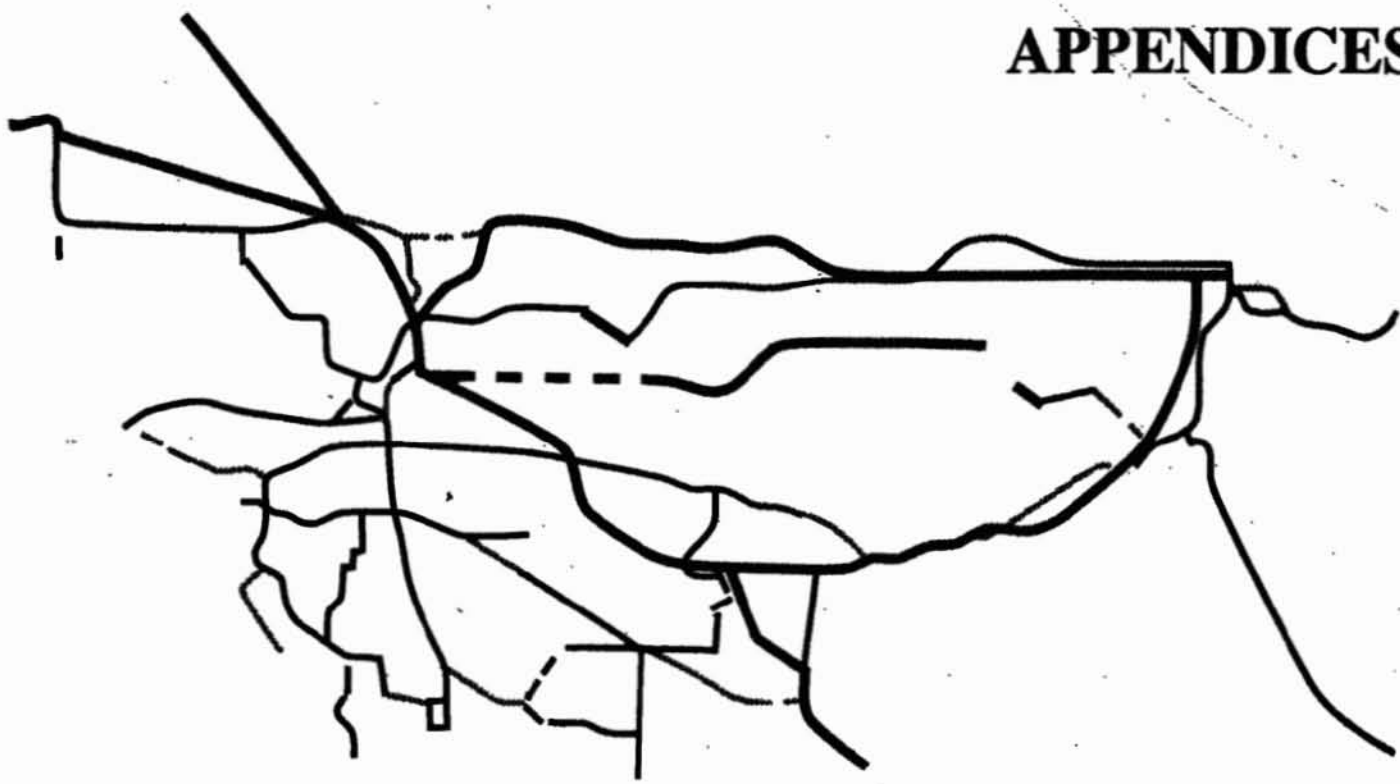
RAILROAD RIGHT-OF-WAY EVALUATION PROJECT

APPENDICES



August 1989

Preliminary Technical Report

scag
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
818 West Seventh Street, 12th Floor • Los Angeles, California 90017 □ (213) 236-1800 • FAX (213) 236-1825

October 9, 1989

To: Agency Staff and Interested Parties

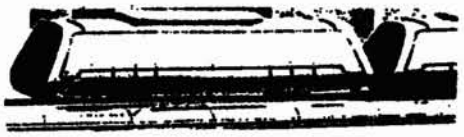
SCAG has recently completed the Railroad Right-of-Way Evaluation Project. Enclosed please find the preliminary technical report (including an executive summary and appendices) which resulted from this study.

We believe that this will be a valuable resource for transportation planning and community development as our area pursues implementation of the Regional Mobility Plan. The report discusses a number of important issues, including preservation of railroad rights-of-way as these become available for public purchase for public transportation purposes, and joint transit/real estate development to enhance development of activity centers and promote environmentally favorable land use patterns.

We appreciate your comments on this document, as we take these critical issues through SCAG's committee process.

Sincerely,

Jim Gosnell,
Director of Transportation Planning



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RAILROAD RIGHT-OF-WAY EVALUATION PROJECT

October 9, 1989

Mr. Joel Woodhull
Policy Analysis Manager
SCRTD
425 S. Main Street
LA, CA 90013

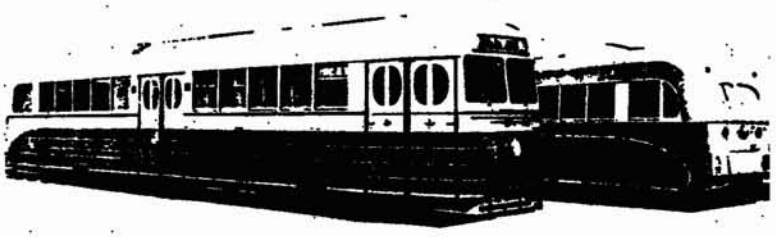
Dear Joel:

Here's the report at long last!

Sincerely,

Alan D. Havens, Ph.D.
Senior Planner

P.S. I thought you'd appreciate the specially modified SCAG stationary which is reserved for the RTP group (Real Tranportation People--not "Regional Transportation Plan"). I doubt that SCAG will adopt this as standard!



RAILROAD RIGHT-OF-WAY EVALUATION PROJECT

APPENDICES

Southern California Association of Governments
818 West Seventh Street, 12th Floor
Los Angeles, California 90017

August 1989

FORWARD

This document is intended to advance the goals and objectives outlined in SCAG's Regional Mobility Plan in the areas of identifying and protecting potential rights-of-way for transportation corridors connecting subregions and major activity centers, and fostering coordinated and mutually supportive transportation and land use development.

The Regional Mobility Plan.

The Southern California Association of Governments has undertaken the challenge to maintain and improve the quality of life for the Region's residents by addressing regional transportation needs as we move into the Twenty-First Century. This challenge of managing rapid growth, avoiding resultant severe congestion, and securing healthful air has evolved into the development of the Regional Mobility Plan which has been adopted by SCAG's Executive Committee. The Plan provides an overall framework to meet regional transportation needs.

Major components of the Regional Mobility Plan are development of new transportation facilities, transportation system management (TSM), transportation demand management (TDM), and growth management.

On The Cover

The network displayed on the front cover is a simplified schematic of the railroad system, with the addition of abandoned rights-of-way.

Black lines:	Transit facilities existing, under construction, or programmed/in final engineering.
Red lines:	Operating main lines, used by existing intercity passenger services, or with commuter rail or transit potential.
Dark blue lines:	Operating railroad branch lines, with transit or commuter rail potential.
Light blue lines:	Abandoned railroad and interurban lines with transit potential.
Dotted lines: (all colors)	Possible links to other rights-of-way (freeway or utility alignments, etc.).

THIS IS THE SECOND OF TWO DOCUMENTS

The FINAL REPORT and Executive Summary for the Railroad Right-of-Way Evaluation Project are separately bound in another volume.

Notice: This document is a preliminary technical report. Because of the widespread interest in the subject matter contained herein, it is released for purposes of public review and information exchange. Specific recommendations in this document, and suggestions as to the potential transit uses of individual rights-of-way, represent a collection of SCAG staff opinions, and should not be construed as adopted SCAG policy. However, study recommendations are consistent with SCAG's adopted Regional Mobility Plan, Growth Management Plan, and other adopted regional policies.

RAILROAD RIGHT-OF-WAY EVALUATION PROJECT
FINAL REPORT

APPENDICES

APPENDICES (Cont'd)

APPENDICES (Cont'd)

APPENDIX FIGURES

APPENDIX FIGURES (Cont'd)

APPENDIX FIGURES (Cont'd)

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Dr. Alan Havens, Ph.D., Senior Planner. Report author and editor; all appendices (except for Appendix I); field work --Phases I, II, and III; report graphics, maps, and illustrations.

Commuter Rail Patronage Modeling (Phase II)

Teresa Wang
Dale Iwai

---

* Former SCAG employee

ACKNOWLEDGMENTS

SCAG staff would like to thank Brian Weber and Ted Tanner (formerly) of the Santa Fe Pacific Realty Co., Rex Lottery and Marty Borko of the Urban Innovations Group, and Professor Marty Wachs and Dean Richard Weinstein of UCLA for guidance and support provided during Phase I of the study. We are grateful to Carol Brooks of the Interstate Commerce Commission and to Lou Cluster of the California PUC for providing information on the railroad abandonment process. Further appreciation is due to Ken Galt, Leon Hackett, and Matt Paul of Caltrans for information on short line railroads, for a status report on the Abandoned Railroad Right-of-Way Account, and for furnishing historical information on the development of intercity and commuter rail service in the Los Angeles area.

Thanks are also due to Christine Huard-Spencer of the OCTD for an update on the Orange County transitway program, and to Gary Spivack of the SCRTD for permission to use his February, 1988 memorandum on right-of-way protection. Numerous individuals supplied information on the regional railroad network and ideas about potential transit routes; while space would not allow all of them to be listed here, their help is very greatly appreciated. Finally, thanks are due to Neil Hancock for his fine work on the report covers.

ABSTRACT

The SCAG region is favored by an extensive network of railroad lines owned primarily by three major rail freight carriers. Many of these rail lines are currently underutilized, and recent trends in the railroad industry to improve efficiency dictate a continuing reduction in route mileage over the next several decades. At the same time, in-migration and vigorous economic growth are leading toward worsened traffic congestion and air quality in urbanized areas of southern California.

Railroad rights-of-way are particularly attractive for transit development, as many of them were former Red Car or steam railroad routes which helped to create our older community centers; and because some are bordered by marginal light industrial land uses, providing opportunities for public/private joint venture projects centered on new transit facilities.

Numerous examples are given of successful transit operations on railroad rights-of-way in North America, using various modes: rapid transit, light rail, busways, commuter rail, and new guideway technologies. Considering the exorbitant cost of tunnel construction and the disruptive effects of new surface right-of-way preparation, it is highly desirable to redevelop certain existing and former railroad lines for transit purposes, where feasible without interfering with viable rail freight services.

A primary objective of the Railroad Right-of-Way Evaluation Project has been to identify underutilized rail lines which may soon be abandoned and could if preserved be used for developing line-haul transit facilities to help solve our urban mobility problems in the relatively near term. Approximately twenty railroad branch lines (and one main line) in Los Angeles, Orange, San Bernardino, Riverside, and Ventura Counties are discussed in detail, which have a modest level of freight activity or may soon be subject to withdrawal of freight operations, thus presenting major public transportation opportunities.

Four lines, the SP Santa Monica, West Santa Ana, and Burbank Branches, and the Santa Fe Second Subdivision, were advanced several years ago by railroad industry representatives as likely candidates for abandonment and subsequent transit use, and have been the subject of considerable recent publicity. Limited development for transit of a fifth line, the Santa Fe Harbor Subdivision, will soon take place under a right-of-way sharing arrangement; more segments of this line may become available after implementation of the Alameda Corridor rail freight consolidation plan to serve port growth. All five lines correspond with recent county transit plans and proposals.

Transit facilities constructed on these railroad rights-of-way would serve numerous employment, residential, retail, and other activity centers which would generate high levels of patronage;

they would provide commuters and other travelers with an alternative to driving on congested, parallel freeways and arterial highways. They would also furnish opportunities to enhance existing centers, facilitate community development, and promote favorable and balanced land use patterns.

An allied project goal has been the identification of abandoned rail lines and former interurban electric railway rights-of-way meriting protection for future transit use: approximately twenty such abandoned rights-of-way are described. In addition, several main line segments (not in danger of abandonment) are discussed which may have considerable transit potential; and plans to develop intercity and commuter rail service on about a half dozen additional lines, entailing trackage rights agreements with the host railroads, are elaborated on.

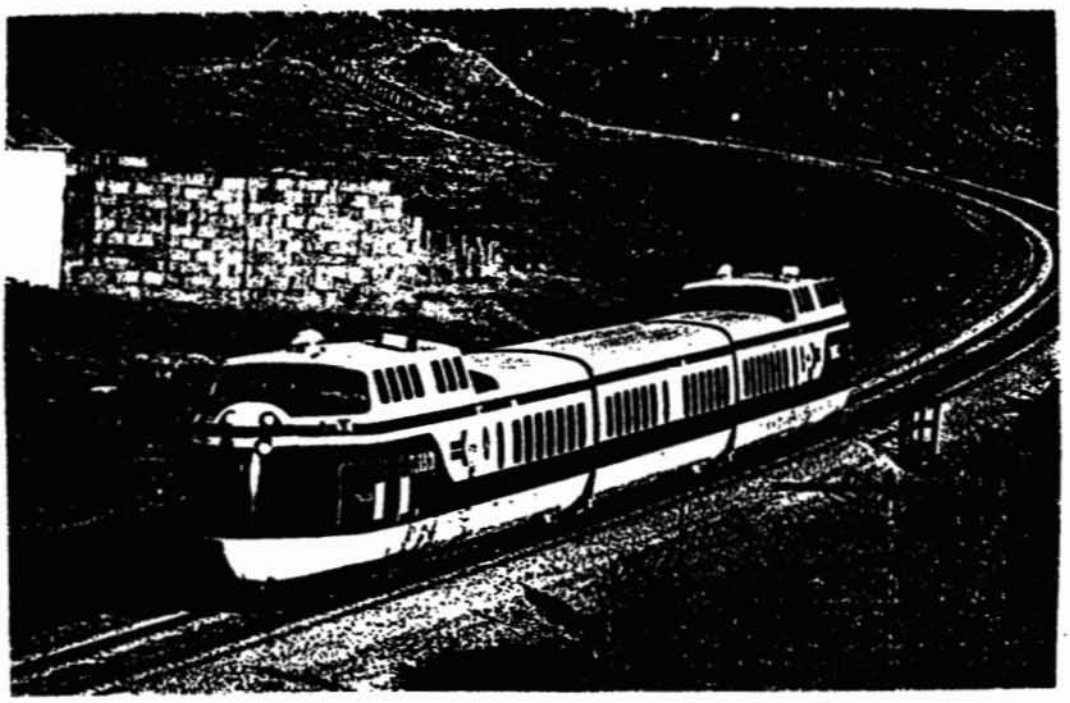
A second major objective of the study has been to investigate transit/real estate joint development opportunities on under-utilized railroad yards and other property which can make transit projects on railroad rights-of-way partially self-supporting. Various strategies exist for transit to capture increases in land values; some of these are especially well suited to railroad industry participation. Some experts believe that from 20 to 40% of capital costs for new transit facilities can be defrayed through public/private joint ventures and a variety of value-capture mechanisms.

Another important reason for interest in joint development is that by focusing growth around transit stations, it can help to promote jobs/housing balance and be a key element in the improvement of mobility and air quality in our multi-centered region. Further, by concentrating new and relocating development (such as mixed-use projects) that will occur in outlying areas along linear rail corridors, environmentally sound development patterns can be engendered, along with reverse commute movements and off-peak travel that will help to reduce transit operating subsidies.

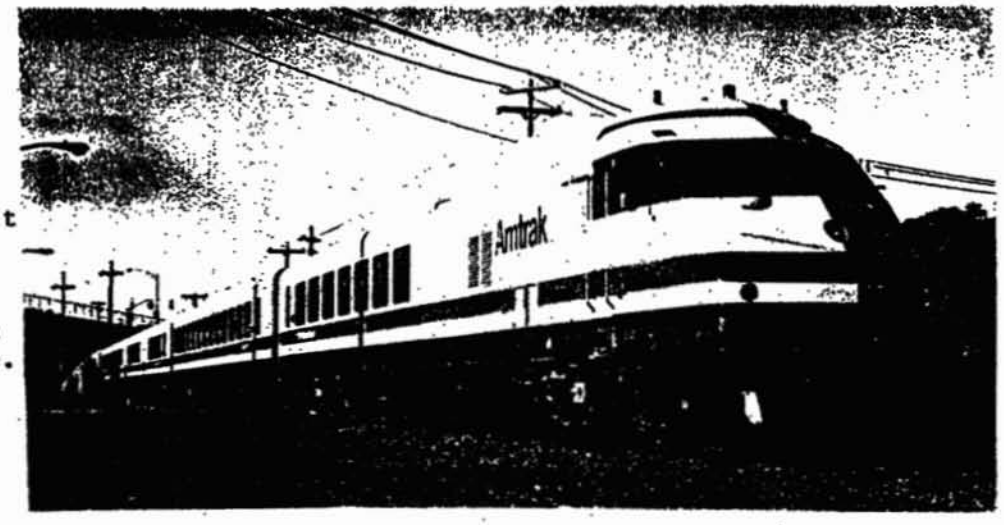
Transit technologies most suitable for operation on railroad rights-of-way are detailed, including representative capital costs and operational and environmental issues. Also discussed are the different ways in which transit facilities may be constructed on existing or former railroad lines, with special regard to accessing major centers. A number of examples of joint transit/commercial undertakings are described, including several cases of privately-financed transit shuttle lines.

Rail freight issues are also covered, with a description of the regional railroad network as it exists today, comments on rail cargo access to the port area, and a discussion of options for right-of-way sharing between freight and passenger lines: including joint LRT/short line freight service, and commuter rail on railroad main lines. Finally, the railroad abandonment process is briefly described, together with the issue of agency responsibility for R/W protection.

TURBINE-POWERED TRAINS USED IN HIGH-SPEED INTERCITY RAIL SERVICE



Above: United Aircraft Turbo Train, shown here on tour in California, just south of San Jose. This train featured a locomotive unit at each end, and self-steered, single axles between each adjacent coach.



Right: Rohr-built turboliner, at Renselaer, NY. --built for the Buffalo-New York corridor service.

APPENDIX A

APPLICABLE TRANSIT MODES AND TECHNOLOGY ISSUES

A.1 Applicable Transit Modes.

Professor Vukan Vuchic, one of the world's leading academic figures in the field of public transportation engineering, states that a transit mode is defined by three characteristics, given below (1):

i). Basic technology: steel wheel on steel rail or other guideway system, free-wheeling rubber tired vehicle on paved roadway, etc.

ii). Type of right-of-way. He further classifies rights-of-way (R/W) into three categories:

A. Fully controlled or grade separated R/W without grade crossings.
B. Surface private R/W which is longitudinally and horizontally separated by curbs, barriers, crossing gates, or type of construction (e.g. railroad track with ties resting on crushed stone ballast, which is difficult for road vehicles to trespass upon).
C. Mixed traffic operation on surface streets, arterials, and freeways (pedestrian-transit malls would be a special case of this).

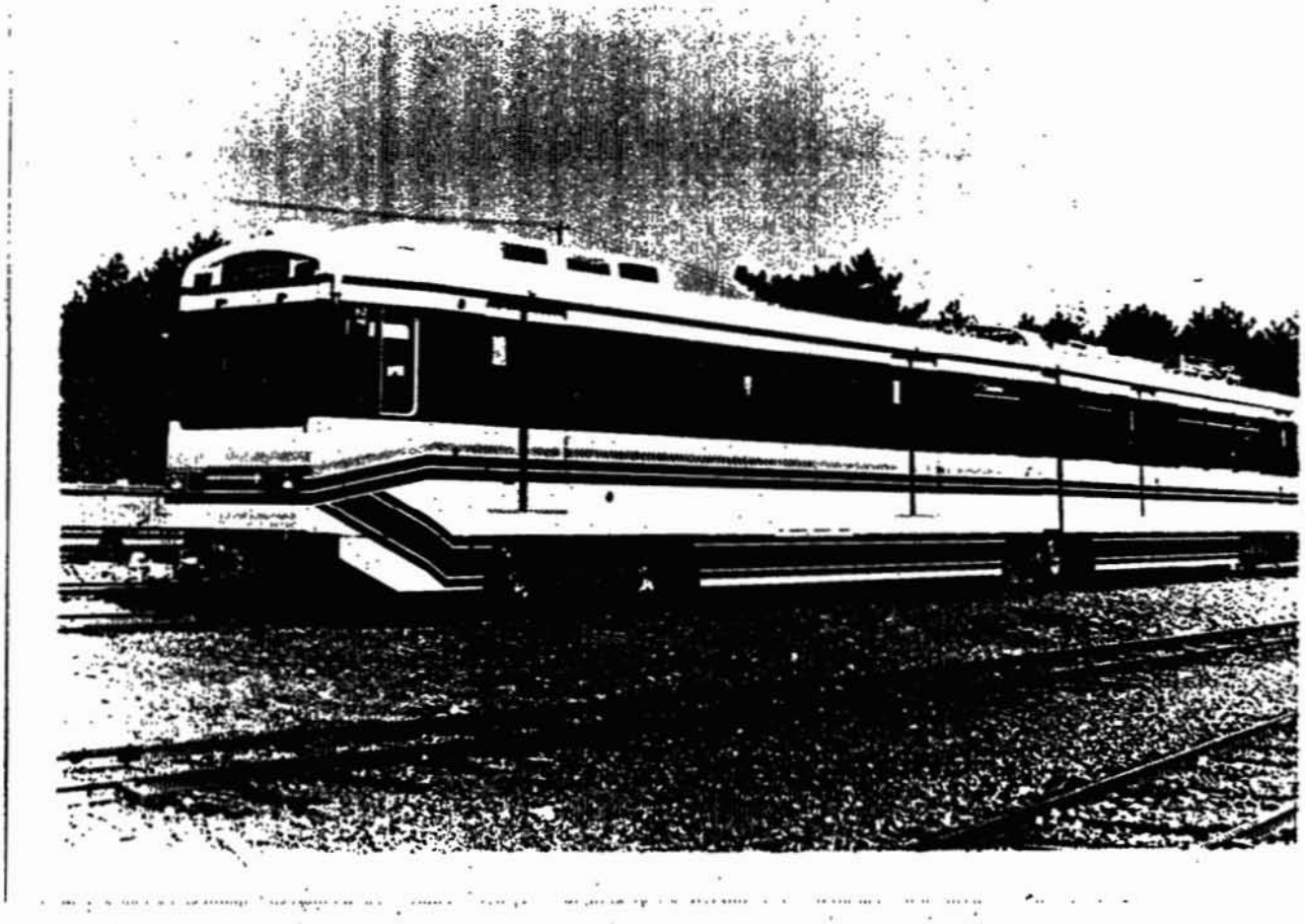
iii). Type of service or operation: local, limited stop, express, etc.

Bearing these facts in mind, the following are descriptions of the transit modes likely to be candidates for operation on existing or former railroad rights-of-way.

Rapid Transit. Rapid transit is generally taken to mean a conventional rail transit system with full grade separation for operation at speeds of 50-80 MPH with no interference from cross traffic (Figure A.1). The terms "heavy rapid transit," or sometimes "heavy rail," are also used, but imply transport of high volumes of people and very high theoretical capacities (2,3). Recently-built rapid transit equipment is generally lightweight in construction.

Grade separation of rapid transit requires either subway or aerial construction, or surface right-of-way with all cross streets and pedestrian ways placed under or over the rail line. Hence, rapid transit is often developed on corridors where no existing surface rights-of-way are available, e.g. along a congested urban arterial where there are no traffic lanes to spare. These situations may often bring with them the demand justifying the high cost of constructing subway lines (4). Rapid transit is limited to right-of-way category A only.

Rapid transit systems employ high platform loading to reduce delays in boarding and alighting large volumes of people. These systems are electrified, usually with 750 Volt DC power distributed at track level by third rail (permitted by full grade separation). However, certain systems (e.g. Cleveland) utilize



LIGHT RAIL DEVELOPMENT ON A FORMER RAILROAD RIGHT-OF-WAY IN THE LOS ANGELES AREA

The Long Beach-Los Angeles LRT line is currently under construction along several Southern Pacific rights-of-way. The first car is shown here at the maintenance facility, located along the abandoned SP East Long Beach Branch.

The Long Beach-LA light rail vehicle is a high-performance car, believed to have a balancing speed of about 65 MPH; straight-line acceleration rate is 3 MPH/S, and the car can attain 55 MPH in 45 seconds. During the initial operation, speed will be governed at 55 MPH which is appropriate for a one-mile station spacing. The Long Beach car has particularly attractive styling, is fully air-conditioned and provides an excellent view out of the front and back ends, as well as from side windows. This type of vehicle, operated on electric power, is very quiet and pollution-free. (Photo, courtesy LACTC.)

overhead catenary and pantograph power pickup.

Whereas most rapid transit lines utilize standard gauge (4' 8 1/2") steel wheel on steel rail technology (Figure A.2), some rapid transit systems (such as Montreal) employ rubber-tired trains (5,6 and Figure A.3). Automation is also possible. Rapid transit lines exist today that are variously manually operated (with automatic block signaling), partially-automated and thus able to be run in either ATC (Automatic Train Control) mode or manually, or fully-automated.

The term "light rapid transit" is used for fully grade separated lines with shorter trains or single cars (and often narrower equipment). Automation of such systems permits very high train frequencies without the need for a driver or attendant in each train. These systems are actually medium capacity rapid transit systems (see Figure A.4).

Light Rail Transit. Light rail transit is a medium capacity electric railway mode with the capability to cross streets, arterials, and pedestrian thoroughfares at grade. This requires overhead trolley wire or catenary, and pantograph power pickup. Power is generally 750 volts DC, the same as for rapid transit systems (7-10).

Light rail can utilize any kind of right-of-way where it is feasible to lay track: subway or aerial (R/W category A), surface railroad R/W with crossing gates to exclude surface traffic when the trains come through (R/W type B), curbed reservation along arterials with traffic signal preemption, transit malls which allow entry to buses and pedestrians, or even mixed traffic situations (streetcar mode) in local areas where traffic is light (R/W type C).

Hence, light rail is the most versatile rail transit mode from the viewpoint of joint operation with other forms of transportation and can utilize non-grade separated former railroad lines, at some considerable savings in construction costs.

Light rail cars are often equipped to pick up passengers at street level or from low platforms; however, they can also be designed to load from high level platforms like rapid transit trains, and some systems utilize adjustable steps for high and low level loading (Figure A.7). Various car configurations are used (Figure A.5) and at the present day most systems operate long articulated cars, permitting higher capacities and better passenger distribution within the vehicles. With trains of several cars under control of a single operator (permitted by self-service fare collection), considerable labor efficiency is achieved as compared to bus operation (Figure A.6).

It is difficult to characterize a "typical" light rail operation, as the term light rail encompasses a whole range of sub-modes with different types of R/W construction, vehicles, and operation. However, an idealized typical LRT line might begin in subway in a big CBD area, transition to a short aerial or freeway alignment and continue on a surface right-of-way (like an old railroad line) with surface traffic excluded by means of crossing gates, gain entry to a smaller satellite CBD or suburban town running on reserved lanes segregated by curbing and with signal preemption at cross streets, and end in a short section of pedestrian/transit mall (Figures A.8-A.12).

Where old railroad lines have been used, it is sometimes possible to incorporate former rail stations with a minimum of rehabilitation (Figure A.13).

If traffic exclusion is effected by a combination of grade separation of major arterials and gating minor cross streets, light rail can operate at much the same speeds as rapid transit. The California PUC allows LRT systems to operate up to 55 MPH through gated crossings, if automatic train protection (ATP: cab or wayside signals) is provided. If, in addition, an automatic train stop feature is provided, there is no speed limit (11). The equipment can be designed for any desired speed: interurban railways in the past operated at up to 70-85 MPH (at grade--see Figure A.14). Assuming the required safety devices, how much faster than 55 MPH it might be desirable to operate LRT through gated crossings in an urban setting would depend upon local factors.

If certain segments of a line rely instead upon signal preemption, average speeds will be lower. The California PUC allows a 10 MPH greater speed than the parallel street between intersections, if the R/W is ungated but fenced (and the same speed as the street for progression through the intersection). Hence, for a 35 MPH arterial, LRT could operate up to 45 MPH between intersections with only signal preemption. At intersections with only traffic lights, the limit would be 35 MPH in this case. For a side-of-road alignment, without ATP but with gates, the maximum allowed speed is 45 MPH.

One more note: despite the term "light rail," neither the cars nor the track are lightweight. LRVs are often heavier than conventional rapid transit cars because the articulation joint and extra (center) truck will add weight; relatively heavy rail tends to be used for the tracks because lightweight rail is seldom available nowdays in this country. The extra wheelsets can be put to good use however if steep grades occur on the line (see Figure A.14): some European systems power all axles, permitting the LRVs to ascend 10% grades easily (as opposed to 6 or 7% with only four of six axles powered, which is the more common practice for operation on level terrain).

The term pre-metro designates an initial design of light rail allowing a fairly easy upgrade to a rapid transit or metro system. The fact that light rail lines can be constructed more cheaply than rapid transit has often made LRT an interim, lower-investment alternative.

Busways. Busways represent another attractive strategy for lower-capital cost transit investment. The general idea is to expedite transit bus operation by routing the vehicles on private right-of-way to bypass congested highway segments, while running on surface streets both for suburban pickup and CBD distribution (12-14). Right-of-way types A and C are most appropriate (see Figure A.17).

A variety of bus equipment can be used, including standard 40' transit buses and intercity coach designs; there has been considerable recent interest in the use of higher-capacity articulated and double-deck buses for busway operation (Figures A.15-A.16).

Express bus operation in mixed-flow lanes on freeways has often failed to

attract the desired volume of transit riders, because the buses tend to bog down in heavy peak period congestion. If instead these express buses are driven over special bus or HOV lanes, or on separate alignments such as former railroad rights-of-way, much more efficient bus system operation is possible, with lower operating costs (better equipment utilization and less driver time) and much improved attractiveness to riders.

Buses have extreme flexibility as compared to any form of fixed guideway transit, as they can operate over any street or arterial. This means that a number of bus routes can fan outward at the end of the busway, providing an extensive network of lines for local pickup and distribution. This can minimize the need to provide transit park-and-ride lots, although some busway facilities (e.g. El Monte) do have extensive station parking.

In CBD areas, the buses can operate on special curb-side, with-flow or contra-flow bus lanes; or bus-only transit malls can be developed. It is sometimes feasible to provide signal preemption to move the buses more rapidly through intersections.

Another useful feature is that where highway traffic is highly directional and right-of-way for busway development limited, one-way, reversible bus lanes can be used, with the return movement made in mixed flow on freeways in the less congested direction. As it happens, most express bus facilities built in recent years have been combined with HOV lanes on freeways, so that the buses operate in a form of relatively uncongested mixed flow traffic. The use of freeway rights-of-way also provides full grade separation.

Many bus-on-HOV facilities permit only one type of express service, with local pick-up/delivery of passengers only at the ends of the bus routes. The El Monte facility is unusual in providing two intermediate station stops and a bus terminal at the outer end. Several busways constructed along former railroad rights-of-way have provided for local stops, so that the facility can be operated much like a rapid transit line.

One of the reasons why busways are financially attractive is that existing bus equipment can be used, without the need to order new vehicles at the same time that the capital investment in the busway is made (however, eventually the equipment must be replaced). Another reason is that as compared to fixed guideway systems, only part of the bus route will require new roadway construction. Another key reason for pursuing busway development is that it is often eligible for state or federal highway funding.

One of the disadvantages of busway operation is that a much larger number of independent vehicles is operated, as opposed to a rail system with train operation. This means much higher driver costs. This can be only partially offset by using longer articulated buses on the heavier bus routes.

A high frequency of service can be provided, which is advantageous in attracting passengers en route if station stops are provided on the facility. However, high frequency with bus priority will require full grade separation, probably with higher per mile capital costs than a surface LRT line with crossing gates. A task force study of possible busway operation on the SP Burbank Branch, in

which it was proposed to gate crossings, concluded that the frequency of the buses would effectively close every intersecting street to cross traffic (15).

In fact, the only known busway operated at-grade with gates was the Ardmore busway in the suburbs of Philadelphia. Here the gates went across the bus lanes to keep automobile drivers out, rather than across the intersecting street. Buses had to slow down at each intersection so-treated. This experiment was considered a failure. Unlike the trolley track previously occupying the R/W, the level paving on this "back-yard" busway made it attractive to pedestrian and bicycle traffic, which became the main source of intrusion onto the facility. As the gates did not stop unauthorized entry by local people, they were eventually removed. (This experience suggests that busways on private rights-of-way should be fully fenced.)

For the radial bus routes fanning out at the end of a busway facility, frequency of service may be very low, as bus runs will be divided between many individual routes. Many prospective transit riders would prefer to drive their own cars to a bus or rail terminal, and take advantage of the much more frequent trunk-line service provided by the guideway/bus lane facility. Likewise, as compared to a fixed guideway system on private right-of-way throughout, the portion of the bus run in mixed traffic will probably suffer from a deterioration of service (e.g., interference caused by cross traffic, pulling in and out of curb lanes at bus stops, uncomfortably rapid braking to avoid accidents). Average speeds for a bus line operating partly on a grade separated busway and partly on city streets will be lower than for a light rail line built entirely on private right-of-way with a few grade separations and mainly gated crossings.

Also, in larger CBD areas, the buses can still become caught up in congestion (in fact the large number of buses that may be funneled past CBD intersections could even increase congestion for cross traffic). Bus tunnels are difficult to operate with diesel equipment owing to the exhaust problem. However, trolley coach or trackless trolley technology can be used to electrify parts of the bus system, and dual mode trolley/diesel buses, like the fleet which has been ordered for Seattle's bus tunnel, would provide a solution to this problem: upon entering the tunnel, they can switch over to electric power.

It is apparent that there are a number of advantages and disadvantages to busway operation, as compared with rail transit systems. The decision as to which type of facility to construct will depend upon a number of factors, including the intended type of service, availability of right-of-way and capital, compatibility with other facilities under development, and environmental questions relating to the type of power plant used. There is no easy answer as to which is better, a busway or a rail/fixed guideway system. Modal evaluation for each corridor should be conducted on a case-by-case basis.

Guideway Buses, like the O-Bahn/Spurbus technology and the GLT (Guided Light Transit) system, are intended to bridge the gap between busways and rail systems (Figure A.18). These systems, which have been placed in service in a very few places (e.g. Adelaide, Australia) have the capability of operating in train configuration on the guideway and as single vehicles on surface streets. The GLT system, if it proves out, may even allow at-grade R/W with gated crossings without loss of speed. All-electric and dual mode buses have been tested on bus

guideway facilities (16,17).

Commuter Rail. Vuchic defines commuter rail as a system which is intended to serve suburban travel markets with high peak and directional volumes and limited off-peak service. He notes that commuter rail trips are relatively long, with an average length of over 20 miles. Stations are often two or more miles apart and park-and-ride is the primary access mode.

The Amtrak enabling legislation defines commuter rail (as opposed to intercity rail service) as a short-haul rail passenger service, characterized by morning/evening peak period operations and reduced fare (as compared to intercity train fares), multiple-ride and commutation tickets (18).

In fact, commuter rail represents a family of modes which can operate on the same trackage as main line freight trains and Amtrak intercity rail services. Commuter operations are subject to safety regulation by the Federal Railroad Administration, whereas rail transit operations are normally only subject to regulation by state and local public utilities commissions.

Commuter rail lines often operate over the tracks of existing freight carriers. This generally means restricted hours of operation, because the freight trains (as the railroads' primary revenue generators) tend to take precedence. There may also be very high liability/indemnity insurance costs (which can be almost as high as the yearly operating costs of the service). Most of the heavily-used commuter rail services operate over track and right-of-way that is wholely owned by public transit authorities: this applies to SEPTA in Philadelphia, NJ Transit in New Jersey, the Long Island Railroad in New York, the Metra Electric service and some of the other commuter services in Chicago. However, some of the SEPTA and NJ Transit services are also operated on Amtrak's Northeast Corridor.

Some commuter rail lines are operated with diesel push-pull equipment: railroad coaches with an engineer's cab at one end to permit the locomotive to push the train in one direction, and pull it in the other (electric locomotives are also used in push-pull service). Some of these services use higher capacity double deck cars (Figure A.19) like those used on Toronto's GO Transit system (19). Gallery cars are also commonly used in push-pull commuter service (in Chicago and the Bay Area); these have a single row of seats and narrow aisles on both sides of the upper deck, with an open area in the middle giving the conductor below access to the upper deck for ticketing purposes (20).

Electric multiple unit railcars are also used (Figures A.20-A.21), usually with power pickup by pantograph from overhead catenary; some of these, like SEPTA's Silverliners (21) and New Jersey Transit's very similar Jersey Arrows, are similar in general design to modern main line railroad coaches. Others like the Long Island Railroad's 100 MPH M-1 and M-3 equipment resemble large subway cars. Hence, the LIRR operation, with high platform loading and MU equipment is really a form of rapid transit service, with full grade separation and third rail power pickup (22,23). The Metra Electric system in Chicago is operated with an electrified MU version of the gallery car (24).

For electrified lines, there are various options for power supply: 11,500 to 25,000 Volt AC, and 750, 1500 or 3000 Volt DC.

Vuchic applies the term Regional Rail to commuter lines that not only access the CBD area but also continue on into the suburbs on the other side. This is the situation with Philadelphia's Center City Commuter Connection, in which commuter rail trains operate a through service with three CBD stations. There are other examples from Europe and in other parts of the world (25,26).

To complete the commuter rail family of sub-modes, there are also diesel railcars or railbuses (Figures A.22-A.23), some of which like the Austrian Federal Type 5090 are designed very much like light rail vehicles (27). Diesel railcars have figured prominently in the privatization of rail in Japan: new "third sector" railways (operating under public-private partnership) have taken over previously unproductive Japanese railroad lines, introduced new diesel railcars which operate in LRT fashion with a single driver and self-service fare collection, and turned these ailing lines into successful public transit operations (28).

Some commuter lines are fully grade separated; many have at-grade crossings, with crossing gate protection. In this respect, commuter rail has much of the flexibility permitted by light rail, except that street running may be difficult, and diesel equipment too noisy to operate in "backyard" situations.

Monorails. Monorails do not constitute a single transportation technology. The term "monorail" is used to refer to a whole range of unconventional fixed guideway transit systems, most of which technically do not rely on a single rail, but have rubber tires bearing on several support/propulsion and guidance surfaces (29).

The best-known type of monorail is the Alweg technology operated in Seattle, at Disneyland, and on Japan's Haneda Airport line (30,31). The Alweg is a supported monorail, with the cars wrapped around a concrete beam (Figures A.24-A.25). The trains cannot be derailed, except at open switches. This system has a relatively poor ride quality at high speed; also, enclosures for the running wheels intrude into the vehicle interior, reducing internal space. Emergency evacuation is a problem, as it is difficult to provide a catwalk next to the beam.

Suspended monorails are in many ways superior to supported monorails, as the cars are hung from an overhead rail or beam, and are inherently stable. The first monorail in Los Angeles, the Fawkes Aerial Trolley Car, which operated in Burbank in 1907, was a suspended type (32). The Wuppertal Schwebebahn (Swallow Railway) is the only true monorail operating in the world; it is suspended from a single overhead steel rail (Figure A.26). Running on an A-frame structure over the River Wupper, it is both a tourist attraction and a very popular local transportation system (33).

The French SAFEGE monorail system (Figure A.27) has 60 MPH cars suspended from overhead, rubber-tired trucks enclosed in an inverted U-shaped tube (34,35). The Japanese operate a SAFEGE monorail on a four mile line to Shonan (Figure A.28), with eight station stops (36). The SAFEGE suspended system has a clever evacuation device consisting of a stairway which drops from the floor of the car to the ground below (37).

An example of a suspended monorail a little closer to home is the LA County Fair monorail (Figure A.29), which is operated as a tourist attraction (38). Despite the small size of the cars, the ride is comfortable (as compared to supported monorail amusement park rides).

All monorails have switching problems, usually requiring some form of transfer table device to laterally shift a section of the main guideway to one side. Although switching time has been reduced to 10 seconds on some recent installations (as compared to less than a second for a conventional railway), this is considered to be an impediment to developing integrated transit networks with frequent switching between trunk lines and branches. Many people consider monorails more suitable for single-line or shuttle operations.

Monorails have little if any advantage when operated in or over freeway alignments, as compared with conventional rail transit in medians or on aerial structure, and are probably at a cost disadvantage as compared to at-grade light rail on railroad rights-of-way. They may however present an opportunity to construct small-diameter, less intrusive aerial guideways over city streets or arterial highways, including former interurban rights-of-way where the median has been constricted in width or converted to lateral strips on either side of the roadway. This would be particularly true of a suspended system with the beam somewhat higher off the ground, reducing the "claustrophobic" feeling that can be engendered by a conventional elevated railway (even a modern one) over a street.

The suspended Aerobus system (Figure A.29), with self-propelled electric cars running on a pair of overhead cables (suspended from pylons like a suspension bridge) may allow a considerable reduction in visual intrusion over boulevards. Ability to cross very uneven terrain, with widely-spaced support towers, is an important feature of this technology (39). Unfortunately, this system appears to have safety and ride quality problems. A recent Aerobus proposal for New Orleans (which never came to fruition) would have employed small steel rails overhead (instead of cables) to solve the safety problem.

