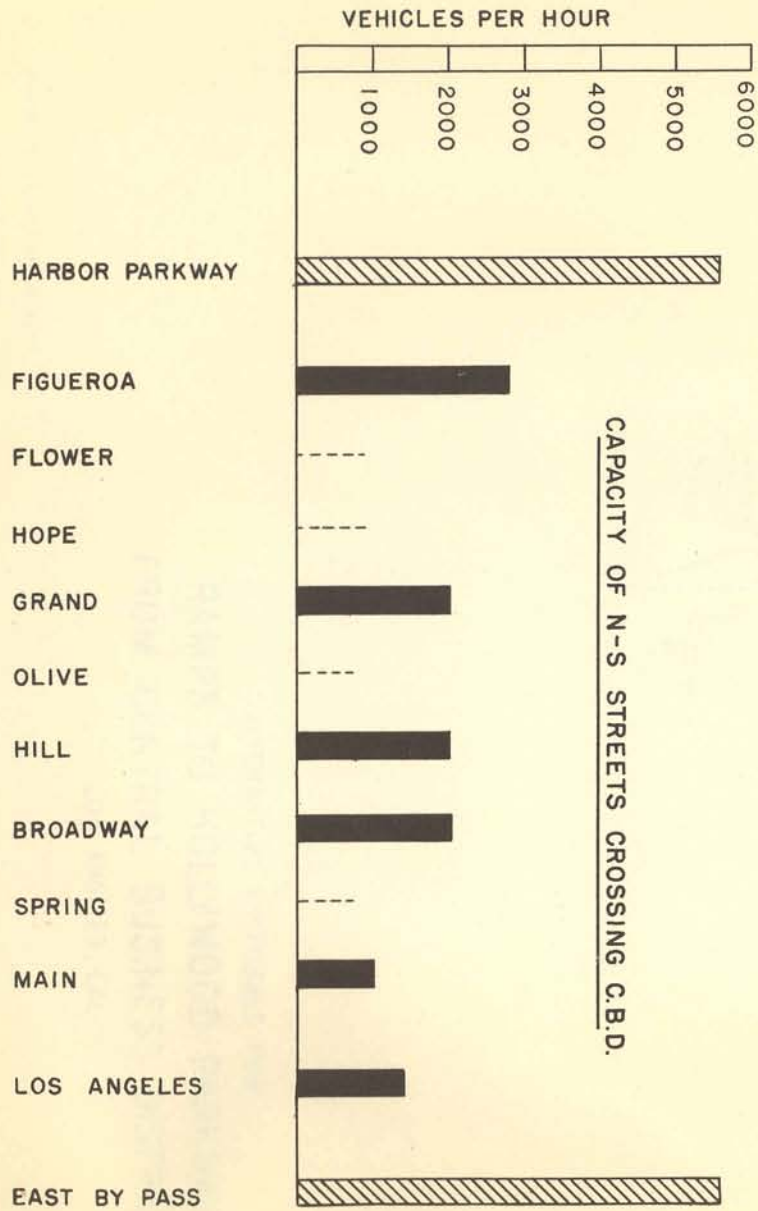
