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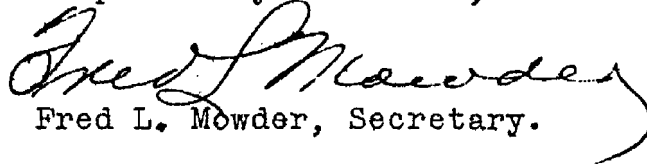
TO THOSE
INTERESTED IN A
RAPID TRANSIT SYSTEM :

Some months ago Mayor Frank L. Shaw announced his Plan for Public Improvements. Among the most prominent was a RAPID TRANSIT SYSTEM for Los Angeles.

It was determined by this Association to further this feature of his plan.

We now present for your perusal the following Engineering Report as a basis for further consideration of this most important project.

Respectfully submitted,


Fred L. Mowder, Secretary.

FLM:TS

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Engineering Office
D O N A L D M. B A K E R
108 West 6th Street
Los Angeles

November 15, 1933

Central Business District Association,
808 H. W. Hellman Building,
Los Angeles, California.

Gentlemen:

In accordance with our verbal understanding, I hand you herewith a report on a proposed system of rapid transit serving the City of Los Angeles and the surrounding area.

This report has been made with the view of its being transmitted by your organization to the City of Los Angeles authorities, to be used by them in support of an application to the Federal Emergency Administration of Public Works for a loan and grant for construction of the system. The following points may be emphasized:

1. With growth of population in the Los Angeles area, a system of rapid transit will be necessary within the next few years, not alone to furnish adequate transportation and to stabilize property values in the Central District, but also to do the same throughout the entire Metropolitan Area.
2. The system proposed comprises four lines radiating outward in four directions from

the Central Business District of Los Angeles, serving: (a) Pasadena and the San Gabriel Valley; (b) the southeastward section of the area from Whittier to Long Beach and San Pedro, and including the Orange County communities; (c) the densely settled section between Downtown Los Angeles and Vineyard, and the area between Vineyard and the Santa Monica Bay Region; (d) Glendale, Burbank and San Fernando Valley. The system proposed is so located that it can, in the future, be extended by grade separations and extensions of subway and/or elevated structures with growth of population.

3. The system meets all the requirements of eligibility set up in the National Industrial Recovery Act.
4. Rapid transit can only be financially feasible for this area for many years by taking advantage now of the opportunity offered under the provisions of the National Industrial Recovery Act, with its grant and resulting low interest rate.
5. The total cost of the system proposed herein amounts to \$37,200,000, including \$35,650,000 for structures and \$1,550,000 for rights-of-way. On this basis, a grant of 30% of labor and materials would amount to \$10,700,000. Various methods of financing the system are possible. The one suggested proposes the issuance of \$30,000,000 in bonds, the use of this sum, plus \$7,200,000 of the grant for construction, utilizing the remaining \$3,500,000 of the grant for payment of debt service during the early years of operation.
6. There will be a deficit from the system amounting to \$500,000 per year for the first three years, \$400,000 per year for the

11/15/33

fourth and fifth years, being progressively reduced to \$10,000 the ninth year after operation commences, and nothing thereafter. This deficit can be met by the creation of an assessment district which should include benefited property. If it were necessary to include only the present Central Business District of Los Angeles in such assessment district, the annual assessments would amount to 30¢ per \$100 of assessed valuation. On a property with an assessed valuation (land and improvements) of \$1,000,000, the levy at this rate would amount to \$3,000 per year, or \$250 per month.

Assessed valuations have been reduced in this area 38% since 1931, with the tax rate remaining practically the same. The assessment levy necessary to carry the deficit during the first three years would amount to an increase in present tax bills of 7%. The saving in lower taxes during the past two years has been nine times the suggested assessment above described.

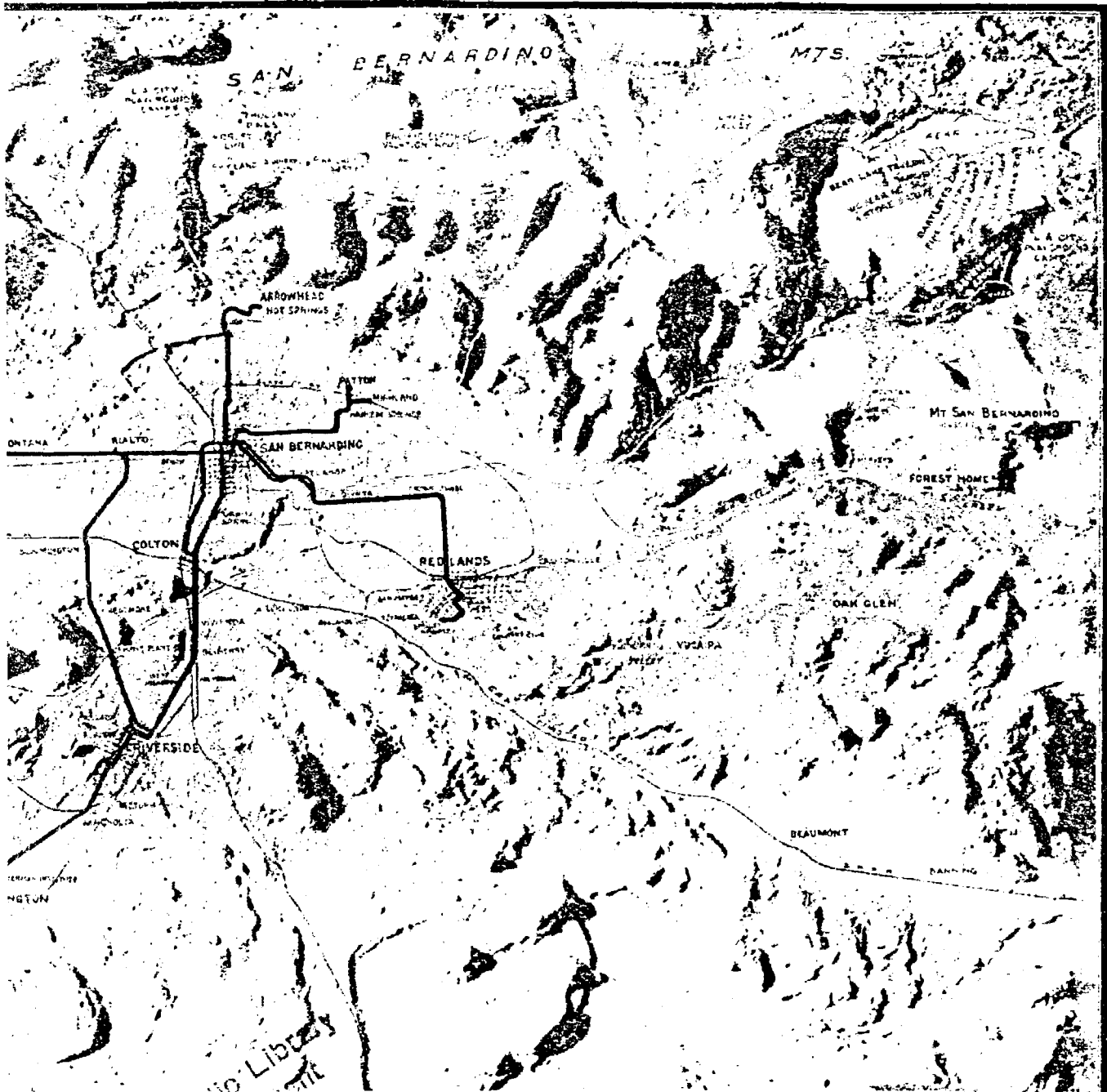
Respectfully submitted,

(Seal)

Donald M. Baker

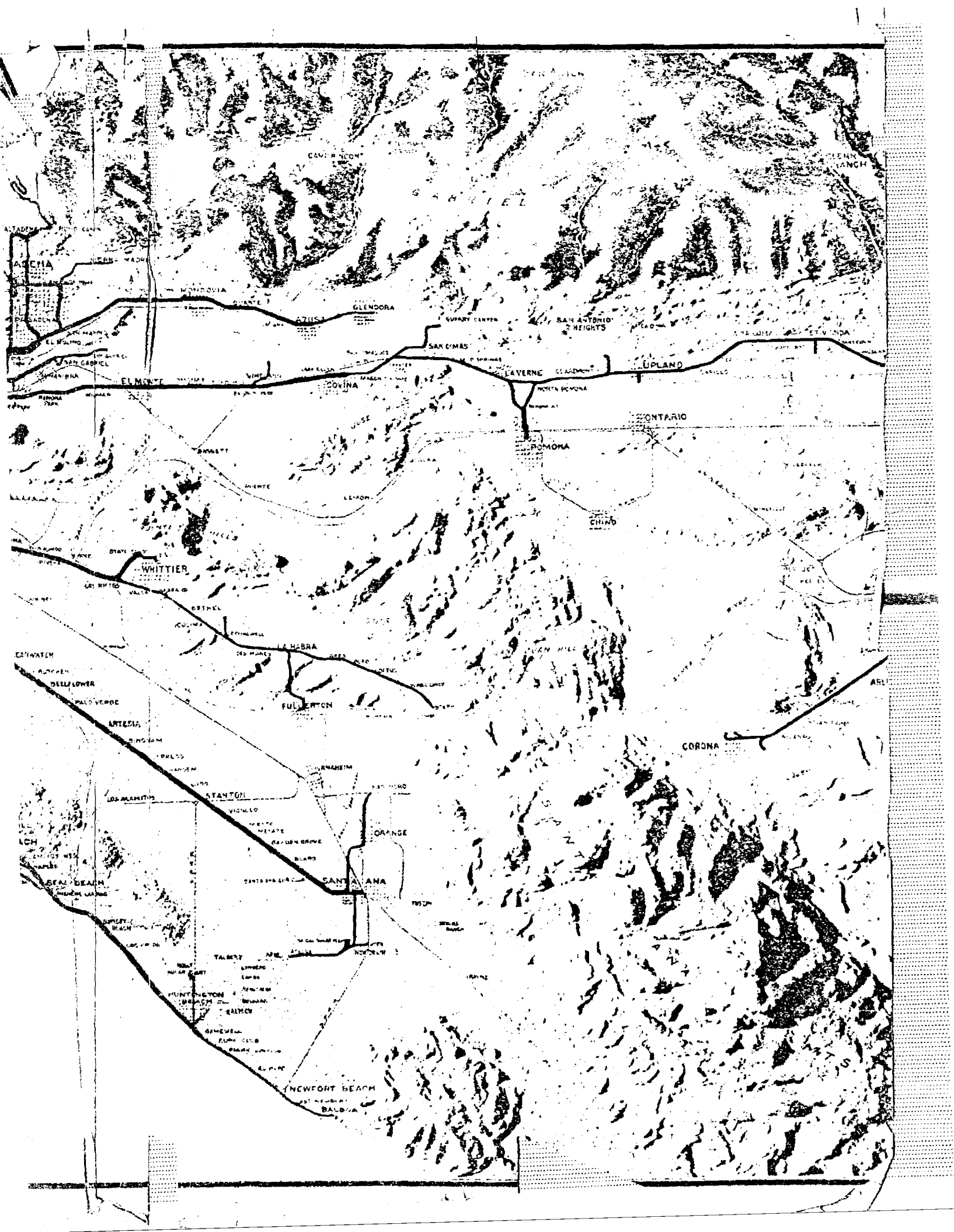
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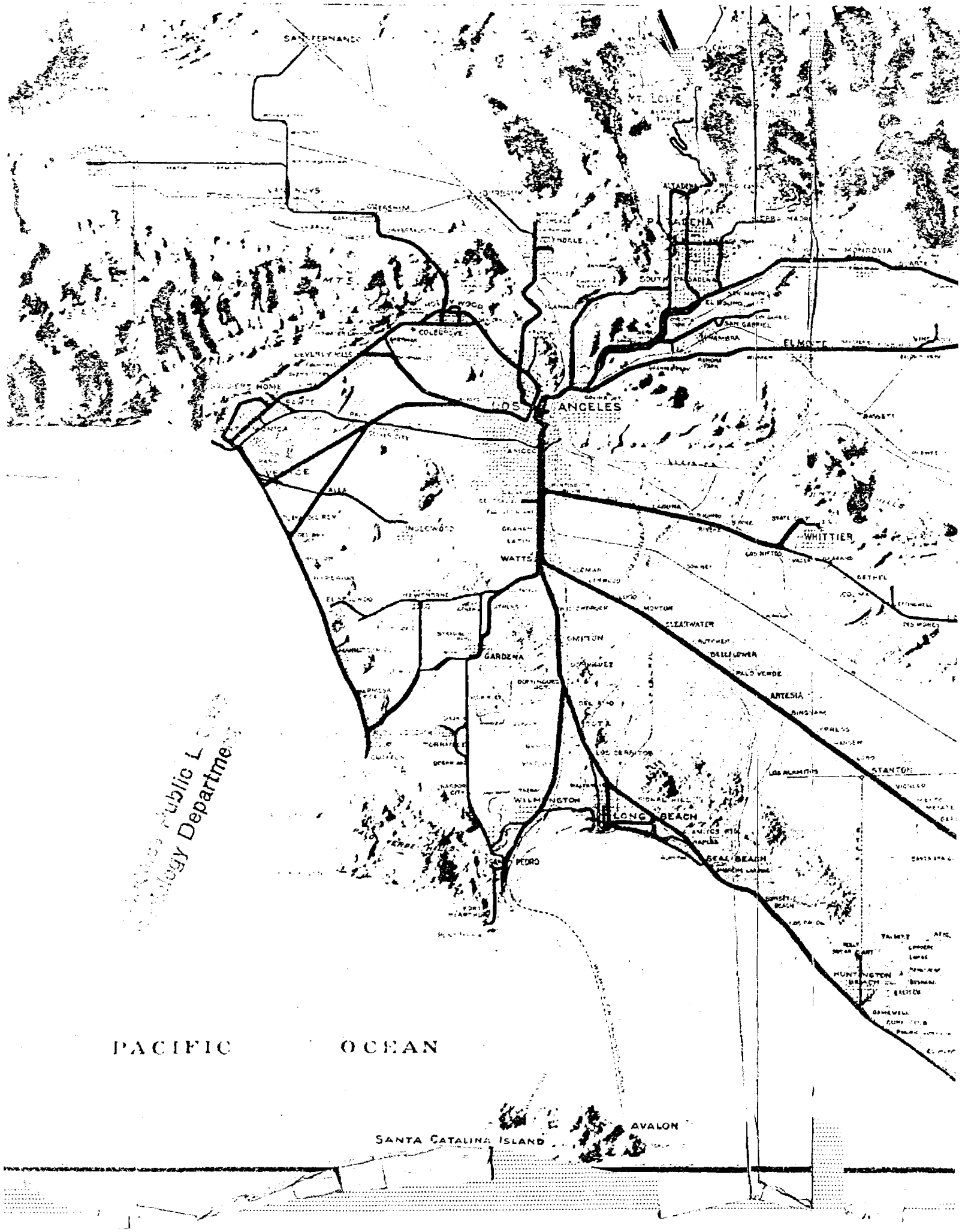
Donald M. Baker
Consulting Engineer.



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RELIEF MAP
 SOUTH COASTAL BASIN
 SHOWING LINES OF PACIFIC ELECTRIC RY.
 MAP PREPARED BY PACIFIC ELECTRIC RAILWAY COMPANY
 TO ACCOMPANY REPORT ON A RAPID TRANSIT SYSTEM
 FOR THE CITY OF LOS ANGELES.
 DONALD M. BAKER CONS. ENG'R.
 NOVEMBER 1933.





PACIFIC

OCEAN

SANTA CATALINA ISLAND

AVALON

R E P O R T

ON A

R A P I D T R A N S I T S Y S T E M

FOR

L O S A N G E L E S

C A L I F O R N I A

R 388.4794 B 167

November 15, 1933

DONALD M. BAKER
Consulting Engineer

STUART M. BATE
Associate Engineer

(5)

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by
Donald M. Baker

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FOREWORD

This report is made in connection with a rapid transit system for which an application on behalf of the City of Los Angeles to the Federal Administration of public works for a loan of federal funds is to be made, such loan being made under the provisions of the National Industrial Recovery Act of 1933.

The proposed system described herein provides such essential service to the existing population of the community as can now be economically justified. It is planned in a manner which will care for the most pressing and immediate needs of the community, and so that it may be expanded with community growth.

Conditions in the Los Angeles region are such that, in all probability, density of population in the dwelling areas will always remain fairly low, with its population widely distributed. Hence the concentration of commercial activities in the Central Business District has been and will continue to be somewhat retarded.

The proposals made comprise a system of rapid transit which is basically correct as to location, which can be expanded with increase in community growth through grade separations, establishment of coordinated bus lines and/or adjustment of surface rail lines, and ulti-

mately by the extension of subway and elevated structures.

This report has purposely been made brief. It contains a general description of local past population growth and a forecast of future increase; studies of population shifts and movements within recent years; a description of existing transportation facilities and services; a discussion of traffic conditions in the city, particularly in the approaches to and within the Central Business District; a suggested comprehensive plan for transportation, with a more detailed description of the system proposed, for the financing of which the above mentioned loan is requested; and estimate of operating revenues and expenses of such system, and a discussion of the suggested method of financing it.

The time available for preparation of the report has been insufficient for the making of extensive field studies or preparation of many original diagrams and maps specifically for this purpose. The necessary basic information and studies, however, were available.

The problem of rapid transit has been considered by public and private agencies in the Los Angeles region for many years. Much material useful for this study had been collected, and some of it analyzed, and this has been found invaluable in the preparation of this report. While some of the material used is from two to three

years old, and in a few cases a year or two older, changes in population and in physical development have been relatively minor since 1923, and the material used is sufficiently current to show present day conditions with reasonable accuracy.

Advantage has been taken of the many existing charts, base maps and reports which have been prepared by various public and private agencies, including the Los Angeles County Regional Planning Commission; Los Angeles Traffic Association; Citizens Committee on Parks, Playgrounds & Recreational Areas, and similar agencies, and many of the maps and charts presented in these reports have been used for illustrative purposes, in some cases material relating to the subject-matter of this report being superimposed thereupon. Credit is given throughout the report to the primary source of all material used which did not originate in the consultant's office. Designs and estimates for structures have been made by the Pacific Electric Railway, and all drafting has been handled by their engineering department.

Excellent cooperation has been achieved and assistance rendered by all the above-named agencies, and also by the Los Angeles City Engineer's Department, the Board of Public Utilities and Transportation and the Street Traffic Engineering Department. Grateful acknowledgement is herewith made for large amount of assistance received.

I.

THE SOUTH COASTAL BASIN

The South Coastal Basin of California -- extending ninety miles east and west, and approximately fifty miles north and south -- contains 2,200 square miles of irrigable or habitable land and a population of 2,500,000. This area, almost twice that of the State of Rhode Island, has four times the latter's population. It almost equals the area of the State of Delaware, with ten times its population. The entire habitable area is in a very high state of development. The eastern 60% of the basin is predominately agricultural and is characterized by relatively small holdings and by high unit productivity. The western portion, with 90% of the population includes Los Angeles County, the richest agricultural county in the United States.

The 1930 Federal Census classifies the larger urban areas of the country into Metropolitan Districts, defining them as:

"Central.....cities, all adjacent and contiguous civil divisions, having a density of not less than 150 inhabitants per square mile, and also, as a rule, those civil divisions of less density that are directly contiguous to the central cities, or are entirely or nearly surrounded by minor civil divisions that have the required density."

The Los Angeles Metropolitan District -- the fourth largest in the country in point of population -- occupies the western portion of the South Coastal Basin and includes

most of Los Angeles County south of the Sierra Madre Mountains, the eastern half of Orange County, and a small section of San Bernardino County. While this Metropolitan District is fourth in point of population and third in area in the country, it is characterized by a low average density of population throughout and a very low density (2,812 per square mile) within the central city. If the large areas of agricultural or mountainous land within the City of Los Angeles are eliminated, however, the city population density approaches 7,000 per square mile -- but even this is lower than that of any of the ten larger central cities.

In 1930 the population of the Los Angeles Metropolitan District was divided as follows:

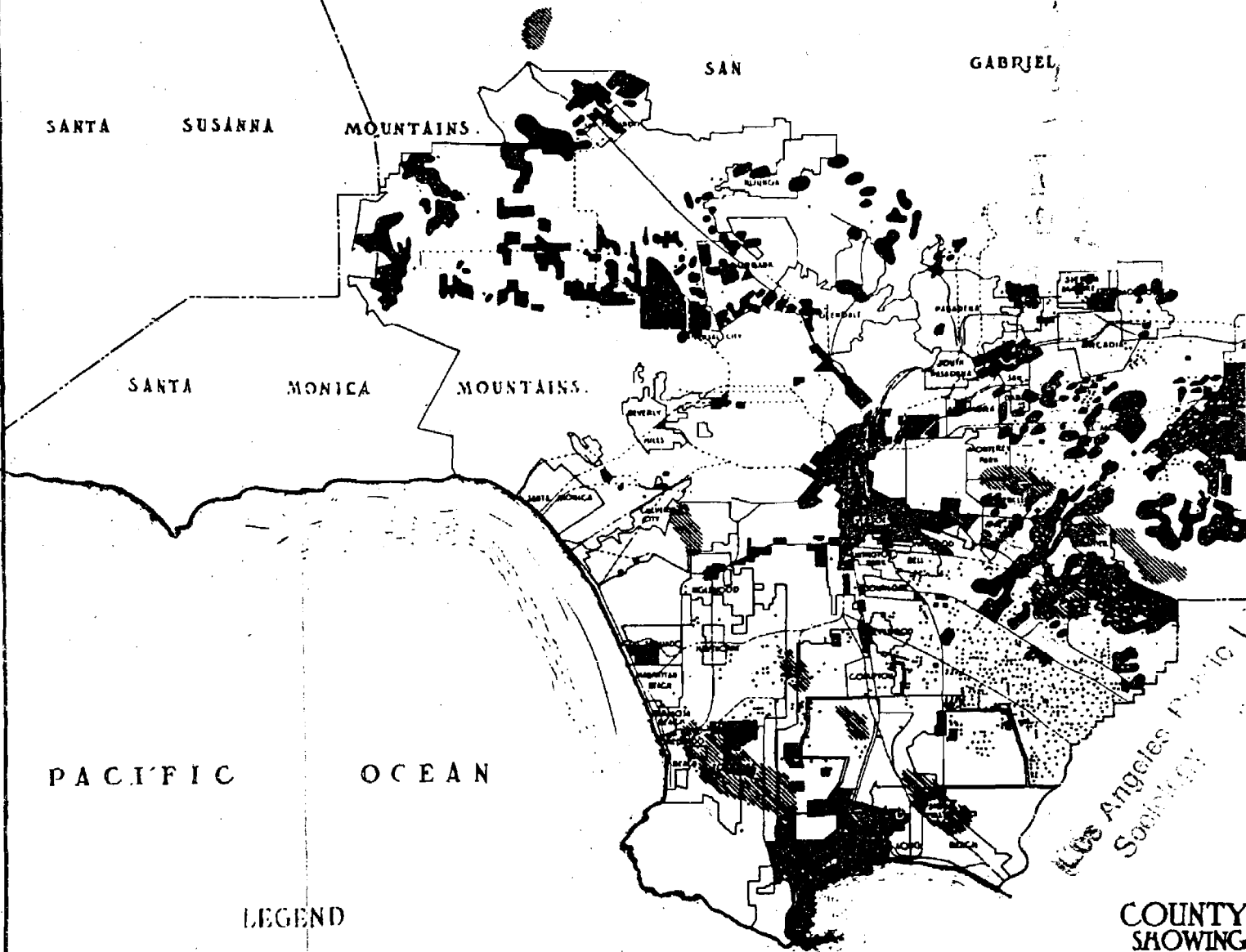
	Population within Los Angeles Metropolitan Area	<u>%</u>
City of Los Angeles	1 238 048	53.40)
County of Los Angeles-outside city	952 690	41.10)
Orange County	108 092	4.65
San Bernardino County	<u>19 696</u>	<u>.85</u>
Total Population	2 318 526	100.00%

Since the population of the district included in this area within Los Angeles County is 2,190,730 or 99.20% of the county population, a discussion of county population and of the physical and other conditions in the county will be illustrative of those within the entire Metropolitan District

Plato 1, prepared by the Regional Planning Commission






1

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LEGEND

-  INDUSTRIAL
-  OIL FIELDS
-  TREE CROPS
-  HOG FARMS
-  DAIRIES

COUNTY
SHOWING
VARIOUS
LAND USES IN
THE REGION



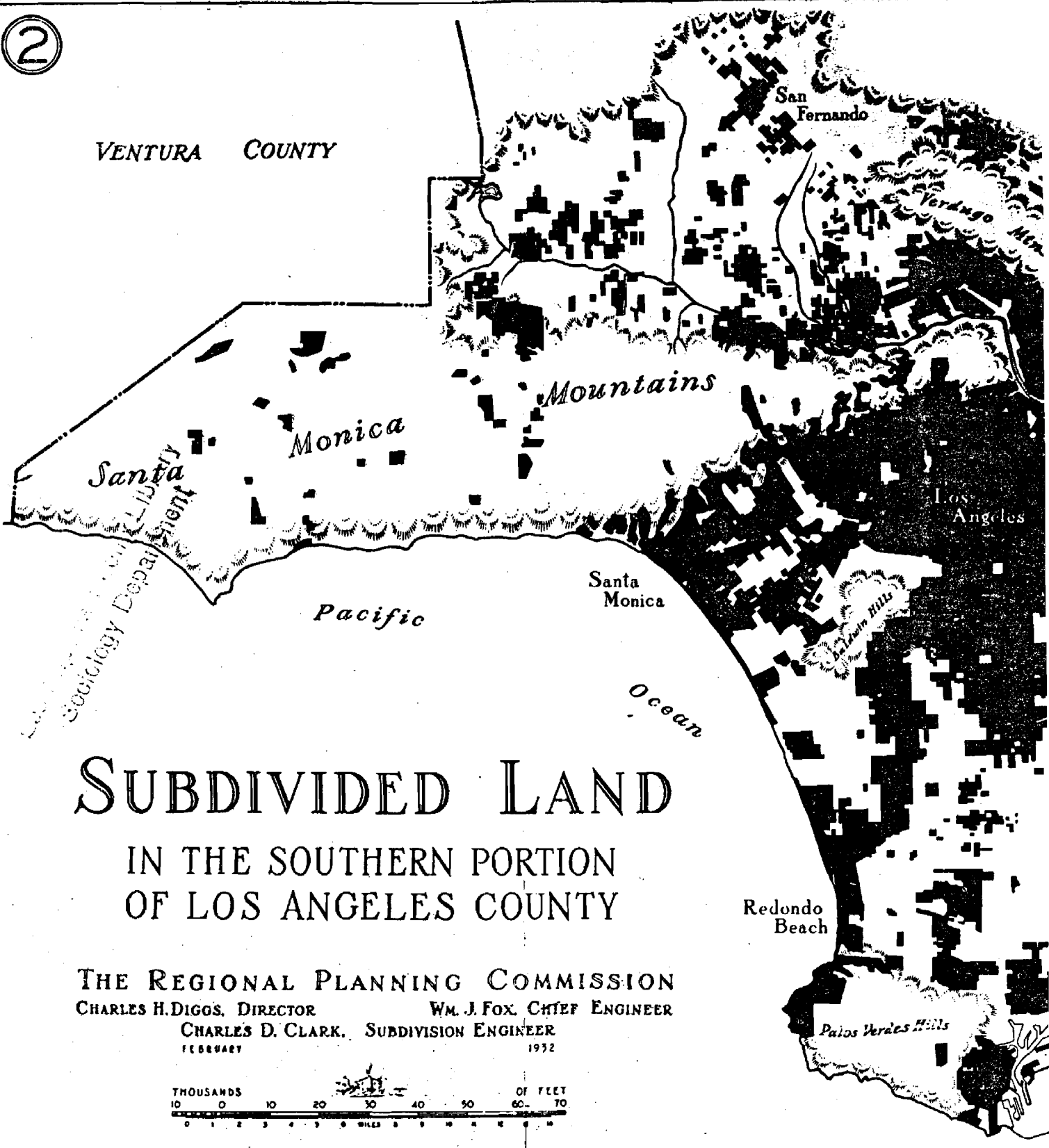
TO ACCOMPANY REPORT ON
A RAPID TRANSIT SYSTEM
FOR THE CITY OF LOS ANGELES
DONALD M. BAKER CONS. ENGR.
NOV. 1933

of Los Angeles County in 1928, shows land uses. Tree crops predominate in San Fernando and San Gabriel Valleys and on the south slopes of Whittier Hills, these being divided into citrus and walnuts, principally. While permanency of a water supply has been the major factor in the location of tree crops, climatic conditions have had a decided influence upon the establishment and location of citrus groves. Industrial uses are concentrated largely in the City of Los Angeles and the Harbor District, altho small scattered industrial areas exist in other parts of the county. Dairying predominates southeast of the City of Los Angeles to the Orange County line. Areas of petroleum production are also shown.

Plate 2 shows the extent of subdivided land in the county in 1932. At that time, of 1075 square miles contained in the Coastal Basin, 382 square miles or 35.5% were subdivided. During the period from 1920 to 1930, subdivisions with a total of 188,352 lots were recorded within the City of Los Angeles. Assuming five lots per acre, this equalled 37,700 acres or 59 square miles. Figures published by the Eberle Economic Service of Los Angeles in 1930 indicated that only 46 out of every 100 subdivided lots in Los Angeles County were occupied by improvements. This excessive rate of land subdivision, while resulting in a scattering of the population, has also caused much agricultural land to be withdrawn from production, both because

2

VENTURA COUNTY



SUBDIVIDED LAND

IN THE SOUTHERN PORTION OF LOS ANGELES COUNTY

THE REGIONAL PLANNING COMMISSION

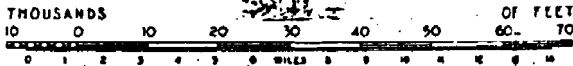
CHARLES H. DIGGS, DIRECTOR

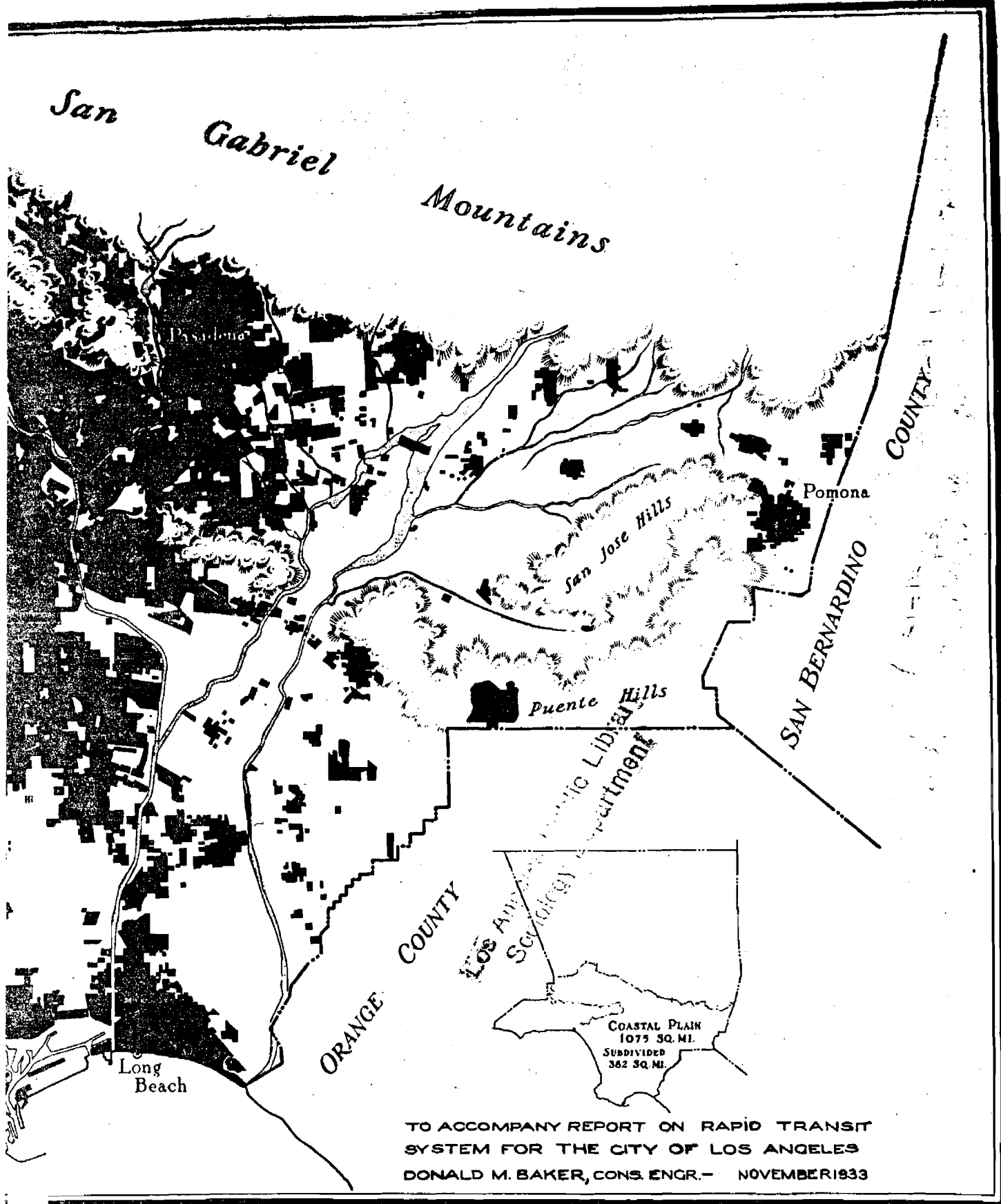
WM. J. FOX, CHIEF ENGINEER

CHARLES D. CLARK, SUBDIVISION ENGINEER

FEBRUARY

1932





TO ACCOMPANY REPORT ON RAPID TRANSIT SYSTEM FOR THE CITY OF LOS ANGELES
 DONALD M. BAKER, CONS. ENGR. — NOVEMBER 1933

of its occupancy by city lots and because of the high prices established by subdivision activity for such land which prevented its continued utilization for agricultural purposes.

During the last thirty years in particular, population within the City and County of Los Angeles has increased in a fairly uniform proportion, the county growing at a somewhat faster rate than the city since 1910.

In the face of all this activity, however, Los Angeles County has maintained its position as the first agricultural county in the United States, at the same time increasing its industrial activity. Los Angeles County is now the thirteenth industrial area in the United States, the tenth wholesale distributing center, and promises to maintain its large oil production for years to come. The standard of living in the county is very high, as compared to that of the remainder of the United States.

While Los Angeles County population in 1930 was thirteen times its 1900 population, such a rate of increase in the future cannot be expected, altho the natural and economic resources of the area will continue to attract a much larger population than is supported at present, once normal economic conditions throughout the country are restored.

Table 1

POPULATION OF METROPOLITAN AREAS

AREA	: POPULATION :			: LAND AREA-Sq.Mi. :			: POPULATION-Per Sq.Mi. :		
	: Total :	: Central :	: Outside :	: Total :	: Central :	: Outside :	: Total :	: Central :	: Outside :
		: Cities :	: Cities :		: Cities :	: Cities :		: Cities :	
New York-N.E.	10 901 424	7 942 600	2 958 824	2 514	353	2 161	4 332	22 500	1 368
New Jersey									
Chicago	4 364 755	3 376 438	988 317	1 119	202	917	3 900	16 723	1 077
Philadelphia	2 847 148	1 950 961	896 187	994	128	866	2 865	15 242	1 035
Los Angeles*	2 318 526	1 238 048	1 080 478	1 474	440	1 034	1 573	2 812	1 045
Boston	2 307 897	781 188	1 526 709	1 023	44	979	2 257	17 795	1 560
Detroit	2 104 764	1 538 662	536 102	747	138	609	2 819	11 375	881
Pittsburgh	1 953 368	669 817	1 283 851	1 626	51	1 575	1 202	13 057	815
St. Louis	1 293 516	896 307	397 209	822	74	748	1 575	12 120	531
San Francisco	1 290 094	918 457	371 637	826	95	731	1 563	9 651	509
Oakland									
Cleveland	1 194 989	900 429	294 560	310	71	239	3 852	12 725	1 230

* Note: The city of Los Angeles contains a large area of farming and mountainous land, very sparsely settled in the San Fernando Valley, Santa Monica Mountains and along the West Coast. Estimated area of this is about 280 square miles.

Estimated population of remaining 160 square miles is about 1,100,000 with a density of 6,880 persons per square mile.

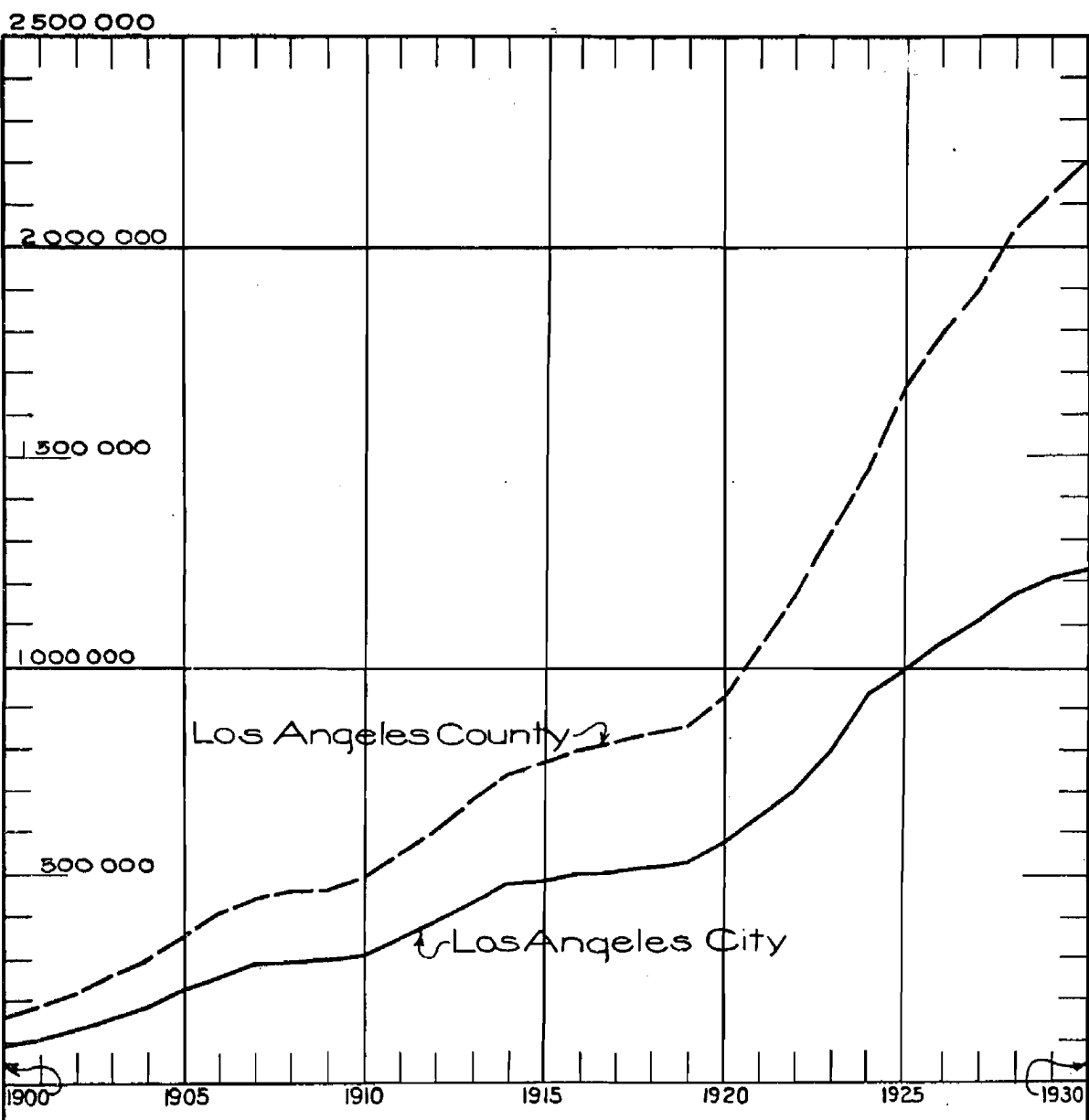
Source: Metropolitan Districts, Fifteenth Census.

Table 2

STATISTICS RE STANDARD OF LIVING -- LOS ANGELES COUNTY

ITEM	LOS ANGELES COUNTY	UNITED STATES	RATIO
			Los Angeles County To United States %
POPULATION -- 1930	2 208 492	122 775 046	1.8
% pop'n filing income tax returns - 1930	5.99	3.34	179
Savings bank deposits per capita - Sept. 1930	\$306	\$229	134
Residence telephones per 1000 pop'n - Jan. 1, 1930	155	107	145
Passenger autos per 1000 July 1, 1930	327	174	188
Postal receipts per capita 1930	\$6.81	\$5.43	125
Retail sales per capita 1930	\$598	\$403	148
Value of mineral products per capita - 1929	\$109	\$ 33	326
Value of agricultural products per capita rural pop'n - 1930	\$343	\$215	160
Value of manufactured products per wage earner - 1929	\$11 524	\$7 970	145
Value added by manufacture per wage earner - 1929	\$ 5 321	\$3 608	148
Annual wage received per wage earner - 1929	\$ 1 536	\$1 318	117
Value of construction per capital - 1929	\$ 101	\$ 51	198

Source: Report, Board of Economic Survey, Port of Los Angeles, 1933.



Note- Figures are for January 1st of each year.

POPULATION OF LOS ANGELES CITY AND COUNTY

TO ACCOMPANY REPORT ON RAPID
TRANSIT SYSTEM FOR CITY OF LOS
ANGELES.

DONALD M. BAKER, CONS. ENGR.

NOVEMBER 1933

II. POPULATION

Past Growth

The growth of population in the Los Angeles region during the last fifty years has not been paralleled in that of any other region of the country. A careful analysis of the underlying factors causing such growth, however, indicates that comparable rates of increase in the future cannot be expected to continue. The relationship between city and county population has been fairly uniform since the commencement of the twentieth century, county population outside of the City of Los Angeles having increased at a somewhat faster rate than city population since 1910.

A study of population of the City of Los Angeles year by year since 1900, indicates that a large proportion of the present population has been due to immigration from other places, and only a small percentage due to excess of births over deaths, and annexations. This increase in city population has occurred in three periods.

	<u>Time Years</u>	<u>Increase No.</u>	<u>%</u>
1900-1908 inclusive	9	194,000	195.3
1909-1918 "	10	238,000	81.5
1919-1929 "	11	704,000	132.9

the greatest increase occurring from 1919 to 1930. Of the total increase during the last period, 550,000 or 78% occurred as a result of immigration, the remainder being due

to excess of births over deaths, and to annexations.

This excessive immigration during the eleven year period was due to the following causes:

- 1) Immigration which would be expected to flow into a new country from older sections under normal economic conditions.
- 2) Immigration which would have naturally occurred during the previous cycle, from 1909-1918 inclusive, but which was delayed by the World War from 1914-1918 and was resumed after the Armistice.
- 3) Immigration caused by economic and social disturbances following the World War, including general restlessness which usually exists following such disturbances, greater ability of residents in the eastern parts of the country to sever home ties and move west as a result of prosperous conditions in that section, etc., etc.
- 4) Immigration attracted by the rapid development of the local area and of its industries including petroleum production, motion pictures, etc., etc.
- 5) Immigration which is always attracted to rapidly growing "boom" communities.

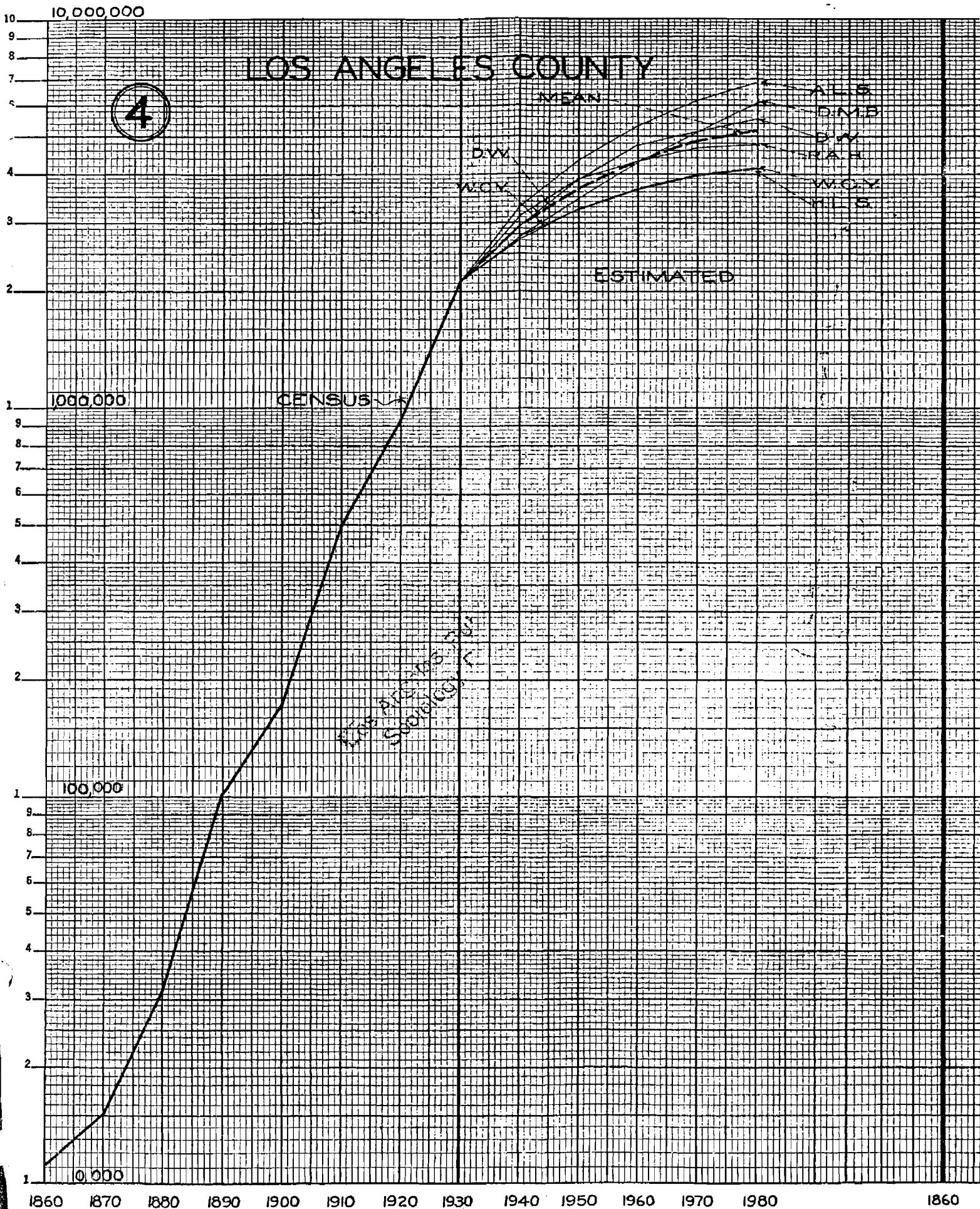
A careful analysis of the population increase during the last period in the light of the above causes would indicate that, in all probability, about one-half of the increase was due to abnormal conditions, which cannot be expected to continue indefinitely.

