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Containing in Full the Report of Bion J. Arnold on The Transportation Problem of Los Angeles

With an Introduction by Thos. E. Gibbon

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For years I have believed that the City of Los Angeles would find it to its interest to construct a line of railway from harbor to its business center; in fact, I have long regarded it as necessary that this should be done, if the city is to reap the benefit from its harbor which it should receive when the Panama Canal is opened.



THOS. E. GIBBON

Chairman of the Commission on Municipal Terminal Railways.

About the first of the year it appeared to me that in view of the early completion of the Canal, the time had arrived for the city to take up the enterprise of building this municipal railroad. For the purpose of getting the matter started I brought it to the attention of the Board of Harbor Commissioners, of which I am



BION J. ARNOLD,

Chief Engineer, Board of Supervising Engineers, Chicago Traction.

a member, by a communication outlining a plan made to that Board on the 16th day of January last. The Board at once passed a resolution requesting me to prepare a communication suggesting the municipal railroad with its advantages, to be presented by the Board to the City Council. I prepared the communication, it was adopted on January 23rd, and by order of the Board, I presented it to the City Council on the 24th day of January. The City Council immediately took the matter up, and after holding a special meeting to discuss it, adopted a resolution appointing as a committee to make and submit plans for the municipal terminal railway system, the members of the Harbor Com-

mission, which at that time consisted of Messrs. Stoddard Jess, M. H. Newmark and myself, the members of the Board of Public Utilities, at that time consisting of Messrs. Meyer Lissner, J. M. Hunter and N. D. Darlington, and the city engineer, Mr. Homer Hamlin. This committee held its first meeting for organizing and trans-



GEO. A. DAMON,

Dean of Throop Polytechnic Institute, Pasadena, and manager of Mr. Arnold's Los Angeles office, upon whom much of the responsibility of preparing the report rested.

acting business on the 18th day of February last. At that meeting Mr. Meyer Lissner suggested that in connection with the planning of the municipal terminal railway, should be taken up the matter of mak-

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ing and submitting complete plans for the future development of all the transportation interests of the city including urban, suburban and steam lines. As a result of this suggestion upon Mr. Lissner's part, and the discussion which it produced, the committee prepared a communication to the City Council recommending the employment of the best available municipal transportation expert to investigate the transportation conditions of the city and its probable needs, and make recommendations of a plan or plans along which these interests should develop in the future. The City Council received the suggestion of this communication favorably and as a result authorized the employment of Mr. Bion J. Arnold, the famous municipal transportation expert of Chicago, who has planned the street railway systems of Chicago and Pittsburg; is one of the consulting engineers in the new subway development just undertaken by the City of New York, involving a probable expenditure of one hun-

dred million dollars, and has had in charge the making of transportation plans and projects for many other cities.

In giving him this commission and outlining the work which it was expected that he should do, Mr. Arnold was asked to submit "A scheme or outlined plans for the handling and future development of our municipal transportation systems based upon the assumption of transportation service for a city increasing from its present population of 350,000 to a population of not less than one million people within the next ten to fifteen years." In doing this he was asked specifically to furnish

"First—A general preliminary scheme or plan for a system of municipal terminal railways.

Second—A general preliminary scheme or plan for future development of other railways now existing in the city, and

Third—A general preliminary plan for connecting and co-ordinating all the transportation systems of the city so that they

can be handled to the greatest advantage to the commerce of the city."

As the result of this employment, Mr. Arnold a short time ago submitted to the committee having the matter in charge the report illustrated by ten maps, which are reproduced in full. A careful study of this report will show that in it Mr. Arnold has complied very fully with the requests of the committee having the matter in charge, and that in doing so he has outlined a development of the transportation interests of the City of Los Angeles within the next ten years which draws a magnificent picture of what these interests should in that time become.

Mr. Arnold's report, while necessarily general in this matter, gives a splendidly outlined plan which should as the years go by, be filled in by the joint efforts of the citizens of Los Angeles and the public service corporations that serve the people and the business of the city with transportation.—Thos. E. Gibbon.

PRELIMINARY REPORT

UPON THE

Transportation Problem of Los Angeles

By BION J. ARNOLD

OCTOBER, 1911

In my study of the transportation problem of Los Angeles and vicinity, I find that I can summarize my preliminary conclusions under the following headings, which are practically coincident with those given in the commission intrusted to me:

Municipal Railroad
 Passenger Stations
 Grade Crossings
 Freight Handling
 Local Street Railways
 Interurban Railways
 Immediate Relief from Main Street Congestion
 City and District Planning
 A Comprehensive and Constructive Transit Plan

In making this report I have endeavored to confine myself to the original intent of developing a preliminary program for a comprehensive transportation plan, not only for Los Angeles, but for the entire surrounding district. I have aimed to bring out fundamental principles upon which to build rather than to discuss the finer details of a completed arrangement and to discover the ultimate transit requirements of the community as well as its immediate needs. In forming a conception of the future City of Los Angeles, I have made a study of the remarkable growth which is taking place and of the natural influences which, by their combined results, are affecting the transit needs of the population throughout this rapidly growing community. I find that over two-thirds of the growth of population in the district has occurred within the last ten years—so that the problems are not only new, but are pressing for solution.

Transportation of both passengers and freight is the very life blood of the district. Hamper this flow to any part of the community and there will result a restricted growth. On the other hand, the providing of facilities too far in advance of actual needs will result in a burden of unproductive investment which is cumulative in its effect. The problem is to find a balance which will automatically provide for the continually increasing demands of the community without periods of oversupply followed by years of constricted development. Furthermore there is nothing which affects the cost of living more certainly than transportation, and the welfare of the people of any district depends largely on their ability to secure adequate transportation at the minimum cost. But in providing for the "city efficient," the "city beautiful" must not be neglected and the railroads should not be permitted to mar the appearance of the city and its environs.

As transportation is so intimately connected with the growth, prosperity and appearance of the community, the development of

transit facilities must reflect at once the amount of attention which the people devote to this problem. If public control has been intelligent and effective, the ultimate result will be a great community stretching from the mountains to the sea, populated by a prosperous people, enjoying the benefits of comfortable, rapid and efficient transportation.

MUNICIPAL RAILROAD

The function of the Municipal Railroad is to connect the main business section of Los Angeles, which is twenty miles inland from the Pacific Ocean, with the new city-owned harbor at Wilmington and San Pedro. The fundamental idea of the city in proposing this road is to provide a competitive line which will have a regulative effect on the rates over present and future railroads, with the idea that eventually the right service will be distributed between the municipal road and all foreign lines upon some equitable and equitable basis.

The location and construction of such a railroad between Los Angeles and the sea is comparatively easy as there are no engineering difficulties of any moment to be overcome. The right-of-way can be located through comparatively inexpensive territory and the maximum grade can be kept down to four-tenths of one per cent.

The arrangement of the tracks in and about the harbor itself will naturally be a part of the harbor design and these details will not affect, to any marked degree, the final decisions regarding the other parts of the transportation system in and about Los Angeles.

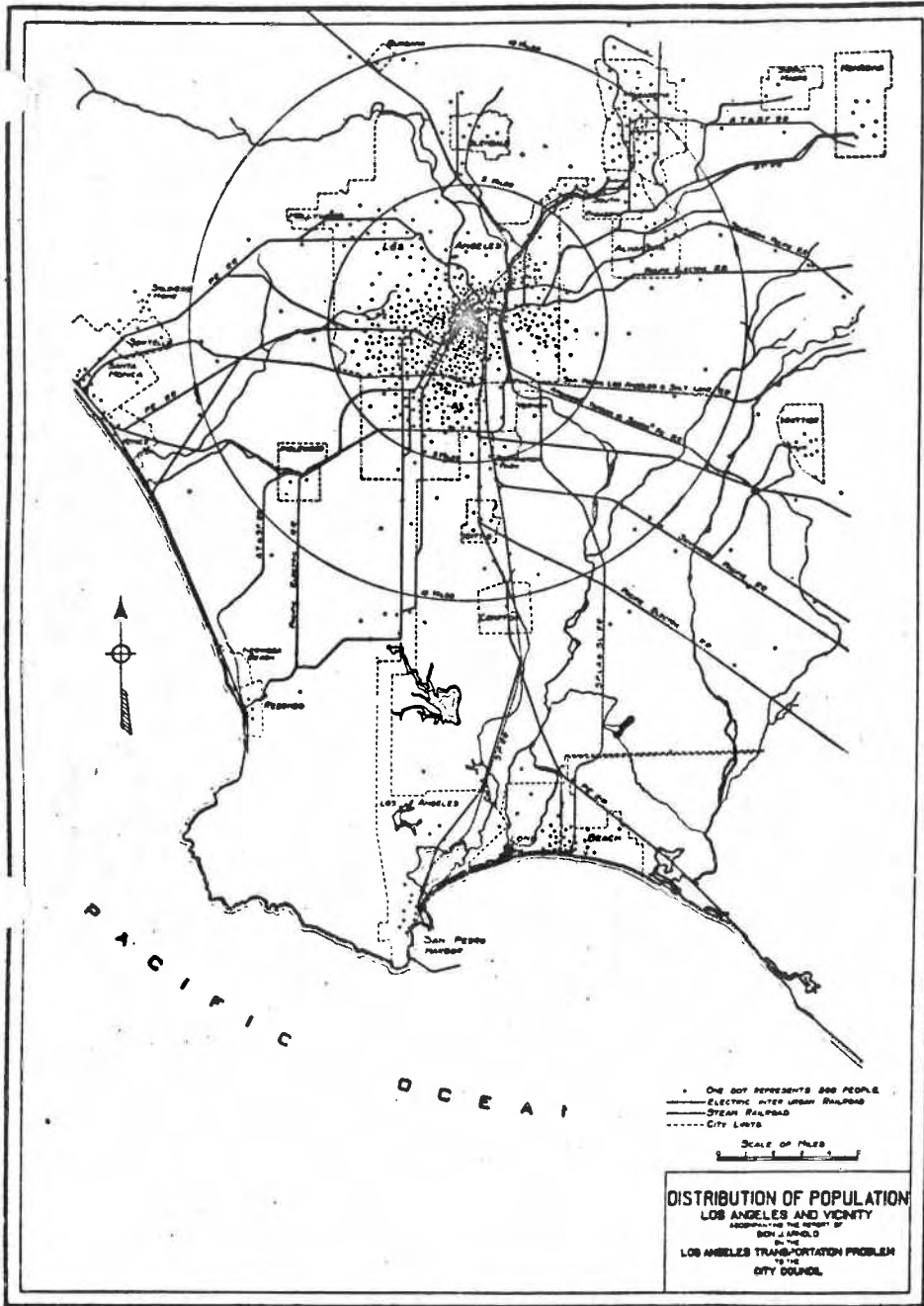
The entrance of any road from the harbor into the city itself however, is a detail of the greatest importance to the entire transit situation, for both passenger and freight transportation will be affected by the location of its additional line. Fortunately in this case the most favorable entrance to the city connects with the natural low grade route which is available between the city and the harbor; in fact, the entire situation contains unique features which appear more advantageous as the subject is more thoroughly studied.

An enterprise of this character must necessarily pass through gradual stages of development in order to be successful and the present plans should not only provide for a step by step process of building, but provision should also be made for future growth even that which cannot definitely be foreseen at the present time.

After a careful study of the situation, I would suggest the following plans:

1. Secure a right-of-way from Slauson Avenue in the vicinity of Ascot Park—directly south along the line of easement grade—

Distribution of Population—Los Angeles and Vicinity



A map showing the distribution of the "sleeping population" as near as can be indicated by the location of dots, each representing 500 inhabitants—shows a population by the last census of 307,000 within a radius of five miles of the corner of Sixth and Main Streets, which from actual calculation is the center of the present city population. Outside of the five-mile circle and within the limits of Los Angeles County there was an additional population by the 1910 census of 197,000, making a total population of the entire district, which may in time be called Greater Los Angeles, amounting to 504,000.

It is a unique fact that the center of population of this larger district is also at Sixth and Main Streets. It is sometimes stated that the center of population is moving toward the southwest at the rate of about a city block each year. This may be more or less true of the city population, but the growth of Glendale, Pasadena, South Pasadena, and the towns in the San Gabriel Valley are at a sufficient rate to balance the growth of the beach communities, so that the center as far as transportation to the outer district is concerned probably will not move far from the present interurban terminal at Sixth and Main streets.

There is no "congestion of population" in the entire city and district. The greatest density is in a few of the districts near the center of the city where there may be found 105 persons to the acre—but when this is compared to the 200 persons to the acre found in many eastern cities and to the 1200 persons to the acre in parts of Manhattan, New York City, it will be seen that Los Angeles is far from being crowded. Some of the close-in districts which now report the greatest density will lose in population from this time on as industrial plants crowd out the cheaper rooming houses, but there will always be a district just outside of the business district where the price of land will dictate apartment houses with a relative high density of population.

A study of the growth of cities shows that with all expansion there is a corresponding contraction and that there is always a percentage of the population which tends to crowd about the center. Even if the present density within the city limits, both at the center and in the outlying districts, is trebled there would still be room for growth without the necessity of adding more territory to the city—in other words, there is room within the present city for three times the population counted by the last census before there is any danger of congestion.

Wilmington. This right-of-way should be at least 250 feet in width in order to provide for eight railroad tracks and two automobile highways. This line and auto-speedway should be located throughout the entire length so as to avoid grade crossings so far as practicable, for it is this feature that will contribute the greatest point of immediate advantage to the plan. In fact, the enterprise appeals strongly on account of its automobile possibilities, for Los Angeles needs an automobile speedway with all crossings eliminated and this proposed highway between the city and the sea is most fortunately located, both for pleasure and business. On such a road there would be no necessity for a low speed limit and with two wide roadways (so that travel could be directed in opposite directions without interference), the maximum of safety could be assured.

The automobile truck is being developed rapidly and it is not unreasonable to expect that a large part of the tonnage between harbor and local delivery and collection points will be handled means of the auto-truck. The cost of handling freight at the terminals is the largest part of the cost of transportation when the distance is comparatively short. It has been claimed that, with our ordinary railroad facilities, after the cost of loading and unloading freight has been taken care of, the additional cost of transportation adds such a comparatively small amount to the total cost that it is practically immaterial whether the goods are transported one

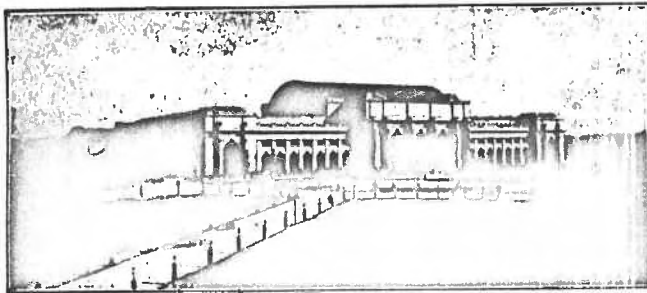
mile or fifty miles. The cost of moving goods between any point in Los Angeles and the harbor terminal will be made up largely of the cost of handling at both ends rather than the cost of actual transit. The use of the auto-truck will make it possible to deliver from wharf or warehouse directly to store or factory and thus eliminate the expense of intermediate transfers. The already extensive use of freight automobiles in this vicinity is proving the practicability of this proposed arrangement.

2. As it may be impossible for the city of Los Angeles to build, maintain and own a highway through the country, and as it is impracticable, on account of grades, to locate the proposed right-of-way in the strip of land known as the "shoestring strip," which connects Los Angeles with Wilmington and San Pedro, it will probably be desirable to make some arrangement with the county authorities to secure this connecting link. The building of a main thoroughfare of this character will add so much value to the country through which it passes that it should not be impossible to secure the entire length of the right-of-way at a very nominal cost. Such a right-of-way would make possible the settling of a beautiful and fertile section of the country which is now lacking transportation facilities, and would make available a number of ideal sites for model industrial communities such as are in great favor in Europe and are now being introduced outside of New York City and several other large Eastern cities.

