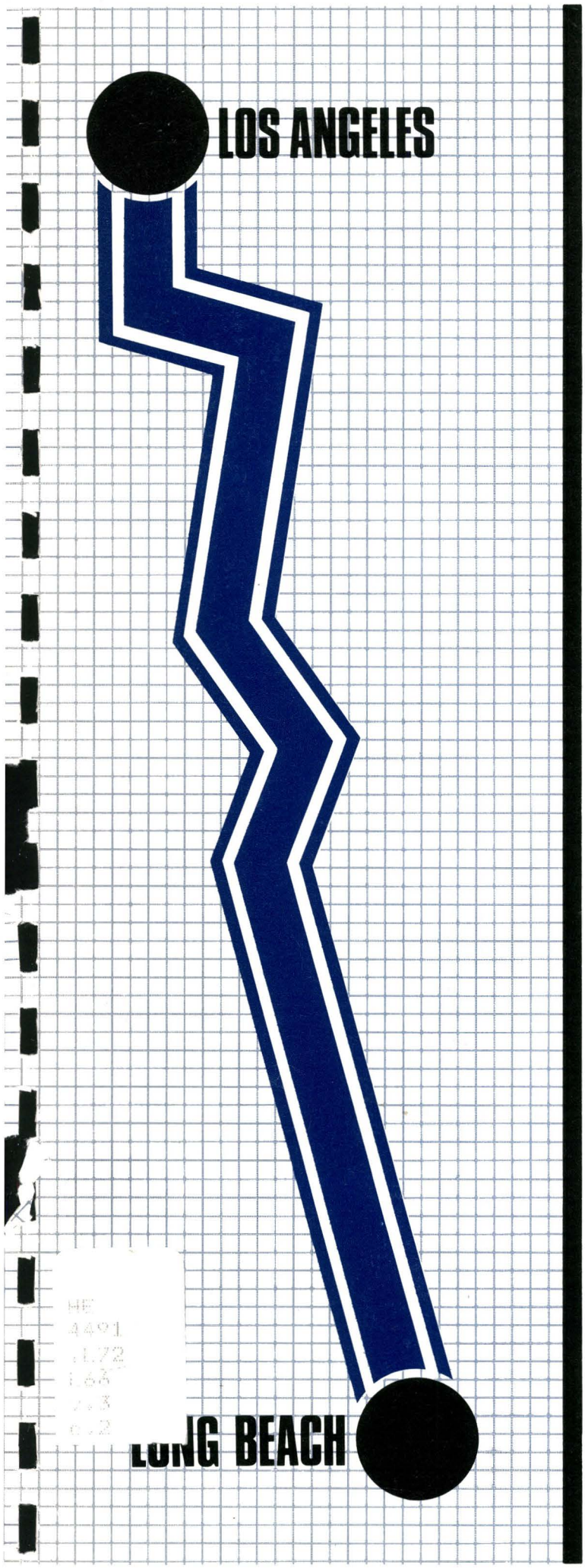

Concept Design Report

Executive Summary

Long Beach - Los Angeles Rail Transit Project

Parsons Brinckerhoff / Kaiser Engineers
In Association With:

- MYRA L. FRANK & ASSOCIATES
- J. WARREN & ASSOCIATES
- KENNARD DESIGN GROUP
- PACIFIC INTERNATIONAL ENGINEERS
- SEDWAY COOKE ASSOCIATES
- WILLIAMS - KUEBELBECK and ASSOCIATES

September 1983

PARTICIPATING GOVERNMENT AGENCIES

COUNTY OF LOS ANGELES
- Department of Regional Planning
- Road Department
- Engineer - Facilities
- Community Development Commission

CITY OF LOS ANGELES
- Department of Transportation
- Planning Department
- DPW - Bureau of Engineering
- Community Redevelopment Agency

CITY OF COMPTON
- Planning Department
- Community Redevelopment Agency

CITY OF LONG BEACH
- Department of Public Works
- Department of Planning and Building
- Department of Community Development
- Long Beach Transit

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
CITY OF CARSON - City Engineer
CALIFORNIA PUBLIC UTILITIES COMMISSION
CALIFORNIA DEPARTMENT OF TRANSPORTATION

LACTC LOS ANGELES COUNTY TRANSPORTATION COMMISSION

LACTC

LOS ANGELES COUNTY TRANSPORTATION COMMISSION • 354 SOUTH SPRING STREET—SUITE 500, LOS ANGELES, CALIFORNIA 90013 • (213) 626-0370

September 30, 1983

Interested Persons and Businesses
Community Organizations
Elected Officials
Participating Government Agencies

On behalf of all members of the Los Angeles County Transportation Commission, it is my pleasure to transmit this Concept Design Report for the Long Beach-Los Angeles rail transit project; I invite review and comment by all those with an interest in the project.

The Commission is proceeding rapidly to prepare this project for construction, with financing provided by Proposition A, sponsored by LACTC and approved by Los Angeles County voters in November, 1980. This half-cent sales tax provides for comprehensive public transportation improvements, including low bus transit fares throughout the County and the local share contribution to financing for the federally-assisted SCRTD Metro Rail project.

The Commission intends to link up the Long Beach-Los Angeles rail project to the Metro Rail project in downtown Los Angeles. With the combined 41 mile length of these two projects--from Long Beach to the San Fernando Valley--the Commission intends to see that modern, convenient rail transit service is available across a large portion of the County by the end of this decade. Under Proposition A, we are also planning additional rail transit lines that will build onto these first two projects, to achieve quality rail transit across the entire County over the next thirty years.

The Commission is now preparing an Environmental Impact Report for the Long Beach-Los Angeles rail project, and needs your comments on this Concept Design Report as soon as possible. If we receive your comments by November 1, 1983 we will be able to consider them as we complete the Environmental Impact Report, and keep the project on schedule to begin its final design and construction phase in 1984.

Sincerely,

Pat Russell

PAT RUSSELL
Chairwoman

LONG BEACH - LOS ANGELES RAIL TRANSIT PROJECT

CONCEPT DESIGN REPORT

EXECUTIVE SUMMARY

Parsons Brinckerhoff/Kaiser Engineers

September 1983

LOS ANGELES COUNTY TRANSPORTATION COMMISSION

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PROJECT BACKGROUND

The current Long Beach - Los Angeles Rail Transit Project is part of an ongoing transportation planning process for Los Angeles County in which this and thirteen other corridors in the county have been identified as candidates for new transit improvements. This Project is one of the first rail projects (along with the SCRTD Metro Rail Project) to be undertaken by the Los Angeles County Transportation Commission (LACTC) in response to the passage of Proposition A, which provides local funding for development and implementation of a county-wide public transit improvement program.

General Description of the Project

The Long Beach-Los Angeles rail project is being planned as a conventional light rail transit system located primarily in the existing Southern Pacific Transportation Company (SPTC) right-of-way (Wilmington and East Long Beach Branches) extending from downtown Los Angeles to downtown Long Beach. A number of alternative routes are under consideration within the downtown areas of these two cities. The proposed line will pass through the cities of Compton and Carson, and the unincorporated areas of Florence-Graham, Willowbrook and Dominguez Hills in Los Angeles County. The total route will be approximately 22 miles in length, with about 18 miles of it following the existing SPTC right-of-way. Much of the project route will be essentially the same as the last line operated by the Pacific Electric Railway's "Red Cars" which ceased operations in 1961. Design and service characteristics, however, will be upgraded and modernized to meet today's transit standards and to satisfy both present and anticipated future needs.

