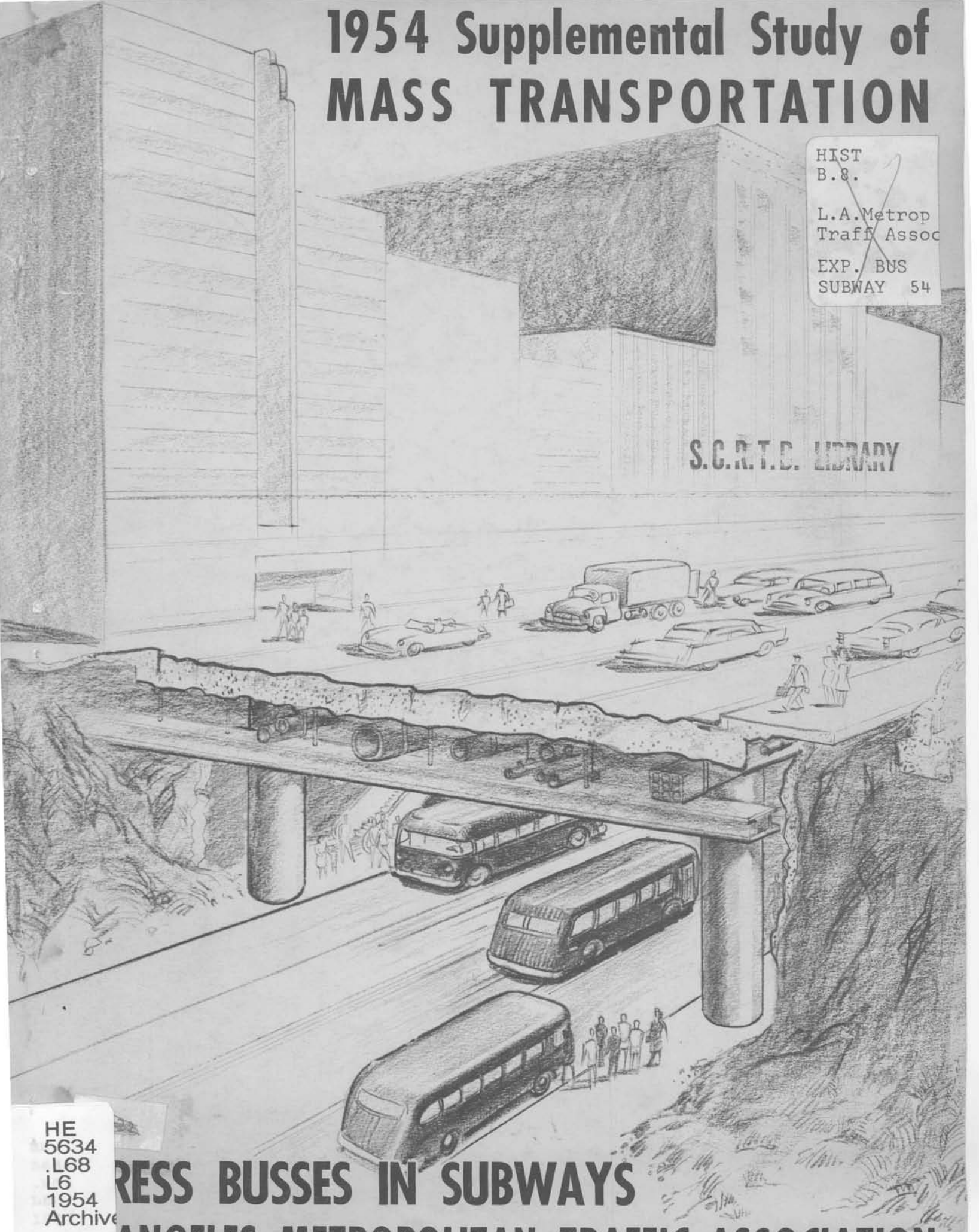


1954 Supplemental Study of MASS TRANSPORTATION

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EXPRESS BUSES IN SUBWAYS

LOS ANGELES METROPOLITAN TRAFFIC ASSOCIATION

SUPPLEMENTAL STUDY OF MASS TRANSPORTATION

CENTRAL BUSINESS DISTRICT

Submitted to: BOARD OF DIRECTORS

LOS ANGELES METROPOLITAN TRAFFIC ASSOCIATION

By: Walter R. Lindersmith, Secretary-Manager
Stuart M. Bate, Chief Engineer
Tenya Smalley, Assistant Secretary

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LOS ANGELES METROPOLITAN TRAFFIC ASSOCIATION

610 SOUTH MAIN STREET, ROOM 987

LOS ANGELES 14, CALIFORNIA

TUCKER 7066

January 24, 1955

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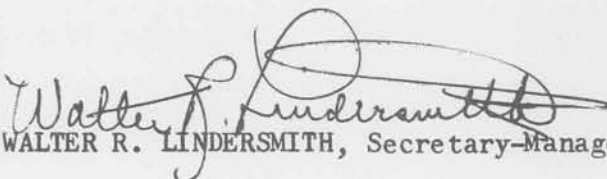
TO THE BOARD OF DIRECTORS LOS ANGELES METROPOLITAN TRAFFIC ASSOCIATION

A word or two regarding this SUPPLEMENTAL STUDY OF MASS TRANSPORTATION -- CENTRAL BUSINESS DISTRICT,

In a previous report titled "EXPRESS BUSES ON FREEWAYS" it was stated that the development of freeways for coach operation is economically feasible in that such operation would provide service much sooner to a greater portion of the area than could otherwise be realized. The freeways are being built. They serve the major centers in the metropolitan area. They provide cross-town travel. We showed the tremendous savings in time which could be effected with a system of this type.

HOWEVER -- there is one weak link in the program. After the buses leave the freeways and co-mingle with all the other forms of traffic on the surface streets in the Central Business District considerable of the time savings and other benefits are lessened or otherwise effected.

THEREFORE, we herewith submit further studies -- limited, of course, because of lack of funds, staff, and time -- of the mass transportation problem in the Central Business District developed a-long such phases as seem essential now.


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SUPPLEMENTAL STUDY OF MASS TRANSPORTATION

CENTRAL BUSINESS DISTRICT

ESSENTIAL PHASES COVERED:

- STREET ARCADES Contemplates set-back space to be taken out of frontage of buildings to make room for extra lane on street
- SPECIAL STREET LANE FOR BUSES Setting aside curb lane for use of buses; restricting certain streets exclusively to mass transportation Accompanying Map.
- INTERSECTION SEPARATIONS Provides for excavation and installation of escalators or ramps for pedestrians to cross below street surface; escalators or ramps for crossing intersections above street surface.
- ONE-WAY STREETS North-South -- East-West
- ELEVATED ROADWAYS In existing alleys for buses Accompanying Map
- STAGGERED HOURS Would reinstate war time requirement that places of business open and close not all at the same time
- NIGHT LOADING AND UNLOADING Contemplates loading and unloading of merchandise at street curbs during night hours
- FRINGE PARKING Contemplates system of fringe parking lots serviced by shuttle buses or express buses on freeways operating into the downtown district. Accompanying Map
- BUS SUBWAYS Provides the most practical means of extending freeway system through the Central Business District Accompanying Map.

STREET ARCADES -- Arcaded Streets

When traffic congestion reaches the point of saturation in central business areas and it is decided to widen streets to provide more room for vehicular traffic it might be cheaper to acquire a right-of-way thru existing high buildings and set the sidewalk back into an arcade than to cut off the front of the building or move it back.

In Seattle, arcades were carried thru two 8-story buildings when Fourth Street was widened. There are several examples of arcaded sidewalks in Europe, but the buildings were generally built with the arcades in them, rather than changed to that form later as an inexpensive means of widening a street. In New York City the arcading of streets has been advocated for over 20 years as a method of street widening, but only two sidewalk arcades have been built in that time. The first was in the New York Telephone Company Building and the other in the 21 West Street Building, both in downtown Manhattan; in each case the arcades were part of the original construction of the building.*

Satisfactory application of the principle of arcading would require set-back on both sides of the street -- arcading one side only, the extra lane gained would throw traffic movement permanently off balance; or to take two lanes, approximately 11 ft. per lane, from one side of the street would create serious condemnation and damage problems to the business and property affected.

Under normal traffic conditions, it is estimated that approximately 600 cars per hour per lane could be moved -- an increase of 1200 cars per hour for both lanes. As a relief for traffic congestion, widening of street fails because as soon as the street is widened more and more cars averaging one and one-half persons per car would be attracted to that particular street and we would be right back in the same traffic congestion mess.

Recent street widenings outside the central business district point up the costs of such improvements:

1946	Olympic Blvd, Parkview to Western	1.23 mi.	\$ 293,270
1947	Olympic Blvd, Los Angeles to Flower	.40 mi.	\$ 114,717
1947	Daly Street, Pasadena Ave to N. Main	.72 mi.	\$ 229,290
1949	Colorado Blvd, Townsend to Eagle Rock Av	.76 mi.	\$ 327,648

It needs no intensive engineering study to show there are no comparable costs for the central business district.

The world's first commercial installation of climbing or moving sidewalks -- trade-named "Speedwalk" -- was placed in operation this year by Hudson and Manhattan Railroad in Jersey City, N.J. This human carrier consists of a wide conveyor belt, reversible in direction to handle peak loads, and fitted with hand rails. Designed by Goodyear and Stephens-Adamson Mfg. Company of Aurora, Illinois, and Los Angeles, it moves at half normal walking speed and can transport close to 11,000 persons per hour up or down a 10 per cent incline for a distance of 227 ft.