There are occasionally proposals to operate monorails over railroad rights-of-way. The Bennie Railplane (Figure A.30) was actually operated on a test track in Britain over a steam railroad line (40). More recently, the Philadelphia Suburban Transportation Company proposed to run a suspended Texas Skyway Monorail (41: see Figure A.30) above its Media-69th Street light rail line. It is believed that the intent was to operate the monorail as an express service, with the trolleys below providing local service at a more moderate speed.

Maglev. Another new technology is maglev, which dispenses with wheels altogether and supports the vehicle by magnetic levitation (Figures A.31-A.32). There are various maglev systems; most have been intended for very high speed intercity ground transport (42,43). Magnetic Transit of America is promoting a form of urban Maglev system which could provide either shuttle service or a higher-speed, rapid transit equivalent (44,45).

In this system, the stator function of the electric motors would be provided by

the track, with the rotor function taken over by permanent magnets on the underbody of the car. This would reduce the weight of the cars, but would require that motor control functions be incorporated into the track structure. As the guide wheels and motor components would be in a trough in the guideway, the width of the track can be reduced to slightly less than that of the cars, meaning less visual intrusion for an aerial system than for conventional elevated railways.

It is believed that electric power requirements can be lowered owing to the reduced weight of the cars. Emergency evacuation would entail an emergency hatch at the end of each car, permitting passengers to walk down a ramp onto the guideway--which is shaped like a flattened "U", reducing the danger of anyone falling off.

Magnetic Transit of America, Inc. and Daniel, Mann, Johnson & Mendenhall have entered into an agreement with the City of Las Vegas and the Las Vegas People Mover Corporation to build and operate an M-Bahn based maglev system at no direct cost to the city. The 1.2 mile line is expected to become operational in 1990. This may provide an effective demonstration of the technology, connecting the Downtown Transportation Center and the new Festival Marketplace (46).

Maglev technology should permit a very quiet and smooth ride. Drawbacks would be the need for complete grade separation as compared to light rail, commuter rail, and busway systems; and (like monorails) inflexibility in switching. From an operational viewpoint, a line-haul urban maglev system would be (again like monorails) a form of medium capacity rapid transit. The structure of the guideway may make maglev a reasonable alternative to an automated light rapid transit system on surface railroad rights-of-way with full grade separation.

There is little doubt but that a monorail or maglev line would attract considerable attention, and draw a certain number of tourists (even more than for a rail transit start-up). It is doubtful however whether this effect would be any greater for an entire system utilizing a new or unusual transit technology than it would be for a single line.

There may be procurement problems associated with adopting a "new technology", in that these systems are proprietary. Obtaining replacement parts for which the patent rights are held by a single manufacturer could present certain difficulties. However, it has been suggested that long-term service contracts be negotiated with the manufacturers of such equipment: fixing the price of spare parts relative to inflation and providing for the possibility that the original company might go out of business, such that other vendors will be allowed to provide the required spare parts, new cars and structures, etc. without infringing on patent rights.

A.2 Operational Considerations.

As noted above, type of operation is an integral part of the transit mode concept. Many transit systems provide a single type of service (local). This means that in order to increase the commercial speed of the system (reduce running time), stations have to be spaced fairly far apart. However, there are

several strategies for providing faster service, even with shorter station spacings. Vuchic identifies three principal types of stopping schedules (47 --see Figure A.33):

i) Skip-stop operation. In this case there are "A" vehicles and "B" vehicles. A vehicles do not stop at B stations; B vehicles do not stop at A stations. Every so often there are A-B or all-vehicle stations, which permit transfers between the A and B vehicles.

ii) Express-local operation. In this case there are expresses which simply pass up a number of intermediate stops, providing much faster service.

iii) Zonal operation. In this case, after leaving a terminal station, vehicles stop only at stations within a defined zone. Vehicles bound for the outer zone leave the terminal first, and run non-stop to that zone. Vehicles bound for the intermediate zone leave next, running non-stop to that zone. Vehicles covering the inner zone leave last, and make short runs. In this way, overtaking is avoided.

Busways with pull-off lanes that allow through runs to bypass locals probably provide the greatest flexibility for scheduling the above kinds of operations since no switching is required. However, rail systems can use all three of the above strategies. Some, like the CTA in Chicago, even combine skip-stop and zonal operation on the same rapid transit line.

For rail systems, skip-stop is easiest to implement, as it requires no extra track or switching. Overtaking is avoided as A and B trains both make the same number of stops on the line. This strategy is especially appropriate for lines passing through a CBD area (as opposed to those terminating in the CBD).

Express-local operation may require a third (reversible) or a third and fourth track to prevent the overtaking problem. This is the kind of operation used in the New York subways. This permits great flexibility, and is also appropriate for lines passing through a CBD area.

However, in Japan, commuter trains are operated in this express-local mode on a double track line with passing sidings at stations. It is possible for express trains to either bypass locals or to meet them and exchange passengers, depending upon station layout. This kind of operation may be more appropriate for automated, fully grade-separated lines.

Zonal service often used in commuter rail, and has also been employed on the medium capacity, fully grade separated Norristown High-Speed line in the Philadelphia suburbs. It is most appropriate for a line stub-ending in a CBD or in an outlying terminal area. This strategy is also quite suitable for a fully automated line. Crossovers and pocket tracks are required to permit trains to change ends and return in the other direction.

For monorails and other unconventional fixed guideway systems with more cumbersome guideway switches, the most appropriate strategy would be skip-stop service, as this does not require switching. Depending upon station spacing and frequency of service, however, express-local operation and limited-stop service

could also be used in some cases.

Where surface right-of-way is limited (e.g. where there is room for only two tracks), skip-stop, zonal, and express-local service with passing sidings should all be feasible. The latter would require more right-of-way where such sidings are located. Where right-of-way is adequate, a reversible, third track can be employed. Combinations of several of these strategies are also possible, either with manual or with automated operation. All of these operational patterns are theoretically possible with at-grade light rail operation, or with busway service.

The decision to implement a zonal or local-express service may influence the design speed of transit equipment. For instance, most modern LRVs are governed at 55 MPH, which is appropriate for local service with a one-mile station spacing. However, SEPTA in Philadelphia has on order for its grade-separated Norristown High-Speed Line, a new series of equipment with three-phase AC propulsion and a maximum speed of 70 MPH uphill on a 2.5% grade--capable of attaining 70 MPH on level track in 51 seconds. These cars will have a balancing speed of considerably greater than 80 MPH on level right-of-way (but will be operated with a governor); they are intended to allow high speed zonal express service on this suburban transit line.

One more point about skip-stop, express, and zonal services is that passenger perception of time savings may be greater than the actual savings realized by implementing these measures. The ability of trains or buses to pass up intermediate station stops or rush past surface traffic is greatly appreciated by passengers. It is understood that in Cleveland, rapid transit express trains were so popular that passengers would often pass up a local to catch the following express train, even though the latter would actually bring them to their destination later (48)! This kind of positive public image can be used to good advantage in marketing a transit system.

A.3 Costs And Evaluation Criteria.

Capital Costs For Different Modes. Vuchic developed some comparative capital cost data using the unit costs available in 1981, for rail transit lines with a station spacing of one kilometer (every .621 miles). The results are as follows (49):

Rapid transit, all in tunnel	$ 49.0 M/mile
" " 30% tunnel, 50% aerial, 20% at-grade	$ 24.5 M/mile
LRT, 30% tunnel, 20% aerial, 50% at-grade	$ 17.8 M/mile
LRT, 20% aerial, 80% at-grade	$ 5.2 M/mile

This kind of analysis is useful in that it compares hypothetical lines with typical mixtures of different kinds of construction. However, inflation has probably more than doubled the cost levels quoted above, which were based on figures from the 1970's. As compared to the mainly surface LRT line in Vuchic's example, the subway/aerial/surface LRT line with grade crossings costs 3.4 times as much; the subway/aerial rapid transit line, 4.7 times as much; and the all-tunnel line, 9.4 times as much.

A more recent comparison was given by consultant Tom Parkinson in conjunction with the San Fernando Valley Citizen's Advisory Panel. He provides the following estimates of costs per mile (50):

Rail Systems

Rail rapid transit	$ 50-250 M/mile
Medium capacity rapid transit, automated	$ 20-50 M/mile
Light rail, with gated crossings	$ 10-20 M/mile
Light rail, street running	$ 7-15 M/mile

New Modes (all aerial construction)

UTDC ALRT/Skytrain (steel rail, LIM propulsion)	$ 40-60 M/mile
Matra VAL system (automated/rubber tired train)	$ 40-60 M/mile
TGI Monorail (Alweg technology)	$ 35-55 M/mile*
Magnetic Levitation	$ 35-55 M/mile**

* Manufacturers claim lower average costs per mile but have not provided substantiating data. These figures must also be weighted against such basic problems as emergency evacuation.

** The manufacturer has claimed $ 25 million/mile, but this according to Parkinson is unsubstantiated.

A recent cost chart developed by Sacramento Regional Transit gives the following comparison based on recent experience (within the past decade) and cost estimates for lines now under construction (51):

Buffalo light rail, mostly in tunnel	$ 102.6 M/mile
Detroit, aerial ALRT shuttle system	$ 60.6 M/mile
Pittsburgh East Busway, surface/grade sep.	$ 23.6 M/mile*
San Jose light rail, surface	$ 18.8 M/mile
Portland light rail, surface (part freeway)	$ 14.1 M/mile**
Sacramento surface LRT (40% double track)	$ 9.6 M/mile***

* $ 16.6 M/mile in 1983 dollars given in Chapter 4.

** A revised cost figure of $ 20.9 M/mile is given in Chapter 4.

*** San Diego double track estimate, $ 10 M/mile (in Chapter 4).

It should be noted that there are few cost estimates available for true busways, as most of the recent projects have been combined with HOV lanes in freeway alignments. The cost figure given in Chapter 6 for the Ottowa busway of $ 13.6 million Canadian dollars (about $ 9.5 million U.S.) is based on preliminary estimates; and most probably does not include right-of-way for major portions of the alignment on pre-existing, grade separated highways which were constructed relatively recently and whose preparation costs could legitimately be added to the total cost of the busway project.

A recent article by Parkinson provides the following capital and operating cost estimates for surface light rail lines as compared with automated, fully grade separated medium capacity transit systems (52). The cost comparison is as follows for line-haul systems only (U.S. dollars):

System	Capital Cost/Mi.	Operating Cost/Pass.	Pass./Year
VAL in Lille	$ 39.1 M	$ 0.80	27 million
SkyTrain, Vancouver	$ 46.2 M	$ 0.84	25 million
Docklands Light Ry.	$ 18.5 M	$ 1.10	7 million
Calgary LRT	$ 20.9 M	$ 0.46	24 million
Nantes LRT	$ 17.1 M	$ 0.30	12 million
Portland LRT	$ 14.0 M*	$ 0.93	7 million

* A revised cost of 20.9 M is given in Chapter 4, this report.

Taking the above sources together, it appears that surface light rail with gated crossings can be constructed as cheaply as about $ 10 million per mile; however, depending upon construction methods, and the incorporation of segments on freeway, aerial structure, etc., per mile costs can easily be $ 20 million/mile or more. If part of the route is in tunnel, costs can be substantially higher than this.

For grade separated automated rail lines, the lowest cost is the $ 18.5 million per mile figure shown for the London Docklands line; this system makes considerable use of older railroad rights-of-way and structures, with much of the route on surface alignment. For primarily aerial lines, $ 39-45 million/mile may be the bottom limit (and can easily attain $ 60 million/mile). LACTC staff believe that under the most favorable circumstances in this country, subway construction with stations spaced one mile apart will cost at minimum $ 135 million/mile. This is corroborated by the fact that the Buffalo system cost about $ 103 million per mile for a line that is mostly in tunnel but with a short section of much cheaper surface transit mall construction.

For new technologies with aerial guideways of smaller dimensions and/or lighter weight cars, it is probable that in a conventional transit application (as opposed to light-duty amusement park rides or shuttle systems), costs will probably be at least $ 35 million per mile.

For busways, the Pittsburgh figure of $ 16-24 million per mile would apply to a fully grade separated facility on railroad R/W, including track relocation. The Ottowa figure of approximately $ 9.6 million/mile suggests that costs can be lowered considerably where half of the busway route is able to utilize previously-existing grade separated highway corridors.

A surprising finding from Parkinson's research is that automated medium capacity rail systems incur somewhat higher per passenger operating costs, when systems with approximately the same total yearly patronage are compared (cf. Lille and Vancouver with Calgary, or Docklands with Portland).

Another way of looking at the capital cost question is to estimate how many miles of transit line could be built with a given sum of money, say one billion dollars. This amount of money would build the following:

100 miles of fully at-grade light rail as in San Diego and Sacramento
62.5 miles of busway with railroad relocation, as in Pittsburgh

28.6 to 40 miles of aerial monorail or Maglev, depending upon whose construction cost figure is correct.
21.6 miles of ALRT-style automated, mostly aerial system
9.7 miles of rail line primarily in tunnel, as in Buffalo

The above figures represent cases in which predominantly one kind of construction is used. For transit lines using substantial mixtures of different kinds of construction, the following could be built:

54.1 miles of Docklands-style automated system, largely at-grade but with some aerial structure in places.
26.8 miles of subway/aerial/surface LRT, with 50% at grade.
19.4 miles of subway/aerial/surface rapid transit fully grade separated.

One more cost issue should be mentioned here: there is reason to believe that the SCAG region is a particularly expensive place in which to construct major transportation facilities. LA-Long Beach construction costs have reached at least $ 34 million per mile; this includes tunneling at the north end of the line, highway and railroad overpasses, and railroad freight track relocation--elements which are expected to markedly increase costs. LACTC staff believe that this represents the lower limit of construction costs for surface light rail in Los Angeles County. (Inclusion of additional grade separations where surface LRT lines intersect major arterial highways can be expected to increase costs above this level in the Los Angeles environment, which is characterized by high volumes of surface traffic.)

The Metro Rail project is expected to average about $ 214 million per mile for an all-tunnel line from the LA CBD to the San Fernando Valley. There is reason to believe that the high cost of living in the Los Angeles area is partially responsible for the fact that per mile costs for both of these LA County projects are higher than those in certain other cities.

However, figures given previously for various modes, and different mixes of underground, aerial, and surface construction are valid relative to each other; in attempting to apply these figures to the Los Angeles area, a multiplier may have to be used.

Evaluation Criteria. Capital cost per mile is important, but certainly additional criteria should be used in transit project evaluation. Although the above figures indicate that busways and at-grade light rail (often constructed on former railroad rights-of-way) will permit the lowest capital costs, other factors such as induced traffic congestion at level crossings and interference with surface traffic patterns may require substantially more expensive construction as compared to idealized, "lowest cost" cases. Further, expensive as it is, there are often instances when underground construction is essential to produce the desired quality of transit service, consistent with goals for urban aesthetics. Also, operating costs for various modes and alternatives for specific corridors need to be considered.

Some construction alternatives (particularly where portions of bus or light rail routes require running in mixed flow traffic) can mean lower total patronage as compared to operation on exclusive right-of-way, and for this reason cost-

effectiveness measures such as cost per passenger need to be considered. (Cost per new transit rider is sometimes used, but this ignores the travel time and comfort benefits that accrue to existing transit riders who are diverted [or rescued!] from local bus travel on surface streets.)

A detailed discussion of these subjects, however, goes beyond the scope of this study.

A.4 Grade Crossings And Traffic Interference.

As this is a study of transit utilization of railroad rights-of-way, it is logical to examine railroad modes of transit operation in some detail, with particular regard to the grade crossing question. Of the modes discussed above, only light rail and commuter rail have proven capable of crossing arterial highways and local streets at grade (the GLT guided busway system may also be able to do this successfully).

Full grade separation entails more costly construction, whether the line is aerial or runs on the surface with overpasses and underpasses (Figure A.35). Surface lines with all cross streets placed over or under the transit line could be even more expensive, owing to the greater width of the streets. Surface construction with gated crossings may be achieved for as little as about $ 10 million per mile. Grade separations, if placed one per mile, can add anything from $ 3.6 to $ 20 million per mile for a double track rail line, depending upon the way they are constructed.

However, interference with cross-traffic may require that light rail and commuter lines be grade separated at major arterial highways. The greater the frequency of rail service, the greater impact on highway levels of service and the need to grade separate. Expected crossing accident rates should also be factored into the decision whether to grade separate or not.

Another issue is, who pays for the grade separations? Although the cost of grade separating major arterials will almost certainly have to be included in the transit construction budget when a surface light rail line is first built, a funding strategy used in San Diego has been to initially go with at-grade crossings where levels of highway traffic are moderate and rely upon Federal highway funds to provide grade separations at a later time, pending the growth of traffic.

Rights-of-way in the medians of arterials may be difficult to fit with gates, depending upon width of the total R/W and traffic levels at intersecting arterials. For this reason, for LRT median alignments (such as former interurban lines), underpasses or signal preemption may often be preferable to crossing gates. It may be easier to provide at-grade crossings on LRT Lines at some distance from parallel streets (e.g. mid-block locations).

Further, a study by the LA DOT indicates that an at-grade diagonal crossing near the intersection of two arterials can cause a 10-40% loss in street capacity, as compared to 5-20% loss to a cross street where the rail line is in a median or side-of-road alignment (53). This suggests that grade separations are particularly desirable in the case of diagonal alignments (Figure A.34).

Where gated crossings are provided, various traffic mitigation measures should be considered. When possible, far-side station stops should be provided, to avoid making motorists wait while a train is loading/unloading passengers at a station platform just before an intersection. Otherwise, for a near-side stop, a device should be provided to bring the gates down 15 or 20 seconds before the train starts up (that is, just after coming to a full stop at the station).

Except where a parallel road abuts the right-of-way, motorists skirting lowered gates can be thwarted by installing median barriers in the grade crossing approaches. Considerable research has been conducted on innovative safety measures such as reflective pavement markers, special crossbucks, and loop detectors for stalled motor vehicles, although few have been widely implemented.

Another factor is the impact of running trains at different speeds on the same rail line. This will apply particularly to commuter rail service where slower local freight trains and faster passenger trains share the same track. However, it would also apply to express/local operation of at-grade light rail or commuter rail. The commonly-used constant distance warning devices bring the gates down as soon as a train arrives at a certain distance from the crossing. This distance is set for the fastest train that operates over the applicable section of track, and can cause much additional highway grade crossing delay when slower trains approach the crossing.

Much less delay is incurred upon motorists if constant warning time devices are installed. These will provide the same advance warning time to motorists, regardless of how fast a train is running. Thus for a faster train, the gates will drop when the train is farther away from the crossing.

For combined express and local operation of electric-powered commuter rail or light rail trains through the same gated crossings, the problem is that local trains will operate at a variable speed and stop at stations either before or after grade crossings, while expresses will move through at a constant, higher speed. At present, technical problems arise from the use of track circuits to trigger the crossing gates, due to electronic interference with the constant warning time devices. However, both Harmon Industries and Safetrans, manufacturers of grade crossing equipment, are working on this problem, and a solution is expected in a year or so (54).

Another proposal for mitigation was made by De Leuw, Cather in a study for the SCRTD: it was suggested that where patronage on a LRT line is highly directional, it would be possible to preempt intersections in the peak direction, requiring trains running in the reverse direction to wait at intersections. In this way, a much higher frequency of service is possible with at-grade crossings than would otherwise be the case (55). This might apply to a line with express as well as local service.

While this study will make no specific modal recommendations for transit lines operating on former railroad rights-of-way, with the high volumes of traffic found throughout the Los Angeles region, we can expect certain new transit lines to be fully grade-separated. Other lines may be built in an at-grade light rail mode, but with grade crossings limited to local streets. Needless to say, any

mitigation measures (such as constant warning time devices) that might prove feasible in specific cases, should be investigated. For commuter rail, grade crossing problems may be a little less acute owing to a lower frequency of service for these longer-distance lines, but even here, grade separations may be desirable for reasons of safety and avoidance of traffic interference.

A.5 Compatibility With Residential, Commercial, And Industrial Environments.

Another issue bearing heavily on the range of acceptable transit modes and type of local treatment applied is surrounding land use. Residential neighborhoods are particularly sensitive and may warrant grade separation even more than industrial areas because of the level of human and vehicular activity.

Additionally, the noise of grade crossing bells could be disruptive to nearby homes. However, sound baffles have been permitted by the Public Utilities Commission in some cases where this was a problem. The general idea is that the sound needs to be vectored down the transit right-of-way and along intersecting streets, but not in the direction of nearby dwellings.

Sound walls are another approach to grade crossing noise. In newer suburban areas such as parts of Orange County, residential blocks are already walled off from arterial intersections, and it might be easier to install gated crossings in these places.

There is little difficulty however in gating level crossings in industrial areas. As many railroad rights-of-way offer a certain degree of industrial buffer, there are opportunities to reduce transit construction costs employing light rail technology where significant portions of the line pass through light industrial sections.

Aerial construction along railroad rights-of-way (or for that matter any other type of right-of-way) may be difficult in residential areas, because of the homeowners' perception of intrusion on their privacy. Where grade separations are required, underpasses may be preferable in residential sections for this reason. Overpasses, however, should be quite satisfactory in commercial and industrial environments.

Possible visual intrusion of surface lines in residential areas may require walls and/or considerable vegetation screening. Often the latter has already been provided by the railroad companies themselves.

Another factor is noise and fumes from transit vehicles. Electric powered buses or fixed guideway vehicles would be preferable for any operation cutting through a residential area, to reduce noise and eliminate diesel emissions. Diesel exhaust will also be undesirable where stops are located in the interiors of shopping malls and such.

Electric buses (including trackless trolleys or trolley coaches) may be the quietest conventional transit mode (maglev should be equally quiet); however, electric trains are also very quiet, especially as compared to diesels. For rail lines, continuously welded rail would be required: it is nearly standard in the transit industry today anyway, for reasons of ride quality and reduced

maintenance costs. However, sound walls or a combination of shallow cut and noise berms may sometimes be needed to further reduce noise related to track and running gear.

Vibration could also be a problem. For a surface rail line in a residential area, it may desirable to employ modern kinds of track construction which have already been used on subway lines to reduce vibration impacts on building foundations. This would include resilient track pads and fastenings (such as the Cologne "egg-track"). It is expected that similar techniques could be applied to monorail or other unusual fixed guideway systems. (Note that Maglev, while quiet, will not be vibration-free, as the vehicles are not weight-free!) It may be more difficult to reduce vibrations caused by busway vehicles.

Finally, it should be noted that electric trains, and particularly single cars or short trains used by medium-capacity transit systems (light rail, automated light rapid transit, maglev, etc.) will have have greatly reduced noise and vibration impacts as compared with long diesel trains.

A.6 Compatibilities And Incompatibilities Between Transit (And Other) Modes.

Compatibilities. Contrary to popular impression, there is no fundamental operational or technological incompatibility between light rail and so-called "heavy rail" rapid transit (Figure A.37). Light rail and rapid transit trains operate on the same tracks in Cleveland, Ohio where both the rapid transit cars and light rail vehicles use overhead power pickup (Figure A.36). Provided the light rail vehicles are designed for low platform loading, and are not wider than the rapid transit cars, there is no problem in passing the high platform stations used by the rapid transit trains.

Differences in floor height require additional anticlimbers on the higher vehicles to match the floor height of the lower vehicles. This has been done in Cleveland, in Oslo, Norway (Figure A.36), and in other places where light rail is operated with other rail modes.

The same commuter rail or transit cars can be designed to switch over from one voltage to another (applicable to AC or DC power); or to accommodate both AC and DC power (e.g., 12,500 Volt AC and 750 Volt DC). Dual mode cars operable from diesel-generated electric power as well as power collected externally are also quite feasible.

Another possibility is the development of light rail vehicles that can operate both in automated rapid transit mode on fully grade-separated trunk lines, and under manual control over at-grade branch lines with crossing gates. In this case, the driver may either alight upon reaching automated territory (if it is a long section) or remain on the train (if it is a shorter stretch). This type of operation (with the driver remaining on board) is already done in Dusseldorf, where automated LRT was introduced in CBD tunnel sections to promote service regularity and reliability.

Commuter rail is, of course, able to operate on the same track as main line freight and passenger trains. The San Diego Trolley operates on the same

trackage as branch line freight service, although at different times of day (with freight service provided during the pre-dawn hours when the LRT is not urunning). The San Diego operation uses 115 lb. rail, and heavy duty electric locks for switches leading to spur tracks; the trolley dispatcher controls freight movements, with conventional block signaling (56).

Light rail under manual control is also fully compatible with bus operation on busways/bus lanes (Figure A.36) and in transit malls. In the case of bus lane operation, it is preferable to stagger the LRT track and the paths for the bus tires so that the latter lie between and outside of the rails. This kind of track construction has been used in Rotterdam and even (for emergency streetcar track) in Philadelphia.

There are also compatibilities between vehicle components, and power supply and maintenance facilities used by light rail, railbus, and electric bus modes (Figures A.37-A.38). In Essen, light rail vehicles and electrified guideway buses have been operated on the same right-of-way (Figure A.39).

Incompatibilities. Mixed operation of buses with any kind of rail transit line collecting power from third rails is obviously impossible; and at-grade vehicular or pedestrian crossings on lines with third rail power are prohibited by the California Public Utilities Commission for safety reasons (57).

Perhaps the most important incompatibility in transit operation is between light rail/automated medium capacity transit and conventional rapid transit where both systems have third rail power pickup and high platform stations, but different platform heights and car widths. This question is addressed in Chapter 8 in the discussion of the Los Angeles County Proposition A rail system.

Another very real incompatibility exists between any type of conventional transit equipment and commuter rail vehicles; the latter need to interface with railroad freight trains and Amtrak equipment (and are thus subject to Federal Railroad Administration rules). The key problem is the FRA regulations that apply to structural integrity of the vehicles, in particular collision safety. For example, commuter railroad equipment is required to have an 800,000 lb./square inch buffing strength, compared with the 400,000 lb./square inch transit industry standard (58).

For this reason, "heavy" rapid transit should not or cannot be mixed with commuter rail. This is so, even though the commuter rail cars may physically and functionally resemble rapid transit equipment (like the Long Island Railroad M-1's and M-3's, and the Metro North Cosmopolitan commuter rail cars in New York). It follows that for operation over lines used by rail freight in daytime, one can also design commuter rail vehicles which look very much like light rail cars, but which cannot operate over the same tracks as their transit counterparts.

A third basic kind of incompatibility is between specialized fixed guideway systems such as monorail and Maglev systems, and conventional rail systems. The introduction of a "new mode" will require separate maintenance facilities and the impossibility of interlining service. That is, if a rail technology forms the primary basis of the transit system and a monorail is introduced on a single

line, passengers will be required to transfer between modes rather than being able to remain on the same train at a branching point or intersection of two lines, for a through trip.

Additionally, switching vehicles from one monorail line to another in regular service may be restricted owing to slow-acting switches, reducing the extent to which interline operation is possible even within the same mode. There is a penalty attached to this in the form of lowered patronage.

However, incompatibility between monorails or maglev, and a rail mode is really no different from the case where incompatibility has been built into the design of the rail network (e.g., rapid transit and light rail modes that cannot share the same track because of platform or third-rail incompatibility). Also, there are many situations in lower density employment and commercial areas where shuttle lines will be needed anyway, and there is no reason why new modes cannot be used in this supporting role.

* * * * * * * * * * * * * * * * * * *

The discussion in this chapter should demonstrate that are no panaceas exist in the realm of transit technology. Every mode has its advantages and disadvantages. Certain modes such as busways and light rail can offer considerable capital cost savings and design flexibility, while others such as automated medium capacity rapid transit can provide high operational flexibility and minimal road traffic interference. A thorough analysis of costs and benefits should be undertaken before the decision is made to adopt a particular mode for any specific line, let alone for an entire urban transit system.

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The Bennie Railplane had a single overhead rail for support and an additional guide rail below, with track brakes acting on both rails. Propellers in the front and back of the each streamlined car were electric powered; the cars could be coupled through the airscrew hubs. This system was capable of 100 MPH. Cab signaling was featured. Platform gates separated passengers from the track area until the train was completely stopped.

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In their present form, constant warning time devices are used on non electrified lines and are incompatible with 750 Volt DC electric traction systems. The impedence bonds used in ordinary track circuitry associated with block signalling pose a problem; the electrical "noise" emitted by the propulsion systems of electric traction vehicles interferes with the low-level AC circuitry used in the constant warning time devices, and this noise is difficult to filter out.

Despite the problems, Harmon is testing units on a DC electrified line in Canada, and tests are also being conducted in Europe. Their approach is to remove the impedence bonds on approaches to grade crossings. In addition,

Harmon is looking at scanner-reader and short-wave radio communication systems for constant time warning devices. Safetrans is experimenting with removing impedence bonds in track circuitry, and superimposing two frequencies to handle both block signaling and grade crossing controls.

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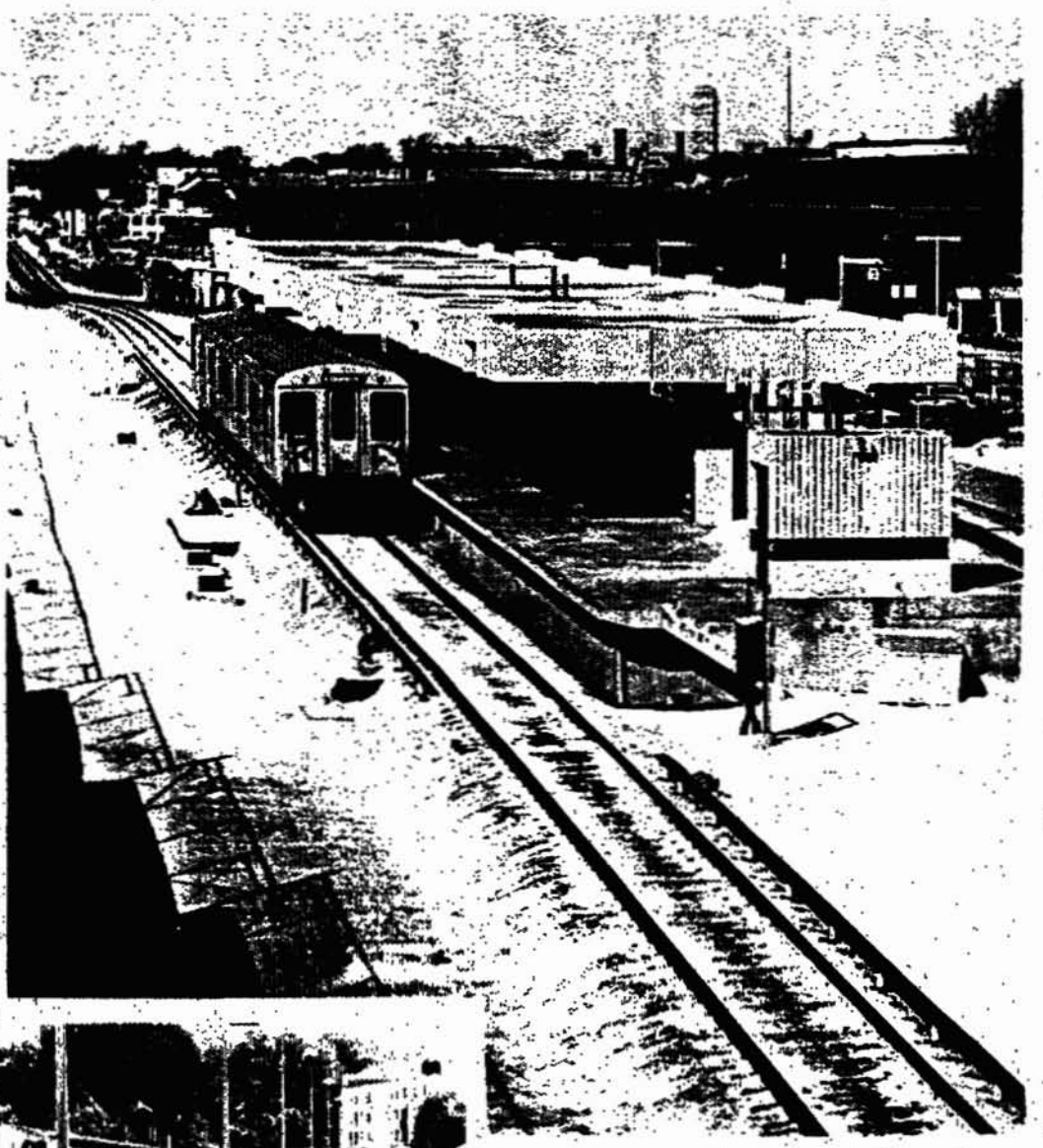
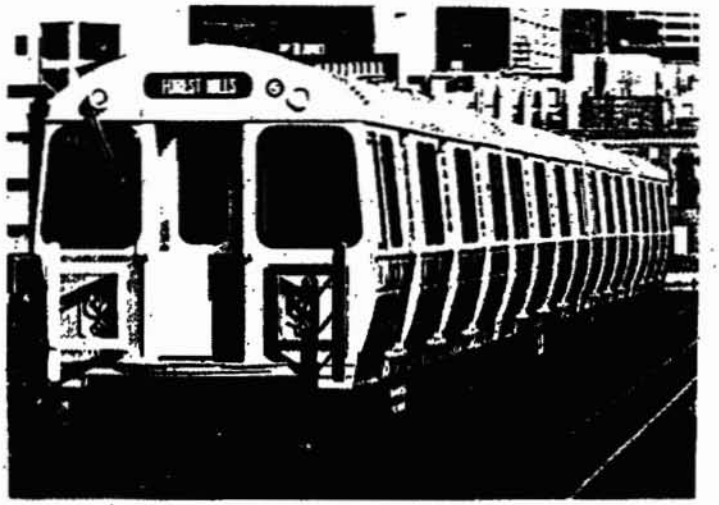
FIGURE A.1 RAPID TRANSIT CONSTRUCTION: RIGHT-OF-WAY TYPE A



Above: Boston Red Line on embankment.

Left: Toronto rapid transit train leaving tunnel.

FIGURE A.2 TYPICAL STEEL-WHEELED RAPID TRANSIT VEHICLES



Right: Orange Line cars in Boston. Train doors are typical of U.S. practice.

Below: Prototype Central Line train of the London Underground. The curved body profile matches the restricted tunnel dimensions of this system.

Right: Madrid underground train.

Below: Munich U-Bahn train. The front end without train doors is not uncommon in Europe.

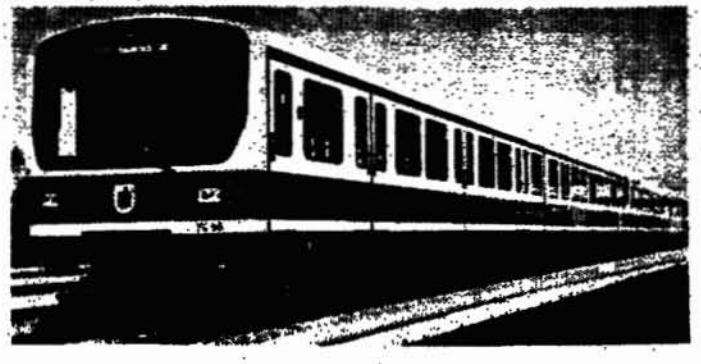
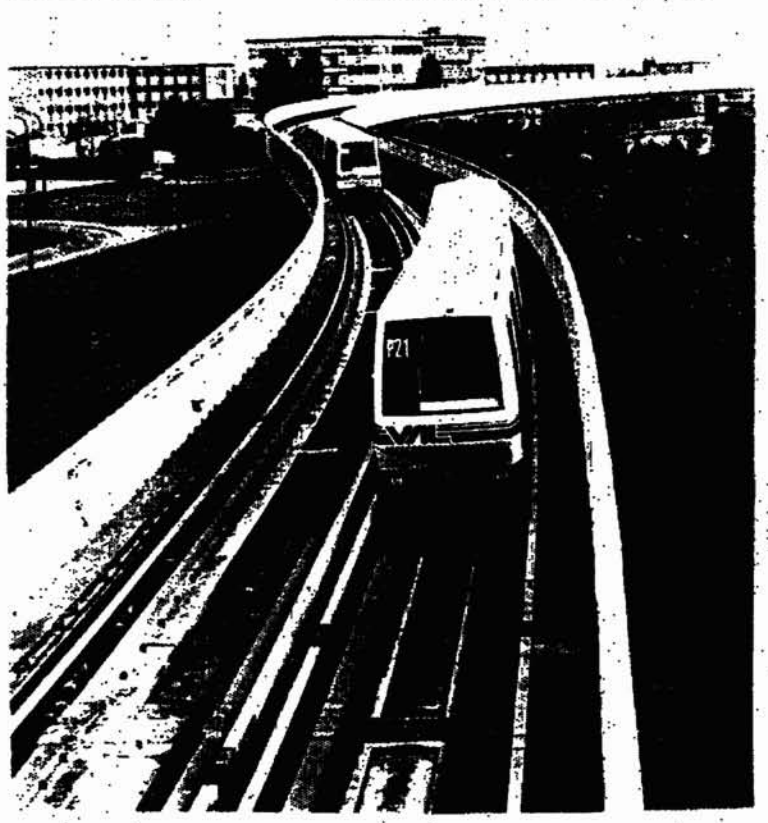


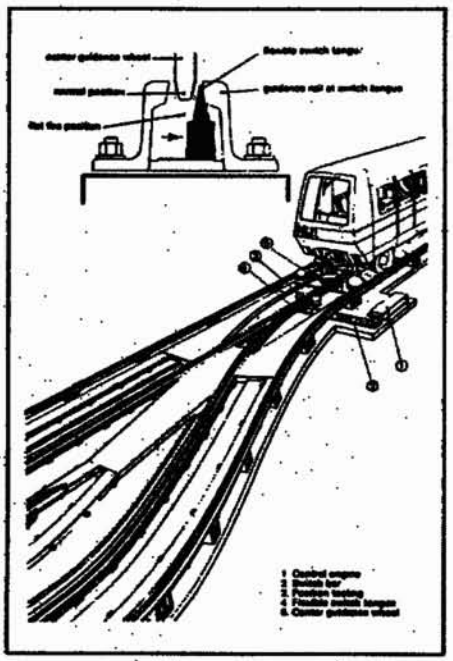
FIGURE A.3 RUBBER-TIRED RAPID TRANSIT SYSTEMS

Left, below: Lyon Metro with distinctive car and station styling.

Above, right: Marseilles Metro. This technology requires separate support rails for the tires, and steel rails for switching.

FIGURE A.4 THE VAL FULLY-AUTOMATED MINI-METRO AT LILLE

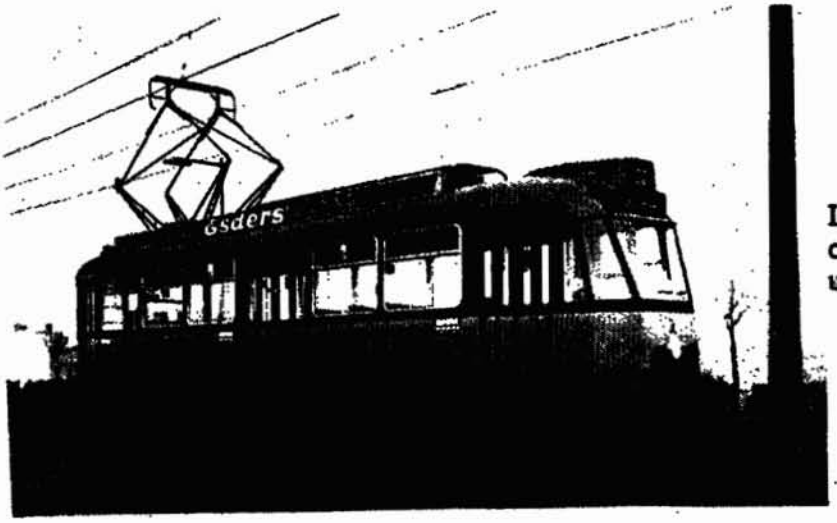




Above: Views of trains and elevated guideways.

Right: Showing the switching mechanism for the little rubber-tired trains.

FIGURE A.5 LIGHT RAIL VEHICLE CONFIGURATION: THREE COMMON TYPES



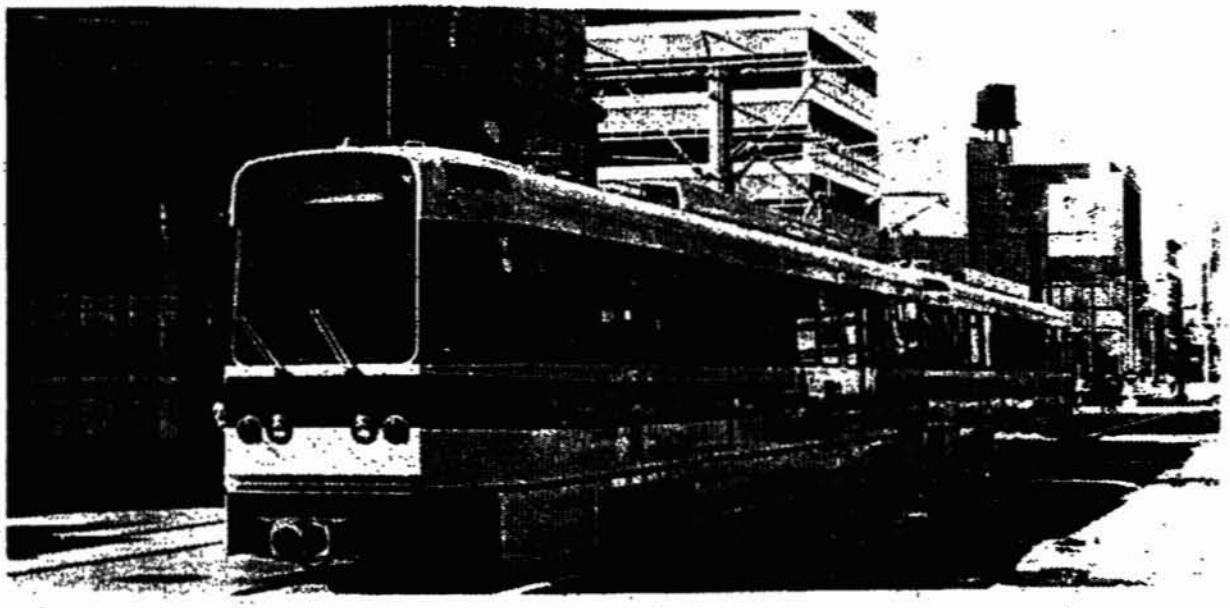
Left: Four-axle Schindler car in Rotterdam, for urban operation.