Future Population

In all probability, the population of the city and county will continue to increase at comparable rates. In predicating future population of a community, the smaller its size and the less self-contained it is, the more difficult the problem becomes. Excess of births over deaths can be forecast with a reasonable degree of accuracy for several decades in the future, but probable future immigration is an uncertain quantity.

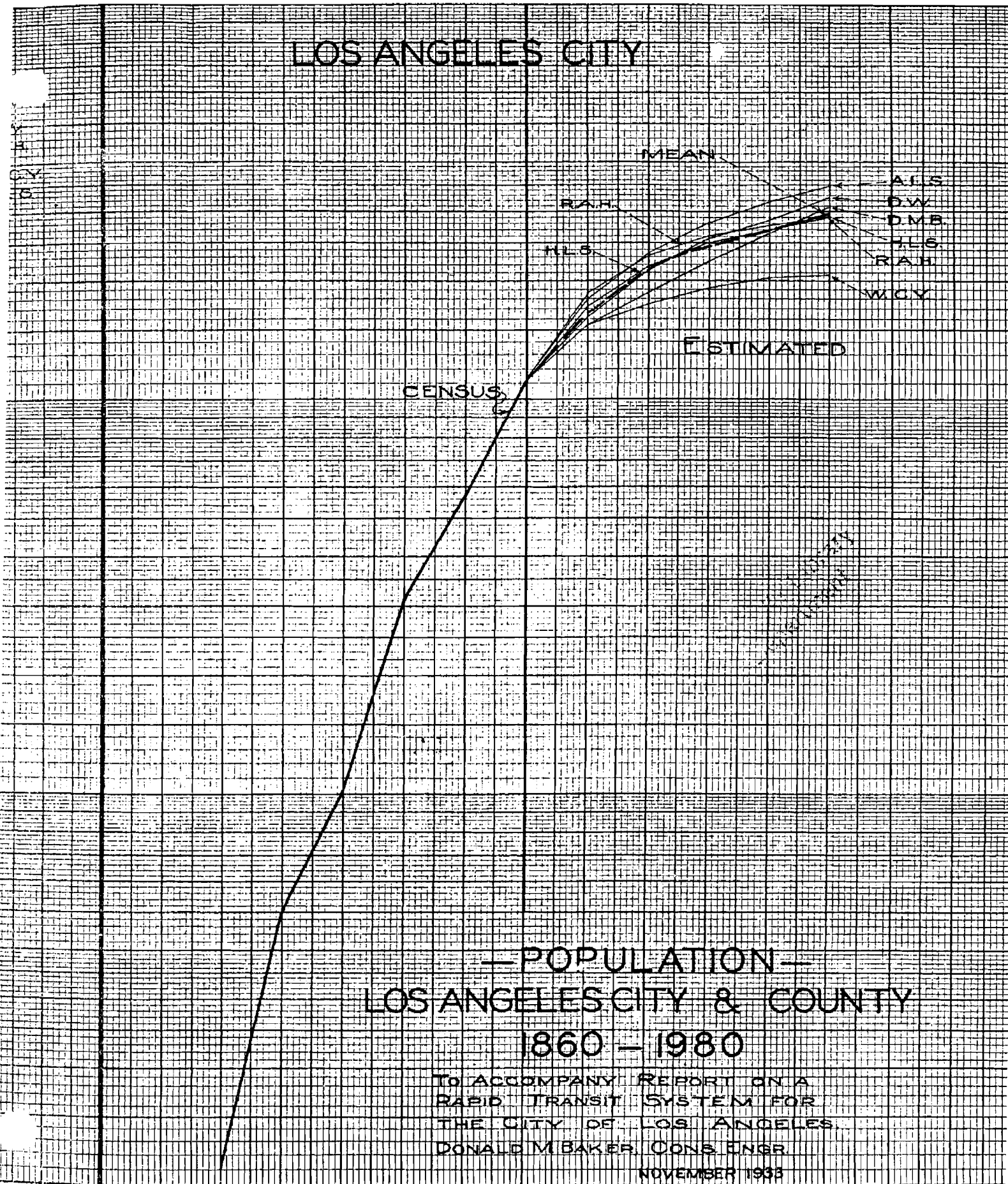
Numerous estimates have been made of the future population of Los Angeles City and County for the next fifty years. To treat the subject adequately would require months of study and the results of the study would occupy a large volume. In dealing with a rapid transit system for this community, however, it becomes necessary to make some reasonable estimate of future population in order to forecast future revenues. Since time does not permit a detailed study, it was thought, for the purposes of this report, that satisfactory figures could be obtained by using the mean of six estimates which have been made of the subject. Not all of these estimates have been carried forward to the year 1980, but in such cases curves have been projected to that date. The estimates used are as follows:

1. Estimate of David Weeks, Associate Professor of Agricultural Economics, University of California, 1933. Figures are given for entire state of California only. This is published in ASCE -- publication of the Los Angeles Section, Am. Soc. C. E. for October, 1933. The estimate is based upon a very comprehensive



*Los Angeles
Society*

LOS ANGELES CITY



— POPULATION — LOS ANGELES CITY & COUNTY 1860 - 1980

TO ACCOMPANY REPORT ON A
RAPID TRANSIT SYSTEM FOR
THE CITY OF LOS ANGELES
DONALD M. BAKER, CONS. ENGR

NOVEMBER 1933

1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980

study made for the Division of Water Resources, State Department of Public Works. Future Population of Los Angeles County has been assumed for the current purpose as 37.5% of the future state population, and the population of Los Angeles City assumed as a varying percentage, ranging from 56.1% to 50% of county population.

2. Estimate of future population of Los Angeles City and County by A. L. Sonderegger, consulting engineer, in a report made to the Metropolitan Water District of Southern California in 1930.
3. Estimate of Messrs. Hill, Lippincott & Sonderegger, consulting engineers, of future population of Los Angeles City and County, contained in a report made to the Department of Water & Power, City of Los Angeles, 1924.
4. Estimate of Raymond A. Hill, consulting engineer, of future population of Los Angeles City and County made in connection with a report entitled "Justified Revision of Plan Adopted by the Metropolitan Water District for Construction of the Colorado River Aqueduct" 1932.
5. Estimate of W. C. Yeatman, contained in a report entitled "Population Trends" published by the Los Angeles Bureau of Municipal Research, 1933.
6. Estimate of the writer published in monograph form titled "Estimating and Forecasting Population", 1933.

Population prior to 1930 of the city and county is shown on the attached Plate 4, together with the future population estimates of the various authorities listed above. Figures adopted for the purpose of this report -- which are taken as an average of the above estimates, and not as the result of a special detailed study of future population -- are as follows:

Table 3
 RELATION OF POPULATION
 OF
 LOS ANGELES CITY AND COUNTY

Census Year	POPULATION		RELATION	
	County	City	County City %	City County %
1860	11 333	4 385	258.5	38.7
1870	15 309	5 728	267.3	37.4
1880	33 331	11 183	298.5	33.5
1890	101 454	50 395	201.3	49.7
1900	170 298	102 479	166.1	60.2
1910	504 131	319 198	158.1	63.2
1920	936 455	576 673	162.5	61.5
1930	2 208 492	1 238 048	178.3	56.1

Table 4

GROWTH IN POPULATION OF THE METROPOLITAN AREA OF LOS ANGELES

A. By Zones

Distance from 7th & Bdwy Miles	January - 1923 (a)			July - 1924 (b)			April - 1930 (c)		
	Pop'n	Pop'n: per Acre	% Total	Pop'n	Pop'n: per Acre	% Total	Pop'n	Pop'n: per Acre	% Total
0 to 2	106 000	13.2	11.9	187 000	23.3	16.5	190 000	23.7	14.1
2 to 5	445 000	10.5	49.9	503 000	11.9	44.5	558 000	13.2	41.4
5 to 7.5	221 000	3.5	24.8	306 000	4.8	27.1	409 000	6.5	30.4
7.5 to 10	120 000	1.4	13.4	134 000*	1.5*	11.9	190 000	2.2	14.1
	892 000	4.4	100.0	1 130 000	5.6	100.0	1 347 000	6.7	100.0

B. TOTAL CUMULATIVE

0 to 2	106 000	13.2	11.9	187 000	23.3	16.5	190 000	23.7	14.1
0 to 5	551 000	11.0	61.8	690 000	13.7	61.0	748 000	14.9	55.6
0 to 7.5	772 000	6.8	86.6	996 000	8.8	88.1	1 157 000	10.2	85.8
0 to 10	892 000	4.4	100.0	1 130 000	5.6	100.0	1 347 000	6.7	100.0

C. BY QUADRANTS

Quadrant	January - 1923			April - 1930			Increase 1930 over 1923	
	Pop'n	% Total	Pop'n: per Acre	Pop'n	% Total	Pop'n: per Acre	Population	%
NE	247 000	27.7	4.9	321 000	23.8	6.4	74 000	30.0
SE	228 000	25.6	4.5	308 000	22.9	6.1	80 000	35.1
SW	240 000	26.9	4.8	313 000	23.2	6.2	73 000	30.4
NW	177 000	17.7	3.5	405 000	30.1	8.0	228 000	129.0
Total and Mean	892 000	100.0	4.4	1 347 000	100.0	6.7	455 000	51.0

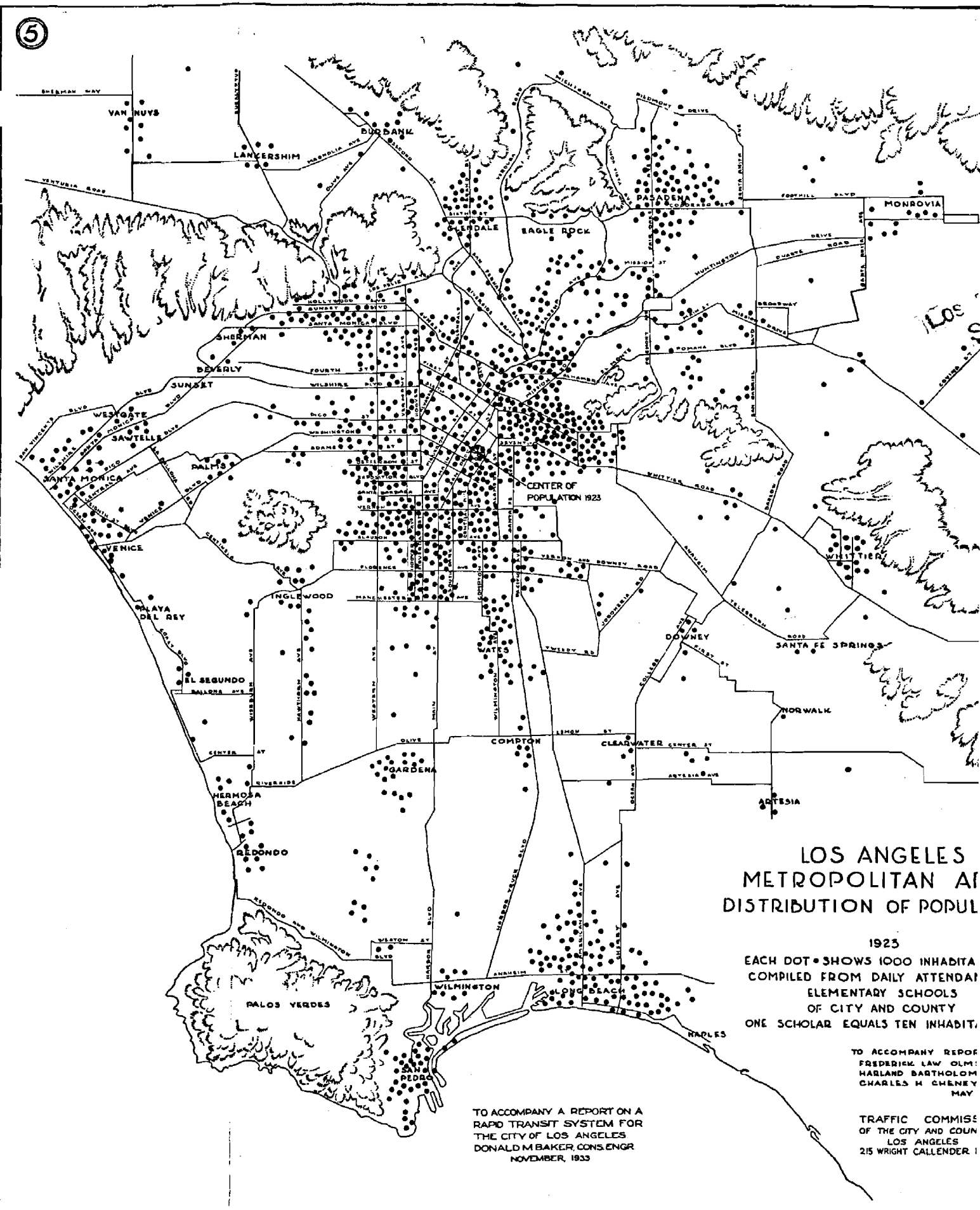
(a) From Major Traffic Street Plan for Los Angeles-Olmsted, Bartholomew & Cheney -- 1924

(b) From Report on Comprehensive Rapid Transit Plan for Los Angeles-Kelker, DeLeuw & Co. -- 1925

(c) From Report on Regrade of Bunker Hill - Wm. H. Babcock & Sons -- 1931

* Estimated

Source: Mass Transportation and Some Related Problems - By Donald M. Baker and presented before Los Angeles Section A.S.C.E. Sept. 1931, and published in the ASCE



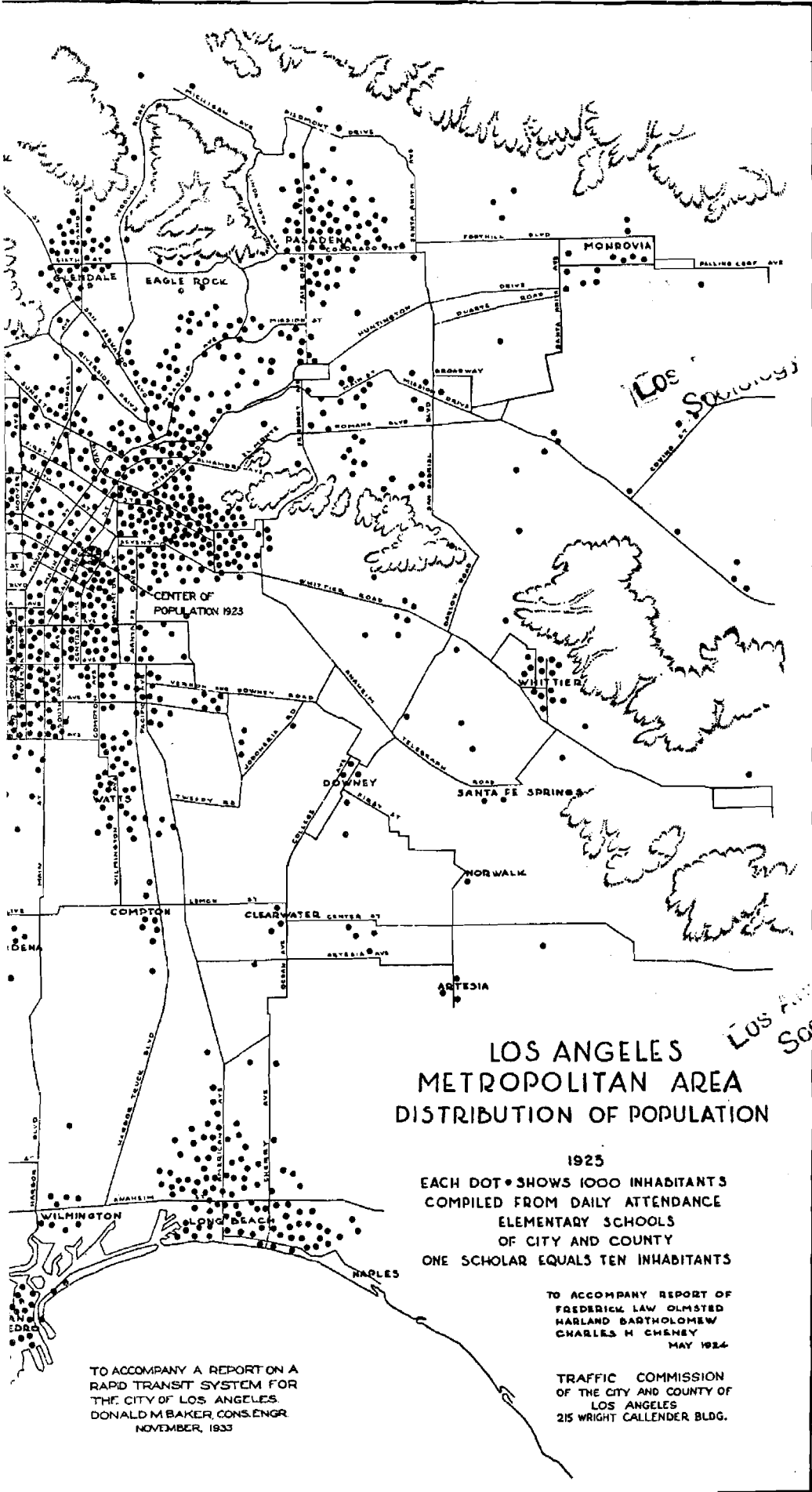
LOS ANGELES METROPOLITAN AREA DISTRIBUTION OF POPULATION 1925

1925
 EACH DOT SHOWS 1000 INHABITANTS
 COMPILED FROM DAILY ATTENDANCE AT
 ELEMENTARY SCHOOLS
 OF CITY AND COUNTY
 ONE SCHOLAR EQUALS TEN INHABITANTS

TO ACCOMPANY REPORT
 BY
 FREDERICK LAW OLMSTEAD
 HARLAND BARTHOLOMEW
 CHARLES H. CHENEY
 MAY 1925

TO ACCOMPANY A REPORT ON A
 RAPID TRANSIT SYSTEM FOR
 THE CITY OF LOS ANGELES
 BY
 DONALD M. BAKER, CONSULTING ENGINEER
 NOVEMBER, 1933

TRAFFIC COMMISSION
 OF THE CITY AND COUNTY
 LOS ANGELES
 215 WRIGHT CALLENDER BUILDING



LOS ANGELES METROPOLITAN AREA DISTRIBUTION OF POPULATION

1925
 EACH DOT SHOWS 1000 INHABITANTS
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 LOS ANGELES
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Year	<u>Los Angeles City</u>		<u>Los Angeles County</u>	
	Number	Increase %	Number	Increase %
1930	1 238 000	35.0	2 208 000	32.7
1940	1 670 000	31.1	2 930 000	25.7
1950	2 190 000	11.4	3 680 000	17.2
1960	2 440 000	10.2	4 310 000	11.8
1970	2 690 000	9.6	4 820 000	7.2
1980	2 950 000		5 170 000	

Distribution of Population

Maps showing the distribution of population for the years 1923 and 1930, and the increase in population for the years 1918 to 1923, and 1923 to 1930, were available for the western section of the county and are shown herein as Plates 5, 6 and 7. The map for 1923 covers an area west of a line about four miles east of Monrovia; whereas the distribution map for 1930 only shows the area west of a line extending thru Arcadia and Artesia -- this area, however, containing about nine-tenths of the county population. The center of population in the area shown on the 1930 map has shifted only slightly since 1918, being located approximately as follows:

1918	Fifth and Spring Streets
1923	Griffith Avonue and Fourteenth St.
1930	Pico and Chorry Streets

Location of new population has shown a decided westward trend. The center of population increase occurring between

6



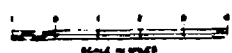
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LEGEND

- CENTER OF POPULATION 1918
- CENTER OF POPULATION 1923
- CENTER OF POPULATION 1930
- CENTER OF POPULATION INCREASE 1918 TO 1923
- CENTER OF POPULATION INCREASE 1923 TO 1930

DISTRIBUTION OF POPULATION
LOS ANGELES AND VICINITY

EACH DOT REPRESENTS 1000 PERSONS
1000



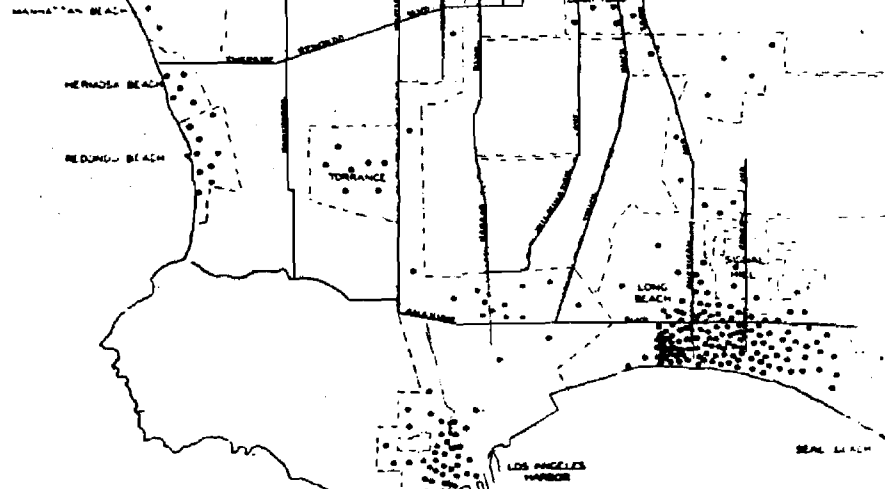
CENTER OF POPULATION INCREASE 1923 TO 1930

CENTER OF POPULATION 1918

CENTER OF POPULATION 1923

CENTER OF POPULATION 1930

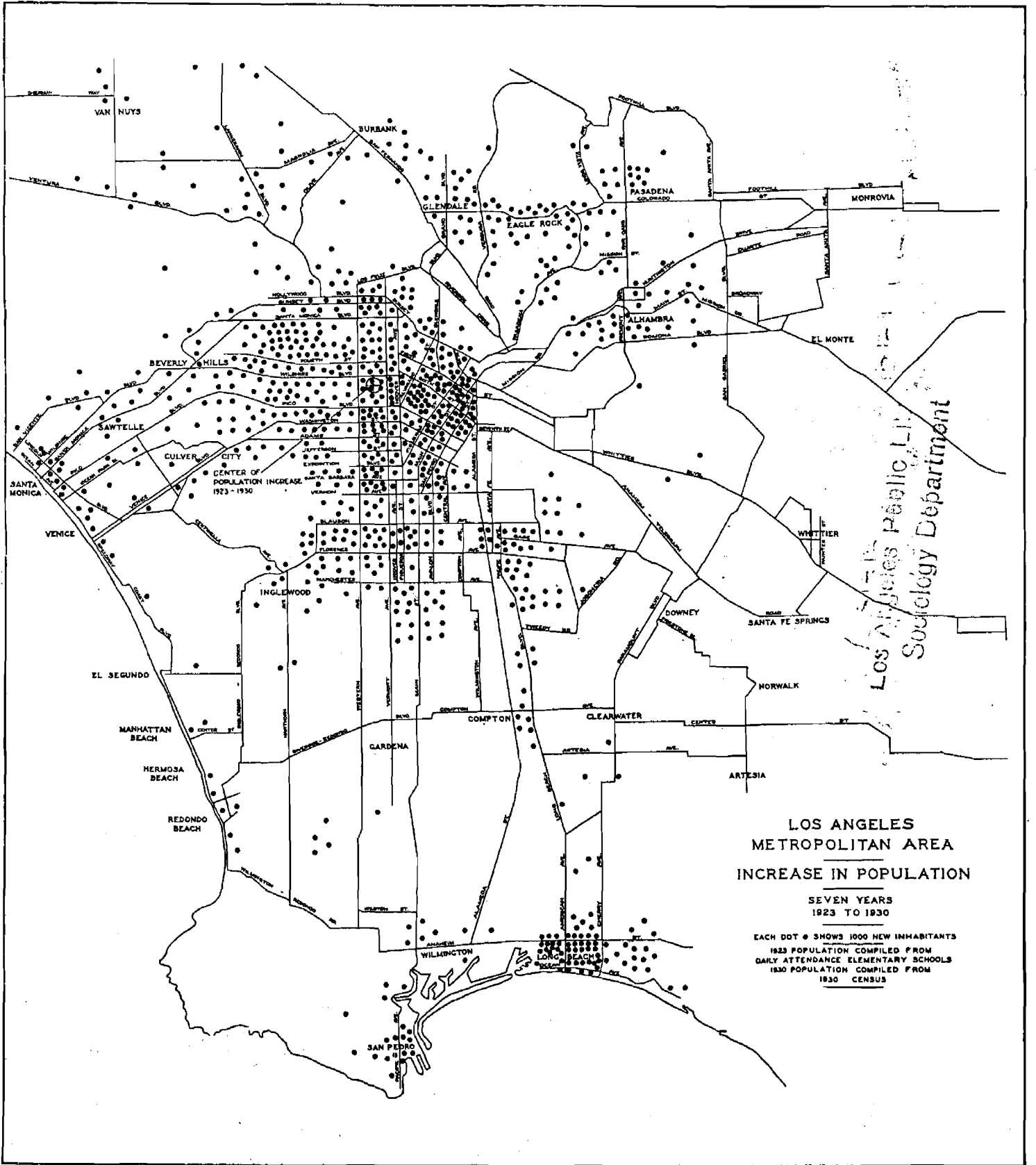
CENTER OF POPULATION INCREASE 1918 TO 1923



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MAP FROM REPORT ON FEASIBILITY OF REGRADING BUNKER HILL,
BY WM. H. BABCOCK & SONS, 1930.

W. H. Babcock & Sons

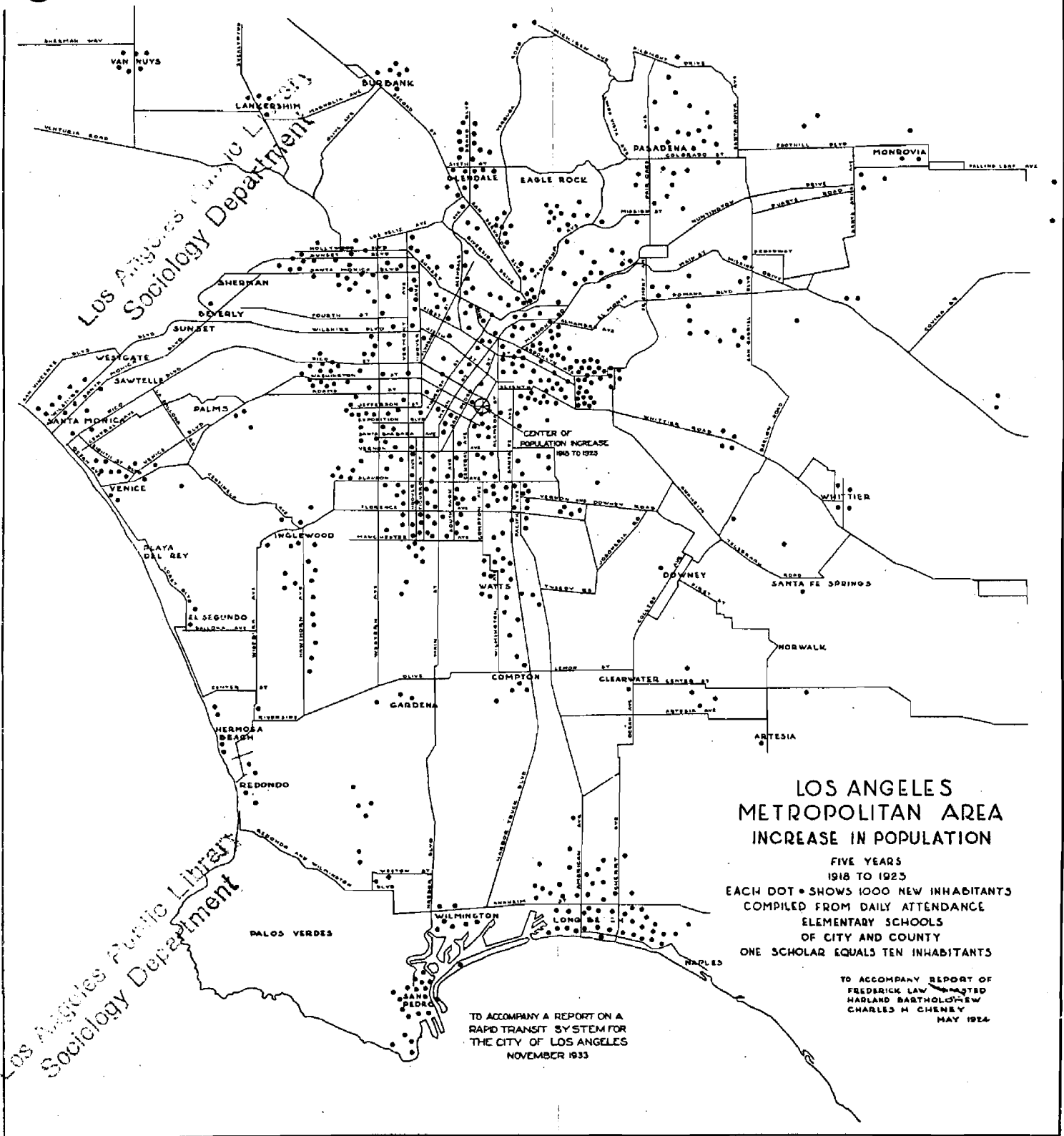


LOS ANGELES
METROPOLITAN AREA
INCREASE IN POPULATION
SEVEN YEARS
1923 TO 1930

EACH DOT • SHOWS 1000 NEW INHABITANTS
1923 POPULATION COMPILED FROM
DAILY ATTENDANCE ELEMENTARY SCHOOLS
1930 POPULATION COMPILED FROM
1930 CENSUS

7

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**LOS ANGELES
METROPOLITAN AREA
INCREASE IN POPULATION**

FIVE YEARS
1918 TO 1923
EACH DOT SHOWS 1000 NEW INHABITANTS
COMPILED FROM DAILY ATTENDANCE
ELEMENTARY SCHOOLS
OF CITY AND COUNTY
ONE SCHOLAR EQUALS TEN INHABITANTS

TO ACCOMPANY REPORT OF
FREDERICK LAW OLMSTED
HARLAND BARTHOLOMEW
CHARLES H. CHENEY
MAY 1924

TO ACCOMPANY A REPORT ON A
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THE CITY OF LOS ANGELES
NOVEMBER 1933

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1918 and 1923 was near Central Avenue and Venice Boulevard; whereas the center of the increase occurring between 1923 and 1930 was in the neighborhood of Ninth Street and Harvard Boulevard, or nearly four miles northwesterly. In all probability this westward tendency will continue, although future industrialization -- particularly if such industrialization occurs in the vicinity of Los Angeles Harbor -- will tend to pull the center of population southward and probably decrease its future westward trend.

Densities of population have tended to increase throughout the entire area, except in the central section, which, as shown on Plate 11, has suffered a loss in density. With the advent of a rapid transit system direction of future population increase will be stabilized, and while increase in density along the rapid transit routes may be expected, the opportunity of living at a distance from the Central Business District and having means of quick access to it will be a strong factor in maintaining continued lower densities.

8

T3N
T2N
T1N
Y1S
T2S
T3S
T4S
T5S

VENTURA COUNTY

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INCORPORATED CITIES
LOS ANGELES COUNTY

R19W

R18W

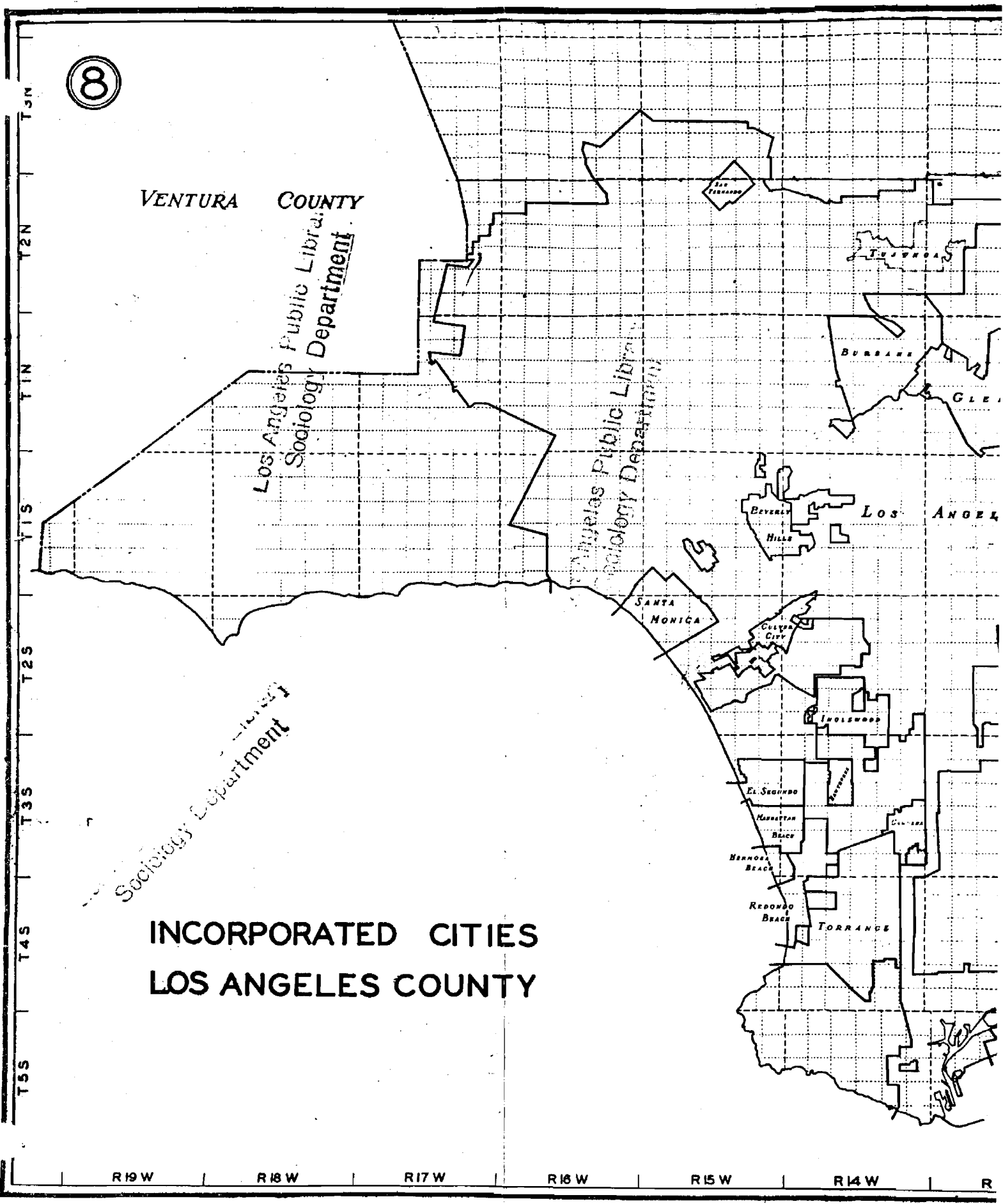
R17W

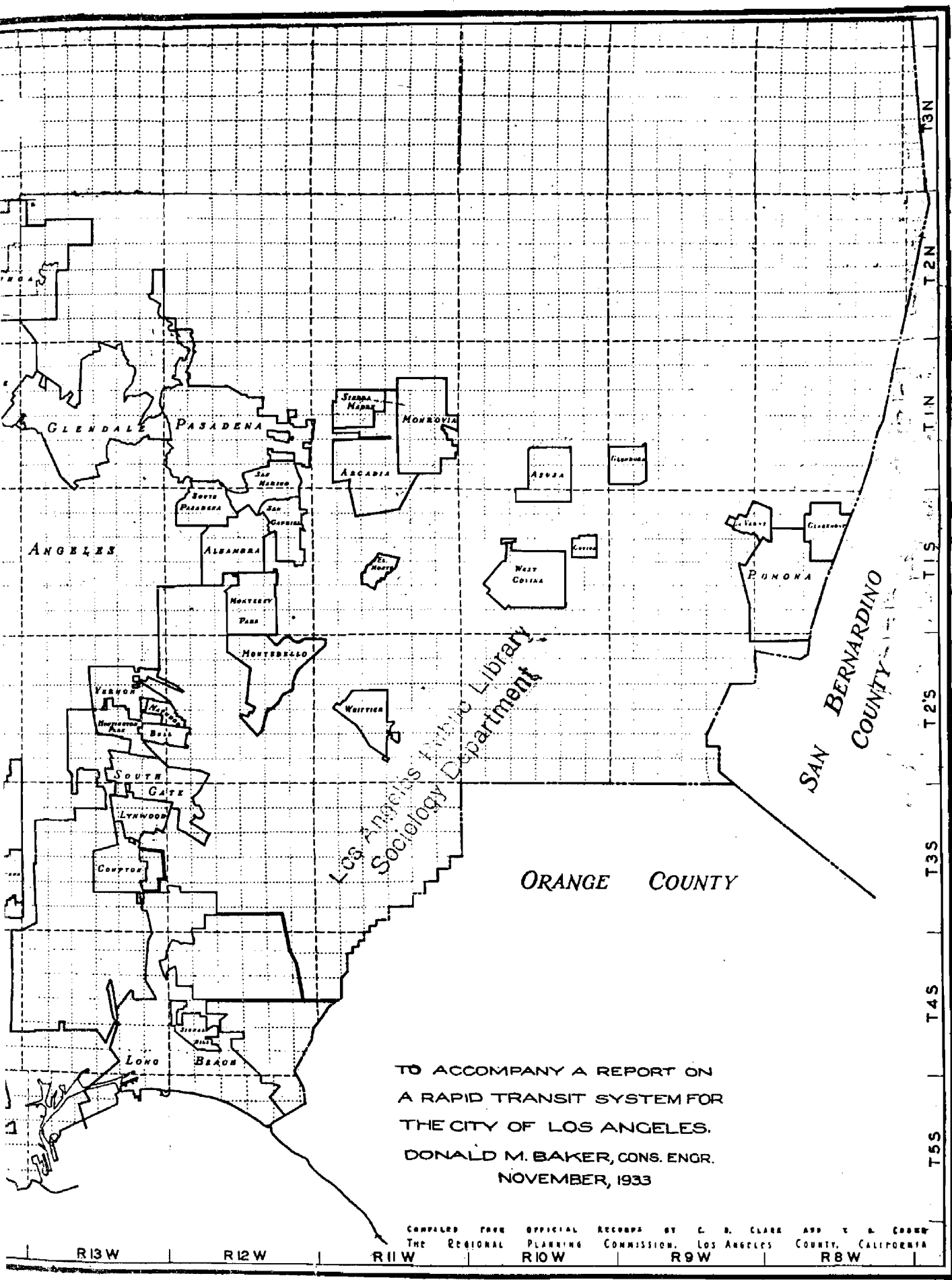
R16W

R15W

R14W

R





TO ACCOMPANY A REPORT ON
 A RAPID TRANSIT SYSTEM FOR
 THE CITY OF LOS ANGELES.
 DONALD M. BAKER, CONS. ENGR.
 NOVEMBER, 1933

COMPILED FROM OFFICIAL RECORDS BY C. D. CLARK AND T. A. COOPER
 THE REGIONAL PLANNING COMMISSION, LOS ANGELES COUNTY, CALIFORNIA

R13W R12W R11W R10W R9W R8W

T1N T2N T3N T4N T5N
 T1S T2S T3S T4S T5S

III.

POLITICAL STRUCTURE & PHYSICAL PATTERN
OF
LOS ANGELES METROPOLITAN DISTRICT

Like other metropolitan districts of similar size throughout the country, the Los Angeles District is made up of a central city with a large number of satellite communities surrounding it, these communities ranging in size from a thousand or so population upwards. Most of them are incorporated cities. Some, like Hollywood, San Pedro and Venice, are within the City of Los Angeles. Some of the incorporated cities, such as San Fernando and Beverly Hills, are entirely encircled by the City of Los Angeles -- while others, like Glendale and Santa Monica, are almost surrounded. A number of independent cities in the past have been consolidated with Los Angeles due to varying reasons.

The County of Los Angeles is a chartered county, governed by a Board of Supervisors of five members elected biennially for four year staggered terms from five supervisorial districts. The county government carries on certain municipal functions within some of the cities of the county, such as assessment of property, collection of taxes, public health service etc., and in unincorporated areas operates many services of a more or less municipal nature, including fire protection, water supply, sewage disposal, through the form of special districts.

The City of Los Angeles operates under a charter

Table 5

COMMUNITIES WITHIN LOS ANGELES METROPOLITAN AREA

COMMUNITY	POPULATION 1930	INCORPORATED	DISTANCE L.A. CITY HALL Miles
<u>LOS ANGELES COUNTY</u>			
Alhambra	29 551	Yes	6.5
Arcadia	5 216	Yes	14
Azusa	4 800	Yes	24
Baldwin Park	4 800	No	17
Bell	7 900	Yes	6
Bellflower	7 600	No	15
Beverly Hills	17 429	Yes	9
Burbank	16 662	Yes	11
Claremont	2 719	Yes	36
Clearwater-Hynes	5 000	No	12
Compton	12 516	Yes	13
Covina	2 775	Yes	22
Culver City	5 591	Yes	9
Downey	4 476	No	16
El Monte	3 454	Yes	14
El Segundo	3 496	Yes	18
Gardena	3 800	Yes	14
Glendale	62 607	Yes	6
Glendora	2 755	Yes	26
Hawthorne	6 574	Yes	12
Hermosa Beach	4 733	Yes	20
Hollywood	(100 000)	(1)	5
Huntington Park	24 575	Yes	5
Inglewood	19 605	Yes	8
La Verne	2 860	Yes	32
Long Beach	142 393	Yes	24
Los Angeles	1 238 048	Yes	
Lynwood	7 298	Yes	12
Manhattan Beach	1 891	Yes	18
Monrovia	10 880	Yes	18
Montebello	5 467	Yes	8
Monterey Park	6 406	Yes	7
North Hollywood	(6 500)	(1)	13
Norwalk	4 449	No	16
Palms-Sawtelle	(14 000)	(1)	28
Pasadena	75 875	Yes	10

Tablo 5. (Con.)

COMMUNITY	1930 POPULATION	INCORPORATED	DISTANCE L.A. CITY HALL Miles
<u>L.A. COUNTY (Con.)</u>			
Pomona	20 695	Yes	32
Redondo Beach	9 328	Yes	23
San Gabriel	7 224	Yes	8
San Fernando	7 559	Yes	22
San Pedro	(34 833)	(1)	24
Santa Monica	36 993	Yes	18
Sierra Madre	3 550	Yes	15
Southgate	19 501	Yes	10
South Pasadena	13 730	Yes	6
Torrance	7 235	Yes	18
Tujunga	(2 311)	(1)	24
Van Nuys	(5 000)	(1)	19
Venice	(13 000)	(1)	15
Vernon	1 269	Yes	3
Watts	(25 000)	(1)	6
W. Los Angeles	(45 332)	(1)	12
Whittier	14 621	Yes	13
Wilmington	(15 486)	(1)	23
<u>ORANGE COUNTY</u>			
Anahcim	10 995	Yes	27
Fullerton	10 860	Yes	25
Orange	8 029	Yes	35
Santa Ana	30 332	Yes	35
<u>SAN BERNARDINO CO.</u>			
Ontario	13 582	Yes	38

(1) Portion of City of Los Angeles.

adopted in 1925. The Mayor, elected for a four year term, is the executive head of the city. Fifteen councilmen are elected biennially from fifteen councilmanic districts, and municipal functions are administered thru sixteen departments each department being under control of a citizen board of commissioners appointed by the Mayor. The city operates its own water and power system, and the harbor.

The other larger municipalities in the county operate under charters, while the smaller ones operate under general municipal government acts. There are 44 incorporated cities within the County of Los Angeles including the central city.