* TRAFFIC and PARKING STUDY by Regional Plan Assn.Inc. New York City 1942.

Adaptability of this type of system to our central business district to relieve pedestrian problem intersections might well be the subject of a study by our traffic engineers. We are informed *that Cincinnati is considering a speedwalk in its business area and a large southwestern city is contemplating a moving sidewalk which would move thru major department stores and office buildings. Another southeastern city is looking into the possibility of establishing a five-block moving sidewalk which would transfer people from parking lots on the perimeter of its downtown area into the heart of the city.

* L.A. Times 7-16-54

CONCLUSIONS: Arcading not recommended for the central business district. Benefits derived would not justify expense. Improvements of this type would involve large scale widening of entire length of street, or streets, necessitating heavy expense of rights-of-way and extensive alterations to buildings, some of them limit height.

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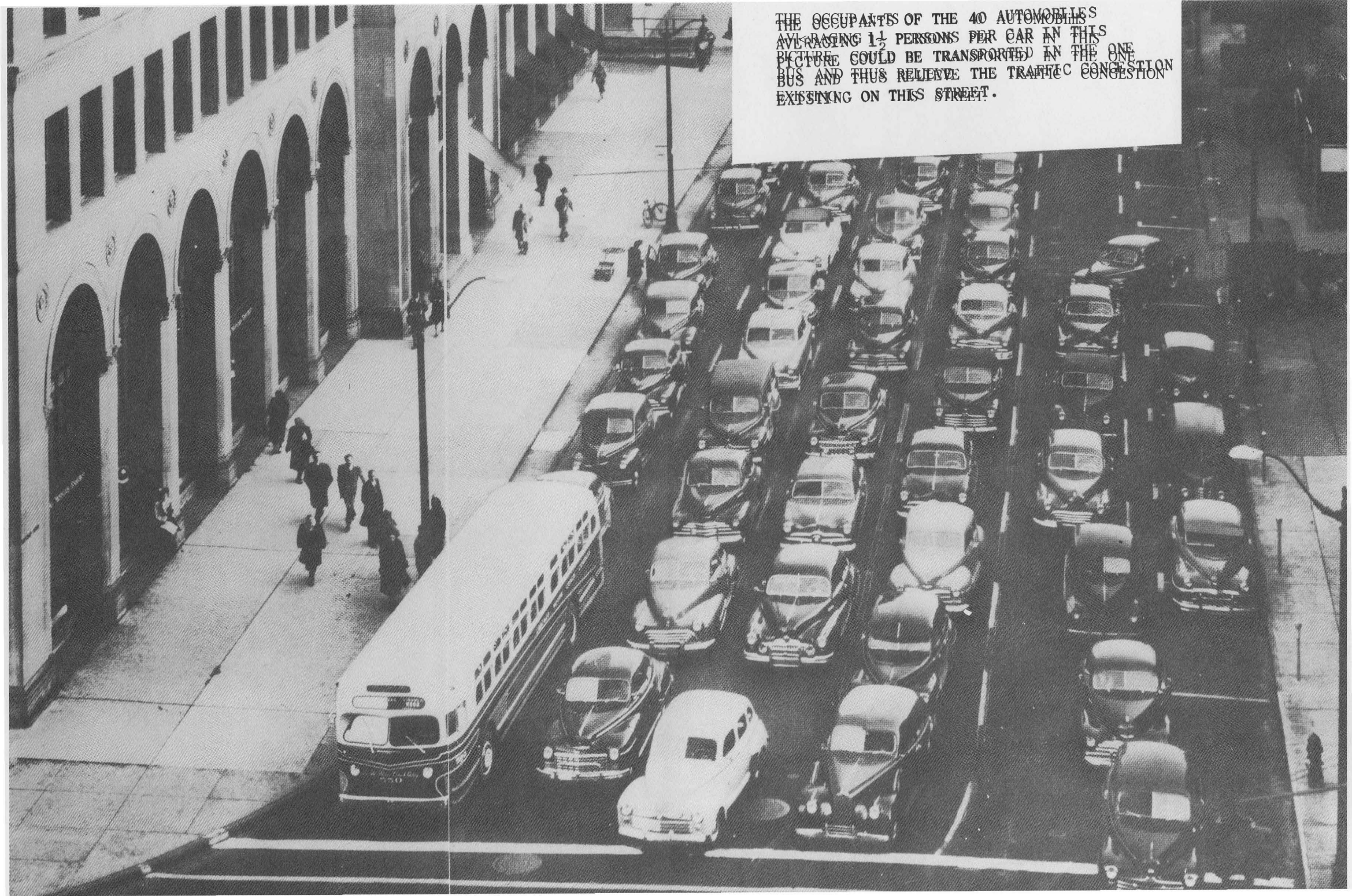
SPECIAL STREET LANE FOR BUSES -- Setting aside the curb lane for use of buses and restricting certain streets exclusively to mass transit.

Mass transit is a vital public service essential to the life of a city. The big problem: what can be done to attract more riders to the mass transit system, thus reduce the number of private automobiles with corresponding subsidence in traffic congestion. Primarily we are concerned with the movement of people, not the number of vehicles. A modern bus transports 60 persons. On the local ratio of 1.5 persons per car, to transport these same 60 persons by private automobile would add 40 vehicles to the rush hour traffic congestion.

In other words, a surface lane in the central business district carrying 600 cars per hour, with an occupancy ratio of 1.5 persons, transports only 900 persons, whereas a bus with its carrying capacity of 60 persons, operating 60 buses at one minute headway per hour, transports 3600 persons, or four times as many as by private automobile in the same period of time over the same lane.

Ralph E. Gross, Transit and Traffic Engineer, City of Chicago, in a recent speech said in part: "The time is rapidly approaching when, in order to obtain more efficient street usage, mass transportation vehicles will have to be confined to a particular lane on the street or to designated specific streets as mass transportation routes only".

THE OCCUPANTS OF THE 40 AUTOMOBILES
AVERAGE 1½ PERSONS PER CAR IN THIS
PICTURE COULD BE TRANSPORTED IN THE ONE
BUS AND THUS RELIEVE THE TRAFFIC CONGESTION
EXISTING ON THIS STREET.



Research does not reveal any specific instance where these two proposals have been formally tried thru enactment of an ordinance by any of the larger cities. However, exclusive use of the curb lane by transit vehicles has been accomplished for all practical purposes in a number of cities.

The American Transit Association reports that in cities where they have "No standing - No Stopping" regulations during peak hour periods, and where transit vehicles are operated on close headways, motorists generally find it inadvisable to position themselves in the curb lane. In places like Newark, New Jersey, on Broad Street practically the entire curb area is allocated for bus-stop zones because of the high concentration of bus routes on the street. This, too, makes for the exclusive use of the curb lane by buses.

In Milwaukee, where all curb parking is prohibited on the main street, where buses and trolley coaches use mid-block stops with routes assigned loading zones in alternate blocks, with the high concentration of transit vehicles and the high proportion of the curb area allocated for bus-stop zones, likewise, it is inadvisable in most instances for the motorist to position himself in the curb lane.

An example where both the curb lane and an entire street is given over to transit operations, for all practical purposes without official designation, can be found in Houston, Texas. This was accomplished by prohibiting all left and right hand turns for a distance of approximately 14 blocks in the center of downtown and a concentration of routes on this main street, making it an almost exclusive transit, pedestrian and shopper street with automobiles moving to adjacent streets. Once a motorist gets on this main street, he cannot get off until he has gone the full 14 blocks.

In the Los Angeles central business district the high concentration of buses is found on Hill Street. During the six hour period (7 to 10 a.m. and 3 to 6 p.m.) Hill at 8th Street carries 1248 buses, adjacent street - Olive at 8th - carries 502 buses, a ratio of 5 buses on Hill to 2 on Olive. During the same period, an average of 4710 automobiles use Hill Street, with 5266 using Olive Street, or an auto use ratio of 1.12 in favor of Olive Street.

Legal questions arise can the City Council pass a valid ordinance grating the exclusive use of a specific street or streets to transit vehicles and bar its use to automobiles. We do not propose to render a legal opinion here. Section 2, subsection 11 m of the City Charter reads:

"to provide for the acquisition, construction, improvement or alteration, maintenance, use and control of streets, tunnels, sub-

ways, rights-of-way . . . and other public improvements on, above or below the surface of land or water."

However, the enactment of any ordinance under the provisions of this charter section must be reasonable and necessary to the public welfare. It has been held by the Supreme Court that the regulation of traffic on the streets of a city is not one of those municipal affairs over which the local authorities are given a power superior to that of the Legislature. Sections 458 and 459 of the Vehicle Code pertain to the powers of local authorities to enact ordinances within the reasonable exercise of the police power. Subsection "L" of Sec.459 Vehicle Code would permit the adoption of a local ordinance "prohibiting the use of particular highways by certain vehicles, except as otherwise provided by the Public Utilities Commission pursuant to Art.2 of Chapter 5 of Part 1 of Division 1 of the Public Utilities Code".

CONCLUSION: In view of the legal problems involved and the question of acceptance by the driving public of such measure, we recommend further study be undertaken to resolve these questions.

** - **

INTERSECTION SEPARATIONS -- Provides for excavation and installation of escalators or ramps for pedestrians to cross below the street surface, or installation of escalators or ramps for crossing intersections above the street surface.