Right: Six-axle articulated interurban car, Salzburg. Articulation permits a longer carbody and greater passenger capacity.

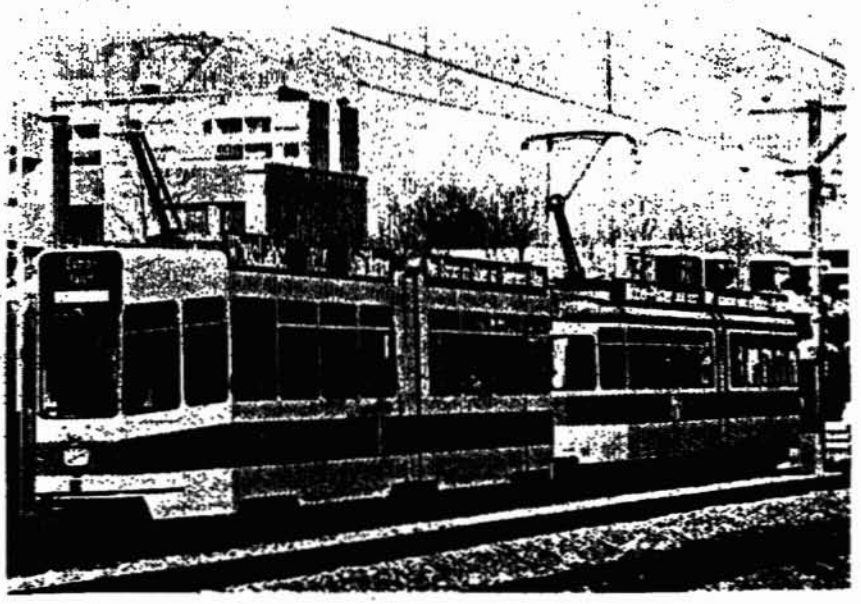
Below: Eight-axle articulated car in Brussels. Even greater capacity is allowed with double articulation.

The Brussels Pre-Metro car has motors applied to each axle, which will improve performance on hills or tunnel ramps.

FIGURE A.6 LIGHT RAIL TRAIN OPERATION

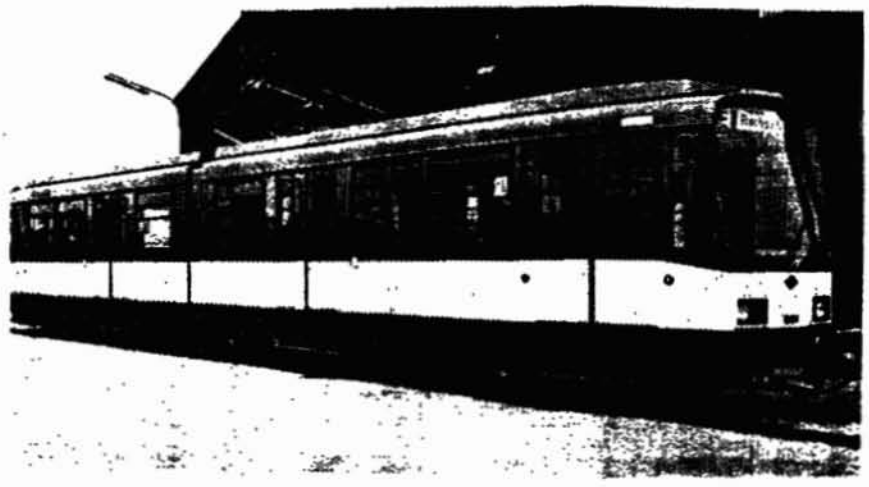


Above: Long, solid-bodied 4-axle cars in Buffalo, shown here in two-car operation. Train operation permits a considerable increase in labor productivity as compared to bus operation.



Right: Train of two, 6-axle articulated cars in Basel. With two cars manned by a single operator, self-service fare collection is required.

FIGURE A.7 LRVs DESIGNED FOR BOTH HIGH AND LOW LEVEL LOADING



Right: Düwag 6-axle car in Hannover. Adjustable steps are seen below each door opening.

Left: Elongated 6-axle Type B car in Essen.

Below: Long, 8-axle P8 car in Frankfurt, for subway-surface operation.

Below left: P8 movable step in low platform position.

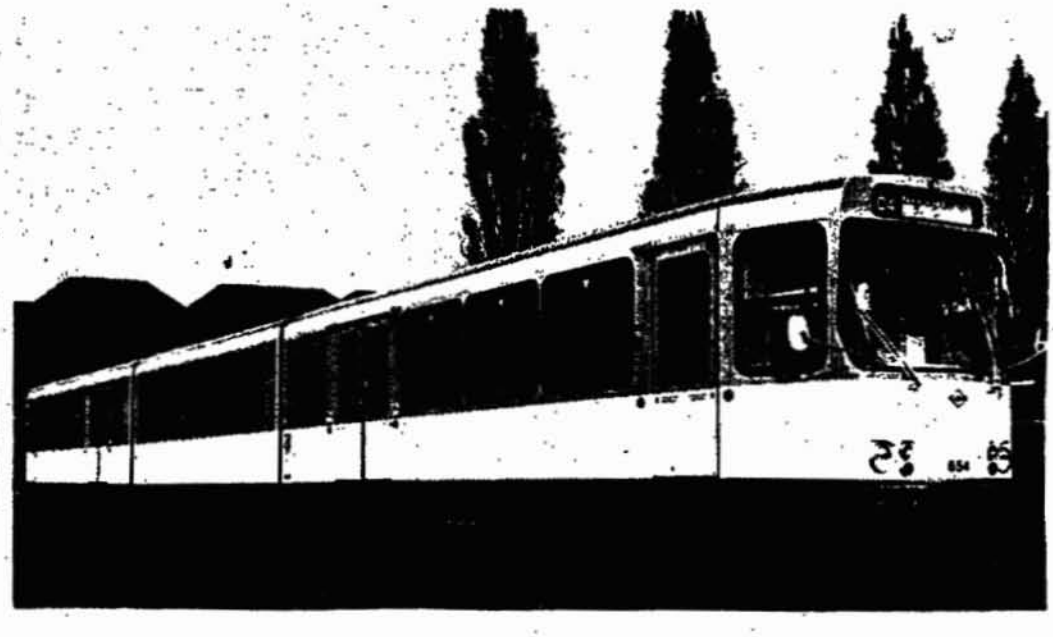


FIGURE A.8 LIGHT RAIL CONSTRUCTION: RIGHT-OF-WAY TYPE A

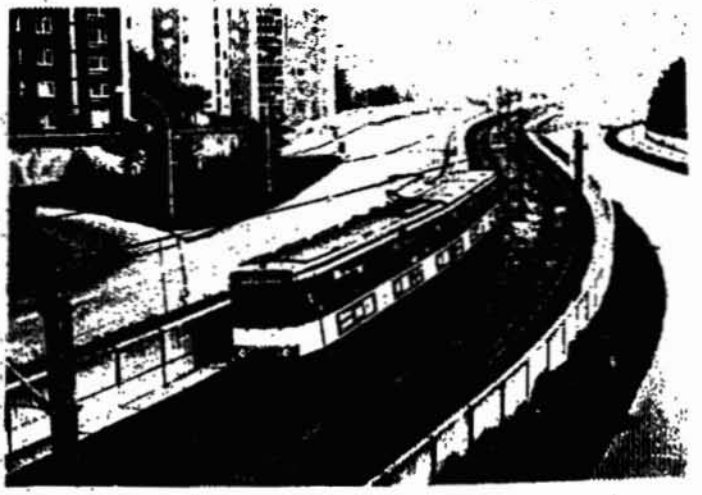
Left: Muni Metro in San Francisco, in tunnel under Market Street (Boeing Vertol 6-axle car).

Below left: Elevated transit station at Centraal Station in The Haag.

Below: The Byker Viaduct on the Tyne Metro represents a modernistic aerial structure design.

FIGURE A.9 LIGHT RAIL CONSTRUCTION: RIGHT-OF-WAY TYPE A (Cont'd)

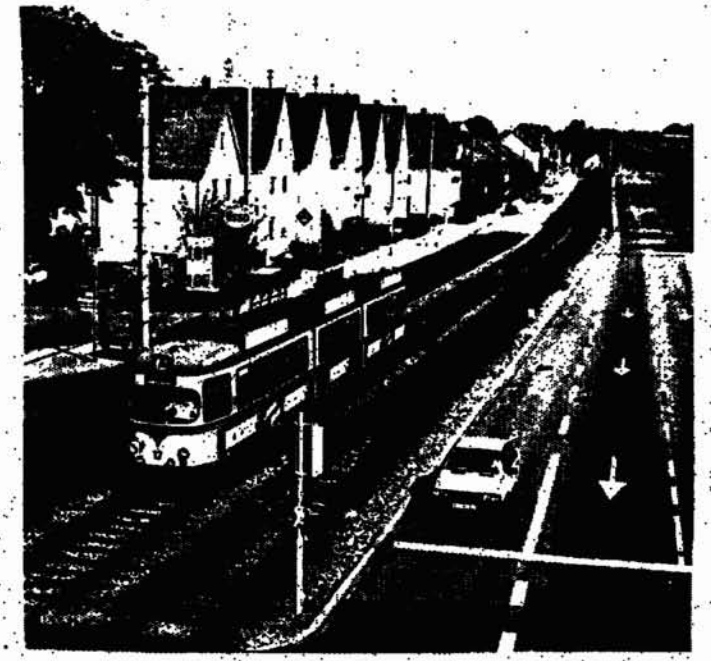
Left: Charleroi light metro on embankment (note the junction).



Right: Cologne system with walled-off surface median construction.

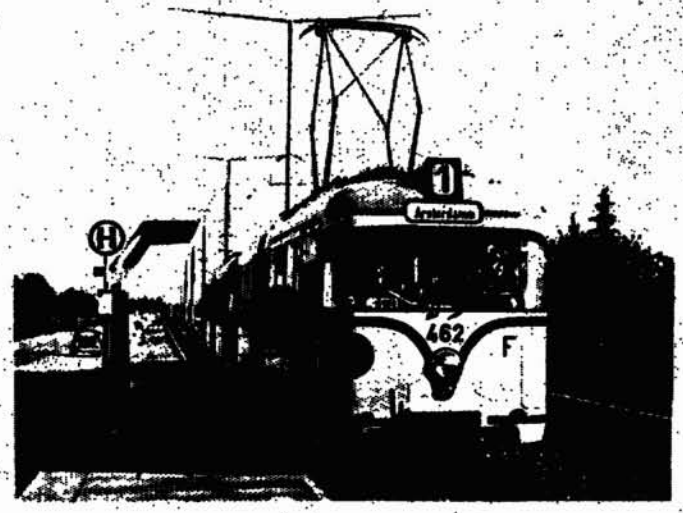
Below: Oslo tramway line in rock cut. Four-axle "Goldfish Car." (Note gauntlet track at right.)

FIGURE A.10 LIGHT RAIL CONSTRUCTION: RIGHT-OF-WAY TYPE B



Left: Albtalbahn in Karlsruhe. Surface R/W with grade crossing in foreground. Line is between a main highway and local service road accessing the residential area at left.

Right: Praha Tramways at Belveder. LRT line in a wooded suburban setting.



Left: Bremen Express Tramway at Blockdiek. Note the simple station design. Train of 4-axle articulated cars.

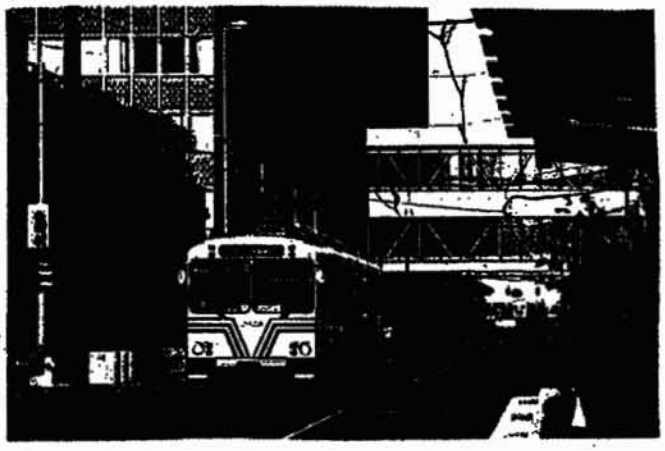
FIGURE A.11 LIGHT RAIL CONSTRUCTION: RIGHT-OF-WAY TYPE C

Right: Street running in built-up urbanized areas is generally an obsolete practice for LRT. Seen here, a 5-axle articulated car on the TKK system in suburban Tokyo.

Left: A better solution is lateral segregation from highway traffic by low barriers or painted-off lanes. Shown here, a center reservation in a congested area in The Haag.

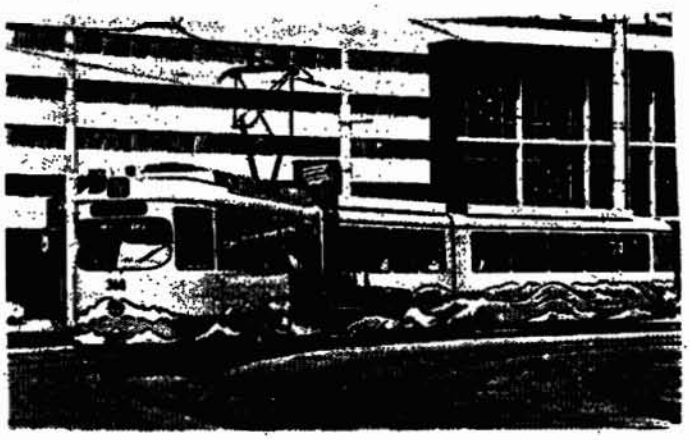
Right: Street-running may be acceptable at the outer ends of routes in suburban areas, on throughfares having minimal highway traffic and with a speed limit of 35-45 MPH. Shown here, a Brilliner car in Cincinnati.

FIGURE A.12 LIGHT RAIL CONSTRUCTION: UNUSUAL RIGHT-OF-WAY TYPES



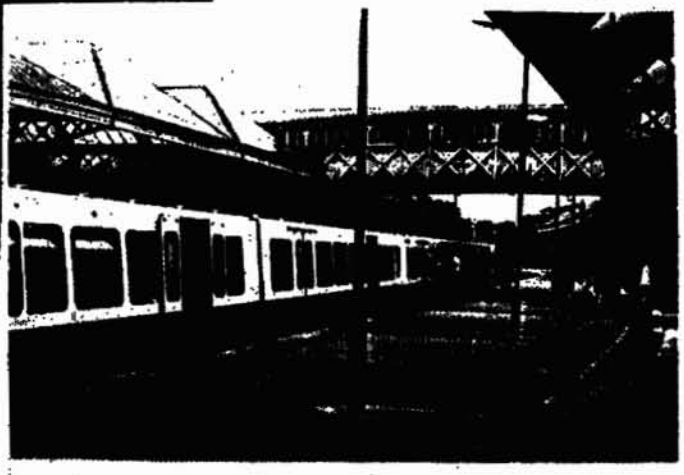
Above, left: 7th Street bus/ light rail transit mall in Calgary. Pedestrian traffic, but not automobiles are permitted on the mall.

Right: Minimal terminal facilities are required in these situations. Pedestrian-compatible turn-around area in Rotterdam. Note the special paint scheme depicting a maritime theme.



Left: Light rail lines may also be routed along marginal industrial or institutional areas. Mongy Tramway in Lille.

FIGURE A.13 LIGHT RAIL CONSTRUCTION: RE-USE OF OLD RAILROAD STATIONS ON THE TYNE & WEAR PTE IN BRITAIN

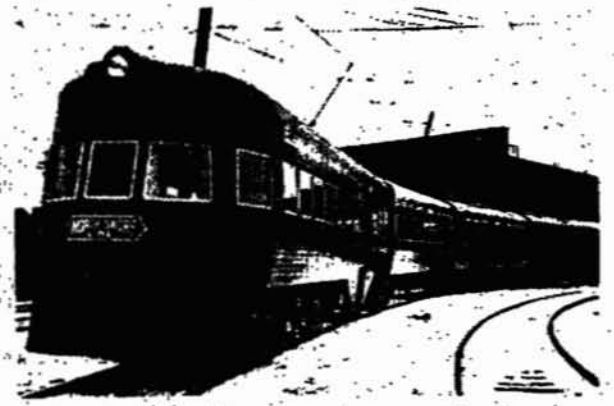


Above, right: Tynemouth Station. Platform widened and track straightened for better driver visibility.

Left: Whitley Bay. Existing structure was in good condition, and simply required repainting.

Right: Monkseaton. Former center siding removed to make way for support poles for the overhead catenary.

FIGURE A.14 SPECIALIZED LIGHT RAIL EQUIPMENT FOR HIGH-SPEED SERVICE AND OPERATION ON STEEP GRADES



Above, left: Ex-KBE Silver Arrow cars in Salzburg. These vehicles are capable of 80 MPH.

Above, right: North Shore Line Electroliners. These articulated interurban cars had a balancing speed of 84 MPH.

Right: Eight-axle articulated car in Freiberg, with four monomotor trucks per car. With all axles thus powered, superior adhesion is permitted for operation up steep grades.

Left: Four-axle articulated car in Neunkirchen, on a hill with an 11.2% grade.

FIGURE A.15 VEHICLES SUITABLE FOR HIGH-SPEED BUSWAY OPERATION: CONVENTIONAL TRANSIT BUSES AND INTERCITY COACH TYPES

Above and right: The Flxible 870/ Grumman Metro line of buses is particularly well adapted for busway operation, with a top speed of at least 75 MPH and good ride quality.

Above: Intercity coach models like these Eagles have recently achieved popularity in suburban commuter service, operating on busways and HOV lanes.

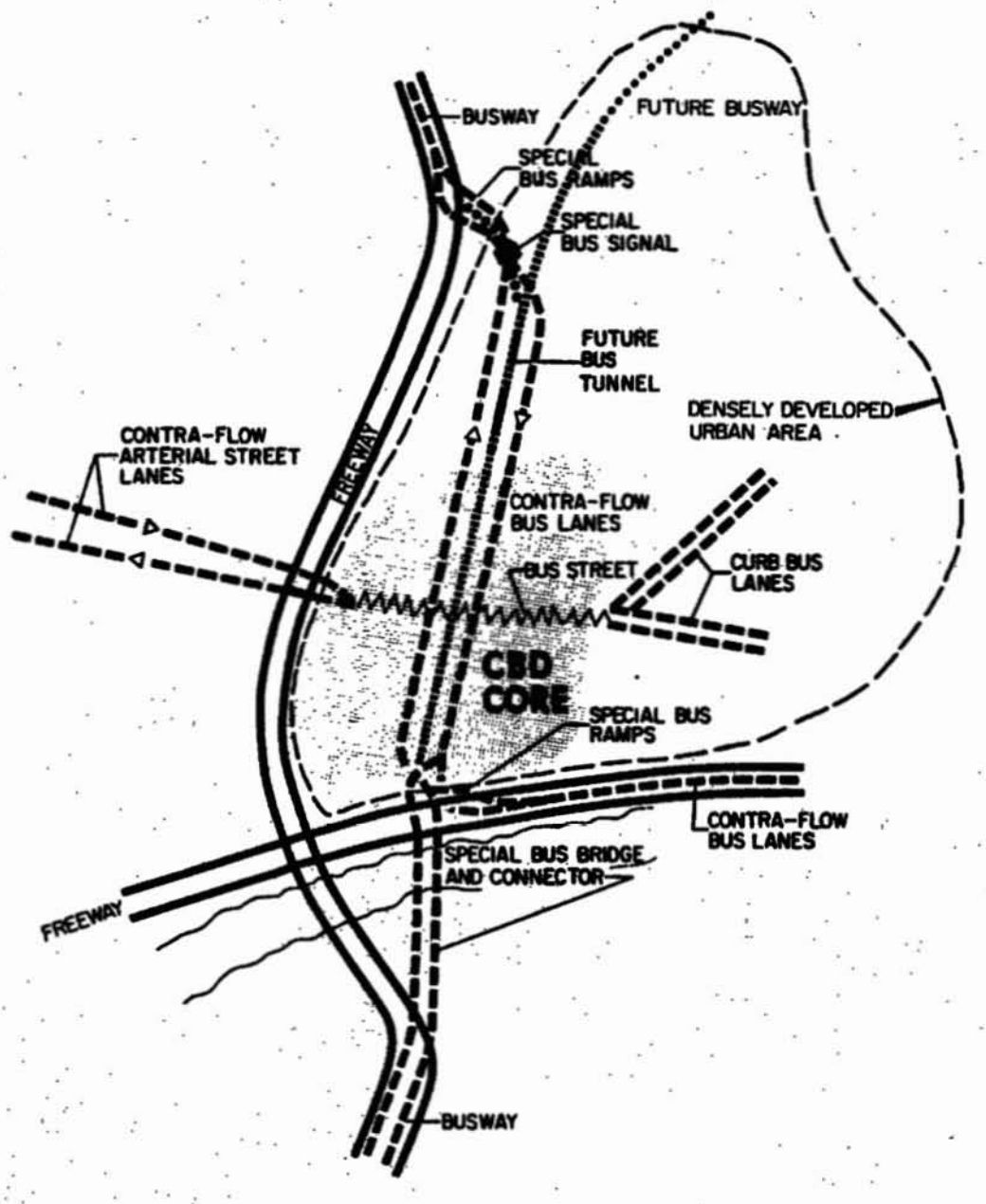
FIGURE A.16 VEHICLES SUITABLE FOR HIGH-SPED BUSWAY OPERATION: ARTICULATED AND DOUBLE-DECK HIGH-CAPACITY BUSES

Above: Articulated "New Look" bus by GM of Canada. Articulation is one means of increasing bus capacity. This vehicle seats 70.

Right: Superbus, a 60-seat tractor-trailer design with low floor entry/exit.

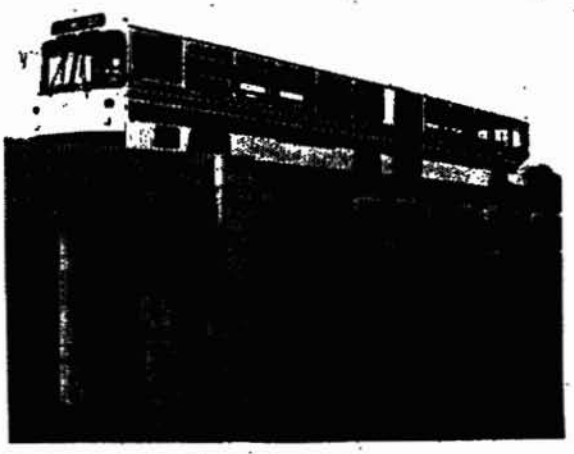
Above: Double deck buses like the Neoplan Skyliner (L) and Highliner (R) can seat up to 108 and operate at up to 70 MPH.

FIGURE A.17 CONCEPTUAL DIAGRAM ILLUSTRATING BUS PRIORITY FACILITIES



Source: Bus Rapid Transit Options for Densely Developed Areas. USDOT 1975.

FIGURE A.18 · GUIDEWAY BUS OPERATION



Above, left and right: MAN articulated vehicle on bus guideway in Munich.

Left: The Spurbus and O-Bahn guideway bus systems rely upon rollers bearing upon lateral guide-rails for self-steering.

Right: Experimental British guideway bus design utilizing a central slot or conduit for steering.

FIGURE A.19 COMMUTER RAIL EQUIPMENT: CARS FOR DIESEL PUSH-PULL OPERATION

Above: Gallery cars have 2-2 seating on the main deck and a single row of seats on each side above. This type of high-capacity equipment is extensively used in Chicago.
Below: True double-deck commuter cars, as developed by UTDC for service in Toronto (now also in service in Miami).

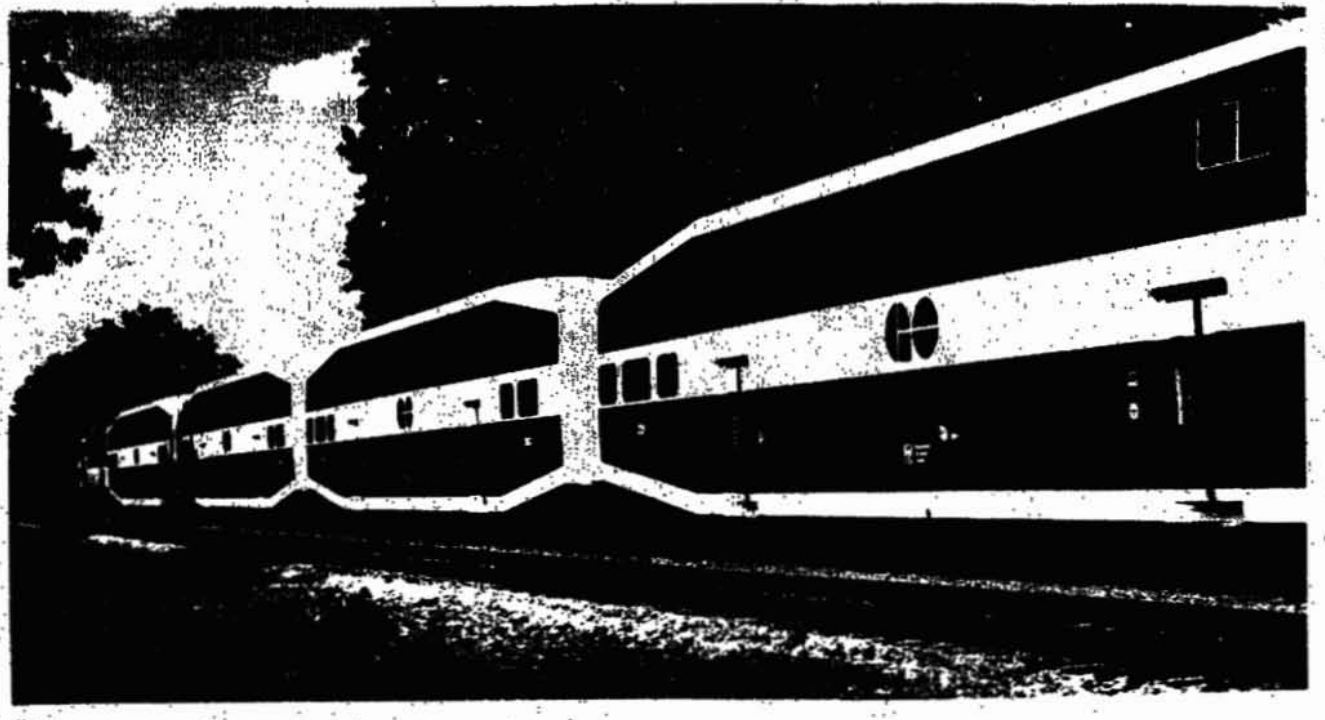
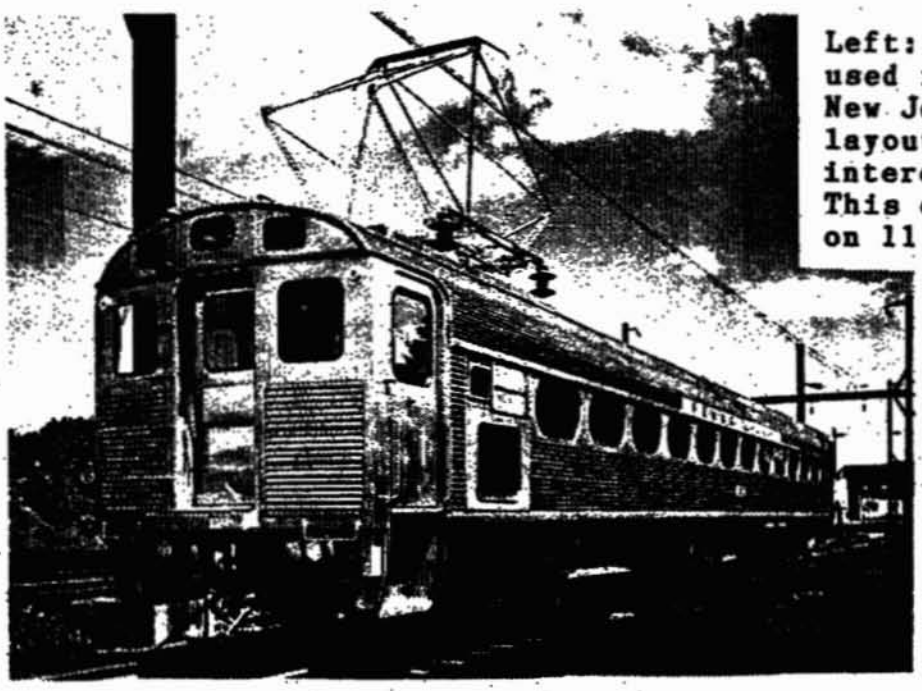
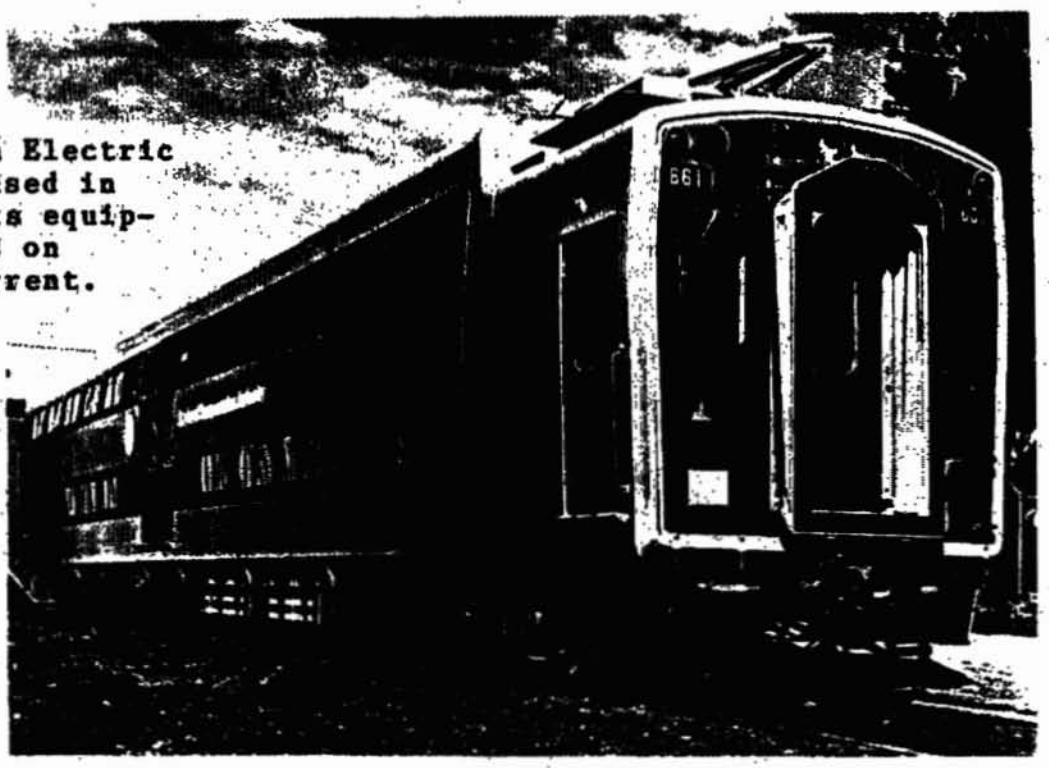


FIGURE A.20 ELECTRIFIED MULTIPLE UNIT COMMUTER CARS

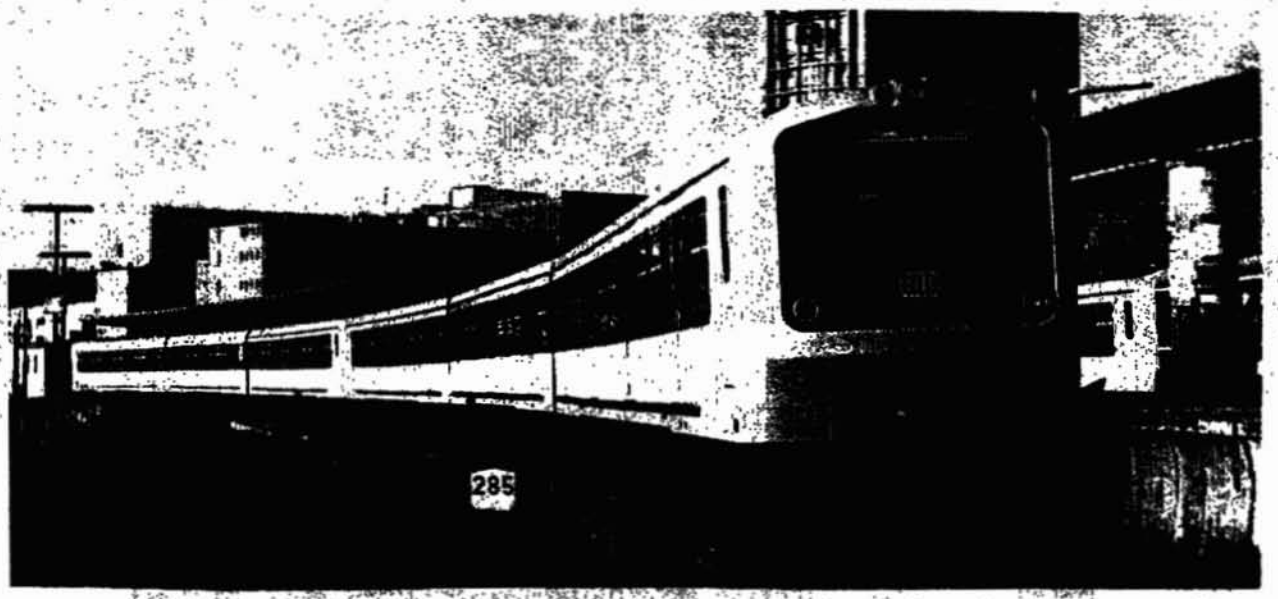


Left: Silverliner type used in Philadelphia/ New Jersey. Similar in layout to lightweight intercity rail coaches. This equipment operates on 11,000 Volt AC current.



Right: Metra Electric gallery car used in Chicago. This equipment operates on 1500 V DC Current.

FIGURE A.21 ELECTRIFIED MULTIPLE UNIT COMMUTER CARS (Cont'd)

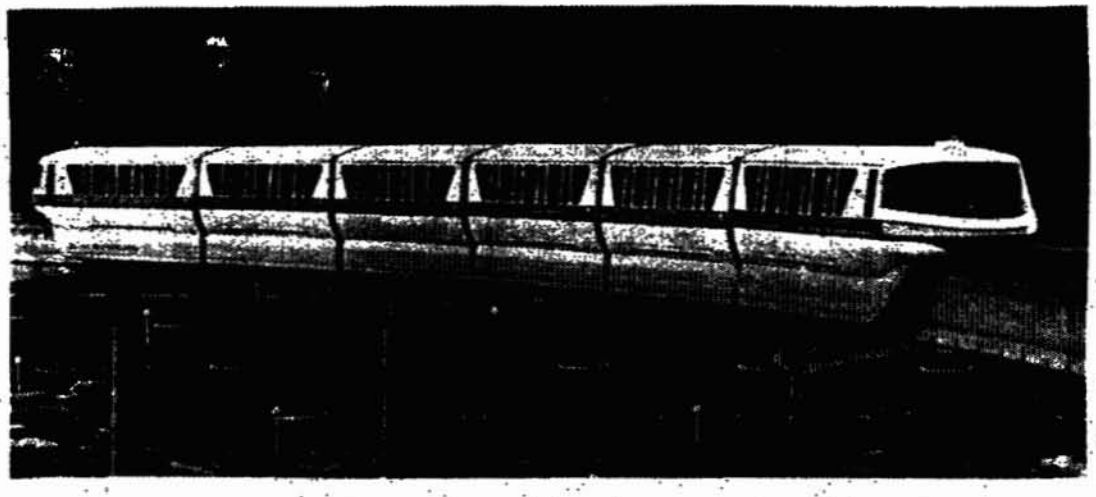


These vehicles, operated on the regional rail system in Hamburg, are rather similar in concept to high-speed rapid transit cars.

FIGURE A.22 FOUR-AXLE DIESEL RAILCARS IN JAPAN

Left: Moka Railway
Right: Akita Inland Through Railway

FIGURE A.25 STRADDLE MONORAILS: ALWEGS IN FLORIDA AND JAPAN



Above, right: Mark IV monorail at Walt Disney World.

Center: Switch.

Above: Mark IV aerial structure.

Right: Tokyo Haneda monorail, also an Alweg design.

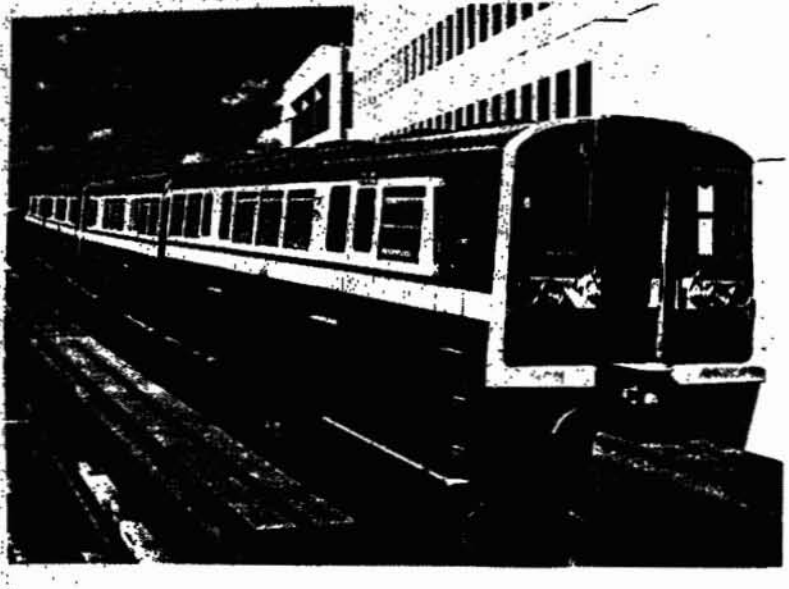
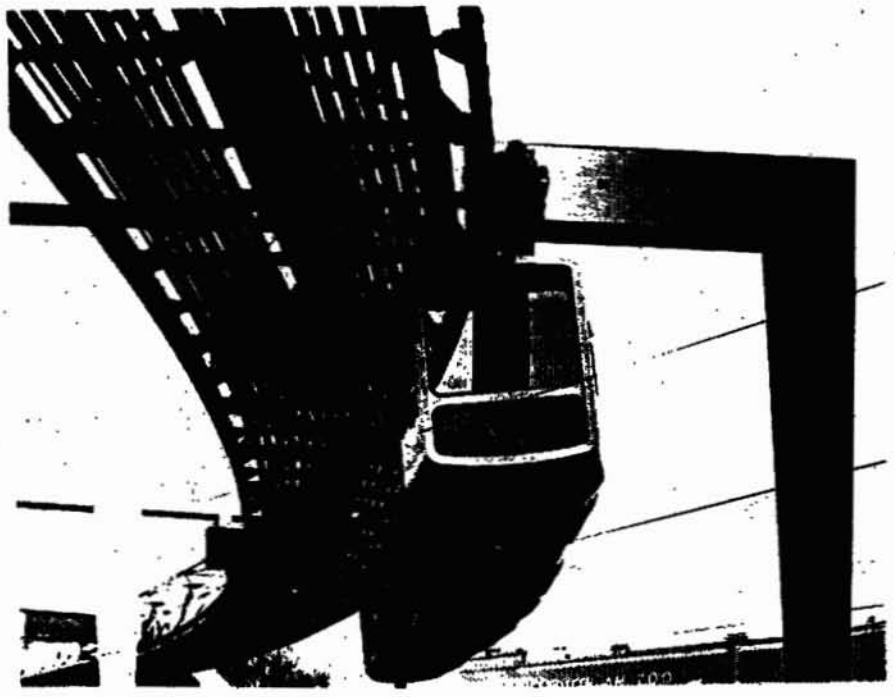


FIGURE A.26 SUSPENDED MONORAILS: WUPPERTAL



Above, left: The historic Wuppertal Schwebebahn, the world's only true operating monorail.

Below: A new Schewebebahn station.