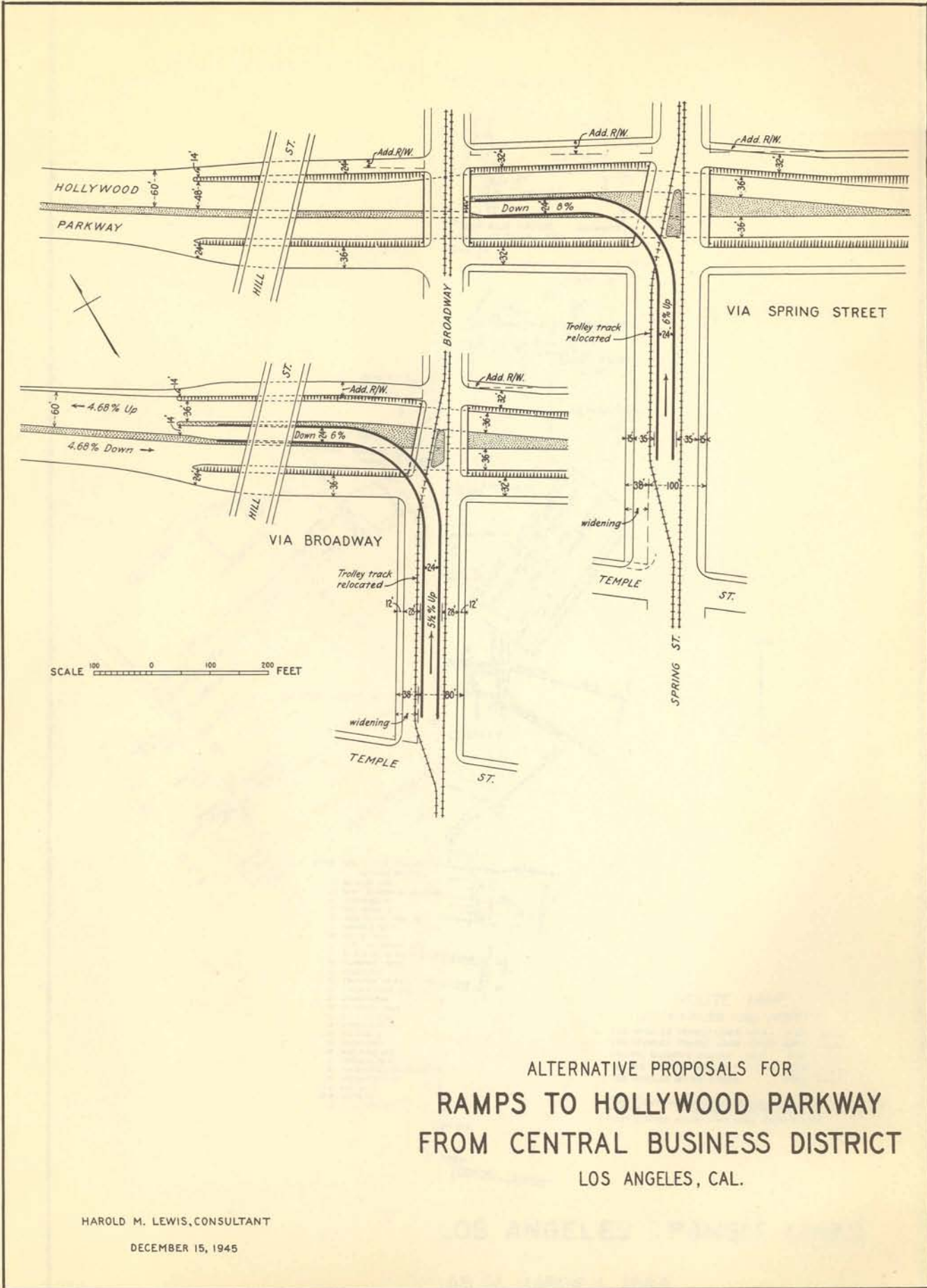
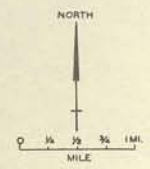