Most delays to traffic can be traced to conflicts at intersections. Even under the best of conditions, a busy intersection is always a point of congestion. Being subjected to the traffic load of two streets, the intersection has to be assigned first to one street and then to the other.

As a first step in consideration of any costly method of separating traffic conflicts it is, of course, necessary to obtain data as to need. Without such technical basis the use of controls may become excessive and inefficient, creating confusion and delay.

Bridges or tunnels provide the absolute separation desired but are usually expensive and not always satisfactory. There are a few pedestrian bridges over streets in New York City, notably those over West Street at Liberty and Barclay street ferry terminals, which are used by large numbers of people.

Herald Square is an outstanding example of underground passages. Here people can enter a large underground concourse at 16 different places and can go to any of the other exits, in many places by crossing diagonally in the shortest possible line, but this opportunity is not used as often as it should be. To induce people to use these underground ways for crossing the east-west direction, there should be at least two escalators, one on the east side of Sixth Avenue at 35th or 34th Street and another on the east side of Broadway at 33rd or 32nd Street. With these improvements, this underground concourse would be used by people crossing thru moving traffic, as many do now. This is the best place in the city to demonstrate the benefits of improved pedestrian facilities. As a rule, however, people will not use either elevated or sub-surface pedestrian ways unless they have some reason to go to the upper or lower level.*

In 1926 Los Angeles saw the start of an intensive construction program of pedestrian subways thru a \$350,000 bond issue voted by the people. There are now 123 of them in use, their primary purpose is to serve school children, and their use by children is very high due to educational programs and traffic safety patrols. Adult use is limited -- altho lighted, women will not use them at night. There are no pedestrian subways located in the central business district nor are there any overpasses for public use.

A survey conducted in 129 cities of various populations (Los Angeles and New York City excluded) uncovered 253 overpasses or underpasses, with only 9 of them in cities over 500,000 population. Overpasses or underpasses require barriers to force pedestrians to use them and should be constructed only where the problem cannot be solved in simpler and more economical manner. Stairways are found to be quite objectionable and ramps or escalators should be substituted.

Schemes and Types -- positive separation between pedestrian and vehicular traffic may be achieved by:

1. Overpasses on the four sides of an intersection with up escalators and down stairways
2. Overpasses in the mid-block area with up escalators and down stairways and barriers at the intersection to prevent crossing the street at all intersections on the pavement level
3. Overpasses in the mid-block area with approach ramps extending to the intersections each way from the overpass bridge on both sides of the street
4. Overpasses of street as a part of a continuous elevated sidewalk extending along entire block at the second street level

5. Underpasses at the intersections on the four sides of each with both up and down escalators
6. Underpasses at subway stations in the event of construction of express bus subways in certain streets.

Benefits -- Separation of Pedestrian and Vehicular Traffic:

1. Increased speed of movement for the vehicular traffic using the central business district streets;
2. Provides steady flow of pedestrians instead of intermittent flow when the movement must be interrupted to permit exclusive use of the intersection by the vehicular movement;
3. Reduction of time required for shoppers to visit all establishments in the district thus making shopping more attractive to greater numbers of people;
4. Reduction of accidents at intersections. Records of 54 large cities have shown that out of a total of 3468 fatal accidents while 53% occurred away from intersections, 25% were at the intersections. In 6 leading cities, out of 8289 accidents, 912 occurred because of crossing against the signal, 797 in crosswalks and 473 crossing with the signal.

While fatal and non-fatal accident rate at intersections in the Los Angeles central traffic district is very low during the daylight hours -- traffic moves slowly because of congestion and because many of the intersections are under officer patrol -- it is during the night and early morning hours when the intersections are unpatrolled that the accident rate piles up.

5. Altho positive separation of pedestrian and vehicular traffic is likely to cost as much as \$280,000 per intersection for overcrossing bridges with escalators, the ratio of benefits to cost might be as much as 1 to 10.

CONCLUSIONS: In the event bus subways are constructed under certain streets in the central business district as shown in study plan "BUS SUBWAYS" of this series, it is recommended that as an integral part of such construction, pedestrian underpasses be provided at intersections and as connections with subway stations; provide mid-block overpasses with escalators (speedwalks) at selected locations, and overpasses with "up" escalators and "down" stairs at other selected intersections.

The location and type of facility would be determined by an engineering and traffic study.

ONE-WAY STREETS

Operation of one-way streets in the Central Business District is in effect on 5th Street - westbound

6th Street - - eastbound

8th Street - westbound

9th Street - - eastbound

Study reveals that one-way operation of streets through increasing street capacity -- moving larger volumes of traffic with more dispatch and fewer accidents -- is a great help in relieving traffic congestion through the downtown area. In fact, so successful has been this operation that more streets have and are being studied for one-way traffic movements. However, there are no fixed sets of warrants for one-way streets because there are too many variables in street patterns, in traffic flows, physical conditions and other factors which influence the final decision. Therefore, conversion must be weighed from the standpoint of public benefits and who will pay the bill.

Additional streets studied -- 3rd Street - westbound

4th Street - - eastbound

History: Present width of 4th Street, Main to Los Angeles, 32.7 ft; Los Angeles to Wall 36.7 ft, balance 40 ft. or more providing 4 lanes capable of carrying 2400 vehicles per hour. Plans for 4th Street cut connecting with Harbor Freeway call for a 44 ft. roadway of 4 lanes.

Recommended by Traffic Engineer (Report June 1953):

- 1) eliminate jog in 4th Street at Alameda;
- 2) widen 4th Street between Main and Wall.

Recommended by City Engineer Lloyd Aldrich (Reports April 1952 and July 1953 to Board of Public Works):

- 1) jog at Alameda be eliminated
- 2) 4th Street be widened from Main to Wall, estimated cost \$80,300 exclusive of acquisition of property for jog.

The financing of both of these improvements has been recommended by City Engineer to the Board of Public Works. It is expected that favorable action by said Board and the City Council will be forthcoming so these two necessary improvements can be completed by the time the 4th Street connection at Harbor Freeway is opened to use about the latter part of year 1955.

3rd Street is temporarily used for one-way movement from Hill Street westerly during the P.M. peak only.

-- 11th Street - westbound

12th Street - - eastbound

History: 11th Street roadway is 40 ft. Relatively not a heavy traffic artery because it ends at San Pedro Street and the "W" car operates between Broadway and Figueroa where there is a bad jog which would have to be eliminated at an estimated cost of \$183,000 for acquisition and construction. The "W" line could be rerouted Broadway to Pico to Figueroa, thence south

on Figueroa to Washington.

History: 12th Street is a continuous 40 ft. roadway from Hooper Avenue to Hoover Street. Now carries a heavy volume of traffic -- one-way operation would materially increase this. Problem: rerouting of #2 trolley coach running east from Main Street and reconstruction of overhead facilities.

On the basis of data presented at conferences and discussions early in 1951 it appeared questionable whether more traffic could be moved if both streets were converted to one-way operation. More actual carrying capacity is available by continuing two-way operation on 11th and one-way operation on 12th during peak travel periods.

-- 1st Street - westbound
2nd Street - - eastbound

History: Recommended by former Traffic Engineer Dorsey: Point of transition on the west would be where 1st and 2nd Streets run into Beverly Blvd at Glendale Blvd -- on the east, at Vignes Street requiring construction of a new roadway in the vicinity of Garey to carry the 2nd Street traffic over First Street Viaduct. The "P" car now operates over First Street between Broadway and Vignes Street. Permitting the westbound "P" movement to remain on First Street, Dorsey pointed out that the eastbound movement could be accomplished by constructing a single track rail on 2nd Street. Recently 1st Street was reconstructed and widened between Main and San Pedro Streets and street car tracks relocated at considerable expense. It would, therefore, appear unlikely that rerouting the "P" line for eastbound movement on 2nd Street with attendant expense should be advocated at this time.

-- Figueroa Street - southbound
Flower " - - northbound

History: Recommended by Traffic Engineer with southerly transition point at 38th Street, northerly at Temple Street.

With the completion of the Harbor Freeway to 23rd Street and the diversion of many vehicles from Figueroa Street to the Freeway -- with the operation of the "W" line on Figueroa between 11th and Washington -- it is questionable whether Figueroa should be considered further as a one-way street north of 23rd Street.

Comparative counts made before and after the opening of the Harbor Freeway indicate a decided traffic switch from Figueroa Street to Harbor Freeway. In 1950 the count on Figueroa at Olympic Blvd was 56,232 -- in 1954, it was 34,934, a drop of 21,298. The first traffic

count at the Olympic Blvd separation taken in July 1954 showed a combined north and south movement of 66,638 vehicles for a 16 hour period from 6 a.m. to 10 p.m. Also, at 6th Street there was a drop in 1953 of 5313 vehicles on Figueroa Street from a total of 65,021 in 1949.

Pending completion of Harbor Freeway to 42nd Street, about November 1955, one-way operation is in effect with Figueroa Street now serving as the one-way artery for southbound traffic and Flower Street for one-way traffic northbound -- both operating between 22nd Street and 38th Street.

Main Street - southbound . from Sunset Blvd to Washington Blvd
Los Angeles - northbound . from 23rd Street to Sunset Blvd

History: Los Angeles Street varies in road width from 40 to 46 ft. between 4th and 5th Streets, south of 5th it widens to 56 ft. To convert to one-way traffic would necessitate widening to 60 ft. from 1st to 6th Streets.