The Present Study

On January 26, 1983 the Los Angeles County Transportation Commission contracted with the joint venture of Parsons Brinckerhoff/Kaiser Engineers (PB/KE) to provide engineering and environmental consultant services for the Long Beach - Long Angeles Rail Transit Project. The purpose of the study is to conduct preliminary design and to prepare an environmental impact report for the project.

The preliminary design will serve to accomplish a number of objectives, including:

- provide a basis for choosing among a number of design options and variations;
- allow further refinement of the rail system's physical and operational characteristics (alignment, stations, equipment, operations plan, fare collection, etc.); and
- contribute to the preparation of a financial plan for project implementation.

The environmental impact assessment will conclude with a Final Environmental Impact Report (FEIR), thus complying with local and state environmental review requirements which must be satisfied prior to project funding and construction.

PURPOSE AND SCOPE OF THIS REPORT

Work on the Long Beach - Los Angeles Rail Transit Project has focused on the progressive refinement and narrowing of potential design options and variations. Appropriate rail technologies have been reviewed. Over 25 alternative alignments and dozens of potential station locations have been defined and evaluated. A variety of system design issues have been explored at a preliminary level, and measures to mitigate potential vehicular traffic impacts have been formulated.

The study is now at the point where it is desirable to have feedback from government agencies and the general public on the findings of the study to date, prior to undertaking the preparation of detailed drawings, cost estimates, environmental impact assessments, and other investigations required to evaluate each of the remaining alternatives. The purpose of this report, therefore, is to summarize the results of the work which has been accomplished up to this time and the process by which the results were obtained, and to describe the alternatives which will be further evaluated. A formal comparison of the evaluations of the alternatives at the conclusion of the study will lead to a selection of a transit system to be implemented in the Long Beach - Los Angeles Corridor.

Volume I of this Concept Design Report contains the following sections:

1.0 Introduction
2.0 Vehicle Technology
3.0 Alignments
4.0 Stations and Stops
5.0 System Operations
6.0 Vehicular Traffic
7.0 System Design Considerations
8.0 Employment and Training
9.0 Economic Development

Volume II contains detailed drawings of the alternative alignments under consideration (plans and profiles), typical sections throughout the corridor, conceptual layouts for a yard and shop facility, and concept plans for eighteen different stations. Approximately 90 drawings are provided.

This Executive Summary covers the major findings and descriptions presented in Sections 2.0 through 9.0 in Volume I. Those sections should be consulted for additional detail.

SUBSEQUENT STUDY ACTIVITIES

A number of reports, meetings, hearings, and decisions will be required before the conclusion of the present study in mid-1984. A list of key study activities and anticipated completion dates is as follows:

Activity	Completion Date
Describe Yard & Shop Alternatives	October, 1983
Refine Patronage Estimates	November, 1983
Estimate Alternative System Costs	November, 1983
Prepare Operations Plans	December, 1983
Circulate Draft EIR	March, 1984
Hold Public Hearings	May, 1984
Preferred Alternative Report	June, 1984

Activity	Completion Date
(continued)	
Adopt Preferred Alternative	July, 1984
Start Detailed Engineering and Conclude Railroad Negotiations	July, 1984
Final EIR	August, 1984

VEHICLE TECHNOLOGY

An early task in the study was the evaluation of alternative rail transit technologies in order to select the vehicle most suited for use in the Long Beach - Los Angeles Corridor. The vehicles were evaluated using criteria covering such issues as: carrying capacity, compatibility with other projects, operational flexibility, competitive procurement potential, and cost. The results of the evaluation confirmed an earlier choice of light rail vehicle technology (LRT) for the following reasons:

- It can be operated in either exclusive right-of-way or in mixed traffic;
- It is compatible with existing railroad tracks in the corridor;
- It is physically compatible with the proposed Metro Rail System;
- It can be used on an upgraded system (fully grade-separated) if desired; and
- It is now available from a variety of manufacturers and can be produced on a competitive basis.

The light rail transit vehicles, modern versions of the trolleycar, will be capable of operating as single cars or in trains. At this time, six-axle articulated vehicles are recommended, but four-axle cars are not precluded. The vehicles will be designed for low-platform passenger loading, and provisions will be made for lifts or ramps to provide access to the elderly and handicapped. Ride characteristics, vehicle interior, appearance, climate, and sound control will all be designed to maximize passenger comfort. Propulsion will be by electric motors and power will be supplied by means of an overhead catenary line and collected with a pantograph. Vehicle operators will be in constant radio communication with control center personnel.

RAIL ALIGNMENTS

Alternative rail transit alignments (horizontal and vertical locations of the proposed tracks) have been developed for three discrete segments of the corridor:

- Downtown Los Angeles - Union Station to Washington Boulevard
- Mid-Corridor - Washington Boulevard (Los Angeles) to Willow Street (Long Beach)
- Downtown Long Beach - Willow Street to First Street (Long Beach Transit Mall)

The process of identifying candidate alignments, evaluating them, and selecting those meriting further study was accomplished as a cooperative effort of staff of the LACTC, Caltrans, Los Angeles County, CRA, RTD, and the cities of Los Angeles, Long Beach, and Compton, with consultant assistance. Considerations in the selection of alignments included areas to be served, traffic impacts and other physical limitations, relationship with other planned systems (such as the SCRTD Metro Rail Project) and the potential role of secondary bus feeder/distribution systems. A bus alternative was also developed for the purpose of comparison with the rail alternatives.

In identifying candidate alignments, primary consideration was given to maximizing the use of existing public right-of-way (i.e., city streets) and existing right-of-way of the Southern Pacific Transportation Company (SPTC) which links the downtown areas of Los Angeles and Long Beach.

Over 25 different alignment alternatives in the three corridor segments were identified. In downtown Los Angeles, configurations were influenced primarily by considerations of servicing development and redevelopment in the midtown and westside areas of the CBD. In the Mid-Corridor, the alignment was constrained by the need to stay within the existing SPTC right-of-way; variations in profile were developed to respond to redevelopment and traffic considerations in the city of Compton. In downtown Long Beach, primary consideration was given to the most appropriate routes to the downtown area from the SPTC right-of-way.

After a lengthy screening and review process, a small number of the most feasible and attractive rail alignment alternatives were selected for further study and development. A total of ten alternative alignments were approved for further study—three in downtown Los Angeles, three in the Compton area of the Mid-Corridor segment, and four in downtown Long Beach. These are now described. (Note that the symbols "LA", "MC", and "LB" are used to denote alternatives in Los Angeles, Mid-Corridor, and Long Beach, respectively).