3. The auto-highways should be built in strips and sections so that the repair of any part of the road will not stop the traffic as is now the case with so many of the country roads. The parking can be set with trees and, at least once in each mile, an overhead or underground crossing of artistic design may be provided eventually. The stations should be designed to cross the right-of-way with convenient access to each track and to the automobile highways on each side without crossing any track or roadway at grade as the whole theory of the design must be to provide the highest speed with the maximum of safety and convenience.

4. With a right-of-way absolutely free of grade crossings and wide enough for eight standard gauge railroad tracks with abundant provisions for stations, turnouts and delivery tracks, it is unreasonable to anticipate that this equipment will be devoted exclusively to the handling of freight. Its ultimate maximum use will be in part, at least, for high speed passenger traffic, for its natural destiny would be to supplant the present passenger carrying tracks now being electrically operated south of the city.

The present four track electric line on private right-of-way from Ninth Street to Watts, a distance of about six miles, runs through what in all probability will develop into the future industrial district of the city. These tracks are now at grade and if the trains are operated at their maximum possible speed there will be constant, and always increasing, danger of crossing accidents. As this district eventually must be served with a large number of switch tracks which must be at grade if industries are to be encouraged, it would appear to be the wise plan to leave these tracks as they are and use them as the main artery for industrial freight delivery and collection, together with an adequate local



NEW UNION STATION, WASHINGTON, D. C.

This station has been completed recently at a cost of over \$20,000,000 and handles all the passenger roads entering the city. To secure a central location near the Capitol and to insure a suitable setting, considerable valuable land was purchased. The passenger traffic in and out of Los Angeles is fully as important as that of the Capitol and deserves terminal facilities as artistic and convenient.

electric passenger service, using two tracks for freight and two tracks for passenger business. The through high speed electric passenger traffic could then be transferred to the tracks occupying the municipally controlled right-of-way, and thus the freight problem and the passenger problem would be solved at the same time.

5. There still remains the problem of finding a suitable entrance into the city north of Ascot Park. The first section consisting of a four track division about one and one-half miles in length from Slauson Avenue, north to Jefferson Street, should, in my opinion, be either an elevated road ballasted, so as to avoid noise, and built of reinforced concrete of artistic design; or should be located in an open cut, which is practically a subway without a roof. An elevated rapid transit line through this district would increase average values very materially within the territory tributary thereto, and therefore there should be but little opposition to its construction, but it is possible the property owners would prefer to pay for the extra cost of the "open cut" instead, in which case, I would favor this latter type of road.

From Jefferson Street north to the vicinity of Pico and Main Streets, another section of about one and six-tenths miles, either the open cut or a subway would be necessary, probably the latter, although in this climate the minimum of subway construction should be adopted. From Pico and Main Streets through the backbone of the business district the subway system is the only practicable rapid transit method. This section should extend to the Plaza, a distance of one and nine-tenths miles, making the municipal high speed four track terminal to be eventually provided from Slauson Avenue to the Plaza, about five miles in length. It must be understood that this proposed terminal construction is one of the last steps in the development of an adequate transit plan, and that it should not be attempted until the density of the traffic would justify the investment.

6. The above program is based upon the assumption that a working agreement will be possible between the city and the company desiring to enter the city with its interurban service. The city should remain, in my opinion, in complete control of its surface rights along its main thoroughfares, and this can be done by the city building all subway structures under its own streets and renting the use of these permanent rights-of-way to an operating company for a sufficient return to provide for interest on the cost and for a Sinking Fund of say 1% per annum, which will retire the investment inside of fifty years. With an assured arrangement of this kind it would be possible if the City Charter permitted for the city to finance the expenditure by issuing bonds outside of the debt limit and thus the city's credit could be used to secure these transit improvements without adding to the city's actual debt burden.

7. It should be made impracticable to attempt the duplication of the present spur and switch tracks in the city and vicinity. An interchange agreement must therefore be made with the present railroads for the use of these tracks for the delivery and collection of foreign carload freight. The three railroads have an interchange agreement of this kind among themselves at the present time, which involves a switching charge of \$2.50 per car for the delivery to or from each other's lines—so that theoretically every shipper has access to all lines irrespective of his location. In practice, however, it is often claimed to be difficult to secure empty cars for loading if the shipment is to be made over a line foreign to the one upon which the shipper is located. There would be considerable advantage to the shippers of this district if the whole question of spur-track terminals could be regulated consistently. This regulation should cover the securing of the permit, the compensation to be paid the city for the use of the streets, safeguards as to safety, noise, smoke, and character of freight, but particularly the arrangements which must be made for the joint use of these tracks so as to make them equally available for use in connection with not only the present lines, but also with all future freight carrying lines—both steam and electric.

This complete interchange agreement which will make every individual spur track part of one comprehensive terminal is not an easy problem, but is really the first requirement for the most efficient freight handling arrangement for Los Angeles.

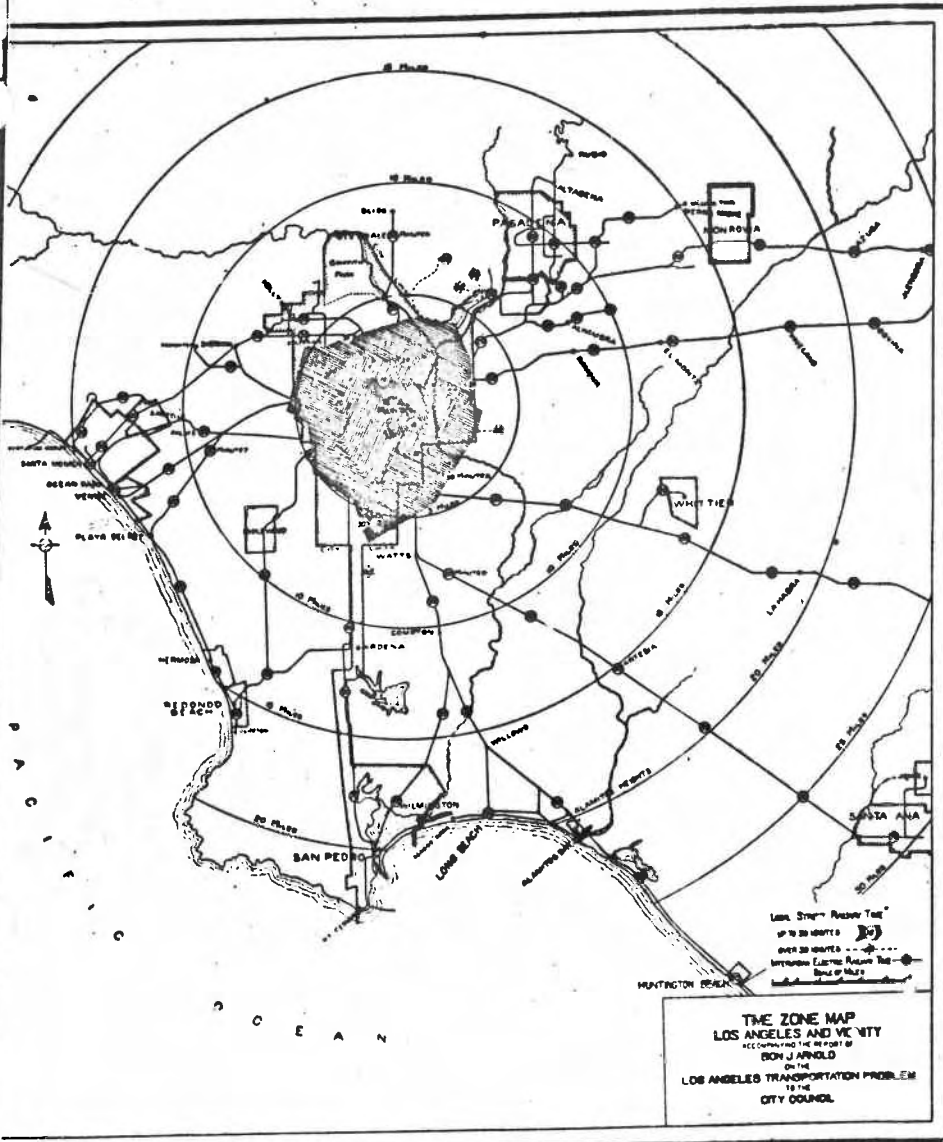
8. As far as the municipal road is concerned, there are a number of locations along San Pedro Street where local carload delivery tracks can be put in, and it may be that the only way to work out the ultimate comprehensive terminal scheme will be to establish these freight delivery sub-stations as part of the municipal system. But the first effort should be to establish the fact that the city has sufficient standing in the form of rights-of-way powers of regulation, control, etc., to become an equal partner in an interchange agreement which practically will combine all of the present and future switch tracks into one union terminal.

9. In developing the network of spur tracks which must be provided to serve the industrial district, the use of the electric locomotive will be found desirable, if not absolutely necessary. The tracks of the municipal railroad on San Pedro Street should be equipped for the electrical operation of freight service, and as all spurs leading off from these main line tracks can have a much shorter radius than if built for steam locomotives, it will be found that the switch track system depending on San Pedro Street for service can be made much more flexible than the steam line switch system. Advantage should be taken of this fact to deliver the cars in the rear of all buildings so as to keep the main thoroughfares free from freight cars. The advantage of electric operation will be one of the fundamental reasons why the municipal railroad tracks on San Pedro Street will become the nucleus of the union freight terminal—the other fundamental advantage being the fact that these municipal tracks can be built and operated at actual cost and that as the terminal becomes more valuable the increase in value, or "the unearned increment," will not be capitalized.

PASSENGER STATIONS.

Each of the three transcontinental lines entering Los Angeles—the Atchison, Topeka and Santa Fe Railroad, the Southern Pacific Railroad, and the San Pedro, Los Angeles and Salt Lake Railroad, have their own independent passenger terminal and depot. The Arcade Depot of the Southern Pacific is located nearest to the center of the city, but it is old, unsightly, inadequate and hardly a credit to either the city or the company. The Santa Fe Station is more modern and sufficient, and although not quite as favorably located, it will probably be considered by its owners as equal to the demands of their business for a number of years and considerable advantage would have to be demonstrated to get them interested in a Union Depot project. The Salt Lake, being affiliated with the Southern Pacific, would probably be glad to abandon their frame depot on the opposite side of the river and join the latter under an equitable arrangement in any proposed station and terminal improvements.

Any plans which are made for a new depot for the Southern



Influence of Transportation Time on the Growth of the Community

With passenger transportation, distance is measured by time rather than by miles.

This map shows the scheduled number of minutes required to reach various localities, the shaded portion showing the time zones of ten minutes—twenty minutes and thirty minutes of the local surface systems and the circles inclosing the numbers indicate the time distance in minutes from the downtown terminals of the interurban systems.

With the city system, it will be seen that the sections to the west and south have the advantage, which explains why the city has grown in these directions. The city limits directly east and directly west correspond very nearly to the thirty-minute limits.

On some of the higher speed interurban lines it is now possible to go twice as far from the center of the city in thirty minutes as can be done on the local street cars and on the interurban tracks running south the rapid transit cars get out into the country fifteen miles in the time it takes a city car to reach the five-mile circle. This latter fact illustrates the advantage of high speed terminals for the interurban lines, for the cars of the southern division of the Pacific Electric lines have the advantage of a private right-of-way and of the use of a surface entrance to their terminal which is not congested until it reaches Main Street. This right-of-way, however, is "on grade" and will become less an advantage as safety will dictate constantly slower speed, but it serves to show the possibilities of a comprehensive high speed terminal for all the interurban cars. Provide such a terminal and there is no reason why points twenty miles from the city's center should not be reached in thirty minutes. Under these circumstances the radius of the surface systems would naturally be confined to about its present thirty-minute limit. Beyond this limit the development of the territory will be influenced more by the building of the interurban system of transportation than by the extension of the present surface street car city system.

Pacific and the Salt Lake roads would naturally include some convenient transfer arrangement between these transcontinental steam lines and the network of interurban electric lines, and in considering possible sites this intimate connection must be kept in mind.

There would appear to be two sites for such a station—one that of the present Arcade Depot, and the other contiguous to the present Pacific Electric terminal building at Sixth and Main Streets. A station plan, if worked out in connection with the proposed elevated or subway extension for the interurban lines running back to, and across the river, could be made convenient and adequate for either location.

It would be a mistake, in my opinion, not to encourage the railroads to develop and submit plans for a terminal station of this character. If these plans could be worked out so as also to accommodate the Santa Fe and other future transcontinental roads, which no doubt in time will reach this city either over new or present tracks, the arrangement would be all the more attractive.

In the course of time the bed of the Los Angeles River may be used for additional tracks carrying transcontinental traffic, but my study of the river-bed has led me to the conclusion that considerable expense will be entailed in protecting any track structure from possible washouts, and that this expense will not be justified until an entrance into the city becomes very valuable and difficult to secure. If the flood waters which now go to waste ultimately stored, it will be possible to take care of the excess off by means of a covered conduit in such a manner that a right-of-way at least 100 feet in width will be available, and this at such an elevation that subway branches could be taken off from the river-bed tracks in the southern part of the city. As the river does not run in the direction that makes it useful for taking care of immediate interurban demands and as the present steam lines are now taken care of along the protected levees or river banks,

the development of the river bed itself as a railroad right-of-way is a future possibility which need not seriously affect present plans. Any elevated structure reaching the river, however, should be so designed that a sub-surface or lower track terminal could be built so as to parallel and double the upper track capacity at some time in the distant future.

If the Arcade Depot site should be favored by the railroads and a Union Station arrangement can be agreed upon, then the city should adopt the plan so admirably worked out several years ago by the Municipal Art Commission and Mr. Charles Mulford Robinson for a beautiful and effective approach to be secured by widening and straightening Fifth Street from Los Angeles Street to Central Avenue. If a Union Station is not possible, then it would appear better to encourage the Southern Pacific and Salt Lake roads to combine with the Pacific Electric in a splendid station adjoining and becoming part of the present Pacific Electric terminal building.

Union Depot at the Plaza

If all of the competing transcontinental steam roads can be brought to consider a Union Depot, independent of the Arcade site, then the most natural thought in regard to this combined railroad entrance to the city is to have one grand monumental portal with an appropriate setting of open spaces, parkways and surrounding buildings.

This gateway to the city should be convenient to the business district with plenty of main arteries leading to and from it; it should be easy of access from the street railway system, and particularly in the case of Los Angeles it should be a mixing chamber or clearinghouse between transcontinental and interurban passenger traffic.

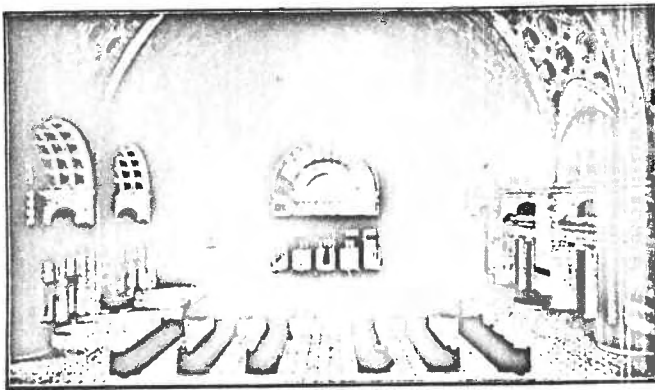
It does not take a lengthy study of the plan of the city and its transportation requirements to discover that there is one site

which is adapted naturally to fulfill the requirements of a grand central depot and transfer station and this location is in the immediate vicinity of the Plaza.

The Plaza was the exact center of the original Spanish grant to the Mission Padres of one league each way from this central point, and this original area of twenty-eight square miles constituted the city limits of Los Angeles up to the year 1869 and was not materially extended until the year 1896. The Plaza was the starting point of all roads which lead in various directions, following in their meanderings the natural topography of the country. Then the street plan of the central part of the city was the outcome of efforts to parallel these original main highways. The result is that there is no one site in the entire city which can be reached so easily from so many different directions as this original Plaza, and as modern transportation naturally follows and accentuates primitive pathways, it would be but natural to have this original center of the older town come into its own as the permanent portal of the newer city which has grown up about it.