Complications: merging of two-way traffic on Spring Street with one-way on Main at 9th Street; operation on Main Street of L. A. Transit Lines #47 Coach, #2 trolley bus, and F and #8 car lines (The California Public Utilities Commission recently authorized the L.A. Transit Lines to abandon rail lines F and "8" on Main Street and substitute bus line #8 in lieu thereof); Metropolitan Coach Lines #52, #56 and #63 out of the 6th Street terminal northbound. On Los Angeles Street, Metropolitan Coach Lines operate nine lines southbound to the 6th & Main and 6th & Los Angeles Streets terminals. As proposed (heretofore by Dorsey) these latter bus movements would have to be rerouted to change their direction as would the three on Main Street.

The street car -- even with the authorized substitution of buses mentioned above -- and the trolley coach lines on Main Street present a change in mass transportation pattern of a magnitude (removal of all service from one street to another) that might decrease patronage for the mass carrier instead of increase it because of inconvenience to present users.

Off-center lane movement -- reversing the direction of movement on off-center lanes to fit peak loads has been employed with considerable success during the A.M. and P.M. peaks. This should be continued.

CONCLUSIONS

1. That one-way traffic be put into effect on 3rd and 4th streets as soon as possible even on a limited basis until
 - a) jog at 4th and Alameda is eliminated
 - b) 4th Street widened to 40 ft. between Main and Wall, and
 - c) 4th Street cut connecting with Harbor Freeway is completed when the plan will be fully effective

- 2) That one-way traffic (westbound) be continued on 12th Street during p.m. peak periods
- 3) That two-way traffic be continued on 11th Street
- 4) That two-way traffic be continued on 1st and 2nd Streets
- 5) That two-way traffic be continued on Figueroa & Flower north of 72nd Street, and
- 6) That two-way traffic be continued on Main & Los Angeles Streets

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ELEVATED ROADWAYS (in existing alleys) for BUSES

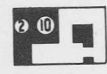
In contemplating the use of existing alleys in the Central Business District as location for construction of elevated roadways for buses -- elevated approximately at second floor level -- it is to be noted:

- 1) there is complete lack of any system of alleys (see map EXISTING LAND USE - STREETS & ALLEYS)
- 2) alleys which now exist lack continuity in most instances
- 3) there are only 6 east and west alleys widely separated and extending one block each
- 4) (excluding Bunker Hill area - Flower, Temple, Hill & 5th Streets) it would be necessary to "break through" the second floors of various height buildings, some of the important larger ones being:

Havenstrite	May Co
Union Oil	Occidental Life
Robinson's	State
Biltmore Hotel	Times
Pacific Mutual	Mirror
Security Title Insurance	Bradbury
Park Central	Spring Arcade
Commercial Exchange	Alexandria Hotel
Bureau of Water & Power	Jewelry Trades
Grand Central Market	H. W. Hellman
Broadway Department Store	Sante Fe
Clark Hotel	Pacific Electric
Los Angeles Theatre	California Club
Bullock's	Public Library

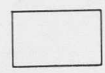


LEGEND



BUILDINGS

NOTE: NUMERALS INDICATE BUILDING HEIGHTS IN STORIES (DWELLINGS AND ONE-STORY COMMERCIAL BUILDINGS EXCEPTED)

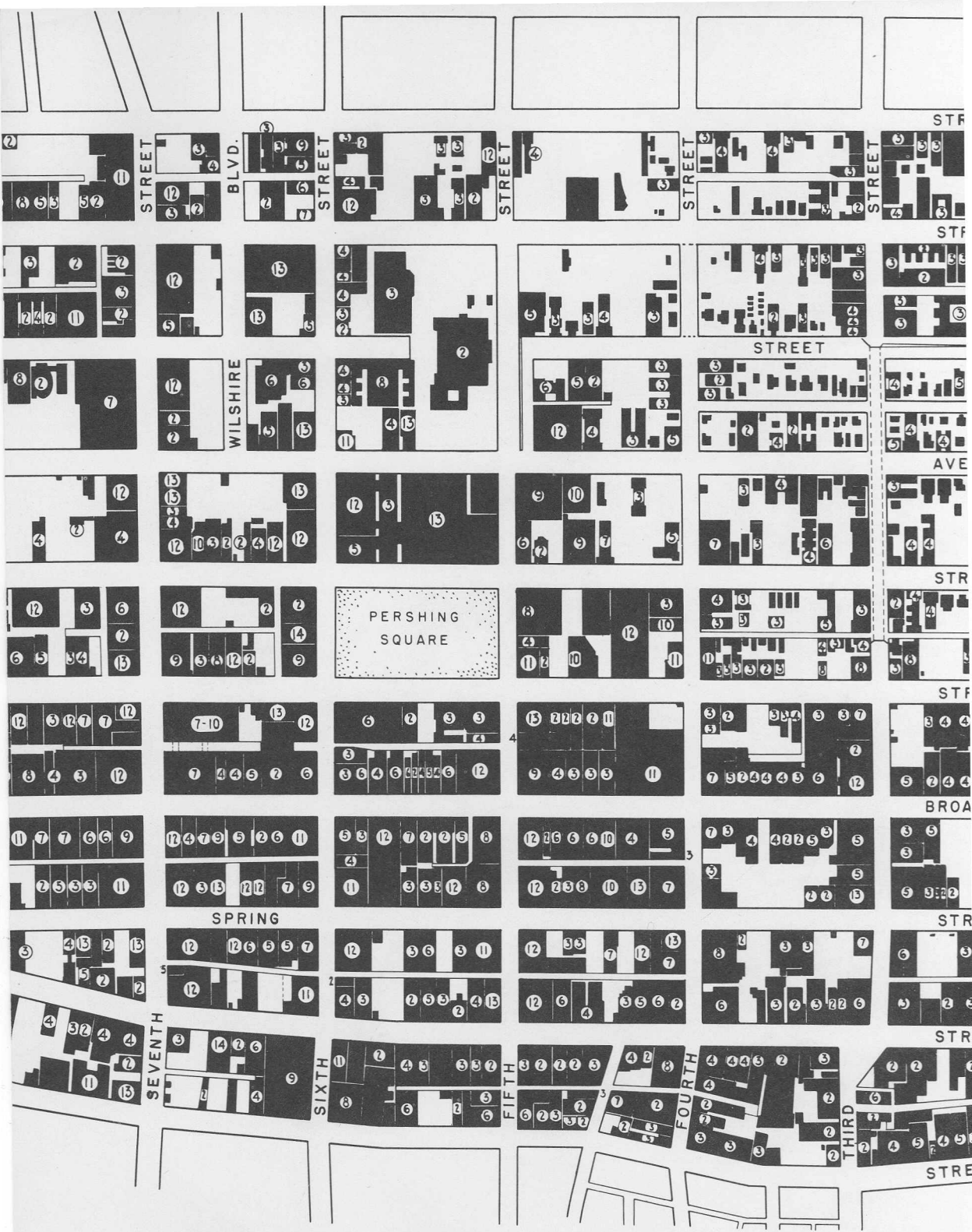


VACANT LAND



PARKS

COMMISSION
CALIFORNIA



STREETS AND ALLEYS

LOT'S



CITY PLANNING
LOS ANGELES

BUSINESS DISTRICT



EXISTING LAND USE - STREET
 AND BUILDING HEIGHT

Our studies developed these problems:

- 1) width of existing alleys permit of only one-way bus operation, with occasional points of turnouts in case of breakdown
- 2) would, therefore, require northbound movement up one alley and southbound movement in alternate block -- east and west likewise would have alternate directional travel of buses
- 3) stops for loading and unloading passengers would necessarily be located at second floor elevation requiring escalators or stairways to reach them
- 4) narrowness of most alleys would necessitate taking additional space on the second floor of buildings to provide for passenger loading and unloading facilities; or, these could be provided over existing streets by widening structures
- 5) where "break through" of a building is involved, the taking of a height up to and including the second floor is mandatory to maintain required elevation of bus roadway throughout the system, with consequent results:
 - a. probability of damages due to noise and vibration of bus operation
 - b. costs of condemnation or acquisition, including severance damages, in some instances, would be higher than the one or two-story buildings are actually worth
- 6) to construct the east and west roadways, with only 6 existing alleys to begin with, would not only involve tremendous costs but would upset the physical structure of so many buildings as to render the proposal uneconomical
- 7) large buildings located near the center of some blocks would be cut through both north-south and east-west, thus materially restricting the use of such buildings for the purposes originally designed
- 8) The Bunker Hill section does not permit of well-laid plan of elevated roadways -- also, grades on certain of the streets leading through the section are too precipitous for bus operation.