Baseline System

A "Baseline" rail transit system has been defined for the purposes of comparing and evaluating the performance, cost, and impact characteristics of each of the alternative systems under consideration. The Baseline System, shown and briefly described in Figure S.1, is, with the exception of a short aerial segment, entirely at grade, and represents the minimum-cost system which can be implemented within the shortest period of time. The Baseline System is comprised of the following alignment alternatives:

Location	Name	Designation
Los Angeles	Broadway/Spring Couplet/ (At Grade)	LA-1
Mid-Corridor	Rail Transit and SPTC Railroad At Grade in Compton	MC-1
Long Beach	Atlantic with Pacific Avenue Loop (At Grade)	LB-4

A detailed description of the alignment of the Baseline System can be found in Figure S.1. More briefly, the alignment begins at the Los Angeles Union Station, providing connections with Amtrak and the proposed Metro Rail System. From there, it proceeds on an aerial structure above the Hollywood Freeway to Broadway and Spring Streets, where an at grade "couplet" (a single one-way track on each street) is formed—southbound on Broadway and returning northbound on Main and Spring Streets. The two tracks rejoin on Washington Boulevard and proceed to the existing SPTC right-of-way near the intersection of Washington Boulevard and Long Beach Avenue. The alignment then follows this right-of-way south to Atlantic Avenue (just below Willow Street) in Long Beach. The rail transit tracks are grade-separated from three major crossing railroad lines and one street

Project Data Sheet - Baseline System

DESCRIPTION

Light Rail Transit technology operating between downtown Los Angeles and downtown Long Beach. Two-track system throughout except for single-track crossing over the Los Angeles River, shared with the Southern Pacific Transportation Company (SPTC). Vehicles operate entirely at-grade, except for aerial section from Broadway or Spring to Union Station, and three new grade-separations at Slauson Junction, Dominguez Junction, and Cota Crossing and one existing at Firestone Avenue. Vehicles generally operate in mixed traffic in downtown Los Angeles and Long Beach, and in reserved right-of-way shared with the SPTC between Washington Boulevard in Los Angeles and Willow Street in Long Beach.

LENGTH

22 miles end to end.

ALTERNATIVES INCLUDED

Los Angeles - Broadway/Spring (Main) Couplet (LA-1)
Mid-Corridor - Compton At-Grade (MC-1)
Long Beach - Atlantic with Pacific Loop (LB-4)

VEHICLE (NOMINAL)

Six-axle articulated LRT car, approximately 85 feet long, with about 64 seated passengers and 96 standees during average peak hour conditions.

STATION FACILITIES

Shelters, benches, information services, elevator and/or escalator access to aerial stations, bus transfer facilities, low-level platforms, and park-and-ride lots at seven stations.

OPERATIONS CRITERIA (PRELIMINARY)

Five two-car trains per hour in each direction during weekday off-peak times. Ten 2-car trains per hour during peak periods. Lower during evenings, weekends, and holidays. Operates 20 hours per day, 365 days per year.

FARE COLLECTION

Pre-purchase at stations; self service system with inspectors. Barrier system eliminated from further consideration. Transfer with Metro Rail system with compatible tickets and/or attendant at interface station. Transfer with bus at rail transit stations provided, with credit or discount.

YARD AND SHOP FACILITIES

Main and satellite yard. Two sites now under consideration--one in Los Angeles and one in Long Beach. Main yard to have full maintenance facilities and storage for 45 cars. Satellite yard to have storage for 12 cars and a light maintenance facility.

TRACTION POWER

750V DC supplied through single-wire catenary throughout.

STATIONS AND STOPS (32 Total; North to South)

1. Union Station (Alameda Street/Macy Street).
2. Broadway north of Temple Street.
3. Broadway between First Street and Second Street.
4. Broadway/Fourth Street.
5. Broadway/Seventh Street.
6. Broadway/Olympic Boulevard.
7. Broadway north of Washington Boulevard.
8. Spring Street north of Temple Street.
9. Spring Street between First Street and Second Street
10. Spring/Fourth Street.
11. Spring/Seventh Street.
12. Main/Olympic Boulevard.
13. Main north of Washington Boulevard.
14. Washington Boulevard/San Pedro Street
15. Long Beach Avenue south of Washington Boulevard.
16. SPTC R.O.W./Vernon Avenue.
17. SPTC R.O.W./Slauson Avenue.
18. SPTC R.O.W./Florence Avenue.
19. SPTC R.O.W./Firestone Boulevard.
20. SPTC R.O.W./103rd Street.
21. SPTC R.O.W./Imperial Highway.
22. SPTC R.O.W./Compton Boulevard.
23. SPTC R.O.W./Artesia Boulevard.
24. SPTC R.O.W./Del Amo Boulevard.
25. SPTC R.O.W./Wardlow Road.
26. SPTC R.O.W. between 27th and 28th Streets.
27. Atlantic Avenue/Pacific Coast Highway.
28. Atlantic Avenue south of Anaheim Street.
29. Long Beach Boulevard/Sixth Street.
30. Long Beach Boulevard/Third Street.
31. First Street between Pacific and Pine Avenues.
32. Pacific Avenue/Sixth Street.

SIGNALS, COMMUNICATIONS, AND CROSSINGS

Manual (operator) control in mixed traffic in downtown areas. Use of block signalling with automatic train protection in the Mid-Corridor area. Grade crossing protection provided at all grade crossings in the Mid-Corridor. Highway traffic signal interconnection throughout with some preemption. Radio communication between operators and central control. Central control to be housed with SCRTD Metro Rail control.

ALIGNMENT DESCRIPTION

The Baseline System begins in the city of Los Angeles (north end) with an aerial, stub-end station located next to Union Station. From there, it proceeds south and then west along the Santa Ana Freeway on aerial structure. An at-grade one-way track couplet is created by a southbound track on Broadway and a northbound track on Spring and Main Streets. They come together on Washington Boulevard, and proceed in a reserved median to Long Beach Avenue. At that point the two tracks join the existing Southern Pacific Transportation Company railroad right-of-way (Wilmington and East Long Beach Branches) and proceed south to Willow Street in the city of Long Beach. The double rail transit tracks are located on the west side of the SPTC track from Washington Boulevard to Slauson Avenue, where they cross on structure over the SPTC track. The Slauson Avenue station is on aerial structure. A third aerial station is located at Firestone Avenue, an existing bridge. The rail transit tracks cross over the SPTC San Pedro Branch Line at Dominguez Junction, and are grade separated with the UP track at Cota Crossing. A new double-track bridge will be provided at Compton Creek. The transit line will share a single-track bridge with the SPTC over the Los Angeles River, the only single track portion of the system. The tracks will leave the SPTC right-of-way at Atlantic Avenue just below Willow Street in the city of Long Beach. Double tracks will be provided on Atlantic, either together in a median or separated at curbside. At Ninth Street, a single one-way track will turn west to Long Beach Boulevard, then south to First Street. There it will turn west to Pacific Avenue, then north on Pacific to Eighth Street. The single track will turn east on Eighth Street to rejoin the other track at Atlantic Avenue.