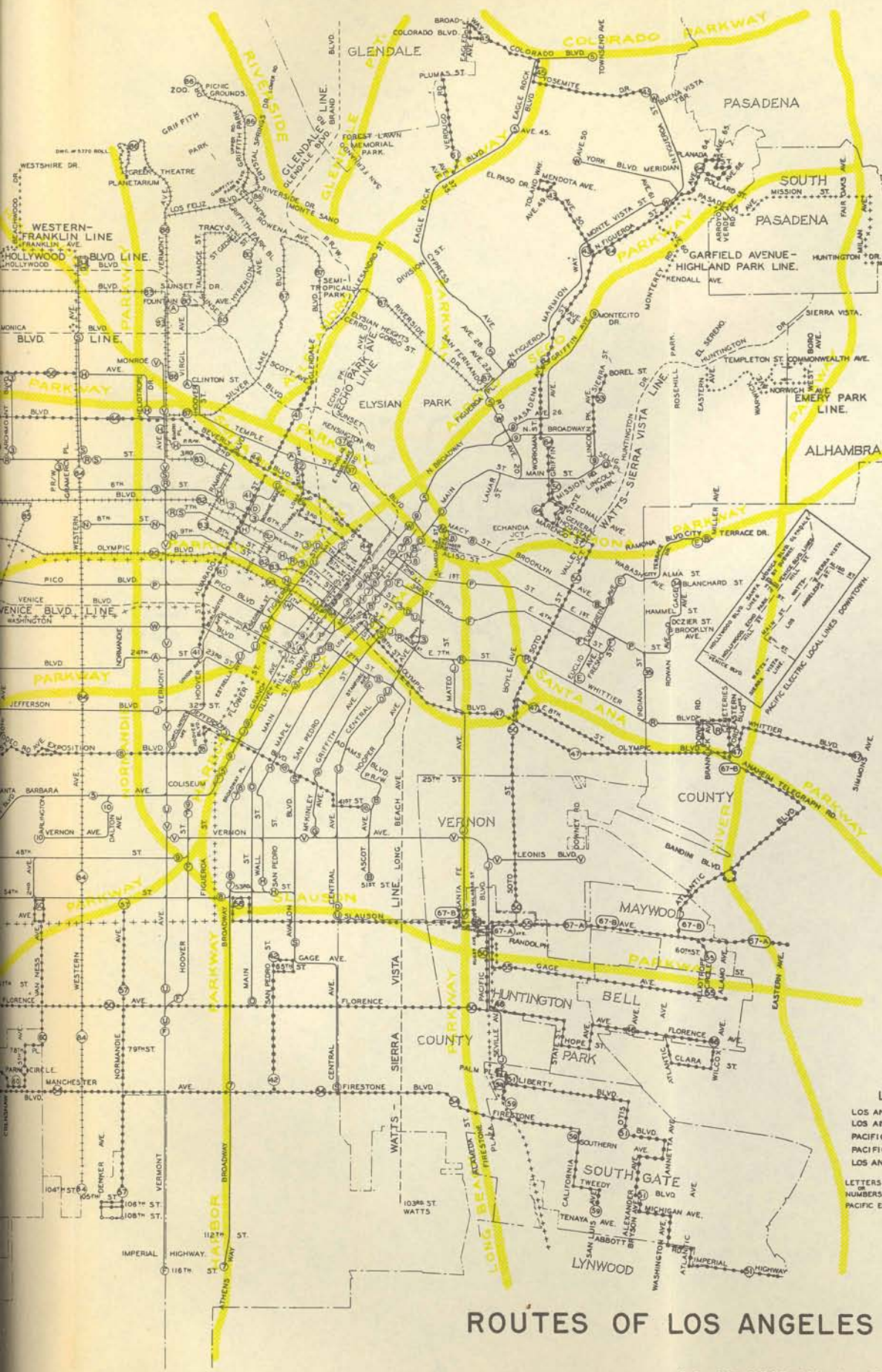