But there are many other reasons for favoring this location for a Union Station. Here is already the beginning of a splendid civic and administration center—with the Court House, Hall of Records, Post Office and Custom House forming an imposing group of monumental buildings and a crystallized sentiment that in this part of the city should be located the new City Hall. Furthermore, the business section, in seeking unobstructed sites for modern buildings, has been growing away from this original center. If values of property in this vicinity are not maintained by means of public improvement of this character, this part of the city will suffer from slow paralysis and Los Angeles is too young and active a city to afford such a contingency in any of its parts.

The natural lay of the land at this point allows for a double



UNION STATION, WASHINGTON, D. C.
Main Waiting Room.

deck station with the trains on the lower level, while the broad streets and possible open spaces will allow for sub-surface subway stations and storage tracks at a minimum expense.

The greatest opportunity exists here for the planning of a center of civic beauty and usefulness, which would hardly have an equal in all the efforts being made by the cities throughout the country to surround their public buildings with imposing settings.

This report is not intended to be a city planning program, but as transportation is the fundamental of the city useful, it should also become the foundation for the city beautiful. It is pleasing to find this splendid opening for a portal which will allow the city to display at its gates the evidence of its growth, its prosperity, its progress in government, and its possibilities in art.

The first impressions which would be created in the minds of the visitor would include a glimpse of the original Plaza and the Old Mission directly back of it. A new Plaza, a central park and open courts should take the place of the old buildings between the old Plaza and the Post Office, and this breathing space would act as a foreground to the new City Hall and to the Post Office, which buildings would naturally be located with an open space between them to allow for their future growth. Back of these buildings would rise the Hill Side Park with terraced gardens furnishing a frame of green and color. Have city builders ever had a more inspiring opportunity?

I recognize the fact that an enterprise of this character takes form very slowly and only if it has in it the elements which will attract to it a consensus of favorable opinion can it be carried out? I do not advance the idea as an absolute necessity as I have already pointed out other sites for railroad stations which will answer all the commercial purposes, but if the city is really desirous of putting its front yard in order, and of creating such a favorable impression on the visitor within its gates that his stay may be

all the longer, I cannot but point out that in the development this Plaza center will be found a great opportunity.

GRADE CROSSINGS.

There are three kinds of grade crossings which it is desirable to eliminate, as they are an inconvenience to vehicle traffic and a constant menace to life.

Of the three kinds, I would class the crossings of the high speed electric interurban system as the most dangerous, the steam freight main lines and switching tracks as the most inconvenient, and transcontinental passenger traffic at grade as the least justifiable.

As a general rule I would say that it will not only be desirable but should be compulsory to bring the electric interurban roads to the city without a single grade crossing and the methods of accomplishing this result are discussed in a separate part of the report.

With freight tracks and switching spurs, however, I believe the cost of complete grade separation would be so large as to be prohibitive under Los Angeles conditions. To compel this investment either by the city, by the railroad companies or by the industries affected would be too heavy a financial handicap, and there a compromise must be found.

Fortunately, natural conditions of topography present a favorable solution. The steam roads follow the lower levels along water courses and industrial developments have taken place contiguous to good shipping facilities. Retail business and residences have sought the higher levels along the banks of the original river. This makes it possible by continuing the bridges over the river and present railroad tracks, to provide long viaducts for main highways, spanning the industrial freight tracks, which remain on the surface as at present.

I would suggest that the first viaduct of this character be on Fourth Street from Main Street, crossing the municipal rail tracks on San Pedro Street, continuing over the present South Pacific tracks on and contiguous to Alameda Street, connecting the present viaduct over the Santa Fe yards, which already crosses the river and is built over the Salt Lake railroad yards. If the viaduct was to be continued over the lowlands on the east side of the river to a proper grade on Fourth Street in Boyle Heights unbroken elevated highway would be supplied from hill to hill. Overhead structure should be amply wide to accommodate street car tracks as well as to provide a highway for automobiles and other street vehicles and pedestrians.

In order to avoid the possibility of damage to property along the street, the height of the overhead roadway should be such that it will be possible to collect and deliver goods from the second floor of the buildings, thus greatly increasing the present facilities for handling goods in and out of warehouses and factories located adjacent to the viaduct. Add to this advantage the privilege of switching load freight to and from the buildings on the lower or present street level, and the double decking of the street will become a decided advantage which will greatly add to, rather than detract from, the value of all contiguous property.

If the Fourth Street viaduct proves its usefulness, the Second Street viaduct over the Salt Lake tracks, the river and the Santa Fe tracks can be continued in a similar manner.

Another connection between the business center and the eastern part of the city across the river and tracks can eventually be provided by building a similar viaduct for vehicles, pedestrians and street cars on Sixth Street, extending from Main Street to F Street Avenue, thus in time, providing three main highways from the business district to Boyle Heights.

From all of these elevated roadways, inclines, with not exceeding a four per cent grade, should lead to the street level at convenient points. On account of the difference in levels between Main Street and Los Angeles Street, the viaducts would leave Main Street but very little rise. In fact it is the natural depression which exists between Main Street and Los Angeles Street which makes these suggestions reasonable. Were it not for the topography a place the wholesale and industrial district would very probably have been scattered in all directions around the retail district, but the lower level between Main Street and the river now forms a natural industrial district which is next to the steam road tracks along the banks of the river. This contiguity of warehouses, tracks and streets makes it practicable to reverse the usual order of track elevation and subway streets as found in other cities and to elevate the main highways leaving the secondary streets and switch tracks on grade thus providing a very acceptable compromise to complete grade separation, at a considerable less expense.

Beyond the limits of the strictly industrial district there are several bad grade crossings. Following the precedent already set by a number of highway bridges over the railroad tracks and consistent with the foregoing suggestion to carry the main highways throughout the wholesale, warehouse and manufacturing section of the city, it would appear best to standardize the practice of the city and eliminate grades, as a rule, by carrying the streets over the tracks.

In connection with grade separation of the passenger traffic

Los Angeles Public Library

Territorial Growth—City of Los Angeles

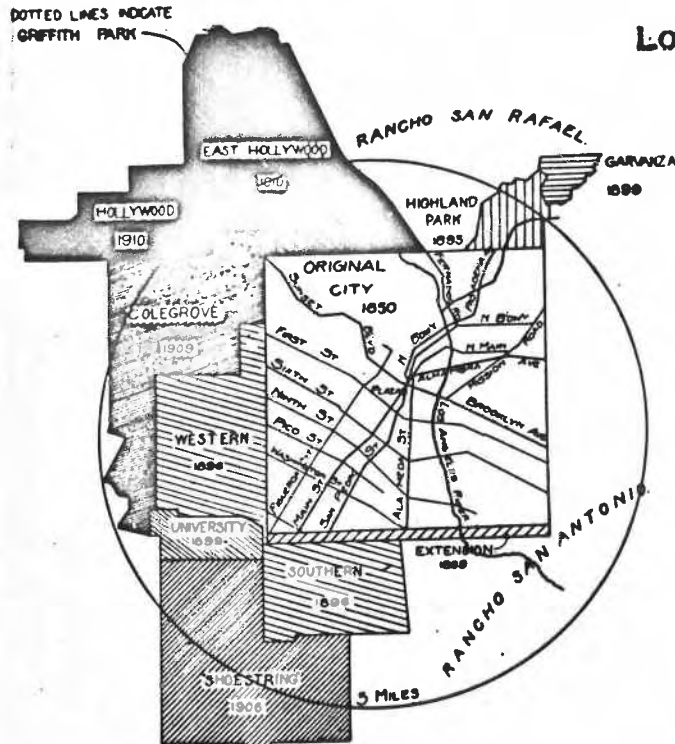
The Plaza was the exact center of the original Spanish grant to the Mission Padres for the Pueblo of Los Angeles in 1781 and the area of twenty-eight square miles or one Spanish league each way from the central point was the original limits of the City of Los Angeles when it was incorporated April 4, 1850.

Successive additions, as shown by the map, have been largely to the West of the original center and there has evidently been a contest between the call of the foothills and the lure of the sea. The annexation of the "shoe-string" strip and the consolidation with Wilmington and San Pedro have put Los Angeles on the map as an actual seaport. The building of a municipal harbor twenty-one miles from the Plaza introduces new problems of transportation, the solution of which will have a decided influence upon the future growth of the City.

The next immediate proposed additions to the City are to the north and west. The districts to the south and west, however, have a natural topographical advantage which only improved transportation facilities in the other direction can in a measure offset.

The layout of the streets in the original city was largely the result of topography—but nearly all of the streets in the annexed districts have been platted to conform to the United States section lines. The map shows how the original main thoroughfares meandered away from the Plaza on the easiest grades. All present and future transportation facilities must be affected by these same natural influences. The railroads seek the water level routes and locations and the industrial part of the community must follow the railroads. The location of additional harbor railroad connections to the South added to the present natural growth of the industrial district in that direction will result in a growth of the city to the south and west which will balance, in a measure, the growth of the city in other directions, making Los Angeles a "round" or "circular" city with its original origin not far from its eventual center.

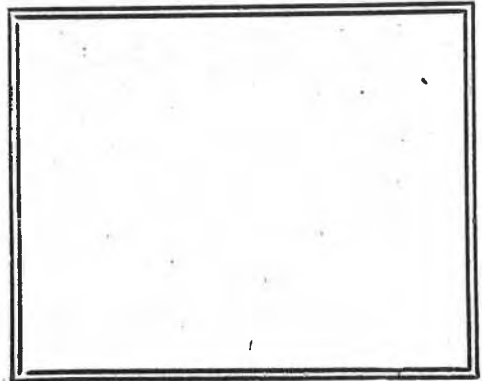
The "city limits" of the City of Los Angeles, however, include only a small part of the district, which, under some form of central government, will no doubt be known in time as Greater Los Angeles.



TERRITORY ANNEXED TO THE CITY OF LOS ANGELES ACCOMPANYING THE REPORT OF BION J ARNOLD ON THE LOS ANGELES TRANSPORTATION PROBLEM TO THE CITY COUNCIL



HISTORY				
DATE	NAME	REVERTED TO	ACREAGE	POP.
APR. 4 1850	C. G. ORIGINAL CITY	SPANISH GRANT	17,284	2,000
JUNE 1 1850	SOUTHERN EXTENSION	ANNEXATION	798	125
OCT. 8 1850	HIGHLAND PARK	ANNEXATION	804	141
APR. 4 1851	SOUTHERN & WESTERN	ANNEXATION	637	500
JUNE 12 1851	GARANZA	ANNEXATION	440	500
JUNE 12 1851	UNIVERSITY	ANNEXATION	1,134	1,771
DEC. 31 1851	"SHOE STRING"	ANNEXATION	433	1,604
AUG. 20 1852	WILMINGTON	CONSOLIDATION	63,518	8,711
AUG. 20 1852	SAN PEDRO	CONSOLIDATION	2,040	4,561
OCT. 27 1852	COLEGROVE	ANNEXATION	2,570	8,321
FEB. 2 1853	HOLLYWOOD	CONSOLIDATION	2,680	4,451
FEB. 2 1853	E. HOLLYWOOD-NARBE TROPIC	ANNEXATION	718	1,111
			TOTAL	100,723



RANCHO LOS PALOS VERDES
SAN PEDRO
PACIFIC

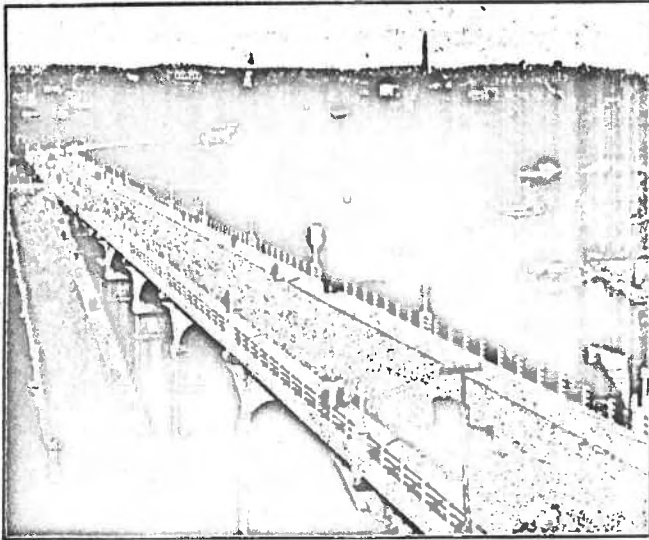
tracks, the city will be called upon to pass upon the plans for a passenger terminal for at least the Southern Pacific and the Salt Lake roads within the not far distant future. One of the first considerations governing the approval of these plans should be the entire elimination of the passenger tracks crossing any street at grade. If this requirement is insisted upon the grade crossing danger from all passenger train movement will be removed as the Santa Fe tracks are along the river and in time may all be crossed by the continuation of the river bridges.

The expense of grade separation by means of overhead street viaducts should be shared by the railroad companies, by the city and by the local street car company. In Chicago the plans for the elimination of grade crossings which have been mainly completed, called for the expenditure of \$150,000,000 in round numbers, which shows how important this problem of grade separation may become. It is an improvement which cannot be much longer delayed in Los Angeles, and if the steam railroads are not called upon to remove their tracks from the city street level they should be expected to contribute liberally to the compromise plan of elevating the main thoroughfares crossing the industrial district.

FREIGHT HANDLING.

The industrial efficiency of any city depends in a large measure upon the convenience and adequacy of its freight terminals. In the building of Los Angeles the freight tracks have been located conveniently, and at the present time cannot be said to be inadequate—the serious problem is to provide sufficient future facilities, as easy of access as the present spur tracks.

There are at present in the city ten miles of team track for less than car load freight, and separate spur tracks aggregating sixty-five



ARTISTIC ELEVATED STREETS.
Mulberry Street Bridge, Showing Incline.

That elevated structures—particularly through industrial districts—may be made to add to the "city beautiful," as well as contribute to the "city efficient," is shown by this picture of a viaduct recently finished at Harrisburgh, Pa. The recent concrete bridges over the Los Angeles River are equally good illustrations of the possibilities of the artistic design of concrete overhead structures.

miles in length for the purpose of connecting factories and warehouses directly with the railroads. There is plenty of room for the extension of switch-track systems, but the convenient opportunities for additions are largely away from the business district. There is a district, however, directly contiguous to the retail streets which has heretofore been used largely for residents and retail business purposes, but which is naturally adapted for wholesale business and manufactories, if it only had the advantage of car load freight delivery. To supply this district with freight service will require the use of some of the city streets for railroad tracks as the reaching of each parcel of property over a private right-of-way is becoming more expensive year by year. To thus turn the streets over to private business is a serious step, and can only be justified by the fact that it is the first duty of the city to foster its own industries. If these industrial tracks were required to be elevated or depressed the expense would prohibit the proposed use of this district for industrial purposes. To remove the objection to the use of the streets for freight car switching it would be possible to limit the movement of the cars largely to night hours. As this district will naturally cease to be a residence section and the cars would be handled by electric locomotives, there remains very little objec-

tion, particularly if there are stringent regulations as to noise, odors and the obstruction to the street for any length of time.

If the district which lies between Main Street and Alameda Street is turned into an industrial section served with frequent switch tracks, there will be an additional reason for providing several overhead highways across this section for the use of street cars and the lighter vehicles, leaving the surface of the street to heavier and slower moving trucks. If this double decking of the streets, which is discussed in more detail in another part of this report, proves to be a natural and favored arrangement, there is no reason why this plan should not be extended to Los Angeles Street. The convenience of Los Angeles Street to the business center has made it the logical location for wholesale business and recently some very fine warehouses have been constructed along this street. There are two serious drawbacks, however, to its future—its narrowness at some parts and its lack of switch track connections. Before further expensive buildings are erected this street should be straightened and widened between Fourth and Sixth Streets to a width of at least eighty feet. Even with this increased width the handling of merchandise will continue to be hampered by the street congestion due to the conflict between the incoming and outgoing trucks and the present system of loading and unloading will continue the use of the sidewalks as temporary storage space, whereas the sidewalks were intended for another purpose. As the street can stand only a certain amount of this kind of congestion, much of the future wholesale business will naturally seek other locations—but by so doing the convenience and accessibility which naturally belong to Los Angeles Street will be lost.