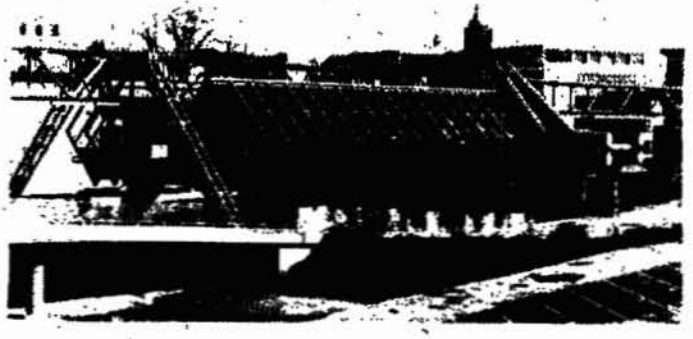
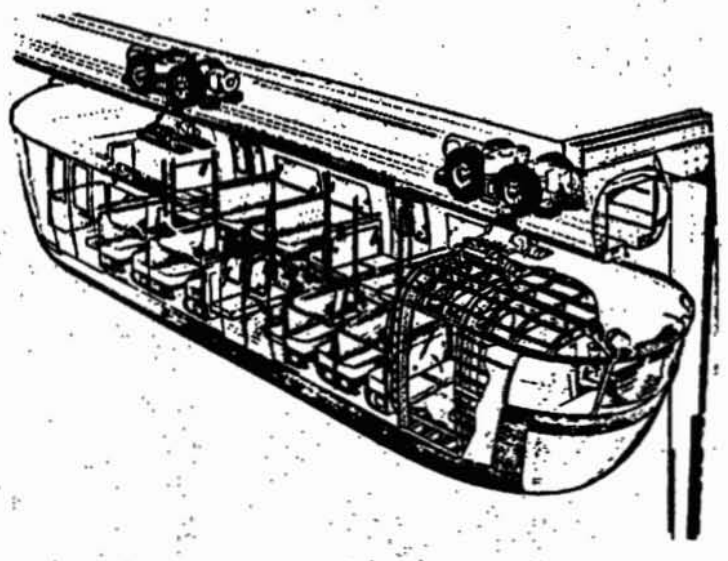


FIGURE A.27 SUSPENDED MONORAILS: SAFEGE TEST TRACK

Above: Original SAFEGE test track at Chateauneuf-sur-Loire.

Right: View of aerial structure in experimental application.



Above: Section through the 75 MPH SAFEGE car and beam.

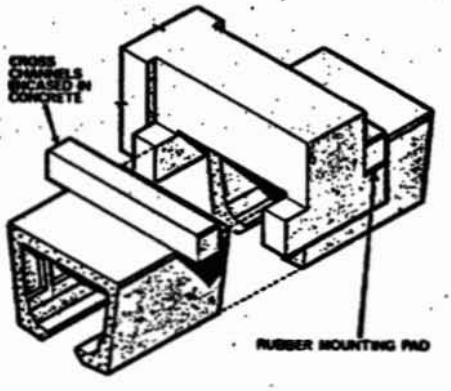


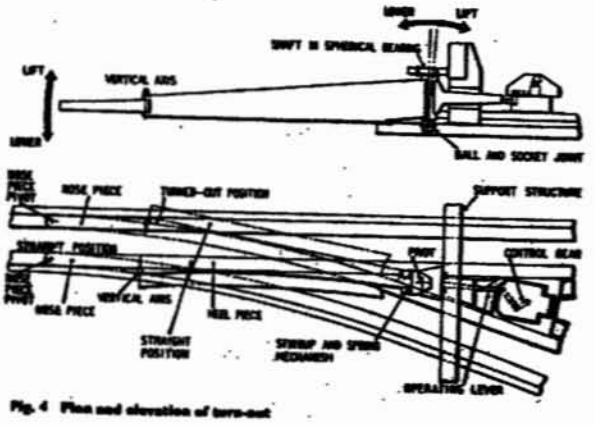
Fig. 3 Method of attaching runway beam sections to column supports

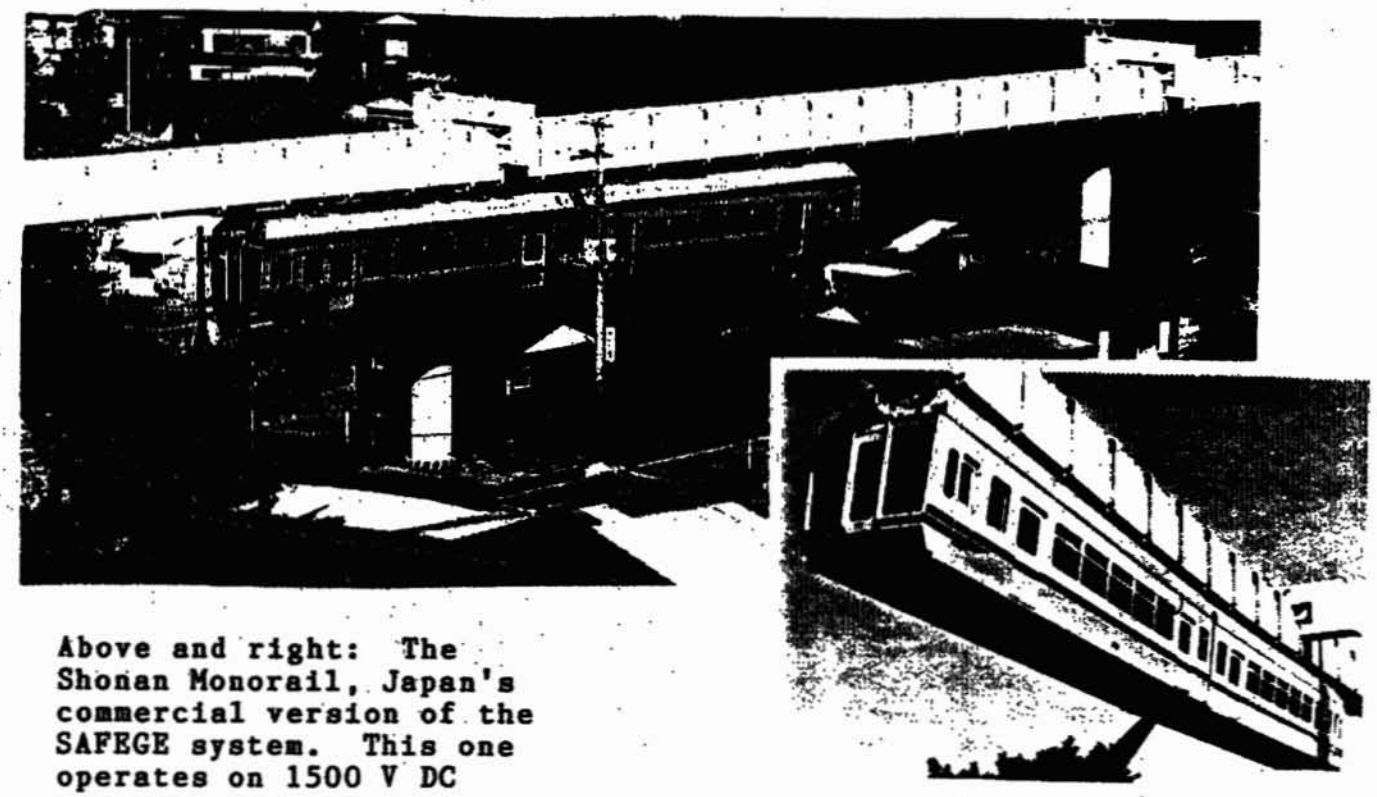
Right: Details of beam.

FIGURE A.28: SUSPENDED MONORAILS: SAFEGE DESIGN AT SHONAN

Right: SAFEGE switch.

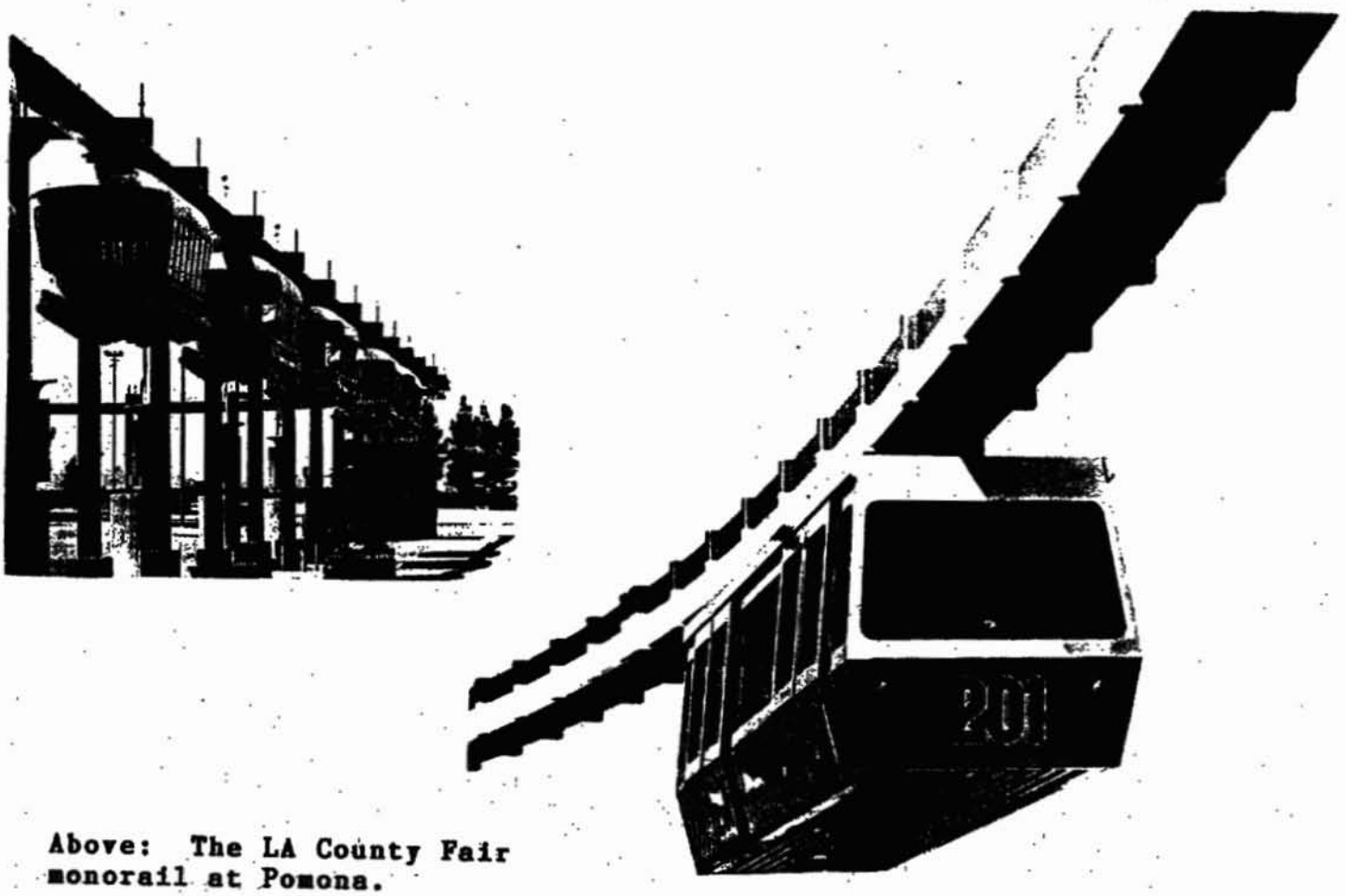
Below: Truck for support, propulsion and braking.





Above and right: The Shonan Monorail, Japan's commercial version of the SAFEGE system. This one operates on 1500 V DC current.

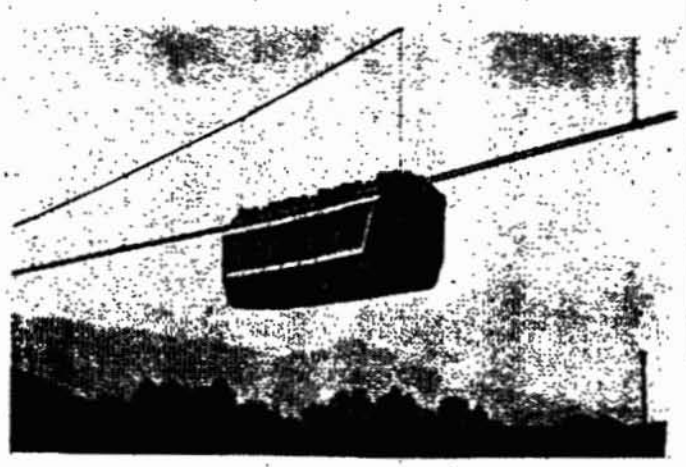
FIGURE A.29 SUSPENDED MONORAILS: VARIOUS TYPES



Above: The LA County Fair monorail at Pomona.

Right: H-Bahn, another low-speed suspended system.

Below and right: Aerobus, a two-wire rapid transit system.



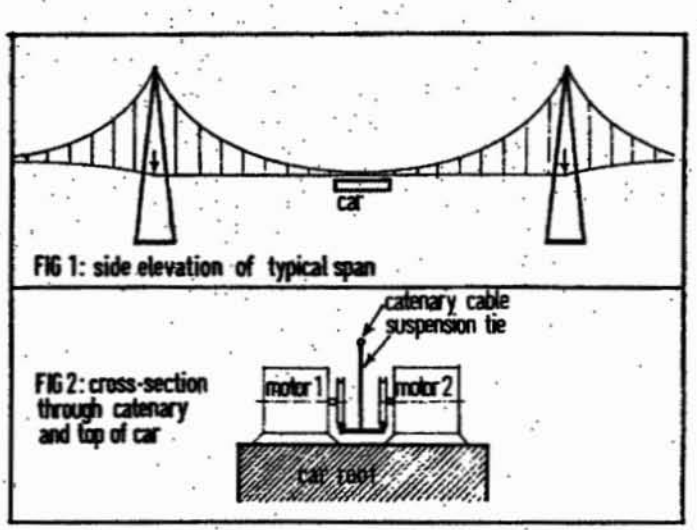


FIGURE A.30 MORE SUSPENDED MONORAILS

Left: Skyway monorail test track at Houston.

Below: Mock-up of coach interior.

Below: Bennie Railplane at a station.

Right: Bennie track over a railroad line near Glascow.

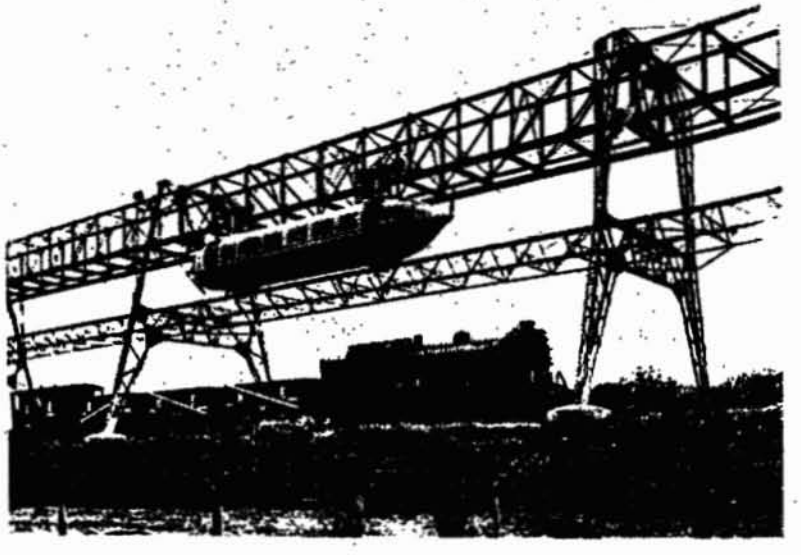
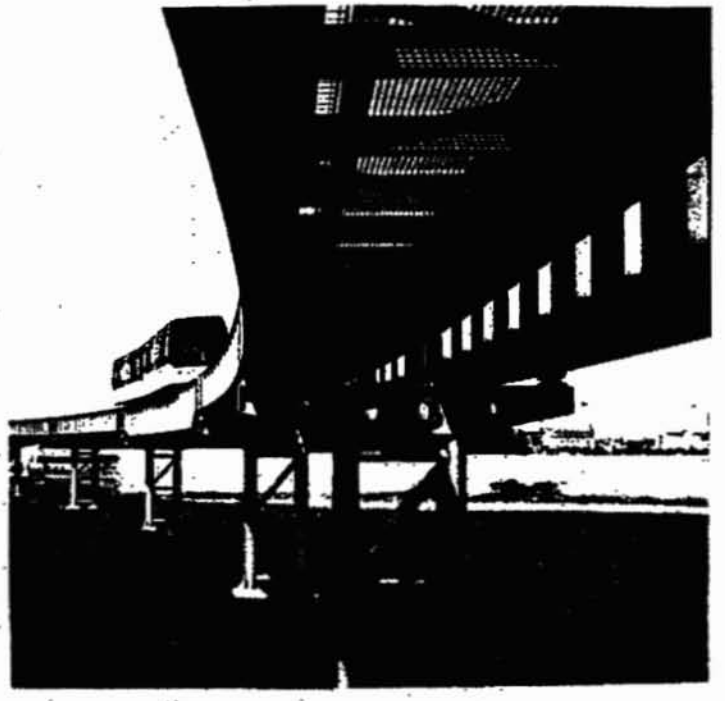


FIGURE A.31 MAGNETIC LEVITATION TRANSIT SYSTEMS



Above, right, and below left: M-Bahn test track.

Below: Section through M-Bahn on T-column support structure.

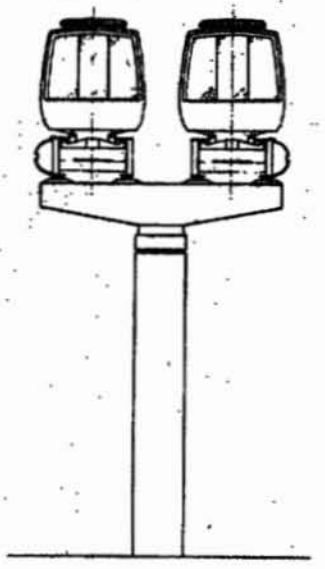
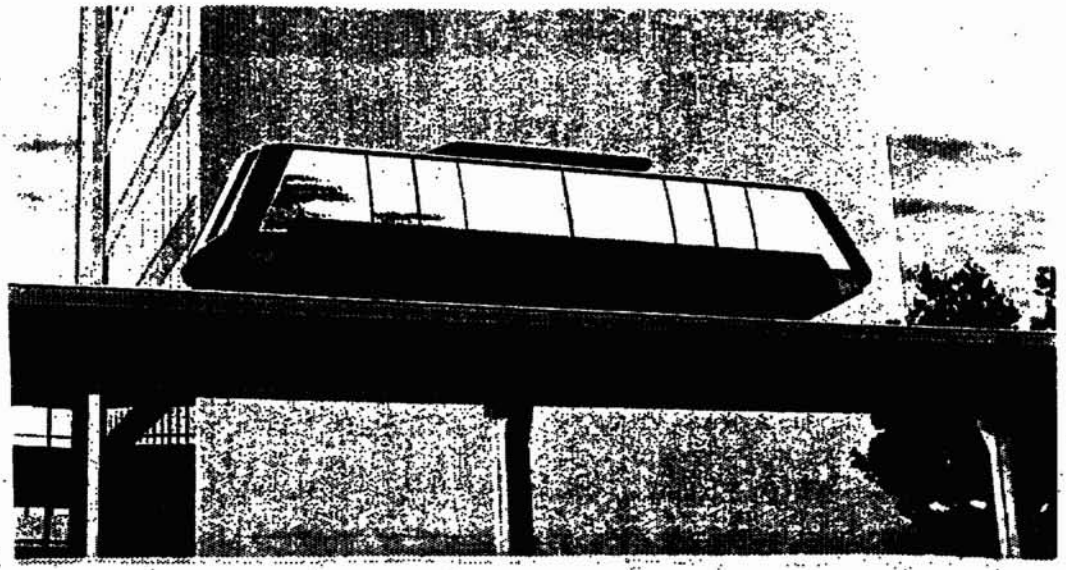
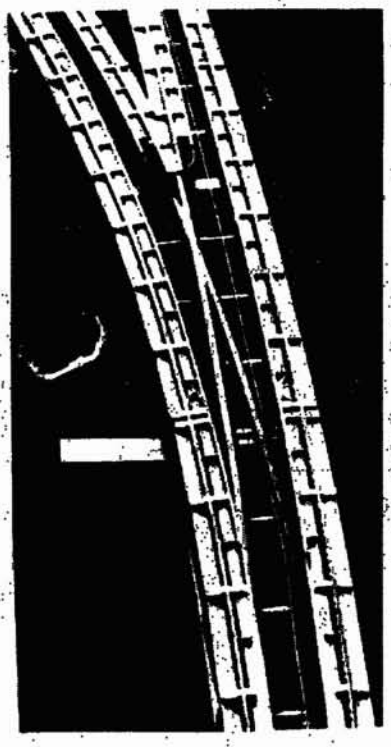


FIGURE A.32 MAGNETIC LEVITATION SYSTEMS (Cont'd)

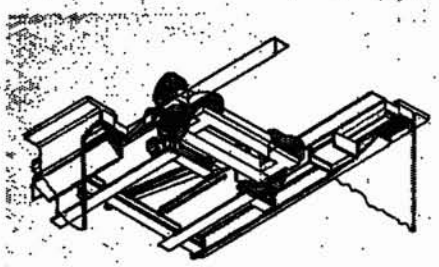


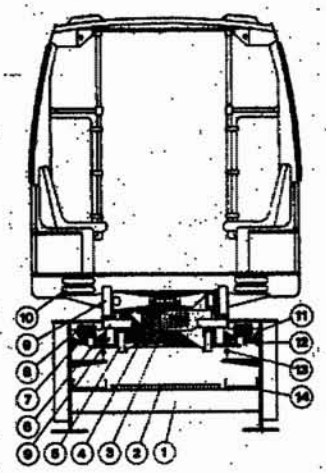
Above: Scheme for streamlined, medium-speed rapid transit car.



Below, left and center: M-Bahn switch.

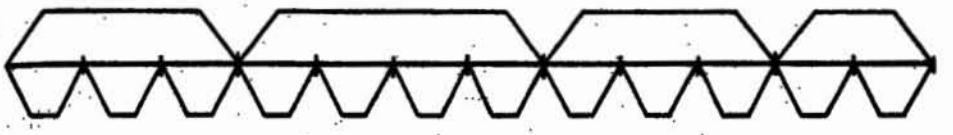
Below: Section through car and guideway, and diagram of guide wheels.



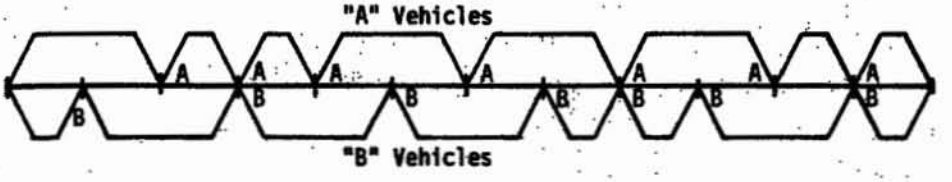


1 Guideway
2 Walkway grating
3 Primary suspension
4 Levitation frame structure
5 Switch guidance rollers
6 Horizontal guide rollers
7 Permanent magnets
8 Travelling-field stator
9 Vertical guide rollers
10 Air suspension
11 Current collector
12 Auxiliary power rail
13 Inductive Loop
14 Cable duct

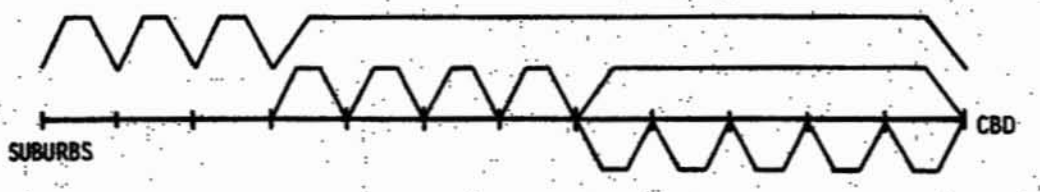
FIGURE A.33 DIFFERENT TYPES OF STOPPING SCHEDULES



a. Express/Local Operation



b. Skip-Stop Operation

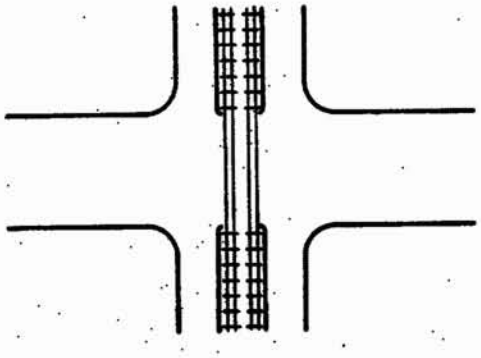


c. Zonal Operation

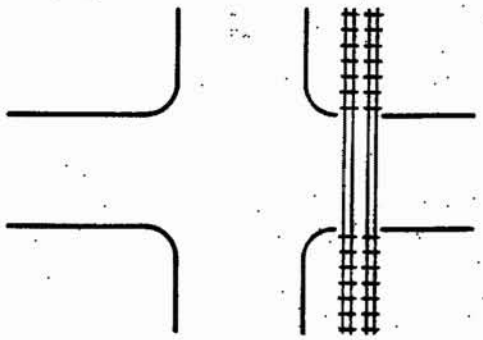
Source: V. Vuchic, Transit Operating Manual, PennDOT 1978.

FIGURE A.34 GRADE CROSSING CONFIGURATIONS

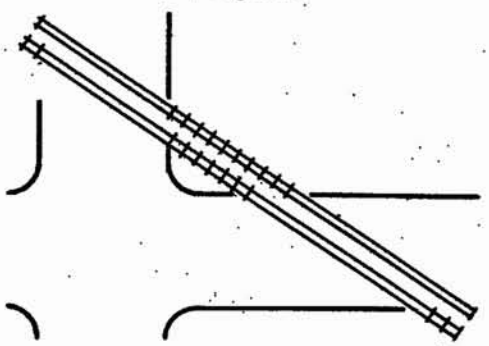
1. At-Grade Median



2. At-Grade Parallel



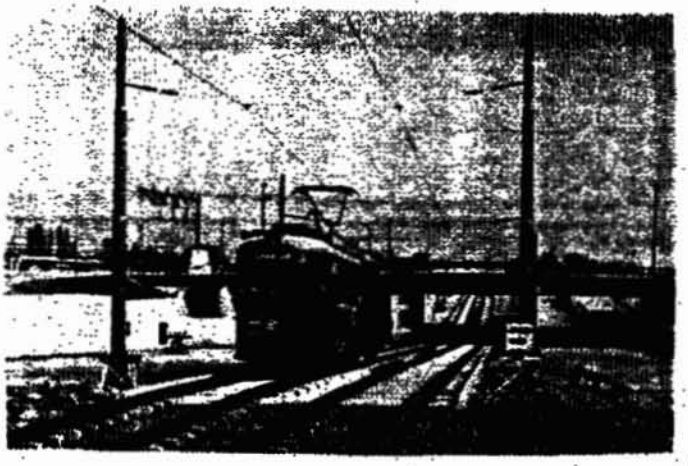
3. At-Grade Diagonal



Source: Rail Impacts And Mitigation On Surface Street Operation, LADOT 1988.

FIGURE A.35 GRADE SEPARATIONS AND GRADE CROSSINGS

Right: LRT overpass above arterial highway in Gothenberg.



Left: LRT underpass, in this case below a main line railroad in Rotterdam.

Right: Gated crossing in Stuttgart, with lights and crossbucks.

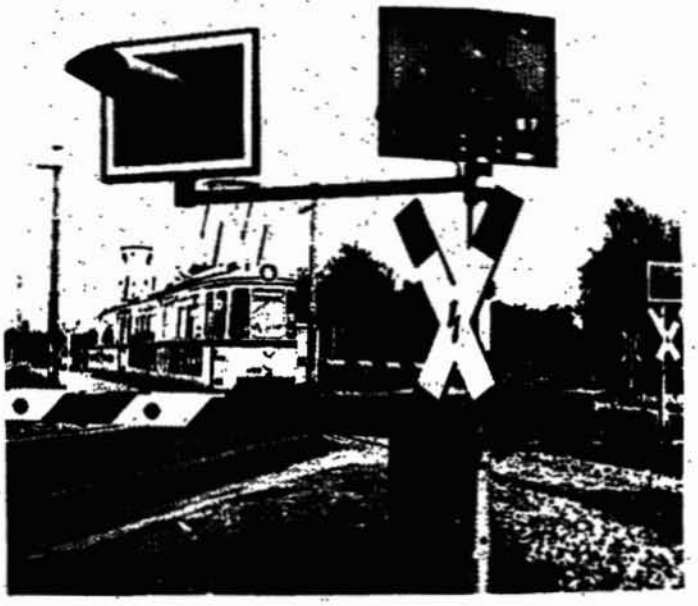
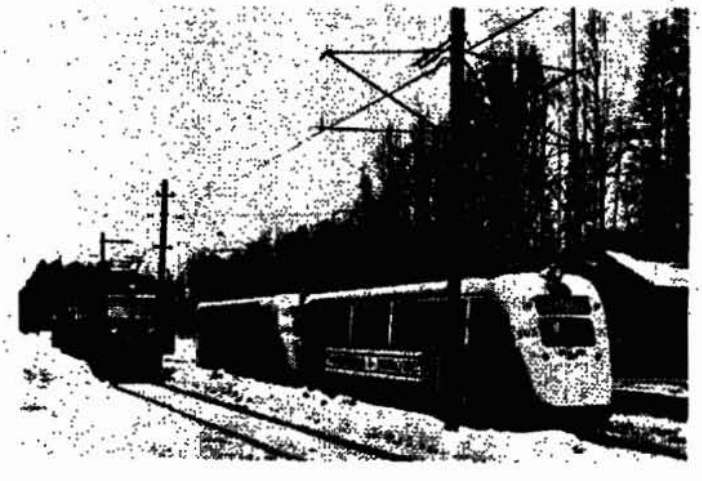


FIGURE A.36 MODAL COMPATIBILITY: LIGHT RAIL WITH BUS AND LRT WITH RAPID TRANSIT

Left: Combined LRT line/ bus lanes in The Haag, with a bypass track around a local bus stop.

Right: Shaker Heights LRT and CTS rapid transit trains using the same tracks in Cleveland; employing platforms of different height.



Left: High-floor Kolsasban "heavy rail" interurban car and low-floor Goldfish tram on the same tracks in Oslo. The platform levels are connected by a ramp.

FIGURE A.37 LRT/RAPID TRANSIT AND LRT/RAILBUS HYBRIDS

Left: The Skokie Swift in Chicago is operated with single-unit rapid transit cars across at-grade crossings, demonstrating that the distinction between light rail and rapid transit is not a hard-and-fast one.

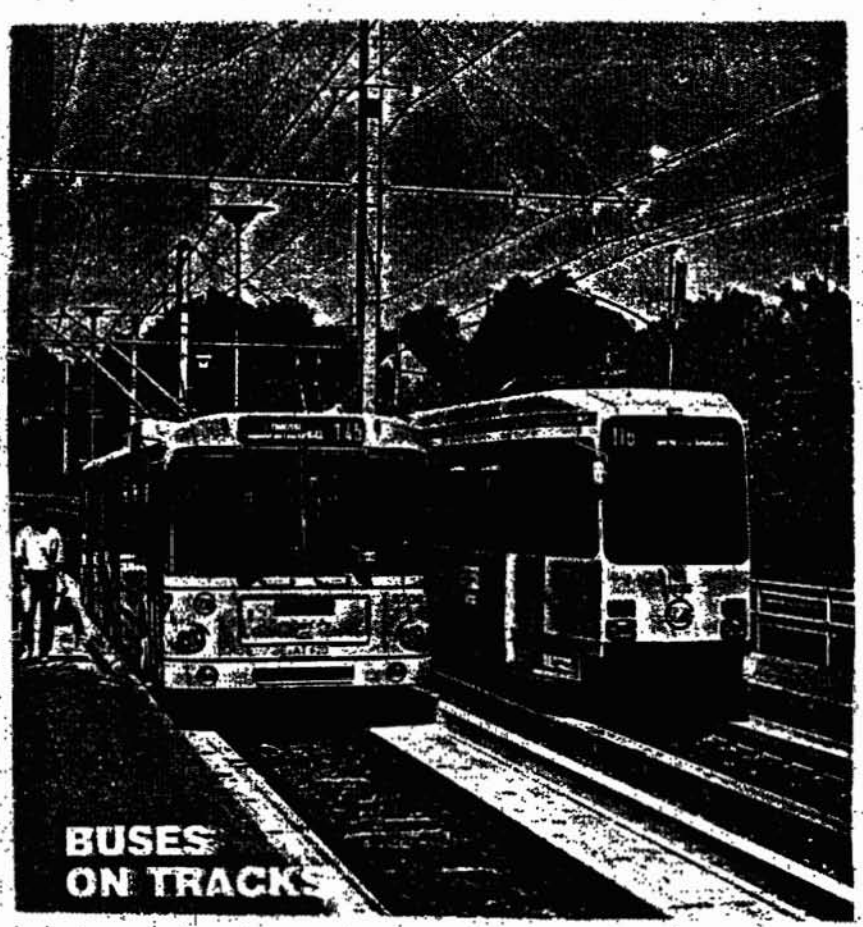
Right: The Mack FCD diesel-electric railbus once operated on the New Haven RR. Using PCC car trucks and motors, it was really a commuter rail/LRT hybrid. Again, the distinction between the modes is blurred.

FIGURE A.38 MODAL COMPATIBILITY: LRT AND ELECTRIC TROLLEY COACH

Right: There is considerable interest in bus system electrification, including the use of trolley coaches or trackless trolleys which can share power substations and maintenance facilities/personnel with LRT. The Boston Coach shown here has doors on both sides for tunnel operation.

Below: A PCC car in Cincinnati using overhead wire instead of the running rails for the current ground. The resultant two-wire system is essentially the same as that used by trackless trolleys, underscoring the high degree of compatibility between these modes.

FIGURE A.39 MODAL COMPATIBILITY: LRT AND GUIDED BUS



Guided electric buses using trolley power pick-up on a test track in Essen. The test track is built on a local tramway, showing that electrified guided busways and LRT are compatible modes.

APPENDIX B

RIGHT-OF-WAY DEVELOPMENT, OPTIONS, AND ISSUES

B.1 Types Of Rights-of-Way, And Reasons Why Railroad Rights-of-Way Are Attractive For Transit Development.

The search for affordable right-of-way has been a major objective of every planning agency engaged in the development of new transit facilities. Each type of right-of-way has certain physical and historical characteristics which will affect the desirability of its use for transit. Periodically, well-intentioned individuals will become advocates of the use of a certain type of right-of-way for transit purposes. But not all classes of right-of-way are created equal: the following are the advantages and disadvantages of using some of the more commonly advocated types.

Arterial Highways. Arterial highways are in theory one of the more desirable types of right-of-way for transit service, as they are designed to serve residential, industrial, and commercial development, or, if built first, have tended to attract such development. Additionally, access from local streets is often restricted, and the arterials are usually favored by signal progression; they are often fairly wide.

However, the fact that arterials are traffic-inducing has led to their becoming so crowded with motor vehicles that withdrawing lanes from mixed-flow vehicular use in order to dedicate them to transit may be politically unfeasible. In this country, arterial lanes can most easily be withdrawn from automobile use in an area with a declining economy, i.e. where lanes become excess; however, in a growth area such as southern California, this condition is seldom met.

It will be easiest to locate new transit private right-of-way along arterials which either (a) were originally designed with a wide, landscaped median or with wide offsets (lawns or sidewalks) between the curb line and the nearest structures, or (b) formerly had electric railways located in the median, with the right-of-way left more or less intact (or translocated to the roadside).

However, even where arterials can be used for transit, the type of intersection design and volume of cross traffic may conflict with the development of a truly fast transit corridor--or require costly underpasses or flyovers to avoid impacting heavily used intersections.

Freeways. Freeways may at first appear to be an attractive place to locate new transit facilities, as they provide full grade separation, and permit some cost-sharing in right-of-way preparation (in the case of new facilities which may be located in the median). However, some urban freeways, together with their shoulders and ramps, are so wide that they pose a formidable barrier to pedestrians desiring access to a median freeway transit line. Expensive aerial structure might therefore need to be constructed along the edge or outside of freeway rights-of-way--often difficult environmentally--to provide satis-

factory access to adjacent activity nodes.

In other cases development has encroached right up to the shoulders of the freeway so that little room remains for further expansion. Here, a transit line would need to be placed on a separate structure, adding greatly to costs. In such cases, there may be limited room for station development or park-and-ride lots. Similarly, the location of freeway ramps may sometimes interfere with station construction, and congestion at interchanges may deter feeder bus access.

It should be noted that many freeways have purposely been routed away from residential areas and other major trip generators. Although freeways have often induced growth, intensive development has also frequently been discouraged immediately adjacent to freeways, greatly reducing their utility for transit. In all of these cases, passengers waiting in or walking to freeway transit stations will be subject to intensified air and noise pollution, which also reduces the desirability of transit development in freeway locations.

The most favorable situation is where a freeway is not of excessive width and where green space has been provided as a buffer on one or both sides. As freeways are growth-inducing, they can offer opportunities for generating transit patronage, as well as obstacles to transit implementation.

Power Line Rights-of-way. Power lines are often thought to provide a good opportunity for transit development. However, the routing of power lines is not directly related to economic activity, other than the fact that there will be more power lines in large urbanized areas. They are not growth-inducing. Although it is not uncommon for power line rights-of-way to cut across residential areas, their presence is generally inimical to development of major office complexes or commercial sections, for aesthetic reasons. Moreover, persuading utility companies to permit the location of transportation facilities directly under their power lines may be difficult, for liability reasons. Hence, power line rights-of-way are of much more limited use for transit development than many people believe.

Short segments of power line R/W may have potential as connectors between other rights-of-way however.

Flood Control Channels And Waterways. Unlike the canals of Holland or Venice, Italy, which are permanently filled with water and provide scenic residential or commercial locations, flood control channels in southern California tend to be starkly utilitarian fixtures, more likely to inhibit than promote nearby economic activity. Location of facilities along or over flood control channels will often pose serious hydraulic engineering and permitting problems as well. For these reasons, most are of limited use in transit development in our area.

Again, pieces of flood-control R/W may be useful as short connectors.

Creation Of New Right-of-Way. While creation of new transit right-of-way by condemning industrial, commercial, or residential property is possible, it can be very expensive and in the case of residential areas there is often major community opposition. It is probably most feasible where light industrial land

uses, parkland, or vacant (undeveloped or redeveloped) land are involved; but in some of these cases, trip generating potential may be limited. Sometimes condemnation is used simply to widen existing rights-of-way, such as arterial streets, to permit transit construction.

Aerial Guideways Above Streets. Aerial construction is expensive, and may be aesthetically undesirable over many streets. Elevated guideways are most feasible where there are extensive linear parking plazas (or even alley-ways) behind buildings, in certain side-of-the-road situations (above sidewalks), or over the centers of very wide boulevards with nearby building heights limited.

Underground Construction. Cut-and-cover subways and bored tunnels are extremely expensive, which tends to prohibit their use except where no other alternatives are available and patronage density is expected to be substantial. However, underground construction is often necessary to provide short connecting links between surface or aerial rights-of-way in environmentally-sensitive localities.

Railroad Rights-of-Way. The use of railroad rights-of-way is often a very attractive option. They frequently traverse a wide cross-section of urban/suburban land uses and pass close to activity centers. Railroads, and transit modes such as LRT and commuter rail, are able to cross existing streets and arterials at grade, while vehicular traffic is prevented from trespassing on the right-of-way, because of the track structure. Thus, these rights-of-way are semi-exclusive, without the requirement for costly grade-separations at every intersection. This can allow transit right-of-way development costs (structures plus land) to be minimized.

Many of the railroad rights-of-way in southern California were formerly Pacific Electric (Red Car) interurban electric railway lines. As such, they helped to build the downtowns of many communities and served intervening residential neighborhoods. The Southern Pacific Transportation Co., which inherited the former Red Car system in 1965, has retained many of these old interurban rights-of-way. Present trends towards rationalization of railroad properties, meaning abandonment of lines no longer needed for freight service, may present a major opportunity and a challenge for transit development.

Some formerly steam railroad lines also present similar opportunities, because the railroads operated intercity and commuter trains which helped build many of the urban nuclei in the SCAG region. In fact, nearly every recognized, diversified, sub-regional center was originally located on a Pacific Electric route or a former steam railroad line.

(By coincidence many significant activity nodes in our area were actually built on former Red Car rights-of-way long after passenger service was abandoned. Examples include the Panorama City shopping center, Century City, Marina del Rey, Fox Hills, Howard Hughes Center, Santa Anita Fashion Square, Tyler Mall, Riverside Plaza Mall, Garden Grove Mall, and Cypress College.)

When electric interurban railways gained ascendancy in passenger transport, the steam railroads increasingly concentrated on freight service, and some railroad lines (e.g. the SP Coast Line through the San Fernando Valley) have attracted primarily industrial development. While these sometimes present more potential

for intercity rail or for commuter service (the latter heavily oriented to park-and-ride rather than walk-on access from local activity centers), even light industry is preferable for patronage than the total absence of activity that often characterizes utility rights-of-way.