LEGEND

- ● Station
- ■ Station with Park and Ride
- ▲ Station with Neighborhood Park and Ride

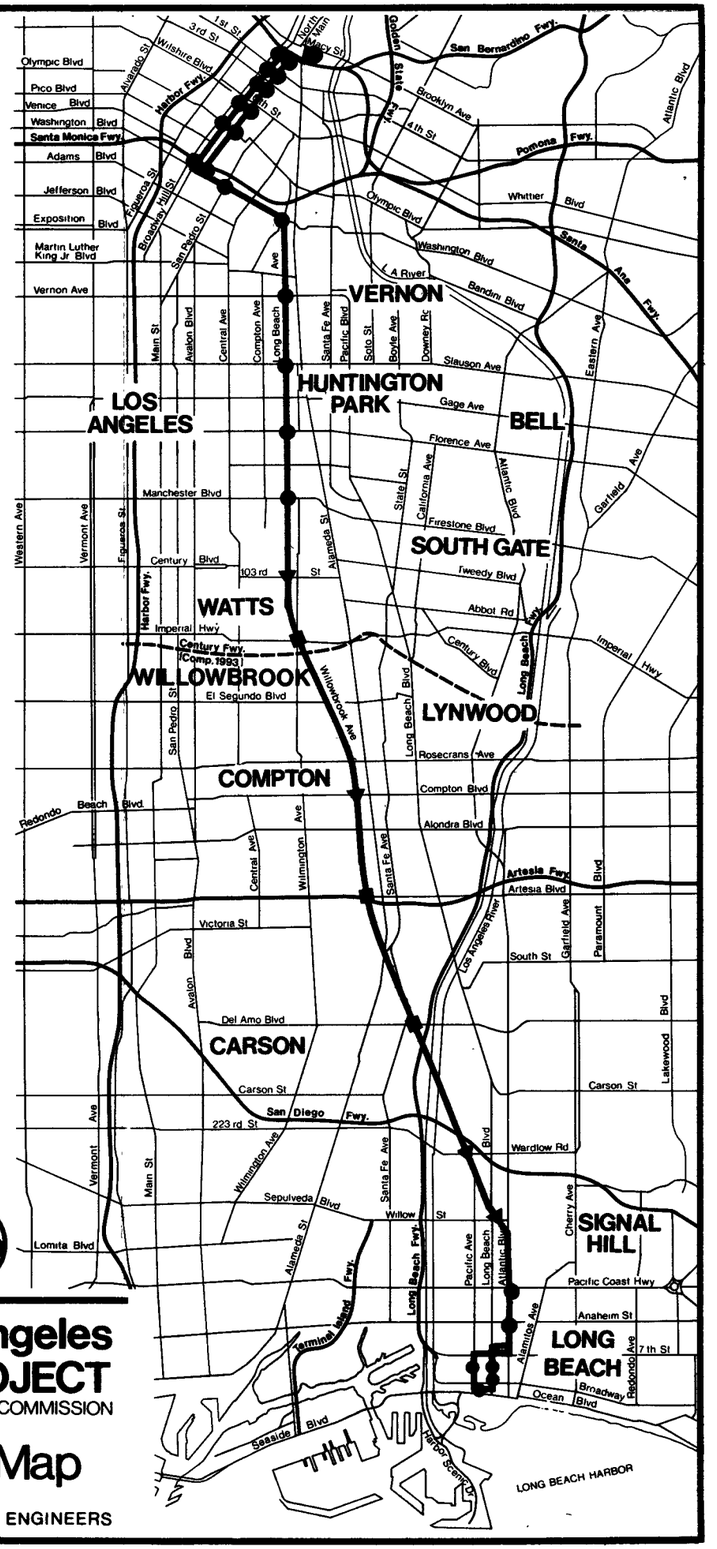

Fig. S.1

Long Beach - Los Angeles RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION

Baseline System Map

PARSONS BRINCKERHOFF / KAISER ENGINEERS

(Firestone Avenue) in the Mid-Corridor segment; otherwise, they cross streets and other rail tracks at grade. The alignment includes a two-track link down Atlantic Avenue in Long Beach, and then a single-track figure-eight loop on Ninth Street, Long Beach Boulevard, First Street, Pacific Avenue, and Eighth Street.

Downtown Los Angeles Alternatives

In addition to the baseline at-grade alignment, two other grade-separated alignments—one subway and one aerial—have been identified for the Los Angeles CBD. These alignments, along with the at-grade alignment, are shown in Figure S.2. Brief descriptions are as follows (going from south to north):

- Alternative LA-2 (Flower Street Subway). From the railroad right-of-way at the southeast corner of downtown Los Angeles, double tracks proceed northwest at-grade in a reserved median in Washington Boulevard, as in Alternative LA-1. From Washington Boulevard, the tracks swing north at Flower Street. On Flower Street between 11th Street and 12th Street, the tracks enter a portal in the middle of the street to become a subway. The subway line terminates at the Metro Rail station at Seventh and Flower Streets.

  A possible future extension of this alignment to the Los Angeles Union Station is shown in Figure 3.2. The tracks would continue up Flower to First Street and turn right on First to Main Street. There the tracks again turn north, then east along the Hollywood Freeway, and finally north into Union Station.

- Alternative LA-3 (Olympic/Ninth Aerial). From the SPTC railroad right-of-way at the southeast corner of downtown Los Angeles, at Washington and Long Beach Avenue, double tracks continue north at-grade in the railroad right-of-way to Olympic Boulevard. At Olympic the tracks elevate to an aerial guideway and proceed west on Olympic/Ninth Street. The Olympic/Ninth line has a segment (SPTC to Santee) in a median of two-way traffic and a segment (Santee to Figueroa) in the west curb lane of the one-way traffic roadway. At Figueroa, it turns to the north to a terminal station south of Third Street.

  A possible future extension of this alignment would proceed as follows: At Third Street the line turns to the east and goes underground through the Bunker