TABLE -- by blocks -- EXISTING ALLEYS -- or HEIGHTS OF BUILDINGS to break through

BLOCK	EXISTING ALLEY	HEIGHTS of BUILDINGS to break through
<u>FLOWER-HOPE Bet.</u>		
5th-6th	-	3 - 4 (California Club)
6th-7th	-	1 - 12 (Havenstrite)
7th-8th	alley	3
8th-9th	alley	
9th-Olympic	alley	
Olympic-11th	alley	
11th-12th	alley	
12th-Pico	alley	1

BLOCK	EXISTING ALLEY	HEIGHTS of BUILDINGS to break through
<u>HOPE-GRAND bet.</u>		
5th-6th		2 - 4 (Public Library)
6th-7th		1 - 2 - 12 (Union Oil Bldg)
7th-8th		7 (Robinson's)
8th-9th		1 - 1 - 4 - 3
9th-Olympic	alley	
Olympic-11th	alley	
11th-12th	alley	
12th-Pico	alley	
<u>GRAND-OLIVE bet.</u>		
5th-6th		12 - 3 - 12 (Biltmore & Pacific Mutual Bldg)
6th-7th		12 - 3 (Security Title Ins.)
7th-8th		4
8th-9th		1
9th-Olympic		1
Olympic-11th	alley	
11th-12th	alley	
12th-Pico	alley	
<u>OLIVE-HILL bet.</u>		
5th-6th		Fershing Square
6th-7th	alley	14 Park Central
7th-8th		2 - 12
8th-9th		13 - 8 Commercial Exchange
9th-Olympic	alley	
Olympic-11th	alley	
11th-12th	alley	
12th-Pico	alley	
<u>HILL-BROADWAY bet.</u>		
Temple-1st		1 - 3 Law Library
1st-2nd		3 - 2 - 4 - 4 - 3
2nd-3rd		10 - 7 - 4 - 4 - 4 Water & Power
3rd-4th		2 - 6 Grand Central Market
4th-5th		11 - 3 - 3 - 3 - 4 - 9 Bdwy Dept & Clark
5th-6th	alley	
6th-7th	alley	2 L.A. Theatre and Bullock's 1 story
7th-8th	alley	2 - 4
8th-9th		9 - 2 May Co
9th-Olympic	alley	
Olympic-11th	alley	
11th-12th	alley	9 Occidental Life
12th-Pico		1 - 1
<u>BROADWAY-SPRING bet.</u>		
Temple-1st		1 - 1 - 13 - 13 Hall of Records & State
1st-2nd		6 - 3 - 11 Times Mirror
2nd-3rd		3 - 2 - 2
3rd-4th		5 Bradbury
4th-5th	alley	Alexandria Hotel

Broadway-Spring continued

5th-6th		8 -12 - 3 - 3 - 12 - 4 Sprg Arcade-Jewelry
6th-7th	alley	Trades
7th-8th	alley	
8th-9th	alley	
9th-Olympic	alley	3

Broadway-Main

Olympic-11th		2 - 1-2 - 1
11th-12th	alley	
12th-Pico		1

SPRING-MAIN bet.

Temple-1st		11 - 25	Health	City Hall
1st-2nd	alley			
2nd-3rd	alley			
3rd-4th		6 - 3 - 3 - 8		H. W. Hellman
4th-5th	alley			
5th-6th	alley			
6th-7th	alley			
7th-8th		13 - 4 - 3 - 3 - 13		

MAIN-LOS ANGELES bet.

Temple-1st		2 - 4 - 3 - 4 - 3		
1st-2nd		3 - 3 - 3		
2nd-3rd	alley	4 - 2		
3rd-4th	alley	2 - 2		
4th-5th	alley			
5th-6th	alley	2 - 8 - 11		Santa Fe Bldg
6th-7th	alley	9 - 4 - 6		Pacific Electric
7th-8th		2 - 11		
8th-9th	alley			
9th-Olympic		2 - 1 - 3		
Olympic-11th	alley			
11th-12th	alley			
12th-Pico		1 - 1 - 6		

It is an indispensable requisite that elevated roadways in the alleys of the Central Business District for bus operation thereon must be an integral part of a mass transportation system connecting directly with the freeway system contiguous to the district and must preferably be capable of serving the area in all four directions. There are approximately 3600 bus units entering the district daily and unless a large majority of these can be taken off the surface streets and operated over the elevated roadways little relief of the congestion problem and the betterment of mass transportation can be expected.

CONCLUSIONS -- The practicability of a plan to utilize the alleys in the Central Business District and construct elevated roadways therein for the use of buses in connection with a mass transit system operating over the freeways would not be economically justified or feasible because of the physical conditions presently existing in the district.

STAGGERED BUSINESS HOURS

Lessons learned during the war show the degree to which staggering of business hours can improve traffic conditions during the morning and evening peak periods. No other device has been found that can spread the traffic load so effectively as staggering working and shopping hours.

It not only improves the load factor of the transit lines, but the spreading of traffic peaks proves helpful to all traffic by reducing congestion and increasing street capacity.

Since the war this practice has been greatly relaxed. To reinstitute the program would require careful planning and education, collection of statistics and factors which can be used to sell business, industrial, labor and homemakers. This project is of such magnitude and expense it would not be within the budget or staff of this Association to undertake study necessary.

CONCLUSION -- Demonstrated benefits of such a program as a major potential for traffic relief are unquestionable.

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NIGHT LOADING AND UNLOADING

The loading and unloading of trucks at the curbs in the central business district during the daylight hours create a number of problems, principal one being the generation of traffic congestion.

This problem has always been a challenge -- is becoming more intensified, and is one that must be handled without seriously handicapping business operations. Wholesale and retail establishments are economically dependent on both the truck service and the free movement of people on the streets.

To now attempt to provide the necessary off-street loading facilities for the many buildings in the downtown district built before the problem became so aggravated would be an expensive undertaking. However, present city zoning ordinance provides that where there is an alley all new buildings shall make provision for off-street loading and unloading as follows: buildings up to 50,000 sq.ft. - 400 sq.ft. loading facility; buildings over 50,000 sq.ft. - 600 sq.ft. loading facility. Where there is

no alley, facilities are not required. Thus, financial limitations and absence of alleys make it impossible to get at the heart of the problem.

Under the existing Municipal Code, trucks carrying refuse or garbage, fuel oil or building materials not to be unloaded in the district, and freight vehicles with trailer or of certain load and size limitations are prohibited in the central business district between 7 a.m. and 6 p.m. Also said Code bans loading and unloading by commercial vehicles on certain streets except between the hours 10 a.m. and 4 p.m. These restrictions are not a solution to the problem -- working hours and labor contracts are a factor, schedules are difficult to maintain and the cost of delays is a large item.

An excellent example of the voluntary provision for off-street loading space is the joint underground facility serving the group of ten office buildings in Rockefeller Center.* This facility provides 40 truck berths capable of serving a total gross floor area of about 7 million square feet. It has not as yet been used to full capacity but its effectiveness in reducing traffic congestion and thus maintaining a high-character business neighborhood is obvious.

CONCLUSION -- The application of such a scheme to a comparable block or blocks where no alley exists in the central business district of Los Angeles might be studied. In recognition of the variable types of businesses conducted, variations in their shipping and receiving demands, certain factual studies would have to be conducted to determine individual needs before any recommendations could be made. Because of the time limit, lack of finances for investigating the many ponderables entering into the problem, we feel such studies cannot be undertaken by us at this time.

*TRAFFIC & PARKING STUDY (1942) By Regional Plan Association, Inc.
New York City.

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FRINGE PARKING

Fringe or perimeter parking calls for a series of parking lots outside the central business district with frequent limited-stop bus service morning and evening peak hours, convenient, regular service off-peak, between the parking lots and the central business district. Purpose: to reduce vehicular traffic in the downtown area. To operate successfully, plan must provide attractive, fast low cost parking-bus trans-

portation, plus savings in over-all time. The benefits: 1) reduction of downtown traffic makes available more short-time parking for shoppers - thus downtown area regains "lost" business; 2) shifts all-day parkers to the fringe lots, speeds up mass transit operations generally; 3) helps maintain high downtown tax base, and 4) increases efficiency of curb-parking enforcements.

Arguments against fringe parking: cost of land in some areas is so high it is questionable whether the lots would be patronized due to corresponding high parking costs plus bus fare -- in Los Angeles people use automobiles for convenience and it will take considerable education to wean them back to mass transportation carriers -- transit companies cannot afford to operate low cost shuttle systems on the basis of peak hours alone.

Only to the extent that fringe parking actually keeps traffic out of the downtown area is it contributing significantly to traffic relief. Inquiry reveals fringe parking experiences in the various cities to be:

ST. LOUIS . Park-Ride Limited Plan launched Nov. 1953. Cars park free on municipal opera lots (2 lots with total capacity of 600 cars, 1 lot of 1000 cars) approx. 5 mi. from downtown; round trip fare 35¢, 1-way 20¢, children under 12 yrs. 10¢; buses operate on a 5 min. headway during peak, 15 min. during middle of day. The operation has reached 600 to 800 car capacity with about 1000 passengers per day.

No rental is paid to city but city watchmen to guard the lots are paid for by the Public Service Co. A personal interview survey was made during the third month of operation by an independent research organization which came up with these interesting facts: 1) 70% of park-ride customers formerly made their trips downtown exclusively by auto; 2) of the remaining 30%, over one-half said their trips were divided about equally between transit and auto; 3) the worker-shopper ratio is about 3 to 2.

Three additional lots have been opened. The first of these, in northwest St. Louis, was opened in Oct. 1954 and is a 700 car lot about $7\frac{1}{2}$ miles from downtown. Fare is 40¢ round trip and 10¢ parking fee. This operation has been disappointing probably because of its greater distance from downtown and relative inaccessibility.

The second new lot is in the North Broadway section and has a 350 car capacity - is about 5 mi. from downtown - fare is 35¢ round trip with free parking. Service has been growing steadily. The third new lot was opened Dec. 13, 1954 in South St. Louis - will accommodate 800 cars - drive-in theatre lot about 5 miles from downtown. Round trip fare is 35¢ - 10¢ parking charge.