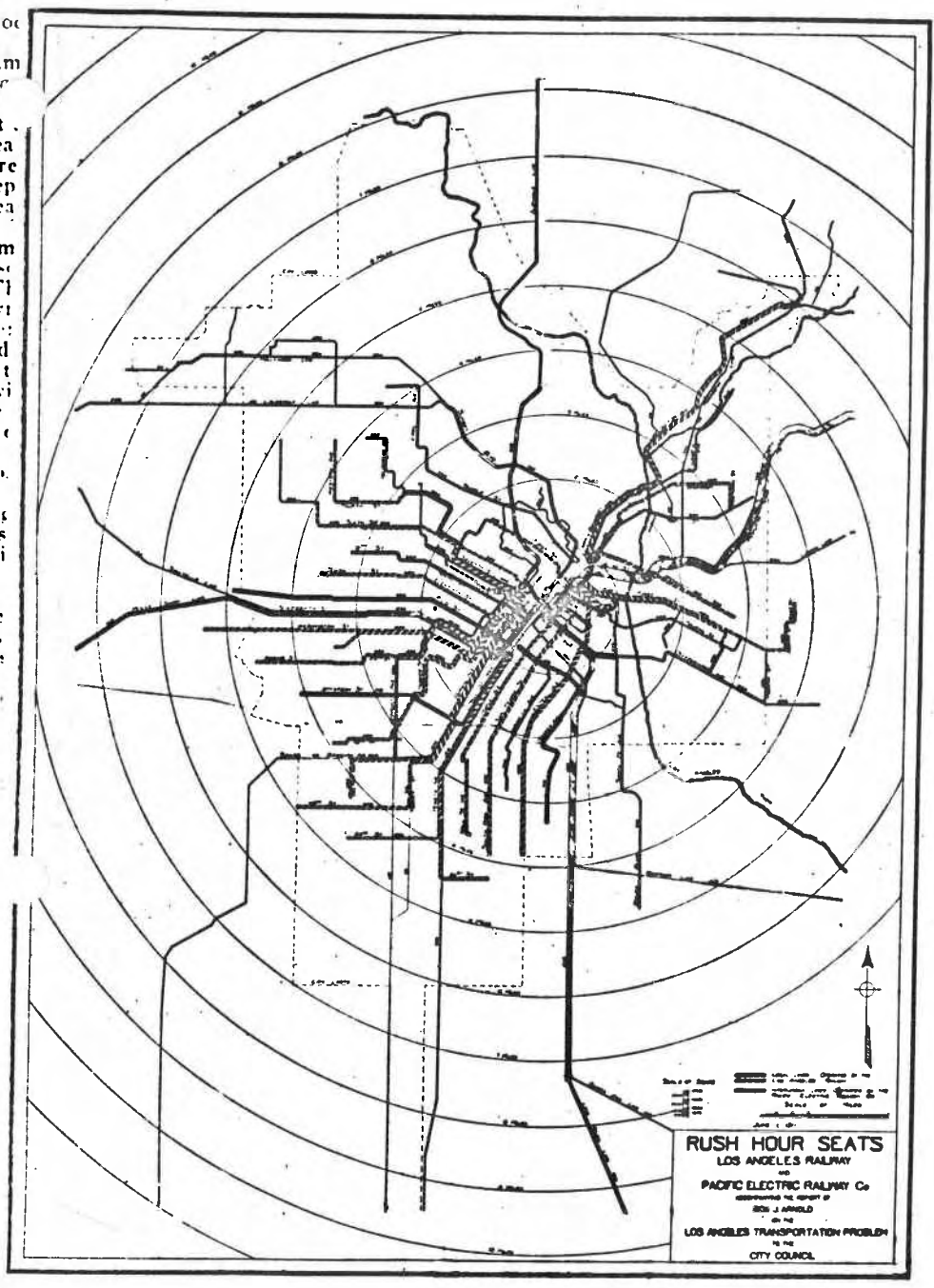
The solution, in my opinion, is to double deck this street between First and Sixth Streets, making an opportunity to handle all heavy freight on the present street level and providing for delivery vehicles an unobstructed highway on the level of the present second story and almost on a grade with Main Street.

The proposition, at first sight, may appear to be more or less radical, but it is an arrangement which has been proposed for other cities which are not favored with as fortunate a combination of favorable conditions as are found here. Los Angeles Street is a natural freight subway already constructed—all it needs is a roof which can be used for vehicles. It is agreed by all students of transportation problems that the handling of merchandise in any community is as important from an economic standpoint as the moving of passengers. In Chicago, millions of dollars have been invested in a comprehensive freight tunnel system connecting the business and wholesale districts with the freight terminals and a similar freight subway has been under consideration for New York City. Although there is now more or less question as to the financial success of the Chicago undertaking up to date, it is yet too early to predict what the ultimate result will be. In Los Angeles, however, the rapid development and successful use of the automobile motor truck will have a decided influence over the ultimate method of local freight transfer. The delivery of car load freight directly to or even into the wholesale warehouse—the handling of goods by escalators, elevators and trucks, and the delivery by the same means to an auto-truck which can leave the building without conflict with the incoming merchandise,—is a system which can be adopted in Los Angeles with a minimum expense. The upper deck proposed for Los Angeles Street should connect with the overhead vehicle highway proposed for First Street and the similar viaduct along Fourth Street, thus completing a system of automobile boulevards connecting the central business district with the wholesale section and both with the local freight and delivery yards. These highways would be entirely free from steam railroad crossings and while forming the loop connections referred to above would also establish main thoroughfares between the retail and wholesale districts and the sections of the city east of the river, which are now handicapped in their development on account of the grades and crossings along First, Third, Fourth and Seventh Streets.

The "less than carload" freight house designed for less than carload lots should be as near as possible to the center of the business district. There are many good reasons for a union freight depot of this class. If the suggestion for a complete unified terminal for the use of all the present and future railroads suggested in another part of this report, can be accomplished eventually, then the local less than carload freight business should be provided for by perhaps one main freight depot with one or more freight sub-stations to be located as the city grows.

If the double decking of some of the main thoroughfares through the industrial district should become an accomplished fact, it is very probable that the railroad officials will recognize the advantage of this arrangement and provide two-story freight houses with mechanical freight handling devices to take the place of the one-story freight depots and the hand trucks which are today the most effective package handling equipment available.

In this connection the city street car lines should be encouraged to develop a system of package and light freight delivery



Number of Rush Hour Seats

This diagram shows the number of seats passing any given point going in one direction during the hour of heaviest travel of a business day.

As far as the scheduled number of seats on each route can do this, the diagram indicates the relative demand for transportation in various parts of the community—both urban and interurban.

This map shows at once the lack of cross-town connections, and how nearly all of the lines are radial lines from the center of the city with, as yet, very few circuit lines which would divert some of the seats round the business center and allow the traffic to redistribute itself before it reaches the business district.

The circuitous routes of some of the lines are also indicated, emphasizing the difficulties of topography and street plan with which the surface car system must contend.

The large number of routes which operate all of their cars to the outer end of the lines is noticeable, and this fact taken in conjunction with the extension of the systems into outlying territory indicates that the local company has a liberal policy as to car service.

As compared to other cities having approximately the same amount of local annual earnings, the number of miles of single track is from 45 per cent to 50 per cent more in Los Angeles than in these other American cities. The number of car miles for each dollar earned, however, is about equal to the average. The size of the cars is relatively larger than in most cities and the type of equipment is far above the average. The good service and perhaps also the climate in Los Angeles is reflected in the record of the earnings per capita which are high enough here to make the total earnings of the local system compare favorably with those of other American cities of 50 per cent greater population. The "riding habit" in Los Angeles is about twice as great per inhabitant as it is in other cities of about the same size—which would apparently prove that the riding habit can be cultivated by good service.

In order to reduce the cost of staple household commodities and use the local surface lines to their full advantage. There is no reason why such a system should not be extended to include express parcels, delivery from department stores, food supplies, ice, papers and all other articles of every day consumption. Department stores in other cities are now loading their motor trucks for delivery to sub-stations by means of racks on what may be termed the cartridge principle, thus saving time at both ends of the line, and this same idea could be used to advantage for a similar service on the local car lines.

The street car companies use their own tracks for the delivery of construction material for their own use and thus secure a considerable saving. The same class of equipment which they use for this purpose could be used to equal advantage for the delivery of materials for street work and paving—and if the contractors on this kind of city work had the privilege of using the local car tracks for carload delivery the city itself would get the benefit of the economy.

LOCAL STREET RAILWAYS.

A large part of the street car system in Los Angeles and its immediate vicinity is operated independently of the electric lines serving the surrounding towns and cities. The difference in track gauge marks a natural division in most cases between the urban

and interurban system. The local narrow gauge system is now controlled by Mr. H. E. Huntington and is being operated in accordance with his policy of supplying a liberal amount of up-to-date and well maintained equipment. The result is that the travel upon the city tracks approximates very nearly one ride for each city inhabitant per day—while in other cities of this size this ratio is about five-tenths to six-tenths. Los Angeles already has the advantage on its city system of "universal transfers," "one city, one fare" and "through routes"—which are benefits still denied to some cities and which have been obtained by other cities only through legal or primitive means.

The present city problem as far as concerns transit requirements, is to do away with the present and future congestion in the business district, to reach a better understanding with the city in regard to future extensions, including the building of cross-town and outside circuit lines and to provide a better pavement between and contiguous to the rails.

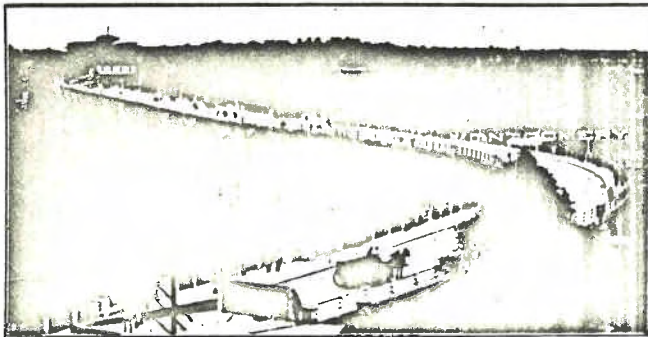
The down-town congestion is due, not so much to an excessive number of cars in this district, as to the loops and curves, the use of which has grown with the evolution of the routing of the systems. It cannot be said that this evolution has been haphazard, but a more systematic arrangement of the down-town routing could have been possible. The maximum improvement

is only possible, however, by eliminating the interurban electric cars from the surface tracks and particularly from Main Street.

As soon as the movement of the surface cars can be accelerated on Main Street during the rush hours, a very decided improvement in car service can be effected throughout the downtown section. An effort should be made to pass the cars through this district in such a way as to avoid the curves at street intersections. A car passing around a curve takes fully 50% more time to clear the crossing than a car passing directly across a street at right angles; the difficulties of the traffic police in clearing the way for the cars on curves are much greater and the threading of the cars from the traffic of one street into that of another makes impracticable the running of cars in pairs at high speed at street intersections.

It is quite feasible to work out a scheme of down-town routing, which by connecting the routes on opposite sides of the city so as to form through routes, will make it possible to have nearly all of the intersections right angle crossings with but very few curves or loops. As already stated, however, this great improvement in operation is contingent on taking the interurban cars off the Main Street tracks, which can be done as suggested in another part of this report.

The surface system is singularly lacking in cross-town and circuit lines, particularly inside the four mile circle. Radiating lines have been provided with liberality and extensions into the non-paying out-lying districts have been built even when the long haul and the small amount of business could mean nothing but loss to the company—but the cross connecting lines, which



ARTISTIC ELEVATED STREETS.
Mulberry Street Bridge.
Showing Railroad Tracks, Harrisburgh, Pa.

are usually considered as desirable parts of a system of this size have been neglected.

In planning these circuit routes, two results should be sought—one to get a route and eventually more than one route, entirely around the city outside of the down-town congested district, and the other result is to use parts of these cross-town lines for the connection of certain parts of radiating lines, thus forming a series of outside loops which will make it possible to increase the service in the short-haul district without running all the cars to the extreme ends of the lines or switching them back and making the passengers take the "next car."

The earnings of the local lines are now increasing at such a satisfactory rate that it is not unreasonable to expect the local company to make a considerable addition to its trackage each year—but these extensions should be located where they will produce the greatest good to the largest number. Extensions beyond the four-mile circle should be put in with caution. Non-paying branches can only be operated at the sacrifice of possible service over the remainder of the system and it is quite a question in city planning whether the opening up of new sub-divisions around the periphery of a city before the closer in sections have been fairly well built up is a good civic policy.

Beyond the five-mile limit it is to be expected that centers of population will begin to gather, particularly at regular stopping points on the rapid transit lines running into the business part of the main city. If a sufficient number of these high speed outlets are provided there will be comparatively little reason for the extension of the local systems beyond the thirty-minute or five-mile radius circle, as the interurban lines can reach the out-lying district in a much shorter running time. If this interurban system is provided with tracks entirely independent of the street grades and nearly all city stops are eliminated, the higher powered cars should reach the five-mile circle in from ten to twelve minutes and in thirty minutes should reach centers fully twelve to fifteen miles from the business center. This superior service as far as time is concerned, emphasizes the fundamental difference between the city or local lines and the rapid transit or

interurban lines, and would seem to indicate that beyond a certain distance from the city's center the territory can best be served by the high speed system.

The time is now ripe for a discussion of this whole question of additions and extensions to the city railway systems and the present and future relations between the company and the city. There are a number of fundamental considerations which, in my opinion, should be recognized.

First: The business of urban transportation is a natural monopoly. Here is one case where competition is wasteful and ineffective. One city—one fare—through routes and universal transfers are the results of having one company serve the entire community.

Second: This monopoly should be completely under effective municipal control, both for the protection of the community and also for the safeguarding of the interests of the corporation itself. This control should secure adequate service at the lowest cost, should encourage the operation of the road at a constantly progressing efficiency and should provide extensions and additions in accordance with public necessity and demand. Public control means publicity of all financial and operating records and to be effective, the public officials charged with the responsibility of exercising this power should be able, honest and beyond the reach of political and particularly local influence.

Third: On the other hand the actual investment in the property, both present and future, should be secure and protected. Before extensions are required or rates reduced, the demands for operating expenses, taxes, maintenance renewals, amortization of intangible values, and a fair profit to capital must be recognized. If there is a surplus, the city and company should be partners and mutually decide whether the surplus is to be used for the extension of the system, for the reduction of the fares or for the betterment of the service.

Fourth: The length of time of the franchise or permit to use the city streets should be indeterminate. The city should be in effective and continuous control of all its streets and this result can be secured best by the company surrendering its present series of terminal franchises for a blanket permit securing a "tenure during good behavior," and giving the city the right to purchase the entire system at a fair value determined upon an agreed basis.

Under these restrictions I can see no reason why the community should not continue in comparative harmony with its local public utility transit company, nor why the company should not give adequate service over a constantly growing system. If the investment is protected, the company can proceed to develop the property without fear of loss or confiscation. The advocates of municipal ownership should see in this arrangement the ultimate opportunity for the city to secure the lines at a fair price without working an injustice on the investors who have done so much to bring prosperity to the city.

A contract ordinance adhering closely to these fundamental principles should prove as effective in Los Angeles as a similar ordinance has proven in Chicago—although it must be understood that the greater density of street car traffic in Chicago creates conditions there which are somewhat different than those in Los Angeles and therefore it cannot be expected that the "Chicago settlement" will apply in all of its details to the situation here.