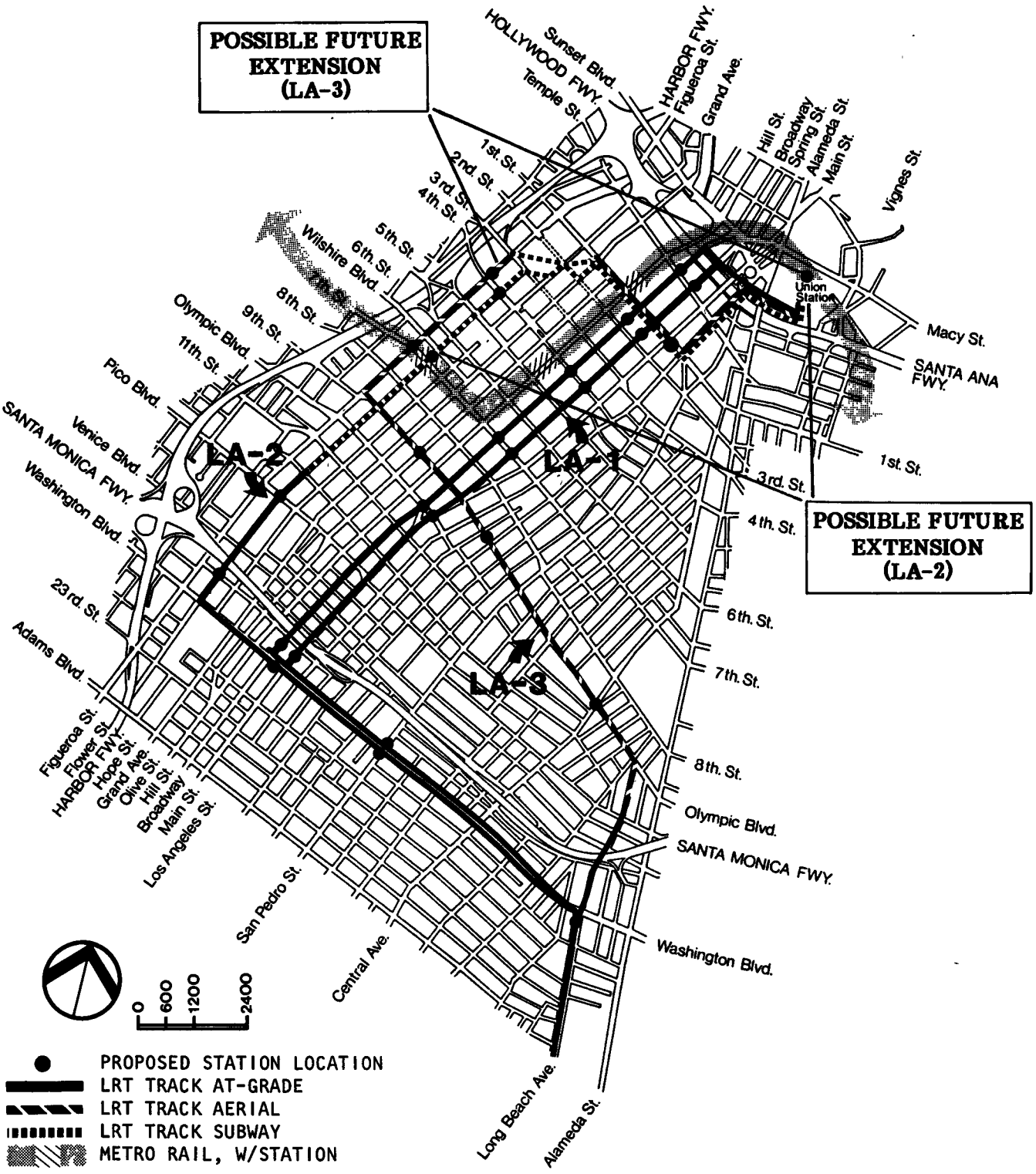

Fig. S.2

Long Beach - Los Angeles RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION

Downtown Los Angeles Alignment Alternatives

PARSONS BRINCKERHOFF / KAISER ENGINEERS

Hill area. The line portals on First Street to an aerial structure east of Hill Street. The line proceeds on First Street to Los Angeles Street where it turns north, and proceeds to the Hollywood Freeway. The line swings to the east along the Hollywood Freeway to a terminal station at the Los Angeles Union Station.

Mid-Corridor Alternatives

The Baseline System calls for both the rail transit line and the existing SPTC Wilmington Branch Line to be at-grade throughout the Mid-Corridor segment, including where they pass through the CBD/City Hall area of the city of Compton (MC-1). In order to reduce the impact of the combination of transit and rail freight traffic through that area, two other alternatives have been developed for the Compton area as shown in Figure S.3. These are:

- Alternative MC-2 (Compton Grade Separation). The rail transit and rail freight tracks are grade-separated (depressed) throughout the central Compton area. All other alignment features in the Mid-Corridor segment are the same as in MC-1.

- Alternative MC-3 (SP Railroad Relocation). The SPTC freight track is relocated from the Wilmington Branch at Watts Junction to the West Santa Ana Branch and the San Pedro Branch. They rejoin the Wilmington Branch at Dominguez Junction. The rail transit tracks are at-grade in exclusive right-of-way through the city of Compton.

Downtown Long Beach Alternatives

Three alternatives in addition to the Atlantic Avenue with Pacific Loop Alternative (LB-4) are under consideration in downtown Long Beach. Two of these traverse the same general

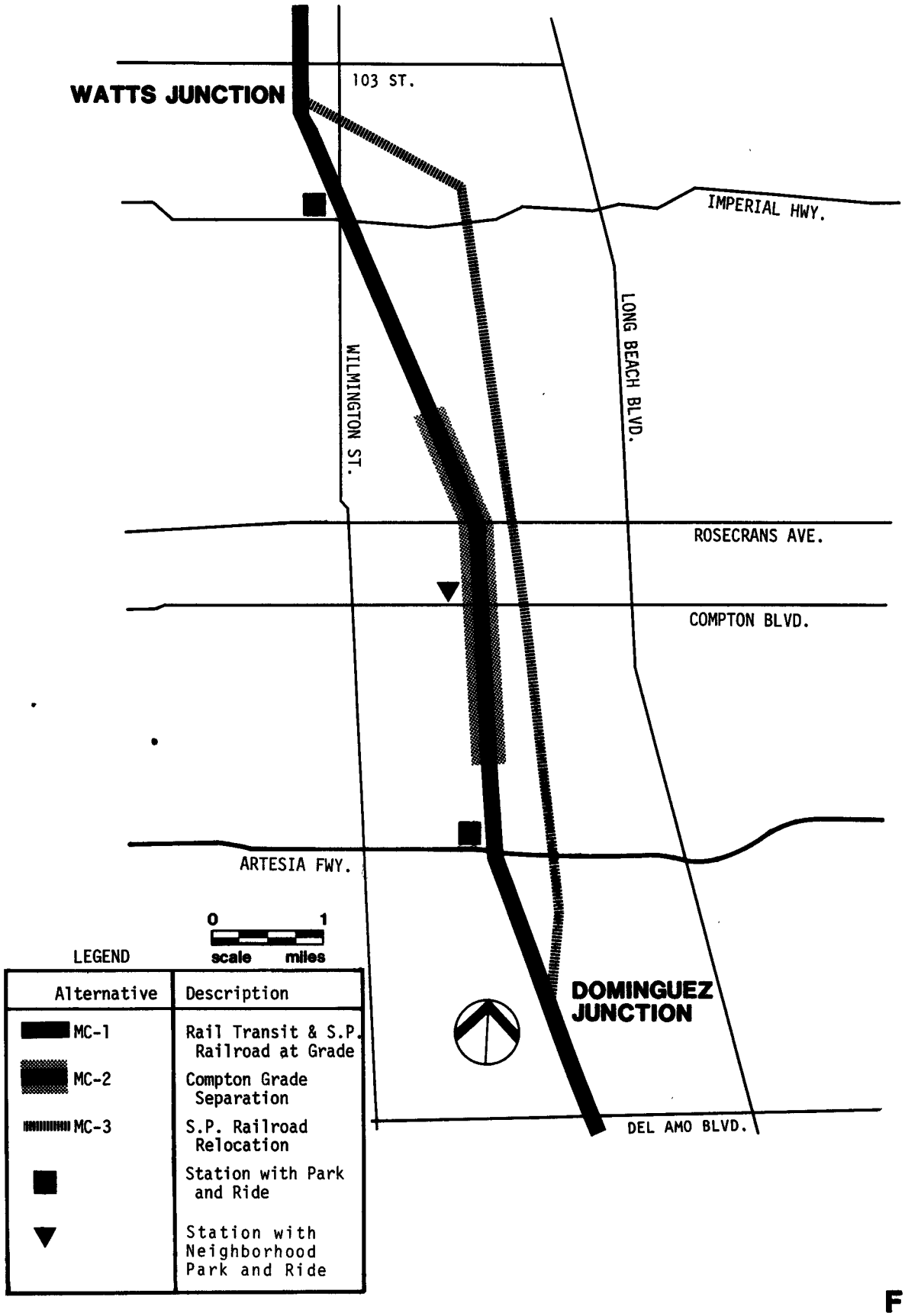

Fig. S.3

Long Beach - Los Angeles RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION

Mid-Corridor Alternatives

PARSONS BRINCKERHOFF / KAISER ENGINEERS

area as the Baseline Alternative, while the other follows a considerably different route. The three alternatives, shown along with the Pacific Loop Alternative in Figure S.4, are:

- Alternative LB-1 (Atlantic Two-Way). This alternative has two tracks at-grade on Atlantic Avenue to First Street, where the tracks turn west and terminate at Long Beach Boulevard. The terminus is a stub-end station with a tail track. Two subalternatives along Atlantic Avenue are: (1) transit tracks in a reserved median; and (2) separated tracks, one at each curb or outer traffic lane.

- Alternative LB-2 (Atlantic/Long Beach Couplet). Beginning at the SPTC railroad right-of-way at Long Beach Boulevard (near Willow Street), a one-way at-grade couplet is created by a track southbound on Long Beach Boulevard, eastbound on First Street, and northbound on Atlantic Avenue, returning to the SPTC right-of-way.

- Alternative LB-3 (River Route). This alternative is located just outside the levee on the east side of the Los Angeles River. The line proceeds from the SPTC bridge crossing the river on retained embankment to Seventh Street, then along the Long Beach Freeway right-of-way at-grade to Fourth Street, eastbound on Fourth, south on Pacific Avenue to First Street, and then east to a stub-end terminus just east of Pacific Avenue.

One version of the Atlantic Two-Way Alternative (LB-1) calls for a reserved median in the center of the street. This would necessitate acquiring considerable property on either side of the street to maintain the required street width. As a result, another version of this alternative has been developed with separated tracks in the parking lanes or outside traffic lanes.

Right-of-Way Requirements

In general, the effort to minimize the impact of the proposed system on private property owners has been successful—all of the alignments lie almost entirely within city streets or within the existing right-of-way of the Southern Pacific Transportation Company. Exceptions where additional right-of-way might be required are summarized here. This information is based on a very preliminary level of engineering, and should be considered

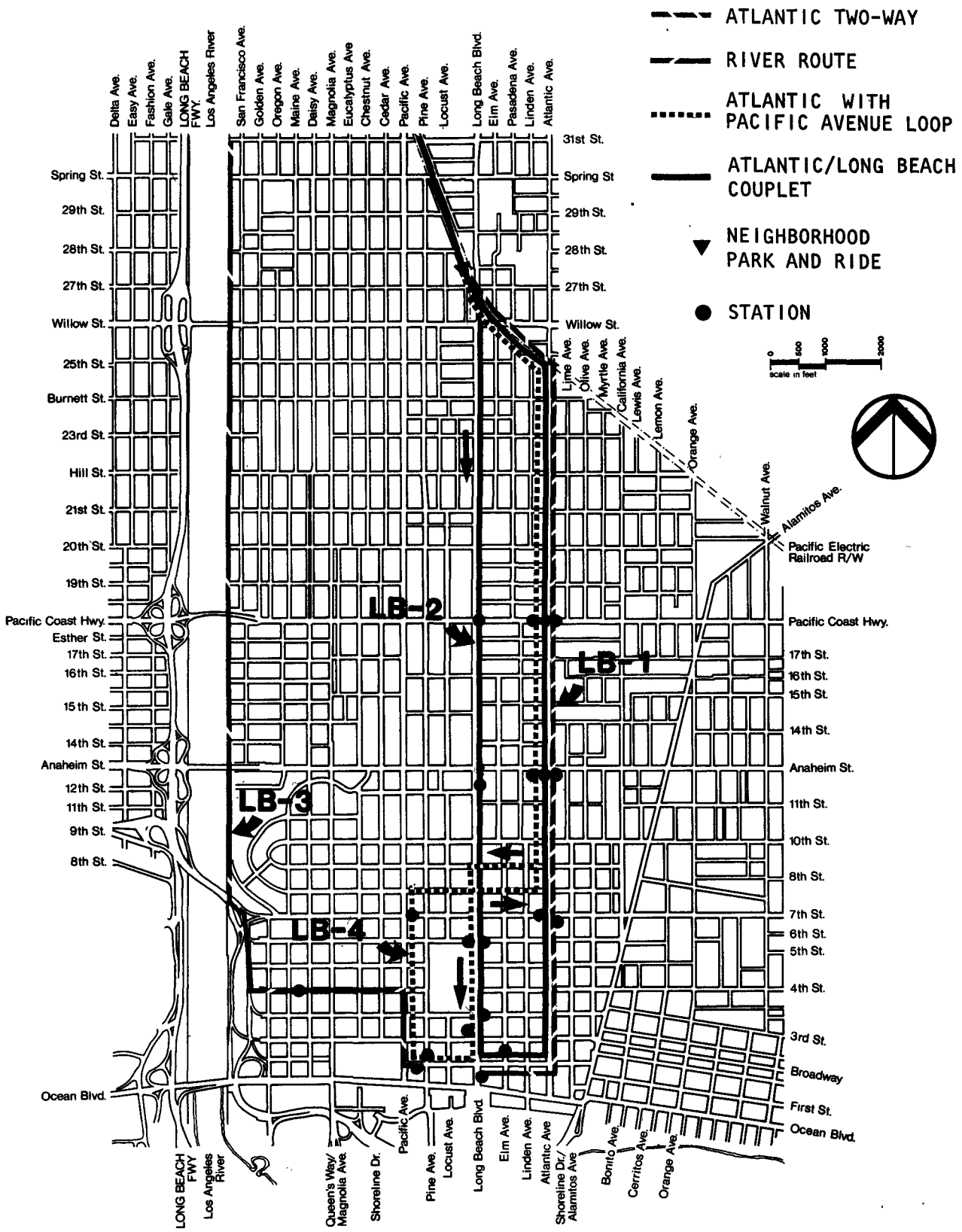

Fig. S.4

Long Beach - Los Angeles RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION

Downtown Long Beach Alignment Alternatives

PARSONS BRINCKERHOFF / KAISER ENGINEERS

only as indicative of likely locations and relative magnitudes of such property requirements, not as firm determinations or estimates.

In downtown Los Angeles, the at-grade alternative (LA-1) will require no acquisition of private property; portions of Broadway will require widening by two feet, which will be taken from the existing sidewalk. The subway alternative (LA-2) will also be generally on or under city streets. Subsurface easements will be required in some areas, particularly if the extension to Union Station is built. The aerial alternative (LA-3) will require aerial easements, and subsurface easements if the future extension is built. Right-of-way in the Union Station area will need to be acquired from either the Los Angeles Union Passenger Terminal Company or Caltrans, which has been negotiating to purchase the site.