O. W. Rexford, Vice-President and Operating Manager of St. Louis Public Service Co. had this to say:

"We believe that the ideal parking site should not be less than 4 acres in size, accommodating approximately 500 cars. It must be easily accessible from main traffic arteries. The terrain must be suitable for economical conversion to parking use. Zoning provisions must permit the operation and the owners of the site must be interested in the possibilities of this use of their land on a reasonable basis. . . . We intend to continue our search for suitable locations in other parts of the city because we believe the park-ride principle is good public relations. In addition, it is the first transit operation known to me which has drawn 70% of its customers from the automobile riding public. As such, it is an important competitive device for transit in our struggle against the exclusive auto user on downtown streets."

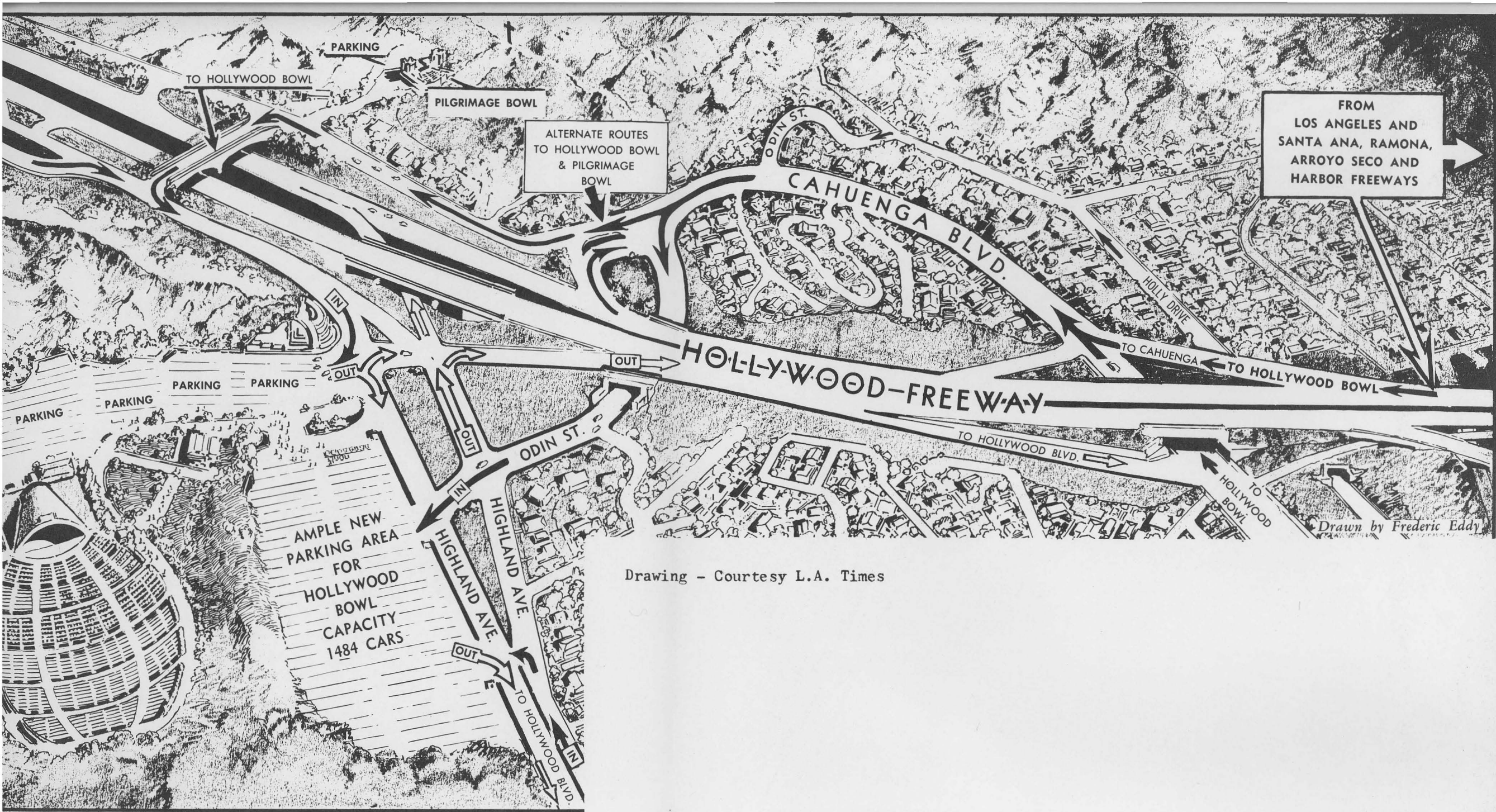
PHILADELPHIA . PARK & RIDE was established October 1925 at either terminus of the Market-Frankford Subway Elevated Line, approximately 5 to 8 mi. from center of the city. Recently enlarged capacity today relieves congested central streets of approx. 1000 cars. All day parking and round trip fare 55¢. Additional park and ride agreements with operators of existing parking fields, 2 to 8 miles from center of city, rate 60 to 70¢, bring total park and ride capacity to 2680 cars.

BOSTON . Parking lots (adjacent to through highways but outside the areas where traffic commences to jam) are owned or controlled by Metropolitan Transit Authority; are operated and managed by independent parking area operators; 55¢ parking-round trip ticket good only on day of sale.

DALLAS . Private operation by A. Harris & Co. large department store. Parking fee 30¢ for 1 hr, 65¢ all day, no additional charge for bus service (6 blocks) to store. Served by 2 Dallas Railway & Terminal Buses. 350 to 500 cars are handled per day.

CLEVELAND . Has two very large fringe parking lots, one municipally owned 2500 car capacity with free parking, the other privately owned 1050 car capacity, parking 35¢; approximately 0.5 miles from downtown, served by 3 downtown loop bus routes, fare 10¢ cash, 6 tickets for 55¢; 5 to 8 minute headway. Filled to capacity - demand is for more fringe parking lots if loop bus served.

PITTSBURGH . Has 3 fringe parking lots 1.5 to 5.5 miles from center of city; 338 car capacity; 2 lots are free, other all day parking 25¢, transit fare 20¢ including transfer. Two additional facilities are planned.



PARKING

TO HOLLYWOOD BOWL

PILGRIMAGE BOWL

ALTERNATE ROUTES
TO HOLLYWOOD BOWL
& PILGRIMAGE
BOWL

FROM
LOS ANGELES AND
SANTA ANA, RAMONA,
ARROYO SECO AND
HARBOR FREEWAYS

CAHUENGA BLVD.

HOLLYWOOD-FREEWAY

HOLLY DRIVE

TO CAHUENGA

TO HOLLYWOOD BOWL

PARKING

PARKING

PARKING

OUT

OUT

TO HOLLYWOOD BLVD.

HOLLYWOOD
TO
BOWL

Drawn by Frederic Eddy

AMPLE NEW
PARKING AREA
FOR
HOLLYWOOD
BOWL
CAPACITY
1484 CARS

Drawing - Courtesy L.A. Times

ODIN ST.

HIGHLAND AVE.

OUT

TO HOLLYWOOD BLVD.

IN

- HOUSTON . Has one city owned fringe parking lot with 350 car capacity. Parking fee 10¢, 15¢ transit fare, 4 min. headway. Operation not too successful -- parking problem in central business district is not too critical as yet.
- BALTIMORE . Has one city owned fringe parking lot leased to transit company. 220 car capacity 0.7 miles from center of city; park and ride fee 40¢ 10 a.m. and after 4 p.m. 50¢ from 10 a.m. to 5 p.m. Comment: "parking lot fee plus round trip are as much and in some cases more than downtown parking rates . . . fringe parking lots must have cheap parking rates, plus low cost transportation . . ."
- MILWAUKEE "It appears that the chief obstacle to securing bids (for fringe parking) is that the local transit company insists that the full cash fare of 15¢ be paid for the trip to and from the parking lot. This plus the cost of parking would raise the total cost to a point where it is believed the use would be inadequate to amortize the cost of lot improvements."
- One facility, 1380 spaces, is being planned.
- DETROIT . Several times in the past 5 years temporary programs of 1 or 2 months duration were tried. Each attempt proved to be a financial failure. However, they are at present planning 3 such facilities.
- WASHINGTON . Planned by Motor Vehicle Parking Agency for immediate operation (after Congress approves budget) 1 fringe parking lot (District owned) located approx. 3 miles from center of city and adjacent to a 2-lane bridge fed by 6-lanes of traffic, thus assuring economical operation by transit companies which service the area. Contemplated time from lot to center of city 18 minutes with 5 min. headway, service to be expedited should future demand warrant. If program is successful, additional facilities would provide 4000 spaces during fiscal year 1955 -- capable of further expansion to provide a total of 10,000 spaces.
- LOS ANGELES . Councilman Ernest E. Debs introduced a resolution in City Council last April "urging an immediate study to develop a plan for the creation of periphery parking areas where those people who now drive to the downtown area for all-day periods could park and enter said area by a feasible, low cost shuttle system, which would open up thousands of parking spaces for persons making central business section calls of short duration and divert the flow of traffic around the downtown area instead of through it".

In the Sierra Vista district on Huntington Drive, Metropolitan Coach Lines have under lease a lot which could accommodate approximately 300 cars but is presently being used by about 100 cars each day. Other locations adjacent to Ramona and Santa Ana Freeways should be studied.