More importantly, many former railroad yards, as well as light industrial areas along certain railroad rights-of-way, are ripe for redevelopment. Along certain railroad branches, recycling of land which presently sustains marginal economic activity (such as auto junk yards, storage lockers, firewood sales, etc.) can present a major opportunity for transit/real estate joint development projects. Further, the resulting mix of the more viable light and heavy industrial employers with new office buildings, shopping centers, retail commercial and recreational centers at different points on the same right-of-way can greatly enhance transit patronage and economic viability (this being one reason why patronage on Sacramento's Folsom Branch LRT line has exceeded predictions.)

While railroad rights-of-way (such as old interurban lines) are sometimes located in side-of-road or highway median locations, many are located at some distance from highway intersections. As such, it is much easier to gate the crossings and to avoid interference with cross-traffic than it is where new fixed-guideway transit lines are located directly along highway corridors.

B.2 Single Corridor Versus Composite Right-of-Way Development.

Before leaving the subject of right-of-way types, it should be noted that there are two basic philosophies in planning transit alignments: (a) focusing on a single, existing right-of-way, such as a former railroad line, and serving whatever trip generators (if any) already exist on the corridor; and (b) emphasizing service to a string of activity centers and piecing together various kinds of available right-of-way to build a composite route. Both methods are quite valid in different circumstances.

It is quite common for transit planners to follow the second approach, and combine the use of, for example, shorter segments of freeway, arterial highway, and old railroad rights-of-way. However, the first approach has its merits in areas where there are many, diffusely located activity areas. It is also a useful approach where consideration is given to major new development on marginally used land, along old industrial corridors.

Railroads often prefer to sell an entire branch line (it simplifies both abandonment procedures and real estate dealings) rather than to break up the corridor into segments and sell the latter piecemeal to a multiplicity of buyers. Owing to the difficulty and expense of condemning new land to piece together entirely new transportation rights-of-way (heavily contributory to the cessation of new freeway construction), it is well worth while for public agencies to take advantage of opportunities to purchase linear railroad rights-of-way of some length and to look for ways of using them both for commuter transportation and as a joint development opportunity.

In cases where only a short segment of railroad right-of-way is used for transit, this is often because the remainder of the former rail corridor has already been lost due to development for other (non-transit) purposes. Also, it

is interesting to note that in a number of proposals, segments of many different rail lines, active and abandoned, are joined together to create the desired right-of-way continuity.

Finally, it is seldom possible to develop a new transit corridor in its entirety along a railroad right-of-way without the need to add at least a small segment of some other kind of right-of-way. Often the latter entails a subway link or transit mall developed on former roadway for CBD access. Another strategy often used where the available railroad rights-of-way are limited to suburban areas, is to route the transit line in the inner core area along a freeway alignment, reverting to cheaper, surface railroad R/W farther out.

B.3 Strategies For Making Railroad Right-of-Way Available For Transit.

There are several different ways in which railroad rights-of-way may be adapted for transit service. These are enumerated below:

1). First, it is possible to acquire an entire branch line facing abandonment. This will permit operation of any desired transit mode: rapid transit, light rail, commuter rail, busway, etc. However, the abandonment process is lengthy, and the railroads may need to go to some trouble to relocate customers, even if only a few customers remain on a given branch.

2). Sometimes a railroad right-of-way does not face abandonment, but acquisition may be desirable or necessary. Diversion of through freight traffic from one line, which is desired for transit, onto another, parallel rail line will permit transit development of the former. Proposed rail consolidation projects in the SCAG region have included the Santa Fe's plan to relocate through freight from its Second to its Third Subdivision, and the Alameda Corridor Project.

In some cases, relocation of a railroad right-of-way to a new location can have the same benefits. A case in point is the removal of the Santa Fe Second District from an old, narrow R/W in a residential neighborhood concomitant with its installation in the median of the 210 Foothill Freeway in Pasadena. Relocation of rail rail freight lines to utility corridors (cf. the segment of the SP Puente Branch that was built along the east levee of the San Gabriel River) will not suffer from a lack of person-trip generators along these rights-of-way, as would transit. Rail freight relocation, like consolidation, is another strategy to free up right-of-way for transit use.

3). Another option is to purchase a fraction of the total width of the railroad right-of-way: only as much as is required to place two tracks or bus lanes (the latter also with shoulders), plus additional space required at station sites. This applies to railroad main lines and also to wider branches which are fairly active (at least several daily train movements) or require all-day access to the track. This has been done in a number of cities; in Los Angeles, examples include the El Monte Busway/HOV lane project, which occupies part of the right-of-way of the SP State Street Line, and the LA-Long Beach LRT line, which will occupy about 2/3 of the width of the SP Wilmington Branch R/W.

An important aspect of this is that lateral relocation of the existing railroad line within the right-of-way is usually necessary, unless the R/W is at least

70-90 feet wide. Generally, a single or double track rail freight line will be located directly in the middle of the right-of-way. To establish a transit line on a portion of the width of the right-of-way, the freight tracks have to be moved over to one side, and the new transit tracks or bus lanes placed on the other side. Track relocation can add substantially to construction costs and delay.

4). Yet another possibility is presented where it is desirable to provide transit service along a segment of railroad right-of-way but where the latter is still in active service without enough room for both on the surface. In this case, an elevated rail or busway transit line might be built, needing space only for the upright columns to support the aerial structure plus lateral clearance. This generally less than the land needed for a single track.

5). A special case related to (3) and (4) above would occur where the width of a railroad right-of-way is restricted in places, but with sufficient space for only one added track next to the freight railroad. In this case, a single track light rail line might be constructed with passing sidings in wider spots. However, this causes severe operational restrictions and long headways as noted in Chapter 4. This strategy might be better limited to short transit branch lines. For trunk lines, it would be better to take additional R/W from nearby streets, condemn property for the second track or even put it above the other track on aerial structure (stacked configuration).

(6). There is, of course, the option of sharing track space and track time with a freight line by instituting commuter rail operation. Where operation is contemplated on railroad main lines, this may necessitate construction of new passing sidings, double track (where the main line is currently single track) or a third track (where it is already double track). For branch lines in only moderate freight use, an arrangement might be made with the railroad to preempt the use of the track during peak hours and restrict freight operation to off-peak periods. For more lightly used transit lines, railbus equipment rather similar to light rail cars could be used.

(Further comments are made on commuter rail issues in Appendix H.)

B.4 Transit Joint Ventures With Short Line Freight Carriers.

Yet another option, which has attracted considerable attention around the country, is the concept of "transitizing" the rail line by providing daytime/evening light rail service, much as was done in San Diego (see Chapter 4), while continuing to provide freight service late at night (during the wee hours) under contract with a short line carrier. Railroad industry personnel have been particularly receptive to this idea, as it permits them to keep their existing customers on minor branch lines, without the need to maintain or pay taxes on the right-of-way or abandon the line and relocate the customers.

Nearly 200 new short line railroad carriers have emerged over the last decade as main line railroads have sought to eliminate lightly-trafficked, money-losing branch lines. Operating without the restraints of railroad union work rules and allowing much greater flexibility in staffing requirements, many short lines run by small entrepreneurs have been able to provide a successful feeder service to

major freight carriers; and have often improved service to customers (1). One such short line, the Iowa Traction, even uses small electric locomotives, which would be compatible with a light rail line, an interurban railway, or a commuter rail operation with multiple unit electric cars (depending upon operating plan, regulatory approval, etc.).

Joint transit/short line freight operation is possible where daytime switching is conducted either on industrial property or on another rail branch not used by transit, and where it will suffice to move freights over the shared-track section between, say, 12 midnight and six in the morning. This type of arrangement, of course, precludes busway development.

For operation on the same tracks with transit equipment, the Interstate Commerce Commission requires a complete temporal separation between the services. This is because different standards for collision safety apply to main line railroad equipment as compared with norms for the transit industry. From this viewpoint, rapid transit and light rail equipment are quite the same; however, it is much easier to provide for joint operation over the same tracks using light rail cars with overhead power pickup and low platform loading.

Otherwise, with conventional rapid transit, there may be constraints on the location of the third rail supplying electric power to the transit cars. With rapid transit or a light rail system built for high platform loading, gauntlet track or sidings are necessary to provide the freight locomotives and cars safe passage around transit station structures. Somewhat heavier rail and/or more frequent maintenance may be required where freight trains operate over the same trackage as a transit line.

However, most light rail lines already utilize fairly heavy rail, owing the limited availability of lightweight rail from suppliers in this country. Wire heights may need to be higher than normal, and maximum gradients reduced to 2% where common running occurs (2). Conversion of signal circuits and crossing protection to AC or audio frequency track circuits that are compatible with electrified operation is another consideration (3).

If it is desired to provide at least half-hourly light rail service off-peak, and also operate daytime freights, an option is to develop a series of electric commuter railcars which meet FRA standards for mixed operation with freight but otherwise conform to the general body layout of conventional transit vehicles. This would probably entail double track transit operation during peak hours and single track operation off-peak, with freights operating on the other track during mid-day. The passenger vehicles used on such a system would likely not be allowed to operate over the same track as regular transit, owing to their different collision standards (buffing strength/other safety requirements).

B.5 Types Of Transit Construction Used On Railroad Rights-of-Way.

Transit construction along extant or former railroad rights-of-way may be on the surface, on embankment, on aerial structure, or in open (uncovered) cut. In the case of rapid transit, monorails, maglev, etc., full grade separation would be required; this would usually also be the case for busways (excepting certain bus guideway systems like GLT). Light rail lines would have at least some at-grade

crossings, and this is also generally the case for commuter rail.

In the event a rail transit line with at-grade crossings is located on a former railroad right-of-way in a highway median, extra space must be provided for crossing gates. Assuming the median separates highway traffic flows in opposing directions, care also needs to be taken to channelize left-turn movements across the tracks from adjacent highway lanes; if possible, separate gate protection should be provided for this traffic. (If space does not allow separate gates, additional flashing lights and traffic signal phases can be used to warn left-turning vehicles.)

In the case of side-of-road rights-of-way (assuming two-way traffic), right turns should be channelized and provided with special, short crossing gates if possible. For left turns in these situations, the gates parallel to the railroad track should be fairly visible to traffic making this movement; however, additional signal phases and flashing lights should also be provided. The same general remarks apply to one-way streets, depending upon orientation.

Where transit rights-of-way are constructed next to freight tracks or yards in active service, the host railroad will almost certainly expect the transit line to be separated by fencing. Where a high-speed freight operation is present on main lines, concrete barriers (e.g., Jersey Barriers) and a slight elevation of the transit line on fill may also be desired as a safeguard against freight derailments which might cause accidents or otherwise interfere with the transit service. In Atlanta, a rapid transit line was placed on aerial structure next to a rail yard which was already free of grade crossings. Presumably this is to guard against the impacts of possible hazardous materials incidents (fires, spills, etc.) on the transit operation.

Similarly, where trench construction is used, a parallel freight line would be placed at a lower level in the cut to guard against the impacts of derailments on the transit line. This would also satisfy the greater vertical clearance requirements of the freight carrier. This type of construction was used by the Lindenwold Hi-Speed Line at Haddonfield, New Jersey (see Chapter 4).

B.6 Use Of Previously Abandoned Interurban Lines.

Where former interurban or street railway rights-of-way have been converted to highways, in some cases a linear median strip remains or the highway has been shifted to the middle of the R/W, leaving wide lawns and sidewalks as an offset on the margin of the street (such as parts of Venice Boulevard). In some cases excessively paved roadway areas remain, painted off in the center of the street. These have not induced traffic growth because such segments are discontinuous (e.g., parts of Van Nuys Blvd.). In such cases, it may be fairly easy to reclaim the former rail R/W for transit purposes.

B.7 Other Uses For Old Railroad Rights-of-Way.

Needless to say, where railroad lines are abandoned in urbanized areas, they can be put to uses other than transit development. There are a number of cases in which linear rail rights-of-way have been converted to hiking and equestrian trails (e.g., the PE Fullerton Line) or bikeways (such as the PE Glendora Line).

In still other cases they have been converted to green belts or linear parks (e.g., the PE San Pedro via Dominguez Line), often in short supply in urban areas. Much of the SP Pasadena Branch R/W in Alhambra and South Pasadena has been preserved as a Southern California Edison Co. power line R/W.

Where the R/W is fairly wide, it is possible to reserve space for a future transit corridor as well. However, where the right-of-way is narrow, reclamation for public transportation purposes may be difficult unless it is made explicitly clear to all users from the beginning that the recreational use is only temporary. This applies to mobile-home parks as well.

There have also been proposals to construct recreational facilities such as bikeways next to transit lines on former railroad rights-of-way; and even to operate a tourist trolley or tourist railroad operation with historic equipment on the same tracks as a light rail line.

With regard to recreational uses of former rail rights-of-way, a national organization, the Rails-to-Trails Conservancy, has become a strong advocate of conversion of abandoned rights-of-way. By the end of 1988, 201 rights-of-way had been developed into hiking trails, bikeways, nature trails, etc. The movement is sympathetic to the "railbanking" concept, in which unused rail corridors can be put into a "bank" for possible future rail utilization, and used as trails in the interim (4). A citizen's manual has even been developed for transforming rail corridors into multipurpose public pathways (5).

It is clear that railbanking of abandoned railroad lines is preferable to breaking them up for other development. A number of temporary uses can provide an interim economic return to the agency owning the right-of-way, including rented parking lots, small cottage industries in temporary structures, retail activities (such as firewood sales) that require open space, storage lockers, sod farms, and plant nurseries or tree farms (which can enhance the surrounding environment by creating the appearance of green space).

Development of arterial streets or local roadways is another possibility, though one which should be applied with care as major new highway facilities tend to be growth-inducing and may increase congestion. In some cases, however, creation of new arterial links and access roads on railroad rights-of-way may be engineered so as to alleviate certain local congestion problems.

It may also be possible to locate HOV lanes on former railroad rights-of-way. However, most HOV proposals call for lanes in freeways medians, which are fully grade-separated facilities. Special efforts would be required to police an HOV lane or transitway on a former rail right-of-way with cross streets in a suburban area. Nevertheless, where it is decided that additional highway capacity is needed, and a railroad right-of-way is already grade separated to a certain extent, HOV lanes might be an attractive possibility. They would also promote public transportation by providing access to transit buses.

Finally, there have been proposals to utilize abandoned railroad rights-of-way for special truck lanes, as proposed last year by Governor Deukmejian as a method of alleviating peak hour highway congestion caused by truck traffic (6). This would be particular applicable in cases where formerly rail-dependent

industrial corridors could benefit from improved truck access. Truck-only roads in such places would utilize rights-of-way which would otherwise be too narrow to support normal arterial highway development. However, the truck lanes could also be shared with transit buses, to provide some public transportation access along the truckway corridor. If the right-of-way were wide enough, an option might be to share the R/W with a light rail or other guideway transit operation.

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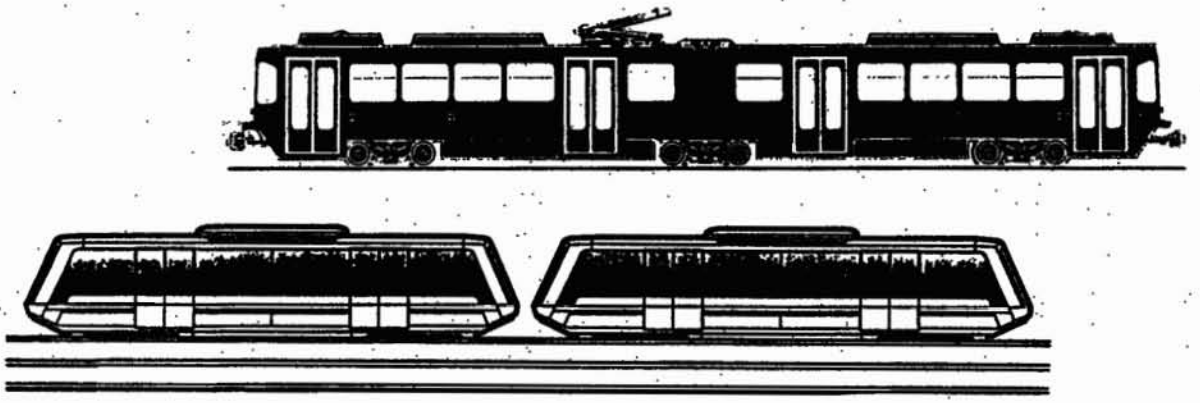
Above: Portland LRV
Below: Maglev train



APPENDIX C

OTHER RAILROAD BRANCH LINES CONSIDERED FOR TRANSIT

In addition to the five corridors discussed in detail in Chapters 10 through 14 of the main report, a number of other rail lines were examined which might become available for transit either in the near term or in the more distant future. A summary of the findings of this section was presented in Chapter 15 of the report, together with a comparison of all the lines examined (Table 15).

This appendix discusses railroad branch lines which are still operational, but which have a relatively low level of traffic and may be up for abandonment soon. It also includes lines which are partially abandoned, or are in the process of abandonment.

C.1 SP Torrance Branch.

The Torrance Branch extends south and west from the SP Wilmington Branch at Watts Junction, generally paralleling the Harbor Freeway down to the Harbor Gateway/Torrance area (Figure C.1). This corresponds to the southern part of the Harbor Freeway Proposition A corridor; use of the Torrance Branch would be an alternative to bus service on the Harbor Freeway Transitway south of the Century Freeway (although it is assumed that HOV lanes would probably be extended south from this point to the 405 Freeway for carpool use, in any case).

Potential Trip Generators. One option would be for a Torrance Branch transit line to feed into the LA-Long Beach LRT. As a branch of the LRT line, it could be instrumental in aiding plans by the City of Los Angeles and Los Angeles County for major redevelopment of the Florence, Watts, and Willowbrook areas, encompassing 5000 acres (eight square miles) of the poorest areas of Los Angeles. This area includes a South West Central enterprise zone (1).

The Torrance Branch originates on the SP Wilmington Branch (whose R/W the LA-Long Beach line shares) at Watts Junction, and proceeds southwest in a median in Lanzit Avenue to the point where the new Century Freeway will cross the Harbor Freeway. The El Segundo Branch also comes off the Torrance Branch at this point (in fact, the junction is now in a tunnel under the Century Freeway embankment). This area is included in a new county redevelopment zone, and is expected to undergo an industrial boom as a result of completion of the Century Freeway (2).

The Torrance Branch continues south in a median in Athens Way and then on private right-of-way roughly parallel to Figueroa St., down to 149th Street where it crosses over the Harbor Freeway. The segment of the Torrance Branch considered thus far has largely run through an area of single family homes. South of this point it occupies a wide median in Vermont Avenue. At Redondo Beach Blvd., it passes the Memorial Hospital and new Gardena Medical Center, and a number of apartment buildings on the east side of Vermont.

At Gardena Blvd. there is a constricted point where two tracks run in the street; for transit use, some additional property would need to be taken. The line then turns west along a median in 167th Street, just below Gardena Blvd. This is a heavily commercial section; and the lower-density residential parcels along the track are rapidly being taken for new apartment development.

At 168th the line turns south to follow the west side of Normandie Avenue. The area along Artesia Boulevard is undergoing rapid redevelopment, with major apartment complexes on three quadrants of the intersection; the Gateway Plaza retail/office area (under construction), the planned Gardenia Gateway Shopping Center, a Pace membership warehouse/store and a light industrial park with factory outlets are also located here. At 182nd/Electric Street the line is a half mile west of the Ascot Park recreational area (where auto races are held).

At 190th, just south of the 405 Freeway, the line passes through a major section of office and bank buildings (including Toyota, Nissan, TRW, etc.); and the large Mc Donnell Douglas and International Light Metals plants are also located nearby. At 204th Street, it turns southwest on private R/W and soon enters the median of Torrance Blvd. This area is rapidly going to apartment construction.

At Western Avenue, it enters a section of Torrance which is undergoing rapid redevelopment into office/industrial parks. At least seven major office buildings are situated here, especially north of the R/W. After passing under a rather picturesque brick railroad bridge, the Torrance Branch veers to the south, following Border Ave. (partly in a very narrow median R/W between access roads). The area west of the line is a mixture of single family residences, new apartments, and older commercial streets, while at Carson Street, the line borders the future sites of the Torrance Center (another big office park) and the Eastgate Plaza Shopping Center. There are smaller shopping plazas on the south side of Carson St., and apartments nearby on Western Avenue.

The line then enters a light industrial area and turns southeast, following a median in Plaza Del Amo, a residential section which is rapidly converting to apartments. It turns south on Normandie and ends at about 229th Street. The former R/W south of this point has largely been converted to new office parks and housing. To continue a transit line south from this point might require either condemnation or a 1/2 mile tunnel (crossing under or over Sepulveda, a major commercial street) to gain access to the ATSF Harbor Subdivision.

(There are several additional pieces of track owned by the SP and ATSF near the present terminus of the Torrance Branch that may warrant preservation, including a single track ATSF spur just north of Del Amo Blvd. that might be useful as an east-west connector between Harbor Subdivision and Torrance Branch transit lines.)

Possible San Pedro Extension. An extension south to San Pedro would require a short link via the ATSF Harbor Subdivision, and construction along the Harbor Freeway for a little over two miles. A large mobile home park and major apartment complexes border the west side of the freeway down to PCH (a major commercial street), while there are large heavy industrial complexes on the east side of the freeway in this section. South of PCH, the line would access the Los Angeles Harbor College.

Continuing south, it may be possible to follow the southern end of the SP San Pedro Branch (used by the Harbor Belt Line railroad) along John Gibson Blvd., which accesses the huge APL container port facility and Todd's Shipyard to the east, and a major heavy industrial area to the west. Below Todd's, the San Pedro Branch goes behind a bluff and emerges to follow the east side of Harbor Blvd. Although the railroad R/W is narrow here, it is bordered on the east side by parking lots which could allow it to be widened along this stretch. This segment of the line would access the World Cruise Center, LA Maritime Museum, Ports O'Call Village (a very major tourist attraction), new office buildings and major residential and commercial sections of San Pedro to the west. A fairly wide rail yard occurs just west of Ports O'Call, which might provide joint development and station parking opportunities.

(It will be noted in passing that with the development of transit on PE and other rights-of-way linking the Harbor Subdivision to Long Beach [Chapter 11], and on the San Pedro Branch R/W in San Pedro, it would be comparatively easy to provide a direct link from Long Beach to San Pedro via the remainder of the San Pedro Branch track used by the Harbor Belt Line to the north of Cerritos Channel).

Freight Use And Current Status. Although most of the Torrance Branch is not in immediate danger, the southern end in Torrance has virtually no train service and may be expected to be abandoned in the very near future. Considering the rapid pace of development in Torrance, consideration should be given to saving the remaining R/W in this area.

A transit extension south to San Pedro would assume the Alameda Corridor to be in place, and transfer of much of the present San Pedro railroad activity to new wharf and bulk storage facilities located on the major Terminal Island landfill area under the ports' 2020 plan. It is uncertain exactly how much freight traffic will remain on this section after implementation of these plans, but operation at night by short line carriers (with passenger service during the daytime and in the evening up until midnight) might be possible both on the southern end of the San Pedro Branch and over the Torrance Branch.

Transit Potential. A 1983 patronage estimate for a simulated 55 MPH Harbor Freeway rapid transit line extending down to Ports O'Call in San Pedro indicated that 54,500 daily riders could be generated (3). Although the Torrance Branch would not connect quite as many commercial or other special trip generators as would certain other rail lines in the area, there is considerable growth at the southern end, and the parallel Harbor Freeway has a very high volume of traffic and is quite congested. Therefore heavy commuter patronage could be expected.

Use of the Torrance Branch for transit would also make it possible to take advantage of the major investment that has already been made in providing a link from south-central Los Angeles to the LA CBD via the LA-Long Beach line.

Another reason for interest in this line is that the Harbor Freeway Transitway (which is part of the LA County Proposition A system) is designed to be convertible to rail; the suggestion has been made that a transit line could operate along the Harbor Freeway between the LA CBD and the Century Freeway, and

thence southward via the Torrance Branch (perhaps in combination with the abandoned interurban R/W in the Vermont Avenue from Imperial to Compton Blvd.).

C.2 SP El Segundo Branch.

This is another SP branch line coming off the SP Wilmington Branch at Watts Junction. From here it proceeds west to southern Inglewood/Hawthorne (Figure C.1). A transit facility on this right-of-way could serve the Los Angeles Southwest College, Hawthorne Municipal Airport, and Northrop facilities; the present rail line runs right through the Hawthorne Plaza shopping mall, terminating near the high-employment section of El Segundo south of LAX.

A problem with developing this R/W as a transit facility is that it parallels the Century Freeway line very closely; it would probably have to be operated as a branch of the Century line to serve the mall, Northrop, and Southwest college (where current Century Freeway design does not permit a stop on the transit line now under development). If the El Segundo Branch were used for transit, it is assumed that it would provide a local route (perhaps a single track shuttle) while the Century line would provide limited-stop service, direct to LAX.

There is relatively little freight on the El Segundo Branch, so it may be a candidate for abandonment in the not too distant future; joint operation with a short line carrier which would provide freight service to Northrop at night might be a possibility. In the event that the addition of an Orange County West Santa Ana Branch train service to LAX should place a capacity or operational constraint on the Century line, the addition of the El Segundo Branch to the regional system might be warranted.

Another possibililty might be to use the El Segundo Branch as a freight link from the consolidated rail corridor along Alameda Street (SP San Pedro Branch) in Lynwood to the Santa Fe Harbor Subdivision near its mid-point in El Segundo. This could facilitate abandonment of the northern segment of the Harbor Subdivision, which figures in proposals to use that line for transit service to Inglewood, either via Crenshaw or from a point farther east (north of El Segundo there are virtually no freight customers remaining on the Harbor Subdivision). Use of the El Segundo Branch in this way would require re-installation of the former freight track along Santa Ana Boulevard in Watts (West Santa Ana Branch).

A related alternative (also assuming the Alameda Corridor in place) would be to use the El Segundo Branch in conjunction with the SP Wilmington Branch to provide the connection to the Harbor Subdivision. It might be possible to do this via a night-time short line operation, and use the same Wilmington Branch track for light rail express service during the daytime as part of the LA-Long Beach operation; this should be feasible as the recently-relocated freight track on this line will completely clear the high platform stations used on parallel (local) LRT line. Under this scenario, the short line operation could be extended west over the El Segundo Branch, and some local, daytime light rail service might also be provided over this branch line.

C.3 SP Los Alamitos Branch.

The Los Alamitos Branch extends from Los Alamitos near the Coyote Creek east

through Cypress to Stanton, where it joins the Stanton Branch and the West Santa Ana Branch (Figure C.2). This very short branch line begins just east of the Los Alamitos City Hall area and passes through the Los Alamitos Race Course. As a transit line, it could be operated as a feeder to a West Santa Ana Branch transit service, connecting with Garden Grove and Santa Ana; or continue straight across to Disneyland and the Anaheim Convention Center via the Stanton Branch). The R/W is 60' wide throughout, certainly adequate for transit.

Potential Trip Generators. At the west end of the line, service would be provided to the Los Alamitos City Hall area and Recreation Center, the major commercial section along Katella Avenue and Los Alamitos Blvd., the large Los Alamitos Medical Center complex, and a number of modern office/industrial parks along both Cerritos Ave. and Katella. Farther east, it would pass through the Los Alamitos Race Course, an important recreational facility, numerous industrial parks and a hotel in Cypress, and farther east, a number of major commercial shopping plazas at Knott.

The sections of Los Alamitos and Cypress served by the line are experiencing rapid growth and are really a "showcase" area of modern commercial and office park construction in western Orange County. Substantial open space also remains along the line (particularly in Cypress), which would be of value in developing major park-and-ride facilities.

Transit Potential And Regional Connections. Initially, a transit line on the Los Alamitos Branch might provide primarily park-and-ride service for LA County commuters traveling in the direction of central Orange County, as well as carrying Orange County people to the Race Course and to employment and shopping areas all along the line. Other regional connections might be made in a westerly direction to the Long Beach CBD: either to the Long Beach Municipal Airport or to Cal State Long Beach and the VA Medical Center. In the latter case the line could be extended to the Belmont Shore area and to the Long Beach CBD. (This is discussed in more detail under the ATSF Harbor Subdivision, Chapter 11 above; see also discussion of the SP East Long Beach Branch in Appendix E).

A technology option would be to provide a guided busway along the Los Alamitos Branch, to furnish a link to the Long Beach CBD (operating in mixed flow traffic on the Long Beach side). This would allow incremental construction with much lower initial capital costs than would an attempt to initially provide fixed-guideway service over the entire route. To reduce noise and air pollution, dual-mode vehicles could be employed that would run on electric power on the railroad R/W and in diesel mode on surface streets. At a later time, when funds might be available to provide a more expensive subway or aerial link through Long Beach, the Los Alamitos Branch transit route might be converted to rail or another fixed guideway system.

Freight Use. The Alamitos Branch is believed to have little or no current freight traffic, and is expected to be abandoned soon. Considering the fact that it would permit a tie-in with the West Santa Ana Branch, public acquisition warrants consideration.

C.4 U.S. Naval Railroad.

The U.S. Naval Railroad provides an east-west corridor paralleling Westminster Avenue between Long Beach and Westminster (Figure C.3). It might be possible to use portions of this rail line, combined with other rights-of-way, to provide another transit link between Orange County and Los Angeles County.

Transit Use And Potential Trip Generators. A transit route using this railroad right-of-way could begin in Huntington Beach on the SP Stanton Branch, proceeding north past the Golden West College and Huntington Center shopping mall. It would then follow the U.S. Naval Railroad line which turns to the northwest at Bolsa, and then runs due west past the Westminster Mall (which is a major shopping center in this area), continuing by the very large McDonnell Douglas plant. At this point the rail line again turns northwest and enters the Naval Weapons Station at Bolsa Chica, closely paralleling Westminster Avenue. The R/W east of the Navy Base is 75' wide, quite adequate for transit purposes.

In all probability, a transit line using the U.S. Naval Railroad R/W would not follow the railroad through the base, but would remain on the Westminster Ave. side of the fence and parallel the highway. This section would allow very high speed operation, as it is a long, straight stretch with no cross traffic. At Seal Beach Boulevard, the transit line would serve the big Rockwell International plant, a large commercial shopping plaza, and Leisure World. Just to the west of the Navy facility, it could again utilize the railroad line on the north side of Westminster Ave., turning northward to follow a rail spur that runs along the western edge of Leisure World.

Continuation Into Long Beach. The extension of a transit line following the U.S. Naval Railroad into Long Beach would require combination with a number of other rights-of-way. Such a route would converge with the San Gabriel River R/W, probably crossing over Route 22 and running between the parallel College Park Drive and Route 22 bridges. It could then parallel 7th Street in Long Beach to a point just west of Ximeno Avenue. This section would provide access to the California State University at Long Beach, the Veterans Administration Medical Center, Recreation Park, the W. Wilson High School, and Blair Field Stadium.

While the type of construction which might be used along this section would require further study, a possibility would be to use a tunnel from a point just west of Studebaker to East Campus Road, a new median in 7th created by taking a narrow strip of parking from Cal State and the VA facility, tunneling from Channel Drive to Santiago, surface median again along the park section, and an underpass to clear the high school and provide a Ximeno/7th Grade separation.

A surface station with a picturesque architectural design might be in order at the VA Hospital/Cal State; and any trees/flower beds removed by construction along the park would need to be replaced. The median R/W design would allow right turns for traffic moving in a westbound direction, to avoid cutting off access to the various public facilities along the way.

After Ximeno, the line could follow the old PE Newport right-of-way, which is

largely intact and runs in a northwesterly direction. It would follow this past Anaheim Street (now becoming the abandoned SP East Long Beach Branch) and continue on to the junction with the LA-Long Beach line at Willow. This section of R/W would provide service to the Long Beach City College Pacific Coast Campus, and several parks. (See discussion of the SP East Long Beach line in Appendix E.)

Further Regional Connections. Beginning in Orange County, the route described above would parallel some heavily-traveled arterials and freeways, including Beach Boulevard, Westminster Ave., the 405 Freeway, the Pacific Coast Highway, and Route 22/7th Street. Once on the LA-Long Beach line, it could continue north to the LA CBD or perhaps follow the Century Freeway line west to LAX.

It would be complementary to a line following the ATSF Harbor Subdivision and other rights-of-way from South Bay east to the Long Beach CBD, thence to Belmont Shore, and northeast along the San Gabriel River to join the SP Los Alamitos Branch. The two could share a short common R/W section east of the San Gabriel River near Leisure World, providing a major transfer point. Another option would be to route a US Naval Railroad line via Belmont Shore and thence northwest in tunnel with the portal near Colorado Lagoon, to continue north across Ximeno/7th on the PE Newport R/W.

Freight Use. The section serving the U.S. Naval Railroad from the Stanton Branch might be a candidate for short line railroad operation, maintaining access to the base from the direction of Anaheim.

C.5 SP Stanton Branch.

The Stanton Branch formerly formerly began in the coastal area, in the City of Huntington Beach. At present it begins near the Civic Center, and runs north on an alignment to the west of Beach Boulevard (Figure C.4). It extends up to Westminster and enters Stanton (where there is a junction with the Los Alamitos Branch). Here it turns east, crossing the West Santa Ana Branch, and goes through Anaheim, turning north in the vicinity of Walnut to join the Santa Ana Branch near Broadway (very close to the 5 Freeway).

Transit Use And Potential Trip Generators--North-South Alignment. As the segment down to PCH has been abandoned, with parts of the R/W heavily built upon, it is not certain whether a transit line on the Stanton Branch would be able to access the beach, pier, and downtown commercial area (there being major commercial redevelopment plans for this section).

For purposes of this discussion we will assume that a Stanton Branch transit line would begin near Yorktown Avenue and follow Main Street to the northeast, using a wide grassy/landscaped median. This would serve the Civic Center, Seacliff Village shopping center, and major apartment complexes/multifamily housing developments (the Huntington Beach High School is also nearby). The Main Street alignment would intercept the south end of the rail line at Garfield. This is within half a mile of Five Points Plaza (a big shopping center), a high-rise apartment building, and nearby apartment complexes.

North to the 22 Freeway, the Stanton Branch is about 1/2 mile west of Beach

Boulevard (the main north-south commercial street in this area). This would be a 10 minute walk (at 3 MPH), so it is assumed that Beach Blvd. access along this segment would primarily be by bus transfer. The southern part of the Stanton Branch varies considerably in width: much of it is 30-40' wide up to about Bolsa Avenue, north of which it is 100' wide. There are a few short, constricted segments near the south end; a rail transit line using the R/W might be limited to single track in these places, or else a narrow strip of adjacent industrial property would need to be purchased. However, most of the Stanton Branch could be double tracked with little trouble.

There should be room for park-and-ride facilities along this southern section of the Stanton Branch. This would provide commuter access to the line from a wide area of Huntington Beach.

Proceeding north to Talbert, there are a number of office/industrial parks along the east side of Gothard St., which parallels the west side of the R/W. The Huntington Beach Library and Huntington Central Park lie to the west of the Stanton Branch in this location (being within walking distance), and a bus transfer could provide access to the Beach Plaza Village commercial area, Kaiser Permanente facility, and Humana Hospital along Beach Blvd. Farther north at Warner, the Warner-Gothard Center commercial area and some apartment complexes are not far to the west of the rail line; other apartments and office buildings lie to the east, with new office parks to the north. A high-rise bank building at Beach Blvd. would be accessible by bus.

At Edinger Avenue, the most important commercial development is centered on the Stanton Branch rather than on parallel Beach Blvd. Here the major Huntington Center shopping mall complex lies just to the east of the line, with some additional large shopping plazas to the west as well (and on the south side of Edinger). The Golden West College is within walking distance of the R/W, also on the west side; and there are some modern office/industrial parks just to the south. North of Edinger, the quaint Old World Shopping Center and about four high-rise buildings (including the Holiday Inn and Memorial Health Center) are located along Center Drive. There are also major apartment complexes in this section. Finally, a shuttle bus could provide a link to the sizable Pavilions/ Target shopping plaza area along Beach at Heil, also nearby.

This area has already been slated for construction of a major multi-modal transit facility by the City of Huntington Beach and the OCTD (see Section 6.4).

The line continues north under the 405 Freeway, and the junction with the U.S. Naval Railroad lies between Bolsa and Hazard. The latter forms a "Y" connection with the Stanton Branch, having forks to the southeast and northeast (along a flood control channel: this NE connection was discovered in the field survey, although it does not show up on AAA or available railroad maps). This track connection occurs on Southern California Edison property; a station here would serve this major industrial facility, and office parks just to the west. From this point northward, the right-of-way is 100' wide, and runs along the west side of Hoover Street. A power line right-of-way also parallels the line to the west, making the rail R/W appear to be even wider.

A station at Westminster Blvd. would access a continuous commercial strip along

this major arterial. In addition, the large Westminster Senior Apartment is right across from the line, and the Humana Hospital Westminster lies a short distance to the northeast. North of the 22 Freeway, Beach Blvd. curves to the west so that it is only .35 miles from the Stanton Branch. This is only a seven minute walk, so effectively Beach Blvd. is within walking distance of the line from this point up to Stanton.

At Garden Grove Blvd., access would be provided to the Hoover Street Center (a new office park area) and some big apartment complexes to the north, more modern office parks to the west, and a major commercial section of Beach Boulevard, including the Village Center North, a motel, and Plaza Boulevard (under construction). Also along Beach are apartments and a mobile home estate. At Chapman the line would access a number of important industrial/office parks which lie to the west, such as the Irvine Industrial Complex of Garden Grove; and on Beach Blvd., the Playa Galleria (a large commercial plaza) and other commercial developments are nearby.

At Katella, the line would access big apartment complexes, a mobile home park, the Katella Square commercial area, and a motel to the west; industrial parks lie to the south, and the Midwood Community Hospital, Stanton Civic Center, and a number of commercial developments also occur in this area.

Transit Use And Potential Trip Generators--East-West Alignment. Just above this point lies the junction with the Los Alamitos and West Santa Ana Branches. Here the Stanton Branch turns east and crosses another continuous commercial section of Beach Boulevard. At Beach and Cerritos Ave. a large modern structure houses the Indoor Swap Meet of Stanton (apartments also occur nearby); and a motel is just south of the grade crossing, with apartments nearby on Cerritos Ave. Otherwise, land use along Beach Boulevard is heavily commercial in this local.

The east-west alignment of the Stanton Branch is only .25 miles from Cerritos Avenue, which parallels it to the north, and .25 miles from Katella, which parallels it to the south. This amounts to an easy five minute walk. For the full length of this alignment, a major power line R/W lies to the north side, used in many places for tree farms/plant nurseries.

A Magnolia Street station would access major apartment complexes north and south of the line, the Katella Village and other big commercial plazas to the south, and a commercial plaza to the north. Magnolia is a major thoroughfare, with very heavy traffic. A Brookhurst Street station would access the Southern California College of Medical and Dental Care and a small commercial plaza and office building just south of the line, as well as a commercial center of considerable size on Katella.

A Euclid Street station would access very large commercial plazas (including Pep Boys/K-Mart) along Katella, a commercial strip along Euclid with house-like commercial and office buildings just south to the line, a small farmer's market just to the north, and the Loara High School at Cerritos. It would also serve apartments at Euclid/Cerritos and on Nutwood, and mobile homes south and east of the R/W.

The line curves to the north at this point, leaving the power line R/W and

paralleled by a flood control channel on the east side. The latter continues as far as Ball Road. A station at Ball Rd. in Anaheim would access apartment complexes to the west, as well as a retirement home, senior apartments and a health care center (now under construction) to the east. About .25 miles east of the line along Walnut is the start of a large hotel strip associated with Disneyland, with several unusual restaurants within walking distance.

A Broadway station at the north end of the Stanton Branch proper would access a mixture of big housing developments and apartments to the west, more apartments to the east, some light industry, and commercial development along Broadway, Euclid, Lincoln, Walnut, and Manchester. The old station building is occupied by a quaint antique/crafts mini-mall. Should a transit line be built along this section of the Stanton Branch, the former station structure should be left in present hands and a new transit station constructed nearby. A connection should be possible with the I-5 transitway express bus services in this general area.

Possible Link To Anaheim CBD. At this point, the Stanton Branch is very close to the Anaheim CBD. An aerial or tunnel connection from the SP line north and east generally following Lincoln would bring the transit line out on the western end of a vast cleared section of downtown Anaheim (with a possible tunnel portal east of Harbor). The line would presumably then continue on aerial structure over the parking lot of a new commercial plaza, or perhaps south of it; and run between the new Chamber of Commerce Building and City Hall (there are probably a number of alternative aerial alignments through this area).

An Anaheim CBD connection would provide access not only to the Civic Center area, but also to new office buildings, high-rise housing and apartments, the new commercial plaza, and other new developments in the very large CBD redevelopment zone. At the east end, such a route could be continued north to Fullerton via the UP Anaheim Branch, and thence to Brea and La Habra via the SP La Habra Branch (described separately, below).

Since the Stanton Branch at Broadway would be very close to Anaheim Plaza, a spur track or more likely a monorail or people mover shuttle line could be provided to serve this important shopping center. The SP Santa Ana Branch yards lie just to the north; however, there appears to be sufficient R/W to run an aerial line northeast, crossing the 5 Freeway to gain access to the Anaheim Plaza shopping mall. Several bank and office buildings are nearby, along with the Anaheim Centre commercial plaza to the northwest, and big apartment complexes to the northeast and southeast.