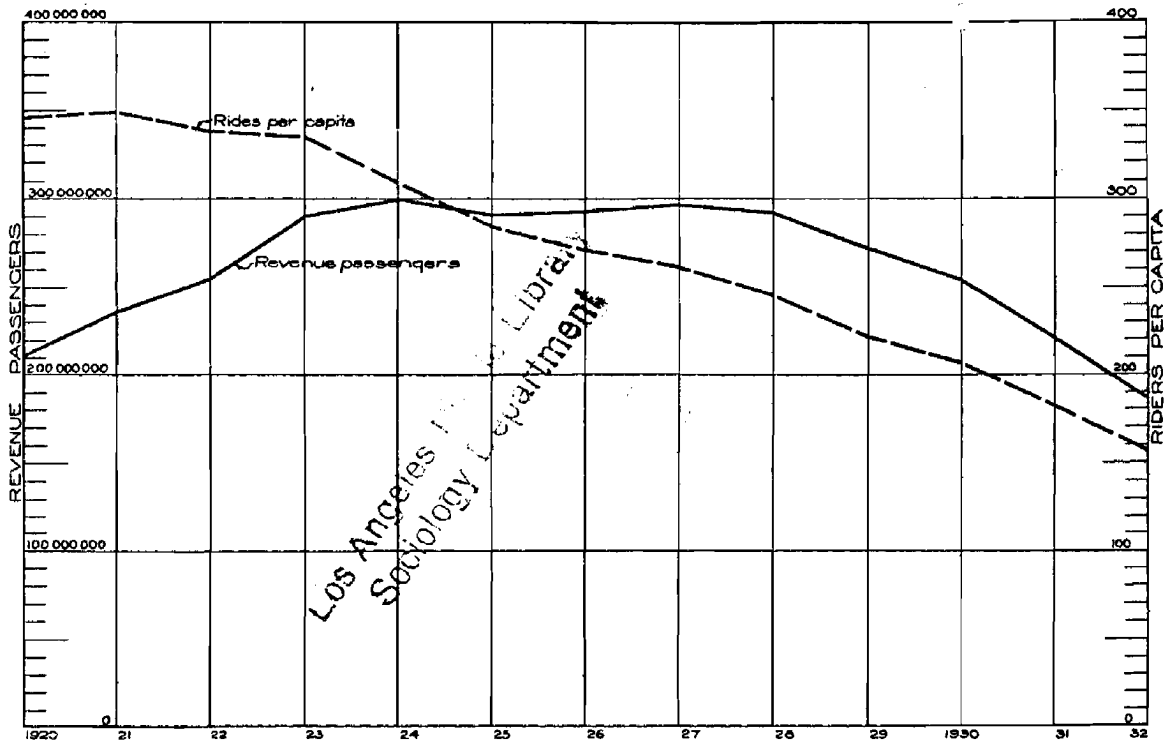
The population of Los Angeles County outside of the city in 1930 was 970,444, of which 648,421 resided in incorporated cities ranging in size from less than 1,000 to over 140,000. The region is characterized by relatively high population density in the urban areas. The high suburban density is due largely to the small farm holdings, which average 42 acres for the entire county, as against 157 acres for the United States as a whole. That this tendency towards smaller holdings is increasing is indicated by the fact that in 1920 average farm holdings in Los Angeles County were 71 acres, as against 149 acres for the country as a whole.

The various sections of the Metropolitan District are connected with the City of Los Angeles by the radiating

interurban electric lines of the Pacific Electric Railroad, and with Los Angeles and each other by a vast network of paved highways. There is practically no interurban rail connection in a circumferential direction between the various satellite communities.

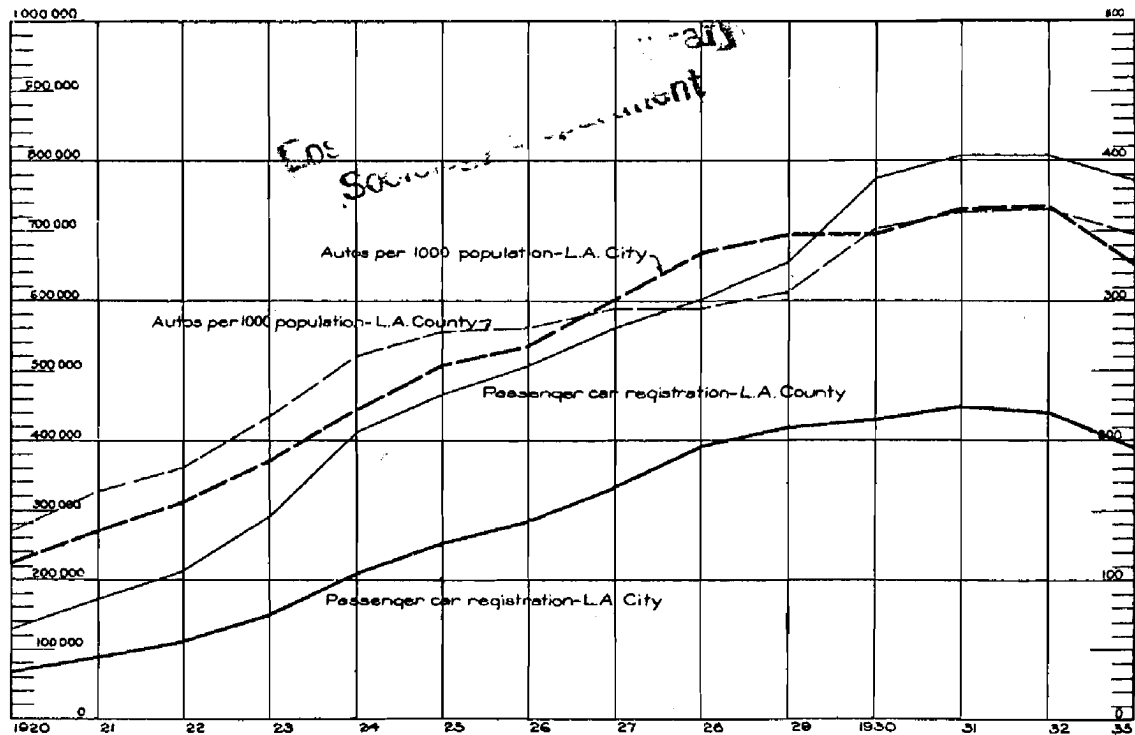
The satellite communities to the west of Los Angeles, from Hollywood and Beverly Hills southerly to Redondo, are primarily residential in character, with the exception of Torrance which has a number of large industries. San Pedro and Wilmington -- south of Los Angeles -- are shipping points, and Long Beach -- the largest city in the county next to Los Angeles -- is a resort, residential and industrial center, as well as having considerable shipping. The communities surrounding the City of Los Angeles to the north and northeast, from Glendale to San Gabriel, are largely residential centers. Those in the San Gabriel Valley are primarily local distributing points in the agricultural centers, while those adjacent to the city on the south and southeast -- such as Maywood, Huntington Park and Vernon --, are industrial communities.

The relatively low density and uniform distribution of population within the built-up section of the City of Los Angeles is due primarily to the following causes, which are more or less inter-related:



Note: Per Capita rides based on total city population.

RAIL AND BUS RIDERS -- LOS ANGELES CITY



PASSENGER CAR REGISTRATION LOS ANGELES CITY AND COUNTY

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SYSTEM FOR THE CITY OF LOS ANGELES.
DONALD M. BAKER, CONS. ENGR. NOVEMBER, 1933

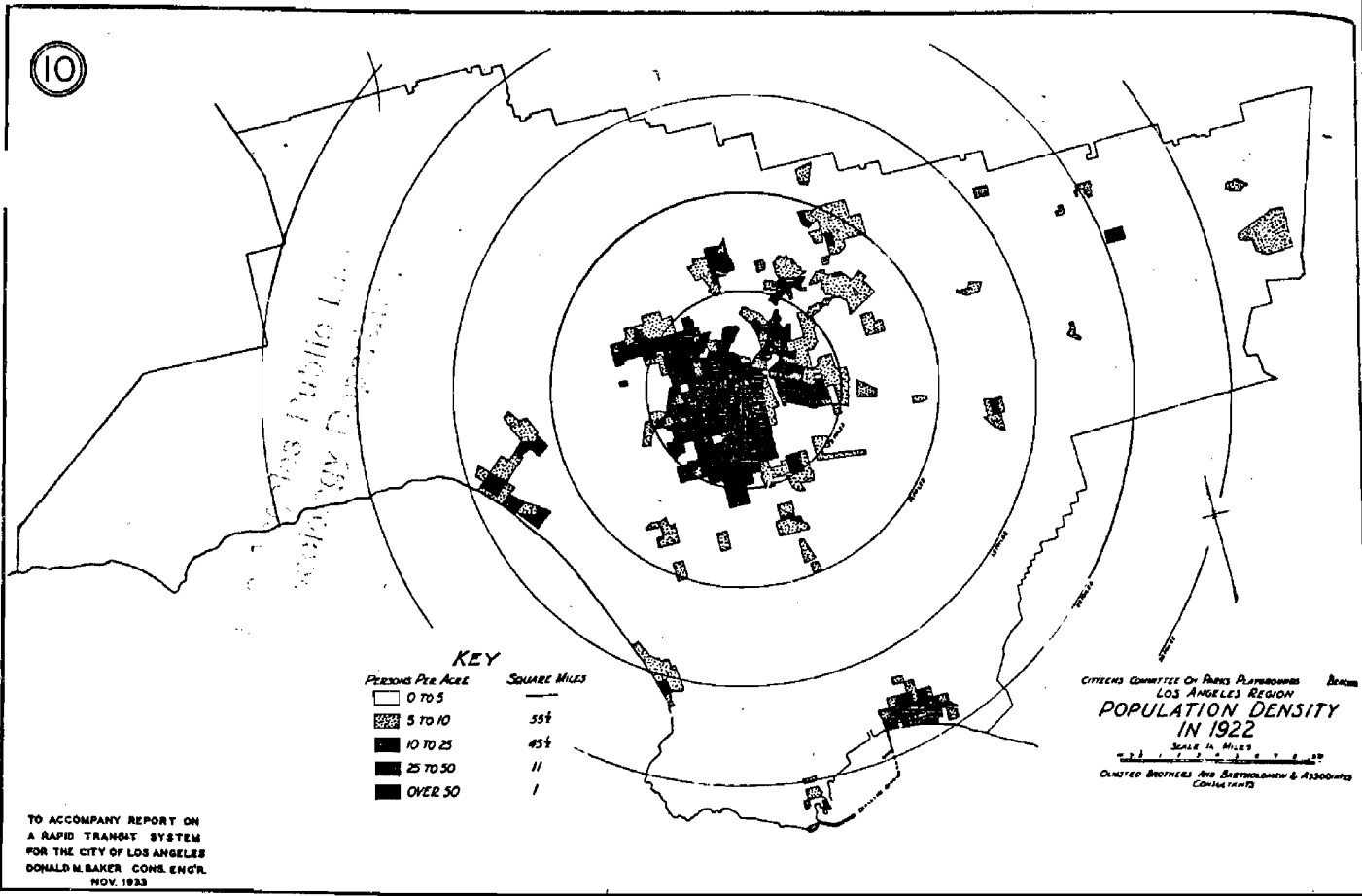
1. The city and district have acquired two-thirds of their population during the past twenty years.

During this period rail facilities have not been extended to any appreciable degree. For example, the Los Angeles Railway Corporation in 1914 was operating 385 miles of line which had increased to only 401 miles, or 4%, in 1930, while the population of the city increased from about 475,000 to 1,238,000 or 260%. The lack of extension of these facilities was due primarily to the increase in the price level which commenced with the World War in 1914, and the existence of a stationary street car fare, which combined to make the financing of extensions unattractive to capital.

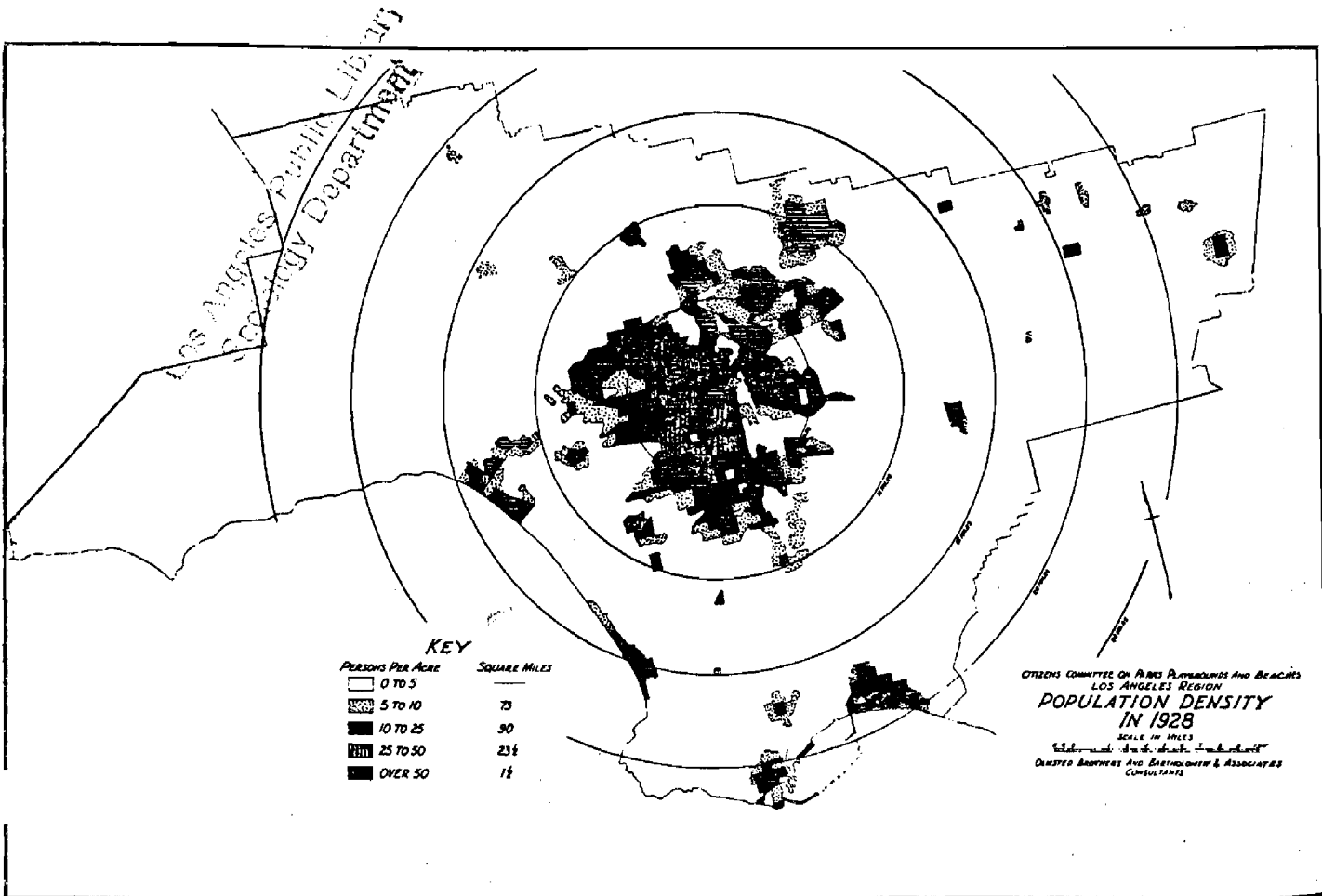
2. The climate of the Los Angeles district allows year around use of the automobile for all purposes.

This has greatly encouraged the intensity of its use. In 1915 there were 17,132 automobiles (35 per thousand population) registered in the city of Los Angeles; whereas in 1931, the city's automobile registration had increased to 447,484 (366 per thousand population). As a result of this, the location of new population coming to the city was not controlled by rail transportation and much of it settled at distances from rail lines, since the motor vehicle was available as a transportation agency.

The city has always been characterized by a high percentage of single family residential occupancy. The trend after the war to 1930 was away from this, as indicated in the following table, but building permits in 1932 indicated a reversal of such tendency.



TO ACCOMPANY REPORT ON
A RAPID TRANSIT SYSTEM
FOR THE CITY OF LOS ANGELES
DONALD M. BAKER CONS. ENGR.
NOV. 1923





KEY

INCREASE IN POPULATION

PERSONS PER ACRE

□ 0 TO 10

■ 10 TO 25

■ 25 TO 50

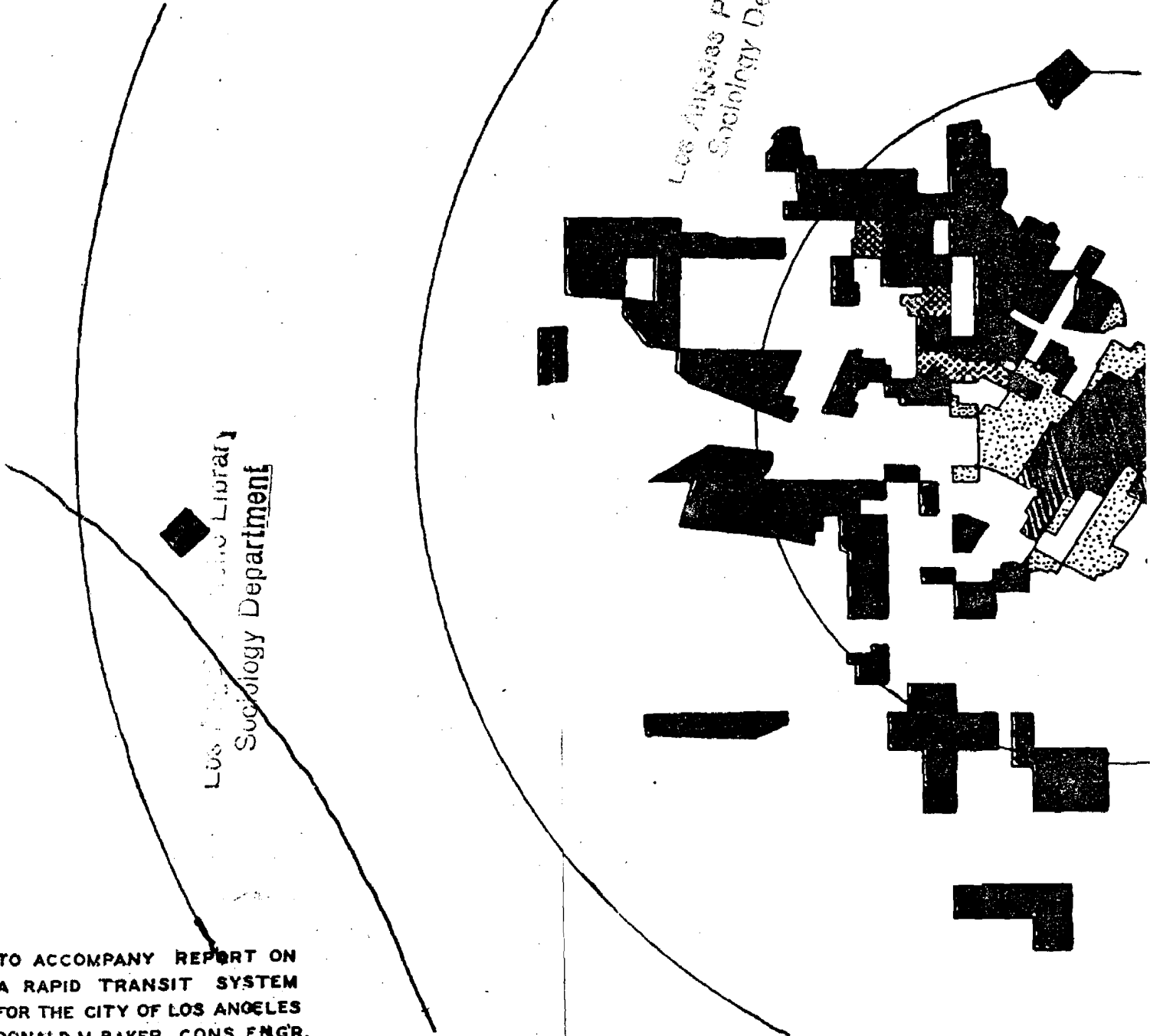
DECREASE IN POPULATION

PERSONS PER ACRE

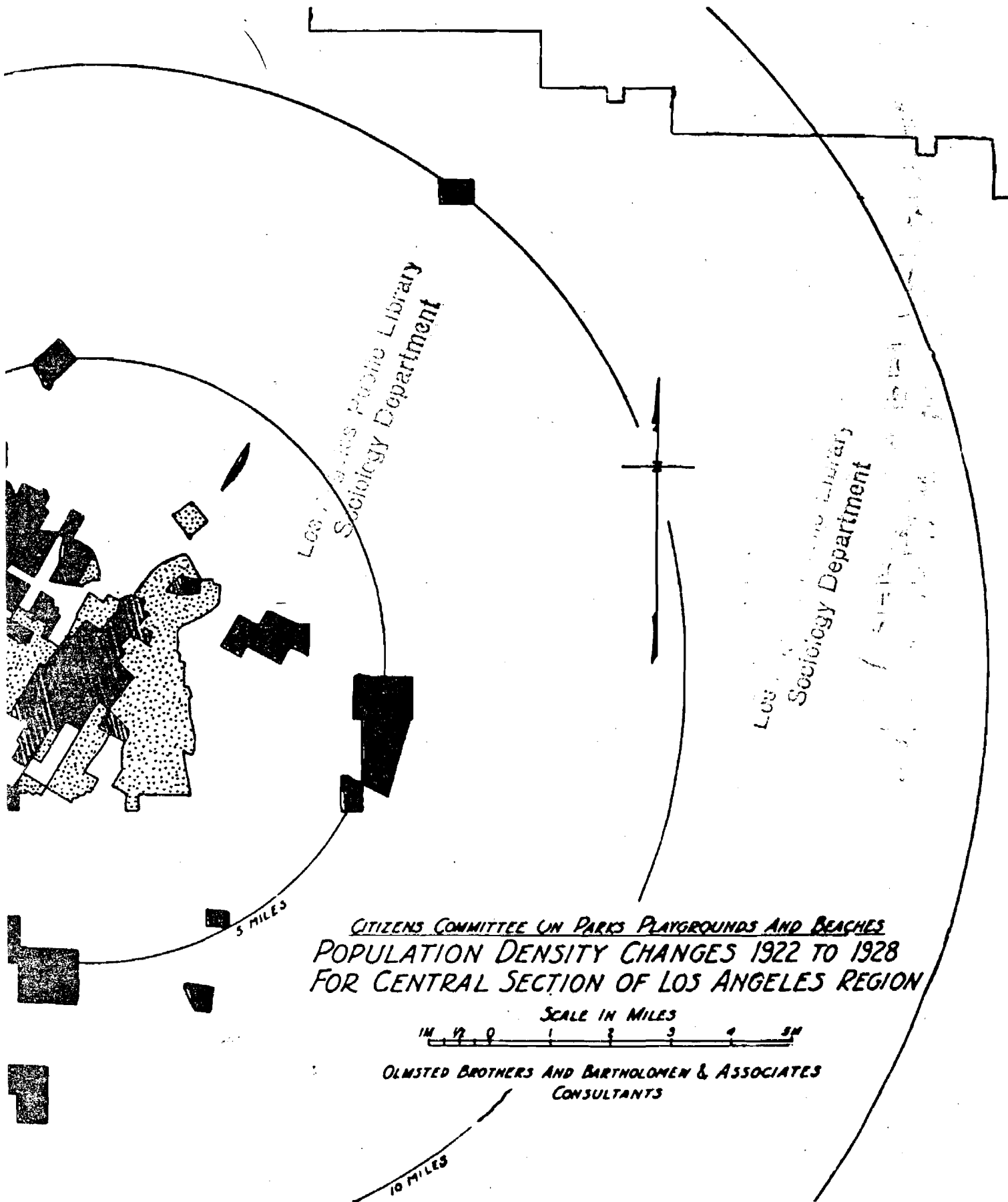
■ 0 TO 10

■ 10 TO 25

■ 25 TO 50



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 NOV. 1933



CITIZENS COMMITTEE ON PARKS PLAYGROUNDS AND BEACHES
POPULATION DENSITY CHANGES 1922 TO 1928
FOR CENTRAL SECTION OF LOS ANGELES REGION

SCALE IN MILES
 0 1 2 3 4 5

OLMSTED BROTHERS AND BARTHOLOMEN & ASSOCIATES
 CONSULTANTS

5 MILES

10 MILES

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FAMILY CAPACITY OF DWELLINGS CONSTRUCTED
CITY OF LOS ANGELES
(From Building & Safety Department, Los Angeles)

	Capacity in Families			
	1919	1923	1930	1932
Total Permits (Residential).....No.	5 312	43 842	11 437	2 703
% Total	100.0	100.0	100.0	100.0
Single Family Permits.....No.	4 112	19 509	4 207	1 819
% Total	77.3	44.5	36.8	67.3
Double Family Permits.....No.	589	11 082	2 103	440
% Total	11.1	25.2	18.4	16.2
Single & Double Family Permits....No.	4 701	30 591	6 310	2 259
% Total	88.4	69.7	55.2	83.5
Other Residential Apts, Flats, etc...No.	611	13 251	5 127	444
% Total	11.6	30.3	44.8	16.5

The physical pattern developed as a result of these causes has many advantages, chief among them being the lack of over-crowding with the high percentage of single family residential occupancy, but certain disadvantages are commencing to become apparent, and with increasing population will become acute and require attention. Among the most important of these are:

1. Lack of stability of land values, with consequent losses in investments.
2. Losses of time due to traffic congestion.

Unstable real estate values are always associated with rapid community growth, but with nothing to permanently anchor travel routes, instability of uses and values has been greatly aggravated. Opening of new traffic arteries -- made necessary by increase in use of automobiles -- cause shifts in traffic.

Business centers which spring up as a result of their accessibility by rail or motor vehicle soon find traffic congestion in their proximity forcing business away and new centers developing. Residential districts likewise soon lose their attractiveness due to congestion caused by increasing motor vehicle traffic.

As long as the community was growing at a rapid rate, these disadvantages were not keenly felt, but less rapid growth has caused serious attention to be given them. The effect upon the Central Business District is discussed in Section VI of this report.

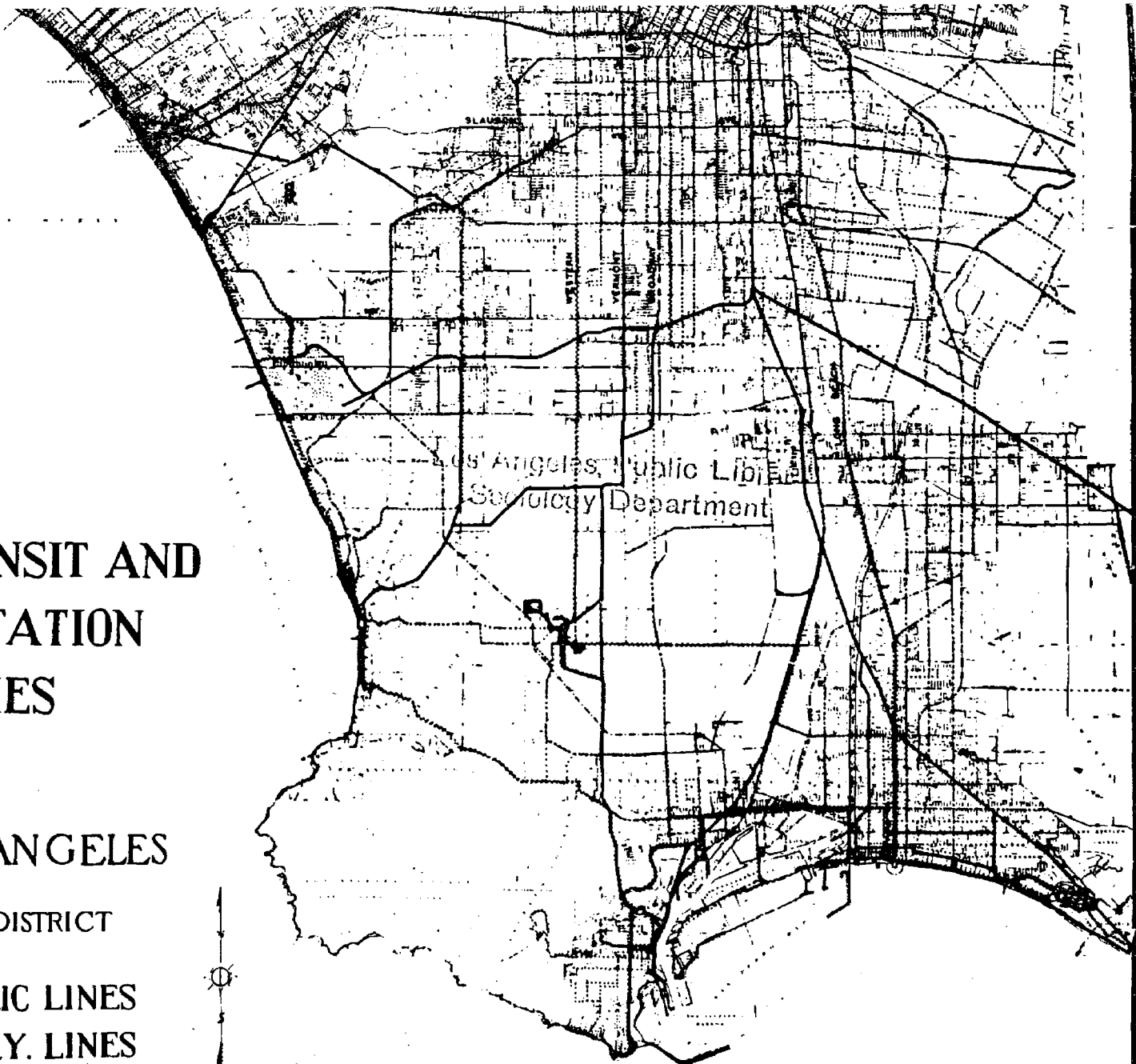
EXISTING TRANSIT AND TRANSPORTATION FACILITIES

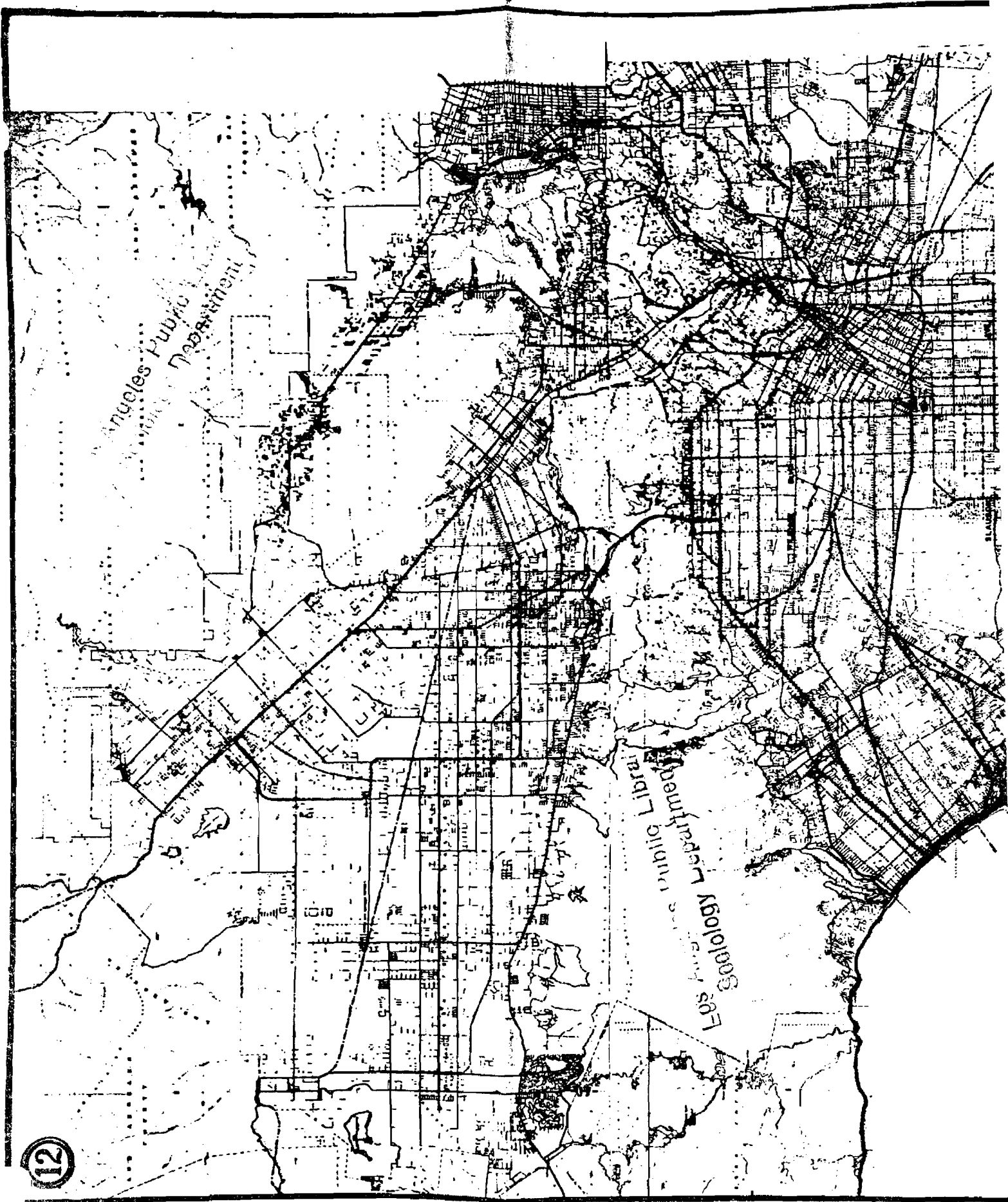
CITY OF LOS ANGELES

AND THE
METROPOLITAN DISTRICT

- PACIFIC ELECTRIC LINES
- LOS ANGELES RY. LINES
- STEAM RAILROADS
- MOTOR BUS LINES

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DONALD M. BAKER CONS. ENGR.
NOVEMBER 1933





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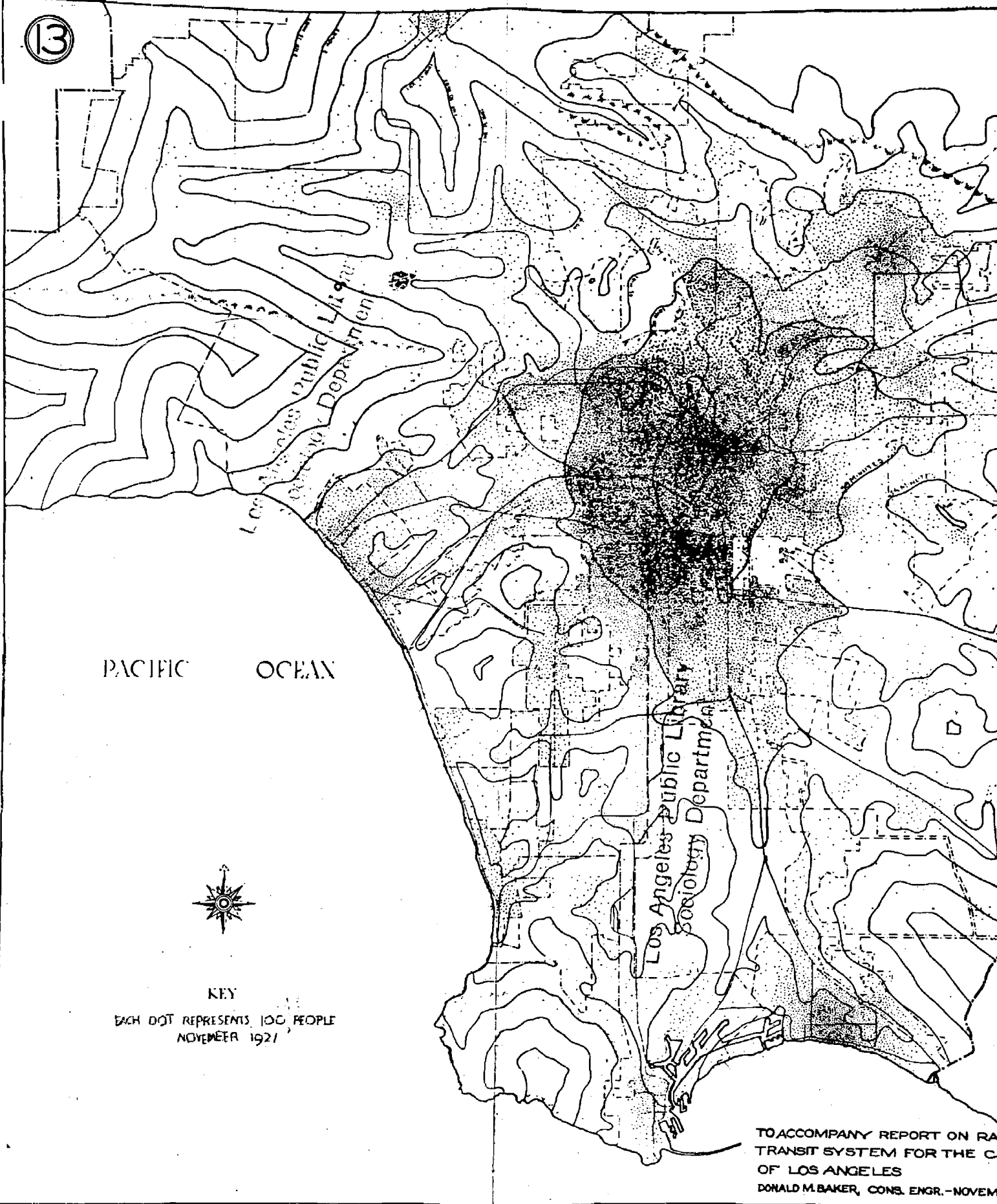
IV.

EXISTING TRANSIT AND TRANSPORTATION
FACILITIES AND SERVICE

The developed area of the City of Los Angeles may be said to be fairly well served by surface transit facilities, much of the subdivided area being without improvements or transit facilities. Within a five mile radius of the central part of the city there are more surface transit facilities than are required, but due to the great extent of automobile traffic and the intensive use of the major traffic thoroughfares which cross the transit lines in this area, the time required to reach the central part of the city on the transit lines is excessive.

The combination transit system operated by the Pacific Electric Railway introduces interurban rail, as well as city traffic, into the central area. Los Angeles does not have a unified transit service, it being supplied by many different companies. The principal urban surface lines within the five mile area are those of the Los Angeles Railway Company and the bus lines of the Los Angeles Motor Coach Company, jointly owned and operated by the Pacific Electric Railway and Los Angeles Railway. The distribution of transit and transportation facilities within the city is shown on the opposite Plate 12. A separation is not made, however, between all of the companies. The four indications designate the four principal types of transit and transportation facilities:

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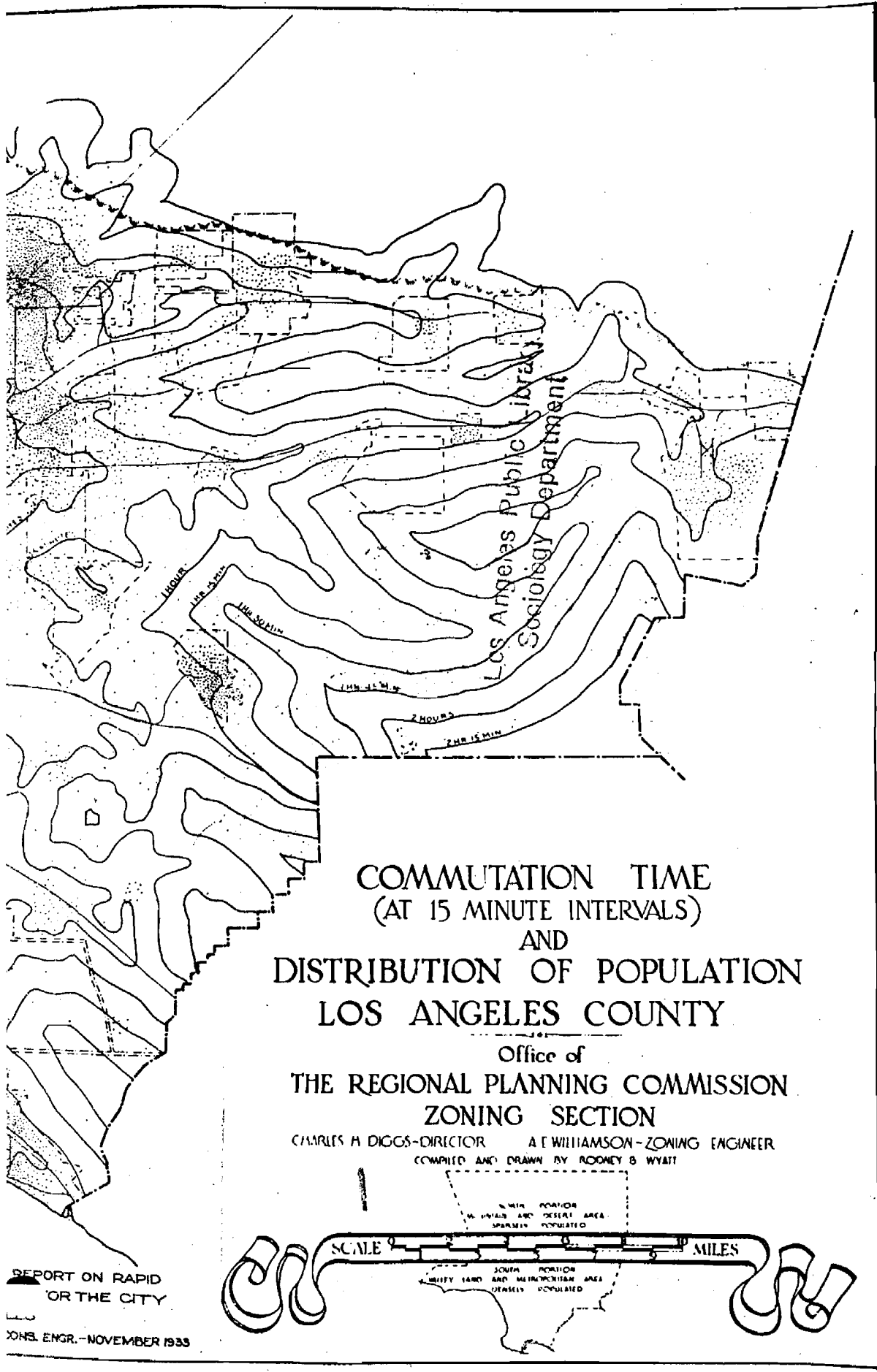


PACIFIC OCEAN



KEY
EACH DOT REPRESENTS 100 PEOPLE
NOVEMBER 1921

TO ACCOMPANY REPORT ON RA
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OF LOS ANGELES
DONALD M. BAKER, CONS. ENGR. - NOVEM

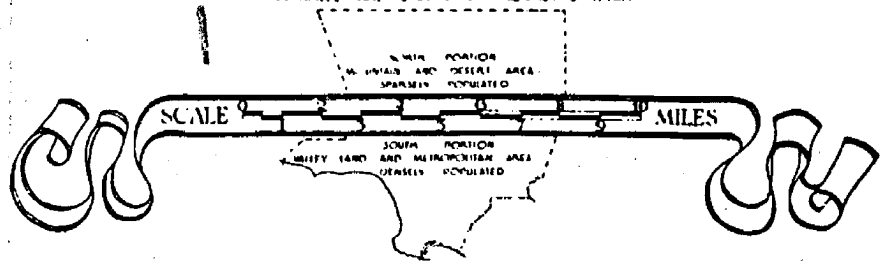


COMMUTATION TIME
 (AT 15 MINUTE INTERVALS)
 AND
 DISTRIBUTION OF POPULATION
 LOS ANGELES COUNTY

Office of
 THE REGIONAL PLANNING COMMISSION
 ZONING SECTION

CHARLES H. DIGGS - DIRECTOR A. F. WILLIAMSON - ZONING ENGINEER
 COMPILED AND DRAWN BY RODNEY B. WYATT

REPORT ON RAPID
 GROWTH OF THE CITY
 U.S. ENGR. - NOVEMBER 1933



Interurban and local lines of the Pacific Electric Railway

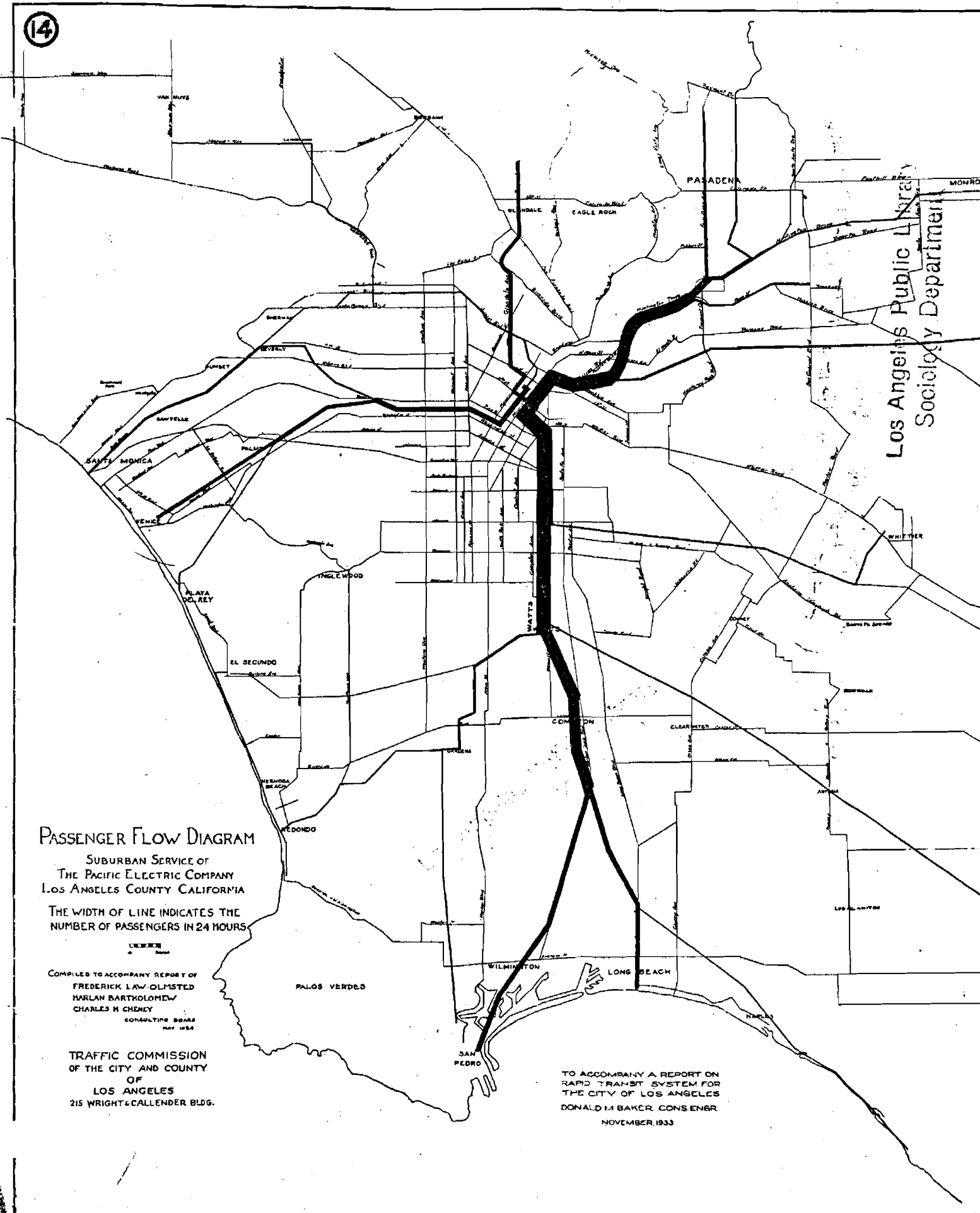
Electric street railway lines of the Los Angeles Railway Company

Motor Coach lines owned and operated by various companies

Steam railroads.