In the Mid-Corridor, acquisition of private property will be limited to small parcels at various park-and-ride facilities, and small strips of property at various points to accomodate tracks, road crossing gates, power substations, etc. A negotiated agreement with the SPTC for a joint use of its right-of-way will of course be required as well.

Two of the four Long Beach alternatives will require no direct acquisition of private property (Atlantic/Long Beach Couplet and Atlantic with Pacific Avenue Loop). If the Atlantic Avenue Two-Way Alternative (LB-1) is built with a reserved median, approximately 22 feet of additional street width will be needed, affecting property (including structures) on both sides of the street from Willow Street to Anaheim Street. Some, but not all, of this impact may be mitigable by reducing the amount of additional right-of-way needed by eliminating parking lanes or narrowing sidewalks at critical points. The fourth Long Beach alternative (River Route), will require an easement from the Los Angeles County Flood Control District. Also, several private parcels will be affected by this alternative, as well as a portion of an SCRTD bus yard. Engineering is not yet far enough advanced to allow determination of the exact number of parcels affected by this alternative.

Bus Alternative

To develop a bus alternative for the purpose of comparison with the rail alternatives, alternative bus alignments were developed and evaluated for all three corridor segments. The results of the evaluation were presented to participating agencies and a single alignment (Figure 3.10) was selected for further analysis and comparison with rail alternatives

(and the No-Build Alternative) in the Draft Environmental Impact Report. The alignment is as follows:

- Downtown Los Angeles. It follows the Baseline rail alignment, Broadway/Spring Couplet (LA-1) in the north part of downtown. It then proceeds to Alameda Street via Olympic/Ninth Street. Access to Union Station is on Macy Street.

- Mid-Corridor. The alignment proceeds south on Alameda Street from Washington Boulevard to Artesia Boulevard, then east to Long Beach Boulevard, then south to downtown Long Beach.

- Downtown Long Beach. The alignment continues southbound on Long Beach Boulevard to First Street, where it turns west and terminates at the transit mall.

STATIONS AND STOPS

Utilizing a process similar to that employed for identifying and evaluating alignment alternatives, staff of the LACTC, Los Angeles County and the cities of Los Angeles, Long Beach, and Compton identified candidate station locations for each of the alternative alignments. Prior studies and a review of former Pacific Electric stops were the initial points of departure for this work. Station locations were then screened using such criteria as: system operating speed, proximity to traffic generators, passenger security and safety, ridership potential, availability of land, development impact potential, and relative cost, among others. Selecting station locations required striking a balance between the competing objectives of providing frequent stops for passenger convenience and the need to achieve a relatively high operating speed to attract riders.

Station locations for the Baseline System are shown in Figure S.1. There are a total of 32 stations and stops included in this system--14 in Los Angeles, 12 in the Mid-Corridor, and 6 in Long Beach. With the exception of stations at Los Angeles Union Station and Slauson Avenue, which are aerial, all of the stations are at-grade. Park-and-ride lots are provided at three Mid-Corridor stops, and smaller "neighborhood" parking facilities are included at four other Mid-Corridor locations.

In addition to locating candidate stations, conceptual plans were developed for a variety of site conditions encountered throughout the corridor. These include: at-grade in mixed traffic; at grade in reserved median; at-grade in railroad right-of-way; aerial station at-curb; aerial station in median; and subway station. Several platform configurations were treated, such as center island, side, and staggered. The concepts were developed to assist in developing locations, preliminary costs, and evaluating environmental impacts.

Additional discussion on the selection of stations, as well as maps showing the locations of stations for the other alignment alternatives, can be found in Sections 3.0 and 4.0 of the main report (Volume I). Six of the station concept plans are also included in Volume I, Section 4.0. Concept plans for eighteen stations (including two variations for two of them) are included in Volume II.

OPERATIONS PLANNING

Patronage Forecast

Patronage forecasting has not yet proceeded to the point where detailed operations planning for the Long Beach - Los Angeles rail system can begin. Formal modelling for the Baseline System has been started by the Southern California Association of Governments (SCAG) and is scheduled to be completed in late 1983. Patronage figures in various forms will be provided for seven "build" alternatives and the No-Build Alternative. For comparison purposes, one of the alternatives will be the bus alternative.

Operational Plan - Preliminary Concepts

Using a preliminary figure of 27,800 daily riders, preliminary operating plan concepts have been formulated. With this patronage level, two-car trains will operate at 12- to 15-minute intervals during normal service hours. Six-minute intervals will be required during the AM and PM peak periods, while reduced service (15- to 20-minute intervals) will be offered during nights, weekends, and holidays. The system will operate 20 hours per day, 365 days per year.

With final patronage numbers, a full conceptual operations plan will be formulated for the system. It will include such items as: peak and off-peak service frequencies; car capacities and loading standards; number of cars per train; night, weekend, and holiday service; running speeds; crew requirements; operating hours; and fleet sizes.

Complementary Bus Network

Existing bus service in the Long Beach - Los Angeles Corridor was reviewed with SCRTD and Long Beach Transit for the purpose of identifying potential modifications to (1) direct bus service to and from rail transit stations, and (2) to eliminate un-needed parallel service after inception of rail transit service.

Two types of bus service modifications have been identified: (1) changes in actual routes (including elimination of some lines and addition of new lines), and (2) changes in service frequency. Few modifications will be necessary in the corridor. Existing service in downtown Los Angeles and Long Beach is such that most local lines will either provide direct access to a rail transit station or will operate within close proximity of a station. In the Mid-Corridor segment, major existing east-west lines will intersect the rail transit in many locations, providing collector/distributor service to most stations. Supplemental bus service will be operated on a demand basis over existing or relocated routes to connect with rail stations. A feeder bus system completely separate from the areawide network of local and express buses will not be needed.

SYSTEM DESIGN CONSIDERATIONS

Preliminary study has been given to operations facility design issues associated with construction and operation of the Long Beach-Los Angeles Rail Transit System. It is anticipated that the conceptual material summarized here will be refined during the latter part of the current study.

Yard and Shop Facilities

The rail transit system will require a major facility for performance of maintenance activities and for storage of transit vehicles when not in service. A second, or "satellite," yard will be highly desirable to provide a secondary storage area and light maintenance facility at the other end of the system from the main facility. This will reduce "dead-head" time, (time when vehicles are moved for reasons other than revenue service).

Several candidate sites have been identified and evaluated using basic screening criteria. Some have been eliminated due to conflicting plans for their use and/or their potential cost. Two potentially feasible sites have been identified--one in downtown Los Angeles

between Hooper Street, 16th Street, and Long Beach Avenue; and one in Long Beach located between the San Diego Freeway (I-405), the Los Angeles River, and the existing SPTC right-of-way. The Los Angeles site (10.3 acres) is too small to serve as a main yard facility. The Long Beach site (23.4 acres) is suitable as either a main yard or a satellite yard.

The project team is currently investigating the availability of additional sites in the corridor. Following completion of this investigation, all remaining sites will be evaluated to select the most appropriate site or sites for the system.