Possible Disneyland/Anaheim Stadium Link. The Anaheim CBD access route (with Anaheim Plaza shuttle) described above is one of two possible eastern termini. It should be feasible to route a second transit branch line east along the power line R/W to connect with the major Disneyland Hotel complex at Walnut (apartments also here), and continue in the same direction across the Disneyland parking lot to serve the amusement park itself. The Anaheim Convention center lies just south of Disneyland; and both Katella to the south and Harbor to the east of Disneyland are bordered by many hotels and motels.

The line could continue east on structure above Freedman Way (avoiding displacement of the small Arcade amusement park occupying the power line R/W in

this location); it could then fly over the 5 Freeway on structure, with a connection to express bus routes on the I-5 transitway. After crossing the freeway, the transit route could continue to follow the power line R/W (combined here with the SP Tustin Branch--which has a 50-60' R/W) east to the ATSF Fourth Subdivision. This is an area with great number of new office/industrial parks.

The proposed Anaheim Intermodal Terminal would be located close to the Santa Fe Railway, north of Katella and west of State College. The Intermodal Terminal would incorporate a relocated Anaheim Amtrak station, bus terminal, heliport, and parking. An elevated busway called Transpark has already been proposed to connect Disneyland and the Convention Center with the Intermodal Terminal.

The ATSF R/W is 100' wide in this section, and the railroad is interested in selling the Fourth Subdivision to public agencies for intercity/commuter rail/transit development. The extension of a Stanton Branch transit line described here could continue south and east along the ATSF R/W to the Anaheim Stadium (site of the current Amtrak train station, where a connection would be made to San Diegan trains). The Stadium is a major recreational trip generator (with a huge parking lot); special exhibitions are occasionally held in temporary tent structures outside the stadium, and it is planned to provide exhibition space inside. The Stadium Towers, Metroplex II high-rise buildings and several other office buildings lie just to the north of the Stadium off Katella.

Freight Use. The Stanton Branch has a moderate amount of freight traffic at present, but may be abandoned in the not too distant future. This might be a good candidate for a joint light rail/short line freight operation.

Other Possible Transit Connections. If transit routes were developed on the West Santa Ana, Stanton, and Los Alamitos Branches, there would be a major junction point in Stanton. This, together with a heavily used Beach Boulevard bus route serving points like Knotts Berry Farm to the north, would provide an excellent opportunity for development of a major transit center, with spokes running in six directions: north, south, east, west, northwest, and southeast. (A northerly rail transit extension along Beach Blvd. to Knotts and the 5 Freeway figured in earlier OCTD plans.) This would provide excellent connectivity within this part of Orange County.

Further, the fact that the Stanton Branch could provide through-running with the West Santa Ana Branch in the direction of LA County (both from the south and from the east) could make it a useful addition to the regional transportation system.

Unlike the West Santa Ana Branch, the Stanton Branch follows rather closely the grid of arterial streets. However, parallel Beach Boulevard is heavily congested with shopping and commuter traffic, and becomes particularly crowded with shore traffic during weekends and summer weekdays. Taken together with the large number of special trip generators which would be served by a Stanton Branch transit line, it is suggested that this railroad right-of-way merits preservation for possible future transit use.

C.6 UP Anaheim Branch--Eastern Segment.

The UP Anaheim Branch extends northward from the Anaheim CBD area along the west side of the ATSF Fourth Subdivision (Figure C.5), continuing west in the Fullerton CBD area to follow the south side of the Third Subdivision. It proceeds and north and east at a point near Brookhurst Road, cutting through a hilly section of Fullerton to emerge at the north end of the city and join the SP La Habra Branch near Lambert/Harbor.

Transit Use And Potential Trip Generators--Southern Leg. Most of the Anaheim Branch south of the 91 Freeway has been abandoned. However, a former yard property (four tracks still in place) exists in a cleared area of at least four acres, which is contiguous with other cleared sections of the Anaheim CBD. The former station building (apparently most recently used by the School Supply Co.) is up on blocks here. This site, including the old station, would provide an opportunity for joint development. An approximately one block long segment of the R/W north of this point has been leased for storage, but the remainder appears to be intact up to the freeway. North of this, the line is still in use, with a low level of freight traffic.

The UP Anaheim Branch could be used for a continuation of a Stanton Branch transit line passing through the Anaheim CBD area on aerial structure, and coming to the ground north of Lincoln and just to the west of the ATSF line. It would continue north past Orangethorpe Avenue, which is a major commercial section of Anaheim and Fullerton. This area, lying west of the rail line, includes the Orangefair Mall, Fullerton Town Center, the Price Club, and the Metrofair Fullerton (under construction). There is also a Northrup plant just to the southwest of the grade crossing, a rather dense mobile home park on the northwest corner, and an area of modern office/industrial parks to the east. Local circulation through this very large commercial section might warrant a monorail shuttle, connecting with the line-haul transit facility.

Shortly after its turn to the northwest and west, the Anaheim Branch passes just to the south of the new Fullerton Intermodal Center, located east of Harbor. This includes the Amtrak station, a major OCTD bus transfer facility, and a parking structure; commercial space is being leased out in the historic ATSF depot, and there is a restaurant styled like a train station just to the west. The old Fullerton downtown area has recently been renovated, and there is a large commercial section along Commonwealth and along Harbor. The Post Office lies just to the east of the train station on Commonwealth, and the large, new City Hall building is located to the west on Commonwealth at Highland. Fullerton College is also situated just to the north and east of the CBD area.

Transit Use And Potential Trip Generators--Northern Leg. Continuing west, the line passes Euclid, which has only minor commercial development nearby. West of the point where the ATSF and UP lines cross over Commonwealth on an overpass (just short of Brookhurst), there occur a major industrial plant, a large office building, and a motel. The line curves to the north on an embankment, bordering the west side of a low density residential area, and crosses Malvern Avenue at grade. Here there are a number of apartment complexes to the east of the R/W on a hillside, and to the west is a major Hughes plant.

The line continues northeast along Bastanchury Road through a rather scenic area with palm trees and other vegetation planted along the R/W; at Warburton Way it passes another access road to the Hughes plant, which also serves the Sunny Hills High School. Continuing past Euclid, the right-of-way is rather well buffered from nearby residential areas, running largely in an open cut, along with the parallel roadway.

Near the intersection of Bastanchury and Harbor, the railroad line veers to the east and passes under Harbor, remaining in cut with some vegetation screening the R/W from homes up on the hillside on its west side. The Bastanchury/Harbor intersection has a number of medical facilities: St. Jude Hospital, the Fullerton Internal Medicine Center, Harbor Medical Center, Bastanchury Medical Building, Laguna Mesa Plaza (medical-office buildings), and Carewest Fullerton Nursing Center. Also located here are a senior citizens' apartment complex, the Fullerton Plaza and Loehman's Plaza (commercial/restaurants), and large tennis courts. Access to the Brea Dam Park is provided nearby. (As the line is down below the shopping center/medical area, transit access might be improved with a small inclined railway.)

The rail line continues north in a cut under Harbor, with another grade separation at Las Palmas. It emerges to cross Imperial Highway, in another major commercial area. This includes the K-Mart and Lucky plazas west of the line on Harbor; a farmer's market lies just southwest of the crossing, and there is a hotel on the northeast corner. There are major apartment complexes to the southeast and southwest; an area of new industrial/office plazas lies to the east, and there are major industrial plants to the west.

Status And Future Freight Potential. The UP Anaheim Branch appears to have only a modest level of freight traffic and might be shut down in entirety if and when the eastern half of the SP La Habra Branch (which provides the connection to the UP main line) is abandoned. The possibility of maintaining freight service on this line during the night (perhaps with small electric locomotives) might be considered, as is the case with the Stanton Branch.

Links With Other Lines. The Anaheim Branch joins the SP La Habra Branch near Lambert in La Habra, just south of another major commercial intersection at La Habra Blvd. and Harbor. A description of potential trip generators east and west of this point is given below in the section on the La Habra Branch. Considering the large number of trip generators that this line would serve, it might have considerable potential as a transit line, connecting northern parts of Orange county with Anaheim, as well as with points to the west and south via the Stanton Branch.

Other Issues. A potential problem would be recent proposal by the City of Fullerton to eliminate the southern leg of the UP Anaheim Branch, and the fact that there are condominiums under development in restored buildings across from the Amtrak Station. In this regard an option might be to tie together a surface transit line following the northern half of the UP Anaheim Branch with an aerial line south along Harbor Boulevard (or possibly other streets) to connect with the Anaheim CBD. A Harbor Blvd. alignment might provide better access to parts of the Orangefair Mall and other commercial trip generators en route.

C.7 SP La Habra Branch.

The La Habra Branch originates on the Wilmington Branch in Florence, and extends through Huntington Park, Bell, Maywood, Bell Gardens, Commerce, Pico Rivera, Whittier, and La Habra, ending in Brea (Figure C.6). There may be a number of ways to utilize the La Habra Branch for transit.

Potential Trip Generators--Western Half. In Huntington Park, access would be provided to major commercial areas at Pacific, and along Gage, which parallels the line just to the south. Also south of the line are the Civic Center on Miles and a new medical building at Zoe/Rugby. From Pacific to State, there are a number of older and newer apartment buildings along Randolph Street (which borders the rail R/W); there is a new shopping plaza on Randolph at Santa Fe Ave., and the St. Matthias High School is at Randolph and Miles.

Also in Huntington Park, north of the line on Slauson there is commercial development from Malabar to Miles, and the Community Hospital of Huntington Park, Pacific Medical Center, and St. Francis family Health Care Unit are also located here. Sections of Vernon just north of the line support a mixture of heavy industry, with some new industrial parks at Downey Road.

Just to the east, the City of Bell borders the line on the south; Gage Avenue is commercial throughout this section, and Atlantic, crossing the line, is also a major commercial street. The Bell Community Center and City Hall are just to the south on Pine Avenue. The City of Maywood and a section of Huntington Park lie to the north of Bell, bordering the R/W; Slauson Blvd. is very heavily commercial, blending with light industry towards the east end of Maywood. The Maywood City Hall and Post Office are situated north of the line on Slauson.

East of the LA River, the La Habra Branch is bordered by Commerce on the North, and Bell Gardens to the south. At Eastern avenue, there is a mix of heavy industry, new office/industrial parks, and several bank buildings; to the south, both Eastern and Gage are commercial (with residential areas away from major intersections). Farther east, from Garfield to the 5 Freeway, land use is heavy industrial to the north and residential to the south, with new apartments and clustered housing developments along Gage, as well as a new senior citizens' housing project.

East of the freeway, the line enters Pico Rivera. Much of this section is low density industrial property, with some vacant land. At Paramount Blvd., the Pico Rivera Indoor Shopping Mart is north of the line on Slauson; to the south, there are a number of apartment complexes, the Rio Hondo Medical Square, and the Rio Hondo Memorial Hospital. At Rosemead, there are apartment complexes on both sides of the R/W, and the street becomes commercial to the south. East of this, at Passons, there are additional apartments and commercial plazas.

Potential Trip Generators--Eastern Half. East of the 605 Freeway, after passing some apartments at Pioneer Blvd., the La Habra Branch penetrates a large area of modern industrial/office parks including the Los Nietos Business Center. Entering Whittier, it enters a solidly residential area. Whittier Boulevard is from .5 to .7 miles to the north, so access from a La Habra Branch transit line

to the main commercial area would be limited. Bus transfers would be required for linkage to the Whittier Quad Shopping Center, Whittwood Mall, and points in between. The line passes just south of a modest commercial plaza at Gunn/ Lambert; the California Internal Medical Group is just north of the line at Colima, and a commercial plaza and some apartment development occur at La Habra Blvd./First Avenue.

In La Habra itself, the line is only .25 miles south of La Habra Blvd. and .25 miles north of Lambert (an easy 5 minute walk to either). Proceeding east, at Beach Blvd., large commercial plazas occur at La Habra Blvd. (but access to the La Habra Fashion Square to the south on Imperial would require a bus transfer). At Idaho, the large La Habra Community Hospital is on Lambert; at Euclid, sizeable shopping plazas lie to the north on La Habra (with a number of apartment buildings near the line at both cross streets).

At Harbor, the line turns southeast. Here, there is another big commercial plaza on La Habra; and there are big industrial plants and office parks to the south of the line. The line again turns east at Puente St. in Brea, entering a low density area of industrial/office parks. At Brea Blvd. there is a mixture of large housing projects, office parks, and strip commercial development along the arterial.

At State College, just west of the 57 Freeway, there are some very major clustered residential projects north of Lambert and several office parks with high-rise buildings just south of the rail line, as well as the Marketplace (a large commercial plaza) on Birch (.25 miles south), and the Brea Mall, just below Birch. The modern Brea Civic Cultural Center, Post Office, and Brea Olinda High School also lie to the southwest of the R/W along Birch.

East of the 57 Freeway, major housing developments, including some apartment complexes, occur on both sides of the line. The railroad ends at Kraemer Blvd., at the beginning of a 3/4 mile-long strip of industrial office parks with large modern buildings, along Imperial Highway. Restoration of the R/W should be possible along the road for this distance, as the buildings are set far back from the curb line.

Current Status And Freight Use. The western end of the La Habra Branch is at present fairly heavily used for port-related freight traffic between Florence and Santa Fe Springs, where a connection is made to the Puente Branch and thence to the UP main line for access to the SP yards in the City of Industry. This segment is certainly not endangered at the present time. However, the section of the La Habra Branch east of Santa Fe Springs has only a modest level of traffic, and may be considered for abandonment in the not too distant future.

It is possible that after implementation of the Alameda Corridor, the west end of the La Habra branch will see less freight service as more trains are diverted to the SP Alhambra and State Street Lines via the LA CBD. In relation to this, the suggestion has been made that La Habra Branch freight traffic be routed from Randolph Street in Bell to the LA Junction Railway along the LA River (see Chapter 7). This would divert the trains to the UP San Pedro Branch at Downey Road, whence they would go north to Hobart Tower and continue west to the UP main. Here they could gain access via Bridge Junction to the SP Wilmington and

San Pedro Branches. This scheme could make the western segment of the line available for transit development.

Transit Potential. The La Habra Branch was investigated by the LACTC as part of their Santa Ana Corridor routing analysis; however, it was subsequently dropped in favor of a Metro Rail extension down the Santa Ana Freeway. Any consideration of this line for transit should complement and supplement this southeastern Metro Rail extension (which will serve the East LA/Boyle Heights area in tunnel, as well as the I-5 corridor), and not attempt to supplant it.

Despite poorer than desired access to commercial centers in the City of Whittier (such that the Whittier section would be used mainly by commuters), the eastern segment from La Habra through Brea could provide access to a large number of commercial, business and industrial trip generators. There should be fairly good potential for commuter movement in both directions along this segment. There is no freeway closely paralleling Whittier Boulevard, with the result that heavy congestion occurs on arterial highways in this area of eastern Los Angeles and northern Orange Counties. For this reason the La Habra Branch may have fairly high potential for intercounty transit service.

The western part of the line would also be well used for a variety of trip purposes, and lies in an area of heavy transit dependency as well. It could have potential some day as a relatively inexpensive light rail extension.

Transit Alternatives. One option for transit use would be the development of a single long line feeding into the LA-Long Beach line, from Brea west to the LA CBD. This would serve the needs of longer-distance commuters as well as providing access to a number of commercial and other special trip generators along much of the line.

A second alternative would be to develop the segment in northern Orange County only, providing eastern and western transit links to commercial areas and connecting with the upper end of a north-south transit facility using the UP Anaheim Branch. The junction would be near Lambert/Harbor on the border between La Habra and Fullerton.

A third alternative would be a feeder line from northern Orange County west to the Metro Rail line on the I-5 corridor. This would be a commuter-oriented route, providing residents from Brea, Fullerton, La Habra, Whittier, Santa Fe Springs, and Pico Rivera with access to the LA CBD. This could be done even if the segment from the SP Wilmington Branch east to Santa Fe Springs continues to be used for rail freight service. While the segment from Boyle Ave. west to the Long Beach line is only about 30' wide (sufficient only for a double track transit facility), the sections to the east of this point are generally very wide, and should permit a single freight track for local switching as well as a double track passenger line.

In conjunction with this, it is noteworthy that the section of Pico Rivera near the 5 Freeway (the future Metro Rail trunk line into the LA CBD) has a considerable amount of vacant or underutilized industrial land, which could be used for station parking as well as major transit/real estate joint development projects.

A fourth option would be to place a local light rail line on the western segment of the La Habra Branch, beginning at the 5 Freeway and running west along Randolph to link up with the LA-Long Beach line.

Technology Considerations. In terms of technology, there might be a number of possibilities, including guided buses and railbus equipment. However, the western end of the La Habra branch connects with the Wilmington Branch, along which will operate the LA-Long Beach light rail line. This would suggest a rail system with cars compatible with those of the Long Beach line, which will use overhead current collection.

If a transit connection were made from the La Habra Branch to the West Santa Ana Branch (assumed to have automated equipment to interface with the Century Line) via the Anaheim and Stanton Branches, dual-mode equipment with the same general dimensions as the Long Beach and Century cars, but provided with pantographs as well as third rail shoes, would provide maximum operational flexibilility for operations over all of these Orange County lines.

On the other hand, if use of the La Habra Branch were restricted to a east-west Metro Rail feeder, consideration might be given to an interurban/commuter version of the Metro Rail rapid transit car (equipped with pantographs as well as third rail pickup and capable of crossing streets at grade if necessary). This would be a wider and higher car than the Century/Long Beach type.

Access To Whittier And Nearby Commercial Areas. As access from the La Habra Branch to commercial areas in Whittier and nearby cities is limited, a possibility would be to develop a connecting bus route that would originate at the Santa Fe Springs Mall, south of the line, serve a station at Painter, and continue north to the Whittier Quad Shopping Center north of the line. It would continue southeast, serving the major commercial strip along Whittier blvd., and especially the Whittier Hospital Medical Center at Colima and the Whittwood Mall at Gertrudes Blvd. Finally, it would run east to Beach Blvd. and south to connect with the La Habra Branch again, continuing on down to the La Habra Fashion Square.

It has also been suggested that a local transit branch line could extend north from the La Habra Branch at Santa Fe Springs along the abandoned SP Whittier Branch. This R/W is intact and parallels Dice Rd./Allport Ave./Gretna Ave. up to Whittier Blvd., crossing the latter to turn east near Haley St.; it is mostly 50-60' wide except for the north end which is about 25-30'. The transit line would then extend southeast along the western segment of the Union Pacific Anaheim Branch, which proceeds along Whittier Blvd. (grade separated at Whittier/Washington) and continues south following Lambert to join the SP La Habra Branch at Mills.

This diversion would serve the industrial area in northern Santa Fe Springs, and commercial sections of Washington and Whittier Blvds.; it would be .5 miles from the Whittier CBD, which has a recently restored shopping area and several high rise apartment buildings. It would also pass very close to the Whittier Quad Shopping Center.

Abandoned Section. The La Habra Branch formerly extended a considerable

distance southeast into Yorba Linda. It might be possible to preserve and restore this right-of-way to furnish a link to the Santa Fe Third Subdivision (which has been proposed for commuter rail) in Placentia in northern Orange County. Presumably a transit extension from the present terminus of the La Habra Branch would follow the median of Route 90 east to Rose, and from that point on utilize the old railroad right-of-way on the south side of the highway, which is intact for the most part south to Esperanza Road and the Santa Fe line (except that a shopping center has been built on the R/W at Yorba Linda Blvd.).

C.8 SP Baldwin Park Branch.

The Baldwin Park Branch extends from the SP Alhambra Line in the City of Industry north and east into Baldwin Park, then turning east to run through West Covina, Covina, San Dimas, La Verne, Pomona, Claremont, Upland, Rancho Cucamonga, Fontana, and Rialto, terminating in San Bernardino (Figures C.7,C.8).

Transit Potential--Western Half. It is often suggested that a Baldwin Park Branch transit route would feed the El Monte Busway (or a future rail facility on the same corridor) at El Monte. The more direct route along the old Ramona Avenue PE right-of-way from the RTD bus terminal in El Monte to the commercial area of Baldwin Park is unfortunately no longer in existence, having been sold off and broken up for commercial and residential development several years ago. A linear strip of housing occupies most of this Ramona Avenue R/W from Peck Road in El Monte to Baldwin Park Blvd. in Baldwin Park; east of which it is occupied by commercial shopping plazas and their parking lots. For this reason, it would be necessary to utilize the SP Alhambra Line for access to the Baldwin Park Branch in the City of Industry.

A transit route using the western half of the Baldwin Park Branch would serve the El Monte CBD area, including the Valley Mall, City Hall, and El Monte Comprehensive Health Center (it is assumed that an aerial structure can be threaded between buildings and over parking lots to connect the El Monte Bus Station with the SP main line).

Along the Alhambra Line, the route would serve major commercial development at Garvey/Valley; farther east in Bassett where the Baldwin Park Branch begins, it would access some industrial/office parks. On the Baldwin Park Branch itself, service would be provided to the commercial section of Baldwin Park (on Ramona Blvd.), and to commercial and apartment development at Vincent and San Bernardino Road, just south of the line (plus the Covina Valley Community Hospital on Badillo, farther south). In addition, access would be provided to apartments in the vicinity of Azusa Ave., to further commercial development at Azusa and Badillo, to the commercial section along Citrus both north and south of the line (and nearby apartments), and to commercial property at Barranca and Grand. There are also some modern office/industrial parks at Grand.

The line turns somewhat to the northeast at Grand, and the segment from here to San Dimas passes through a number of new apartment and townhouse projects, as well as the Walnut Creek Business Park near Cataract. Space is available for station development at Citrus, where there is an area about 80' wide on the east side of the grade crossing; and there are a few 50' wide areas in San Dimas.

Overall, residential densities along this western segment of the Baldwin Park Branch are relatively low; there are no very large shopping centers or enclosed shopping malls, and much of the industry along the right-of-way is older and relatively low density. A problem with using this western half of the Baldwin Park Branch for transit is its narrowness; for most of its length it is 25-30' wide, with the walls delineating the back yards of residential sections and industrial buildings encroaching on the R/W. Along most of this section, there appears to be sufficient room for a single track only, plus the necessary clearance required by the PUC for crossing gates; there are relatively few locations where station development and park-and-ride lots could be provided without additional property acquisition.

It might be possible to develop a single track light rail line with passing sidings in places; however, wide sections are not regularly spaced, and double track/station areas should ideally be located at major cross streets. In any case, a single track transit facility would fix headways at a periodicity determined by the speed of the service and the locations of passing sidings. This is generally undesirable. A single lane busway would be possible, but the buses should be electric-powered in order to run this close to houses.

There appears to be as much if not more room to develop a transit facility on parallel arterial streets such as Badillo Street (a former PE right-of-way), which has a total R/W width (including highway lanes, shoulders, etc.) of over 100' wide in West Covina.

Comparison With El Monte Busway/HOV Lane Extension. It should be noted that the biggest commercial developments in this section of the San Gabriel Valley occur along the parallel San Bernardino Freeway--including the new Baldwin Park Town Center/Pavilions commercial complex, the West Covina Fashion Plaza, and the Eastland Shopping Center, as well as new industrial/office space and major apartment developments. It is planned to extend the El Monte Busway/HOV lanes eastward along this section of the freeway, paralleling the Baldwin Park Branch east to Grand. By comparison, the rail line would serve much smaller, more localized commercial centers.

If only the western half of the Baldwin Park Branch were under consideration, it would probably be better to develop the 10 Freeway HOV facility for express bus transit, with transit stations on the freeway at major shopping centers (as well as feeders on the north-south arterials) rather than to attempt to use the Baldwin Park Branch for transit.

Transit Potential--Eastern Half. The eastern half of the Baldwin Park Branch rather closely parallels the ATSF Second Subdivision and would serve largely the same trip generators: the University of La Verne, the LA County Fairgrounds, Claremont Colleges, the Upland Civic Center, Fontana City Hall, and Rialto Civic Center. A short extension at the east end of the line near San Bernardino could provide a tie-in with the Amtrak station and access to the Central City Mall and CBD area.

Access to the major Montclair Plaza and Mountain Green Plaza commercial areas would be poorer than for the ATSF line; however, better access would be provided to the Civic Center and San Antonio Community Hospital in Upland, the Rancho

Cucamonga City Hall and commercial areas, and Fontana City Hall. The eastern half of the route is a little more circuitous than the Second Subdivision in terms of a direct line from Claremont to San Bernardino.

On the other hand, the section through Rancho Cucamonga provides a useful diagonal corridor (with no parallel arterial streets). By comparison, use of the parallel Santa Fe line would require commuters from this community to drive some distance over north-south streets to reach park-and-ride lots.

The eastern half does serve a number of centers: tending to duplicate the ATSF Second Subdivision. The suggestion has sometimes been made that the western half of the ATSF Second Subdivision could be mated to the eastern half of the Baldwin Park Branch, as the lines cross each other near the LA/San Bernardino County Line. However, it is understood that the ATSF would prefer to sell off the Second Subdivision in entirety, not piecemeal it. It is uncertain whether both the ATSF line and the of the Baldwin Park Branch could be purchased for transit in the near future, unless one of the lines (probably the Baldwin Park Branch) were purchased using bikeway funds.

Transit Potential With Respect To Recent SP Offer. The Southern Pacific Transportation Company has recently suggested development of a single, long commuter or transit line from San Bernardino to Los Angeles, using the Baldwin Park Branch together with the State Street Line from El Monte to LA. (see Chapter 3). Their offer stipulates right-of-way sharing along several segments: from Bassett to Baldwin Park, and near Claremont (this on the ATSF); as well as an easement on the Alhambra Line from Bassett to El Monte.

This proposal would be most workable if a single track commuter line were developed. Owing to the lack of passing places along the State Street Line, and the narrowness of the western half of the Baldwin Park Branch, it is assumed that this would be operated as a unidirectional peak period service. The residential nature of the Baldwin Park Branch itself suggests that electrification would be desirable; however this might not be cost-effective for a peak-only service.

Dual-mode, diesel-electric/electric equipment could be an option here: since there would be no need (initially) to electrify segments of the line through industrial areas or where the line is in freeway median, the cost of electrification could be reduced by confining the electrified sections to residential areas. Strings of self-propelled cars may be preferable to long locomotive-hauled diesel trains from the viewpoint of residential impacts.

If it were desired to develop on the Baldwin Park Branch a double-track light rail line or interurban electric railway, it might be possible to swap right-of-way with the existing El Monte Busway, and convert the HOV lanes to a one-way, reversible facility. Under this scenario, the transit line would use the present HOV lanes and bus stations at the USC Medical Center and Cal State LA; while farther east, the present rail line and the HOV lane on one side of the State Street Line/freeway median would be converted to transit right-of-way. This would require additional structures to provide on-and off-ramps for the remaining (now reversible) HOV lane.

For the section between Bassett and Baldwin Park, it might be possible to provide the SP with freight access to the Azusa Branch by means of a night-time short line operation, as is done with the San Diego Trolley/SDIV (see also Chapter 4 and Appendix B).

For the western half of the Baldwin Park Branch east from the City of Baldwin Park, an option would be to install a one-way couplet combining the existing rail line with a new median R/W reclaimed from parallel arterial streets. The additional track could solve the problem of congestion along what would otherwise have to be a single-track line, albeit introducing some interesting operational considerations. Some passing sidings would probably also be desirable on the Baldwin Park Branch itself, in addition to the (slower) bypass track on an arterial alignment; a flexible operation would be required, quite possibly with an AM/PM reversal of flow along both tracks.

In general, for the eastern half of the Baldwin Park Branch, there should be no problem with double tracking; however, it should be noted that the SP line was consolidated with the ATSF Second Subdivision through Claremont some years ago, so the R/W no longer exists in this city. Development of through service on the Baldwin Park Branch would require use of this section of the Santa Fe line to connect both halves of the Southern Pacific line, following a section of right-of-way which is barely wide enough for double track.

In summary, it would appear that a bi-directional transit operation should be possible on the Baldwin Park Branch, but a number of engineering, operational, and environmental issues need to be addressed before the desirability of establishing such service can be established.

Other Possible Uses. If the Baldwin Park Branch in its entirety, or segments of it, are not purchased for transit, consideration should be given to preservation for jogging/bike/riding trails, as suggested by the Rails-to-Trails Conservancy (see Appendix B). This might make it possible to use non-transit funding sources for right-of-way preservation, and could allow eventual transit use in the more distant future.

C.9 ATSF Redlands Subdivision.

The segment of the ATSF Redlands Subdivision which might be usable for transit begins in Mentone, near the Redlands Municipal Airport (Figure C.9). From here south to Mentone Blvd. along Opal Avenue, the rails are still in place, but most of the ties have been removed (the old freight station remains intact at Mentone). The R/W has a north-south configuration here, curving to the southwest at Mentone to a junction with the former SP Redlands Branch, which still exists as a short spur connecting with the ATSF line near Wabash Ave.

At Wabash the Santa Fe Redlands line turns west, paralleling Independence Ave., Park Avenue, and Stuart Avenue in places. It then turns northwest to follow Redlands Blvd., paralleling the 10 Freeway from Nevada to Bryn Mawr, and crossing under the freeway; and curves to the northwest, west, and northwest again, to Waterman Avenue, at which point it runs north in the direction of the San Bernardino CBD. At Sierra it turns west to parallel Rialto Avenue, following this alignment to the 215 Freeway, finally heading north along a very

narrow R/W through residential areas to gain access to Santa Fe yard and station area.

Potential Trip Generators. Land use along the eastern end of the ATSF Redlands Subdivision is a mixture of orange groves, low density housing, and some light industry; however, this entire area is rapidly being redeveloped, with major new housing projects including densified single family housing, townhouses, and apartments south of the line east and west of Wabash, and above Colton Avenue (with mobile homes at Dearborn). The R/W in this section is quite wide, and where newer residential sections border the line, sound walls have been put in.

As a transit facililty, there would be ample room for park-and-ride development as well as potential for walk-on access. A short branch line along the abandoned SP Redlands Branch R/W along Colton Avenue would also be feasible; although this has been built upon from Beryl to King, space is available for an extension along the south side of the street as far as Crafton, or beyond. This area is also developing rapidly. Ownership status of the former SP spur and the abandoned R/W along Colton Avenue is uncertain.

The Redlands Subdivision would serve the University of Redlands campus at University Street, and some nearby apartment complexes. Residential buffering is provided here by a row of carports that line the R/W on the south side.

The Santa Fe Redlands Subdivision would provide very convenient access to downtown Redlands. A station at Orange Street would provide access to commercial sections of Orange, Redlands Blvd., Citrus, and Cajon, as well as the Civic Center, bank buildings, the Redlands Mall, and the State Street shopping mall. An excellent job has been done of restoring the older commercial section in downtown Redlands. The historic ATSF Redlands station is still intact, and if renovated for transit purposes, it would be a fine addition to the CBD redevelopment; just across the street there are major new shopping plazas along Orange.

West of the CBD, where the line crosses Colton and Alabama, there is a large new shopping center, with nearby motels and restaurants associated with the freeway off-ramps. Continuing west, at California Street the San Bernardino County Museum (complete with steam locomotive) lies just to the north of the rail line and the 10 Freeway; also in this complex are the Edwards Mansion and several modern business parks. To the south of the R/W in this location there is a commercial/light industrial section including a big post office general mail facility, a large housing development, and an RV park. At Mountain View just to the west, there are additional new office parks. There is room to double track where the line passes under the freeway. Another sizable housing development occurs along Mountain View north of the freeway, and near to the line.

The western end of a Redlands Subdivision transit line would serve the San Bernardino CBD, providing access to the Central City Mall, San Bernardino City Hall, San Bernardino Government Center and Court House, banks, office buildings, the Associated Technical College, Roy C. Hill education center, Central City Plaza, several theatres, library, motels, and high-rise housing.

Access To Norton Air Force Base. An interesting option would be to tie in the

abandoned segment of the SP San Bernardino Branch which runs through Norton Air Force Base, as the latter may soon be closed and revert to a general aviation airport and/or other land uses. The way north along Mountain View to link up with the old SP line at San Bernardino Avenue is largely across open land; the former railroad R/W picks up above this point, and the Santa Ana River railroad bridge is intact. West of the base, the R/W still exists in the form of a wide lawn along the south side of Mill Street (with a narrower section around Valley View where there is an access road on the south side). To connect with the Santa Fe Redlands Subdivision in the other direction, a new R/W could be reserved on the north side of Mill, for about a half mile to the west. Ownership of the abandoned section of the San Bernardino Branch is uncertain.

Current Status And Transit Potential. There would appear to be considerable space for park-and-ride as well as room for new commercial/residential development along both the Santa Fe Redlands Subdivision and the abandoned SP line, between Redlands and San Bernardino. Despite the relatively short length of a transit route using these rights-of-way, such a service may be quite viable owing to the number of activity centers served, the growth in this area, and the possibility of tying in with San Bernardino-LA commuter rail line and other transit facilities.

The ATSF is interested in selling its Redlands and San Jacinto lines to a single short line freight carrier, to guarantee maintenance of existing freight customers. However, this would not preclude transit operation on either line, perhaps using light rail or railbus technology. One concept would be to provide light rail service from Mentone/Redlands to the San Bernardino CBD, thence south along the SP San Bernardino and Riverside Branches to the City of Riverside, west through the Riverside CBD, to connect with the UP Crestmore Branch via the Mission Blvd. median (see below).

C.10 SP San Bernardino And Riverside Branches.

These little-used SP branch lines running south from the San Bernardino CBD through Colton, Grand Terrace, Highgrove, and Riverside may also have transit potential: perhaps tying in with the ATSF Redlands Subdivision to the north and the UP Crestmore Branch to the south (Figure C.9).

Potential Trip Generators--San Bernardino To Colton. The San Bernardino Branch begins just south of the Central City Mall in San Bernardino; a transit facility on this line could serve City Hall, County and State buildings, an important financial center, high-rise housing, and additional commercial areas. The northern end of the line is also about 3/4 mile away from the Santa Fe's San Bernardino train station (presently used by Amtrak), which could be the terminus of a Los Angeles-San Bernardino commuter rail or interurban line in the future.

Access from the northern terminus of the San Bernardino Branch to the Central City Mall might be provided via a short aerial structure running east of the Mervyns store and crossing over parking lots to gain entry to the mall area. Just south of this point, a connection could be made to the ATSF Redlands Subdivison. The SP branch line presently terminates in a rather wide, cleared area to the west of E Street and north of Mill. This property could be used for a transit joint development project of some size.

The Southern Pacific rail line continues south along Inland Center Drive/Colton Avenue, near the Inland Shopping Center and National Orange Show Grounds and Speedway; and it is also within walking distance of the San Bernardino Valley College. Continuing south to Colton, it is very close to the Colton Civic Center and library (and the site of a future senior housing complex); it then crosses the major Valley Boulevard commercial strip in Colton, which includes hotels and restaurants associated with the freeway.

Routing Options South Of Colton. The San Bernardino Branch goes under the 10 Freeway and curves to the east to terminate in the large SP Colton Yard; although there is no direct physical connection, the Riverside Branch continues to the south of this yard in a direct line with the San Bernardino Branch, along 9th Street in Colton. From there the line extends south to Riverside, roughly paralleling the 215 Freeway corridor.

One way to connect the San Bernardino Branch with the Riverside Branch would be to use an underpass to clear both the 10 Freeway and the SP yard. However, as the north end of the SP Riverside line actually goes down middle of 9th Street, a better option might be to fly over the SP facility on an overpass beginning on the north side of the yard, curving over it to follow the Santa Ana River south and southwest to joint the Riverside Branch near Washington Street. This would provide access to major commercial plazas and residential developments in Grand Terrace and the southeastern end of Colton.

Potential Trip Generators--Grand Terrace To Riverside. The Riverside Branch continues south through Grand Terrace (being grade separated at Vivienda and Barton) into Highgrove and northern Riverside. A transit facility on this line would provide park-and-ride access to major residential areas in Grand Terrace, and walk-on access to some large housing developments near the line at Pico and Spring as well as to new industrial/office parks at Palmyrita. Here the line courses to the southwest, through additional new office park areas (and land which will soon be developed in the same way). At Spruce, it enters another very large residential development zone.

At this point the line passes under the 215 Freeway, running along the south side of a local street (however the roadway is wide enough to provide room for an additional track); it curves southwest along the 91 Freeway and the ATSF main line, to come out in a large, former rail station and freight yard area just to the east of the Riverside CBD. This area extends from Third Street south to 10th, and comprises three sets of old SP tracks straddling Commerce Street (with some track in the street) as well as the ATSF Third Subdivision (main line). It also includes the Santa Fe depot and the old Union Pacific Station.

Union Pacific trains currently follow the Santa Fe tracks, but much of the old UP R/W and associated bridge structures are intact (with a section of track near the station). This area, if tied into a transit line, would also provide an ample amount of land for joint development, which would be of particular value if this is the end point of a Riverside-Orange commuter rail line.

The Riverside CBD is experiencing considerable growth at the present time. A transit link to the CBD would provide access to City Hall, the Riverside County

Court House and County Administration Center, state office buildings, the Mission Inn development, the Riverside Art Center and Museum, Raincross Square Convention Center, bank and financial buildings, the Main Street pedestrian mall and shopping area, hotels and theatres, Greyhound Station, a high-rise apartment building, the Riverside Community Hospital, and Riverside City College.

Current Status And Transit Potential. There appears to be relatively little freight service on the SP San Bernardino and Riverside Branches at the present day; they could provide good candidates for transit development combined with short line railroad operation at night. Other than furnishing a transit link between the ATSF Redlands Subdivision and the Crestmore Branch as mentioned above, there are various other possibilities. In the event that a railbus or modern interurban railway technology were used for the LA-San Bernardino rail line, it might be possible to through-route trains from the latter onto this SP trackage, to provide a direct connection to Riverside. It may also be feasible to route trains from the San Jacinto Branch, both west to Riverside and north to Colton and San Bernardino, over the SP Riverside and San Bernardino Branches. Yet another option would be a continuation of the transit service south along the former PE Riverside-Corona Line R/W in Magnolia Avenue (see Appendix E).

C.11 UP Crestmore Branch.

The UP Crestmore Branch runs from the UP main line at Van Buren Blvd. in Glen Avon east to the 60 Freeway, following along the south side of Jurupa Road (Figure C.9). A Crestmore Branch transit facility could be routed along Mission Boulevard, for service to Rubidoux and the Riverside CBD. From this point, such a line could be extended north to San Bernardino via the SP Riverside and San Bernardino Branches, and thence east to Redlands along the ATSF Redlands Subdivision.

Potential Trip Generators. A Crestmore Branch transit line could begin near Bellgrave Avenue on the main line (where the R/W is wide enough to allow an additional transit track). At Van Buren, it would join the Crestmore Branch itself. In this location, there are large shopping plazas (and perhaps even potential for a small joint development project near the "Y" where the Crestmore line joins the main line). The line would proceed past an older low density housing area, and the Circle J Arena. At Agate and east to Camina Real, there are a number of major new housing projects along the R/W; all of these are protected by sound walls. Housing development continues up into the Pedley Hills along Camina Real. Along Jurupa, there are a few single homes on the south side of the track, with dirt driveways crossing the track to access the road; however, in Europe there are light rail lines which cross driveways of this kind with little difficulty.

At Valley Way near the freeway, the freight line curves north of Jurupa, and runs for a short distance east along the freeway before crossing under it to head north to Crestmore. A transit link to the Riverside CBD would follow the median of Mission Boulevard (an unidentified interurban or utility right-of-way) which in most places is wide enough for two tracks. Mission is a continuous, older commercial strip; a transit line here would serve some mobile home parks, a larger commercial area at Mission Plaza, and the Rubidoux Court House. The Mission Blvd. commercial strip is a likely candidate for future redevelopment.

Access To The Riverside CBD. Access to the Riverside CBD would require a new bridge structure parallel to the Buena Vista Drive bridge; and a short tunnel (perhaps initially single track) under Mount Rubidoux, probably emerging at the west end of University Avenue. This would be necessary, because Buena Vista Drive is very scenic, with an attractive arch over the road and a parallel pedestrian walkway which should be left intact. Access to the Riverside CBD might entail creation of new right-of-way in what is now roadway, or a pedestrian/transit mall. A link would need to be provided to the old UP/ATSF station area (and SP freight yard area), where connections would be made with other transport services.

Status And Transit Potential. Track along the UP Crestmore Branch to the cement plant served by the line was recently refurbished. However, owing to the light density of traffic, it is probable that the railroad would be interested in selling the line for transit development if it were assured that freight access would be maintained by short line carrier at night. Although the transit line described above would be relatively short, it would serve some rapidly growing sections west of the City of Riverside and provide linkage to the Riverside CBD, and also (if tied in with the SP Riverside/San Bernardino Branches and ATSF Redlands Subdivision) to cities to the north and east.

Another possibility would be to extend a Crestmore Branch transit line from Riverside to Ontario and the Ontario International Airport along the UP main line. This could perhaps follow the Euclid Avenue R/W north through the Ontario CBD area or proceed west along a combination of the UP/SP main lines and the Pomona Freeway to the LA CBD (see Appendix section D.2). However, any use of the UP main line would require transit development on a strip of excess R/W parallel to the present freight track, to avoid interfering with important transcontinental freight operations.

C.12 ATSF San Jacinto Subdivision.

Riverside County is currently interested in providing either commuter rail or light rail service along the ATSF line from Riverside to Hemet (Figures C.10, C.11). This would serve rapidly developing residential areas along the 215/74 highway corridor.