FIGURE 12



ALTERNATIVE PROPOSALS FOR
RAMPS TO HOLLYWOOD PARKWAY
FROM CENTRAL BUSINESS DISTRICT
LOS ANGELES, CAL.

HAROLD M. LEWIS, CONSULTANT
DECEMBER 15, 1945



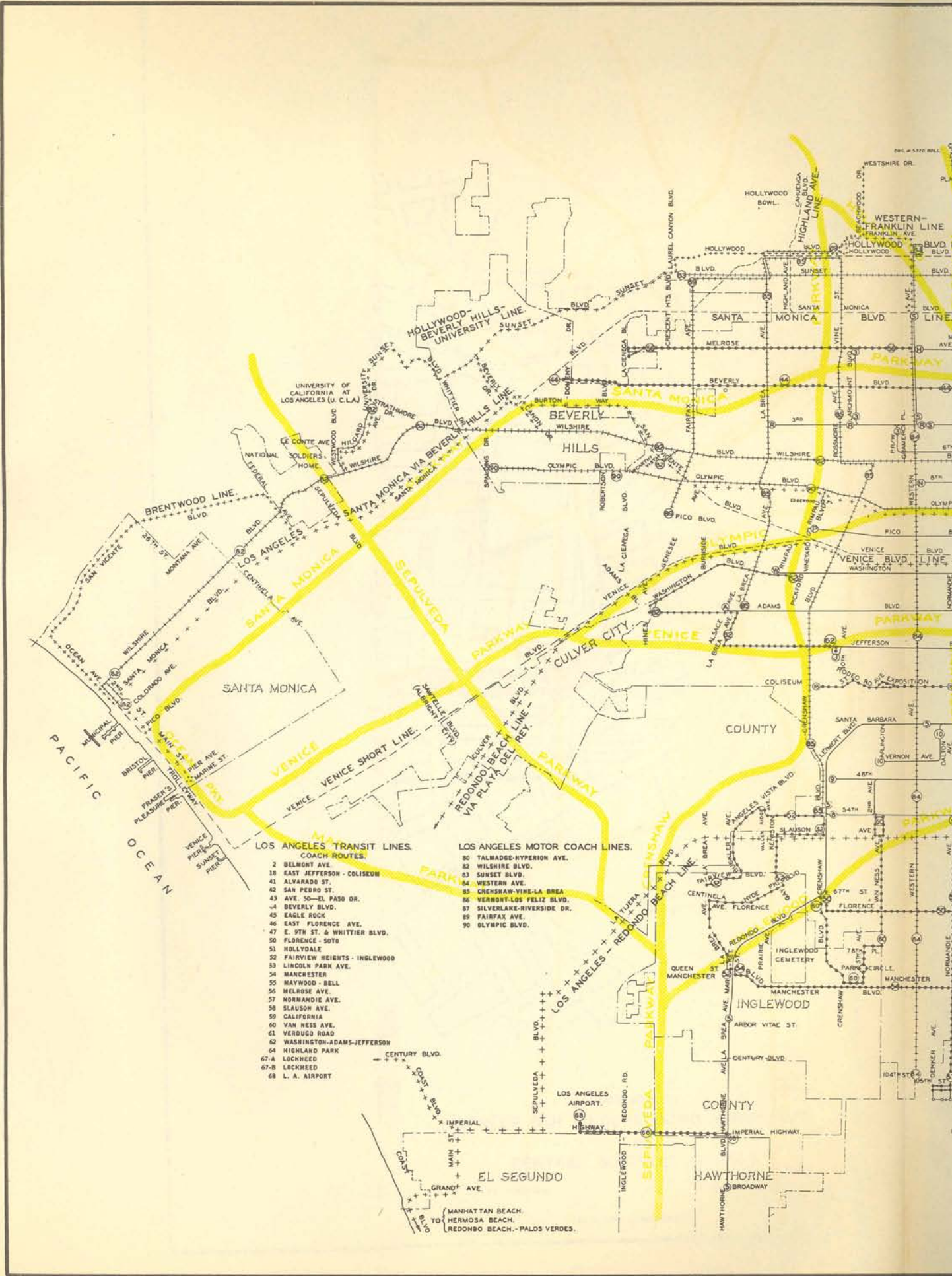
**ROUTE MAP
LOS ANGELES AND VICINITY.**

- LOS ANGELES TRANSIT LINES - CAR LINES ———
- LOS ANGELES TRANSIT LINES - COACH LINES - - - - -
- PACIFIC ELECTRIC RAILWAY - CAR LINES - - - - -
- PACIFIC ELECTRIC RAILWAY - COACH LINES - - - - -
- LOS ANGELES MOTOR COACH LINES - - - - -

LETTERS IN CIRCLES SHOW LOS ANGELES TRANSIT LINES CAR & COACH ROUTES
NUMBERS IN CIRCLES SHOW LOS ANGELES MOTOR COACH LINES COACH ROUTES.
PACIFIC ELECTRIC RAILWAY LOCAL LINES SHOWN BY NAME.