INTERURBAN ELECTRIC RAILWAYS

Los Angeles owes much of its prosperity as a commercial center and its pre-eminence as a resort city to its interurban electric system. Located as it is, part way between the mountains and the sea, it naturally gets the benefit of the extraordinary growth of population and wealth which is taking place in all directions. It must be recognized, however, that had it not been for the broad constructive policy followed by the present management in producing the network of electric lines which binds together the different communities of the district, the City of Los Angeles itself would be less attractive both for business and pleasure. The electric railway systems play a large part in the prosperity and happiness of the people of this entire section, and I believe it is a fortunate circumstance that the entire system is under one control. Much depends upon the future attitude of the citizens of Los Angeles and the present owners of the system—the Southern Pacific Railroad.

The continual growth of this interurban system should not be hampered. Immediate attention must be paid to the subject of terminal facilities as the present arrangements are already overloaded. A suggestion has been made in another section of this report, for the use of San Pedro Street and the handling of the interurban cars from the lower floor of the present Pacific Electric depot, but while this plan will relieve at once the congestion on Main Street and provide a means of keeping the cars on their schedule, it must be regarded as but a temporary expedient and not as a permanent terminal solution.

There are promising possibilities in the use of an elevated structure or a subway running from the rear of the present ter-

Switch or Spur Tracks

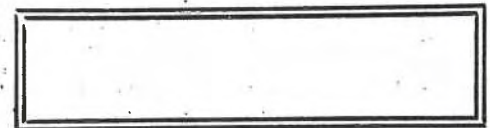
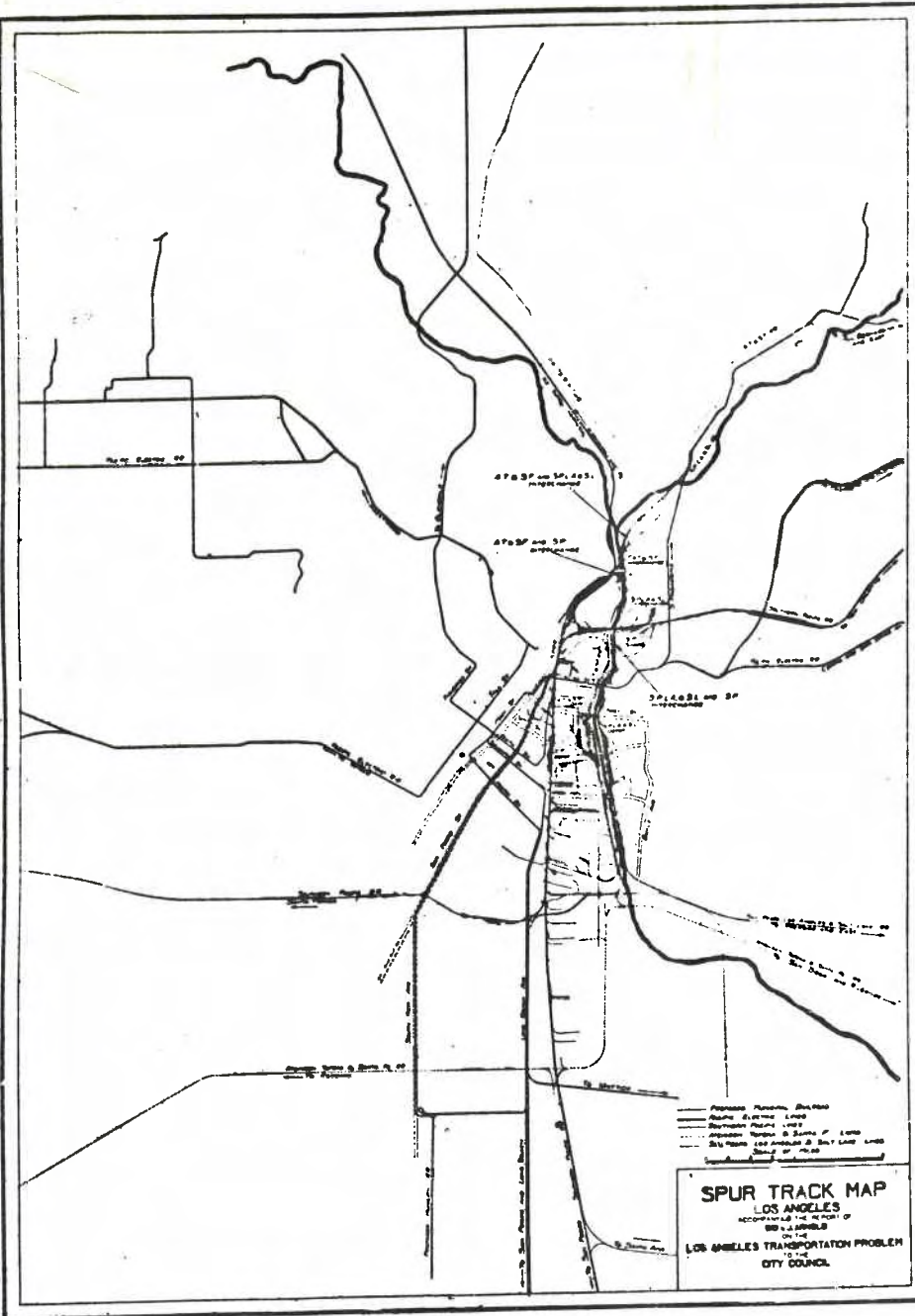
There are three separate systems of steam road spur tracks in Los Angeles. These are located, practically parallel to one another along the river banks—the Southern Pacific occupying the old river bed, while the Santa Fe extends along the west bank of the present course of the stream, with the Salt Lake on the east bank. This natural location of the steam railroads dictates the limits of the industrial district as the factories and warehouses must be located where they are convenient to a spur track from one of the three present roads.

The three spur track systems are practically independent, the main connection being at the points of interchange shown upon the map. It will be noticed, however, that the two networks of tracks belonging to the Southern Pacific and the Santa Fe on the west side of the river cross each other at numerous points indicating considerable rivalry in the location of switch tracks in this district.

It will be seen that if switch tracks are installed on San Pedro Street that an entirely new part of the city will be opened for industrial purposes, which is not available from any of the present steam roads.

It will also be noticed that it would not be a difficult matter to connect tracks on San Pedro Street at its northern end with the tracks of the Southern Pacific and Santa Fe and by means of the Pacific Electric tracks on Allso Street with the Salt Lake tracks on the other side of the river.

If the four track road of the Pacific Electric Interurban line on Long Beach Avenue should eventually become available for industrial switching purposes, the fan shaped industrial district would have five diverging main line feeders which would allow any point in the district to be effectively reached by a cross connection of reasonable length.



minal building and back to and across the river, with a connection in the vicinity of the present Southern Pacific Arcade Depot to the four tracks of the Southern Division of the electric interurban system running to Long Beach, San Pedro, Santa Ana, Whittier, etc. After crossing the river, this extension should connect with the Northern Division, which serves Pasadena, Alhambra and the other foothill communities.

Outside of the assistance of a franchise from the city, this entire improvement could be built by the owners of the present system without the city's aid, credit or money, and although the investment would be considerable, it would seem to be justified.

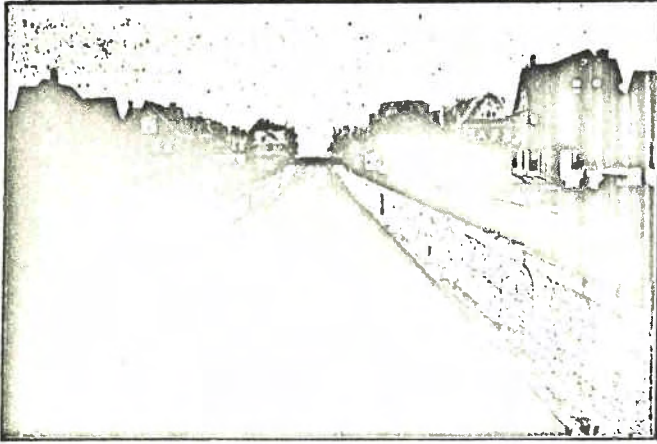
I believe that the company should be encouraged to work out and disclose a plan to provide this permanent way for an entrance into the city, free from grade crossings, and at the same time disclose their plans for a tunnel connection running northwest from Hill Street parallel to Sixth Street. Several years ago a tunnel enterprise was proposed to take care of the traffic to Santa Monica and vicinity, but the financial depression caused a delay in pushing the undertaking. The growth of the Hollywood district, the opening up of the San Fernando Valley and the extension of the electric lines into this district through the Cahuenga Pass would seem to be additional reasons for the construction of this double track outlet through the hills west of the business center.

Now that all of the interurban lines are under one control, this western sub-surface branch should be designed to connect with the other divisions of the system by a sub-way under the streets of the down-town district to the Pacific Electric Terminal at Sixth and Main Streets. Care should be used, however, in the location of this cross-town subway, so that it will not interfere with longitudinal subways which eventually may be located on Broadway, Spring or Main Streets. It will be a question as to which subway should have the right-of-way on the upper level as crossings at the same level would not be advisable.

It will thus be possible for the interurban electric company to be provided with a high speed terminal equipment of its own design, construction and ownership. These roads should have an entrance into the city entirely independent of any other transportation system, and if they are to expend the millions which this suggested terminal will cost, it would seem right that they should have a long term franchise. An indeterminate franchise, such as might be advisable with the surface railway system, would probably not be as applicable in this case as, on the one hand, the Company would not want to part with their expensive terminals, and on the other, the city would hardly care to exercise its right to purchase terminal facilities only, without acquiring the continuous lines.

Attention should be called to the fact, however, that although the building of these terminal connections will probably be found desirable by both company and the city, that this arrangement ultimately will be found lacking in adequacy as the extensions are directly at right angles to the city's most probable direction of growth and therefore congestion at a concentrated terminal eventually will result. It will take a number of years' growth, however, to develop this defect, at which time additional terminal facilities will be needed in any event, so that the proposed elevated and tunnel lines, which can be built within the next few years, will always continue to be useful up to their full capacity, and their building at the present will interfere in no way with, but rather will supplement, future terminal arrangements.

Ultimately there will be need for an elongated sub-surface terminal along the axis of natural growth and with a number of stations for the distribution and collection of passengers. Such a terminal would collect the electric interurban lines of the west and northwest at a point near the original Plaza, and interurban lines entering the city from the south, the west and southwest at a center located in the vicinity of Pico and Main Streets. By means of express tracks paralleled by local tracks, as in the New York subway, it would provide convenient outlets for interurban traffic to the entire business district. While such an elongated terminal would serve a certain amount of short haul local patronage, its principal function would be to provide a high speed connection through the city for the electric lines radiating to and connecting the centers of population which are now growing up



THE "OPEN CUT" METHOD OF CONSTRUCTION

Sub-surface railway construction in Los Angeles should be of the "open cut" type as far as possible. This has been described as "a subway without a roof," and is particularly adapted to the climate of Southern California. The accompanying illustration shows the four track depression recently constructed through the Flatbush section of Brooklyn, N. Y.

Many of the homes along this road were built after the road was constructed, showing the small objection to this type of construction.

all about the city. The best service to these outlying districts can be provided only by the elimination of all stops on the express tracks within the city limits of Los Angeles, except the four suggested in the business district.

If local stops within the city and just outside the city are to be provided in connection with the high speed interurban service, this can be done best by providing four tracks for some distance, using two of the tracks for local and two for express service, then dropping down to three tracks in the more removed districts, using the odd track for one-way rush-hour traffic into the city in the morning, and away from the city in the evening of working days and always with the crowd upon holidays and Sundays.

On account of the length of many of the interurban runs it will be found more economical to store the cars carrying much of this one-way traffic near the central terminal during the middle of the business day, and the design of the complete terminal should include provision for these storage tracks. Transfer stations should be provided between the two high speed terminal systems where they intersect near Sixth and Main, and the subway which will serve the largest number of patrons should be located on the upper level.

The development of high speed terminals for the interurban systems will have the same effect on the business center of Los Angeles as the moving into the present city limits of a large amount of the surrounding population. With real rapid transit to Pasadena, for instance, the 35,000 people at present living there

would be as near the shopping center of Los Angeles as the residents of the city itself now living between the three and four-mile circles. There is apparently no way in which Los Angeles can extend its sphere of influence, both for pleasure and business, as easily and effectively as providing an unobstructed entrance and exit for the interurban electric system. The rides per capita of the people of this district are already very high, but every improvement which will make it still easier to travel from one center to all other centers will further increase the "riding habit." The remarkable history of the building up of the towns and cities of this district and the correlation existing between the prosperity of the community and the activity of its people which was made possible by the splendid electric car service can only be an encouragement for still greater improvements and extensions. Of all possible betterments, the building of a comprehensive Los Angeles city terminal for the interurban system will be of the greatest benefit.

Pending the removal of the interurban cars entirely from the surface of the streets of Los Angeles city, there should be an arrangement made which will make it possible to transfer from one system to the other inside the city limits. The Pacific Electric system now operates about seventy miles of track, located upon the streets of the city (not including Wilmington and San Pedro). The carrying out of the comprehensive plan for a high speed terminal will eventually do away with the use of any tracks on the surface of the streets by the interurban cars—and at such time the operation of these street car lines should be turned over to the local company so as to secure one system for the entire city.

In order to obtain practically the same result without the delay incident to the carrying out of the terminal plan, it should be possible for the two companies to enter into a local transfer agreement, covering the interchange of passengers inside the city limits only, and I would suggest that at the first opportunity such an agreement be insisted upon.

IMMEDIATE RELIEF FROM MAIN STREET CONGESTION

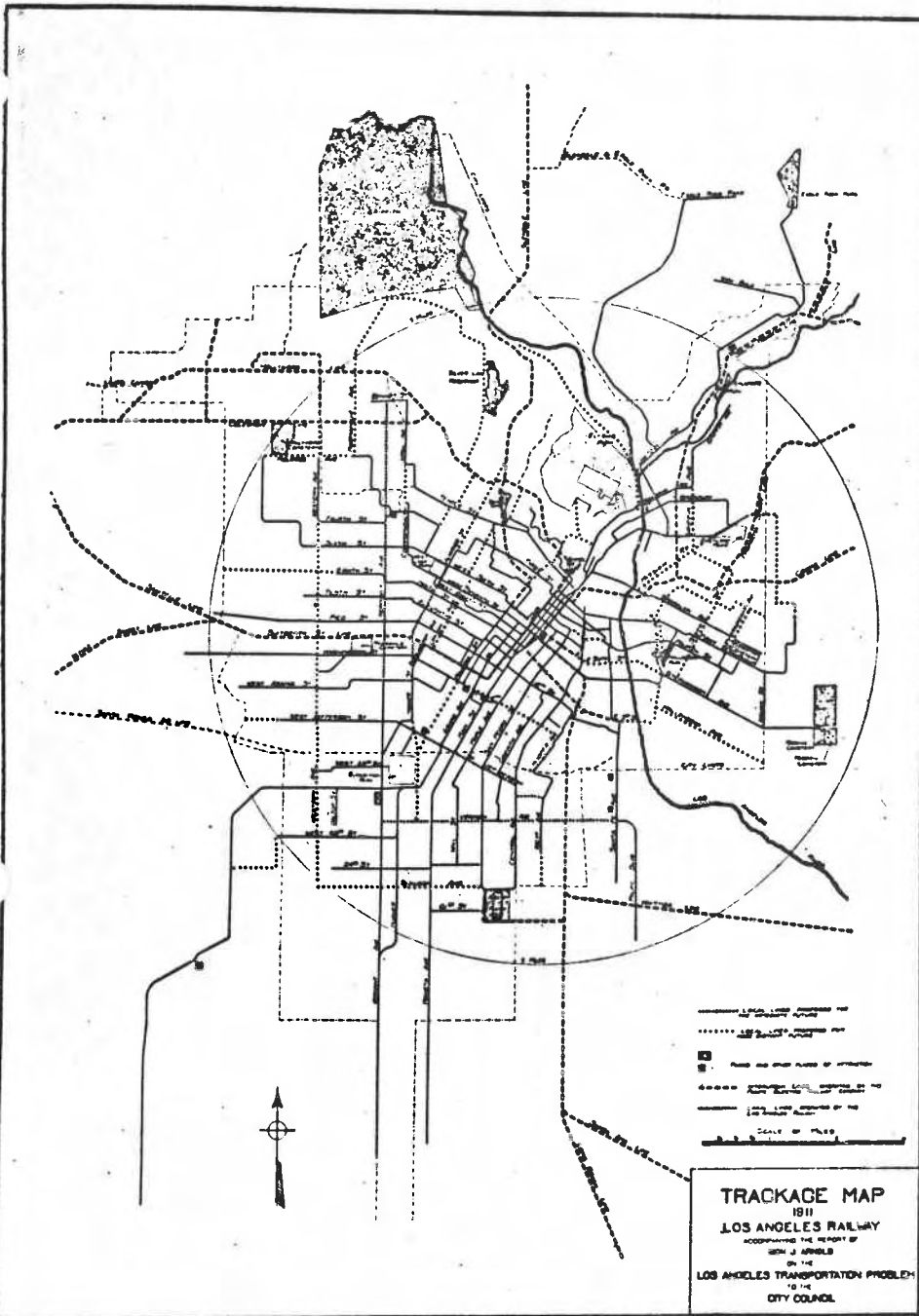
There can be little doubt that the first step to be taken toward improving the transit conditions in Los Angeles and vicinity is to relieve the congestion of traffic due to the operation of both interurban and local surface cars on Main Street. Fully 40,000 riders on both systems are delayed from five to forty minutes during the rush hours each day and as many more are inconvenienced during the non-rush hours, due to the fundamental defects of the transportation arrangements along Main Street. Even a partial list of these defects makes a formidable catalogue of possibilities for improvements.