Pacific Electric Railway Local and Interurban System

The lines of this company radiate in four principal directions from terminals located in the Central Business District. To the west and northwest, local service extends to Vineyard and Hollywood, with interurban service beyond that to the San Fernando Valley and to the Pacific Coast at various beaches from Santa Monica to Redondo. Northward is a rather heavily used line to the Cities of Glendale and Burbank, with local service supplied north of the central business section to the Los Angeles River. To the east and northeast, local service is supplied to that part of the city lying between the Central Business District and Pasadena, Alhambra, Monterey Park and Montebello, the interurban lines extending beyond serving these municipalities and Altadena, Arcadia, El Monte, Monrovia, San Gabriel, Whittier, and eastward to San Bernardino and Riverside. Southward the heavily used local lines extend to Slauson Junction and Watts, with interurban service being supplied to the Harbor district at San Pedro, Wilmington and Long Beach and beyond with branch lines ex-



Los Angeles Public Utility
Society Department

PASSENGER FLOW DIAGRAM

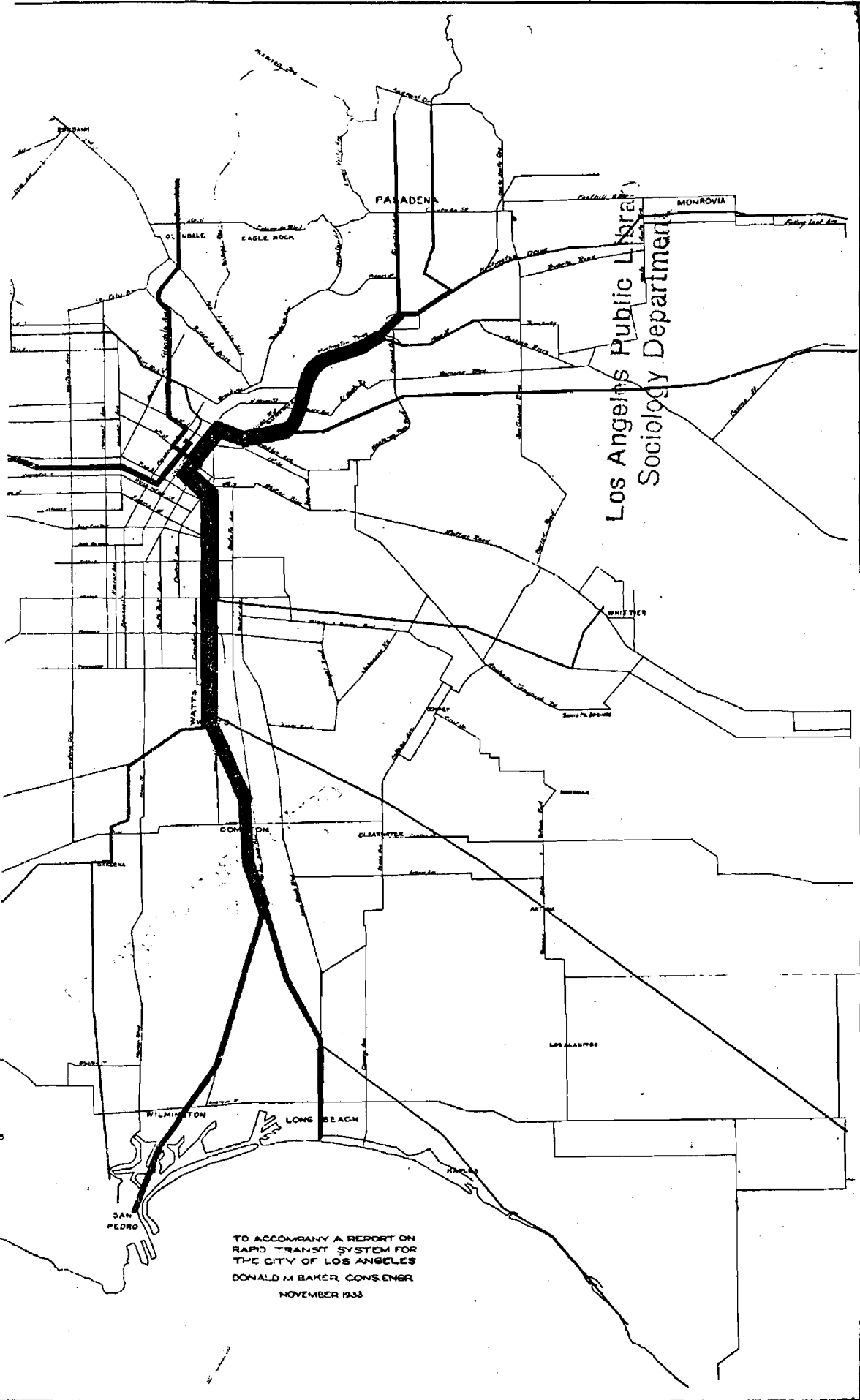
SUBURBAN SERVICE OF
THE PACIFIC ELECTRIC COMPANY
LOS ANGELES COUNTY CALIFORNIA

THE WIDTH OF LINE INDICATES THE
NUMBER OF PASSENGERS IN 24 HOURS

COMPILED TO ACCOMPANY REPORT OF
FREDERICK LAW OLMSTED
HARLAN BARTHOLOMEW
CHARLES H CHENEY
CONSULTING BOARD
MAY 1934

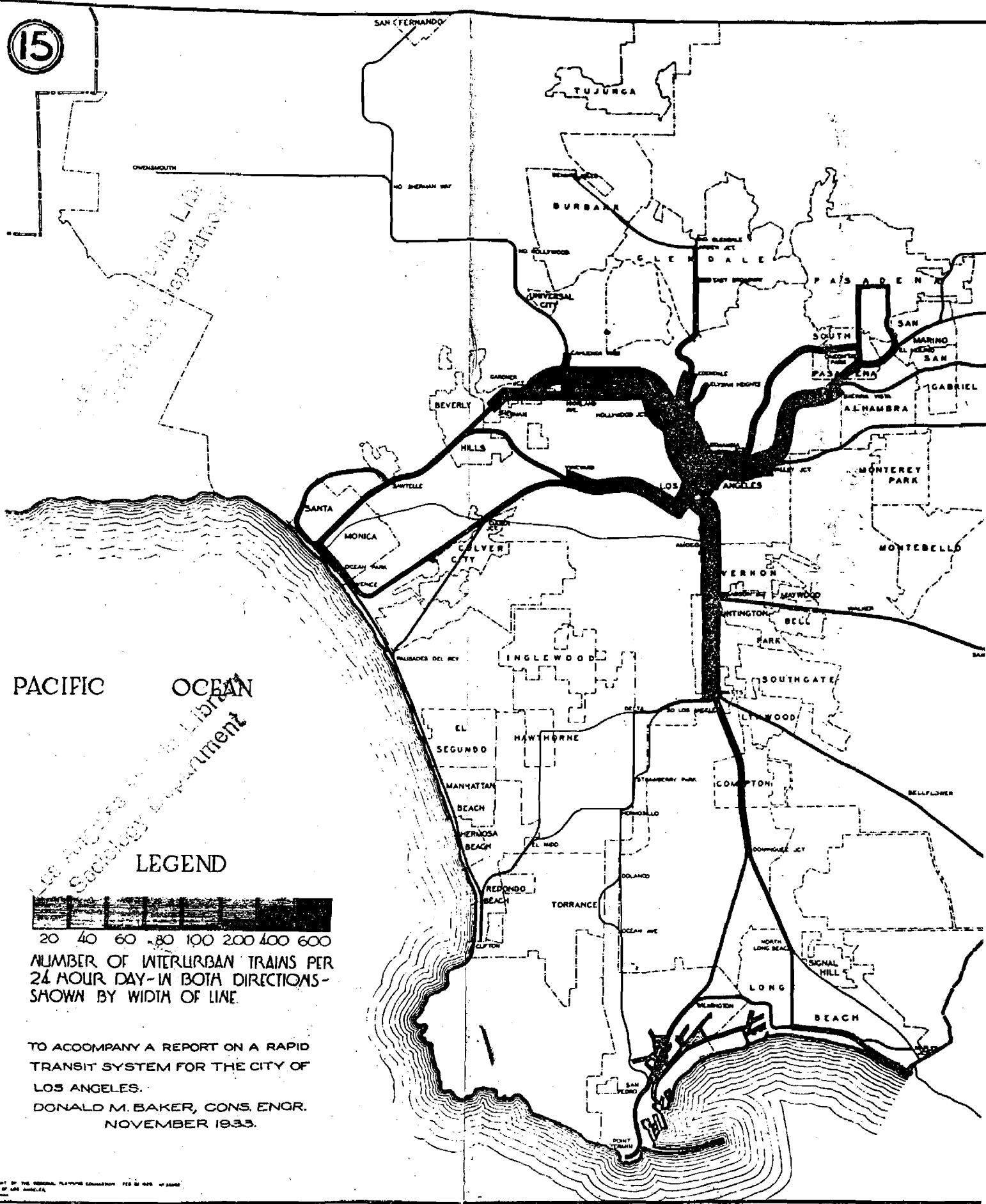
TRAFFIC COMMISSION
OF THE CITY AND COUNTY
OF
LOS ANGELES
215 WRIGHT & CALLENDER BLDG.

TO ACCOMPANY A REPORT ON
RAPID TRANSIT SYSTEM FOR
THE CITY OF LOS ANGELES
DONALD M BAKER CONSULTING ENGR
NOVEMBER 1933



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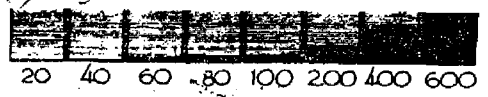
TO ACCOMPANY A REPORT ON
RAPID TRANSIT SYSTEM FOR
THE CITY OF LOS ANGELES
DONALD M. BAKER, CONSULTANT
NOVEMBER 1933



PACIFIC OCEAN

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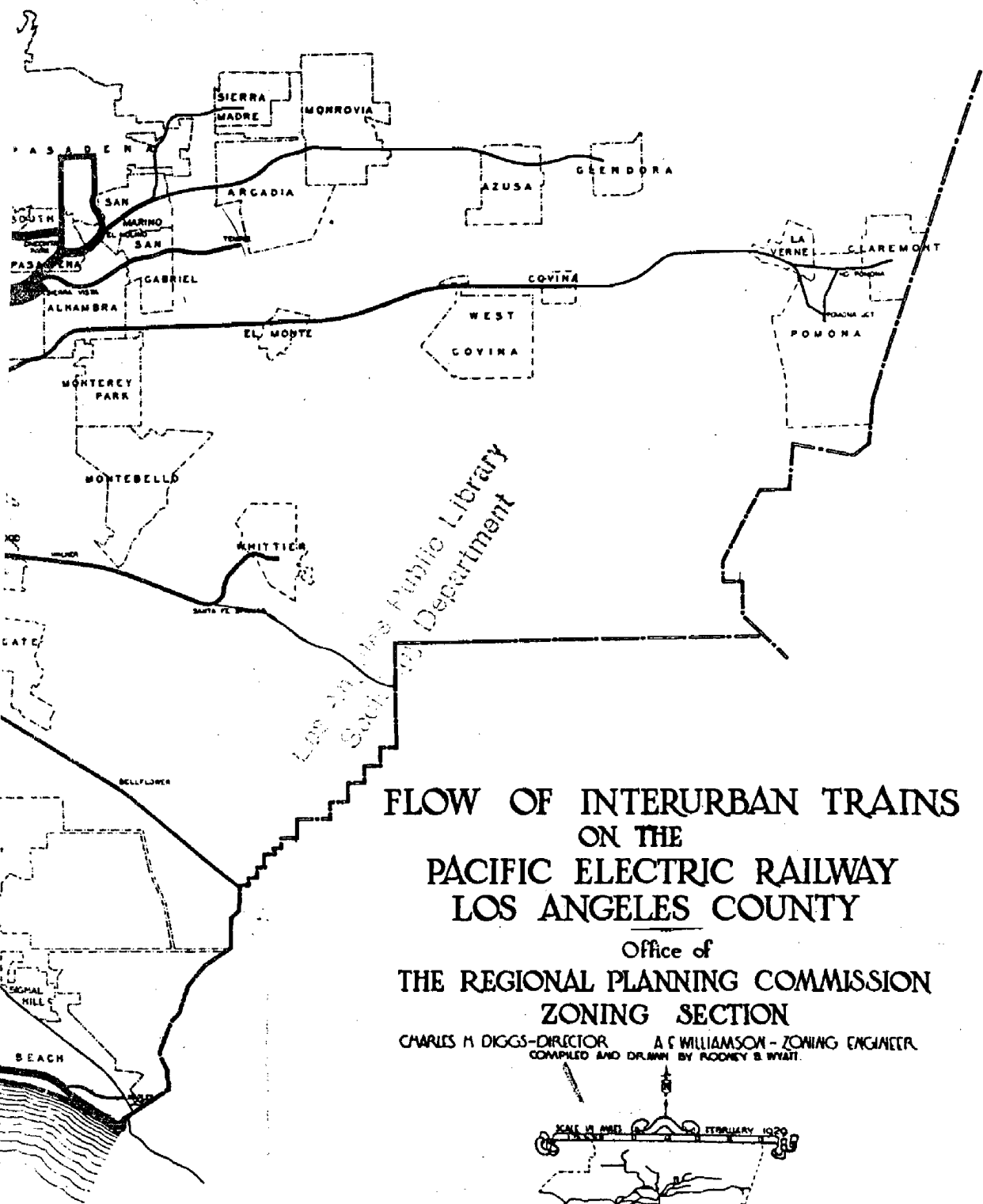
LEGEND



NUMBER OF INTERURBAN TRAINS PER 24 HOUR DAY- IN BOTH DIRECTIONS- SHOWN BY WIDTH OF LINE.

TO ACCOMPANY A REPORT ON A RAPID TRANSIT SYSTEM FOR THE CITY OF LOS ANGELES.

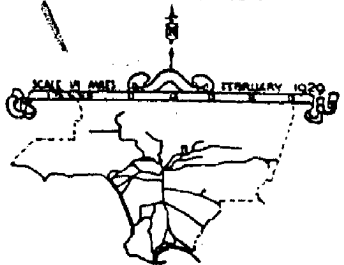
DONALD M. BAKER, CONS. ENGR. NOVEMBER 1933.



**FLOW OF INTERURBAN TRAINS
ON THE
PACIFIC ELECTRIC RAILWAY
LOS ANGELES COUNTY**

Office of
**THE REGIONAL PLANNING COMMISSION
ZONING SECTION**

CHARLES M. DIGGS - DIRECTOR A. C. WILLIAMSON - ZONING ENGINEER
COMPILED AND DRAWN BY RODNEY B. WYATT



tending from Watts westward to the Pacific Ocean at Redondo and southeastward to Artesia in Los Angeles County, and Stanton and Santa Ana in Orange County.

The relative intensity of use of these various principal lines is indicated on the traffic flow diagram Plate 15. The miles of track included in the system at present and during the past two decades, the number of passengers carried each year on the two systems, and the number of car-miles operated, are shown on Table 6. The system is arranged, in general, so as to pass through the principal dwelling areas in the entire region, altho the electric lines of the Los Angeles Railway Company are necessary in serving the closer-in areas.

There is a rather unnecessary amount of duplication of service by other transportation agencies noticeable on Sunset, Hollywood and Santa Monica Boulevards, and in the outlying areas to the west. This is one result of the lack of unification of transit facilities. As a foundation for a rapid transit system, it is doubtful if the Pacific Electric lines could be located to better advantage than they are at present, altho as will be noted in the closer-in sections of the rapid transit system proposed, some slight adjustments are made to meet existing distribution of population and construction conditions to best advantage.

The regional highway plan and the existing status of grade crossing eliminations at the intersection of

Table 6

PACIFIC ELECTRIC RAILWAY

Year	Miles of Track Operated		: Car Miles Operated :		Revenue Passengers :		Car Miles : per Mile : of Track :	Revenue Passengers per car Mile
	Number	% of 1914	Number	% of 1914	Number	% of 1914		

RAIL LINES

1914	1005.8	100	26 553 127	100	70 678 719	100	26 400	2.66
1915	1058.9	105	26 352 589	99	64 719 754	92	24 900	2.45
1916	1054.5	106	25 712 283	97	63 530 501	90	24 200	2.47
1917	1076.6	107	26 898 331	101	65 028 315	92	25 000	2.42
1918	1092.7	109	28 284 419	106	67 915 099	96	25 900	2.40
1919	1095.3	109	25 509 350	97	68 379 676	97	23 400	2.67
1920	1100.9	110	28 382 145	107	84 492 579	120	25 800	2.98
1921	1106.1	110	29 091 665	109	88 539 486	126	26 300	3.05
1922	1114.9	111	29 082 672	109	88 124 305	125	26 100	3.03
1923	1125.7	112	31 411 749	118	100 073 544	143	27 900	3.18
1924	1138.6	113	33 082 082	124	100 907 063	143	29 000	3.05
1925	1160.7	116	32 367 443	122	94 752 809	134	27 800	2.93
1926	1164.4	116	31 991 909	120	92 837 726	131	27 500	2.90
1927	1151.6	114	26 116 561	98	79 823 715	113	22 700	3.06
1928	1149.1	114	26 130 729	98	80 495 384	114	22 800	3.08
1929	1112.2	110	26 017 479	98	81 979 005	116	23 400	3.15
1930	1119.1	111	24 889 540	94	75 558 601	107	22 200	3.04
1931	1111.2	110	22 892 890	86	66 230 179	94	20 600	2.89
1932	1106.2	110	20 774 941	78	54 884 879	78	18 800	2.64

Table 6 - Cont.

Pacific Electric Railway

Year	Busses Operated		Bus Miles Operated		Revenue Passengers		Bus Miles	Revenue Passengers
	Number	% of 1927	Number	% of 1927	Number	% of 1927		

- BUS LINES -

Note: Bus Operations prior to 1927 included in Rail Line Figures.

1927	167	100	5 285 979	100	11 804 369	100	31 600	2.23
1928	117	70	5 882 024	111	13 268 712	112	50 300	2.25
1929	131	79	5 458 170	122	15 038 146	127	49 400	2.33
1930	141	84	7 008 129	133	14 978 119	127	49 700	2.14
1931	170	102	6 736 051	127	13 850 399	117	39 700	2.06
1932	138	83	6 751 226	128	12 210 097	103	48 600	1.81

Table 6 - Cont.

LOS ANGELES RAILWAY

Year	Miles of Track Operated :		: Car Miles Operated :		: Revenue Passengers :		: Car Miles :		Revenue
	Number	% of	Number	% of	Number	% of	per mile	Passengers	
	1914	1914	1914	1914	1914	1914	of track	per car mile	
- RAIL LINES -									
1914	385.8	100	30 078 929	100	140 019 381	100	77 800	4.67	
1915	385.1	101	29 251 200	97	125 939 855	90	75 200	4.32	
1916	391.3	102	29 455 552	98	121 574 028	87	75 200	3.53	
1917	390.9	101	30 053 573	100	123 074 300	88	76 800	4.10	
1918	387.8	101	31 243 690	104	130 358 704	93	80 500	4.15	
1919	388.9	101	28 563 366	95	145 424 597	104	73 400	5.09	
1920	390.6	101	29 980 055	100	179 227 041	128	76 700	6.00	
1921	384.6	100	30 062 428	100	200 978 652	143	78 200	6.55	
1922	384.6	100	29 458 292	98	219 022 470	156	76 700	7.40	
1923	395.9	103	31 974 244	106	247 956 553	177	80 700	7.75	
1924	397.1	103	34 103 134	113	252 530 337	180	85 800	7.40	
1925	401.3	104	33 612 520	112	243 402 571	174	83 800	7.20	
1926	402.3	104	33 337 023	111	242 323 419	173	82 800	7.25	
1927	405.7	105	32 992 573	110	242 831 558	173	81 200	7.32	
1928	405.1	105	33 193 370	110	235 721 106	169	81 700	7.10	
1929	401.4	104	32 993 047	110	204 305 741	145	82 200	6.20	
1930	401.4	104	30 425 617	101	196 325 900	133	76 000	5.12	
1931	405.5	105	29 123 452	97	164 302 591	119	71 700	5.53	
1932	404.9	105	26 553 917	99	139 491 393	99	65 800	5.12	

Table 5 - Cont.

Los Angeles Railway

Year	Busses Operated		Bus Miles Operated		Revenue Passengers		Bus Miles per bus	Revenue Passengers per bus mile
	Number	% of 1924	Number	% of 1924	Number	% of 1924		

- BUS LINES -

1923	5	7	284 732	28	524 240	28	48 800	1.98
1924	22	100	1 035 563	100	2 245 573	100	12 700	2.16
1925	114	139	1 835 112	187	4 742 874	211	17 000	2.45
1926	138	170	2 558 408	288	3 457 158	377	21 500	2.82
1927	119	145	4 051 588	391	11 521 358	513	34 100	2.95
1928	137	204	4 322 151	417	11 253 733	502	25 900	2.50
1929	189	231	4 851 243	458	10 378 834	463	25 700	2.14
1930	202	245	5 282 275	510	10 821 834	476	26 000	2.02
1931	192	230	5 257 451	507	10 002 528	445	27 800	1.90
1932	186	227	5 240 358	503	9 506 420	378	23 200	1.52

- LOS ANGELES MOTOR BUS COMPANY -

Year	1 Way Route Length		Bus Miles Operated		Revenue Passengers		Bus Miles per mile of route	Revenue Passengers per bus mile
	Miles	% of 1925	Number	% of 1925	Number	% of 1925		
1925	29.02	100	2 082 805	100	7 882 057	100	72 200	3.82
1926	29.68	102	2 305 421	110	8 778 883	110	77 600	3.81
1927	29.70	102	2 343 074	112	9 548 867	119	78 900	4.07
1928	41.30	142	3 322 414	158	13 052 887	163	90 400	3.93
1929	50.75	175	4 257 032	203	17 082 328	214	83 800	4.00
1930	50.75	175	4 468 382	214	17 504 305	218	88 000	3.92
1931	115.85	398	4 550 508	217	15 322 751	205	89 300	3.60
1932	133.70	462	5 201 215	248	14 887 328	185	83 800	2.95

major highways with various Pacific Electric lines, as well as separations proposed to be made in a five year program extending from 1930 to 1935 are shown on Plate 23.

The equipment now used by the Pacific Electric Railway is of two general classifications: fairly modern all steel cars, and practically obsolete, altho still operated, cars of wooden construction, these latter operating on many of the outlying lines. Facilities for maintenance and repairs to equipment are located near Torrance, between the principal part of the city and the Harbor district. Power for the operation of this system is supplied by the Southern California Edison Company from its various power plants.

As shown on Plate 12, many of the lines of this system are operated in city streets, with a consequent slowing down of running time, altho a considerable proportion are located on private rights-of-way with few street crossings, and in many cases -- as shown on Plate 23, showing the grade crossing plan -- having the grades separated. In a few instances -- such as the line extending from Beverly Boulevard to the Subway Terminal Building between Fourth and Fifth Streets on Hill, and certain tunnels in the hills to the north of the Central Business District -- tracks are operated below the surface. The lines extending southward and eastward terminate in an elevated station located at Sixth and Main Streets, and there is an elevated approach to this station at present extending to San Pedro Street.

In addition to local service in Los Angeles proper, this company also furnishes such service in Long Beach, San Pedro, Pasadena, and Santa Monica. The general offices of the company are located at Sixth and Main Streets in Los Angeles.

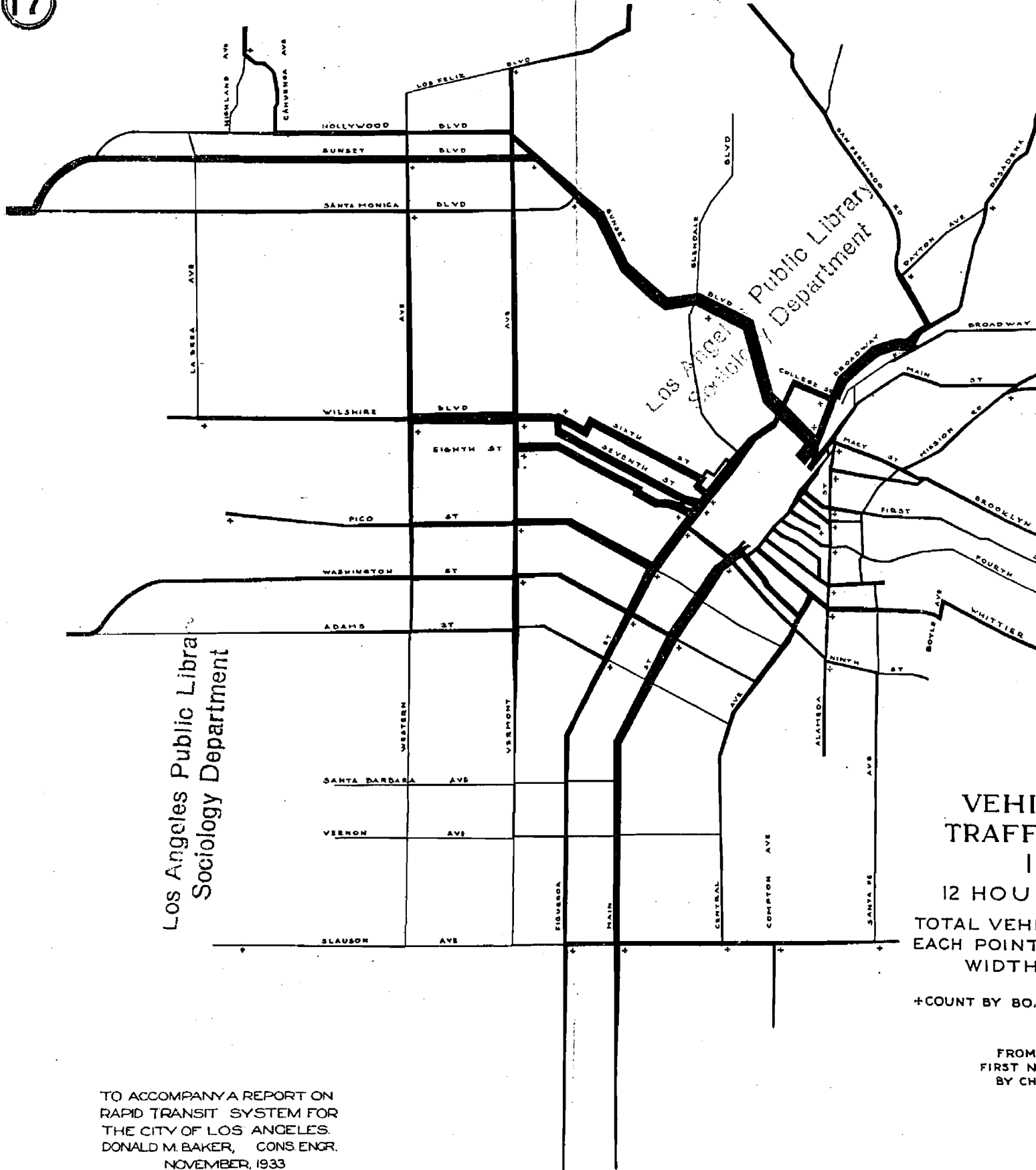
Los Angeles Railway.

The surface electric lines of this company, commonly known as the "yellow lines", radiate in all directions from the central part of the city with a few cross-town lines. They are particularly numerous to the west and south, altho service is afforded in all directions. The total passengers carried by years from 1914 to date, the car-miles operated and the number of miles of track in the system are shown in Table 6. It will be noted that within the Central Business District this company has lines on nearly every street, most of the routes passing thru the District in either an east-west or north-south direction, the routes being fairly well balanced as to length and use on the opposite ends, and the system being without objectionable loop operation. Within the five mile area there is some duplication of service with the local lines of the Pacific Electric Railway, which results in insufficient use and revenue on some of the lines. When the proposed rapid transit lines are constructed, it may be desirable to make some adjustment in this relation. This

applies principally, however, between the central part of the city and Vineyard, the other proposed locations being comparatively free from duplications between Pacific Electric and Los Angeles Railway lines.

In addition to the electric lines, this company also operates a considerable number of bus lines, principally, however, as extensions to and feeders for the electric lines, or thru areas of relatively low population density which have not been considered as justifying the extension of the electric service.

In connection with the multiplicity of lines in the central area, it has been suggested and discussed in various reports that, in addition to subways for rapid transit, provision should be made for street cars as well. There are some advantages, beyond doubt, which can be claimed for street car subways, but it would appear that their cost -- at least at the present time -- would be extremely difficult to justify. Much can be accomplished in the movement of street cars thru the congested areas by a thorough investigation and study of routing and traffic control, and beyond this there will be no immediate need for separating the street railway cars from other traffic as to grade. Undoubtedly if some of the streets now used for this purpose could be relieved of street car traffic, which appears to be entirely feasible, much improvement in the traffic situation would result.



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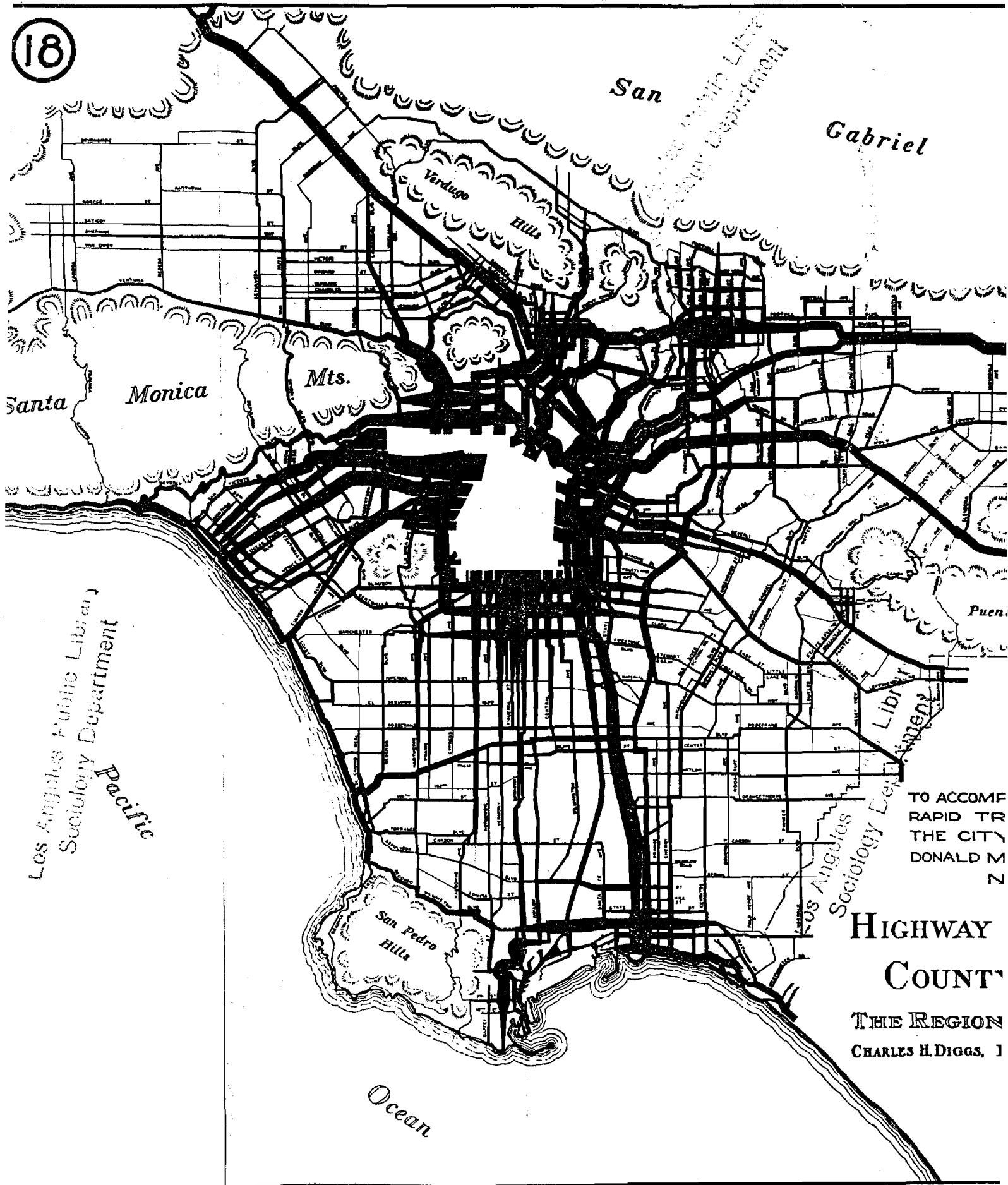
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TO ACCOMPANY A REPORT ON
RAPID TRANSIT SYSTEM FOR
THE CITY OF LOS ANGELES.
DONALD M. BAKER, CONS. ENGR.
NOVEMBER, 1933



TO ACCOMPLISH
 RAPID TRAVEL
 THROUGH THE CITY
 DONALD M. Z

**HIGHWAY
 COUNTY**

THE REGION
 CHARLES H. DIGGS, 1



TO ACCOMPANY A REPORT ON A
 RAPID TRANSIT SYSTEM FOR
 THE CITY OF LOS ANGELES.
 DONALD M. BAKER, CONS. ENGR.
 NOVEMBER 1933

HIGHWAY TRAFFIC SURVEY COUNTY OF LOS ANGELES

THE REGIONAL PLANNING COMMISSION
 CHARLES H. DIGGS, DIRECTOR * WM. J. FOX, CHIEF ENGINEER

Scale in Meters
 JULY 1932

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Motor Bus Lines

In addition to the busses operated by the Pacific Electric and Los Angeles Railway Company and the jointly owned Los Angeles Motor Coach Company, lines are operated by the:

Bay Cities Transit Company, in Santa Monica and western part of the city.

Culver City Municipal Bus Line, also extending into the city.

El Segundo Transit Company Lines.

Highland Transportation Company.

Independent Motor Coach Company, in San Pedro and Wilmington.

Lang Motor Coach Company.

Motor Transit Company.

Pasadena-Ocean Park Motor Coach Line.

Pickwick and Original Stage Lines, operating interurban lines to and from city.

Santa Monica Municipal Bus Lines, which extend into the city.

West Coast Rapid Transit Company Lines.

West Side Transit Company.

This multiplicity of independently owned and operated transit services has resulted in expensive and unsatisfactory surface transportation for the most part. Franchises have been secured in the areas having the greatest population, and little has been accomplished in the way of furnishing service in the areas where, from the standpoint of de-

velopment, such service might be desirable. Instead, lines have been established where, to a considerable extent, they interfere and compete with the original transit service to the detriment of both.

There are, however, certain lines which are furnishing excellent service and which may be said to be desirably located and are heavily used. Examples of these are certain lines of the Bay Cities Transit Company and the Santa Monica Municipal Bus Line extending on Pico Blvd. from the end of the Los Angeles Railway Pico line near Vineyard to Santa Monica and the intervening area.

After the original rapid transit lines are put in operation and at such time as service improves beyond the end of the proposed construction, either by elimination of grade crossings or use of some of the railroad tracks, the general motor bus situation should be entirely re-arranged in order to afford the maximum coordination with the rapid transit system. This is touched upon in connection with certain tentative proposals under Plate 21, "A Comprehensive Rapid Transit Plan". In addition to the motor bus lines within the city extending thru the principal dwelling areas, local lines operate in Pasadena, Glendale, San Pedro, Wilmington, Long Beach and to some extent provide connection with the interurban lines of the Pacific Electric Railway.

STEAM RAILROADS

The principal railroad service in this area is supplied by the Atchison, Topeka & Santa Fe, the Southern Pacific and the Union Pacific Systems.

Atchison, Topeka & Santa Fe

This transcontinental line provides thru railroad service from Los Angeles to Chicago by way of Albuquerque, New Mexico and Kansas City, Missouri, with a connection at Barstow northerly to the central part of the state and San Francisco, and a branch line extending southeastward from Los Angeles to San Diego. The line enters the city from the northeast by way of the Arroyo Seco, the passenger station being located at First Street and Central Ave., the branch to San Diego extending southward along the Los Angeles River and thence southeast thru the industrial district. There is also a branch line westward to the Pacific Coast serving Manhattan and Hermosa Beaches and Redondo. This branch extends from a connection with the main line near Twenty-Sixth Street and Santa Fe Avenue westward on Slauson Avenue to Western Avenue, and thence southwest thru Inglewood. The principal terminal and yard facilities of this road are located along the Los Angeles River in the general vicinity of the other railroad facilities.

Southern Pacific

The lines of this transcontinental railroad are widely distributed throughout the state. Northward, service is provided for the San Joaquin Valley, Sacramento, and beyond into the State of Oregon as far as Portland with a Pacific Coast line extending from Burbank along the coast to San Francisco. The main line to the east extends thru Yuma and Gila Bend, Arizona to El Paso, Texas, with a branch from there to Tucumcari, New Mexico, connecting with the Rock Island to Chicago, and the main line continuing along the Gulf Coast to Houston, Texas, and New Orleans, Louisiana. The San Joaquin Valley line and the coast line from San Francisco enter the city thru Glendale, thence southward along the Los Angeles River to the present Arcade Station at Fifth Street and Central Avenue, with a branch to the Harbor district, and another southeastward to Santa Ana and Orange County. The principal yards and terminals are located near the Los Angeles River in the central part of the city.

Union Pacific

This transcontinental line extends eastward from San Francisco to Salt Lake and Omaha. The service to Los Angeles is provided by a branch line from Salt Lake southward to the city. The main line enters the city from the east in the same general vicinity as the Santa Fe line to

San Diego, the system using the present Arcade passenger station of the Southern Pacific. The principal yards and terminals are located in the Los Angeles River bottom east of the central part of the city south of Belvedere.

Within the city various lines of the principal steam railroads furnishing transportation service to and from Los Angeles are very largely confined to the vicinity of the Los Angeles River, the northeastern and the southeastern part of the city. The Southern Pacific dominates in amount of trackage and yard and terminal facilities, their main lines extending northward along the river to Glendale, Burbank, San Fernando, and thence westward thru North Hollywood and Van Nuys. Their approach from the east is thru Pasadena and South Pasadena, and the Arroyo Seco, and important industrial lines extend southward to the Harbor district and southeastward into Orange County. The principal classification yard is located a short distance north of the central part of the city, known as the Riverside Yard. Additional yard and tracks are located near Taylor Street, two miles further north.

Facilities for maintenance and repair of rolling stock are located just east of the Los Angeles River between Mission Road and Alhambra Boulevard. In the construction of the new Union Station in the Civic Center district, the Southern Pacific track on Alameda Street thru the central part of the city will be relieved of the

present rather intensive passenger traffic and its use will be largely confined to switching at night to the various industries located in this area. Altho no definite understanding has been reached, it is possible that this switching may be done by Pacific Electric equipment, thus relieving the street entirely of steam operation.

Steam Railroad Lines and Facilities within the City

The Atchison, Topeka & Santa Fe main line approaches the central part of the city thru Pasadena, South Pasadena, and along the Arroyo Seco, thence south along the west side of the Los Angeles River to the junction near Twenty-fourth Street where branch lines diverge southeastward to Orange County and San Diego and southwestward to the Pacific Ocean at Manhattan and Hermosa Beaches, and thence southeasterly to the Harbor district. The principal classification yard is just east of the central part of the city adjoining the Los Angeles River south of First Street. Facilities for maintenance and repair of rolling stock are located at the junction near Twenty-fourth Street. The use of this railroad by transcontinental passengers is quite heavy, as it affords direct service to Chicago and the east. Some of the tracks of this company are located in city streets but they are not heavily used, being principally for the purpose of switching to industries in the central part of the city, the principal team tracks

being located near the classification yards adjoining the river. The main line to the east through Pasadena is the most heavily used track, followed by that to Orange County and San Diego.

The Union Pacific approaches the central part of the city in the same general vicinity as the San Diego branch of the Santa Fe to the Santa Fe junction at Twenty-fourth Street, thence following the east side of the Los Angeles River and northward, affording local industrial service to South Pasadena, Pasadena and Montrose. The yards and terminal facilities are located in the same general vicinity as the Santa Fe and Southern Pacific, the lines of this railroad being the least heavily used of any of the steam railroads.

Considered from the standpoint of adding rapid transit facilities to the transit and transportation lines now in operation, there could probably be no clearer picture presented than the multiplicity of uncoordinated and conflicting routes shown on this plan. If the introduction of rapid transit lines, or merely their consideration, leads to bringing some order out of the present chaos, this discussion will have served an excellent purpose.

PREVIOUS PARTIAL CITY PLAN REPORTS

The City of Los Angeles has a Board of City Planning Commissioners and a Board of Public Utilities and Transportation with duties prescribed by the City Charter. The County of Los Angeles has a Regional Planning Commission. Various planning studies have been made by these agencies and references pertaining to them occur in their respective annual reports. Certain studies and investigations of a city planning nature have been made by public and private agencies during the past decade, as described below.

In 1923 the Los Angeles Traffic Commission -- now known as the Los Angeles Traffic Association -- an unofficial body -- employed a Board of Consultants, consisting of Messrs. Frederick L. Olmsted, Harland Bartholomew and Charles H. Cheney, who prepared a report on a major street plan for the City of Los Angeles. This report was published in printed form. This plan was officially adopted by the voters of the city and many miles of street have been opened, widened and constructed in accordance therewith.

In 1924 the City and County of Los Angeles jointly employed the firm of Kelker-DeLeuw & Company, Consulting Engineers of Chicago, to make a report on a rapid transit plan for the city. This report is available in printed

form, but nothing was done towards following out the recommendations therein.

In 1925 the Greater Harbor Committee of Two Hundred, a privately financed body, made a study of Los Angeles Harbor and the contiguous territory. The local engineering firm of Leeds & Barnard, and F. B. Cole were employed as engineers for the Committee, with Francis Lee Stuart of New York as consultant. No final report was made, but progress reports and recommendations, many of which were carried out, were made concerning the general layout of the port and surrounding territory. As a result of the Committee's activity, railroads already in the harbor area, including the Los Angeles Municipal Railroad, were combined in an operating agency known as the "Belt Line Railroad" which is now functioning very effectively. In addition, a site was acquired by the city for future use as a classification yard.

The County Regional Planning Commission has published two reports concerning regional highway plans, the first in 1929 covering the San Gabriel Valley, and the second in 1931 covering the Long Beach-Redondo area.

In 1930 certain private interests, in conjunction with the City and County of Los Angeles, employed the firm of Wm. H. Babcock & Sons of Chicago to make a report on

the feasibility of regrading Bunker Hill in the heart of the city. This report has been printed and contains a vast amount of very valuable information relative to conditions in Downtown Los Angeles, decentralization, etc.

In 1933 the Board of Harbor Commissioners of the City of Los Angeles, jointly with a Citizens Harbor Survey Committee named by the Mayor, appointed a Board of Consultants termed "The Board of Economic Survey for the Port of Los Angeles" consisting of the following: Charles T. Leeds, C. C. Thomas, Donald M. Baker, Ralph J. Reed and John Parke Young. This Board prepared a very comprehensive report upon the economic background of the port, the financial structure of same, and similar matters.

Considerable information has also been published from time to time by city departments and private agencies which contain much valuable data, and in making this report advantage has been taken of the information contained in them, the conclusions reached and the recommendations made.

VI.