Potential Trip Generators. During the current study, the San Jacinto Subdivision was surveyed only from Hemet west to Riverside. Hemet, at the eastern end, is a fast-growing residential area with a vast number of mobile home estates, many new single family homes, some apartment projects, and trailer parks. At the west end of Hemet, the line would pass very close to the Hemet Airport, which has a certain amount of air cargo traffic. There appears to be ample room for park-and-ride in this location.

From Hemet, the railroad line runs southwest across open land, curving to a westerly orientation at Winchester. It is assumed that the next station to the west would be at Winchester Road. This has at present a small commercial area next to the presumed station site; however, the Winchester Town Center, a retail shopping area, will soon be under construction (there are also mobile homes in the immediate vicinity). A few miles west of Winchester, the line turns to the

northwest. (This segment passes through largely open space.)

The next station would be at Romoland, near the intersection of Route 74 and the 215 Expressway. This would be an appropriate park-and-ride site. Additionally, there is a farmer's market area here, with stores and even a restaurant made up of old railroad cars; and there are a number of mobile home parks along Route 74, both near Route 215 and to the east.

The San Jacinto Subdivision crosses under Route 215, and continues on into the center of the town of Perris, accessing the commercial area. There is much new residential development in Perris, which is also home to the Orange Empire Railway Museum. The latter has a large collection of historic streetcars and interurbans on display (including Los Angeles Yellow Cars and Red Cars). Some of these are in operation on dual-gauge track on weekends, and the museum is a major tourist attraction. The trolley museum has recently installed catenary north to the center of town, providing a link to the San Jacinto line and to the former train station (slated to open in the summer of 1989 as the Perris Valley Historical Museum).

The Orange Empire trolley line passes next to one of the new housing developments; and the former rail yard area in the town center (where the museum line and San Jacinto Branch meet) appears large enough to support a small joint development project with an historical theme. It is assumed that large park-and-ride lots in the vicinity of Perris would probably be sited outside of the town, to reduce possible congestion impacts.

After leaving Perris, the San Jacinto Subdivision continues northwest across open land along the west side of Route 215. As such it would provide park-and-ride access to very major housing developments to the east in the Perris and Moreno Valleys, and service to the March Air Force Base; this facility is likely to be expanded with the closure of other regional Air Force bases and consolidation of their activities at March.

Farther north, where the 60 Freeway joins Route 215, there is a considerable amount of highway congestion. A park-and-ride lot in this location would provide access to additional, expansive residential areas of the Moreno Valley, via Route 60. Access could also be provided via shuttle bus to the Riverside International Raceway. Also near the 215/60 junction point, the San Jacinto line passes through the Box Springs and Canon Springs Industrial Parks.

Above Central Avenue, the railroad line diverges from Route 215, running north along the base of the Box Springs Mountains. It skirts the large residential neighborhoods of Canyon Crest Heights and Belvedere Heights; this part of the ride would be very scenic, with the mountains to the east and the valley to the west of the R/W (passengers would look down into the valley below). The line turns to the west along Watkins Drive, and would provide access to the University of California at Riverside (probably by bus or van shuttle).

The San Jacinto Subdivision next continues in a northwesterly direction, and crosses the SP Riverside Branch near Marlborough Avenue. This area has a number of modern industrial parks. A connection could be made via the Riverside Branch northward in the direction of San Bernardino, and southwest to access the

Riverside CBD.

Possible Destination Points In The Riverside CBD. It is assumed that the old ATSF/UP station area would be the major stop accessing downtown Riverside (see above). Parts of the CBD would be within walking distance of the line, and others would require bus access. A number of local bus routes already pass through this area; if a commuter rail or rail transit line were to terminate here, the old station site would become a real transit hub.

One option would be for a San Jacinto Subdivision transit line to end here; the Santa Fe and UP depots (separated by an attractive park at present) together with the land occupied by a number of unused sidings in this location might have considerable joint development potential, including creative reuse of older station buildings for shops and restaurants. Intercity rail service together with a Riverside-Fullerton/Irvine commuter line would greatly enhance this.

If desired, a San Jacinto transit line might be extended to the southwest to serve the Riverside Plaza Mall, by constructing track in the space between the 91 Freeway and the ATSF Third Subdivision. This link would provide good access to the Riverside City College (just west of the ATSF/UP line and the freeway), and could cross over the Central Avenue off-ramp in a westerly direction, perhaps running on structure over the parking lot and automatic teller lanes behind the Riverside National Bank, on the south side of Central. At Riverside Avenue, it could cross to the north side of Central again, and terminate at a station over the mall parking lot.

Transit Potential. A railbus technology could be applicable to this corridor, taking the form of main line-compatible diesel or electric railcars operating in short trains. This would facilitate passenger service together with operation of a short line freight carrier. It would appear that with long stretches of single track and few grade crossings, very high speeds could be attained in places. Another possibility is an interurban electric railway (high-speed light rail) technology, which could be compatible with a more localized transit operation on the Redlands, San Bernardino, Riverside, and Crestmore Branches (see above). In this case, freight service could be provided at night, as is done on the San Diego Trolley line.

This corridor is a priority for transit development by the Riverside County Transportation Commission, since a portion of the proceeds from the recently-passed 1/2 cent sales tax is intended for rail passenger system development.

C.13 SP Santa Paula Branch.

The SP Santa Paula Branch has been partially abandoned. The line formerly extended all the way from the Saugus Line in the Santa Clarita Valley west along highway Route 126 to Montalvo near Ventura and Oxnard, where it joins the Coast Line (Figure C.12). The eastern half of the line has been abandoned between Santa Clarita and Piru; the section which remains in service runs east to Fillmore and Santa Paula.

The primary land use along the Santa Paula Branch is agriculture; there are numerous orange groves, but population is nil along much of the route. For this

reason, restoration of the abandoned segment for transit purposes is not recommended, with the following exceptions:

Possible Valencia Connection. The tracks are still intact for about two miles from a point just east of the 5 Freeway along Magic Mountain Parkway in Valencia, to Castaic Junction. It is believed that this line segment was purchased by a private individual. Some old railroad cars and other equipment are presently stored at the west end of this track, at Castaic Junction. This fragment of the former freight line runs very close to Six Flags Magic Mountain. In the event that a commuter rail service of some kind were initiated on the Saugus Line (see Appendix H), it might be worthwhile providing a connection via this abandoned section to the amusement park.

Most of the former R/W linking the privately-owned section with the Saugus Line is intact, along the north side of Magic Mountain Parkway. However, a short segment at Mc Bean Parkway has been built upon, and a shopping center will be constructed on the south side of the road in this area. Timely action would be needed to preserve the remainder.

Possible Santa Paula-Santa Barbara Commuter Link. The other stretch that might be feasible to use for passenger service would be the western end from Ventura to Santa Paula, where there is considerable residential coverage. For reasons of circuity, this would not be of much value for a Ventura-Los Angeles commuter service (see Appendix H). However, the suggestion has been made that there may be potential for a Ventura County-Santa Barbara commute service on the Coast Line, serving the Santa Barbara CBD. A variation of such a route might be an extension to Santa Paula, along this branch line. There is a certain amount of freight service on this segment of the line, so it may be assumed that the R/W is not immediately endangered. Railbus operation might be an option for such a Santa Paula Branch/Coast Line commuter rail operation.

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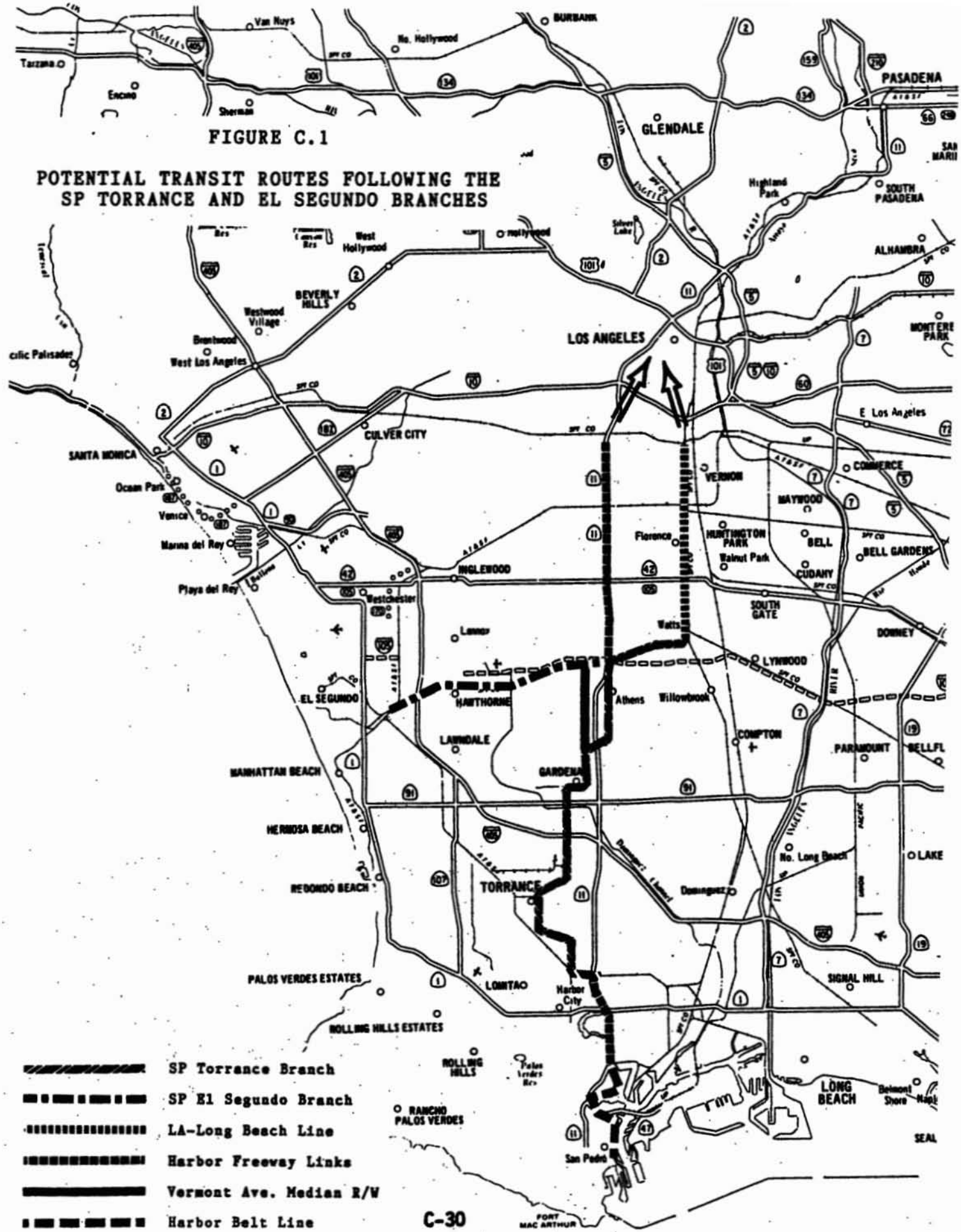
2. Ibid.
3. Draft Estimation Of Patronage for Rail Transit Implementation (Stage 2). Phase 1. Prepared by SCAG for the LACTC, Sept. 1983, pp. IX-23, IX-27.

FIGURE C.1

POTENTIAL TRANSIT ROUTES FOLLOWING THE SP TORRANCE AND EL SEGUNDO BRANCHES



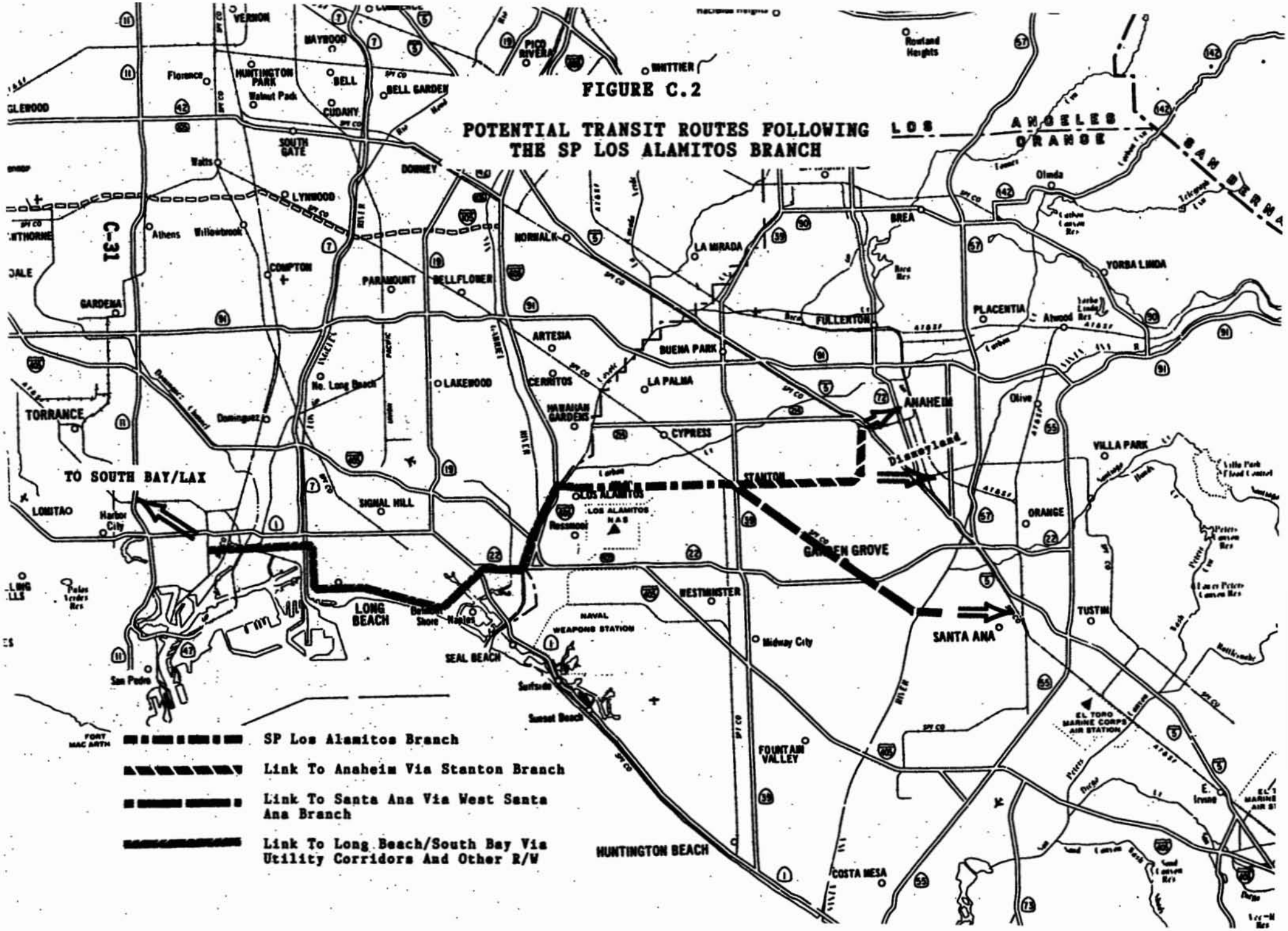


FIGURE C.2

POTENTIAL TRANSIT ROUTES FOLLOWING THE SP LOS ALAMITOS BRANCH

FIGURE C.3

POTENTIAL TRANSIT ROUTES FOLLOWING THE US NAVAL RAILROAD AND SP EAST LONG BEACH BRANCH

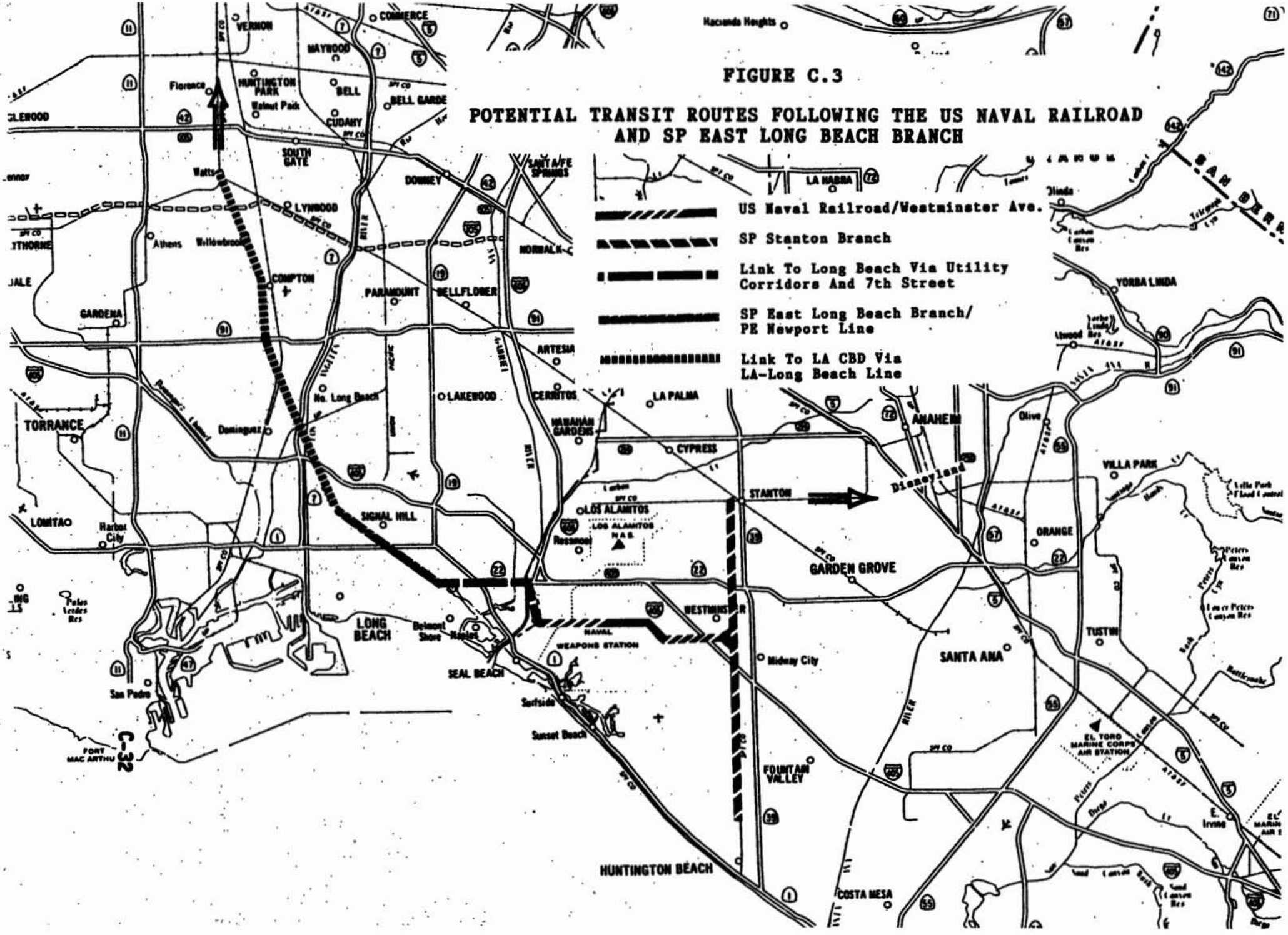


FIGURE C.4

POTENTIAL TRANSIT ROUTES FOLLOWING THE SP STANTON BRANCH

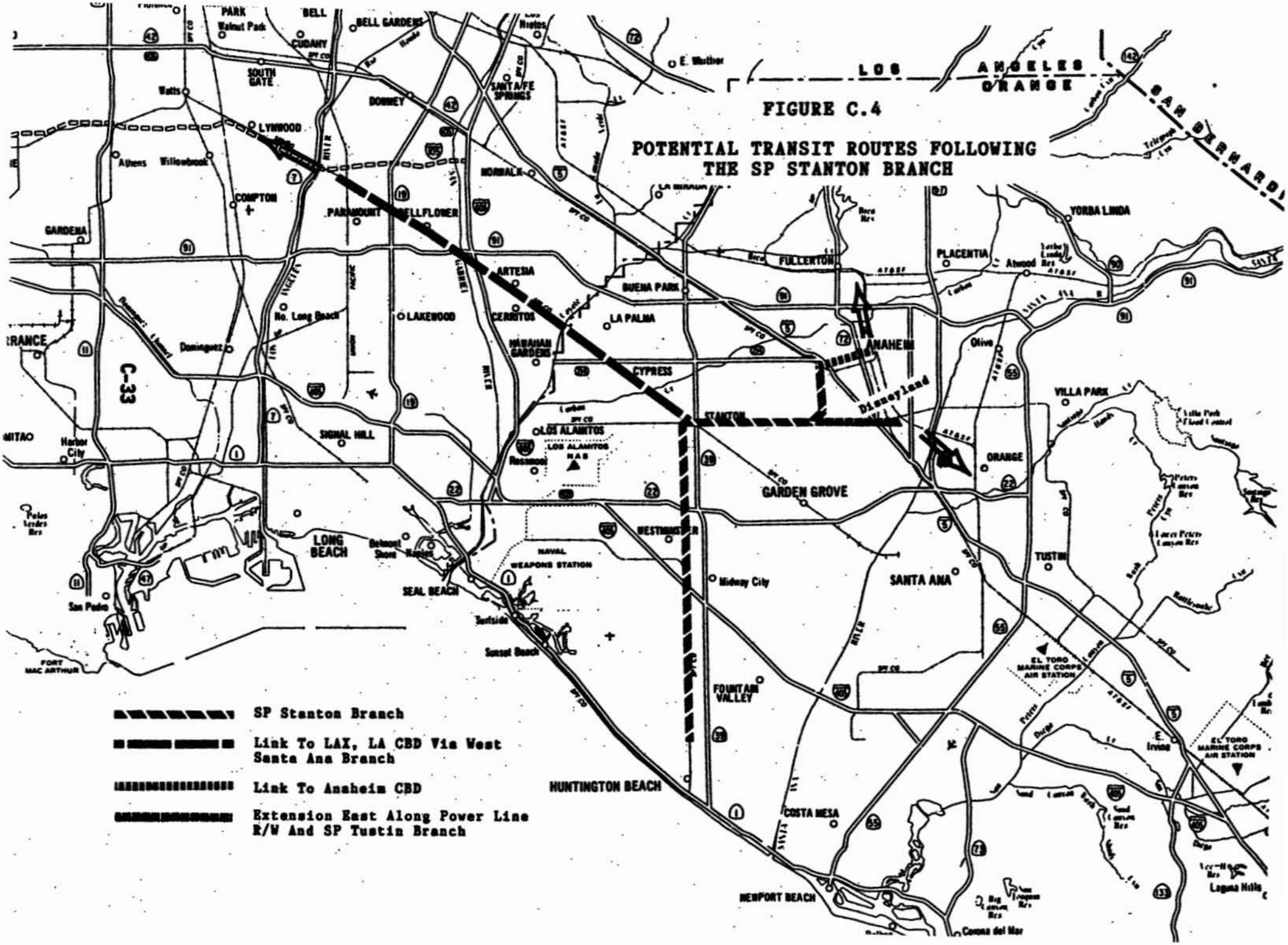


FIGURE C.5

POTENTIAL TRANSIT ROUTES FOLLOWING THE EASTERN HALF OF THE UP ANAHEIM BRANCH

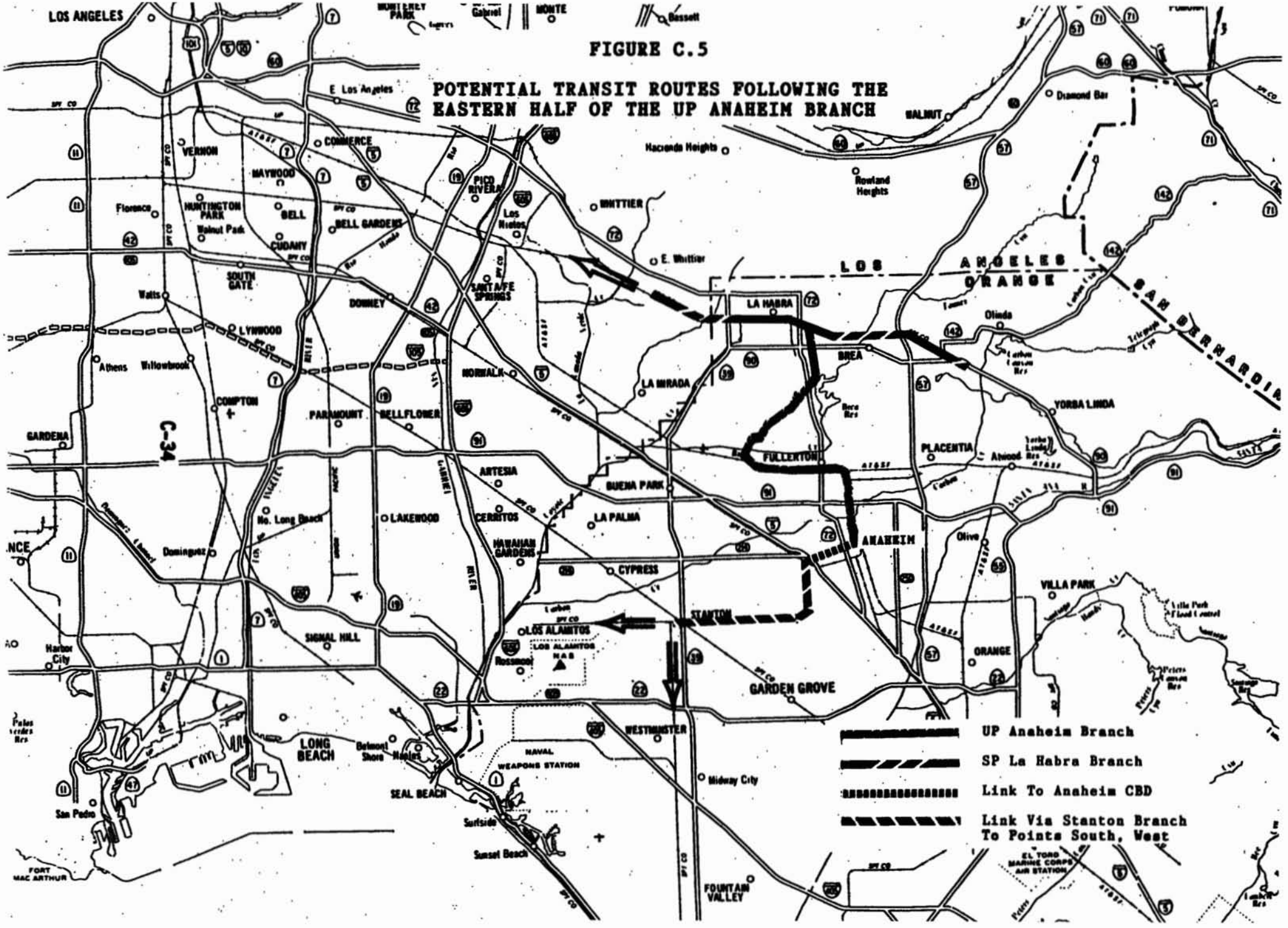


FIGURE C.6

POTENTIAL TRANSIT ROUTES FOLLOWING THE SP LA HABRA BRANCH

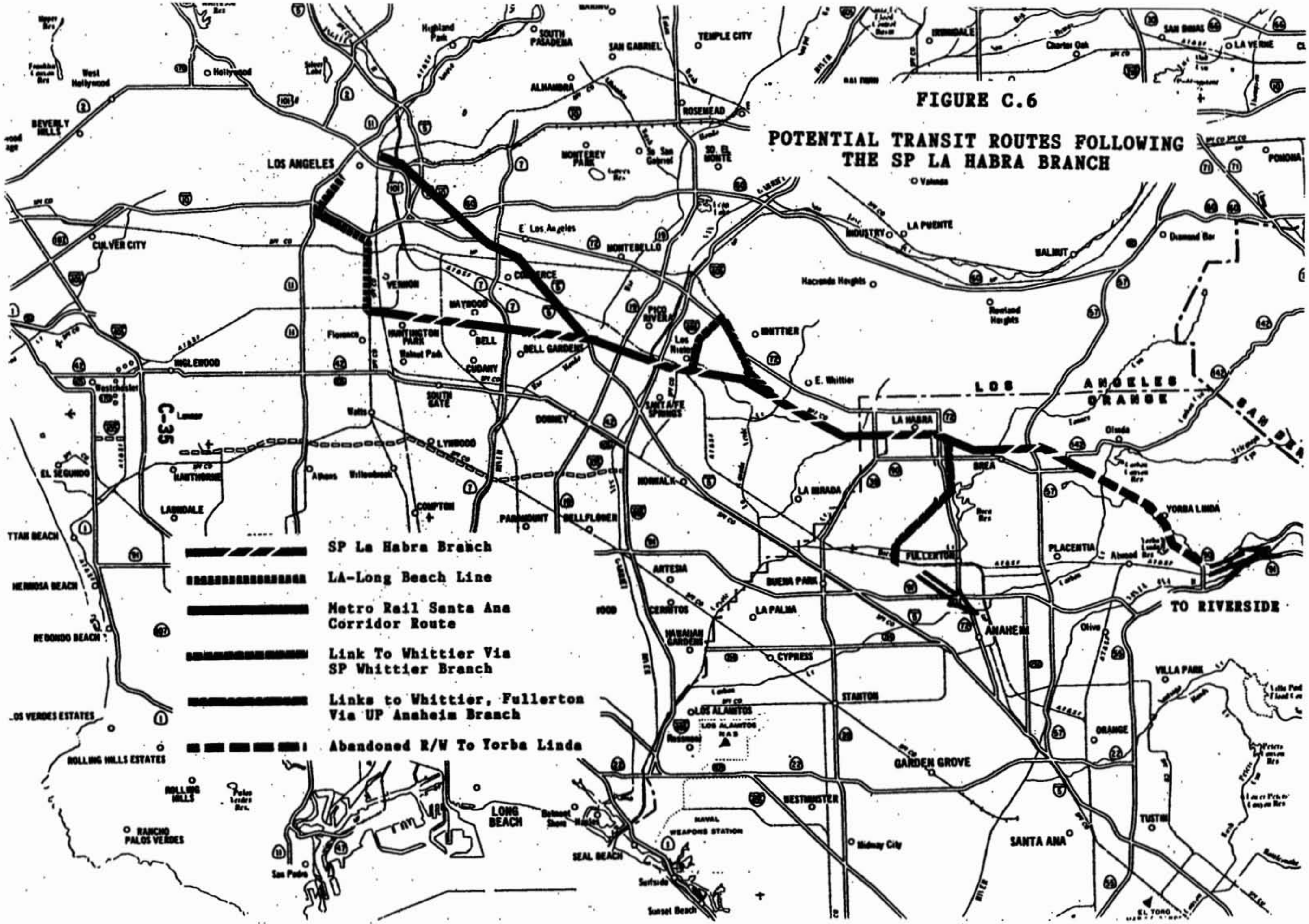


FIGURE C.7

POTENTIAL TRANSIT ROUTE FOLLOWING THE SP BALDWIN PARK BRANCH
Western Segment

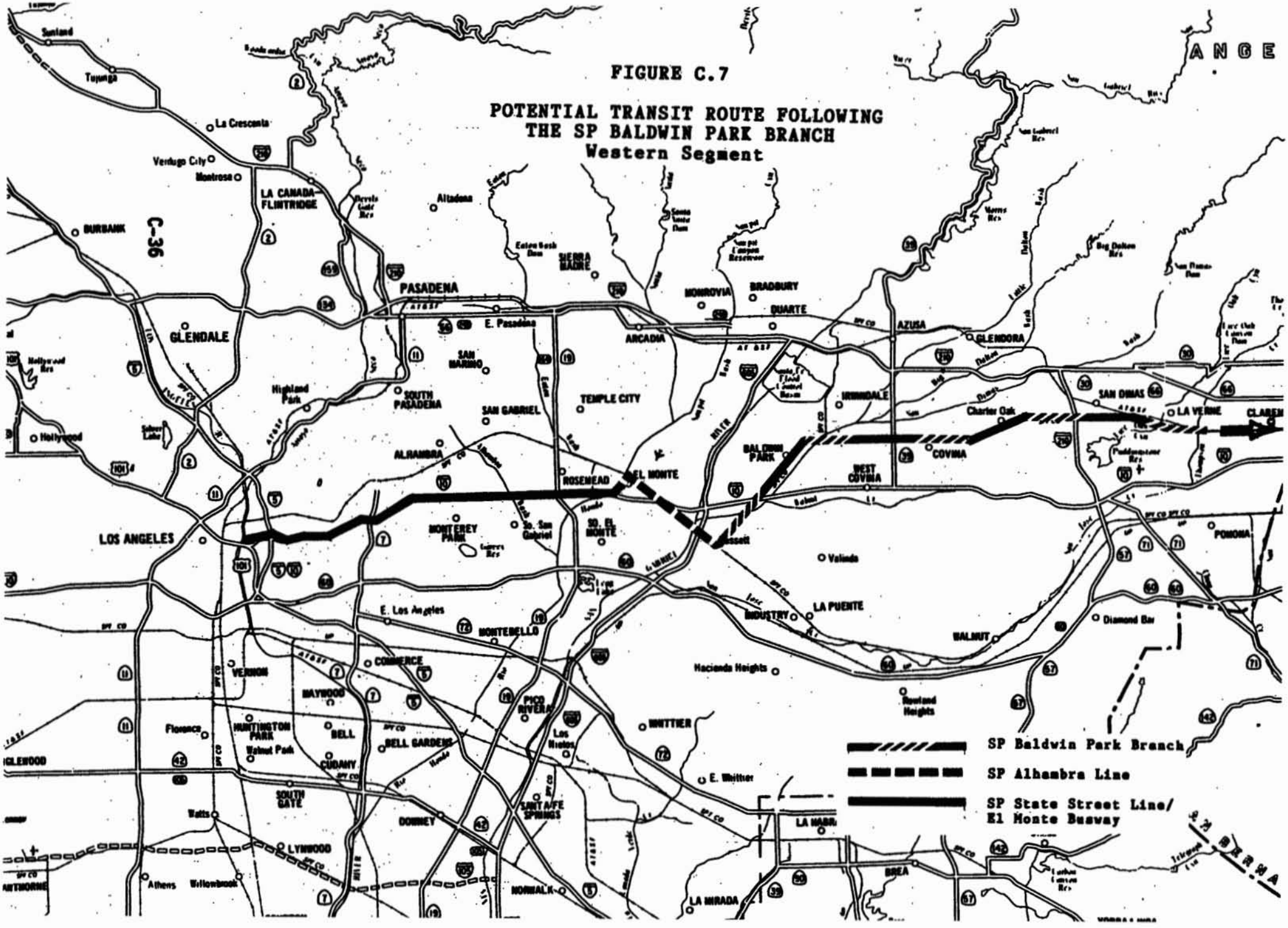


FIGURE C.8

POTENTIAL TRANSIT ROUTE FOLLOWING SP BALDWIN PARK BRANCH Eastern Segment

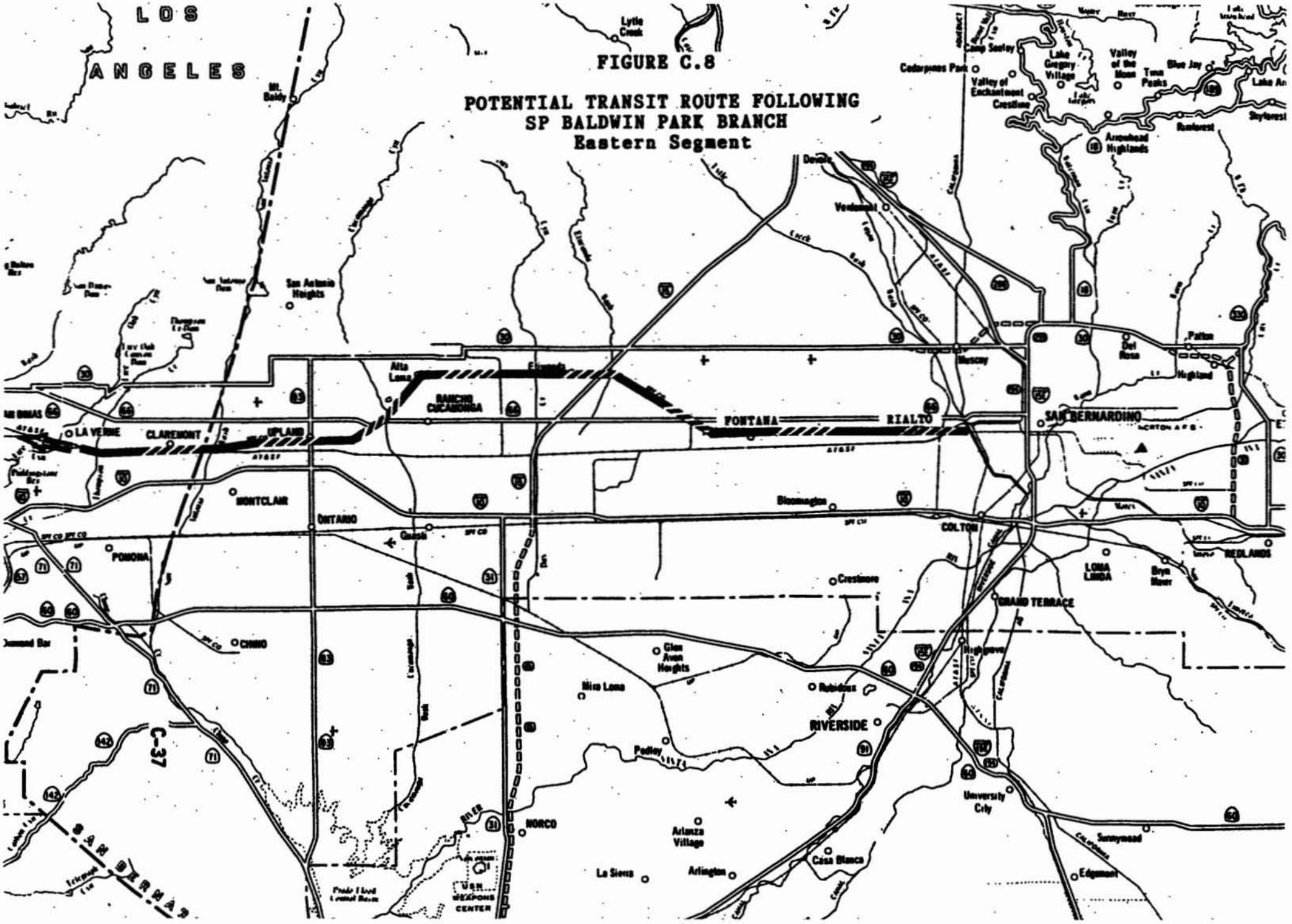


FIGURE C.9

POTENTIAL TRANSIT ROUTES FOLLOWING THE SANTA FE REDLANDS SUBDIVISION, SP SAN BERNARDINO/RIVERSIDE BRANCHES, AND UP CRESTMORE BRANCH