At the interurban terminal building of the Pacific Electric Company at Sixth and Main Streets we find a "stub end" terminal arranged in such a way that the incoming track of the north division of the interurban system intersects the out-going track of the south division. All of the entering and leaving tracks contain curves directly in front of the building upon Main Street, which carries a heavy vehicle and local surface car traffic. The movement of the cars in and out of this building, therefore, is hampered constantly.

All interurban cars using this terminal must wait their turn to discharge and load their passengers and no provision has been made, by means of storage tracks, to supply trippers or extras to take the place of delayed cars. The loading arrangements are no longer suitable to handle crowds conveniently or comfortably. In order to take a car from the terminal waiting-room one must stand before a closed gate until his car is called, and as the schedule becomes disarranged during the blockade there is no way of telling when any particular car is to be expected. Frequently the delays to the standing patrons become exceedingly tedious and when the car does come there is a general scramble and contest to obtain a seat. The height of the car steps above the ground level platform makes the loading slow and inconvenient, especially to passengers with hand baggage.

The cars leave the terminal slowly as they must find their place in the procession of local cars upon Main Street and at every street intersection the entire line of mixed traffic is further delayed either by crossing cars and vehicles, or by surface cars weaving their way in or out of the file. At one place (Third and Main Streets) the intersecting line becomes part of the main line for a short distance, causing a double delay, which is made worse by the overhang of the cars and the spacing of the track centers on the curves which permits only one car to pass at a time. The fact that the cars from different systems and routes are alternated prevents the moving of the cars across the intersections in groups of two and three at a time, and as it is hard to tell whether a car is going straight ahead or is to turn a corner, both the vehicle traffic and the pedestrian travel are considerably delayed at nearly every street crossing.

The use of a narrow gauge track by the local cars and a standard gauge by the interurban system necessitates duplex or gauntlet tracks, which cut up the pavement on the streets. The heavy flanges on the cars, in conjunction with the duplex inter-



Local Passenger Electric Lines

The strictly local electric street car system, the Los Angeles Railway, consists of about 320 miles of single track inside and about fifty miles of single track outside of the city limits. This system is shown by the unbroken lines on the map.

The Pacific Electric Company's lines which may be called the interurban system are shown by the dashed lines.

This latter system uses standard gauge tracks, while the local system uses a gauge fourteen inches narrower—so that physically, the two systems are independent except where the joint use of streets makes duplex track construction necessary as upon Sixteenth, Seventh, Hill and Main Streets.

While the present local system is well spread out over the territory served, there are numerous opportunities for cross connections and for extensions which should be made in order to complete the system. The map shows in a diagrammatic way some of these possibilities. The addition of about eighty miles of single track to the present mileage will produce a local transportation system inside of the five-mile circle which would be nearly "completed"—as each section of the city would have easy access to the business center by means of the radial lines, while it would be possible to reach any part of the outlying districts from any other part by means of the circuit of cross-town lines.

If the interurban cars can be taken off the streets and the routes they now occupy consolidated by ownership or operating agreement with the present local system, so as to secure one city one fare, and a continuous ride in one direction with one transfer, then Los Angeles would be provided with a transportation system which would be hard to improve.



sections and the use of heavy cars, cause excessive noise at street intersections.

The delays incident to this Main Street congestion become cumulative as the cars first delayed pick up a large share of the rush hour load, thus becoming automatically slower in their loading and unloading operations until the result is three or four crowded cars on a route followed by a number of only partly loaded ones. As a rule the schedule provides for a liberal number of seats, but the Main Street difficulties introduce delays which reduce the car supply just at a time when the system should be working at its maximum capacity.

This description is not intended as a criticism of the designers of the track layout or of the present management as it is apparent that the tracks are taking care of many more cars than they were intended to serve at the time the terminal was put in operation—some seven years ago. The present situation is plainly due to the remarkable growth of the city and district, with a corresponding development of city and interurban traffic, much larger than was anticipated.

Permanent Relief

The solution which will provide permanent relief from present Main Street conditions will be an arrangement which will elim-

inate the interurban system entirely from the grade of city streets, either by means of a subway, open cut or elevated structure—as discussed at greater length in another part of this report.

This permanent arrangement, however, will require considerable time, perhaps several years, for designing, financing and building, and, therefore, there is need for a temporary expedient which will at once relieve the present transit situation, which is now almost intolerable and which is rapidly growing worse.

Temporary Use of San Pedro Street

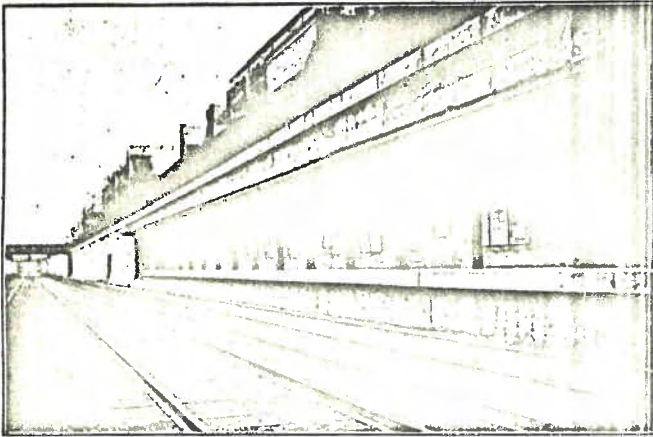
Of several streets parallel to Main Street which might be used for relief tracks, San Pedro Street with its recently opened extension to Aliso Street is by far the most available and desirable. A study of the map will show how the cars of the northern division of the interurban system could be diverted from Aliso Street down San Pedro Street to Sixth, and thence to a terminal, using the lower floor of the present Pacific Electric building.

The difference in levels between the front of this building on Main Street and its rear entrance on Los Angeles Street fortunately allows for a very convenient rearrangement, continuing the use of the present waiting-room, which can be enlarged by opening the restaurant room in the rear. Additional waiting room can be secured by using some of the upper level space now

devoted to express office and stores, and also by turning part of the basement, which is not being used for any purpose at present, into a concourse. Seven tracks with a capacity of three cars on each track can be supplied with ample loading and unloading platforms on the lower level and the two tracks on the upper level with their platforms can also be retained.

The new arrangement will provide two improvements which will be greatly appreciated. Storage tracks will be possible on which cars can be held in readiness to take the place of delayed cars—in other words, to act as a reservoir which will allow irregularities in the schedule to be removed and the cars run practically on time. The use of more than two terminal tracks will allow the cars on various routes to be loaded slowly and it will be possible for the passengers to wait for the leaving time, seated in the cars, instead of being herded in the standing room before the gates as at present. Speed and comfort, two of the essentials for good transportation, will thus be greatly increased by the proposed changes.

The local "Watts" and "El Molino" cars could still continue to run on Main Street, as at present, transferring passengers to the through or express cars at Aliso and San Pedro Streets, thus maintaining the rights of the Pacific Electric Company on Main Street pending the development of a permanent terminal solution. It may be found that during the non-rush hours the other unlimited cars could also continue to use Main Street, but all of the rush hour extras and the flyers during the day should leave the lower terminal in order to secure the advantage of leaving ex-



THE "OPEN CUT" METHOD OF CONSTRUCTION.
Brooklyn Union Elevated Railroad.

This is a typical "Local" Station. The platform serves the outside local tracks only. These stations are located about every fourth block.

actly on time and passing out of the city with but little delay from street traffic and car congestion. It will be found desirable to make a cross-connection between the tracks of the Pacific Electric Company on Main Street and on Sixth Street so that cars can be transferred conveniently and in addition allow the El Molino cars to be run to the Arcade depot.

The elimination of a large number of interurban cars from Main Street, particularly during the rush hours, would at once remove the fundamental cause of considerable poor service during that time on the local surface system, and it should be possible for the Los Angeles Railway Company to re-route some of its cars so as to do away with the many curves at street intersections in the downtown district. The lessening of the noise on Main Street by decreasing the number of heavy interurban cars crossing the special work at each street crossing will not be the least advantage of the proposed plan.

As the suggested use of San Pedro Street is only intended to be temporary, pending the working out of a more permanent arrangement, and is apparently the most feasible solution of the present difficulties, some way should be found by the city and the railway companies to bring about this result.

First Section of Municipal Railroad

The double track on San Pedro Street from Aliso Street to Seventh Street may be considered as the first section of the proposed municipal railroad. With a connection to the tracks of the Pacific Electric at Aliso Street on one end, and at Sixth Street and at Seventh Street on the other, and a possible connection to the Southern Pacific at Third Street, carload freight could be delivered and collected to and from any spur or siding along its length, thus opening up at once a centrally located section nearly a mile in length, particularly adapted for warehouse and factory purposes.

The city should control this important main line in the heart of the industrial district as it has spur-track possibilities which will permit railroad connections throughout a large territory which is now dependent upon teams and trucks for its freight service. It will be apparent that San Pedro Street is in a position to serve both the passengers and freight traffic of the city, the former at once, and the latter more and more as the industrial establishments locate along the lines of the main track and its branches. Eventually as the passenger business is withdrawn from the surface, the freight use of the tracks will become more pronounced. During the period that the interurban cars are using the tracks the freight should be hauled largely at night. The crossing of this entire industrial district by viaducts for street cars and vehicle traffic is discussed in another part of this report.

The building of the tracks on San Pedro Street and their temporary use for interurban passenger traffic is an important step toward the development of a comprehensive traction program, and the consummation of this improvement, at this time, would be the greatest encouragement toward the working out of a satisfactory permanent plan.

Financial and Franchise Arrangements

The possible joint use of the proposed San Pedro Street tracks by the interurban electric system and by the municipal railroad will require some franchise arrangement quite out of the ordinary, and the temporary use of the tracks by the Pacific Electric Company during the period of securing a private right-of-way makes the situation unique and without precedent.

There are apparently two financial and franchise plans by means of which these proposed tracks on San Pedro Street could be built.

One plan, which might be called "the immediate municipal ownership plan," would be for the city to construct the tracks with its own funds as part of the proposed municipal railroad and enter into an agreement with the Pacific Electric Company for the use of these tracks on a rental basis.

The other plan, which may be termed "the ultimate municipal ownership plan," would be for the Pacific Electric Company to build the tracks under an agreement that the city is to have the right to purchase the tracks at any time at actual cost, and that when such a permanent right-of-way can be provided by means of an elevated, or sub-surface structure, the company will withdraw its interurban cars from the street surface. This latter plan would practically be an indeterminate franchise, which is sometimes called a "tenure during good behavior," and is a form of permit for public utilities which is rapidly growing in favor, as it combines the advantages of both the short term franchise and the long-term franchise without their objectionable features.

It is not the intention of this preliminary technical report to discuss at length the comparative merits of these two plans. With proper precautions either form of agreement will accomplish the result desired, and that is to relieve the Main Street congestion by allowing the use of San Pedro Street for the interurban cars as a temporary expedient pending the development of a permanent and independent terminal for the Pacific Electric system. As any agreement would not be a permanent one, it would seem that the result to be accomplished is of greater importance than the method selected to secure the improvement.

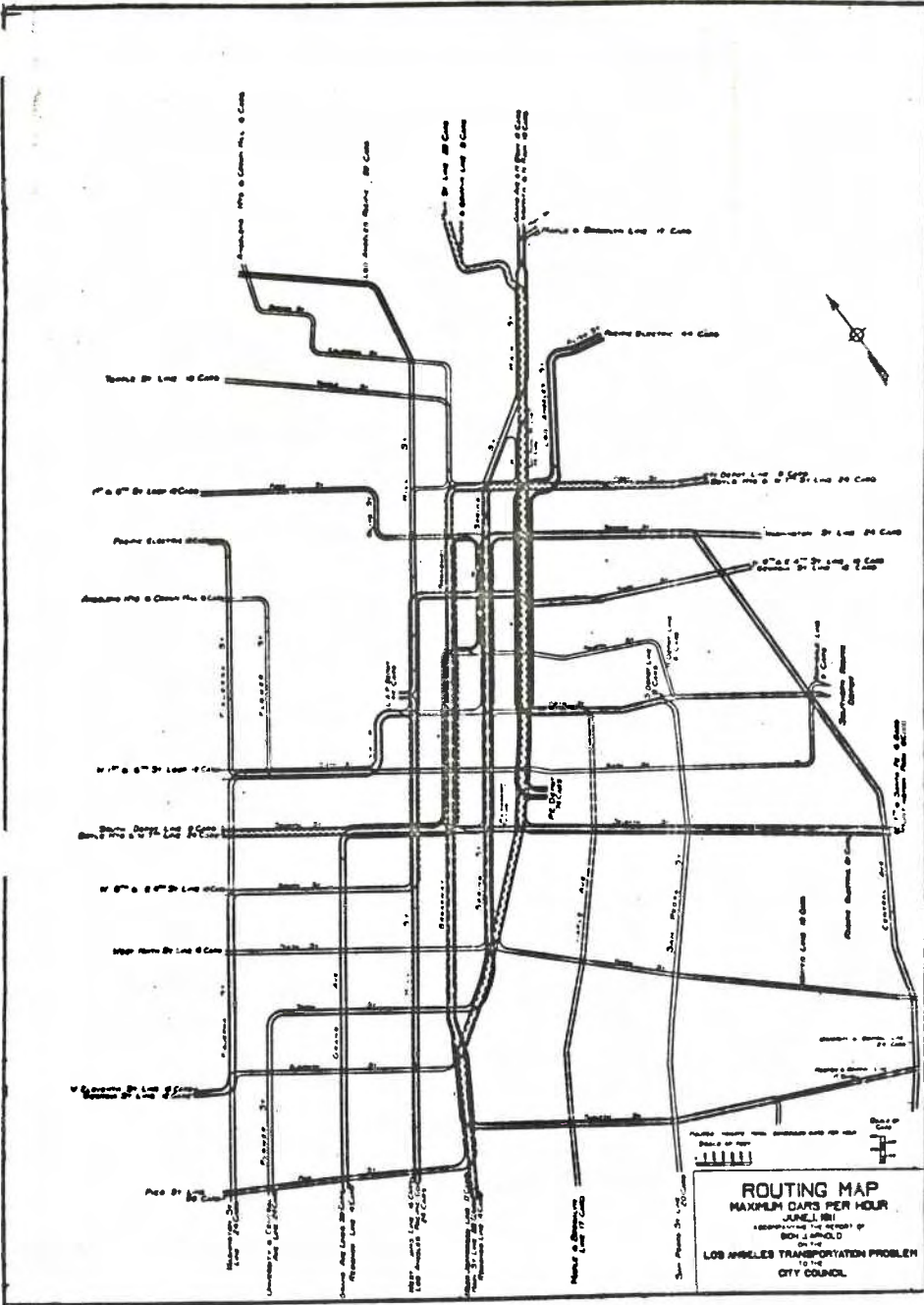
If any further arguments as to the "public necessity and demand" for such an arrangement are needed, I append herewith several photographs showing the daily congestion of cars upon Main Street. In my study of the transportation system of the various cities in the country I have found no worse situation, nor one which apparently can be corrected more readily.