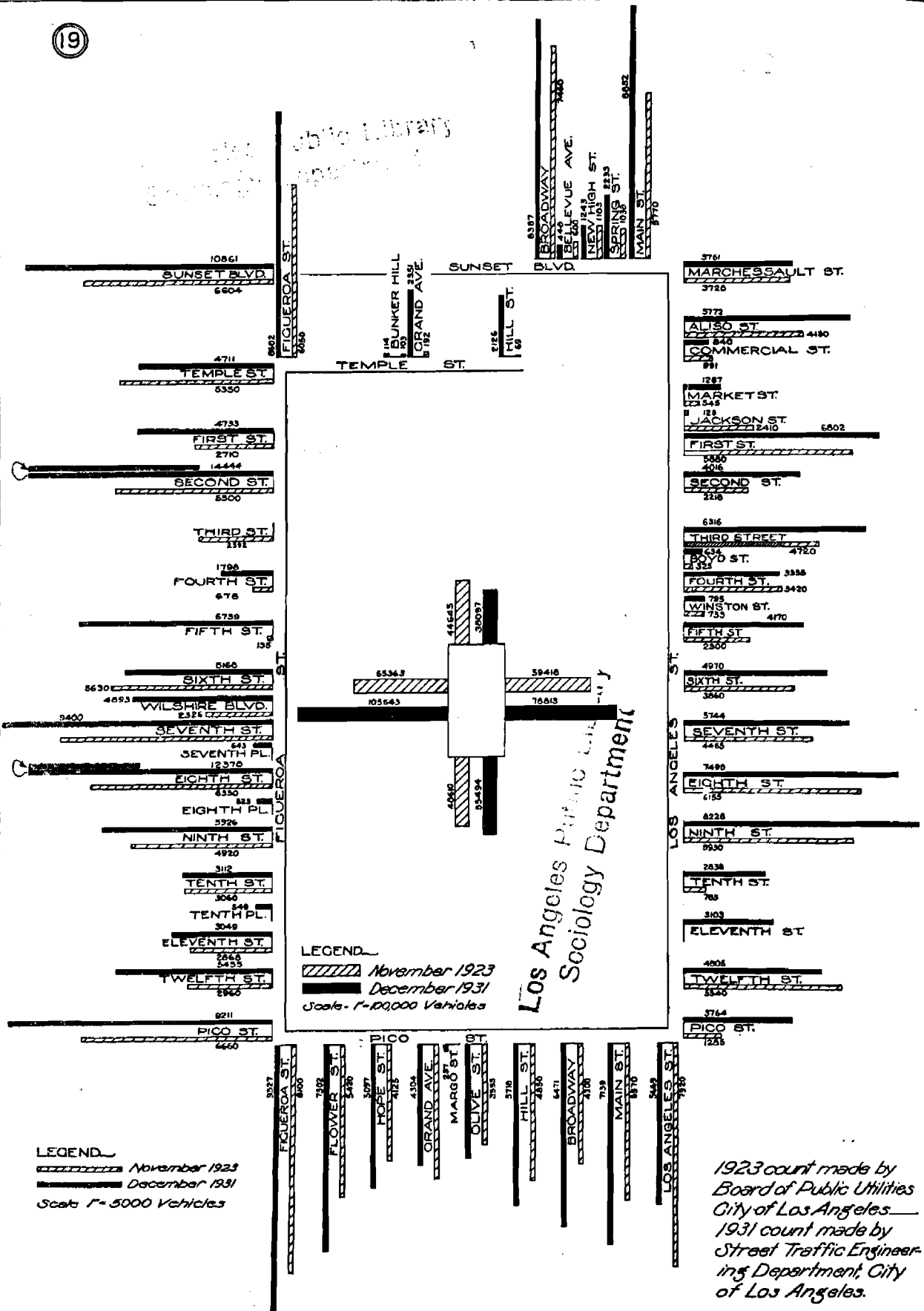
THE CENTRAL BUSINESS DISTRICT OF LOS ANGELES

As would be expected, the growth in population in the Los Angeles region has caused an expansion of the built up area, as well as an increase in population densities. Plate 10 shows the population density in 1922 and 1928, and indicates that density increases have occurred largely in a westward direction, while Plate 11 indicates a decrease in density from 1922 to 1928 within the central part of the area.

Persons Entering Central Business District

Table 4 indicates a total of 1,347,000 persons residing within a ten mile radius of Seventh and Broadway in 1930, this being 58.2% of the population of the Los Angeles Metropolitan District in that year. This table shows that the greatest increase in population during the seven year period 1923-1930 occurred in the northwestern quadrant, which includes the area between lines extending northerly from Seventh and Broadway into the center of Glendale and westerly along a line just south of Pico Boulevard. The increases within the ten mile radius in the other three quadrants range from 30% to 35%, while that in the northwest quadrant was from 177,000 to 405,000 persons, or 129%.

A survey made late in 1923 or early in 1924 showed a total of 605,000 persons, not including pedestrians,



LEGEND
 Hatched line November 1923
 Solid line December 1931
 Scale 1" = 5000 Feet

LEGEND
 Hatched line November 1923
 Solid line December 1931
 Scale 1" = 10000 Feet

1923 count made by Board of Public Utilities City of Los Angeles
 1931 count made by Street Traffic Engineering Department, City of Los Angeles.

AUTOMOBILE TRAFFIC ENTERING CENTRAL BUSINESS DISTRICT OF LOS ANGELES

NOVEMBER 1923 AND DECEMBER 1931

TO ACCOMPANY REPORT ON A RAPID TRANSIT SYSTEM FOR THE CITY OF LOS ANGELES.
 DONALD M. BAKER, CONSULTING ENGINEER.
 NOVEMBER 1933.

entered the Central Business District daily between the hours of 7:00 A.M. and 7:00 P.M. Of this number 315,000 or 52% came by rail transportation and 290,000 or 48% by automobiles. A similar survey made in December, 1931, showed a total of 697,000 persons, excluding pedestrians, entering the central district between the same hours, of which 435,000 or 62% entered by automobiles, as against 262,000 or 38% by rail and bus transportation.

Plate 19 shows the number of autos entering the district at different points in the two surveys. The marked increase in the number entering from the west is significant and is to be expected from the large increase in population in that direction which took place during the years between counts. Table 7 contains results of a cordon count made in 1931, showing the number of persons entering district by various modes of transportation.

Table 8 summarizes the results of these surveys, and shows that while in both 1923-24 and 1931 the same number of people per hundred residing within a ten mile radius used automobiles to travel to the Central District, a much less number per hundred used bus and rail transportation in 1931 than they did seven years previous. These figures also show, however, that at the present time a number of persons equivalent to more than 1 out of 2 residing within a ten mile radius, and nearly 1 out of every 3 residing within the entire Metropolitan District of Los Angeles

Table 7.

PASSENGERS ENTERING CENTRAL BUSINESS DISTRICT

DECEMBER 16, 1931

Time	Rail	Bus	Total Public Carriers	Auto	Grand Total
<u>WESTSIDE</u>					
<u>A.M.</u>					
7-8	7 519	630	8 149	14 294	22 443
8-9	11 333	1 889	13 222	21 691	34 913
9-10	6 561	959	7 520	18 071	25 591
10-11	6 338	854	7 192	15 877	23 069
11-12	6 025	1 048	7 073	14 864	21 937
<u>P.M.</u>					
12-1	5 100	804	5 904	12 189	18 093
1-2	4 610	832	5 442	13 333	18 775
2-3	3 965	517	4 482	12 970	17 352
3-4	3 209	557	3 766	12 074	15 840
4-5	3 606	380	3 986	12 636	16 622
5-6	3 140	363	3 503	11 101	14 604
6-7	2 044	261	2 305	7 764	10 069
Total	63 450	9 094	72 544	166 764	239 308
<u>EASTSIDE</u>					
<u>A.M.</u>					
7-8	10 009	213	10 222	6 849	17 071
8-9	9 726	225	9 951	8 933	18 884
9-10	6 604	197	6 801	9 775	16 576
10-11	6 791	207	6 998	10 974	17 972
11-12	5 726	151	5 877	11 154	17 031
<u>P.M.</u>					
12-1	4 898	103	5 001	10 303	15 304
1-2	4 635	89	4 724	9 820	14 544
2-3	4 163	74	4 237	10 709	14 946
3-4	3 915	58	3 973	10 641	14 614
4-5	6 162	90	6 252	12 502	18 754
5-6	5 380	74	5 454	15 130	20 584
6-7	2 716	26	2 742	6 850	9 592
Total	70 725	1 507	72 232	123 640	195 872

Table 7. (Con.)

Passengers Entering Central Business District
December 16, 1931

Time	Rail	Bus	Total Public Carriers	Auto	Grand Total
<u>SOUTHSIDE</u>					
<u>A.M.</u>					
7-8	10 110	236	10 346	7 901	18 247
8-9	12 076	337	12 413	9 679	22 092
9-10	7 228	150	7 378	8 440	15 818
10-11	7 543	165	7 708	8 381	16 089
11-12	6 859	141	7 000	8 459	15 459
<u>P.M.</u>					
12-1	5 058	125	5 183	6 858	12 041
1-2	4 654	111	4 765	6 897	11 662
2-3	3 553	77	3 630	7 283	10 913
3-4	3 363	52	3 415	6 763	10 178
4-5	3 254	78	3 332	6 691	10 023
5-6	2 489	61	2 550	5 985	8 535
6-7	1 674	36	1 710	4 029	5 739
Total	67 861	1 569	69 430	87 366	156 796
<u>NORTHSIDE</u>					
<u>A.M.</u>					
7-8	7 569		7 569	5 261	12 830
8-9	7 160		7 160	6 697	13 857
9-10	5 354		5 354	6 175	11 529
10-11	5 378		5 378	5 506	10 884
11-12	4 323		4 323	4 656	8 979
<u>P.M.</u>					
12-1	3 478		3 478	3 902	7 380
1-2	3 550		3 550	4 305	7 855
2-3	2 542		2 542	4 242	6 784
3-4	2 551		2 551	4 420	6 971
4-5	2 532		2 532	4 848	7 380
5-6	2 040		2 040	4 112	6 152
6-7	1 573		1 573	3 092	4 665
Total	48 050		48 050	57 216	105 266

Table 7. (Con.)

Passengers Entering Central Business District
December 16, 1931

Time	Rail	Bus	Total Public Carriers	Auto	Grand Total	% Total
<u>TOTALS</u>						
<u>A.M.</u>						
7-8	35 207	1 079	36 286	34 305	70 591	
8-9	40 295	2 451	42 746	47 000	89 746	
9-10	25 747	1 306	27 053	42 461	69 514	
10-11	26 050	1 226	27 276	40 738	68 014	
11-12	22 933	1 340	24 273	39 133	63 406	
<u>P.M.</u>						
12-1	18 534	1 032	19 566	33 252	52 818	
1-2	17 449	1 032	18 481	34 355	52 836	
2-3	14 223	668	14 891	35 104	49 995	
3-4	13 038	667	13 705	33 898	47 603	
4-5	15 554	548	16 102	36 677	52 779	
5-6	13 049	498	13 547	36 328	49 875	
6-7	8 007	323	8 330	21 735	30 065	
Total	250 086	12 170	262 256	434 986	697 242	

SUMMARYBoundary

West	63 450	9 094	72 544	166 764	239 308	34.3
East	70 725	1 507	72 232	123 640	195 872	28.2
South	67 861	1 569	69 430	87 366	156 796	22.5
North	48 050		48 050	57 216	105 266	15.1
Totals	250 086	12 170	262 256	434 986	697 242	100.0
% Total	35.9	1.7	37.6	62.4	100.0	

Auto traffic counts made by Street Traffic Engineering Dept,
 City of Los Angeles.

Rail and bus Traffic counts made by respective companies.

Table 8.
 PERSONS ENTERING CENTRAL BUSINESS DISTRICT
 OF LOS ANGELES
DAILY 7:00 A.M. to 7:00 P.M.

	1923	1931	% Increase or Decrease
Population 10 mi. radius from Seventh and Broadway	892 000	1 347 000	51.0
Persons entering C.B.D. ⁺	605 000	697 000	15.2
By Auto -- Total	290 000	435 000	50.0
Per 100 pop'n in 10 mile Radius	32.5	32.3	-0.6*
By Street Car -- Total	315 000	250 000	-20.6*
Per 100 pop'n in 10 mile Radius	35.3	18.6	-47.1*
By Bus		12 000	
Per 100 pop'n in 10 mile Radius		0.9	
TOTAL -- per 100 pop'n in 10 mile radius	67.8	51.7	-23.8*

+ Pedestrians not included.

* Decrease.

Table 9.

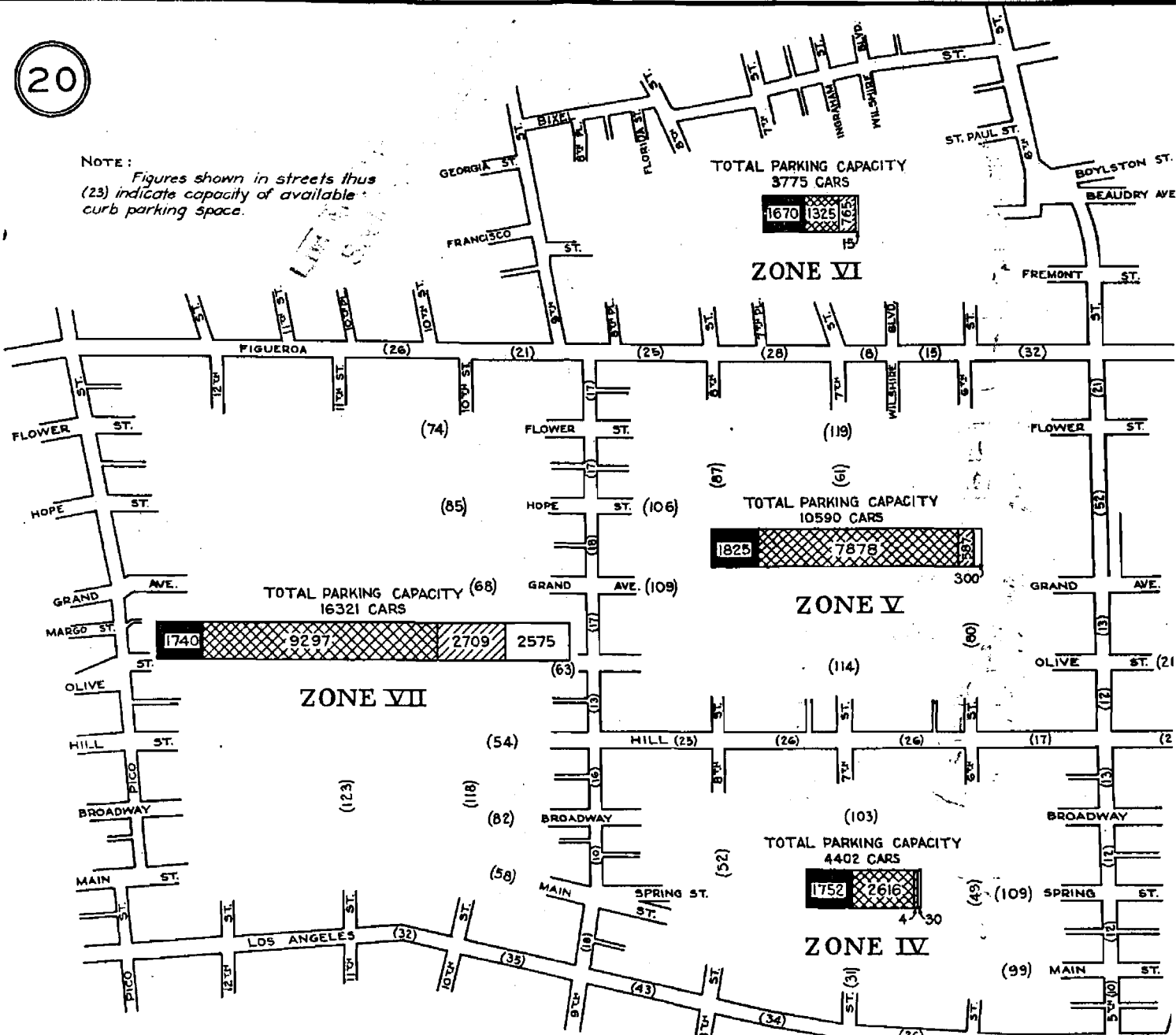
MOTOR VEHICLES IN CENTRAL BUSINESS DISTRICTS

	: Population:	: of Area:	: Motor Vehicles Entering CBD District: 1930	: Motor Vehicles Entering CBD District: 12 hours	: Motor Vehicles Entering CBD District: 1000 popn per sq.mi. Metro.Dist. Area	: Autos Entering CBD Daily
Chicago	4 364 755	0.85	113 331	25.9	133 000	
Philadelphia	2 847 148	2.04	79 315	27.9	39 000	
<u>Los Angeles</u>	<u>2 318 526</u>	<u>0.82</u>	<u>276 753</u>	<u>119.4</u>	<u>338 000</u>	
Boston	2 307 897	0.88	65 656	28.5	74 500	
Detroit	2 104 764	0.67	82 439	39.2	123 000	
Pittsburgh	1 953 668	0.28	39 477	20.2	141 000	
St. Louis	1 293 516	0.99	48 895	37.8	49 500	
Baltimore	949 247	0.49	64 667	68.1	132 000	
Washington	621 059	1.50	130 893	210.8	87 200	
Kansas City	608 186	0.38	69 775	114.7	184 000	

	: Population:	: Total Registered Motor Vehicles	: Registered Motor Vehicles per 1000 Population
Chicago	3 376 478	485 565	144
Philadelphia	1 950 961	229 371	117
<u>Los Angeles</u>	<u>1 238 048</u>	<u>517 693</u>	<u>418</u>
Boston	781 188	113 116	145
Detroit	1 568 622	388 946	248
Pittsburgh	669 817	74 584	112
St. Louis	896 307	168 176	188
Baltimore	804 874	325 597	404
Washington	486 869	156 686	322
Kansas City	521 603	126 119	242

Source of Data: Bureau of Street Traffic Engineering,
Los Angeles.

NOTE: Figures shown in streets thus (23) indicate capacity of available curb parking space.



NOTE: Total curb parking space available Figueroa St to Los Angeles St and Temple St to Eleventh St. (not including Bunker Hill area, Temple St to Fifth St. and Figueroa St to Hill St.) ----- 3564 Cars.

Los Angeles Public Library
Sociology Department

CAPACITY AND TURNOVER

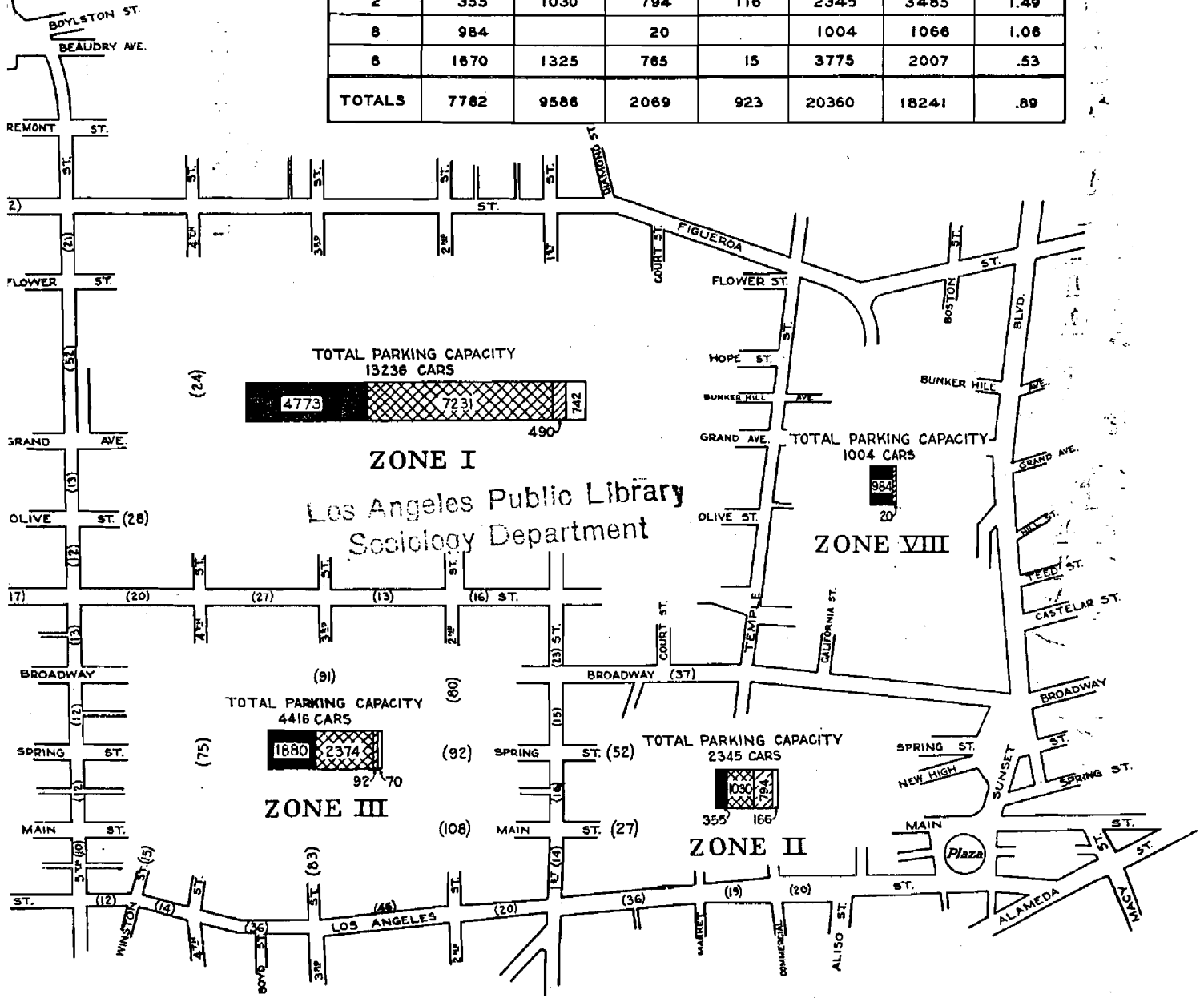
TOTAL CAPACITY

ZONE	PUBLIC GARAGES	PUBLIC AUTO PARKS	PRIVATE GARAGES	PRIVATE AUTO PARKS	TOTAL CAPACITY STALLS	NR AUTOS PARKED DAILY	NR AUTOS PER STALL PER DAY
3	1880	2374	92	70	4416	5742	1.30
4	1752	2616	4	30	4402	8214	1.87
5	1825	7878	587	300	10590	12534	1.18
7	1740	9297	2709	2575	16321	15100	.92
TOTALS	7197	22165	3392	2975	35729	41590	1.16

GRAND TOTALS	PUBLIC GARAGES	PUBLIC AUTO PARKS	PRIVATE GARAGES
TOTAL CAPACITY STALLS	14979	31751	5461
NR AUTOS PARKED DAILY	13247	38947	5181
NR AUTOS PER STALL PER DAY	.88	1.23	.95

CAPACITY AND TURNOVER

ZONE	PUBLIC GARAGES	PUBLIC AUTO PARKS	PRIVATE GARAGES	PRIVATE AUTO PARKS	TOTAL CAPACITY STALLS	Nº AUTOS PARKED DAILY	Nº AUTOS PER STALL PER DAY
1	4773	7231	490	742	13236	11883	.88
2	355	1030	794	116	2345	3485	1.49
8	984		20		1004	1066	1.06
6	1670	1325	765	15	3775	2007	.53
TOTALS	7762	9586	2069	923	20360	18241	.89

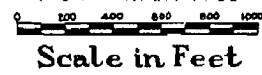


CAPACITY AND TURNOVER

LOCATIONS	PRIVATE GARAGES	PRIVATE AUTO PARKS	TOTAL CAPACITY STALLS	Nº AUTOS PARKED DAILY	Nº AUTOS PER STALL PER DAY
1	5461	3898	56089		
7	5161	2556		59831	
	.95	.65			1.07

OFFSTREET PARKING FACILITIES
CENTRAL BUSINESS DISTRICT
CITY OF LOS ANGELES

TO ACCOMPANY REPORT
ON RAPID TRANSIT SYSTEM
FOR CITY OF LOS ANGELES
DONALD M. BAKER CON. ENGR.
NOVEMBER 1933



entered its Central Business District daily, and illustrates the very intimate community of interest between such district and the entire Metropolitan Area. The factors mentioned in Part III of the report which resulted in the lack of extension of transportation facilities and the increase in automobile usage have caused excessive congestion in the approaches to the district and a consequent decentralization. The extent to which auto traffic increases as the Central District is approached and the relative growth of such traffic from 1922 to 1932 is brought out in Plate 17.

Parking Facilities in Central Business District

A survey of curb parking habits made by the writer during June and July, 1932, indicates that a maximum of 30,000 automobiles could park at the curb in the Central Business District during business hours, providing each automobile remained for the legal parking time limit of forty-five minutes and one hour. An actual count, however, made by visiting each location every forty-five minutes, indicated that only 20,000 automobiles actually parked during business hours, due to overtime violations of the parking ordinance. It is probable that this figure is somewhat less than the true number parked because of some vehicles remaining less than the forty-five minutes.

A study of offstreet parking facilities in the

Central Business District, in the Bunker Hill area, and in the section between Fifth and Ninth Streets from Figueroa to Bixel Streets, made early in 1932 by the Los Angeles Bureau of Street Traffic Engineering, found 593 offstreet parking places within the area, including public and private auto parks and garages. These places had a capacity of 56,089 parking stalls and parked 59,831 cars daily, or 1.07 automobiles daily per parking stall. This figure is significant inasmuch as it indicates that most people using offstreet parking facilities apparently leave their cars in such places during the entire day. The rate of turnover of various types of facilities was as follows:

Public Garages	.88
Public Auto Parks	1.23
Private Garages	.95
Private Auto Parks	.65

With around 275,000 automobiles daily entering the Central Business District, with somewhat over 20,000 autos actually parking at the curb and nearly 60,000 using offstreet parking facilities within the district and adjacent areas, it would appear that there are nearly 200,000 autos entering the district which are either constantly driving around the streets thereof looking for a place to park, or are passing through it. This condition, in connection with the fact that the downtown section of Los Angeles has the smallest area of street space of any large city in the

country, makes for serious traffic congestion.

Area of Usable Street Space in Terms of Total
Area of Central Business District

<u>City</u>	<u>% of Total Area</u>
Los Angeles	21½
Chicago	29
Detroit	29½
Pittsburgh	34
St. Louis	34½
Cleveland	39½

Source: Report on Major Street Traffic Plan for City of Los Angeles by Olmsted, Bartholomew & Cheney, 1924.

Decentralization and Its Effect

Considerable decentralization of the Central Business District has resulted from this congestion, and loss of riding on rail facilities and increase in automobile use is continuing. The point has now been reached where time losses due to congestion, losses in sales by business concerns and from depreciation of property values, are beginning to reach serious proportions.

Assuming a delay due to congestion of five minutes daily on the part of 700,000 persons who go into the Central Business District, a value of 1¢ per minute for the time of each person and 2/3¢ per minute for oper-

ating time of automobiles, 7¢ per minute for operating time of street cars -- the annual cost of congestion in traveling to and through the Central Business District amounts to nearly \$15,000,000 annually -- a staggering sum. Losses in sales in downtown stores, and thru depreciation of property values are likewise large, although difficult to evaluate.

The assessed valuation of the Central Business District of Los Angeles -- extending from Temple to Pico and from Los Angeles west to Figueroa south of Fifth, and west to Hill north of Fifth Street -- is this year \$168,000,000, including land and improvements. This amount is equal to one-sixth of the assessed valuation of the entire City of Los Angeles, or one-tenth of the assessed valuation of Los Angeles County, and represents an actual value at present of around one-third of a billion dollars.

The Central Business District as above described, has a gross area of 0.824 square miles, or 528 acres. The central core of this district, including land and improvements, and consisting of the area with an assessed value in excess of \$8.00 per square foot, has a gross area of 0.27 square miles, or 173 acres. 30% of this area is taken up by dedicated streets and sidewalks. The remainder is available for building space.

The center of the business district, originally located at the Plaza at the time of the founding of the

city, has followed a general southerly and westerly direction. At the present time the center of the gross floor area of buildings within such area is located just south of Sixth and Hill Streets. Some idea of recent rates of decentralization can be obtained from the following table:

Per Capita Use of Property and Gross Floor Space in Buildings - Central Business District

Approximate Year	City Population	Gross Floor Space Per capita Sq.Ft.	Occupied Land Area Per Capita Sq.Ft.	Annual Rate of Increase of Floor Space Per capita Sq.Ft.	Annual Rate of Increase of Occupied Land Area Per capita Sq.Ft.
1909	300 000	48.8	15.0	53.2	17.8
1923	800 000	42.7	11.3	37.3	8.3
1930	1 200 000	38.1	8.8	24.3	5.6

Basic data from "Report on Feasibility of Regrading the Bunker Hill Area" by Wm. H. Babcock & Sons, 1930.

Of further interest in this direction are figures showing the fact that for an increase in population of 100,000 which occurred during the period 1915-1920, approximately 880,000 square feet or 20 acres of ground area were built upon, and approximately 3,000,000 square feet of gross floor area in buildings were added within the central district. For a similar rate of increase in popu-

lation between the years 1927 and 1930, only 300,000 square feet of land area or 6.9 acres were built upon, and 2,270,000 square feet of floor area were added in buildings. In general, land area occupied by buildings increases in proportion to population, although at a smaller rate as higher buildings are built, but gross floor area in business buildings should increase almost in direct proportion to population growth. These figures are significant in that they indicate that new building development in the central district is not keeping pace with population growth, but is taking place outside of the central district.

VII.

NEED FOR FURTHER TRANSIT DEVELOPMENT
INCLUDING RAPID TRANSIT

The general characteristics of the South Coastal Basin and the Los Angeles Metropolitan District are favorable to continued, although somewhat slower, growth of population. So is the city and regional pattern. Previous partial city plan reports are conceived on the same basis. If the population increase of 260% which took place in the past twenty years had occurred during the period from 1890 to 1910, when mass transportation was only possible by rail, considerable extensions of rail lines would have occurred, with relatively high population densities along their routes. Because this growth occurred during the automotive period, and because motor vehicle transit is particularly favored by the climate of the region, the general city pattern has assumed a wide-spread and relatively less dense aspect than could have been foreseen. Instead, therefore, of a considerable increase in riding habit on existing rail lines, keeping pace with the growth of population, it has steadily declined during the last ten years.

This decline is not entirely due to the emotional force of possessing a private mode of transportation, nor to present economic conditions, although these could be considered contributing factors. The fact is that because of growth in the use of motor vehicles, conditions on

the highways -- upon which most of the rail lines in the City of Los Angeles and many in the suburban areas have been placed -- the delays at intersectiong streets, and the final congestion encountered when the Central Business District is reached, have resulted in retarding surface rail movements, and riders have deserted rail transportation for the more rapid motor vehicle. The vicious spiral, rail riders to autos, more autos, more congestion, slower rail schedules, and again more rail riders to autos -- as has been demonstrated in other cities and countries, eventually leads to separation of grades, elevated or subway transit.

It has been quite definitely established by studies -- such as those of the Regional Plan of New York and its Environs -- that it is an economic necessity for about one person in three of the population residing within a metropolitan district to daily assemble and transact their business in the heart of the community commonly known as the Central Business District. Here business can be transacted with the greatest efficiency and the most dispatch. At present 30 out of every 100 persons living within the los Angeles Metropolitan District enter the central district during the twelve hours of each business day, and 52 out of every 100 persons living within a ten mile radius enter the area. Studies made in New York in 1924, indicate that the ratio of 30 per 100 living within

a twenty mile radius of the Metropolitan District likewise entered the central area daily, the population within an approximate twenty mile radius in 1924 being 9,700,000.

Assuming this rate to continue locally, by 1945, or twelve years hence, there should be in the neighborhood of 1,070,000 persons daily entering the Central Business District, of Los Angeles, which district by that date may be somewhat enlarged in area over that at present.

In 1931, 435,000 persons entered the district by automobile, using somewhat over 275,000 vehicles. Anyone familiar with local conditions in Los Angeles must admit that the saturation point, as far as automobile traffic is concerned, is fast approaching, or may even be considered as reached. Curb and offstreet parking facilities will probably not be materially increased because they cannot be economically justified. Taking the optimistic view that probably 75,000 more automobiles could physically enter the Central Business during a business day, this would bring the total automobiles entering daily in the neighborhood of 350,000, carrying 550,000 persons, and still leaving 520,000 to reach it by rail and bus transportation.

In 1931 the street railroads transported 250,000 persons into the area and the busses 12,000. It is questionable whether, with an additional 75,000 automobiles entering the area, rail and bus lines could or would transport more than this figure. If the growth of this section

continues in accordance with the estimates of future population given and business is not to be throttled, it is obvious that considerably before 1945, some means of improved mass transportation to and from the central district will become a vital necessity. The rapid transit system described hereafter with its initial units proposed in this report, is suggested as a first step in the solution.

Not alone is a rapid transit system necessary for the stabilization of the Central Business District and for tying it in with outlying centers, but it is likewise essential to maintain the present wide distribution of population which now exists and which makes living conditions so attractive in this section. If such a system is not provided, two courses will be open to future population coming to the community. A large portion will either be forced to congregate in densely settled areas close to the Central Business District in order to have proper access to it, or it will continue to spread out in smaller centers with further losses from instability and decentralization taking place. While no one living in this area desires to see congestion of business activities reach the point which exists in the larger eastern cities -- such as New York, Chicago and Philadelphia -- nevertheless concentration of such activities in one place is desirable, and from the standpoint of efficiency in doing business, is necessary.

A rapid transit system affords the only plan for this section whereby that portion of the residents of this community who must, in order to transact their business efficiently, come to the Central Business District daily, may maintain their homes in outlying areas of low population density, and still reach their place of business daily without undue losses and delays.

Adjustments of the transit plan should, however, not stop with the development of rapid transit alone. Only sufficient time and expense have been donated to this present study to assure procedure under the plan proposed being logical and consistent with the final and ultimate organization of all transit and transportation facilities. A larger and more detailed study is urgently required.

Instead of an occasional dip into such existing factual information as has been available, there should be an exhaustive analysis of such data and a supplementary collection of such additional facts as are necessary. Beginning with the plan which has been developed by the Regional Planning Commission for a county-wide system of major highways -- and proceeding thru the various phases of transportation to and from the city by railroad, automotive, air lines and water lines; transit by surface rail, motor bus and rapid transit subway and elevated lines, public recreation or parks, playgrounds, schools, pleasure places and driveways -- which are now also receiving at-

tention from the Regional Planning Commission -- a review of existing zoning regulations, and finally some effective means of improving the city's appearance -- a complete and comprehensive city plan must be evolved if whatever is done about the transit and transportation adjustment to the best advantage is to bring about the stabilization of property values, and the economical and orderly development of the city.

NOTE: Reroute Florence
and La Brea Bus Lines
via Rapid Transit Terminals

- ■ ■ PROPOSED RAPID TRANSIT SYSTEM.
- ○ ○ POSSIBLE FUTURE EXTENSIONS.

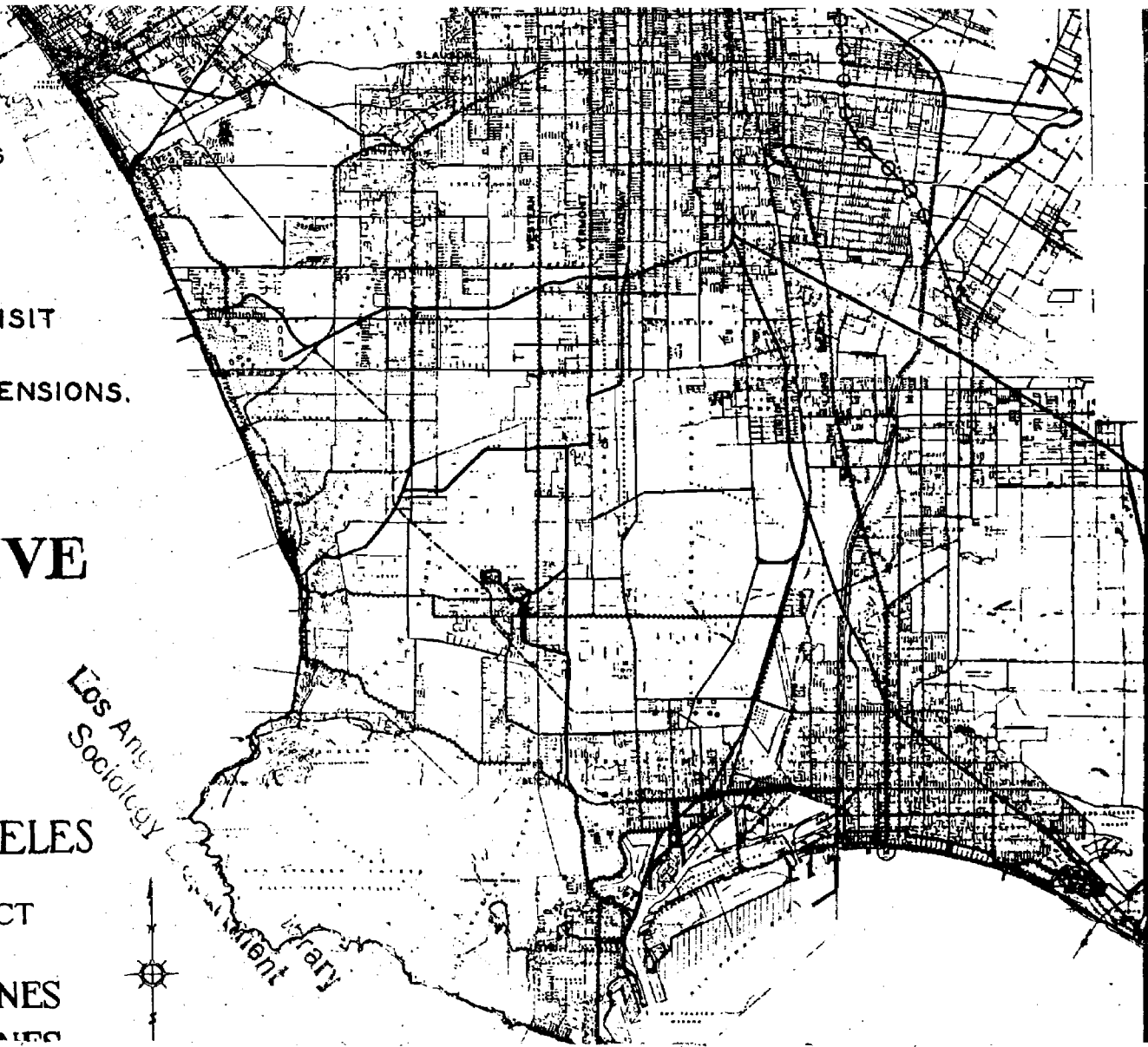
COMPREHENSIVE PLAN

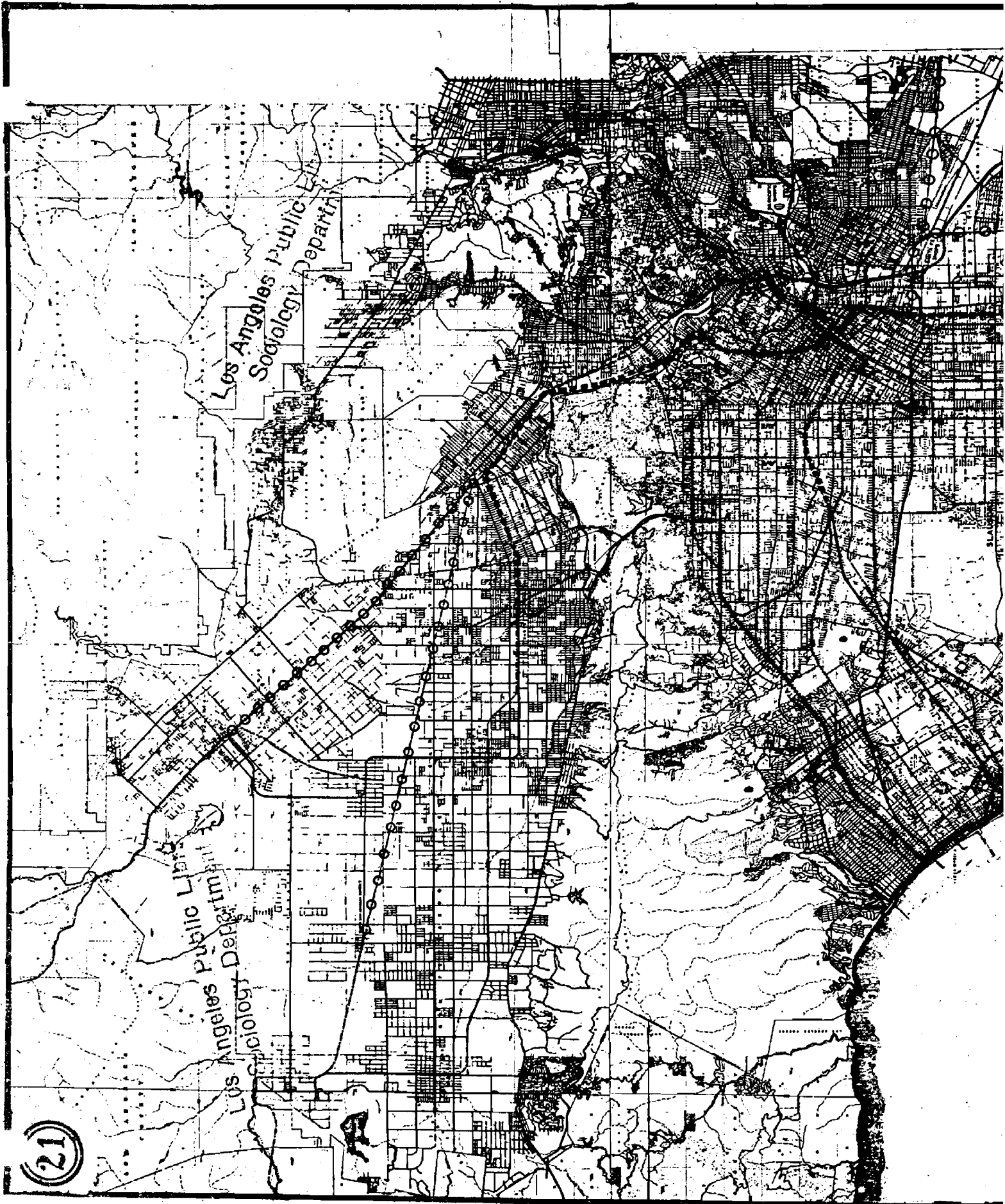
BUREAU OF ENGINEERING
LLOYD ALLEN & CO. ENGINEERS

CITY OF LOS ANGELES
AND THE
METROPOLITAN DISTRICT

— PACIFIC ELECTRIC LINES
LOS ANGELES RY LINES

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VIII.

COMPREHENSIVE TRANSIT PLAN

In considering a comprehensive transit plan for the Los Angeles Metropolitan District, not only must all of the factors mentioned in the preceding section be thought of, but also the existing surface rail and motor transit lines must be given special consideration. In addition, the possibility of future use of certain of the steam railroad lines is not to be neglected. Active consideration is being given at the present time to coordination and unification of steam railroad lines under the direction of Joseph B. Eastman, appointed by President Roosevelt as the National Coordinator of Railroads. This governmental office is functioning under the general direction of Mr. Eastman, with regional or district coordinators in charge of three general divisions of the country, comprising the eastern lines, western lines and southern lines. Each division is further subdivided into specific economic areas, one of which, the Pacific Coast region, comprises Washington, Oregon, Utah and California, in charge of J. E. Hutchinson, formerly Vice-President of the "Frisco Lines". At present there are no plans available as to what may ultimately result from such coordination studies as are being conducted by the Federal Government.