The parking area at Hollywood Bowl in close proximity to Hollywood Freeway was enlarged last summer by about 1500 cars so that the entire area can now accommodate approximately 3000 cars. The location of this large lot offers a good opportunity for a pilot project. The property is publicly owned (county) and through a cooperative arrangement with the Bowl Association the County and the transit companies a plan could be worked out. (See accompanying map of Hollywood Bowl)

CONCLUSIONS -- It appears that the development of fringe parking is desirable. Success of such a program depends on these basic requirements:

- 1) an inexpensive parking charge integrated with transit fare
- 2) sufficient parking capacity to support reasonable frequent rapid transit service
- 3) adequate highway or freeway facilities close to parking area

Biggest problems that must be overcome appear to be:

- 1) acquiring land for the parking lot at a price which will permit the establishment of a combined parking and transportation charge that will be attractive to the motorist. In some cases, this might mean free parking on city or authority owned property and possible subsidized bus service where there is lack of revenue from pick-up riders not parking on fringe lots;
- 2) strategically located 1.5 to 10 miles from center of city preferably adjacent to a freeway;
- 3) providing fast, regularly scheduled transportation from lot to downtown area;
- 4) educating motorists thru various media as to advantages of fringe parking;
- 5) complete cooperation between city, county, state and the transit companies is most essential.

RECOMMENDATION -- To investigate and report on the feasibility of instituting a system of fringe parking lots serviced by buses, it is recommended a committee be comprised of:

1	member	appointed	by	the	Board	of	Supervisors				
1	"	"	"	"	Los	Angeles	City	Council			
1	"	"	"	"	L.A.	Bd	of	Public	Util.	&	Transportation
1	"	"	"	"	Board	of	Public	Works			
1	"	"	"	"	California	Public	Utilities	Commission			
1	"	"	"	"	Los	Angeles	Transit	Lines			
1	"	"	"	"	Metropolitan	Coach	Lines				
1	"	"	"	"	State	Division	of	Highways			
1	"	"	"	"	Los	Angeles	Metropolitan	Traffic	Assn.		

BUS SUBWAYS

Of the many plans for the solution of the transit problem, express buses on freeways has been concurred in by experienced and well qualified transit operators and accepted as the one plan which is economically feasible and capable of the earliest realization.

Supplementing our 1953 report -- EXPRESS BUSES ON FREEWAYS -- we herewith attempt to face the problem of caring for the vehicles in the central business district by a system of bus subways.

But first, a brief examination of some of the characteristics of the district is in order: the general spread of improvements now constructed or authorized by the voters of the City of Los Angeles is indicated by a glance at the miles and value of orders on hand June 30, 1953. Totals for all divisions and district offices are:

Street surface improvements	- Miles	337.10	Value \$	36,519,000
Sewers and treatment plants		211.63		43,849,000
Storm drains		154.25		78,293,000
Bridges and structures				<u>12,053,000</u>
				TOTAL - \$170,714,000

For the last 20 years the total of street improvement (surface), storm drains and culverts, sewers, structures, water systems and ornamental lighting systems has amounted to \$274,787,446. In the fiscal year 1950-51 the facilities amounted to \$33,605,427 - for 1952-53 the total was \$35,663,473, a total for the two years of \$69,268,900, or approximately the amount estimated for a rail rapid transit system in the freeways by the Board of Engineers employed by the City in 1945.

There is probably no better way of judging the size and importance of leading cities in the country than by presenting such statistical data as the above costs of municipal improvements. There has been, of course, a wide variation in these costs from year to year, and this is unavoidable since growth and requirements depend upon many factors. In the fiscal year 1933-34, a depression year, costs were as low as \$3,157,456, while in the year 1952-53 they were \$35,663,473.

These rapidly accelerating municipal improvement costs, largely the result of population increases, further emphasize the increasing necessity for catching up with traffic facility improvements in the central business district, the official limits of which have long been recognized as Figueroa Street on the west, Sunset Boulevard on the north, Los Angeles Street on the east, and Pico Boulevard on the south. Thus far construction of systems of freeways have been halted at these boundaries. It is only logical to provide substitutes for the freeways through this area, the most practical being by means

of realizably cheap vehicular underground passages, namely bus subways. Since the plan contemplates the abandonment of some of the older rail lines, and the industry is capable, able and willing to substitute a real system of through buses whenever the community and responsible leaders of the community get behind them with the necessary support required to make these improvements, it now becomes necessary to formulate proposals to accomplish this additional subway phase of the freeway system rapid transit plan.

How to build them -- Any subway, whether for vehicles or some form of rail operation, must be carefully designed in the utmost detail to fit each condition encountered during construction. In general, the so-called "cut and cover" procedure would probably prove most practical in the central business district. There are several different procedures which may be followed. In this preliminary consideration we have a design in mind which would go forward somewhat as follows:

The steel columns which would form the supports for the deck system would be placed in shafts excavated to the required depth and the footing placed in the bottom of the shaft. These columns would be spaced about 50 feet apart approximately along the existing curb line. Girders would then be inserted between the columns in both directions, across the street and along the curb line. In this manner the main supporting structure or box is formed. In the square so formed the floor or deck system composed of girders and beams would be installed and when riveted together would receive the reinforced deck or pavement of concrete.

By adopting this method of construction, one box composed of four columns and the deck system could be completed and ready for the traffic load before any other section need be started. Thus progressively the roadway for an entire block could be completed before any excavating for the subway need be undertaken.

As to the size of the contracts to be let for construction, there would seem to be a definite advantage in awarding the entire system in a single contract. This is for the reason that much of the success of the enterprise depends upon the rapid completion of the freeway system, and the Hollywood, Harbor, Santa Ana and Olympic Freeways will constitute the principal entrances from the freeways to the downtown subway system. Rapid completion by several different contractors is not, therefore, of paramount importance and the work could proceed in somewhat leisurely fashion with finish scheduled coincidentally with the Olympic Freeway south of the central business district. In addition, the project contemplates depositing the excavated material produced by subway construction in the fills which will compose the embankment for the Olympic Freeway. Thus it is of some importance to have the Olympic Freeway and the bus subway undertaking proceed simultaneously.

Subway Street Pattern -- The streets selected in this preliminary consideration of the subway pattern in the central business district include two principal north-south streets and four east-west streets. The map included in this section of the report shows the north-south subways located in both Hill Street and Spring Street. From north to south the east-west streets are First, Fourth, Seventh Streets and Olympic Boulevard. In addition, the subway terminal tunnel and the overhead structure east of the Pacific Electric Building will be utilized.

While there were a very considerable number of studies made in arriving at the pattern shown, the use of Hill and Spring Streets was thought to provide the most satisfactory plan since the principal area to be served is considered to be that portion of the central business district between Los Angeles Street and Grand Avenue. The selection of the east-west streets has been upon the basis of equal area between Sunset and Pico Boulevards, the adopted streets being three blocks apart throughout the length of the district.

It is probably important that in the subsequent detailed study of the proposed bus subway system in the downtown area, special attention will be required to the feature of desirability and adequacy of the general arrangement from the standpoint of existing travel habits of transit passengers. In this connection it should be emphasized that the study will require more information as to the destination of passengers now being loaded and unloaded along the various streets than is given in this tentative preliminary discussion.

The primary objective of this present report is to reach an area of agreement upon the basic idea of extending the freeway system through the central business district in the form of relatively inexpensive vehicular subways. It is, of course, recognized that any form of subway in an area which has reached the stage of development now present in the downtown section of Los Angeles will cost a rather sizable amount of money.

Cost Estimates -- No itemized estimate of cost for the system has been undertaken for this preliminary report. However, from information available at this time an approximation of the total appears to be on the order of \$40,000,000.00.


Estimated Use -- In the year 1953 the number of persons entering the central business district, within which we have shown the proposed bus subway system, was 211,300. This number crossed the cordon bounded by Sunset Blvd, Los Angeles Street, Pico Blvd, and Figueroa Street by public transportation during a normal 12 hour week day. Approximately 7200 public transportation units enter the central business district in 24 hours. The figure is based on information supplied by the princi-