ROUTES OF LOS ANGELES TRANSIT LINES

AS OF MARCH 1, 1945



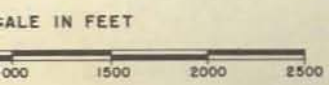
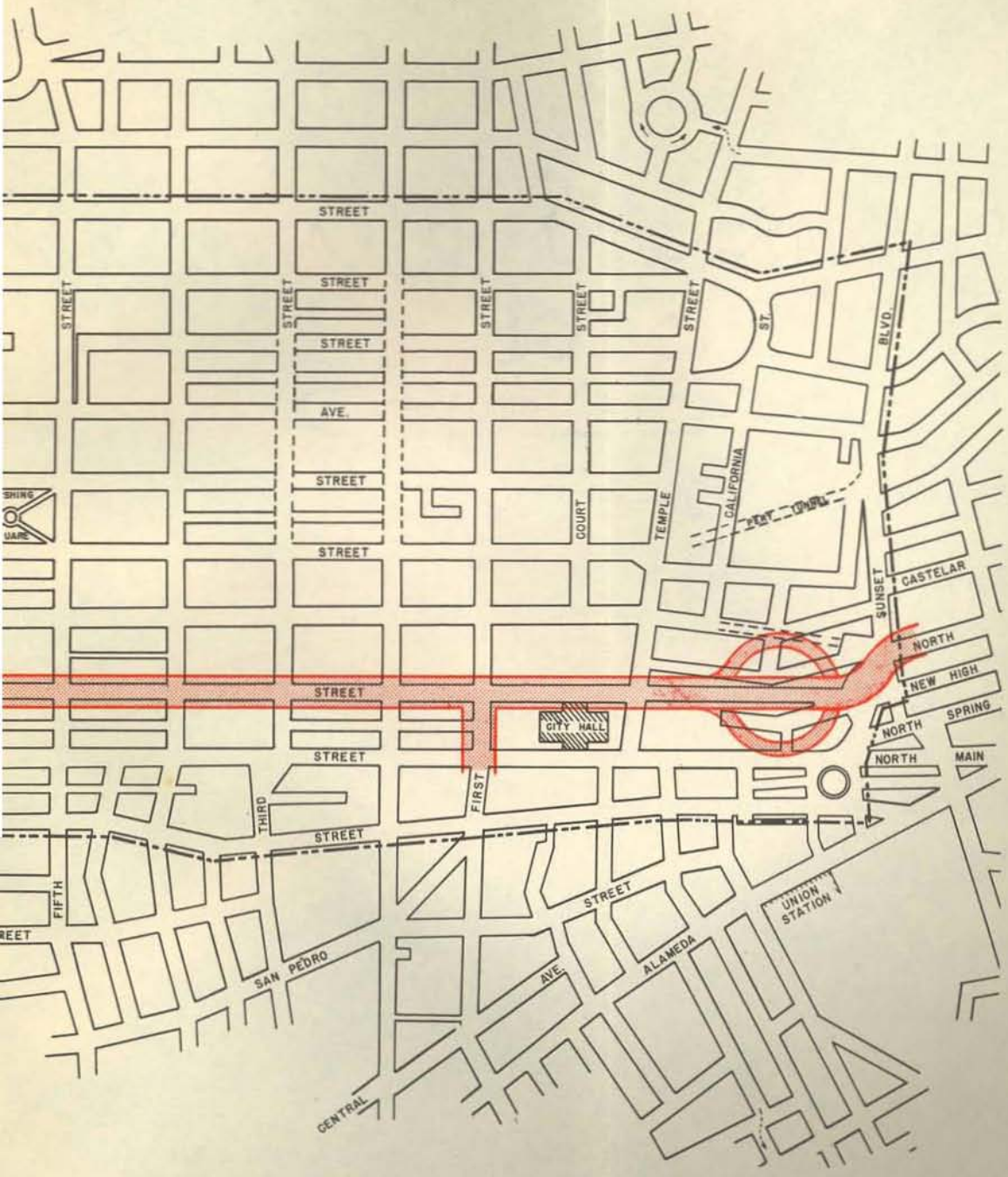
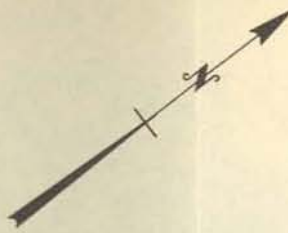
LOS ANGELES TRANSIT LINES.

- COACH ROUTES.**
- 2 BELMONT AVE.
 - 10 EAST JEFFERSON - COLISEUM
 - 41 ALVARADO ST.
 - 42 SAN PEDRO ST.
 - 43 AVE. 50—EL PASO DR.
 - 44 BEVERLY BLVD.
 - 45 EAGLE ROCK
 - 46 EAST FLORENCE AVE.
 - 47 E. 9TH ST. & WHITTIER BLVD.
 - 50 FLORENCE - SOTO
 - 51 HOLLYDALE
 - 52 FAIRVIEW HEIGHTS - INGLEWOOD
 - 53 LINCOLN PARK AVE.
 - 54 MANCHESTER
 - 55 MAYWOOD - BELL
 - 56 MELROSE AVE.
 - 57 NORMANDIE AVE.
 - 58 SLAUSON AVE.
 - 59 CALIFORNIA
 - 60 VAN NESS AVE.
 - 61 VERDUGO ROAD
 - 62 WASHINGTON-ADAMS-JEFFERSON
 - 64 HIGHLAND PARK
 - 67-A LOCKNEED
 - 67-B LOCKNEED
 - 68 L. A. AIRPORT

LOS ANGELES MOTOR COACH LINES.