Operating Systems

Preliminary design concepts and criteria have been developed for electrification, signaling and communications, safety, security, and fare collection. Major elements are summarized here.

- Electrification. The electrical system will provide power for vehicle propulsion (DC current) and auxilliary needs (AC current), as well as for station and maintenance yard requirements. Power will be supplied directly by the city of Los Angeles Department of Water and Power and the Southern California Edison Company. Power for the vehicles will be distributed through an overhead wire catenary system, and collected with a pantograph. Redundancy, interlocking, and other design features will help ensure system reliability during normal and abnormal operating conditions.

- Signaling and Communications. A control center unified with the Metro Rail System will be the focal point of system operations and security functions. It will house control and communications equipment and operating personnel. The amount and type of signaling equipment necessary to maximize the safe and efficient movement of trains will be determined separately for each track section. The train operator will have primary responsibility for train protection in mixed traffic, while a block detection system may be used in the Mid-Corridor segment. These systems will be evaluated at the end of the current engineering phase. All road crossings will have automatic gate protection.

The communications system will provide the means for exchange of information between the train operators, security, emergency, control center, administrative and maintenance personnel; and the operator to the passengers. It will include radio (four channels), telephone (three systems), public address at selected station, closed circuit television at stations, and a data transmission system for monitoring remote equipment conditions. A cable transmission system will provide signal paths for all other systems except radio. The operations and security cable systems will be combined.

- Safety. All dynamic (moving) system elements will be designed to be fail-safe--that is, the system will revert to a safe condition when a failure occurs. In general, under conditions which do not pose an immediate threat to the health or safety of passengers or staff, vehicle evacuation will be performed only under the supervision of emergency personnel. However, all facilities and procedures will be designed to permit unsupervised vehicle evacuation in emergency conditions.

- Security. High levels of perceived and actual security/control will be provided. Enforcement will be the responsibility of the SCRTD transit police and law enforcement organizations throughout the corridor. Security provisions for the rail transit system will likely include the following: the system will have open and well-lighted stations, each equipped with at least one closed circuit television camera; maintenance facilities will have intrusion alarms and closed circuit cameras. Fencing will be provided along all at-grade sections and on structures that pass over or are adjacent to the railroad tracks. Silent alarms will be provided for all train operators. Vehicle windows will be made of impact-resistant materials to provide protection from thrown objects. Seating and interior finishes will be vandal-resistant, and windows at car ends will afford visibility between cars. Inspectors and sworn transit police will ride the trains and be stationed at high-crime locations. Closed circuit camera monitors will be staffed 24 hours a day, and personnel will report all observed violations to appropriate local police agencies for response.

- Fare Collection. A system for fare collection on the rail transit system has not yet been finalized. However the system will likely include several of the following elements. Regular fares will be handled through self-service pre-

purchase at transit stations, and will be enforced by patrolling inspectors. A zoned fare system will be used, with possible use of bus transfers and county-wide transit passes for all SCRTD operations. Transfers to and from Metro Rail will be handled either by magnetically encoded tickets suitable for both light rail transit and Metro Rail operations, or transfer attendants at interface stations, or both.

Streets and Utilities

Construction of any of the at-grade alternatives will require extensive modifications to and, in some cases total reconstruction of, city streets and utility systems. This will be the case in all three segments, but particularly in downtown Los Angeles and Long Beach. Both aerial and subway alternatives in Los Angeles will have somewhat less impact--much of the subway boring will be at a level below existing utilities, while the aerial configuration will create problems only at pylon locations. In general, utility lines that are perpendicular to the alignment will not require relocation or modification. Overhead utility wires, street lights, and traffic signals will require modification and/or relocation at various points throughout the corridor. A major storm drain relocation will be needed in the vicinity of Compton Avenue in the event that Alternative MC-2 (Compton Grade Separation) is implemented.

Railroad Freight Operations

All of the proposed alignments will share a portion of the Southern Pacific Transportation Company right-of-way with rail freight operations. While there is sufficient room at virtually all points to accommodate the two-track rail transit system and a single-track SPTC line, a number of industrial spur turnouts along the route will necessitate that the two systems--transit and freight--cross at-grade.

For all three Mid-Corridor alternatives, rail transit grade separations will be built over rail freight lines at Slauson Junction, Dominguez Junction, and Cota Crossing. In addition, five industrial spur lines will be crossed by the rail transit tracks at-grade for all three alternatives. Freight traffic on these spurs is forecast to be very light, and fail-safe interlocking signals will be maintained at every at-grade crossing.

The rail transit system will share an existing single-track bridge over the Los Angeles River with the SPTC freight line, which will also require the use of interlocking signals. Freight operations are presently very light over this bridge, and plans by the SPTC call for abandonment of this track section, which will eliminate this transit/freight conflict point.

OTHER PROJECT CONSIDERATIONS

Impact on Vehicular Traffic

A traffic impact analysis was conducted to assess the probable effect of the planned rail transit system on traffic circulation, roadway capacity, parking and loading, and traffic safety. Mitigation measures were identified for areas with unacceptable design conditions.

In downtown Los Angeles, the impact of the at-grade alternative (LA-1) on traffic should be moderate, including some potential conflicts on Broadway and Main Street near Washington Boulevard. The subway and aerial alternatives will have little or no impact on downtown traffic, except possibly in the areas of support pylons or the subway portal. None of these impacts is considered severe, and many will be mitigable with modifications to signals, lane configurations, etc.

In the Mid-Corridor, an analysis of running service at six-minute intervals in both directions in the Year 2000 was conducted. The results indicate that transit service alone will not significantly affect traffic flow at most locations--resulting queues will usually clear within two signal cycles. A simulation of the effect of rail freight operations showed that if long freight trains pass in rush hours, excessive queueing will occur at over half of the street crossings, whether or not there is rail transit service in the corridor. A traffic signal progression system was developed for the rail transit system, and showed that both vehicular traffic and rail transit traffic can be accommodated with a mix of preempted traffic signals, and signals where the trains must wait for their portion of the cycle.

Traffic impacts in downtown Long Beach will be similar to those described in downtown Los Angeles. Conflicting movements at several locations, including the rail crossing at Eighth Street and Long Beach Boulevard in the Baseline Pacific Loop Alternative, will require application of specific traffic control devices to maintain proper priority assignment at these locations.

Employment and Training

The Los Angeles County Transportation Commission will be addressing ways to ensure that proper affirmative action in employment will be addressed in contracts for final design and construction of the project. Policies may be restricted by such considerations as provisions of law, labor union agreements, the specialized nature of rail transit construction, and the need to limit costs. The Commission is now investigating the feasibility of adopting program components for AA/EEO hiring by contractors, MBE and WBE participation in design and construction, apprenticeship and training programs, and a limited youth training program. None have been adopted as of this report date.

Economic Development

The Los Angeles County Transportation Commission is now in the process of defining an appropriate role to be assumed during construction of the rail project, in order to maximize the project's potential for impact on economic development in the corridor. The Commission will work closely with redevelopment and planning agencies throughout the corridor to coordinate redevelopment programs with the location and design of stations. The Commission welcomes proposals from agencies and private developers for joint-development projects at station sites.