SUGGESTED

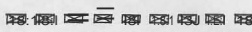
Bus SUBWAY STREET PATTERN

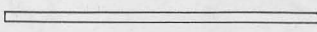
LEGEND

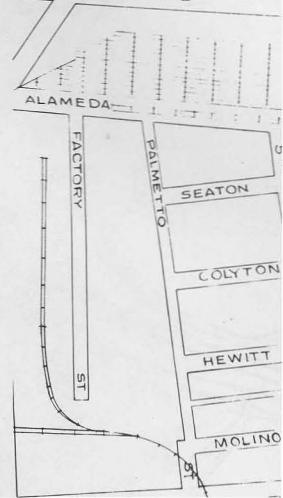
 PROPOSED SUBWAYS

 INDICATES CONNECTION TO FREEWAY

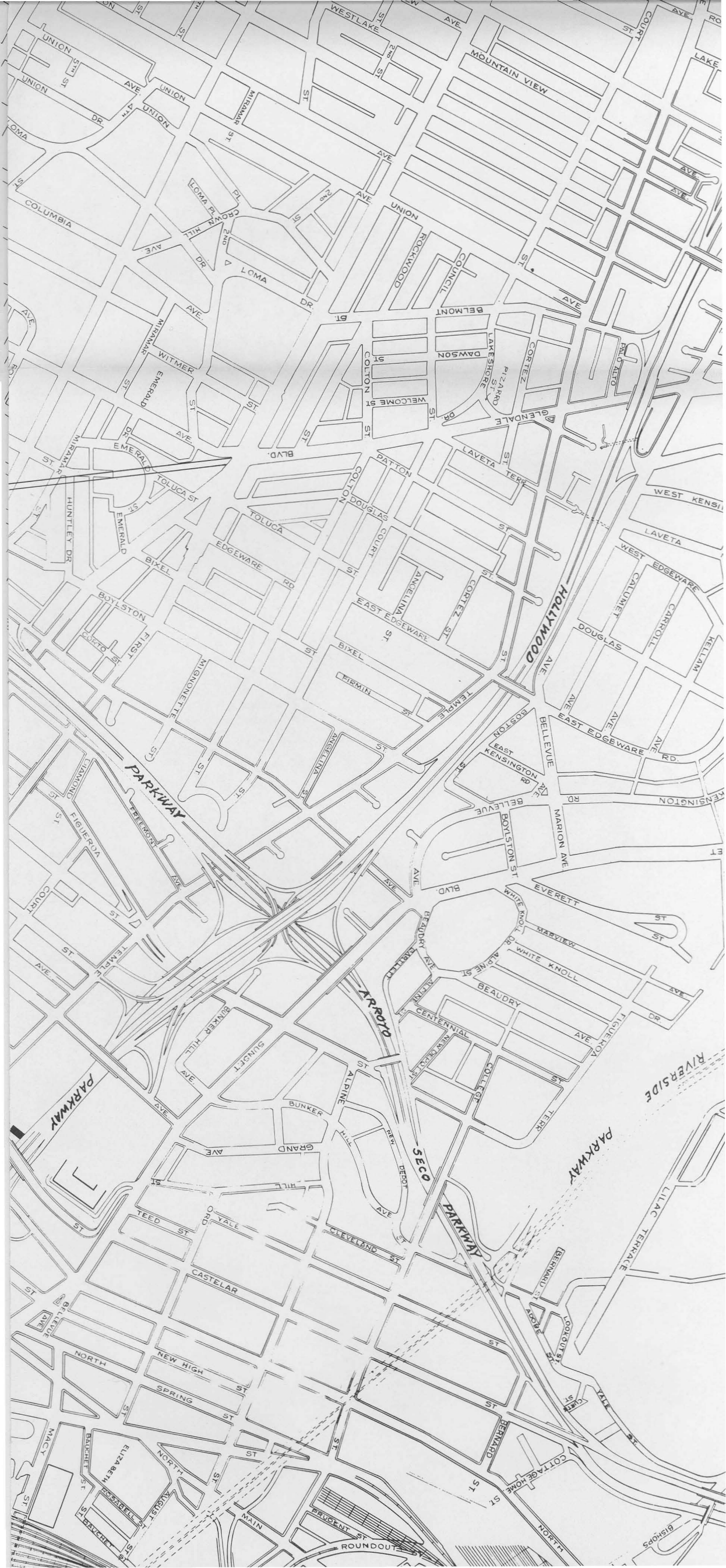
 RAMP - SUBWAY TO ELEVATED

 ELEVATED STRUCTURE

 SUBWAY TERMINAL TUNNEL







pal operators, Pacific Electric Railway Company and Los Angeles Transit Lines. In our planning of the subway system we have increased this total somewhat because of the relatively few additional lines which enter the district such as the Asbury Lines, Torrance Municipal, and the like, which would ultimately use the subway system. Also we have made allowances for increases which may be expected if and when the subway system begins operation and for any additions which may result if it is decided to institute such features as the park and ride phase referred to in this report.

It will be observed that there are factors involved in this study of subway system capacities which will require much additional study before any definite overall number of passengers can be determined. Should it develop that additional subway capacity is required, we feel it a matter for future planning and consideration and not one that can be even reasonably foretold at this time.

Authority to Construct -- The authority of the City of Los Angeles to construct subways is contained in the following charter provision:

Art. 1 Sec. 2-11-(M) Shall have the right and power, subject to the restrictions in this charter contained, to provide for the acquisition, construction, improvement or alteration, maintenance, use and control of streets, tunnels, subways, rights-of-way, public places, harbors, sewers, storm drains and other public or local improvements on, above, or below the surface of the land or water.

Additional Studies required -- The subway structure must be designed in all its detail. This will require the services of several engineers for some time. Accompanying the designing of the subway structure, detailed studies must be given to location and construction of the subway stations -- specifications for the handling of excavation work since it will require the examination of all sub-surface conditions -- bearing capacity of the soils encountered for the supporting columns, and the designing of the whole structure to best advantage with reference to existing large sewers, etc.

All detailed plans must be completed before any contracts can be let for the construction of the system. In fact, much of this work must be completed before even the detailed estimates of cost can be determined. While not considered particularly difficult the ventilation feature must be carefully planned in all its phases. Also plans for the drainage of the subways. Where the subways connect with overhead structures as seem likely there will be required the designing of the forms or falsework. While this is often left to the contractor awarded the work, even in that event arrangements must be made for the checking of his plans.

ADDITIONAL WORK BY THIS ASSOCIATION

It is contemplated that the Association will cooperate in the preparation of the necessary routing maps to show just which lines will operate in each of the subways. This can only be satisfactorily accomplished by a series of illustrations showing the initial routes as they can be placed under the existing conditions, followed by others showing the various steps which will be required as the changes in the existing routings or equipment are made. This will require not only a very considerable amount of time but also must coincide with the changes as authorized by the regulatory authorities, which it is realized is a phase of the enterprise which cannot be hurried.

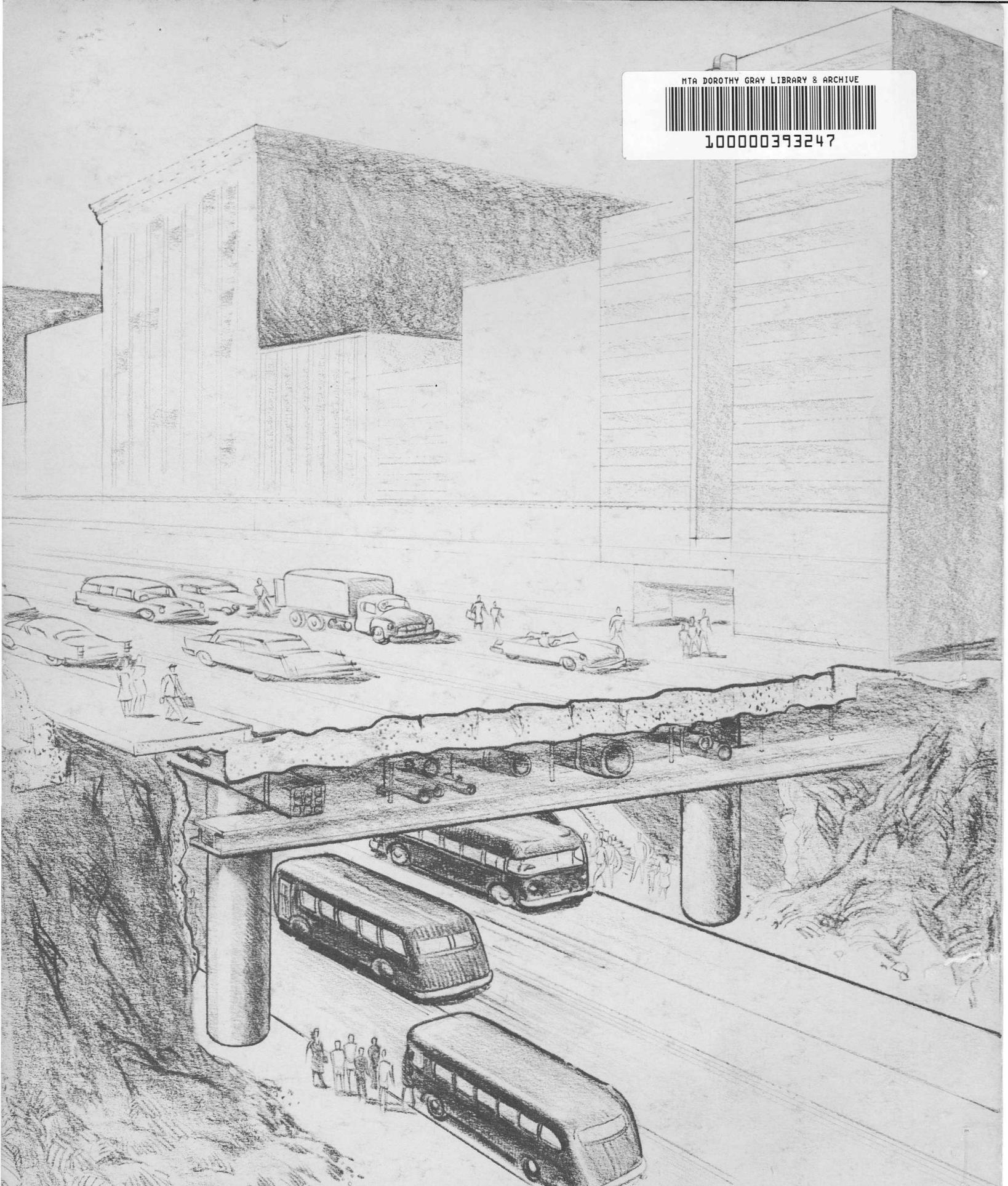
The preliminary study and the discussion which it is likely to promote have been considered sufficient to justify publication at this time. Once the basic idea has been concurred in by agencies and individuals concerned, the Association has in mind the preparation of further detailed report which will form the basis for the preparation of the detailed plans and specifications to be undertaken by the appropriate divisions of the Los Angeles City government.

CONCLUSION -- It is concluded that the highly satisfactory results of such freeway bus line operation as has been placed in service fully justify the further planning for such operation on the freeways and the further extension of the system through the Los Angeles City central business district by means of the relatively inexpensive vehicular subways herein described.

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