It is possible to give only the briefest and most cursory consideration to a comprehensive transit plan at



PROPOSED RAPID TRANSIT LINES

- LEGEND**
- PROPOSED 4 TRACK SUBWAY
 - PROPOSED 2 TRACK SUBWAY
 - PROPOSED 2 TRACK ELEVATED
 - PROPOSED 2 TRACK OPEN CUT
 - PROPOSED 2 TRACKS WITH STREETS DEPRESSED
 - PROPOSED 2 TRACKS ON PRIVATE RIGHT OF WAY
 - PROPOSED GRADE SEPARATIONS
 - POSSIBLE FUTURE GRADE SEPARATIONS
 - EXISTING GRADE SEPARATIONS
 - OTHER LINES OF THE PACIFIC ELECTRIC RAILWAY CO.
 - POSSIBLE FUTURE EXTENSION OF RAPID TRANSIT SYSTEM ON OTHER RAILWAY LINES

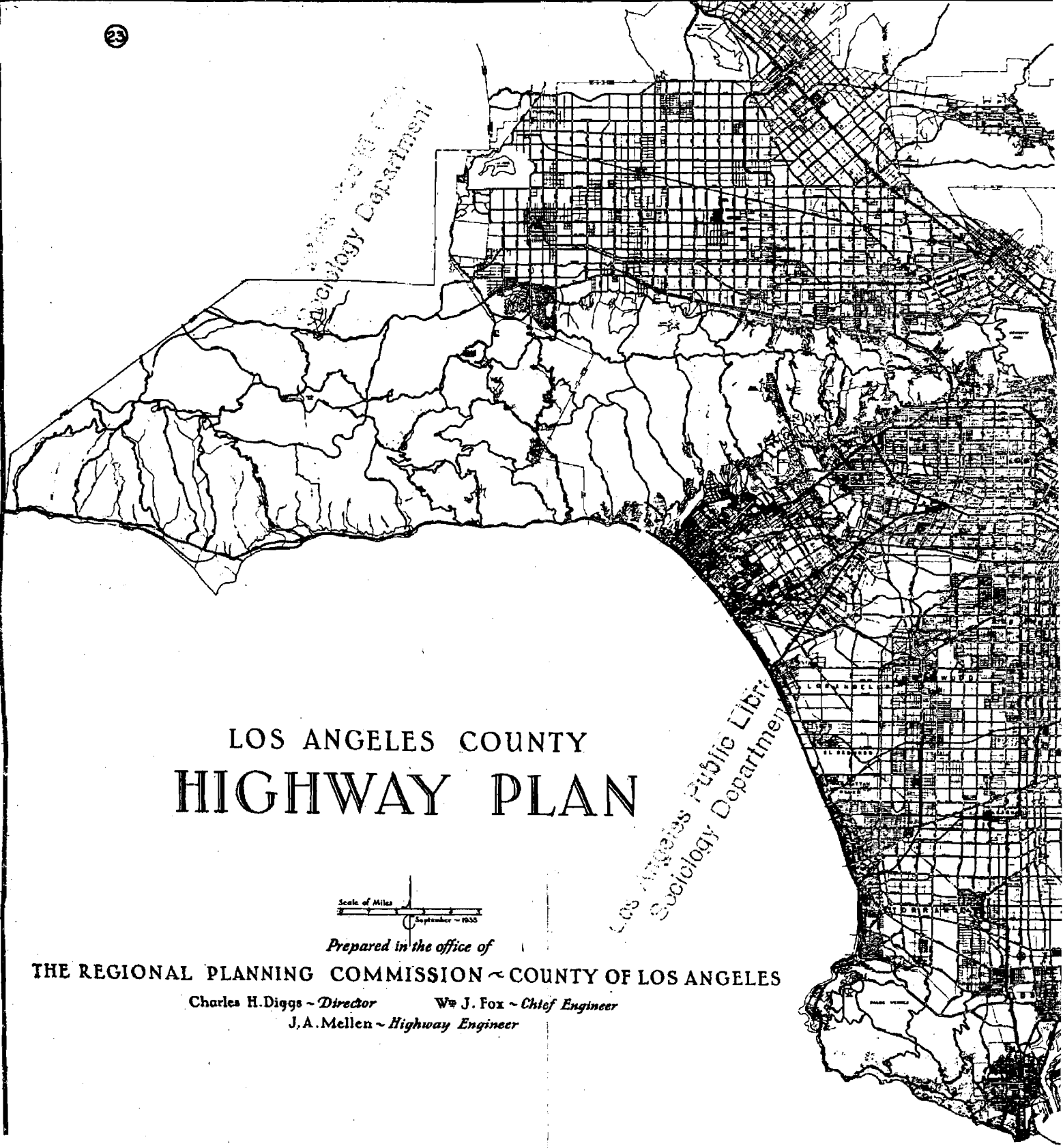
TO ACCOMPANY REPORT ON A RAPID TRANSIT SYSTEM FOR THE CITY OF LOS ANGELES & DONALD M. BAKER CONSULTING ENG'S. NOVEMBER 1932.

this time. For convenience, such consideration as is herein given is subdivided into the following phases:

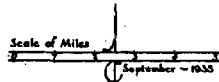
Los Angeles Union Station
 Grade Crossing Elimination
 Coordination of Railroad Lines
 Relation of Pacific Electric Lines and
 Steam Railroad Lines
 Relation of Los Angeles Railway Lines and
 Steam Railroad Lines
 Relation of Los Angeles Railway Lines to
 Motor Bus Systems
 Relation of Los Angeles Railway Lines to
 Proposed Rapid Transit Lines
 Relation of Motor Bus Systems to Rapid
 Transit System
 Relation of Motor Bus Systems to Steam
 Railroad Lines

Proposed Los Angeles Union Station

A plan has been completed and approved by the necessary authorities for the construction of a new Union Station for the city to be located in the so-called Plaza site fronting on Alameda Street in the Civic Center area near the City Hall. This project will result in the abandonment of the present district passenger stations, and to a considerable degree will affect the present plan of operation of the various railroad lines. The location and general arrangement of the proposed station facilities are indicated on Plate 22. It will be noted that the proposed rapid transit facilities will afford service to and from the Union Station by means of rapid transit provided for in the four principal directions. The station is a logical



LOS ANGELES COUNTY HIGHWAY PLAN



Prepared in the office of

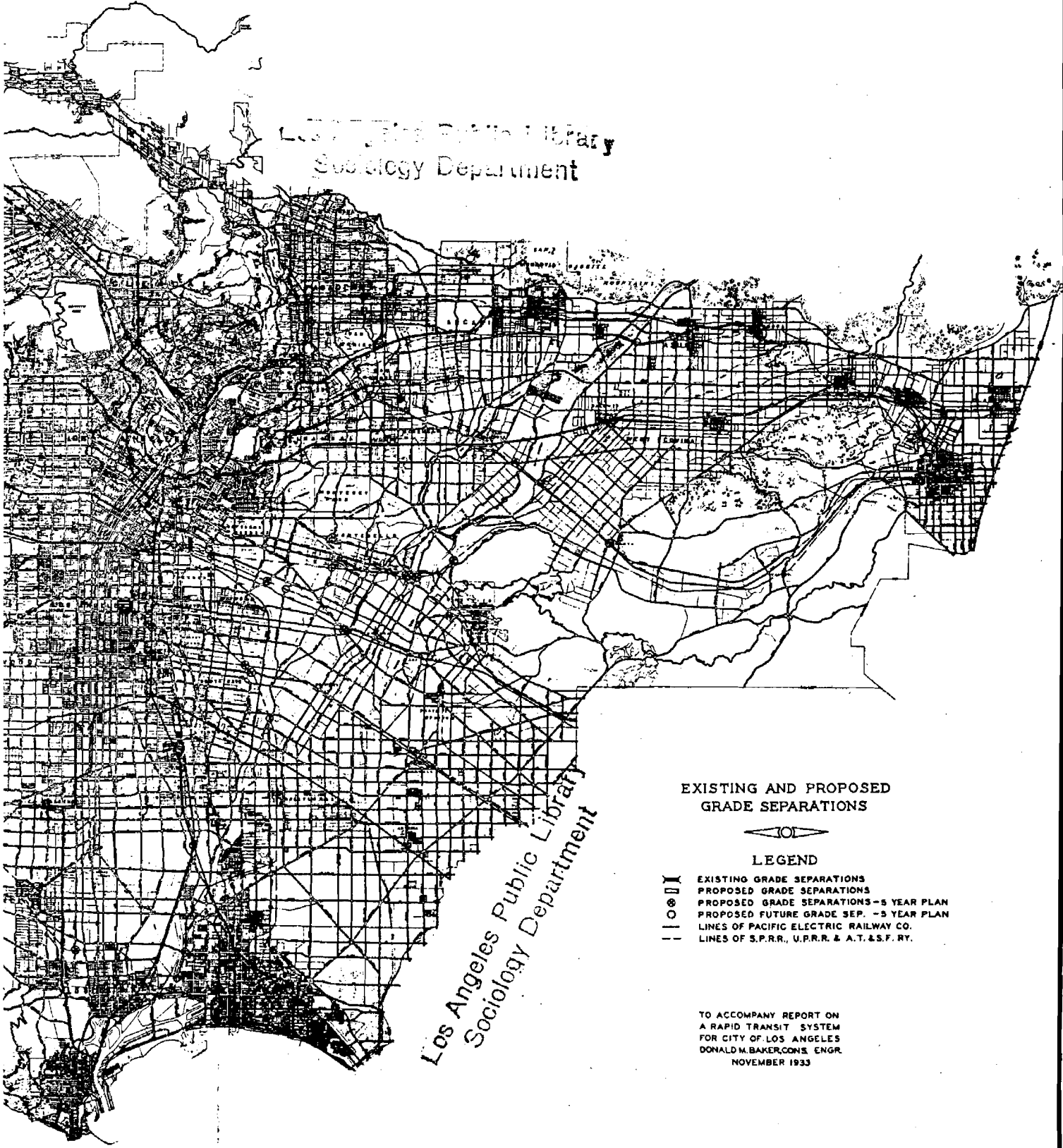
THE REGIONAL PLANNING COMMISSION - COUNTY OF LOS ANGELES

Charles H. Diggs - Director

W. J. Fox - Chief Engineer

J. A. Mellen - Highway Engineer

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EXISTING AND PROPOSED
GRADE SEPARATIONS



LEGEND

- ||| X ||| EXISTING GRADE SEPARATIONS
- ||| ○ ||| PROPOSED GRADE SEPARATIONS
- ||| ○ ○ ○ ||| PROPOSED GRADE SEPARATIONS - 5 YEAR PLAN
- ||| ○ ○ ○ ○ ||| PROPOSED FUTURE GRADE SEP. - 5 YEAR PLAN
- — — — — LINES OF PACIFIC ELECTRIC RAILWAY CO.
- — — — — LINES OF S.P.R.R., U.P.R.R. & A.T.&S.F. RY.

TO ACCOMPANY REPORT ON
A RAPID TRANSIT SYSTEM
FOR CITY OF LOS ANGELES
DONALD M. BAKER, CONS. ENGR.
NOVEMBER 1933

first step in the coordination and unification of railroad facilities of the city, and the tentative suggestions shown on the comprehensive plan for possible future use of rail lines for rapid transit have been made with the view of taking advantage of operating changes which will result from the construction of the Union Station.

Grade Crossing Elimination

Plate 23 shows the intersections of major highways and the Pacific Electric and steam railroad lines where grade separation structures have either been constructed or are proposed under the five year plan agreed upon by the various railroads and public agencies. The possibilities of the use of these various railroad lines for rapid transit are enhanced by the past construction or proposed separation of grades at these intersections.

Coordination of Railroad Lines

The location of the various railroad lines within the city, together with their passenger and freight stations, yards and terminal facilities, are shown on the opposite Plate, Comprehensive Transit Plan of the city. Within the city the possible use of some of these existing railroad facilities for rapid transit appears logical and probable under the program which will be set up by the

railroad coordinator, and a certain amount of joint use of existing facilities by the rail lines will be realized. The independent ownership and use of railroad facilities within the city have resulted not only in the installation of more main line trackage than appears to be required, but also in duplication of passenger and freight stations, classification yards, and facilities for storage, maintenance and repairs to rolling stock. For example, in the Arroyo Seco area the Union Pacific and Santa Fe lines practically parallel each other, lying only a short distance apart; in the northern part of the city the Southern Pacific and Union Pacific lines along the Los Angeles River are similarly located. To the southeast the Santa Fe and Union Pacific lines would serve very largely the same area, and branch lines extending to Long Beach and the Harbor district of the Southern Pacific and Union Pacific might reasonably be expected to be subject to such adjustment that this business could be handled in a single location. It would therefore appear that at some time in the future under the comprehensive rapid transit plan, existing steam railroad trackage might be used for this purpose in the northern part of the city; in the northeastern section; southeastward towards Orange County; southward toward the Harbor district; and southwestward thru Inglewood. Tentative suggestions are therefore included in the comprehensive rapid transit plan for such use of these lines, and they

are indicated on Plate 22 with reference to the rapid transit facilities which are proposed to be constructed at the present time.

Relation of Pacific Electric & Steam Railroad Facilities

The present proposals covering construction of rapid transit facilities are necessarily more intimately related to existing Pacific Electric lines than to the railroad lines, as no commuter or transit service is supplied by the latter. The determination of future extensions of present proposed rapid transit facilities and whether or not the use of steam lines for such extensions is desirable, or can be justified will depend upon a more detailed study of the various factors concerned in the problem than can be undertaken at this time. However, it will be noted that the locations selected for the present construction not only serve as entrances to the central part of the city from the four general directions from which rapid transit service is now most urgently needed, but also connections to it can readily be made from any of the steam lines which it may be ultimately determined could be used for this purpose. Many of the steam railroad lines are paralleled more or less by one of the lines of the Pacific Electric radiating from the central part of the city, and the choice of possible future routes is thereby augmented.

Relation Los Angeles Railway Lines to Steam Railroad
Facilities

While the accompanying comprehensive transit plan does not contemplate any extensive changes in the surface rail lines of the Los Angeles Railway, these lines are largely confined to serving the area in the central part of the city lying within a five mile radius from the central point at Seventh and Broadway. Further study will, no doubt, indicate a considerable amount of readjustment in these lines to properly coordinate them with rapid transit facilities. In making these adjustments consideration will be given to any utilization of the steam railroad lines, in addition to their possible use as part of the rapid transit system, to relieve congestion in certain sections now resulting from the almost universal use of downtown streets by the Los Angeles Railway Lines.

Relation-Los Angeles Railway Lines to Motor Bus Systems

The motor bus lines operated by the Los Angeles Railway have been located with the principal object of serving as feeders to the Company's rail lines, altho they do, in a measure, afford some cross-town service in addition. There is no coordination between motor bus lines operated by other companies and Los Angeles street railway lines, insofar as these bus lines may be said to have been designed to afford service to the central part of the city.

There are instances -- as for example, the Bay Cities and Santa Monica Municipal Bus Line -- where service is afforded to the outlying areas from the end of a car line but in general the bus lines are either in direct competition with the street railway lines or serve specific areas without any evident intention of their use as a part of a comprehensive plan.

RELATION of Los Angeles Railway Lines to Proposed
Rapid Transit Lines.

No operation of Los Angeles Railway lines is contemplated over the present proposed rapid transit lines. As shown on Plate 21, certain minor adjustments have been suggested, but it is not intended in this report to outline a general revision of the operation of Los Angeles Railway lines. There are certain results and benefits to the Los Angeles Railway lines which will naturally follow the construction of initial units of a rapid transit system. The interurban service of the Pacific Electric should be entirely removed from downtown streets, in which event the schedules of the Los Angeles Railway lines can be speeded up. In addition, the tendency for persons living in the areas tributary to the rapid transit system will be increasingly toward the use of the system and away from private automobiles. This will result in a reduction in the number of automobiles entering and leaving or

passing thru the business district, which will reduce congestion therein, thereby allowing improvement in the service of Los Angeles Railway lines. Beyond doubt, the declining trend of riding on the Los Angeles Railway lines has been due, to a considerable extent, to increasing difficulty in operating cars into and thru the central congested district, for -- while the average base schedule for the system is $11\frac{1}{2}$ miles per hour -- this is reduced to as low as 4 to 6 miles an hour as the central area is approached. The net result of these various factors will be an increased amount of riding on Los Angeles Railway lines, which, within a reasonable period, will more than overcome any direct losses from the Los Angeles Railway lines to the rapid transit lines.

Relation of Motor Bus Systems to Rapid Transit Systems

The comprehensive plan -- Plate 21 -- indicates the existing motor bus service, both local and interurban, within the city. Due to the flexible nature of this service no attempt has been made in the comprehensive plan to outline, to any extent, the changes which may be found desirable and necessary in the present routes. Certain minor adjustments have been indicated which, without any great amount of detailed study, are readily apparent as desirable in connection with the proposed rapid transit plans.

Relation of Motor Bus Systems to Steam Railroad Lines

At the present time there is no very intimate relation between motor bus service and steam railroad lines. It is known that the automotive industry has given some consideration to a type of vehicle which can be operated on both the city streets and rail lines, and it may be possible that in connection with further studies of this general subject some thought should be given to this feature.

Effect of Various Phases Upon the Comprehensive Plan.

The Union Station will make possible the removal of passenger service of the Union Pacific from the Union Pacific-Southern Pacific connection between Washington and Leonard Streets, facilitating the use of this track for rapid transit, if desired.

Its construction would also make possible, should it prove expedient, the extension of rapid transit service over either the Santa Fe or Union Pacific tracks northward from Alsio Street along the Los Angeles River.

The elimination of various grade crossings under the five year plan and such additional crossings as may be agreed upon at various major highways will reduce running time upon the existing Pacific Electric Railway lines, as well as facilitating the use of steam railroad lines for rapid transit in the future should this prove desirable.

The coordination of the steam railroad lines and terminal facilities should be worked out with the future rapid transit requirements in mind, and this consideration should be an important factor in solving the railroad coordination problem.

In any plan agreed upon, such use of the Pacific Electric and steam railroad lines in handling the rapid transit and freight requirements of the city should be made as will result in the most economical and desirable plan, from the standpoint of both the city and the carriers.

While no very intimate relation now exists between the local street railway lines and the steam lines, sight should not be lost of any opportunities to coordinate these, and this appears to be possible in at least one instance, namely, better service for the Eagle Rock area into the Central Business District.

Motor bus operation will have to be rearranged in relation to the Los Angeles Railway lines so that areas served by these carriers may be either tributary to the appropriate surface rail lines in each case; replace certain of the rail lines; function as cross-town lines; as routes between population centers outside of the Central Business District; or as extensions of the Los Angeles Railway lines into sparsely settled areas where this may be done without affecting adversely the future rapid transit system.

There need be no hesitation in stating that the proposed rapid transit lines will dispense with certain lines of the Los Angeles Railway and will curtail the extent of use of others. The general effect, however, will be to increase riding on all car lines. Factors which will bring this about are:

The use of automobiles to and from the central area will be reduced.

The use of the downtown streets by Pacific Electric Railway cars will be reduced. This means better service for the street railway cars, and that in turn will encourage riding.

Combining street railway lines with rapid transit lines -- as in Eagle Rock service -- will increase riding on such lines because of faster service.

Crowding on lines now fed by certain bus lines will be reduced -- this has already been the source of complaint by riders using the line for the more profitable short hauls -- and the short haul riders will be increased.

Certain motor bus lines which now operate in direct competition with the street railway lines should be used as feeders to the rapid transit lines. Also new lines may be necessary depending upon a wider and more detailed study of the transit requirements. Other lines should be re-routed to avoid duplication of service with the rapid transit lines.

The use of any of the steam railroad lines or rights-of-way by motor busses is only remotely possible if some satisfactory vehicle is made practicable.

IX.

PLAN OF INITIAL RAPID TRANSIT ROUTES PROPOSED

Economic considerations do not at the present time justify the construction of a comprehensive system of rapid transit for the entire Los Angeles Metropolitan District. Such comprehensive system will come with increase in community growth. The initial development herewith proposed serves immediate needs, and is planned as a framework from which a comprehensive system may be expanded in the future through a program of grade separations and/or extensions of subway and elevated structures. This plan consists of four routes, extending in four directions from the heart of the City of Los Angeles, serving respectively, (a) Pasadena and the San Gabriel Valley; (b) the southeastern and southern portions of the Metropolitan District from Whittier to San Pedro; (c) the densely settled western section of the City of Los Angeles and the Santa Monica Bay region from Redondo to Santa Monica, and (d) the San Fernando Valley, Burbank and Glendale. As shown on Plate 22.

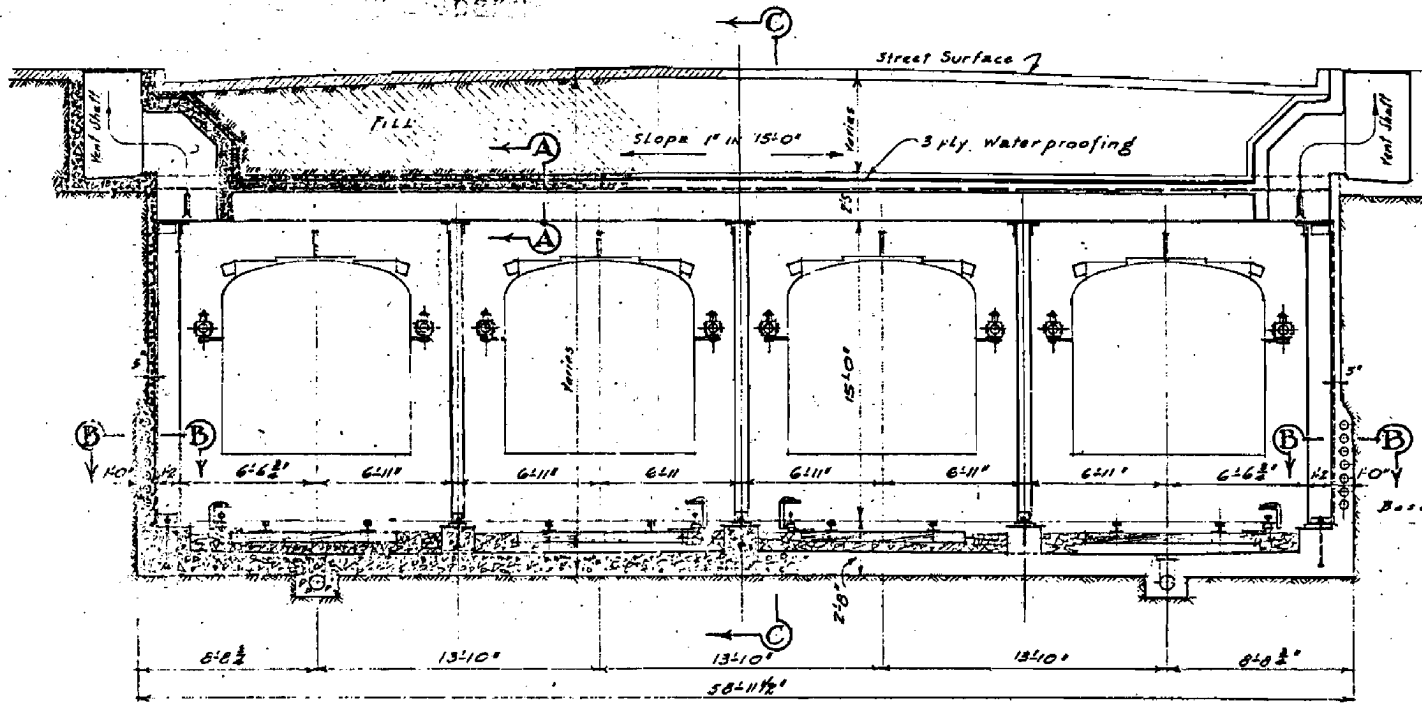
Under this plan, rapid transit service is possible in all directions thru the approximate center of population and along the major lines of its distribution. In addition to affording facilities for the greatest number of people living on all sides of the Central Business District to reach that district in less time than they can at present on public transit lines, it provides for those re-

siding east of the district and along rapid transit routes to make trips to the west coast beaches without delay and in much less time than is now possible by using public carriers.

Since there appears to be a lesser need for thru service in a north-south direction, the principal riding being to and from the Central Business District, a connection between the elevated section of the proposed line running out of the Pacific Electric terminal and the Glendale line at the Subway Terminal Building cannot at present be economically justified.

Pasadena-San Gabriel Valley Line

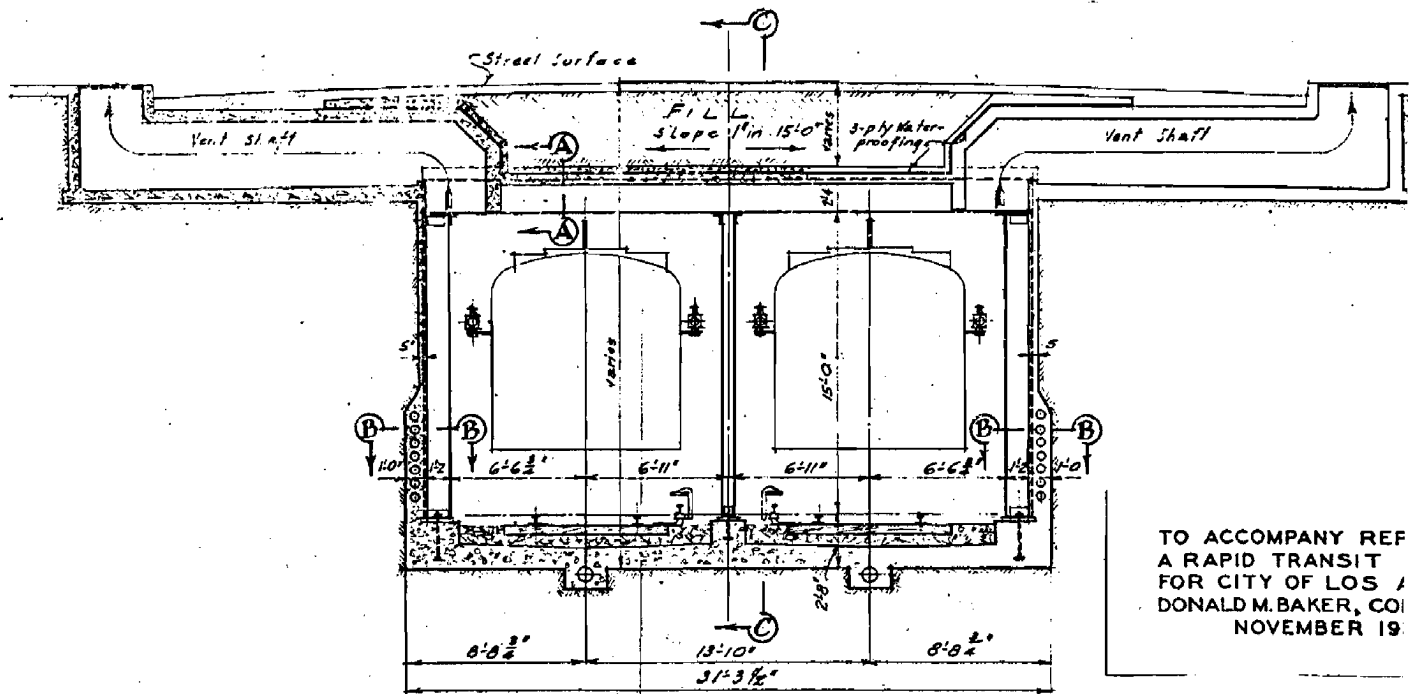
The plan proposed contemplates a subway north and south thru the downtown section as far south as Tenth Street, extending northward thru the Civic Center and the proposed Union Passenger Station to Aliso Street, and thence eastward. It will cross the Los Angeles River either by bridge or by tube, depending upon the outcome of detailed cost studies, returning to the present surface tracks at Mission Road. This line will serve Pasadena, the San Gabriel Valley and other easterly lines, and will eliminate serious delays now encountered thru the present crowded downtown streets. Cost estimates given herein are based upon crossing under the Los Angeles River by a tube, the more expensive of the two means of crossing. The ex-



SECTION THROUGH 4-TRACK SUBWAY

Scale: 1/4" = 1'-0"

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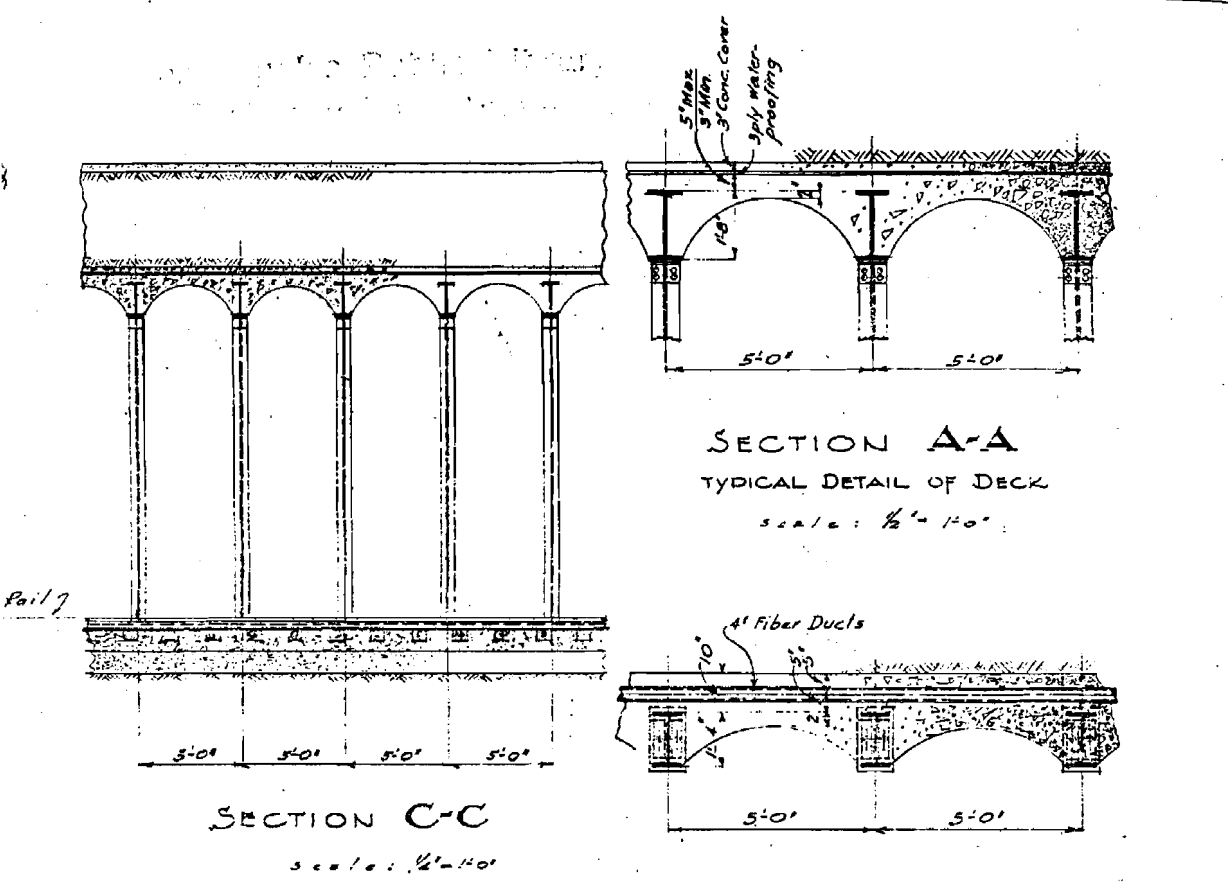
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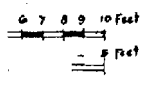
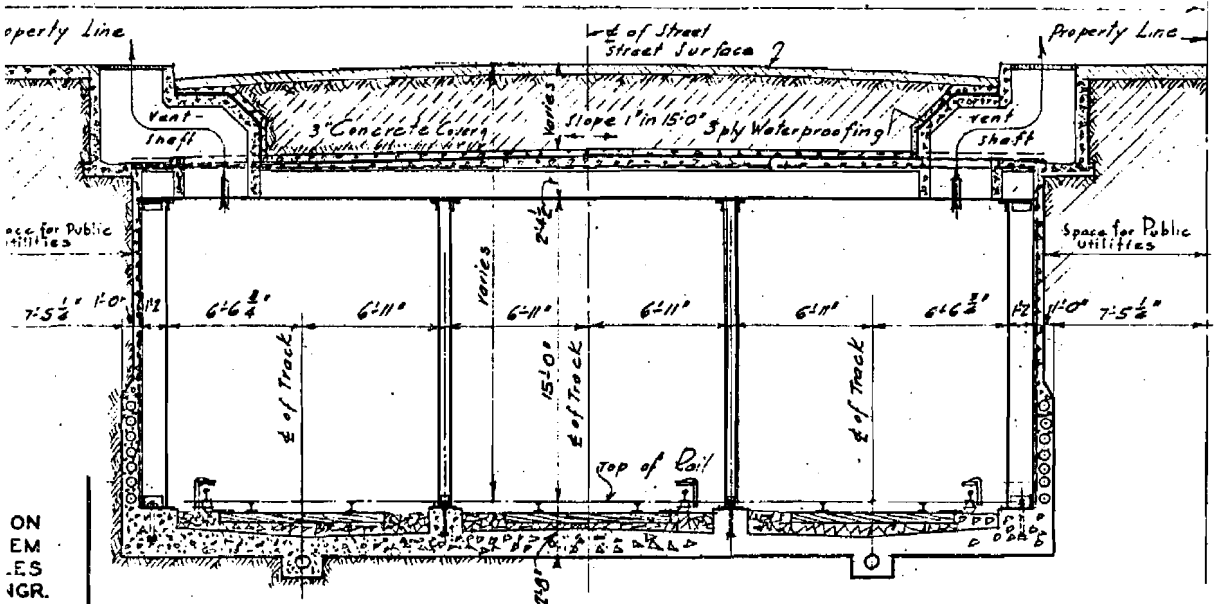
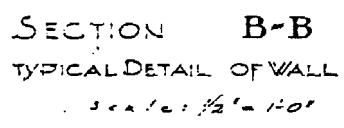
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FOR CITY OF LOS
DONALD M. BAKER, CO
NOVEMBER 19

Scale 1/2" = 1 Foot:

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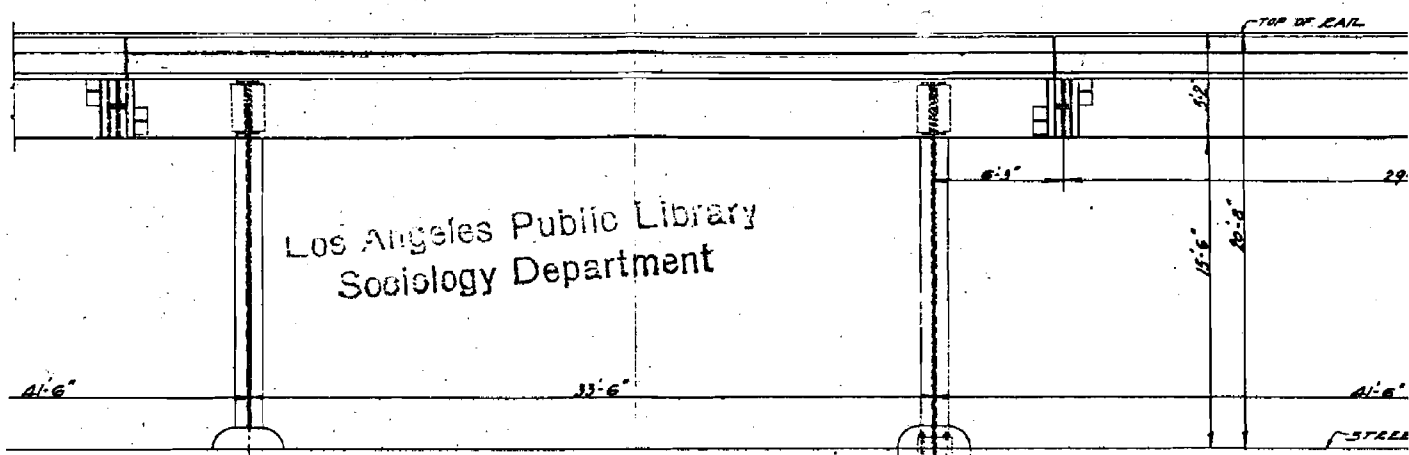
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PROPOSED SUBWAY LOS ANGELES, CAL.	
DESIGNED BY CHECKED BY APPROVED BY DATE	TYPICAL SUBWAY SECTIONS
PL 1	SCALE AS SHOWN

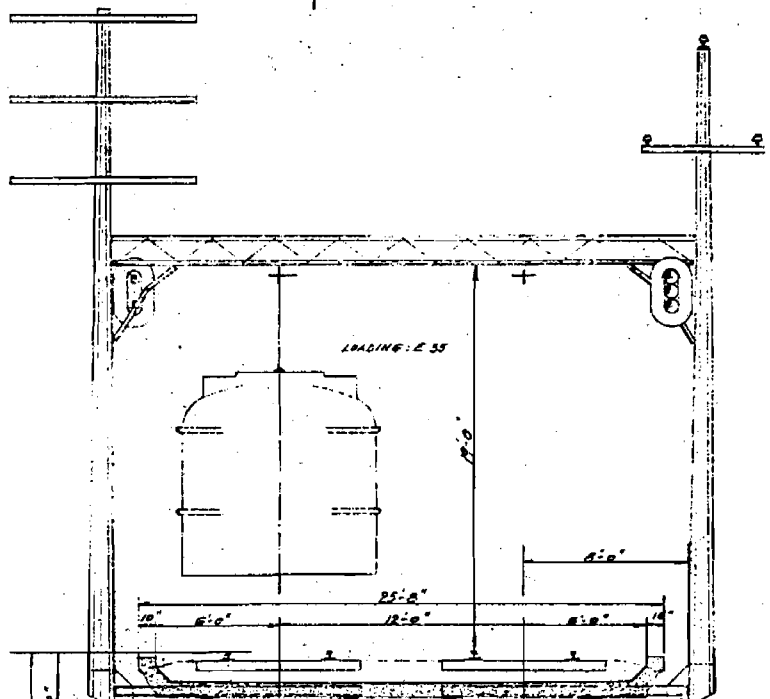
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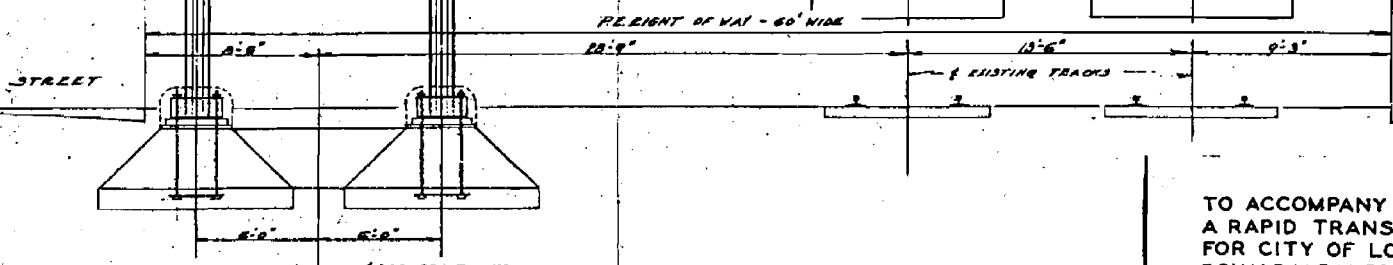
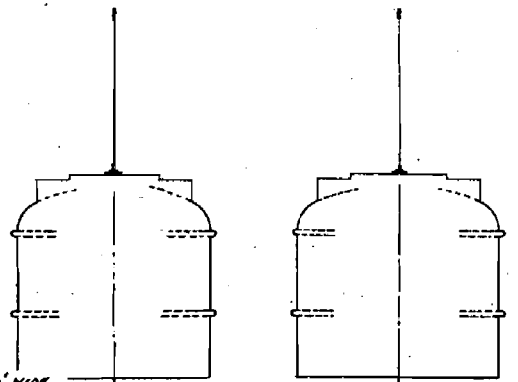
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ELEVATION
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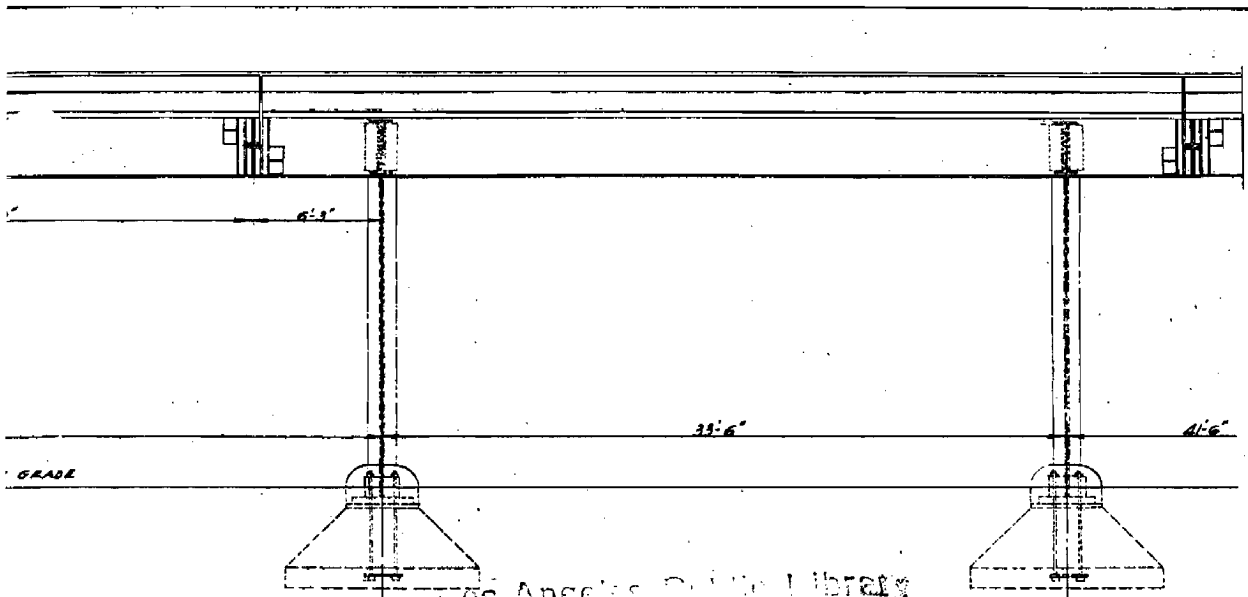


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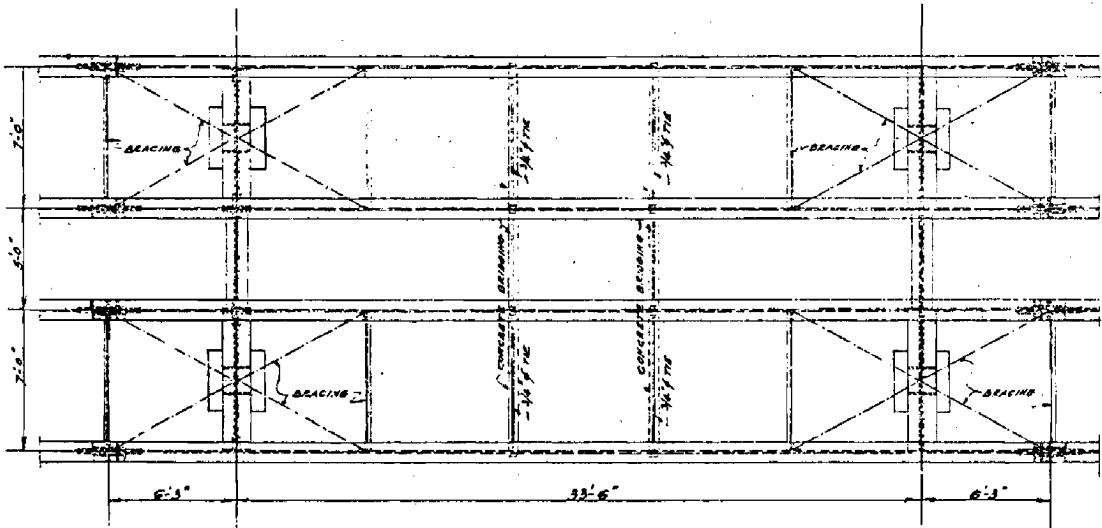
TYPICAL CROSS SECTION
1/4" = 1'-0"

TO ACCOMPANY
A RAPID TRANSIT
FOR CITY OF LOS ANGELES
DONALD M. BAKER
NOVEMBER 1911



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1/8" = 1'-0"



PLAN OF STEEL FRAMING
1/8" = 1'-0"

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STEEL

REPORT ON
T SYSTEM
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CONS. ENGR.

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ENGINEERING DEPT.
LOS ANGELES CALIFORNIA

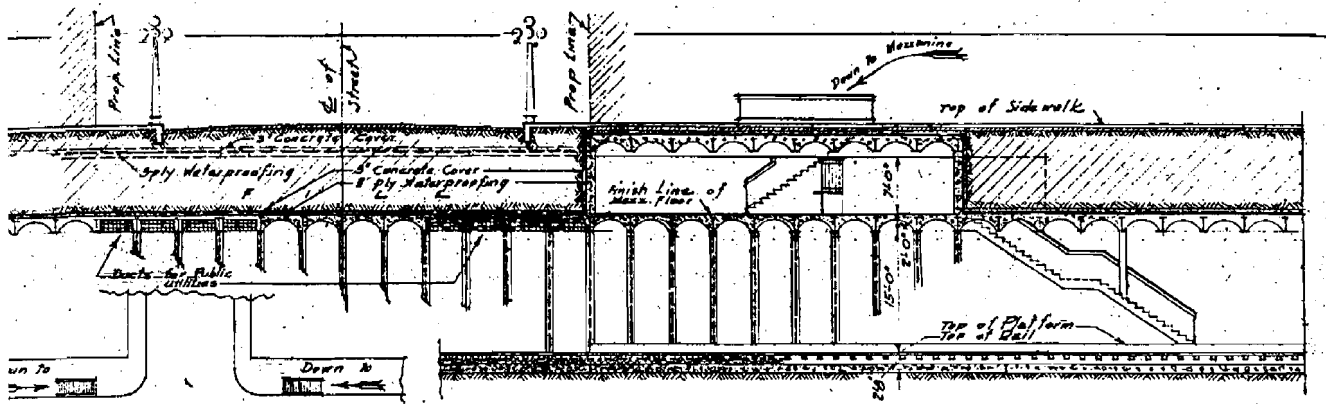
PROPOSED ELEVATED
LOS ANGELES, CAL.

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TYPICAL
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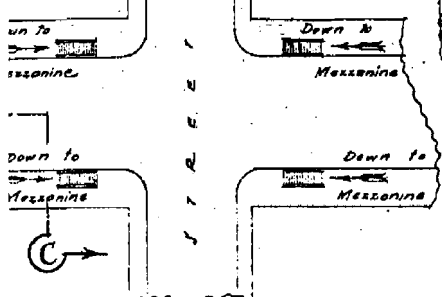
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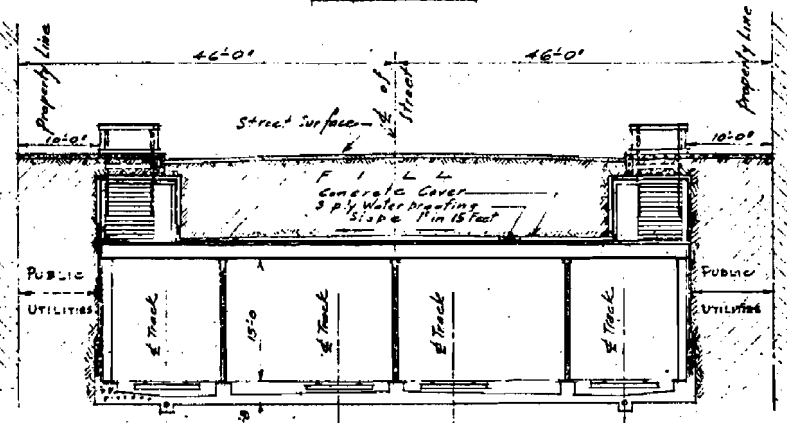


SECTION A-A.