- 80 TALMADGE-HYPERION AVE.
- 82 WILSHIRE BLVD.
- 83 SUNSET BLVD.
- 84 WESTERN AVE.
- 85 CRENSHAW-VINE-LA BREA
- 86 VERMONT-LOS FELIZ BLVD.
- 87 SILVERLAKE-RIVERSIDE DR.
- 89 FAIRFAX AVE.
- 90 OLYMPIC BLVD.

Dist. # 3770 ROLL

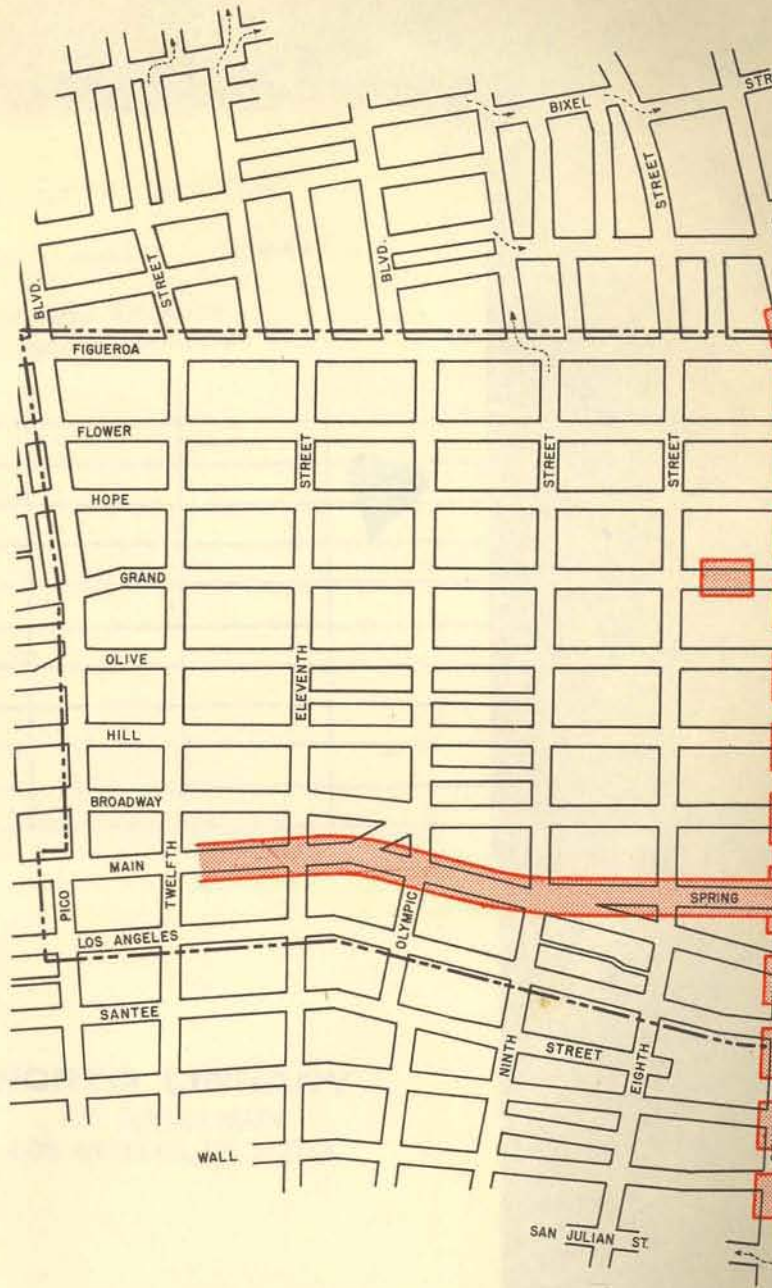


RECOMMENDED
STREET CAR UNDERGROUND TERMINALS
in the
CENTRAL BUSINESS DISTRICT

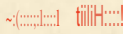
Los Angeles

December 1945

Joe R. Ong, Consultant



Proposed Spring Street Subway



Proposed Seventh Street Subway

Proposed Seventh Street Subway

MEY DOROTHY GRAY LIBRARY & ARCHIVE
City of Los Angeles recommended progra
City of Los Angeles Archives
HE340 I27 C58 Archives
10000017733

S.C.R.T.D. LIBRARY