CITY AND DISTRICT PLANNING

The making of Greater Los Angeles will apparently be the result of some system of unification of the present city with its satellite communities—within a radius of perhaps twenty-five miles from the present center. But it hardly seems possible that this enlarged district could reach its highest possibilities of civic development under the present form of city government. What is needed, apparently, is some method of consolidation, such as the borough system, which will unite the present metropolitan center with the other surrounding communities so as to enable the common problems of transportation, water supply, sewage and street plans to be co-ordinated and centrally controlled, leaving the more strictly local problems, such as street cleaning and lighting, fire and police protection, etc., to be administered by each individual locality.

This report does not purport to be a city plan, but it would be better for transportation and for city planning, if the two problems could proceed to a solution hand in hand, for it is fully as important to have a plan for the symmetrical and economic development of the city and district as it is to have a comprehensive transportation plan.

There are places in the city where the lack of a comprehensive city plan has left obstacles in the way of a thoroughly effective street railway transportation system. It will cost more to correct these defects than to have made them right in the first place and



Downtown Routing

This map shows the route of each car line after it reaches the business district and the relative widths of the bands indicate the numbers of cars on each route.

Los Angeles already has the benefit of a large number of through routes, that is, the cars from one section of the city pass on through the business district to another section, thus avoiding loops in the downtown districts. As will be seen from the diagram there are only a few loops and a few turnbacks in the business center.

There are, however, a large number of curves which interfere with the car tracks being used up to their full capacity. A car leaving a street at a curve interferes with traffic on both streets and when on outside track blocks the car service on all the other three tracks.

The diagram indicates, at once, the points of great congestion and shows where improvements in routing should be made.

The relative amount of interurban traffic is shown by the heavy lines and the interference of this traffic with the local street car service is apparent.

Topographical difficulties practically close the outlets from the shopping districts to the west along Second, Third and Fourth and Fifth Streets and the diagram shows the possibilities of more direct routes by means of tunnels and open cuts through these hills.

Six hundred cars during each rush hour enter the business district over the lines of the narrow gauge local system and 150 cars per hour come into the city over the broad gauge interurban system.

as the city grows in population and as land values increase, it will become more and more difficult to finance the very evident and even necessary improvements. There are other situations in the outlying districts where intelligent foresight at this time will avoid a repetition of the mistakes which have been made in the inlying territory. The development of the most efficient transit system will be made possible only by taking advantage of all the rapidly developing art of city planning. The selection of natural centers, the laying out of diagonal streets, the plotting of subdivisions so that streets will follow natural grades instead of blindly adopting the checkerboard plan without considering topography, are all important considerations for both transportation and city planning.

There is a natural tendency in the growth of every community to develop about centers. Every city has its business center and even in this district certain kinds of business are to be found together—so that we have a wholesale district, a manufacturing district, a retail district and sometimes a financial district. Taking advantage of this fact it would seem to be the best kind of city planning to cater to this tendency toward centralization and establish centers of amusement, of recreation, of art, and education, of conventions and assemblies, etc., and then arrange the

transportation system so as to carry the people most effectively between their homes and these common points of meeting.

A center of this character could be established, for instance, in the vicinity of Pico and Main Streets. Here we have all the essentials for an attractive park and open plaza in the midst of which could be located a subway station with radiating walks leading to an auditorium, lodge halls, clubs and other attractions which call for gatherings attended regularly by people from all parts of the city.

Another center is naturally developing in the vicinity of Agricultural Park and this could be encouraged still further by locating more educational institutions in this immediate vicinity.

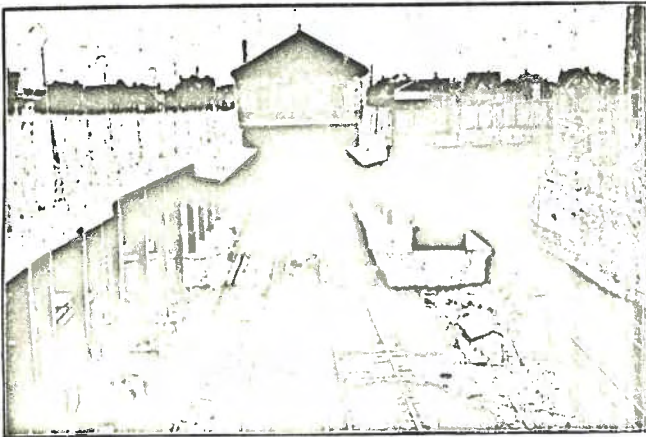
Surrounding the western portal of the proposed tunnel through the northwest hills would be found a location almost directly on the line of a future cross-town surface railway, which would make a favorable location for hotels, apartment houses, or perhaps an art and music center.

While the transportation companies are vitally interested in any plans which may be made and adopted for the physical development of the city and surrounding districts and could well afford to make liberal contributions toward the expense of creating these plans, the responsibility of making final conclusions should be

vested in some public body entirely independent of possible profit or prejudice. There should be a clearing-house of influence and ideas; an open tribunal which would take account of the various interests affected by the details of a comprehensive plan for the entire district.

A City and District Plan Commission should represent not only the metropolitan districts now within the city limits, but also all of the district within a radius of perhaps twenty-five miles of the city's center. Such a commission, if its work is to be effective, must proceed along natural lines. As transportation is the crucial part of the problem, the fundamental requirements for efficient transit of both passengers and freight must be thoroughly understood.

It is natural to expect a plan for an ideal city to include a portal or gateway in the form of a transcontinental railroad union station approached by broad streets, set in an ornamental open plaza and surrounded by monumental public buildings showing the city's civic importance. From such a civic center surface lines should radiate throughout the city and rapid transit lines throughout the district in the most direct ways. The city street car system should terminate in a park and boulevard belt surrounding the main or metropolitan district, thus giving all of the city dwellers abundant opportunity for play and recreation. Beyond the outskirts of the park zone the suburban country can best be reached by the interurban system of transportation—supplemented by local street car collecting and distributing systems. At each of these outlying centers will be found individual problems of



THE "OPEN CUT" METHOD OF CONSTRUCTION.
Brooklyn Union Elevated Railroad.

This is a typical "Express" Station. Note the transfer platforms between the outside local tracks and the inside express tracks. The station spans all four tracks.

town planning as each locality should have its own amusements, churches, business blocks, schools and recreation facilities. While connected in the most direct way with the main city by automobile highways and rapid transit lines, these centers should also be connected with each other by highways and cross-country transit lines, thus tying the whole community together by means of radials and circuits.

In the development of all of the utilities of a community there are three fundamental laws which must be recognized—and these may be compared to the natural forces of contraction, of expansion and of crystallization. There is always the first tendency to gather about the origin—then comes the spreading out along the natural outlets and finally the forming of sub-centers. These sub-centers develop in turn as did the original by expanding at the edges and contracting at the center and eventually the sub-centers become interconnected by a system of circuits as well as by the original radials and the entire structure becomes a unified whole.

City and District Planning therefore will start with the adoption of this principle of centers and with the recognition of the fact that the development about any center—even the original one—may become too large. The location and character of these sub-centers must be controlled by natural influences which have a way of expressing themselves. Artificial development cannot be sustained. Transportation will play the greatest part in developing the district by providing a rapid, comfortable and economic system of communication to reach each center, to pass through it or avoiding it entirely by a convenient by-pass route. As the centers grow they each will need an individual collecting and distributing street car system which will contribute to the effectiveness of the main rapid transit lines by making all the local stops—thus allowing the interurban lines to confine their service to the stops at centers only.

Other parts of this report have been devoted to the discussion of the high speed passenger terminal, to the handling of freight and to the problems of the local street car system—but if the suggestions are to become effective, co-operation must be secured between all the influences which are now separately working for better roads, for the city beautiful and for good government, for the civic pride of each individual center and for the private interests of business enterprise and property ownership. Individually and collectively the people of the district must come to realize that the securing of good transportation and the working out of a district plan is the next great problem in developing Greater Los Angeles into an ideal location for health and happiness, for pleasure and prosperity.

COMPREHENSIVE AND CONSTRUCTIVE TRANSIT PLAN

It is always hazardous to lay down a set program to meet conditions which are constantly changing, but it is more dangerous to proceed in a haphazard manner without an adequate plan. A comprehensive policy should first establish certain fundamental principles and then recognize that progress toward the ideal can only be secured by working consistently and constantly along natural lines. There are technical, legal, financial and political requirements to be co-ordinated in securing developments which will provide passenger and freight transportation at minimum cost. The doctrine of public control, the protection of actual investment, the necessity for adequate service, the demands for future growth, particularly under Los Angeles conditions as they will be developed by the opening of the Panama Canal, are all factors which enter into the problem.

A step by step program, which it is believed will meet the requirements of immediate and future needs, and which is discussed in more detail in other parts of this report may be recapitulated as follows:

Main Street Congestion

1. Make every effort to relieve at once the congestion on Main Street by placing tracks on San Pedro Street and using the rear entrance into the present Pacific Electric terminal building for the interurban cars.

Universal Transfers Inside City Limits

2. Insist upon a transfer agreement between the "red lines" (Pacific Electric Railway) and the "yellow lines" (Los Angeles Railway)—so as to make it possible to reach any part of the city from any other part by the payment of one fare.

Re-route Local System

3. Secure the re-routing of the local street cars so as to do away with the curves in the downtown business districts. This can be done by running all the cars through and making all the crossings at right angles.

First Section Municipal Railroad

4. Make arrangements for the use of the tracks on San Pedro Street for the delivery of freight in carloads to spur tracks leading off from these new tracks, using this as the first section of the proposed municipal terminal railroad.

Right-of-Way—City to Harbor

5. Secure a right-of-way at minimum cost between the city limits of Los Angeles and Wilmington. This right-of-way should be 250 feet wide in order to provide for eight tracks and automobile highways free from grade crossings on either side. Co-operate with the county highway commission to provide an auto speedway and a motor truck highway from Los Angeles to the sea.

Harbor Terminals

6. Continue with the design of the Wilmington-San Pedro terminals in conjunction with the development of the harbor plans so as to make it possible to receive and deliver cars from and to any transcontinental railroad.

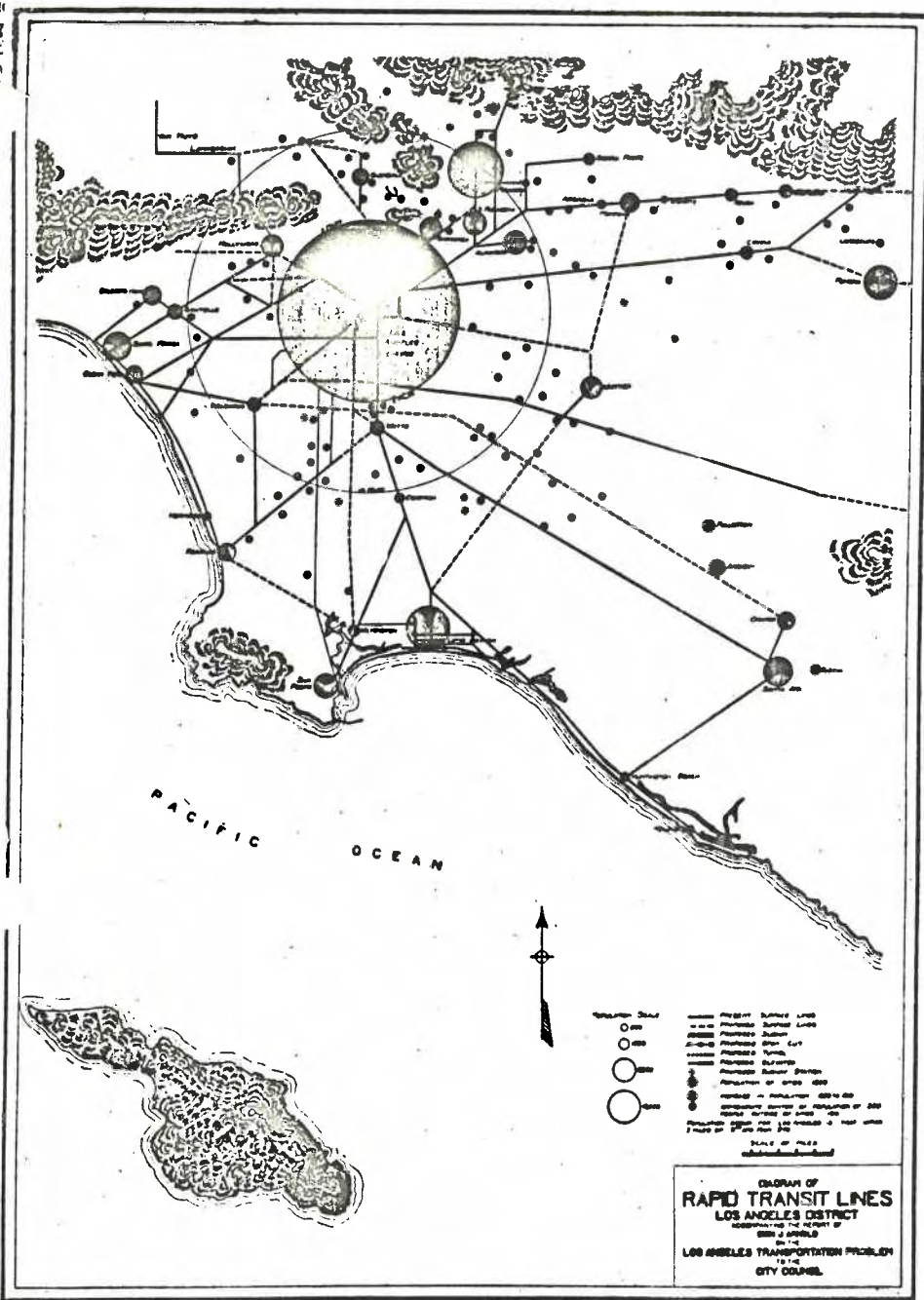
The influence of the opening of the Panama Canal upon transportation and upon the amount and character of the growth of the district must have constant attention. The opening of Port Los Angeles as one of the world harbors and the focus, at this point of the present and additional transcontinental railroads and ocean steamship lines will cause a readjustment of the commerce of this entire part of the country. It is too early to predict with accuracy the amount of tonnage which will pass through the harbor and over the tracks of the municipal terminal railroad—but the first requirement of all plans should be to allow for an unhampered growth.

Permanent Terminal Pacific Electric System.

7. Encourage the Pacific Electric Company to develop and disclose plans for a permanent terminal for their northern, southern and Santa Monica Divisions, and if these plans require franchises to enable these high speed lines to be removed entirely from the street grade, the franchises should be liberal in their conditions, particularly in regard to length of grant, in order to encourage private capital to invest in these permanent improvements on practically private property.