Scale: 1" = 10 feet

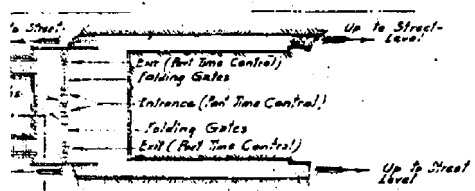
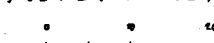


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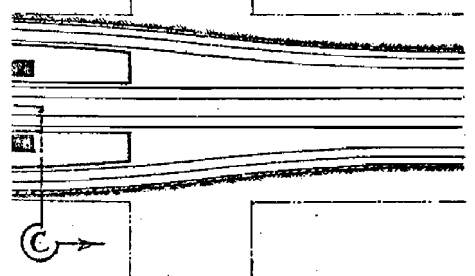
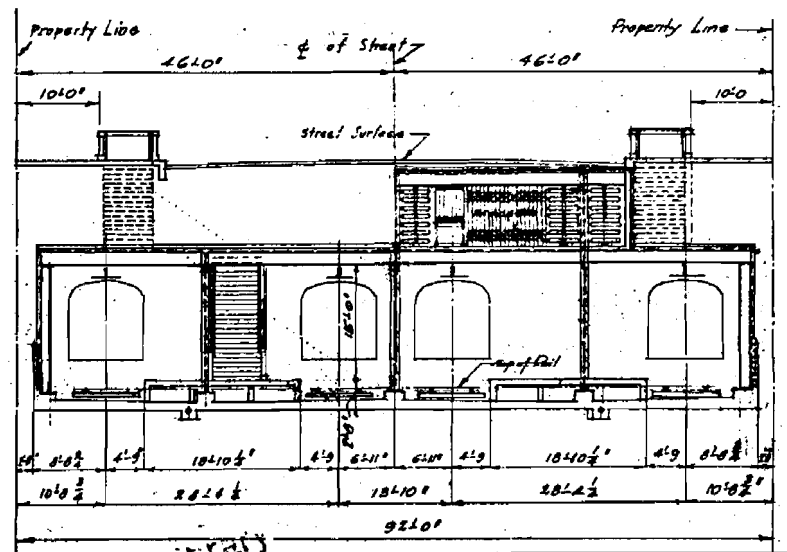


SECTION B-B

Scale: 1" = 10 feet



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1933

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ENGINEERING DEPT.
LOS ANGELES CALIFORNIA

PROPOSED SUBWAY
LOS ANGELES, CAL

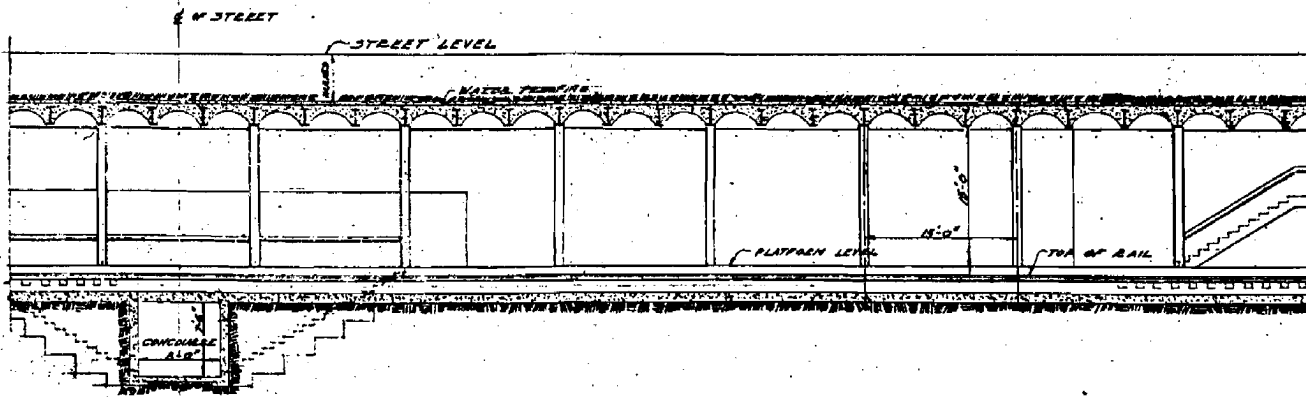
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APPROVED BY

4 TRACK
STATION

Sheet No. **3**

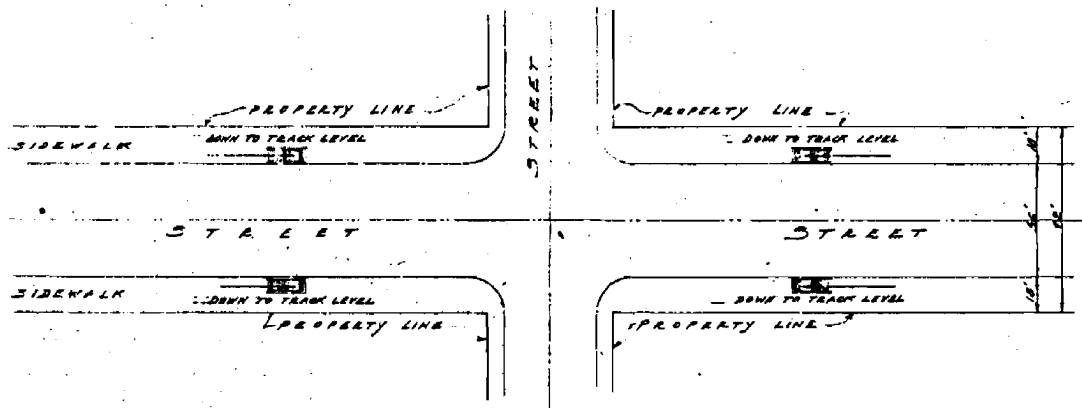
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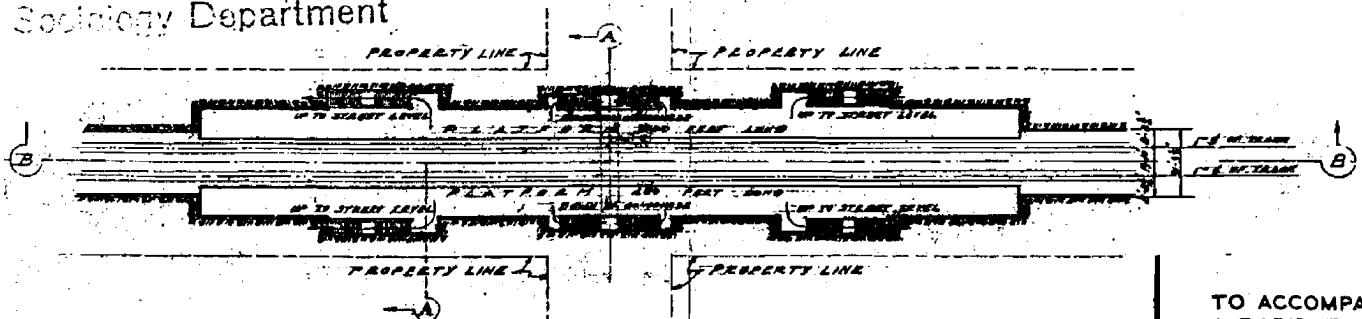
HALF-LONGITUDINAL-SECTION
SCALE 1/8" = 1'-0"

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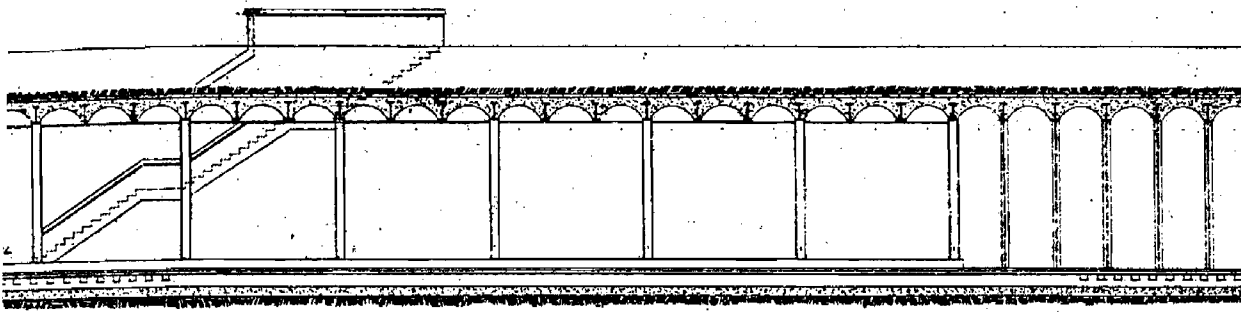
PLAN-AT-STREET-LEVEL
SCALE 1" = 40'

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PLAN-AT-TRACK-LEVEL
SCALE 1" = 40'

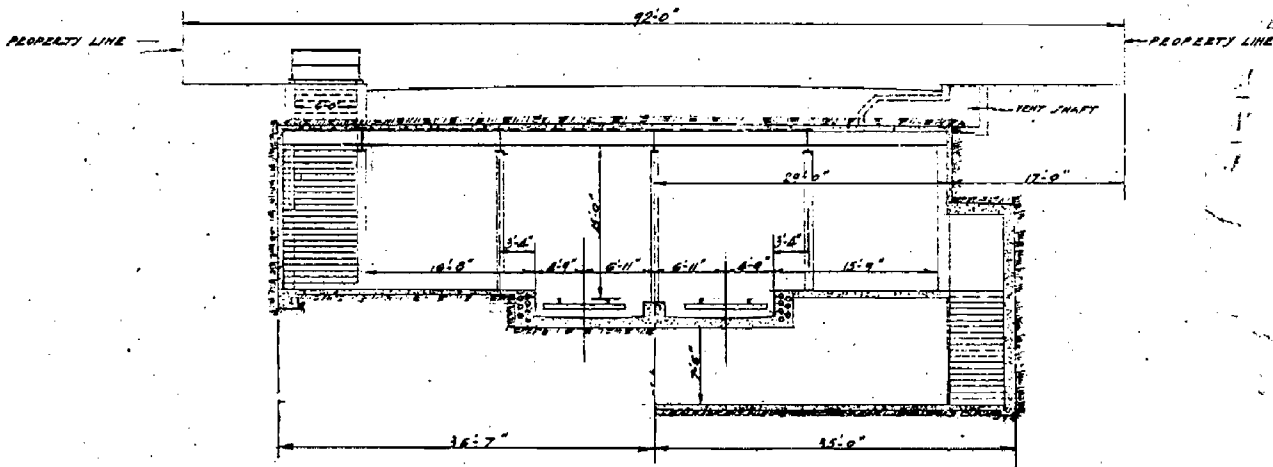
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FOR CITY OF LOS
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NOVEMBER 1



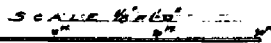
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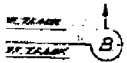
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CROSS-SECTION - A-A



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TO ACCOMPANY REPORT ON
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FOR CITY OF LOS ANGELES
BY M. BAKER, CONS. ENGR.
NOVEMBER 1933

REVISIONS		
NO.	DATE	DESCRIPTION

PACIFIC ELECTRIC RAILWAY CO. ENGINEERING DEPT. LOS ANGELES CALIFORNIA	
PROPOSED SUBWAY LOS ANGELES, CALIF.	
DRAWN BY A. M. PLYSTER CHECKED BY DATE W.S.	2 TRACK STATION

S.E. 1731

act location of the north and south subway, as discussed later, is subject to further study during construction, etc.

It is planned to have a subway station adjoining the new Union Passenger Station in the Civic Center, connected with such station by a subway concourse. The line will consist of a two track subway from its entrance near the Los Angeles River, extending south to about Fourth St. From there a four track section will continue south to Tenth Street, thence west to Figueroa, with turn-back facilities being provided at the latter point. This four track section will be so constructed that thru service may later be arranged in connection with it from Glendale and the San Fernando Valley, and westward from Vineyard and the Western area -- the latter, however, being the service which will be first established. Cross sections, station plans, etc., of the subway thru the Central Business District are shown on Plates 24, 26 and 27.

Long Beach -- San Pedro Line

The elevated line southward towards San Pedro and Long Beach will commence just east of the present Pacific Electric terminal at Sixth and Main Streets, and will be located on a wide private right-of-way which will transverse a district largely devoted to industry. The usual objection to construction of rapid transit lines will not, therefore, be applicable in this case and subway

construction need not be resorted to. Moreover, future possible extensions along railroad lines indicated on the plans may be accomplished by partial elevation of track and elimination of major highway grade crossings. The type of construction for this plan is shown on Plate 25, and service required on it will be amply provided for by the two track structure shown. With future excessive expansion and development occurring between the central part of the city and the Harbor district, more elevated structures may be required, rights-of-way provided being ample for this purpose.

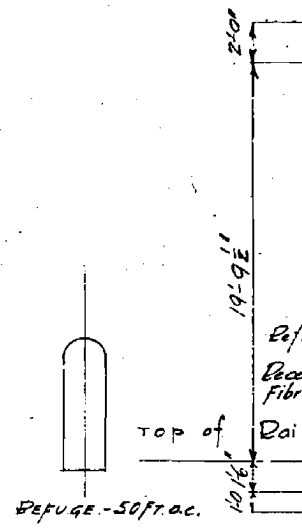
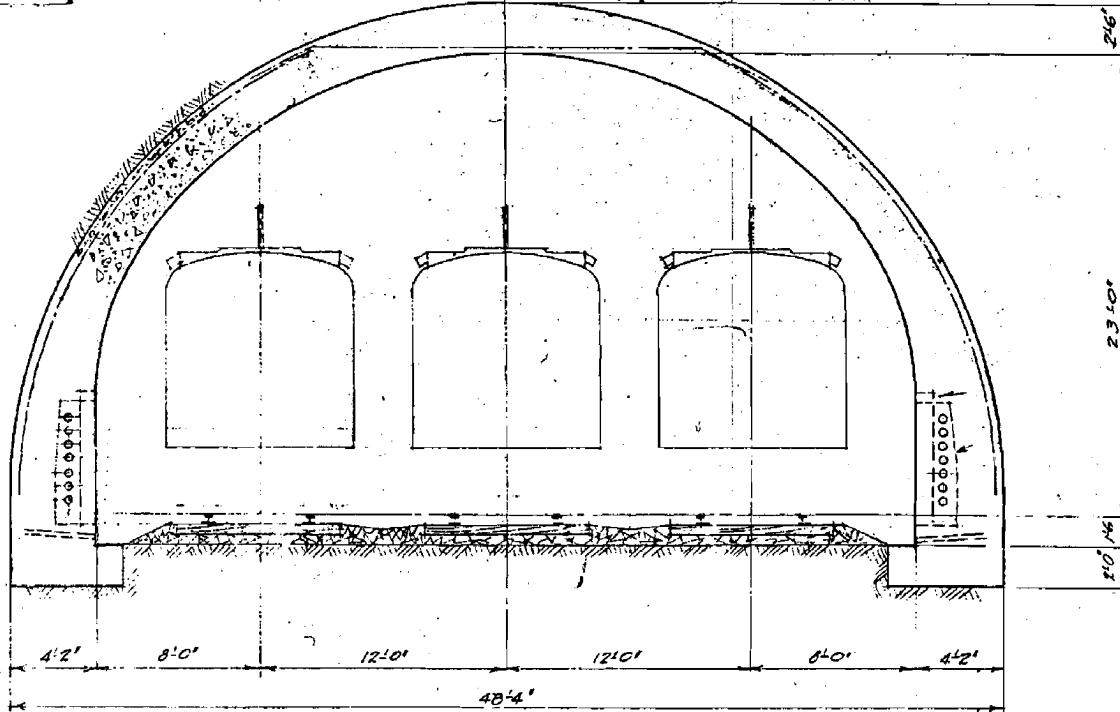
Vineyard Line

This consists of a four track subway on a north and south street -- to be selected after further study -- from about Fourth Street to Tenth and Figueroa Streets. It will be a continuation of the Pasadena Line. From Figueroa, a three track subway will continue along Tenth Street to Hoover, thence in a straight line to Eighth St. which it will follow for a short distance, until it meets with the existing Pacific Electric right-of-way near Harvard Boulevard. It follows this right-of-way beneath the surface and in an open cut to a point near Pico and West Boulevards, there coming to the surface and crossing Pico on an elevated structure to join the present Pacific Electric tracks at Vineyard Junction. From here west,

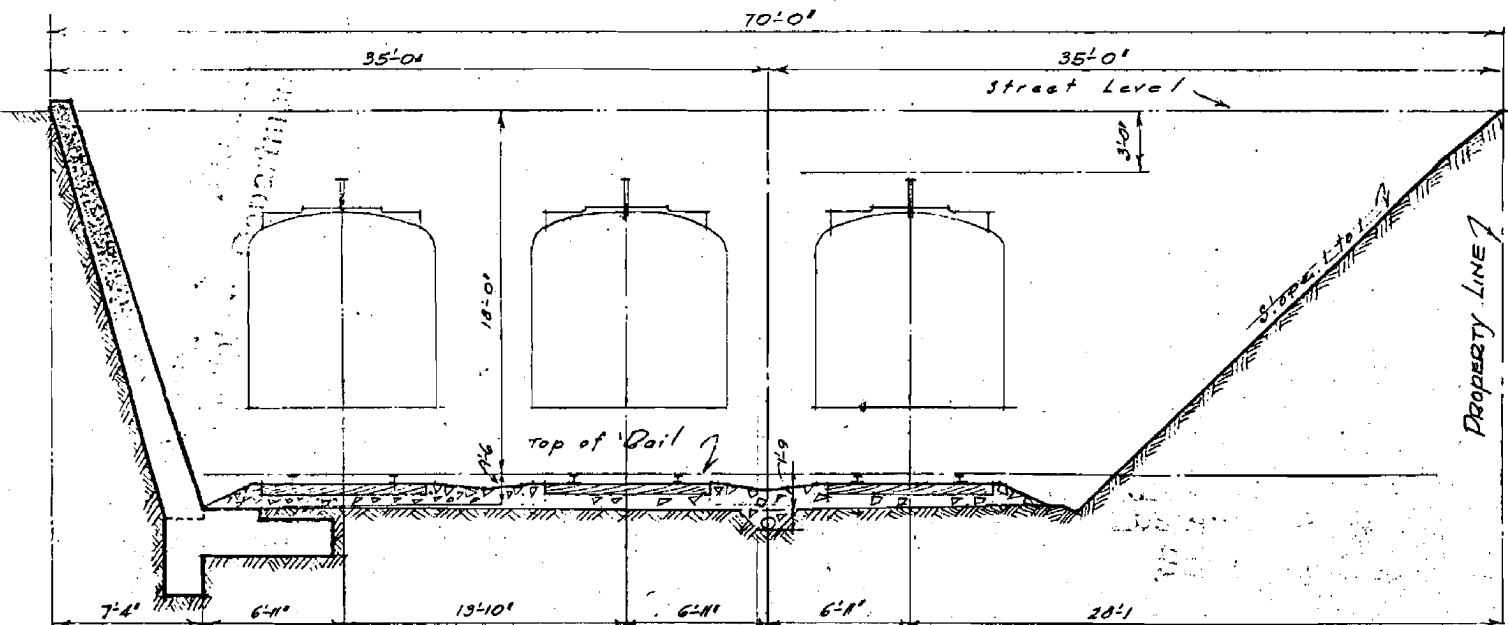
existing surface lines are used to the coast. The three track line will provide local service for the large population residing between Vineyard and the Central District, and express service to points west of Vineyard.

In case it is found feasible to construct this and the Pasadena-San Gabriel Valley line along Hill Street, a connection can be made with the Glendale-San Fernando Valley Line at small cost, bringing these trains to Tenth and Figueroa Streets.

Before the exact north and south downtown street upon which this subway is to be located can be definitely established, it will be necessary to make further investigations into such matters as cost of construction, underground conditions, traffic delays and business losses during construction, and operating schedules, and if the results of such studies indicate the advisability of locating this line on some street other than Hill, the connection between it and the Glendale-San Fernando Valley Line will involve some considerable cost, and a decision upon the final location can only be made after such detailed studies have been completed. Because transfers from the Pasadena-San Gabriel Valley Line to the Vineyard Line will be merely a matter of stepping across a platform from the subway terminal from one train to another, it is not considered necessary to provide four tracks north of the terminal in Hill Street. If some other



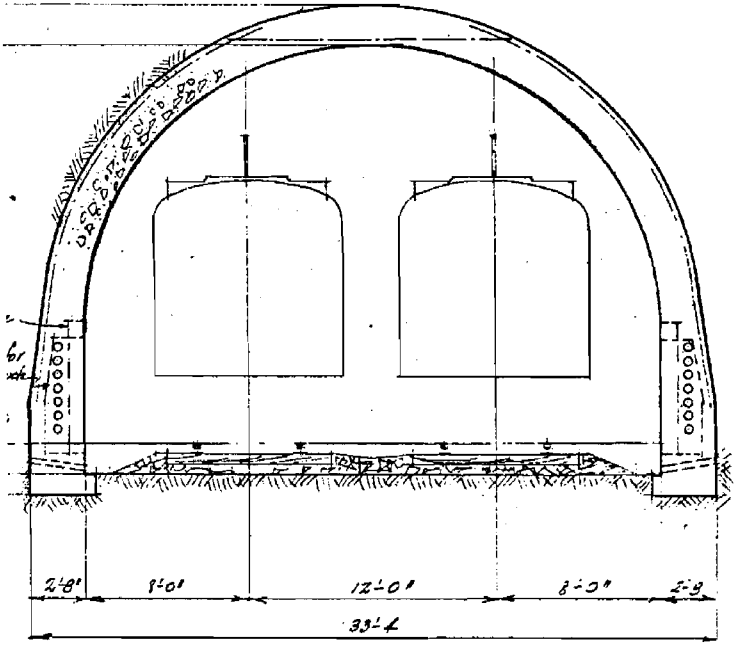
3 TRACK TUNNEL SECTION



3 TRACK OPEN CUT

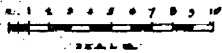
TO ACCOMPANY REPORT
 A RAPID TRANSIT SYSTEM
 FOR CITY OF LOS ANGELES
 DONALD M. BAKER, CONS. EN.
 NOVEMBER 1933

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Sociology Department



2-TRACK TUNNEL SECTION

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Sociology Department



REVISIONS	
NO.	DATE

PACIFIC ELECTRIC RAILWAY CO. ENGINEERING DEPT. LOS ANGELES CALIFORNIA	
PROPOSED SUBWAY LOS ANGELES, CAL.	
DRAWN BY J. S. STANLEY CIV. ENGR.	SHEET NO. 4
CHECKED BY _____	TYPICAL SECTIONS FOR TUNNELS & OPEN CUT
COMPUTATIONS SHEET NO. _____	SCALE 1" = 10'-0"
DATE _____	_____

S.E. 1731-C

street is chosen for the final location, it may be necessary to extend the four track route further north.

Glendale-San Fernando Valley Line

This line proposes using the present tunnel from the Subway Terminal Building to Beverly Boulevard, crossing under it, at which point there is the possible choice of two alternatives. The first is extending the tunnel under Beverly Boulevard and coming to the surface thru an open cut a short distance beyond that point; the second, extending the tunnel under both Beverly Boulevard and Temple, coming to the surface thru an open cut north of Temple Str. near Bellevue. The latter plan, while affording a saving of some minutes in running time, will involve a considerable added cost, and it would appear from present available information that it may be advisable to delay its construction until such time as future riding on the line warrants it. Cost estimates given herein are based upon the extension of the line to Bellevue. The line then follows the present Glendale line to the private right-of-way at Baxter Street, along which it continues to Riverside Drive, crossing the Drive at the existing grade separation and continuing across the Los Angeles River. Here it leaves the present line and follows along the east side of the Los Angeles River on the private right-of-way to a point opposite the end of Doran Street in Glendale. Here the line crosses San

Fernando Road on an elevated structure to a connection with the present Burbank line at about Grand View and Glen Oaks Boulevard. An elevated structure continues northward from opposite Doran Street thru Burbank along and adjacent to the Southern Pacific right-of-way. At Olive Ave. use of the existing Southern Pacific branch line is begun, the proposed line utilizing present track right-of-way to a connection with the Cahuenga Blvd. line at Vineland Ave. in North Hollywood.

Bus lines operating along the east and west streets in Glendale to the proposed line along the Los Angeles River will provide much quicker service to the city than is provided by the present Glendale line along Brand Blvd. Burbank is now served by the line thru the business district of Glendale. North Hollywood is served by the Cahuenga line thru Universal City and the business section of Hollywood. The proposed line will provide a much faster route for San Fernando Valley passengers to the downtown area. As population increases in the San Fernando Valley, more direct and faster service will be required between the entire valley as far west as Chatsworth, Canoga Park, Reseda, and Van Nuys to the downtown area, and this can be accomplished by using the present Southern Pacific tracks or rights-of-way for extending rail rapid transit service.

Cost of System

Estimates of the cost of the system, including rights-of-way and structures, have been prepared by the Pacific Electric Railway. Unit prices assumed have been liberal and considerably above 1933 figures so as to care for any reasonable increase in construction costs during the next year or two. Costs given include overhead, engineering, contingencies, and interest during construction.

On the Glendale line, the subway has been assumed as coming to the surface north of Bellevue Drive, which would involve an added cost of about one and a quarter million dollars. Likewise on the Pasadena line estimates have been made on the basis of crossing under the Los Angeles River by means of a tube, which involves a cost of about two million dollars more than crossing on the surface by a bridge, if the cost of such bridge is considered as a part of the Union Station project. If the river is crossed by a bridge, the line will enter the subway thru a slot on Aliso Street just west of the river, and widening Aliso Street at that point will be necessary to maintain adequate traffic capacity. These two savings on the Glendale and Pasadena lines will reduce construction costs between two and three million dollars, or from $5\frac{1}{2}\%$ to 8% of the total cost of the project.

Following is a brief summary of the cost of the entire system:

Table 10
ESTIMATED COST OF RAPID TRANSIT LINES
(Prepared by the Pacific Electric Railway)

Line	Rights of Way	Structures	Total Cost
PASADENA			
Macy St to Hill St Terminal	\$ 80 000	\$ 5 724 850	\$ 5 804 850
LONG BEACH			
P.E. Terminal to Slauson Junction	100 000*	4 140 000	4 240 000
VINEYARD			
Hill St Terminal to 10th & Figueroa		7 372 350	7 372 350
10th & Figueroa to Vineyard Junction	1 100 000	12 385 060	13 485 060
GLENDALE			
Hill St Terminal to Bellevue Drive	255 000	6 023 525	6 278 525
TOTAL	\$1 535 000	\$35 645 785	\$37 180 785

* Not including present rights-of-way owned by Pacific Electric Railway on Long Beach line, valued by them at \$1,362,000, and on Vineyard line, valued by them at \$913,000.

In discussing the financing of the system, round numbers have been used as follows:

Structures	\$35 650 000
Rights-of-way	<u>1 550 000</u>
Total	\$37 200 000

X.

PASSENGER REVENUES FROM PROPOSED RAPID TRANSIT SYSTEM

To estimate probable future revenues from a rapid transit system in the Los Angeles area involves the utilization of many uncertain factors. In New York, Chicago or Philadelphia rapid transit has existed for years past and previous experiences and local habits serve as a guide. Locally no such experience is available and past and present riding habits on surface lines offer no assistance. Nevertheless, such an estimate covering the life of bonds to be issued for constructing the system is necessary, and such estimate has been made, based upon reasonable and conservative assumptions.

FUNDAMENTAL PREMISES

Passenger revenues upon a transit system during a given year are the product of population tributary to the system, the number of rides per capita per year which such population contributes, and the average fare received per ride. Judgment, based upon familiarity with the problem and upon past experience, must be applied to the selection of each factor for any given year in arriving at the revenue for that year. If for any year each line of the system is divided into a number of sections and population increase, riding habit and resulting revenue for each computed separately, errors in judgment used and in assumptions made will be more apt to be compensating and the final result

for the entire system more likely to approximate the actual revenues which will be received, than if the entire system revenue were estimated for a given date as a single operation.

The financial feasibility of the system proposed -- unless it forever remain a burden upon property which is to underwrite a portion of the cost in the initial years -- depends upon a very considerable future increase in revenues which in turn depends upon future increase in population and riding habit. It is believe that such increase is a safe expectation for the following reasons:

1. The geographic location of this area, its natural and economic resources, the spirit of its people, and its past history all point to continued population increase in the future.
2. Per capita automobile registration in this area has about reached the saturation point. Since 1927, the figure has remained practically constant, even declining somewhat during the depression.
3. Traffic congestion due to automobiles is likewise approaching an upper limit and few more automobiles will find it possible to enter the Central District unless large sums are spent for new street approaches and for offstreet parking facilities. The economic feasibility of doing this appears questionable. This situation will, therefore, require that future increments of our population who must daily enter the Central District use rail transportation, and will necessitate a material increase in present riding habit.
4. Wherever rapid transit has been developed in other places, its use, expressed both in terms of total rides and rides per capita of tributary population, has continued to increase, even in years during the depression.

The method used in estimating future passenger revenues for the system discussed herein is predicated upon the following:

1. Population of Los Angeles City and County will increase in accordance with the curve shown on Plate 4, and regional population will increase as shown in Table 11.
2. 30% of the population residing within the Los Angeles Metropolitan District will daily travel to and from the Central Business District by some means of transportation.
3. Population increase along proposed transit lines will follow general population increase in the area, being at a greater or lesser rate in accordance with whether it occurred at a greater or lesser rate than general regional increase during years 1923 to 1930.
4. Riding habits on various lines proposed would have approximated those on existing surface lines in 1930, with a decided increase over this rate by 1940, and a continued increase in a lesser amount to 1980, being controlled in the estimate by the number of rides each ten year period to and from the Central Business District as shown in the last column of Table 11.
5. Average fare received was taken as the present $6\frac{1}{4}\%$ rate for local riding and the 60 day-60 ride individual commutation rate beyond the local zones. Future increase in riding will undoubtedly result in a reduction of fare in the outlying zones.

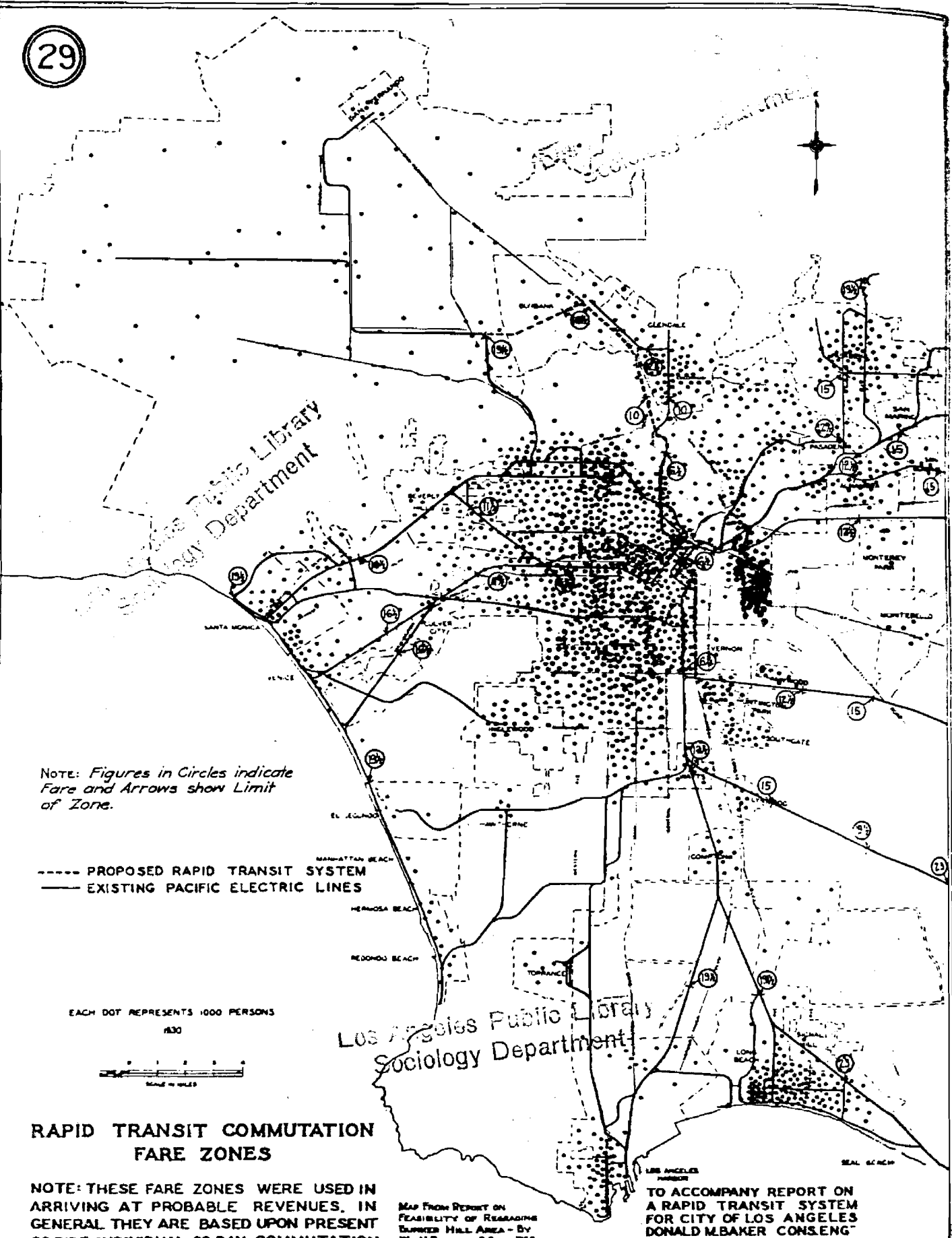
Method Used in Estimating Revenues

Future population at each ten year period from 1930 to 1980 within each fare zone for each line was estimated using the percentage increase in population in such zone

Table 11

ESTIMATE OF NUMBER OF PERSONS ENTERING CENTRAL BUSINESS DISTRICT
IN FUTURE YEARS

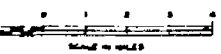
Year	County	Pop'n : 1000's	Dist. : % Dist	Pop'n : 1000's	% Dist : Pop'n	Number : 1000's	By Rail : 1000's	By L.A. : 1000's	By Rapid : 1000's	By Transit : 1000's	Rapid : Transit : Passengers : Annually : Millions
1930		2 208	94.5	2 318	30	697					
1940		2 930	93.6	3 130	30	938	350	588	300	288	90.7
1950		3 680	92.7	3 970	30	1 191	400	791	325	466	146.6
1960		4 310	91.8	4 690	30	1 407	450	957	350	607	191.0
1970		4 820	90.9	5 300	30	1 590	500	1 090	375	715	225.2
1980		5 170	90.0	5 740	30	1 721	550	1 171	400	771	242.8



Note: Figures in Circles indicate Fare and Arrows show Limit of Zone.

--- PROPOSED RAPID TRANSIT SYSTEM
— EXISTING PACIFIC ELECTRIC LINES

EACH DOT REPRESENTS 1000 PERSONS
1:50



RAPID TRANSIT COMMUTATION FARE ZONES

NOTE: THESE FARE ZONES WERE USED IN ARRIVING AT PROBABLE REVENUES. IN GENERAL THEY ARE BASED UPON PRESENT 60 RIDE INDIVIDUAL 60 DAY COMMUTATION

MAP FROM REPORT ON FEASIBILITY OF REMODELING BURBANK HILL AREA - BY Wm. H. BARBOUR & Sons, 1930.

TO ACCOMPANY REPORT ON A RAPID TRANSIT SYSTEM FOR CITY OF LOS ANGELES DONALD M. BAKER CONSULTING

from 1925 to 1930, shown in Table 12, as a guide to judgment. The number of annual rides originating in each fare zone at each ten year date is therefore the product of population within the zone at that date times the riding habit. Revenue obtained from passengers within each zone is likewise the product of the number of passengers originating therein times the average fare for each zone. The detailed method of computation is shown in Table 13 and the result summarized in Table 14. Estimates of revenues have been based solely upon an area within the present 23¢ fare zone, as this area includes most of the district population and it was felt that riding beyond such zone would not be stimulated to any large degree by the rapid transit system.

The riding habits used are based upon population within a half mile radius from present lines of the Pacific Electric Railway. Increases in the riding habit in the future are considered fairly conservative, as such habit will be stimulated in the future by feeder bus lines, increased running time due to future grade separations and extensions of elevated and subway structures. A comparison of estimated passengers on the system for the year 1980 shown as 245,400,000 with a district population of 5,740,000 -- results in a riding habit of 43 per capita for the entire population of the Metropolitan District, as against a present riding habit of over 250 per capita on

Table 12

POPULATION INCREASE IN VARIOUS FARE ZONES
OF PACIFIC ELECTRIC COMPANY
Based upon 60 Ride Individual 60 Day Commutation Ticket
Routes Following Proposed Rapid Transit Lines

Figures in 1000's

Fare Zones	Population		Increase 1918-23		Pop'n 1930	Increase 1923-30			
	1918	1923	No.	%		No.	%	%*	%*

PASADENA-SAN GABRIEL VALLEY LINES

Local-6 $\frac{1}{4}$	4	11	7	175	35	21	10	91	13
6 $\frac{1}{4}$ -12 $\frac{1}{2}$	37	90	53	143	29	95	5	6	1
12 $\frac{1}{2}$ -15	18	31	13	72	14	43	12	39	6
15--19 $\frac{1}{2}$	31	49	18	58	12	60	11	22	3
19 $\frac{1}{2}$ -23	2	3	1	50	10	10	7	233	33
Totals	92	184	92	100	20	229	45	24	3

LONG BEACH, SAN PEDRO, WHITTIER & Orange COUNTY LINES

Local-6 $\frac{1}{4}$	24	39	15	62	12	48	9	23	3
6 $\frac{1}{4}$ -12 $\frac{1}{2}$	14	40	26	186	37	50	10	25	4
12 $\frac{1}{2}$ -15	1	10	9	900	180	14	4	40	6
15--19 $\frac{1}{2}$	7	13	6	86	17	15	2	15	2
19 $\frac{1}{2}$ -23	56	121	65	116	23	158	37	31	4
Totals	102	223	121	109	22	285	62	28	4

VINEYARD and SANTA MONICA BAY LINES

Local-6 $\frac{1}{4}$	13	32	19	146	29	83	51	159	23
6 $\frac{1}{4}$ -11 $\frac{1}{2}$	7	9	2	29	6	30	21	233	33
11 $\frac{1}{2}$ -16 $\frac{1}{2}$	3	6	3	100	20	25	19	317	45
16 $\frac{1}{2}$ -19 $\frac{1}{2}$	23	45	22	96	19	58	13	29	4
19 $\frac{1}{2}$ -23	5	11	6	120	20	17	6	55	8
Totals	51	103	52	102	20	213	110	107	15

GLENDALE-NORTH HOLLYWOOD LINES

Local-6 $\frac{1}{4}$	10	21	11	110	22	44	23	109	16
6 $\frac{1}{4}$ -10	1	4	3	300	60	7	3	75	11
10--12 $\frac{1}{2}$	15	33	18	120	24	44	11	33	5
12 $\frac{1}{2}$ -16 $\frac{1}{2}$	2	6	4	200	40	15	9	150	21
16 $\frac{1}{2}$ -19 $\frac{1}{2}$	1	3	2	200	40	6	3	100	14
Totals	29	67	38	131	26	116	49	73	10

* Not Compounded

Table 12 - Con.

SUMMARY TABLES

Figures in 1000's

Line	Population		Increase 1918-23			Pop'n 1930	Increase 1923-30		
	1918:	1923	No.:	%	%*		No.:	%	%*

TOTALS -- ALL ZONES									
Pasadena	92	184	92	100	20	229	49	24	3
Long Beach	102	223	121	109	22	285	62	28	4
Vineyard	51	103	52	102	20	213	110	107	15
Glendale	29	67	38	131	26	116	49	73	10
Totals and Mean	274	577	303	111	22	843	266	46	7

TOTALS -- LOCAL 6¼¢ ZONE									
Pasadena	4	11	7	175	35	21	10	91	13
Long Beach	24	39	15	62	12	48	9	23	3
Vineyard	13	32	19	146	29	83	51	159	23
Glendale	10	21	11	110	22	44	23	109	16
Totals and Mean	51	103	52	102	20	196	93	90	18

* Not Compounded

	County Population	Population in All Fare Zones	% County Population In all Fare Zones
1918	848 000*	274 000	32
1923	1 450 000*	577 000	40
1930	2 208 000	843 000	38

	City Population	Population in Local 6¼¢ Fare Zone	% City Population In 6¼¢ Fare Zone
1918	527 000*	51 000	10
1923	870 000*	103 000	12
1930	1 238 000	196 000	16

* Mean for Year.

Table 13

ESTIMATED PASSENGERS and PASSENGER REVENUES
Within Fare Zones -- $6\frac{1}{2}\phi$ to 23ϕ

PASADENA, Etc.

Year	10 Year Increase In Pop'n In Zone %	Pop'n in Zone 1000's	Rides per Capita	Total Passengers Millions	Revenues \$1000's
<u>Local Zone-$6\frac{1}{2}\phi$ Fare-Av'ge Fare $6\frac{1}{2}\phi$.1923-30 Pop'n Incr.13% Annually</u>					
1930		21	30	0.6	\$ 38
1940	40	29	40	1.2	75
1950	30	38	45	1.7	106
1960	20	46	50	2.3	144
1970	10	51	55	2.8	175
1980	5	54	55	3.0	188
<u>$6\frac{1}{2}$-$12\frac{1}{2}$ Fare Zone-Average Fare $9\frac{1}{2}\phi$.1923-30 Pop'n Incr.1% Annually</u>					
1930		95	40	3.8	361
1940	10	105	100	10.5	997
1950	10	115	120	13.8	1 311
1960	9	125	130	16.2	1 540
1970	8	135	135	18.2	1 729
1980	7	145	135	19.6	1 862
<u>$12\frac{1}{2}$-15 Fare Zone-Average Fare 14ϕ.1923-30 Pop'n Incr.6% Annually</u>					
1930		43	40	1.7	238
1940	30	56	95	5.3	742
1950	30	73	115	8.4	1 177
1960	20	88	125	11.0	1 540
1970	15	101	130	13.1	1 835
1980	10	111	130	14.4	2 018
<u>15-$19\frac{1}{2}\phi$ Fare Zone-Average Fare 17ϕ.1923-30 Pop'n Inc.3% Annually</u>					
1930		60	40	2.4	408
1940	30	78	85	6.6	1 123
1950	30	101	100	10.1	1 718
1960	20	121	110	13.3	2 263
1970	15	139	115	16.0	2 720
1980	10	153	115	17.6	2 992
<u>$19\frac{1}{2}$-23 Fare Zone-Average Fare 21ϕ.1923-30 Pop'n Incr.33% Annually</u>					
1930		10	40	0.4	84
1940	80	18	80	1.4	294
1950	60	29	100	2.9	608
1960	40	41	110	4.5	945
1970	30	53	115	6.1	1 282
1980	20	64	115	7.3	1 534

Table 13 - Con.

LONG BEACH, etc.

Year	10 Year Increase In Pop'n In Zone %	Pop'n in Zone 1000's	Rides per Capita	Total Passengers Millions	Revenues \$1000's
<u>Local Zone-6¼¢ Fare-Av'ge Fare 6¼¢.1923-30 Pop'n Inc.3% Annually</u>					
1930		48	30	1.4	87
1940	20	58	35	2.0	125
1950	20	70	40	2.8	175
1960	10	77	45	3.5	219
1970	5	81	50	4.0	250
1980	5	85	50	4.2	263
<u>6½-12½¢ Fare Zone-Average Fare 9½¢.1923-30 Pop'n Inc.4% Annually</u>					
1930		50	30	1.5	142
1940	30	65	70	4.5	428
1950	25	81	90	7.3	694
1960	15	93	100	9.3	882
1970	10	102	105	10.7	1 017
1980	5	107	105	11.2	1 064
<u>12½-15¢ Fare Zone-Average Fare 14¢.1923-30 Pop'n Inc.6% Annually</u>					
1930		14	30	0.4	56
1940	30	18	70	1.3	182
1950	25	22	90	2.0	280
1960	15	25	100	2.5	350
1970	10	27	105	2.8	392
1980	5	28	105	2.9	406
<u>15-19½¢ Fare Zone-Average Fare 17¢.1923-30 Pop'n Inc.2% Annually</u>					
1930		15	30	0.5	85
1940	15	17	60	1.0	170
1950	12	19	75	1.4	238
1960	8	21	85	1.8	306
1970	6	22	90	2.0	340
1980	4	23	90	2.1	357
<u>19½-23¢ Fare Zone-Average Fare 21¢.1923-30 Pop'n Inc.4% Annually</u>					
1930		158	30	4.7	987
1940	30	206	50	10.3	2 162
1950	25	258	60	15.5	3 253
1960	15	296	65	19.2	4 030
1970	10	326	68	22.2	4 670
1980	5	342	68	23.2	4 870

Table 13 - Cont.

VINEYARD, Etc.

Year	10 Year Increase In pop'n In Zone %	Pop'n in Zone 1000's	Rides per Capita	Total Passengers Millions	Revenues \$1000's
<u>Local Zone 6¼¢ Fare-Average Fare 6¼¢.1923-30 Pop'n Inc.23% Annually</u>					
1930		83	100	8.3	518
1940	60	133	140	18.8	1 175
1950	50	199	170	33.8	2 112
1960	20	239	175	41.8	2 617
1970	10	263	178	46.8	2 928
1980	5	276	178	49.1	3 068
<u>6¼-11½¢ Fare Zone-Average Fare 9¢.1923-30 Pop'n Incr.33% Annually</u>					
1930		30	30	0.9	81
1940	70	51	70	3.6	324
1950	50	76	90	6.8	612
1960	20	91	100	9.1	819
1970	10	100	103	10.3	927
1980	5	105	103	10.8	972
<u>11½-16¼¢ Fare Zone-Average Fare 14¢.1923-30 Pop'n Inc.45% Annually</u>					
1930		25	30	0.8	112
1940	80	45	70	3.2	448
1950	60	72	90	6.5	910
1960	30	94	100	9.4	1 317
1970	20	113	103	11.6	1 623
1980	10	124	103	12.8	1 791
<u>16½-19¼¢ Fare Zone-Average Fare 18¢.1923-30 Pop'n Inc.4% Annually</u>					
1930		58	30	1.7	306
1940	30	75	70	5.3	954
1950	20	90	90	8.1	1 460
1960	15	104	100	10.4	1 872
1970	10	114	103	11.7	2 108
1980	5	120	103	12.4	2 233
<u>19½-23¢ Fare Zone-Average Fare 21¢.1923-30 Pop'n Incr.8% Annually</u>					
1930		17	30	0.5	105
1940	40	24	70	1.7	357
1950	30	31	90	2.8	582
1960	20	37	100	3.7	777
1970	15	43	103	4.4	924
1980	10	47	103	4.8	1 007

Table 13 - Cont.

GLENDALE, etc.

Year	10 Year Increase In Pop'n In Zone %	Pop'n in Zone 1000's	Rides per Capita	Total Passengers Millions	Revenues \$1000's
<u>Local Zone 6$\frac{1}{4}$¢ Fare-Av'ge Fare 6$\frac{1}{4}$¢.1923-30 Pop'n Inc.16% Annually</u>					
1930		44	20	0.9	56
1940	60	70	30	2.1	131
1950	50	105	35	3.7	231
1960	30	136	40	5.4	338
1970	20	163	40	6.5	407
1980	10	179	40	7.1	444
<u>6$\frac{1}{2}$-10¢ Fare Zone-Average Fare 8¢.1923-30 Pop'n Incr.11% Annually</u>					
1930		7	40	0.3	24
1940	50	11	50	0.6	48
1950	40	15	60	0.9	72
1960	20	18	70	1.3	104
1970	15	21	75	1.6	128
1980	10	23	75	1.7	136
<u>10-12$\frac{1}{2}$¢ Fare Zone-Average Fare 11¢.1923-30 Pop'n Inc.5% Annually</u>					
1930		44	70	3.1	341
1940	50	66	115	7.6	835
1950	40	92	125	11.5	1 263
1960	30	120	135	16.2	1 782
1970	20	144	140	20.2	2 222
1980	10	158	140	22.1	2 431
<u>12$\frac{1}{2}$-16$\frac{1}{2}$¢ Fare Zone-Average Fare 14$\frac{1}{2}$¢.1923-30 Pop'n Inc.21% Annually</u>					
1930		15	60	0.9	130
1940	70	26	105	2.7	392
1950	60	42	120	5.1	739
1960	40	59	130	7.7	1 116
1970	30	77	135	10.4	1 508
1980	20	92	135	12.4	1 799
<u>16$\frac{1}{2}$-19$\frac{1}{2}$¢ Fare Zone-Av'ge Fare 18¢.1923-30 Pop'n Inc.14% Annually</u>					
1930		6	60	0.4	72
1940	60	10	100	1.0	180
1950	60	16	120	1.9	342
1960	50	24	130	3.1	558
1970	50	36	135	4.9	882
1980	40	50	135	6.7	1 206

Table 14

SUMMARY OF
POPULATION, TOTAL REVENUE PASSENGERS AND TOTAL REVENUES
WITHIN HALF MILE RADIUS OF RAPID TRANSIT LINES
BY TEN YEAR PERIODS - 1930 to 1980

Lines	1930	1940	1950	1960	1970	1980
<u>Population in Half Mile Radius from Lines - 1000's</u>						
Pasadena-etc	229	286	356	421	479	527
Long Beach-etc	285	364	450	512	558	585
Vineyard-etc	213	328	468	565	633	672
Glendale-etc	116	183	270	357	441	502
Total	843	1 161	1 544	1 855	2 111	2 286
Rides per capita		78.0	94.8	110.4	106.7	106.2
<u>Total Revenue Passengers - 1,000,000's</u>						
Pasadena-etc	8.9	25.0	36.9	47.3	56.2	61.9
Long Beach-etc	8.5	19.1	29.0	36.3	41.7	43.6
Vineyard-etc	12.2	32.6	58.0	74.4	84.8	89.9
Glendale-etc	5.6	14.0	23.1	33.7	43.6	50.0
Total	35.2	90.7	147.0	191.7	226.3	245.4
<u>Revenues - \$1000's</u>						
Pasadena-etc	\$1 129	\$3 231	\$4 920	\$6 432	\$7 741	\$8 594
Long Beach-etc	1 357	3 067	4 640	5 787	6 669	6 960
Vineyard-etc	1 122	3 258	5 682	7 402	8 510	9 071
Glendale-etc	623	1 586	2 847	3 898	5 147	6 016
Total	\$4 231	\$11 142	\$18 089	\$23 519	\$28 067	\$30 641

Note: Above figures for total revenue passengers and revenues are based upon rides to and from the central area, and do not include any local riding which might occur..

the Interborough Rapid Transit and Brooklyn-Manhattan Transit Lines in New York, based upon New York Metropolitan area population. This indicates that future riding habit assumed is undoubtedly conservative.

There will without question be considerable short haul riding on the lines, which will further increase revenues. As against this, it can be expected that with growth in business, fares at a future date will be reduced in the outlying zones, and this may materially reduce revenues. This reduction, however, should not be considered until such time as the system is able to care for its full share of debt service on construction costs, and then should only be made with the fact in mind that future capital expenditures for grade separations and subway and elevated extensions will be necessary to serve increasing population and reduce running time.

A further source of revenue is that of advertising concessions in the cars and also of concessions at stations. Experience in New York indicates that gross receipts from these aggregate approximately 4% of passenger revenue, and gross passenger revenues have been increased by this percentage in Section XII of the report in the discussion of net income.

XI.

OPERATING COST OF PROPOSED RAPID TRANSIT

As in the case of estimating future passenger revenues, local experience offers little assistance in making intelligent estimates of future operating costs of a rapid transit system in this area. The declining riding habit, which has resulted in a decline in car miles operated, and the unstable economic conditions existing during the last few years, make recent figures useless. For example, the expenses per car mile for passenger operations of the Pacific Electric Railway show a decline in expenses with a decline in passenger car miles operated.

Year	Passenger Car Miles		Operating Expense Per Car Mile	
		% 1930		% 1930
1930	24 889 540	100.0	\$ 0.3748	100.0
1931	22 892 890	92.0	0.3600	96.0
1932	20 774 941	83.0	0.3263	87.0

This decline in operating costs has been due to deferred maintenance, as well as forced economies resulting from decrease in passengers carried, and is not representative of normal conditions.

The basis used herein for estimating operating expenses is the number of car miles operated and the cost per car mile. The latter includes all such expenses as maintenance of way and structures, maintenance of equip-

ment, power, operating labor, materials, and equipment, injuries and damages, overhead and depreciation, but not taxes, interest or dividends.

Revenue Passengers Per Car Mile

Rather than set up an elaborate schedule of car operation in order to determine car miles operated each ten year period, this quantity has been derived for each line from the revenue passengers per car mile. This factor for a route of given length is a measure of the number of car miles necessary to operate in order to provide adequate service. If the cars are operated to full capacity, the factor varies directly with the carrying capacity of the cars used and inversely with the length of the line. However, it is also controlled by the headway between cars or frequency of operation. For example, assume a line ten miles long upon which are operated cars which can carry an average of 80 passengers per one way trip, with 7,200 passengers carried daily. With a factor of 8 revenue passengers per car mile, the cars would be operated to full capacity each trip and would travel 900 car miles per day, making 90 one way or 45 round trips -- one round trip each 24 minutes for an eighteen hour operating day. This might and undoubtedly would afford too infrequent service to satisfy the riders along the route, and

a figure for revenue passengers per car mile somewhat less than 8 would be necessary in order to afford proper headway or frequency, and would increase the number of car miles operated daily, with a reduced average number of passengers carried per trip.

In estimating the car miles operated annually for each line, the number of revenue passengers per car mile for the year 1930 was taken as an initial figure. Considering car capacity and length of line, it is very apparent that the cars in the Pacific Electric system are operating well under full capacity. Therefore in the succeeding ten year period the figure for revenue passengers per car mile for each line was increased in line with past experience on the system. The number of car miles operated at each ten year date will on this basis increase at a rate slower than the increase in total passengers carried. Actual car miles operated in the future on each line will of necessity have to be governed by traffic as it occurs, but it is felt the assumptions made are reasonable.

Cost of Operation per Car Mile

It may be safely assumed that operating costs per car mile on a rapid transit system will be lower than they are at present on the Pacific Electric system. For example, figures for the year 1930 show the following per car mile:

Subway -- New York	18.00¢
Elevated -- New York	20.12
Surface lines -- Manhattan	55.24
Surface lines -- Bronx	40.29
Surface lines -- Brooklyn	36.84
112 Surface lines throughout country	32.08
40 Interurban lines " "	38.24

Lesser maintenance costs per operation in subway or on elevated structures over surface operation on paved streets or in private right-of-way, reduced labor operating costs due to increased running time and to train operation, and similar factors, all serve to lower aggregate operating costs per car mile. Likewise many factors which go to make up costs of operation do not increase in direct proportion to the number of car miles operated, and this results in a lower cost per car mile as the number of car miles increase.

Operating Costs.

In estimating operating costs for the local system, it is not assumed that New York experience will be reached, but operating costs are assumed at the outset for surface lines to be equivalent to present costs, and for subway and elevated sections will be considerably above New York experience. These figures, however, will be reduced with increase in traffic, and such a reduction is assumed

in operating costs used herein. The proportion of car miles operated on each class of structure -- surface, elevated and subways -- is taken in the approximate proportion that length of track on each structure bears to the average length of line operated. Based on these assumptions, a weighted cost of operation per car mile is developed. All of this data pertaining to unit costs per car mile and costs per car mile for each line at ten year future dates is shown on Table 15.

In Table 16 are shown the operating costs for each line at each ten year period from 1930 to 1980, total passengers carried being taken from Table 13. Car miles operating are computed as heretofore described and cost per car mile used is given in Table 15 referred to.

The operating ratio -- total operating cost ÷ total operating revenues, expressed as a percentage -- becomes very low in future years with the fares used. Operating ratios on New York rapid transit lines were 68% in 1930. The five cent fare in New York makes for low operating revenues, and were the fare there increased in proportion to length of trip, the operating ratio would be much lower. Our operating ratio of 60.6% is reached for the system in 1950, and in the discussion of financing the system, actual estimated revenues as given in Tables 13 and 14 are reduced beyond this date to maintain this operating ratio, on the theory that fares will commence to be reduced after 1950. Such an assumption makes for conservatism.

Table 15

BASIC DATA - OPERATING COSTSA. Assumed Cost of Operation per Car Mile on Rapid Transit System

	<u>1930</u>	<u>1940</u>	<u>1950</u>	<u>1960</u>	<u>1970</u>	<u>1980</u>
	\$	\$	\$	\$	\$	\$
Subways	0.27	0.24	0.23	0.22	0.22	0.22
Elevated	0.32	0.29	0.27	0.26	0.26	0.26
Surface	0.38	0.35	0.33	0.32	0.31	0.31

B. Assumed Proportion of Car Miles Operated on Various Types Track*

<u>Line</u>	<u>Subway</u>	<u>Elevated</u>	<u>Surface</u>	<u>Total</u>
	%	%	%	%
Pasadena-etc	11		89	100
Long Beach-etc		38	62	100
Vineyard-etc	38		62	100
Glendale-etc	9	30	61	100

C. Assumed Average Cost of Operation Per Car Mile*

Weighted in accordance with type of track structure used.

<u>Line</u>	<u>1930</u>	<u>1940</u>	<u>1950</u>	<u>1960</u>	<u>1970</u>	<u>1980</u>
	\$	\$	\$	\$	\$	\$
Pasadena-etc	0.368	0.338	0.319	0.307	0.298	0.298
Long Beach-etc	0.358	0.325	0.308	0.297	0.291	0.291
Vineyard-etc	0.339	0.308	0.292	0.282	0.276	0.276
Glendale-etc	0.352	0.323	0.304	0.293	0.287	0.287

* With construction of grade separations and extension of subway and/or elevated structures, these proportions will change and average operating costs per car mile will be reduced.

Table 16

OPERATING COSTS OF RAPID TRANSIT SYSTEM

Year	Passengers: Millions	Passengers :per Car Mile	:Car Miles :Millions	:Cost per: :Car Mile :\$	Total Operating Expense :\$1000's
PASADENA-Etc-LINES					
1930	8.9	2.5	3.56	0.368	\$ 1 311
1940	25.0	3.0	8.33	.338	2 818
1950	36.9	3.5	10.54	.319	3 361
1960	47.3	4.0	11.82	.309	3 652
1970	56.2	4.3	13.07	.300	3 921
1980	61.9	4.5	13.76	0.300	4 128
LONG BEACH-Etc-LINES					
1930	8.5	2.1	4.04	0.358	1 447
1940	19.1	2.5	7.63	.327	2 496
1950	29.0	3.0	9.67	.308	2 977
1960	36.3	3.4	10.68	.297	3 172
1970	41.7	3.7	11.28	.291	3 347
1980	43.6	3.8	11.48	0.291	3 408
VINEYARD LOCAL LINE*					
1930	8.3	6.3	1.32	0.270	357
1940	18.8	8.0	2.35	.240	564
1950	33.8	9.0	3.76	.230	864
1960	41.8	9.5	4.40	.220	967
1970	46.8	10.0	4.68	.220	1 029
1980	49.1	10.3	4.77	0.220	1 048
VINEYARD INTERURBAN LINES*					
1930	3.9	2.5	1.56	0.339	529
1940	13.8	3.0	4.60	.308	1 417
1950	24.2	3.5	6.91	.292	2 011
1960	32.6	4.0	8.15	.282	2 299
1970	38.0	4.3	8.83	.276	2 438
1980	40.8	4.5	9.07	0.276	2 504
GLENDALE-Etc-LINE					
1930	5.6	3.0	1.87	0.352	652
1940	14.0	3.5	4.00	.323	1 292
1950	23.1	4.0	5.77	.304	1 753
1960	33.7	4.5	7.49	.293	2 197
1970	43.6	4.8	9.07	.287	2 604
1980	50.0	5.0	10.00	0.287	2 870

* Vineyard Service separated because of local and express service operated.

XII.

NET OPERATING REVENUEOperating Ratio

Estimates of total operating revenues and operating expenses have been made for succeeding ten year periods, commencing with 1930 and ending with 1980, for each of the four lines. In order to develop future annual operating revenues and expenses, Table 17 was prepared, in which these quantities are shown for each year, interpolating between ten year intervals for the annual figures. Total operating revenue in this table is given as revenue from passenger fares, plus 4% additional from concessions.

Net operating revenue is applicable to payment of taxes, interest, principal repayment, dividends, and may be devoted also to extensions and improvements in service. The operating ratio, 83.8% in 1935, is gradually reduced to 60.6% in 1950, and without fare reductions would continue to decrease until 1974, at the end of which year all bonds would have been paid off. Since in all probability fares will be reduced with increase in traffic, it was assumed that the operating ratio would remain at 60.6% from 1950 onwards, and that fares would be reduced commencing with 1950 in such proportion as to continue the above operating revenue with the operating expenses as shown.

Table 17

SUMMARY OF OPERATING REVENUES, OPERATING EXPENSE,
ETC. AND BALANCE AVAILABLE FOR INTEREST,
PRINCIPAL PAYMENTS, ETC.

RAPID TRANSIT SYSTEM

Year	Operating Revenues	Operating Expense	Operating Revenue	Operating Ratio*	Retained by P.E. For Taxes Interest Etc.	Balance ^o
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Figures in \$1000's

1930	4 400	4 296	104	101.6		
1935	7 994	6 442	1 552	83.8	1 400	152
1936	8 713	6 871	1 842	81.7	1 600	242
1937	9 432	7 300	2 132	80.5	1 800	332
1938	10 150	7 729	2 421	79.2	2 000	421
1939	10 869	8 158	2 711	78.1	2 200	511
1940	11 588	8 587	3 001	77.1	2 300	701
1941	12 311	8 825	3 486	74.6	2 500	986
1942	13 033	9 063	3 970	72.4	2 600	1 370
1943	13 756	9 301	4 455	70.3	2 900	1 555
1944	14 478	9 539	4 939	68.5	3 100	1 839
1945	15 201	9 777	5 424	66.8	3 300	2 124
1946	15 923	10 014	5 909	65.3	3 600	2 309
1947	16 646	10 252	6 394	64.0	4 000	2 394
1948	17 368	10 490	6 878	62.8	4 400	2 478
1949	18 091	10 728	7 363	61.7	4 800	2 563
1950*	18 813	10 966	7 847	60.6	5 200	2 647
1951	19 040	11 098	7 942	"	5 400	2 542
1952	19 267	11 230	8 037	"	5 500	2 537
1953	19 494	11 362	8 132	"	5 600	2 532
1954	19 721	11 494	8 227	"	5 700	2 527
1955	19 948	11 627	8 321	"	5 800	2 521
1956	20 175	11 759	8 416	"	5 900	2 516
1957	20 402	11 891	8 511	"	6 000	2 516
1958	20 629	12 023	8 606	"	6 100	2 506
1959	20 856	12 155	8 701	"	6 200	2 501
1960	21 083	12 287	8 796	"	6 300	2 496

Table 17 - Cont.

Year	Operating Revenues	Operating Expense	Operating Revenue	Operating Ratio*	For Taxes Interest Etc.	Retained by P.E. Balance ^o
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Figures in \$1000's

1961	21 262	12 392	8 870	60.6	6 300	2 570
1962	21 441	12 497	8 944	"	6 400	2 544
1963	21 621	12 603	9 018	"	6 500	2 518
1964	21 800	12 708	9 092	"	6 500	2 592
1965	21 979	12 813	9 166	"	6 600	2 566
1966	22 158	12 918	9 240	"	6 700	2 540
1967	22 337	13 023	9 314	"	6 800	2 514
1968	22 517	13 129	9 388	"	6 800	2 588
1969	22 696	13 234	9 462	"	6 900	2 562
1970	22 875	13 339	9 536	"	7 000	2 536
1971	22 983	13 401	9 582	"	7 000	2 582
1972	23 090	13 463	9 627	"	7 100	2 527
1973	23 198	13 525	9 673	"	7 100	2 573
1974	23 305	13 587	9 718	"	7 200	2 518

* Operating Ratio based upon Passenger Revenues alone.

^o This annual balance is available to pay interest upon bonds issued for cost of system, for principal repayment, to purchase new equipment, to provide bus feeder service, and to finance grade separations and extensions of subway and/or elevated structures.

[±] From 1950 on, operating revenues reduced to maintain an operating ratio of 60.6% on the assumption that fares will be reduced after that date.

Amount to be Retained by Pacific Electric from
Net Operating Revenue.

The net operating revenue in 1935 -- assumed as the first year of operation -- is \$1,552,000, which increases to \$9,718,000 in 1974.

Since the Pacific Electric Railway will continue to operate a large mileage of existing track in connection with the rapid transit system upon which debt service must be met, in connection with which other expenses are necessary -- and since it is likewise entitled to a profit upon its operations -- it is not possible to apply the entire proceeds of net operating revenue towards payment of debt service of the rapid transit system. Accordingly, a figure amounting in 1935 to \$1,400,000, which is 17.5% of the operating revenue for that year, was set aside as operating income to be retained by the Pacific Electric for the purposes above described. This figure was progressively increased each year until between 1955 and 1960 when it approaches 30% of the total operating revenue, and continues at approximately this figure until 1974, when all bonds are paid off.

At present, public utilities operating in the State of California do not pay local taxes upon their operating properties, payments being made to the State on the basis of a percentage of gross revenues received from utility operations, the present rate being $4\frac{1}{4}\%$ of such

revenues for electric railroads. As a result of legislative action during the 1933 session, this basis of taxation is to be changed and all utility properties will return to local assessment rolls. Any attempt to forecast probable taxation on the railroad properties at this time is impossible; and likewise it has been impossible in the time available to estimate bond interest and other charges upon that portion of the entire system which is considered herein as comprising the rapid transit system.

For the year ending December 31, 1930, the Pacific Electric Railway -- according to the report of the California Railroad Commission -- had a net operating revenue of \$1,693,446, paid taxes of \$1,082,934, leaving an operating income of \$610,512. With a non-operating income of \$331,484, its gross income was \$941,996. Total deductions from gross income for that year totaled \$2,911,818, leaving a net loss of operation of \$1,969,822. Interest on funded debt for the year ending December 31, 1930, was \$2,652,669.

It is felt that the amounts allowed in Table 17 to be retained by the railroad, while not affording much or any profits after taxes during the early years of operation, will later enable the road to operate under profitable circumstances, even with future fare reductions.

XIII

METHOD OF FINANCING PROPOSED RAPID TRANSIT SYSTEMNational Industrial Recovery Act.

The President of the United States, under this act, has created an "Emergency Administration of Public Works" which functions under the direction of an administrator appointed by him. The Administrator is authorized to prepare a comprehensive program of public works:*

"to increase the consumption of industrial and agricultural products by increasing purchasing power, to reduce and relieve unemployment, to improve standards of labor, and otherwise to rehabilitate industry and to conserve natural resources."

The act contemplates an immediate plan of public works "to provide employment quickly" and the formulation of a "long-range national plan to follow". To that end the President has created a long-range planning board to assist the Administrator in the preparation of the "comprehensive program of public works". The duty and function of the Emergency Administration as to Federal projects and/or public works is to determine eligibility from the standpoint of national planning

The President is empowered to make grants to public bodies to carry out the purposes of this act, grants being upon such terms as he shall prescribe, but not in

*Phrases in quotations are quoted from Circular No.1 Federal Emergency Administration of Public Works.

excess of 30% of the cost of labor and materials employed upon any project. A State Advisory Board and a State Engineer for the Public Works Administration are appointed in each state, and these together with the Administrator are required to apply the following tests in determining the eligibility of public projects submitted by public bodies upon which grants are requested:

1. "The relation of the particular project to coordinated planning and its social desirability.
Note: "No project will be considered which is more makeshift to supply work..."
2. "Economic desirability of the project, i.e., its relation to unemployment and revival of industry.
3. "The soundness of the project from an engineering and technical standpoint.
4. "The financial ability of the applicant to complete the work and to reasonably secure any loans made by the United States.
5. "The legal enforceability of the securities to be purchased by the United States or of any lease to be entered into between the applicant and the United States."

The President has proscribed and the Administrator will apply the following test to enable him to determine whether to make the grant, and if so, to what extent:

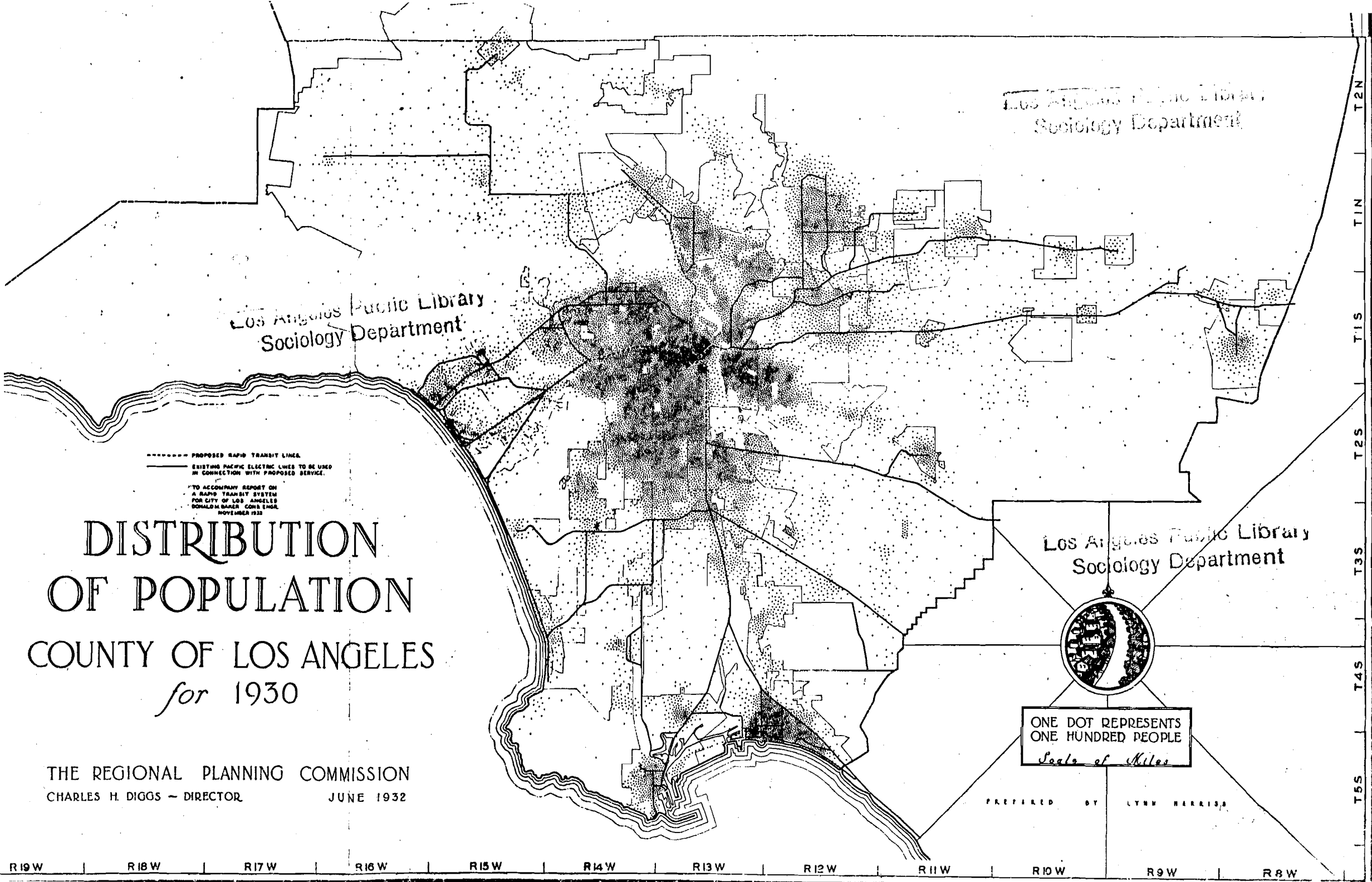
"The social and economic significance of the project and its relative importance in the comprehensive national program of public works contemplated by the act, and the extent its construction will provide employment and purchasing power in the vicinity."

Bonds purchased by the Government are to be annually amortized pursuant to state statutes and according to the life of the project in a period "not to exceed thirty years except in the case of such projects as obviously have a longer life and in no case to exceed fifty years".

The system of rapid transit proposed in this report meets all the requirements of eligibility for a Federal loan and grant as prescribed in the National Industrial Recovery Act. The plan proposed is part of a comprehensive plan, is urgently needed from the standpoint of creating and maintaining social and economic values, is sound from an engineering and technical standpoint, is financially feasible, statutes exist which allow adequate securities to be issued, and it will provide a large amount of employment and create an extensive local purchasing power.

A further point -- in fact, the most important of all -- in its support is that only by means of such financing as can be provided under the National Industrial Recovery Act can a system of rapid transit be made possible in Los Angeles for many years to come. It is possible thereunder because of (1) the low interest rate, 3.2% of total cost of the project which is due to the 30% grant and (2) the possibility of using a portion of the grant to apply upon the debt service in the early years.

The rapid transit service will be a competitive business and fares sufficiently high to provide adequate return to pay such interest rates as even the City of



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----- PROPOSED RAPID TRANSIT LINES.
 _____ EXISTING PACIFIC ELECTRIC LINES TO BE USED
 IN CONNECTION WITH PROPOSED SERVICE.

TO ACCOMPANY REPORT ON
 A RAPID TRANSIT SYSTEM
 FOR CITY OF LOS ANGELES
 DONALD M. BAKER, CONSULTING ENGINEER
 NOVEMBER 1932

DISTRIBUTION OF POPULATION COUNTY OF LOS ANGELES *for 1930*

THE REGIONAL PLANNING COMMISSION
 CHARLES H. DIGGS - DIRECTOR JUNE 1932

ONE DOT REPRESENTS
 ONE HUNDRED PEOPLE
Scale of Miles

PREPARED BY LYNN HARRISA

R 19 W R 18 W R 17 W R 16 W R 15 W R 14 W R 13 W R 12 W R 11 W R 10 W R 9 W R 8 W

T 2 N
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S

Los Angeles could command would not attract sufficient riding. A $4\frac{1}{2}\%$ interest rate upon the cost of the project would call for annual interest charges of \$1,670,000 at the outset, and with principal repayment deferred ten years, a total debt service of \$2,910,000 in 1945 with no means except assessment levies to care for deficits in the early years.

Other local projects, of a monopolistic nature, can attract and maintain custom at higher rates to support higher cost of debt service, but a rapid transit system is not of this nature.

Method of Financing

The question as to whether the application for the loan and grant is to be made by the City of Los Angeles or by some other public agency empowered to do so is one to be decided by local interests and will not be discussed herein.

An analysis of future revenues, operating expenses and debt service, as given in Table 18, shows that after the first few years the project will be financially self-supporting. The National Industrial Recovery Act allows public bodies to decide whether bonds will be issued in an amount equal to the entire cost of the project as approved, or for such amount less the Federal grant, if the latter is made. In the former case the grant may be utilized towards meeting debt service during early years.

Table 18

INTEREST, PRINCIPAL PAYMENTS
PROPERTY ASSESSMENT AND SURPLUS

RAPID TRANSIT SYSTEM

Basic Data:

Total Cost of System		\$37 200 000	
Right of Way		1 550 000	
Structures-Labor and Materials		35 650 000	
30% Grant-Labor & Materials		10 700 000	
Balance - Loan		26 500 000	
Bond Issue		30 000 000	
Portion of grant to be used for debt service		3 500 000	
Bond Interest - 4%		1 200 000	annually
) 6 years	0	"
Bond Retirement) 8 "	500 000	"
) 26 "	\$ 1 000 000	"
	40 years		

:	:	:	:	:Received:	Paid by :	:
:	:	:	:	: from :	Assess- :	Paid :
:	:	:	:	: Pacific:	ment :	from :
Year:	Interest:	Principal:	Total :	Electric:	District:	Grant:
Payment:	Payment :	Payments:	Electric:	District:	Grant:	Surplus

Figures in \$1000's

1935	1 200		1 200	152	500	548
1936	1 200		1 200	242	500	458
1937	1 200		1 200	332	500	368
1938	1 200		1 200	421	400	379
1939	1 200		1 200	511	400	289
1940	1 200	500	1 700	701	300	699
1941	1 180	500	1 680	986	200	494
1942	1 160	500	1 660	1 370	100	190
1943	1 140	500	1 640	1 555	10	75
1944	1 120	500	1 620	1 839		219
1945	1 100	500	1 600	2 124		524
1946	1 080	500	1 580	2 309		729
1947	1 060	500	1 560	2 394		834
1948	1 040	500	1 540	2 478		938
1949	1 020	500	1 520	2 563		1 043
1950	1 000	1 500	2 000	2 647		647
1951	960	1 000	1 960	2 542		582
1952	920	1 000	1 920	2 537		617
1953	880	1 000	1 880	2 532		652
1954	840	1 000	1 840	2 527		687
1955	800	1 000	1 800	2 521		721

Table 18 - Cont.

:	:	:	:	:Received:	Paid by :	:	
:	:	:	:	: from :	Assess- :	Paid :	
:	:Interest:	Principal:	To al :	Pacific:	ment :	from :	
Year:	Payment:	Payment :	Payments:	Electric:	District:	Grant:	Surplus

Figures in \$1000's

1956	760	1 000	1 760	2 516		756	
1957	720	1 000	1 720	2 511		791	
1958	680	1 000	1 680	2 506		826	
1959	640	1 000	1 640	2 501		861	
1960	600	1 000	1 600	2 496		896	
1961	560	1 000	1 560	2 570		1 010	
1962	520	1 000	1 520	2 544		1 024	
1963	480	1 000	1 480	2 518		1 038	
1964	440	1 000	1 440	2 592		1 152	
1965	400	1 000	1 400	2 566		1 166	
1966	360	1 000	1 360	2 540		1 180	
1967	320	1 000	1 320	2 514		1 194	
1968	280	1 000	1 280	2 588		1 308	
1969	240	1 000	1 240	2 562		1 322	
1970	200	1 000	1 200	2 536		1 336	
1971	160	1 000	1 160	2 582		1 422	
1972	120	1 000	1 120	2 527		1 407	
1973	80	1 000	1 080	2 573		1 493	
1974	40	1 000	1 040	2 518		1 478	
Totals	30 100	30 000	60 100	83 543	2 910	3 500	29 853

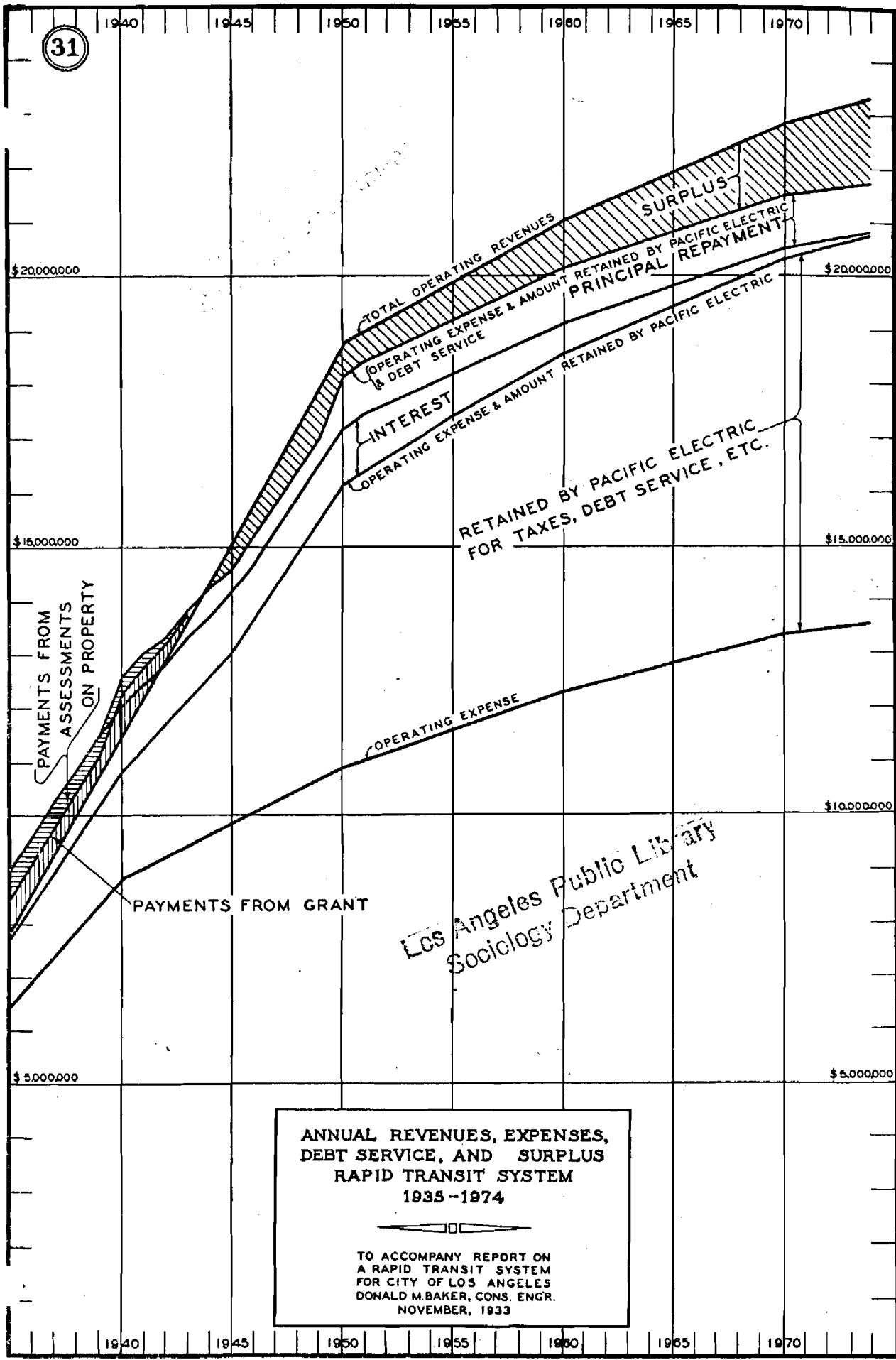
Under this method it is possible to make a variety of estimates covering the financing of this project. The one given in Table 18 is not the only one available, but is presented as affording a reasonable basis of financing. The total cost of the project -- taken as \$37,200,000 -- involves \$1,550,000 for rights-of-way and \$35,650,000 for structures. Of the latter, 30% or \$10,700,000 is assumed to be received as a grant from the Federal Government, and the balance of \$26,500,000 as a loan. The estimate in Table 18 assumes that bonds will be issued in the sum of \$30,000,000, bearing 4% interest, which bonds will be purchased by the government. Of the grant of \$10,700,000 the sum of \$3,500,000 will be reserved for payment of a portion of the debt service during the first nine years of the project, the remainder of the grant -- \$7,200,000, with the proceeds of the bond issue of \$30,000,000 -- being used for construction.

On this basis there will still be a deficit to meet the debt service during the first nine years. This deficit must be cared for by the creation of an assessment district in which is included benefited property. The deficit amounts to \$500,000 annually for the first three years, \$400,000 annually for the fourth and fifth years, and is reduced progressively to \$10,000 the ninth year, after which no assessment will be necessary.

Interest payments alone of \$1,200,000 annually are made for the first six years, and at the end of the sixth year the payment of \$500,000 per year on principal commences, with reduction of interest payments. The principal payment is increased to \$1,000,000 year in 1950, the maximum annual payment of interest and principal-\$2,000,000 occurring that year. Principal payments continue at \$1,000,000 a year until 1974 when the bond issue is completely retired. The total amount to be raised by local assessment is \$2,910,000 over a period of nine years, or an average of \$323,000 per year.

In the last column of Table 18, commencing with the year 1944, a surplus is shown, which gradually increases to the year 1949, is reduced in 1950 because of increased principal payments, and progressively increases from that date until the bond issue is retired. This surplus may be used for a variety of purposes, including grade separations, extensions of elevated and/or subway structures, and other betterments and improvements to the system. No detailed discussion is given as to ways and means of utilizing it, as it is felt that such could come better at a future date after the service has been in operation for some years.

The location and extent of the assessment district necessary to meet the deficit on the system in the early years is a matter beyond the scope of this present report. It might include outlying areas which are served by the



**ANNUAL REVENUES, EXPENSES,
DEBT SERVICE, AND SURPLUS
RAPID TRANSIT SYSTEM
1935-1974**

TO ACCOMPANY REPORT ON
A RAPID TRANSIT SYSTEM
FOR CITY OF LOS ANGELES
DONALD M. BAKER, CONS. ENGR.
NOVEMBER, 1933

Los Angeles Public Library
Sociology Department

system. However, it should be pointed out that if such district included solely the Central Business District of Los Angeles -- which has this year an assessed valuation in land and improvements of \$168,000,000 -- the assessment rate caused by an annual levy of \$500,000 would amount to but 30¢ per \$100 of assessed valuation in the area. On this basis a property with a present assessed valuation of \$1,000,000 would be required to pay as its share of the cost of the rapid transit system, the sum of \$3000 a year or \$250 a month during the first three years. This would be reduced to \$2,400 per year or \$200 per month during the following two years, and progressively decreasing until after the ninth year it would disappear.

In this connection it is of interest to note that assessed valuations of property locally have been reduced about 38% since 1931. The total city, county, school and district rate during the current year is \$4.24 per \$100 and in 1931 was \$4.27* per \$100. Assuming a property assessed in 1933 at a value of \$1,000,000 :

		<u>Tax Rate</u>	<u>Taxes Paid</u>
1931 Assessed Value	\$ 1 613 000	\$ 4.27	\$ 68 800
1933 Assessed Value	1,000 000	4.24	<u>42 400</u>
(38% less)			
Saving in taxes since 1931			\$ 26 400

The \$3000 per year would raise present taxes on this property 7%, whereas the saving in taxes since 1931 would have

*The Flood Control District rate of 10¢ per \$100 is levied upon real estate only.

been nine times this sum. If a district were created which included the Central District and sections outside of it served by the system, with a total assessed valuation of \$250,000,000, the levy during initial years on the above basis would be 20¢ per \$100, and would amount to \$8.00 per year for an average house and lot assessed at \$4,000.

HIGHLIGHTS
of
REPORT ON A RAPID TRANSIT SYSTEM FOR LOS ANGELES
By
DONALD M. BAKER
Consulting Engineer

PAGE

5. Los Angeles Metropolitan District is fourth largest in the country in population. It has the lowest population density of any large district -- average density in settled area of Los Angeles being about 7000 per square mile. City of Los Angeles has 53.4% of population of Metropolitan Area.
6. 36% of the land in the Coastal Plain in Los Angeles County has been subdivided, but only 46 out of every 100 lots so subdivided are improved.
7. Los Angeles County increased its population thirteen times in the 30 years from 1900-30.
- 7-b Per Capita figures for Los Angeles County and the United States at large show that locally average savings bank deposits are 1-1/3 times national average; residential telephones 1.45; automobiles 1.9; retail sales 1.5; output of manufacturing products 1.5, and average wages 1-1/6 times the national average indicating very high standard of living.
8. Population growth of City of Los Angeles from 1900 to 1930 occurred in three cycles, the last one, commencing in 1919 and ending in 1930, had an increase of 704,000 population of whom 550,000 were residents from other states.
- 11-a The population in Los Angeles County outside of the City of Los Angeles is now increasing more rapidly than that of city.
- 11-a About 3/4 million people live within a 7 mile radius of 7th and Broadway, and 1-1/3 million live within a 10 mile radius of this point. Greatest increase in population in Los Angeles City and adjacent area between period 1923-30 occurred in the northwest section, being 129%; that in other sections ranging from 30% to 35%.
12. It is estimated that the population of Los Angeles County will have increased over that of 1930 by 33% in 1940, 67% by 1950 and 95% by 1960.
13. The center of population in the western portion of Los Ange-

AGE

les County, including the cities of Los Angeles, Pasadena and Long Beach, has shifted from Fifth and Spring Streets in 1918 to Pico and Cherry in 1930. Center of new population added between 1918 and 1923 was Central and Venice, center of increase between 1923 and 1930 being at Ninth and Harvard, 4 miles northwesterly.

5. About 2/3 of the population of Los Angeles County outside of the City of Los Angeles live within incorporated cities. Average individual farm acreage holdings in entire county are 42 acres as against 157 acres for United States as a whole.
7. About 2/3 of present population of Los Angeles City and Metropolitan District acquired in past 20 years, passenger auto registration of Los Angeles City in 1915 was 35 per 1000 population in 1931 was 366 per 1000.
8. The trend in residential construction from 1919 to 1930 was decidedly towards multiple dwellings, but in 1932 this trend had been reversed to single family dwellings.
- 2-a Pacific Electric Railway in 1932 operated 110% of their 1914 track mileage, 78% of their 1914 car mileage and carried 78% of the number of revenue passengers they carried in 1914.
- 2-b Pacific Electric busses carried 18% of total passengers carried by system -- except L. A. Motor Coach Company.
- 2-c Los Angeles Railway in 1932 operated 105% of their 1914 track mileage, 89% of 1914 car mileage and carried 99% of 1914 revenue passengers.
- 2-d Los Angeles Railway busses carried 6% of total revenue passengers carried by system, excluding L. A. Motor Coach Company.
- 6-7 In 1923, 605,000 persons entered Central Business District in 12 hour day, 52% coming by rail and 48% by automobiles. In 1931 697,000 persons entered the district during the same time, 62% by automobiles and 38% by rail and bus.
7. One person out of two residing within 10 mile radius, or 1 out of every 3 residing within the entire Metropolitan District now enter the Central Business District daily.

The proportion of persons within the 10 mile radius who enter the district by automobile was the same in 1923 and 1931. Proportion of persons entering district by rail and bus transportation has decreased nearly 50% between these dates.

3. About 30,000 automobiles, each parking 45 minutes, could be accommodated in the Central Business District during a business day at the curb. Due to overtime parking, only 20,000 are actually accommodated.
9. Offstreet parking facilities within and adjacent to the Central Business District have a capacity for 56,000 car stalls and actually park 60,000 daily. About 275,000 automobiles daily entered the Central Business District in December 1931.
3. Los Angeles has smallest percentage of usable street space in terms of total area in its Central Business District of any large city.
1. It is estimated that cost of delays due to traffic congestion within the Central Business District reach a sum of at least \$15,000,000 annually. Assessed valuation of the Central Business District is now \$168,000,000 -- equal to 1/6 of assessed valuation of entire city of Los Angeles, or 1/10 of valuation of Los Angeles County.
2. During period 1915-20, about 20 acres of ground were built upon per 100,000 population increase in the Central Business District while between 1927 and 1930, the rate of utilization had dropped to 7 acres per 100,000 increase, indicating a high degree of decentralization.
5. About 30% of the people living within the Metropolitan District of New York enter its Central District daily, this figure being the same as that for Los Angeles Metropolitan District and its Central Business District.
6. By 1945 it is estimated that 1,070,000 persons will enter the Central Business District of Los Angeles daily. With the present saturation of automotive traffic, it will not be possible for many more persons to travel to and from the Central District by automobile, which will make some means of rapid transit essential.
0. A comprehensive study of transportation facilities, including stem and electric and motor busses, is needed to coordinate systems.

The possibility is indicated of utilizing some steam railroad tracks or rights-of-way for future rapid transit extensions.

1. The rapid transit plan proposed shows four lines radiating from Central Business District serving all four directions. It includes (a) a subway on Aliso Street from Los Angeles River connecting with proposed Union Station at the Plaza through Civic Center, southerly on Hill (or some other street to be decided later) to (b) Tenth Street westerly on Tenth to Hoover, thence to Eighth, along Eighth to Pacific Electric right-of-way and terminating at Vineyard; (c) an elevated line from present Pacific Electric Station to Alameda Street southerly between Alameda and Compton to Slauson, and (d) a continuation of existing Glendale line under Temple to Bellevue, leaving Glendale line at Riverside Drive, following east bank of Los Angeles River to opposite Burbank, thence westerly to North Hollywood.
9. Estimated cost of structures in system is \$35,650,000 -- for rights-of-way \$1,550,000. Total \$37,200,000.
- 2-a Estimated that system will carry 90,000,000 passengers in 1940 and 147,000,000 in 1950, and 191,000,000 in 1960.
7. Using a portion of the 30% grant obtained under the Public Works Administration to pay interest during initial years and issuing bonds for \$30,000,000, it is estimated that the system can be constructed, operated and debt service met with a deficit of \$500,000 annually for the first three years of operation. This deficit will be reduced to \$400,000 annually for the fourth and fifth years, and progressively reduces to \$10,000 the ninth year after which it will disappear. Such deficit must be met by creation of an assessment district. If such district were to include property in downtown Los Angeles, the rate to be levied the first year would be 30¢ per \$100 assessed valuation, as a tax of \$3000 per year on a property assessed at \$1,000,000.

Reduction of assessed valuations during the past two years has amounted to 38%. A 30¢ levy would increase present taxes paid on downtown property 7%. The savings made in taxes over those paid two years ago are nine times the tax levy necessary to meet the deficit the first year.