Steam Railroad Terminals

8. Encourage the steam railroads to prepare and submit plans for passenger and freight terminals. If plans can be made to re-



RAPID TRANSIT DIAGRAM

Greater Los Angeles District

Like the growth of all communities the tendency here is to crystallize about centers. The diagram map shows the relative size and location of these centers—the lower vertically shaded segments of the circles indicating the growth during the last ten years. The smaller dots represent 500 persons showing a scattered population throughout the district between the incorporated centers.

The transportation problem of the entire district is to get safe and rapid transit first between the main city of Los Angeles and each of its satellite towns by means of the most direct radial routes and then to connect these sub-centers by means of auxiliary cross-country or circuit lines.

To provide for high speed terminals inside the City of Los Angeles for this comprehensive interurban system is the larger part of the problem.

The diagram indicates how the present interurban lines can be combined so as to jointly use the more expensive sub-surface facilities through the heart of the city.

The backbone of the system shown by the diagram is a four-track subway running through the retail district from the Plaza to about Twelfth Street. This subway would receive at its northern terminal all of the cars from the foothill cities to the north and west of the city and at its southern terminal the cars from the towns and cities south of Los Angeles. This subway connection will allow through car service between these communities on opposite sides of the city—or the cars from the northern divisions, for instance, will turn at the southern terminal—thus giving all cars the benefit of four downtown station stops.

To provide for the district west of the city, a tunnel has been suggested through the hills, westward from Hill Street to above Hoover Street, and thence by an open cut to connect with the lines of the present western division. This tunnel would be at right angles to the proposed subway or elevated connection to be built east of the present terminal at Sixth and Main Streets to eventually serve the cars from the towns directly east of the city.

This plan reduces the high speed terminal arrangements to two lines—entirely off of the street surface and at right angles to each other, with a connection between the two terminal systems at or near the present Pacific Electric building at Sixth and Main Streets.

lieve Alameda Street of its present passenger and freight traffic the railroads should be treated liberally in securing other permanent rights-of-way.

Interchange Agreement

9. Make an interchange freight agreement with all the steam roads so as to reduce to a minimum the cost of handling freight between the city's industries and the harbor. The city should be on equal terms or better in participating in this agreement and further provisions should be made for extending these privileges to all future transcontinental or other lines entering Los Angeles under the proper arrangements for sharing the burden of the cost of the terminals.

Spur Tracks

10. The city should encourage the building of a comprehensive spur track system as fast as necessity demands. As these tracks must be upon grade, if the investment is to be kept within reasonable limits, their location should be confined to industrial districts and preferably to districts where the main thoroughfares for street cars and vehicles can be elevated so as to pass over the industrial tracks. All future spur track permits should provide for the joint use of the switch track by the municipal terminal railroad and all other railroads entering the city.

It is not unreasonable to expect that eventually the entire terminal tracks of the industrial district will be pooled into one

holding company—the investment reduced to a minimum and switching service secured probably by electric locomotives at the lowest possible actual cost.

Union Depot at Plaza.

11. A movement should be started looking forward to the location of a Union Depot in the vicinity of the Plaza. All of the sentiment which develops for the Plaza site will be useful competition for the movement to build a new station on or near the present Arcade depot site and in case the Southern Pacific should be slow in its plans for an independent depot, public opinion in favor of a Union Station at the Plaza may become sufficiently unanimous to dictate the co-operative use of this latter location.

Grade Separation by Means of Viaducts.

12. Prepare preliminary designs for a viaduct on Fourth Street from Main Street to Boyle Avenue and discuss the building and financing of this viaduct with the property owners affected and with both the street and steam railroads.

Double Deck Streets.

13. Through the city engineer's office, establish the second story levels for streets throughout that part of the industrial district bounded by Los Angeles Street, First Street, the River and Seventh Street, so that new buildings in this section may be designed to secure the advantage of double decking the streets in this district.



Relief of Main Street by Use of San Pedro Street

This map developed for Main Street only shows a typical congestion of Interurban and local cars due to the use of Main Street by the interurban cars to reach their terminal building at Sixth and Main Streets.

The dashed lines on San Pedro Street indicate the broad gauge tracks which should be built to enable the cars of the Pacific Electric Company to avoid Main Street entirely, and thus remove the cause of the congestion which is seriously handicapping the present service of both the city and the interurban systems.

Fortunately the Pacific Electric Company own the terminal building and the vacant lot in the rear—so that it will be possible for them to rearrange their terminal by putting seven tracks into the building from Los Angeles Street level and providing storage tracks in the yard—thus making a desirable stub-end reservoir type terminal.

The San Pedro street tracks can be connected with the Southern Pacific tracks by extending through to Alameda Street and a switch track connection can be made with the Southern Pacific between Second and Third Streets.

A connection between the intersecting tracks of the Pacific Electric Company at Sixth and Main Streets, which will allow an interchange of cars between Main and Sixth Street, will be a desirable adjunct to the new terminal arrangement.

It will be noted that, in conjunction with the tracks on Aliso Street, carload freight can be received from and delivered to the Santa Fe Railroad and the Salt Lake Railroad. These connections would make San Pedro Street the backbone of a convenient electrically operated freight terminal system, which could gradually be extended so as to cover the entire industrial section east of Main Street.

If it is found desirable to operate the municipal railroad upon the surface of San Pedro Street south of Seventh Street, the industrial district will eventually tend to build up along San Pedro Street, convenient to switching accommodations. There are a number of properties along San Pedro Street upon which carload team tracks may be located.

Contract Ordinance for Local Lines.

14. A contract ordinance should be the result of an agreement between the City and the local surface railway companies which should attain the following objects:

- a. The very best possible street car service at the lowest cost of operation, maintenance and depreciation.
- b. The protection of the actual present value of the property plus the actual money invested in future extensions and betterments and temporarily (until amortized out of earnings) the intangible investment made by the company, comprising obsolescence, and other expenses incurred in developing the property; all of this on the assumption of only a reasonable return on the true investment having been paid in the past.
- c. The complete maintenance, periodic renewals and constantly increasing efficiency of the system.
- d. Additions and extensions slightly in advance of actual ed.
- e. One city—one fare—universal transfers—through routes and publicity of records.
- f. Public supervision which will include the regulation of the surplus earnings so as to better the service, reduce the fares, or to amortize the obsolescent investment or other costs now included in the capitalization of the present companies, but representing no real physical property, so that the community will

eventually pay a rate which will produce a reasonable return upon the real value of the physical property producing the service.

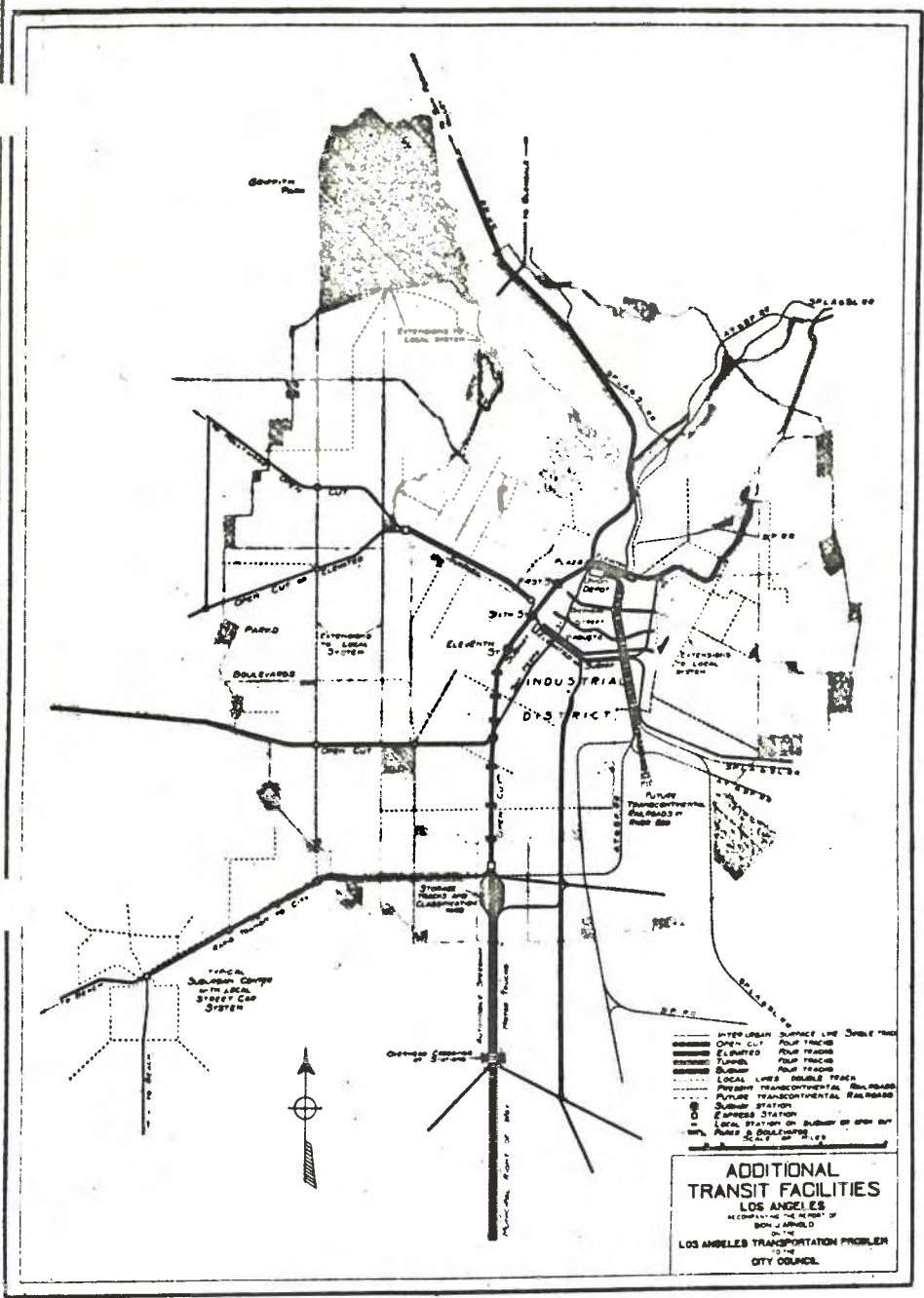
g. Public control over plans for additional construction and equipment, regulation of contracts, rates and transfers and control of capitalization, accounts and transfer of power.

h. Right of the city to purchase the property at reasonable intervals and at a fair price which is not to include any franchise value and the further right to transfer the property to other agents by paying an agreed bonus.

As a result of this contract ordinance the entire surface systems should be operated and developed as one single system inside the city limits and the interurban cars should be displaced from the streets onto private rights-of-way.

Different Policies Toward Local and Interurban Lines.

15. Different methods should be followed in determining the city's policy on the one hand, toward the Los Angeles Railway, which owns a large part of the local street car lines and charges a uniform five-cent fare, and on the other hand, toward the Pacific Electric Company, which controls the interurban lines and charges a zone system of fares. It is possible that public control of the surface lines may some time develop into city ownership of the local system in its entirety—but the city would hardly expect to purchase the city terminals only of the larger interurban system, which is being constantly extended into new territory and is



- ADDITIONAL TRANSIT FACILITIES**
- This map shows in diagrammatic form the various suggestions made in this report for the future improvement of transportation in and about Los Angeles. Briefly, these future developments may be recapitulated as follows.
1. Tracks on San Pedro Street to be used temporarily to relieve Main Street congestion and eventually as a nucleus for an electrified union freight terminal.
 2. Municipal Railroad to Wilmington and San Pedro harbor.
 3. Automobile Speedway and Motor Truck highway from Los Angeles to the sea.
 4. Municipal Subway through heart of downtown retail district with four stations between the Plaza and Twelfth Street to serve as a high speed terminal for a large part of the Interurban electric system.
 5. Tunnel built through western hills by Pacific Electric Railroad to serve Hollywood, San Fernando and Santa Monica cars.
 6. Elevated Road from rear of present Pacific Electric terminal to serve interurban cars from territory east of Los Angeles.
 7. Open Cut construction for rapid transit lines through residence districts.
 8. Union Depot at Plaza convenient to all railroads and contiguous to interurban subway terminal.
 9. Future Transcontinental Railroad along the river bed.
 10. Overhead Viaducts for street cars and vehicle traffic over railroad tracks in the industrial district.
 11. Extension to Local Systems confined largely to cross-town lines and other new tracks largely inside of the five-mile circle.
 12. Park and Boulevard System to mark limits of Metropolitan district, with suburban districts built up about centers.

already being connected with interurban lines in other districts. The city should co-operate with the Pacific Electric Company in securing permanent terminal facilities adequate for its immediate and future needs. The object to be attained should be to remove the interurban cars entirely from the streets and then consolidate all of the local surface lines in the city into one system.

Eventual City-Owned and Privately-Operated Terminal.

16. Eventually the Pacific Electric Company will be the logical tenant and operator of a system of subways and open cuts which should be built and owned by the city and rented as a high speed terminal upon terms which will pay the interest on the cost of construction and provide a Sinking Fund to retire the city's transit bonds. As the rates of fare upon the entire interurban system will presumably be under public control, the city will get at once the benefit of any economies which can be introduced in the building of the subways and in the use of the city's credit to secure funds at a low rate of interest. As soon as the city gets through the building of the aqueduct it should turn its experience and attention toward this municipal subway and its natural auxiliaries—galleries for all of the public utilities now arranged in a haphazard manner under the paving in the streets.

Interchange of Rights-of-Way.

17. The four-track Long Beach line of the Pacific Electric Company now on private right-of-way must either be elevated,

depressed or abandoned as a high speed line. If the railroad and the city can agree upon terms for the use of a city-owned subway by all of the interurban lines entering the city, then this four-track line located down the center of what promises to be the future industrial district, can be used to good advantage as a combined freight and local passenger road and the high speed passenger cars can enter and leave the heart of the city by means of an open cut or subway.

Parcel and Freight Delivery.

18. The local lines should be allowed and expected to operate a system of light freight and package delivery between the center of the city and a system of sub-stations throughout the city for the purpose of reducing the cost of living by facilitating the delivery of every day commodities such as ice, milk, food supplies, etc., which are now distributed uneconomically by horse or auto trucks. As the local lines are narrow gauge the moving of foreign carload freight through the city's residence streets will be impracticable, but foreign carload movement is possible and should be permitted over the private rights-of-way of the interurban lines and over the system of freight spur tracks throughout the industrial district.

Use of River Bed for Transcontinental Lines.

19. Reserve the river bed for the rights-of-way of future transcontinental steam railroads which, no doubt, will be seeking

an entrance to and through the city. All developments along the river banks should be at such levels as not to interfere with the future use of part of the river bed for this purpose.

City and District Planning.

20. There is nothing which will advertise the city better, affect the value of real estate more widely and leave a more lasting impression on the entire community than a definite and comprehensive City and District Plan. A City and District Planning Commission should be organized to replace the present haphazard system of growth with a carefully studied policy for the development of the district into a unified Greater Los Angeles. The fundamental idea of this commission should be to encourage a central metropolitan district with city regulations surrounded by satellite smaller town centers with suburban forms of restriction all combined into one centralized government on the borough plan for the control of transportation, water, sewer, composite street plans, parks and boulevards but with each community retaining undivided control of its own police, fire protection, lighting and other purely local problems. This commission should originate and pass upon

plans for parks, boulevards, subdivisions, housing, civic centers, industrial districts and manufacturing communities and secure the co-operation of all interests in building up a district both beautiful and useful around the most efficient transportation system which can be secured.

Finally it must be understood that a community is not master of its own growth and destiny until it has complete control over its transportation facilities and that just in proportion as this power of control is exercised intelligently and justly will the community develop and its citizens be prosperous and happy. In bringing about this result there is an opportunity for the united work of every individual and every interest. Co-operation must be the keynote of any comprehensive transit plan which will be sufficiently adequate to fit the requirements of the wonderful growth and the political and social evolution which is taking place in Southern California.

Respectfully submitted

(Signed) **BION J. ARNOLD,**
Consulting Engineer.

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