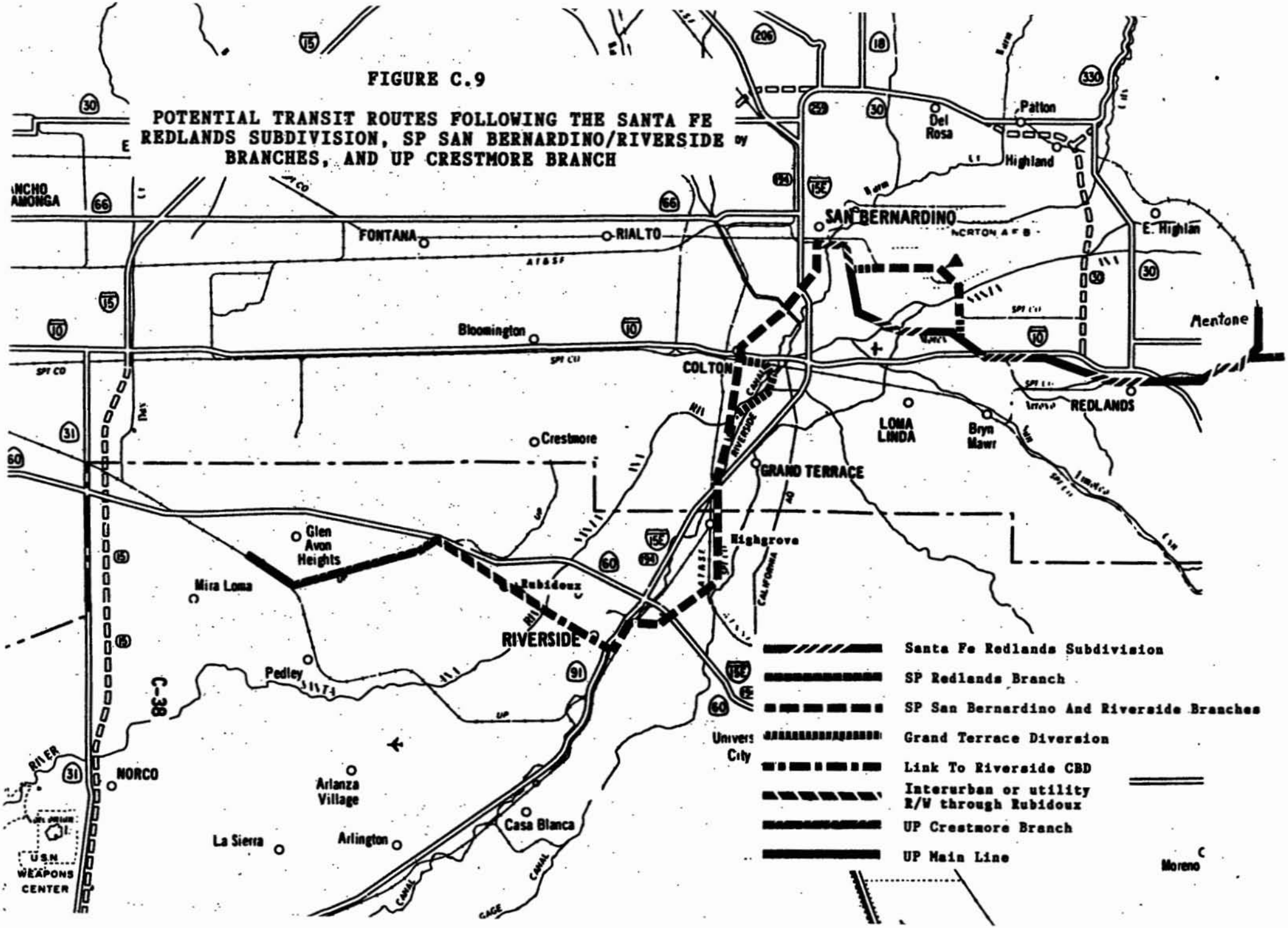
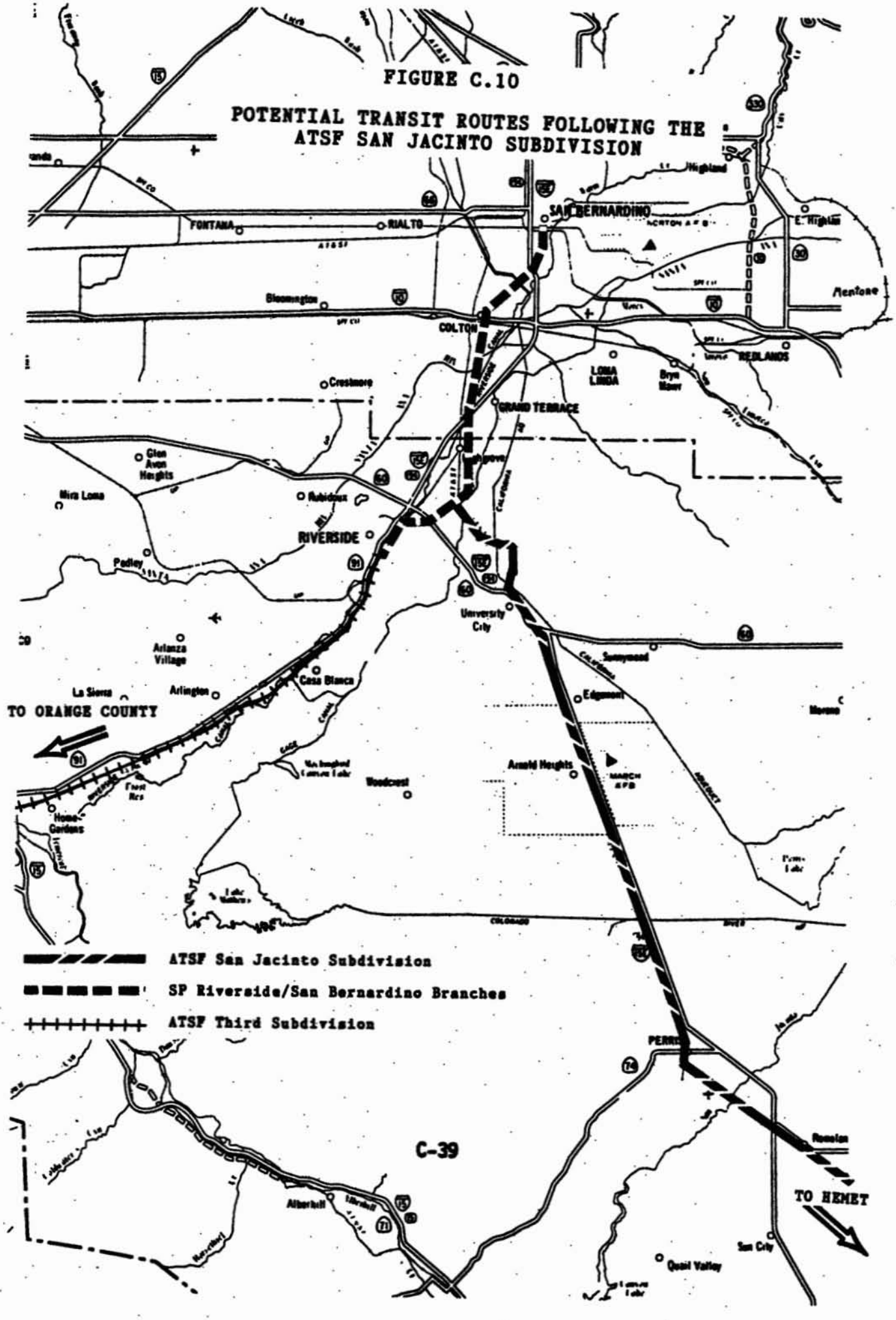


FIGURE C.10

POTENTIAL TRANSIT ROUTES FOLLOWING THE ATSF SAN JACINTO SUBDIVISION



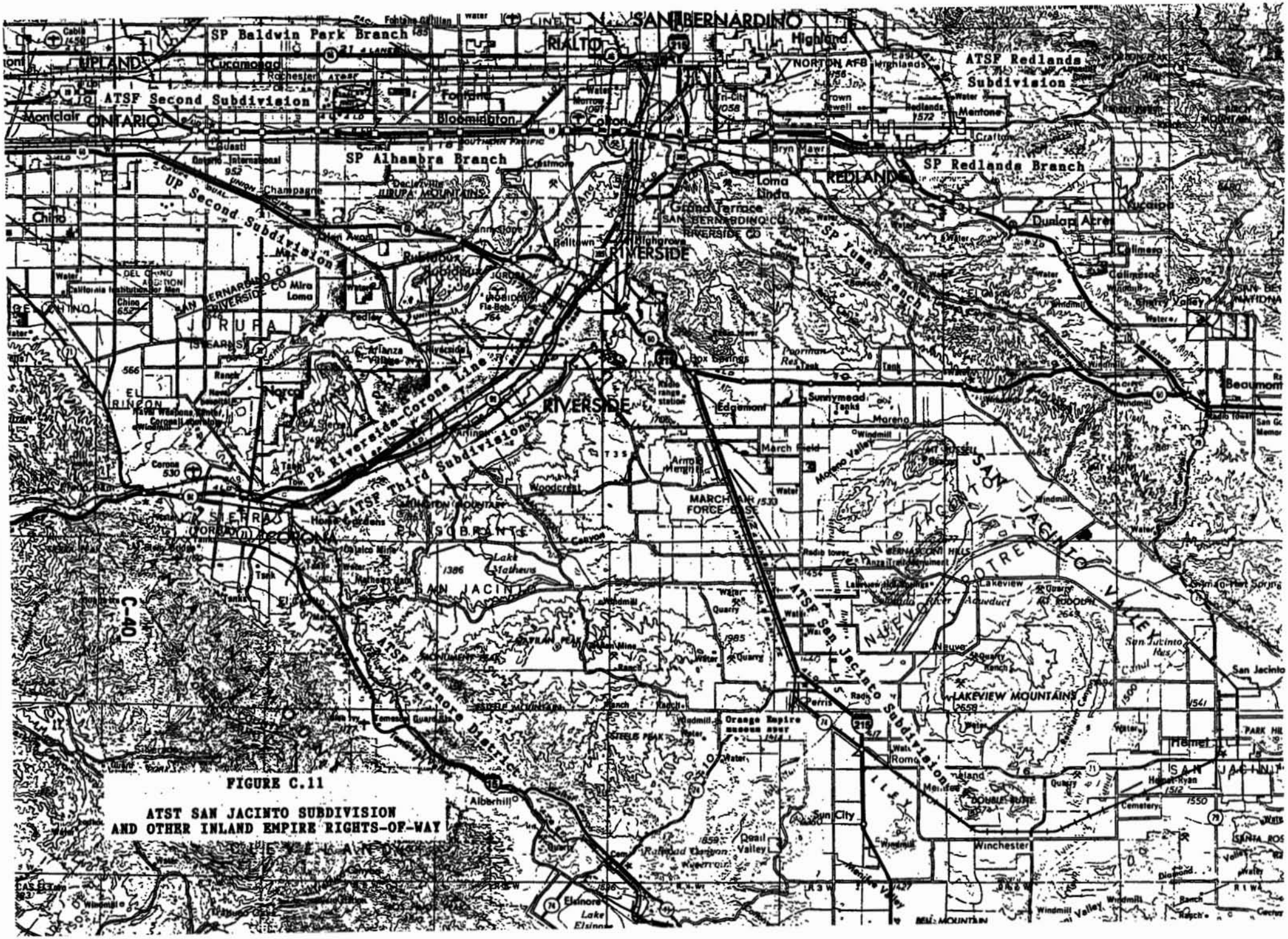


FIGURE C.11

ATST SAN JACINTO SUBDIVISION
AND OTHER INLAND EMPIRE RIGHTS-OF-WAY

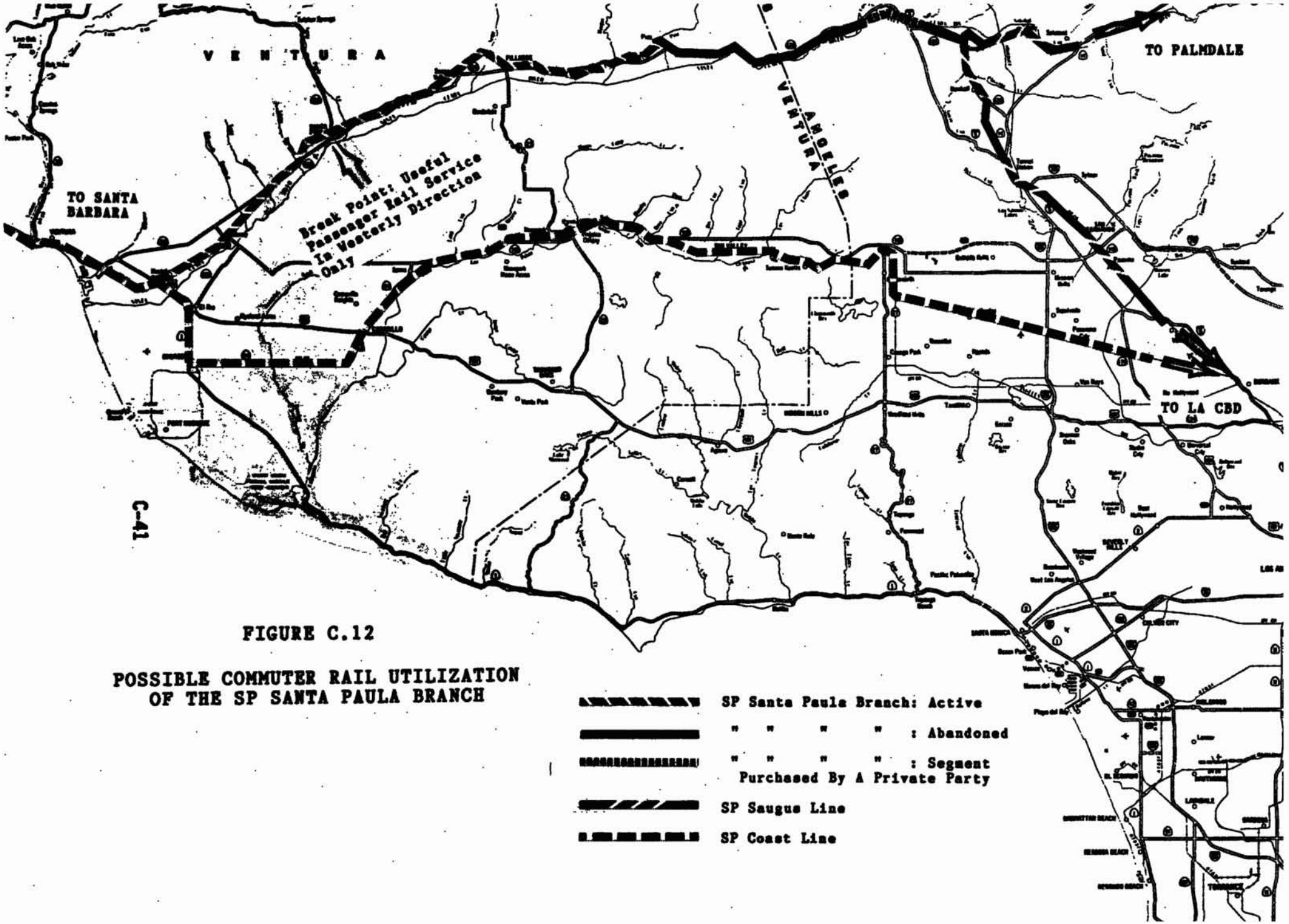
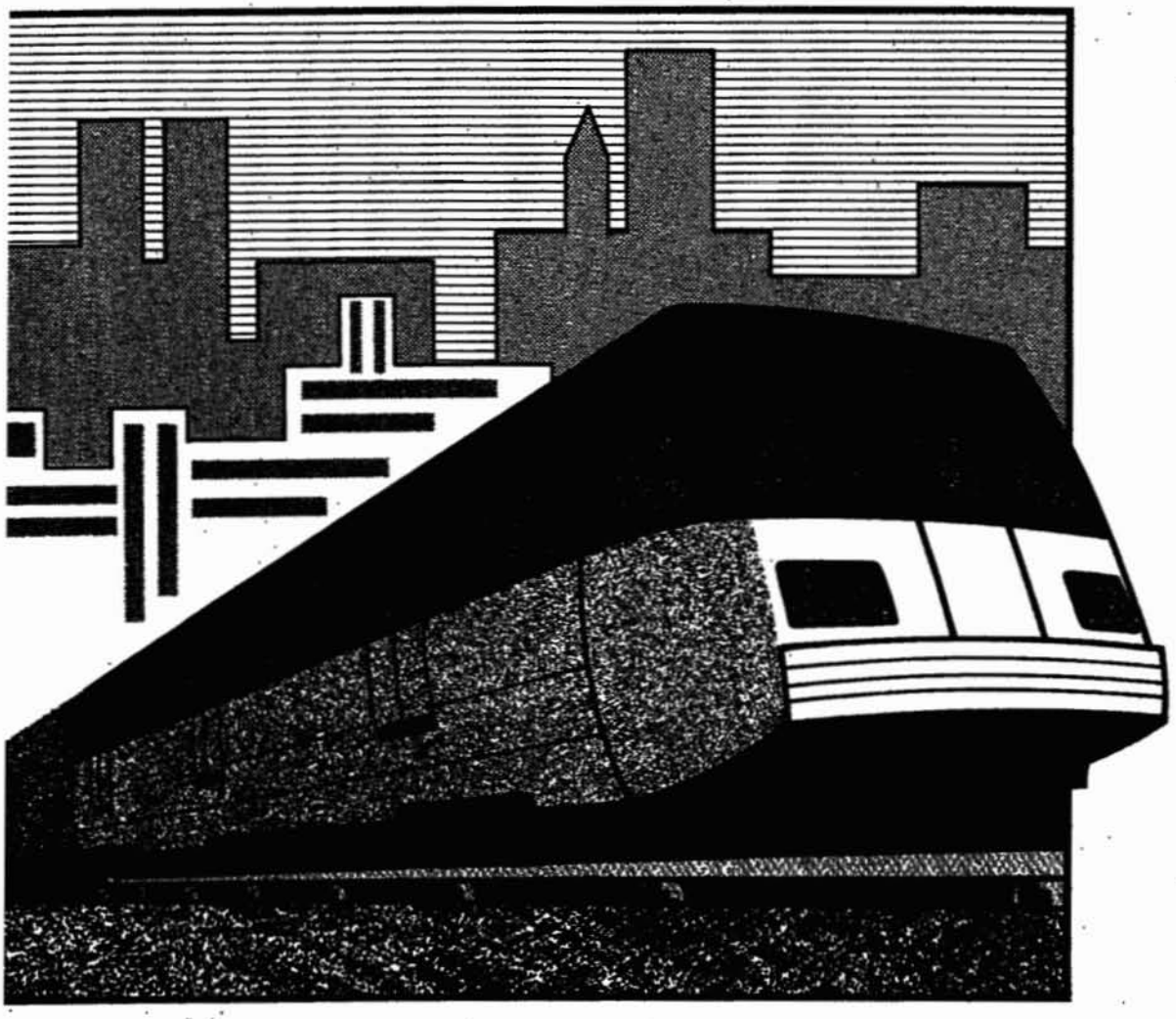


FIGURE C.12

POSSIBLE COMMUTER RAIL UTILIZATION OF THE SP SANTA PAULA BRANCH



Artist's rendering of the Advanced Concept Train (ACT), a high-speed rapid transit vehicle.

Congestion

APPENDIX D

OTHER RAILROAD MAIN LINES CONSIDERED

This appendix provides information on railroad main lines that could have potential for conventional transit operation (that is, other than commuter rail operating under a track-sharing arrangement). The lines considered here are currently in heavy use, and are not in danger of abandonment.

D.1 SP Saugus Line.

The SP Saugus Line enters the San Fernando Valley near Sylmar, continuing south through the City of San Fernando, and down through the Pacoima and Sun Valley sections, joining the Coast Line at Burbank Junction near the Golden Mall (Figure D.1). It was recently proposed to use the Saugus Line, together with the SP Coast Line, for a light rail alignment extending from San Fernando to the LA CBD, during the proceedings of the San Fernando Valley Citizen's Panel On Transportation Solutions (1).

This was intended to be a largely at-grade route along San Fernando Road which would serve heavily transit dependent people both at the north end of the line and in communities such as Glassell Park south of Glendale. It was proposed to obtain the right to public use of the SP right-of-way, by means of a trade-off for tax abatement or developmental rights.

The Saugus Line north of Burbank Junction is largely single tracked, on a very wide right-of-way. There appears to be room for two additional tracks for transit on this part of the corridor. Right-of-way is more constrained in places south of Burbank (particularly at the Glendale Amtrak station). However, this section of the line would parallel the Glendale Proposition A route which will most probably run along Brand Boulevard. In addition, the Cities of Glendale and Burbank have in the past expressed an interest in a transit link along Glenoaks Blvd. (the median here being a former PE line), rather than along the railroad main line.

Hence, an option for routing a Saugus Line transit facility southeast of the Burbank Airport area would be diversion to these other rights-of-way through downtown Burbank and Glendale to join the SP Coast Line near the LA CBD (similar to the Burbank-LA CBD route described in Chapter 14).

Potential Trip Generators. A transit line on the Saugus corridor could serve a major commercial area in San Fernando, the northern Van Nuys Blvd. commercial strip and nearby light industrial area, the commercial/industrial section near Osborne, and major apartment complexes in nearby sections of Pacoima. It could also serve light industrial areas, hospitals, and a busy swap meet in Sun Valley, with access to apartment complexes, commercial plazas, and industrial parks at Sunland. In northern Burbank, it could serve Lockheed/other industrial plants and apartments at Hollywood Way, and hotels, residential, and industrial areas at Buena Vista.

Access could also be provided by shuttle bus to the Burbank Airport, while there are many locations which would allow park-and-ride development. Finally, the northern half of the route penetrates an area which may have fairly high future development potential, and a transit line along this right-of-way could stimulate a number of projects on nearby vacant or underutilized light industrial land. It is not unreasonable to expect that as most of the available land in other parts of the San Fernando Valley becomes filled in, developers will next focus their attention on the San Fernando Road area.

A connection with the Golden Mall, the Glendale CBD, and downtown LA would provide access to the trip generators which were elaborated in Chapter 14 under the discussion of the Burbank Branch/Coast Line combination, including possible redevelopment sites in Taylor Yard, at the Bullring/Cornfield Yard near Chinatown, and centering on Union Station.

Transit Potential. It should be noted that in addition to the option of providing a direct service from San Fernando to the LA CBD via Burbank/Glendale, it would also be possible to link a Saugus Line surface transit route with a Metro Rail extension from North Hollywood to the Burbank Airport (tunnel alignment), or to connect it to a 170 Freeway transit line which would feed Metro Rail in North Hollywood. Discussion of a commuter rail alternative which has also been proposed for this right-of-way is included in Appendix H.

It is understood that the City of Los Angeles will fund a study of potential transit development along this corridor. Right-of-way preservation would seem to be a relatively low priority as this is a main line in heavy freight use today.

D.2 SP/UP Main Lines Combined With The Pomona Freeway.

In conjunction with SCAG's preliminary work on the Regional Mobility Plan, consideration was given to a route from Los Angeles to western San Bernardino County following a more southerly route than the ATSF Second Subdivision, SP Baldwin Park Branch, and the El Monte Busway. This would follow the crowded Pomona Freeway corridor from Boyle Heights east to the junction with the 605 Freeway, and then generally run along the UP Second Subdivision and San Jose Creek to the City of Industry (Figure D.2). From this point it follow either the UP main line or the SP Alhambra Line to Pomona and Montclair (where the two lines are very close together) and thence east along the SP main line to Ontario International Airport.

Potential Trip Generators--Pomona Freeway Segment. An Atlantic Boulevard stop would serve the East Los Angeles College, large commercial plazas along Atlantic to the north and south and along Beverly to the southeast, the Municipal Courts Building and library near Belvedere County Park, apartment buildings to the north, a big Mormon temple, and the La Luz Del Mondo. Farther east at Garfield, service would be provided to the Montebello Plaza commercial area, a medical center, and Bicknell Park on the south side; and to a commercial section of Garfield together with apartment complexes and a driving school on the north side. At Potrero, there are additional apartments, a hotel, and several modern industrial parks.

At Paramount, service would be provided to the Montebello Town Center, the Don Bosco Technical Institute, a Kaiser Permanente medical center, a hotel, and some big apartment complexes. At Rosemead, access would be provided to the major Legg Lake recreation area; at Peck Road, service would be provided to office/ industrial parks, commercial development, motels, a small amusement park, a high school, and the Whittier Narrows Nature Center. At this point a bus link could provide access to the Rio Hondo College and the Pico Rivera Sports Arena.

Potential Trip Generators--UP Main Line. From the 605 Freeway eastward, in the City of Industry, the line might follow the Union Pacific R/W on aerial structure or on excess surface R/W in places where the latter is especially wide; being careful to avoid interference with vital rail freight activities. To a large extent, land use here is industrial with major new office parks in the San Jose Creek lowlands area, and large residential areas to the north and south, in La Puente, Hacienda Heights, Walnut, and other communities.

At Hacienda Blvd., access would be provided to commercial plazas on Gale Ave. just to the south, and a commercial plaza on Valley Blvd. to the north; a bus link would provide service to the La Puente Civic Center and commercial area, and to the Industry Civic and Financial Center. At Azusa, access would be provided to modern office parks, a large commercial plaza right next to the line, and the Puente Hills Mall, to the southeast; and between Azusa and Fullerton Road, there is a long (1.5 mile) section of commercial shopping plazas, just on the south side of the railroad line, with numerous stores and restaurants. The Colima Town Mall lies to the southeast at Fullerton.

At Nogales, there are additional industrial/office plazas and commercial areas; and at Brea Canyon Road there are modern office parks and apartment complexes, with some major new single family housing developments in nearby Walnut. At Temple, near the 57 Freeway, access would be provided to more office parks, a hotel, the University Technical Center, large new apartment complexes on the hillside to the south, and the Lanterman State Hospital/Lanterman Development Center (with the possibility of a bus link to the California State Polytechnic University of Pomona and Mount San Antonio College).

Potential Trip Generators--SP Main Line. A Garey Avenue stop would serve the center of Pomona, with access to the Pomona City Hall, Court House, library, and Pomona District Health Center to the south, as well as the Second Street commercial mall area (with a number of restored buildings, specializing in antiques) and the College of Osteopathic Medicine of the Pacific. There are also office buildings, the Mission Osteopathic Medical Center, an old hotel, and big new apartment complexes (including some senior apartments) south of the tracks. To the north lie the Holt Avenue and Garey Avenue commercial sections, including some bank buildings, and the big Grocery Warehouse plaza near San Antonio.

Farther east at the Pomona/Montclair border, there is a big commercial section along Indian Hill Blvd. north of the line; also located here are the Indian Hill Mall, Indoor Swap Meet, apartments and mobile homes along Holt, and the U.S. Naval Reserve Training Center just south of the line (otherwise the area to the south is light industrial). In Pomona, some minor commercial joint development projects might be created from the older industrial strip along the rail line.

At Central Avenue in Montclair, a commercial section as well as some modern industrial/office parks lie to the north of the line, and to the south there are major apartment complexes. In this section, there is adequate space between the SP and UP tracks to permit commercial joint development in association with a transit line.

At Mountain in Ontario, there are commercial sections north and south of the line, major new housing projects to the south along Mission, and an Army Reserve Center to the east. In this location there is a considerable amount of space between the SP and UP tracks which would permit joint development projects of some size. Farther east at Euclid lies the center of Ontario, with commercial development along both Holt and Euclid north of the line, the City Hall and Library, and the Museum of History and Art. Again, there may be major opportunities for recycling older land between the two sets of tracks for new public/private joint venture projects.

The line would next serve the Ontario International Airport, which in addition to numerous passenger flights is a center for air freight activity (UPS, Emery, and Federal Express). Lockheed also has a facility here, and north along Vineyard Avenue there are hotels, office parks, and major apartment complexes. A transit maintenance facility might be located on open land east of the airport, making possible a revenue stop at the J. Filippi Vineyard/Guasti Plaza tourist area.

There is considerable office park development activity near Ontario Airport, such as the 70 acre, $ 250 million Centrelake Business Park project which will include one million square feet of space for research and development facilities, high-rise office towers, and an 800 room hotel.

Residential Buffering. To a very large extent, shopping centers, parkland, and open space provide residential buffering for neighborhoods along the Pomona Freeway east of the 710 Freeway: including the Belvedere County Park west of Atlantic, access roads together with the Montebello Country Club and shopping centers west and east of Garfield in the City of Montebello, a vegetated hillside and power line R/W in Monterey Park, a shopping center in Montebello near Paramount, the Whittier Narrows Recreation Area in the vicinity of Rosemead, and commercial areas in South El Monte. Hence, unlike certain other freeways in our area, there is considerable excess R/W surrounding the 60 Freeway, making transit construction easier and providing some space for park-and-ride.

Transit Potential. Modeling work done in conjunction with the Regional Mobility Plan, and assuming an 80 MPH transit line on this corridor, projected over 50,000 daily Year 2010 riders (home to work trips only) between Ontario Airport and the LA CBD--in addition to, and separate from, patronage on the El Monte Busway and a Second Subdivision transit line. Ridership could be much higher than this owing to the large number of commercial, recreational, institutional, and other trip generators which would be located on a Pomona Freeway/railroad main line transit corridor. This route might be a candidate for Metro Rail extension. (However, the suggestion has also been made that a high-speed Maglev service might be developed along the corridor from Ontario Airport to the LA

CBD, and thence to LAX via the Harbor Subdivision).

This freeway/railroad hybrid route would be largely or fully grade separated, in part because of the Pomona Freeway alignment, and in part because aerial structure would be needed along the section from Erie St. in Pomona to Ramona Ave. in Montclair where the SP and UP main lines occupy a rather constricted right-of-way (with only enough room for the three main freight tracks currently in use, plus aerial columns for the transit line). Right-of-way protection would be a relatively minor concern along this corridor, as the route would follow main lines that are heavily used for freight service.

Possible Variations. An option would be to combine this corridor, east to Ontario Airport, with a northeasterly extension on new R/W across what is now largely vacant land, to join the ATSF Second Subdivision. This would allow San Bernardino trains to be routed through Rialto and Fontana and thence to Ontario and Pomona via the SP/UP main lines; and finally via the Pomona Freeway to the LA CBD.

Under this scenario, a second transit route on the Santa Fe Second Subdivision would extend from Pasadena east to Claremont/Upland, connecting with the present route in Ontario via the former PE north-south R/W in Euclid Avenue (or perhaps via a new alignment following Cucamonga Creek). Such a connection could also provide an opportunity to route the Pasadena-Claremont-Upland-Ontario line south and east along the UP main line to serve major industrial/office park developments just to the south of the Ontario Airport.

Yet another option might be for the Pomona Freeway-Ontario line to follow the UP main line south and east of the Ontario Airport, serving new office parks there, and continuing along the UP R/W to the suburbs north of the Riverside CBD. As parts of the UP main line in Riverside appear to be too narrow for a transit line in addition to the freight track (with residential land use that would discourage an aerial line here), it is suggested that the UP Crestmore Branch combined with the Mission Blvd. R/W could be used to access downtown Riverside (see Appendix C). However, the Pomona Freeway might also be used for Riverside transit access.

Freight Service. It should be emphasized that only air rights over the main lines would be considered where the right-of-way is narrow, and either excess R/W or adjacent industrial property for surface transit construction where it is wider. No encroachment can be permitted on the main tracks which are used for transcontinental freight traffic, as a matter of policy.

REFERENCES

1. Overview: San Fernando Corridor Passenger Rail Project. Paper presented to the San Fernando Valley Citizen's Advisory Panel On Transportation Solutions, spring of 1988. 14 p.

FIGURE D.1

POTENTIAL TRANSIT ROUTE FOLLOWING THE SP SAUGUS MAIN LINE

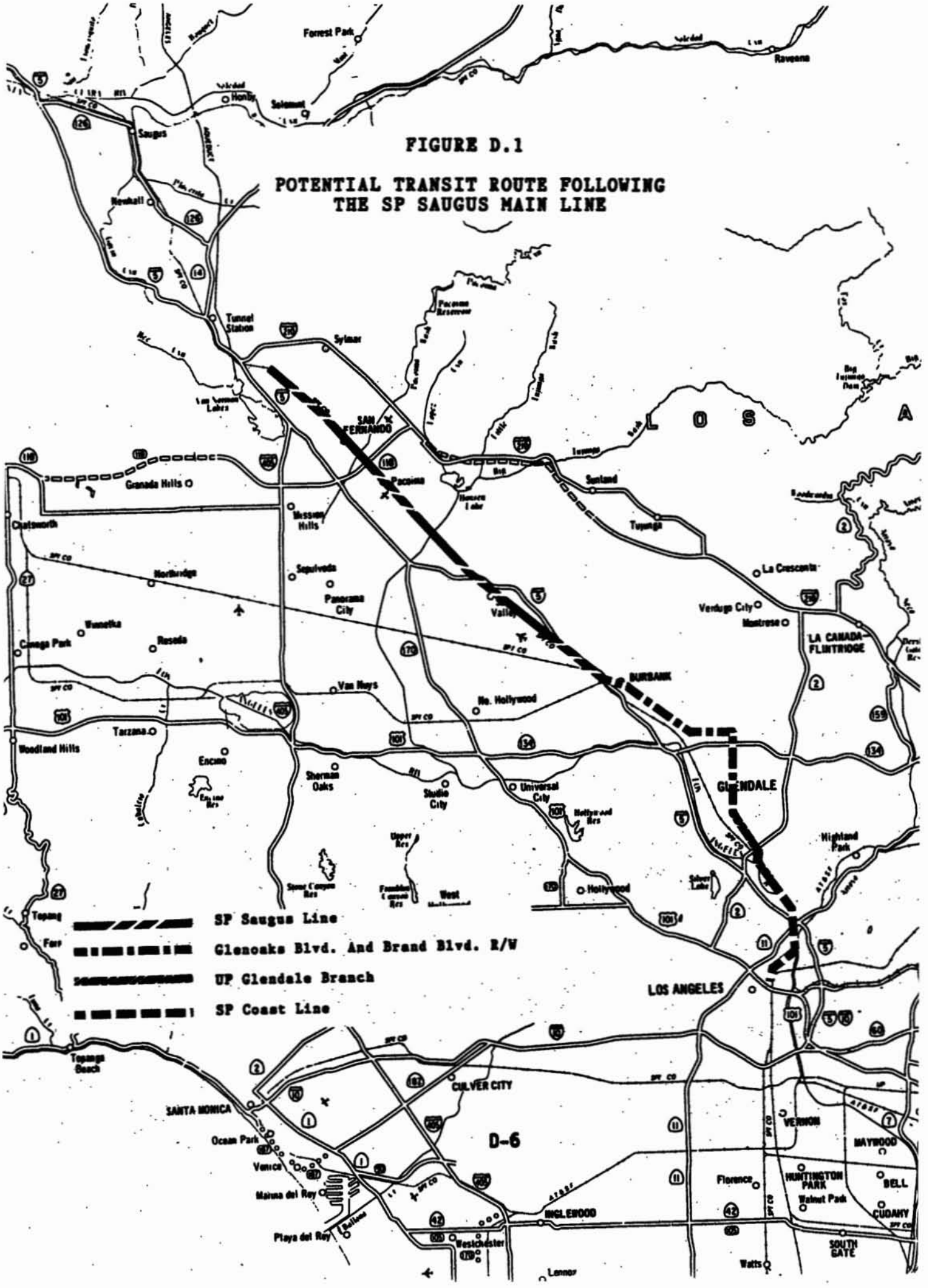
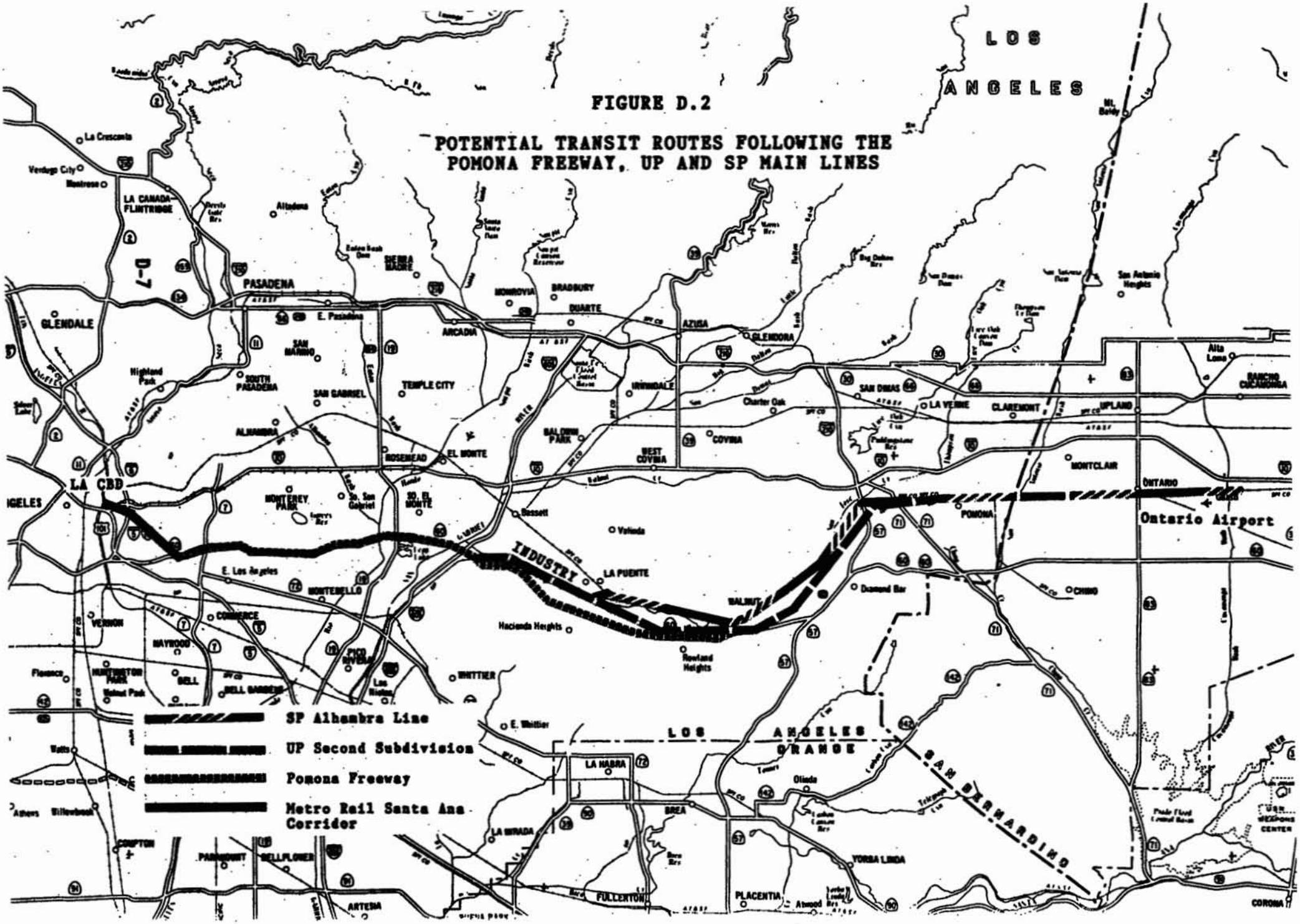
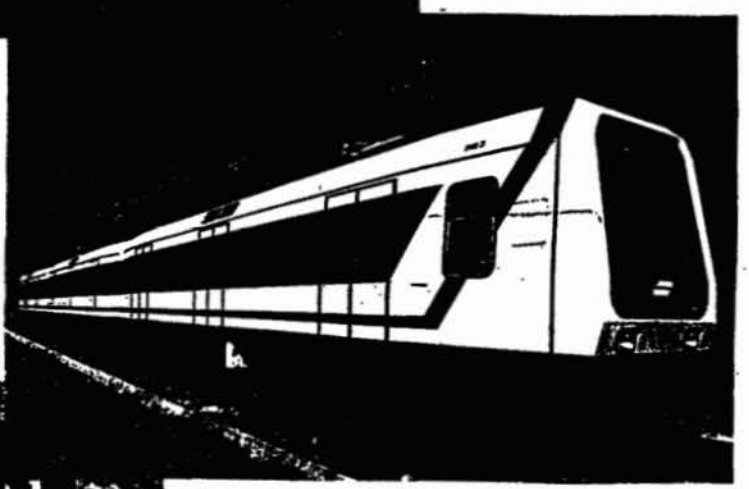


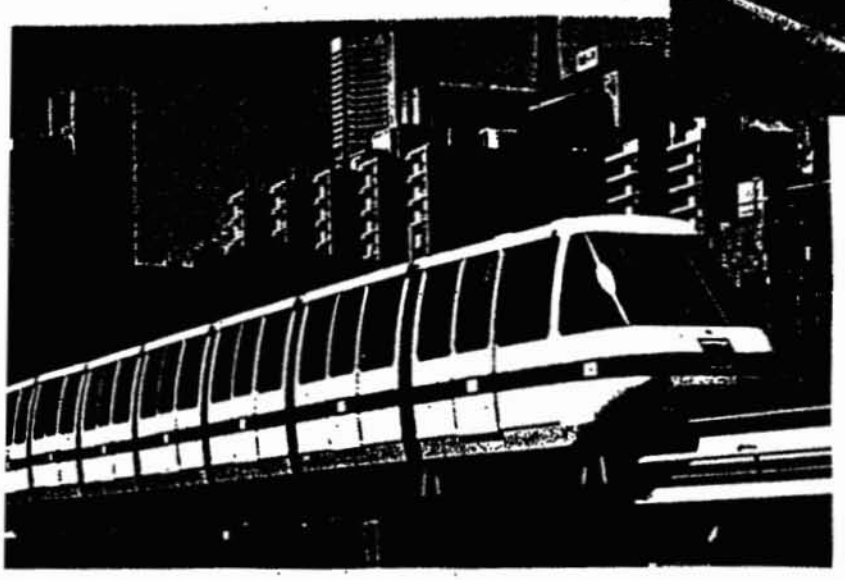
FIGURE D.2

POTENTIAL TRANSIT ROUTES FOLLOWING THE POMONA FREEWAY, UP AND SP MAIN LINES



From top to bottom:
- Charleroi semi-metro
- Osaka minimetro
- Bilbo metro





VON ROLL MONORAIL

APPENDIX E

PE RIGHTS-OF-WAY AND ABANDONED RAILROAD RIGHTS-OF-WAY CONSIDERED

This appendix provides information on rail lines which have been completely abandoned, either recently or in the more distant past. Former rights-of-way of the Pacific Electric of course fall into the latter category.

E.1 SP Inglewood-Alla Branches.

The Inglewood and Alla Branches taken together form a continuous right-of-way from La Cienega north of Florence Avenue, to Venice Boulevard in Venice (Figure E.1). It is not certain which segments of these former railroad lines remain in Southern Pacific ownership.

Possible Transit Route. A transit facility following Inglewood-Alla Branches would probably have its point of origin on a Harbor Subdivision transit line, near the 405 Freeway crossing. As the old SP right-of-way has been lost east of this point, it is assumed that access to the former rail line would require a short aerial structure along the 405 Freeway. The R/W follows the east side of the freeway in a northwesterly direction, paralleled by a small drainage ditch (being grade separated along with the freeway at Tijera). It lies between the 405 Freeway and Centinela Avenue in Fox Hills, and crosses under the freeway (where it is 45' wide) to turn to the southwest, following the south side of Centinela and Jefferson. Just west of Sepulveda, part of the R/W has been used for parking; as there is a major intersection nearby, and a freeway structure overhead, an underpass would be required here.

The right-of-way next parallels the former Hughes Aircraft Industrial Airport, turning northwest again and crossing the Ballona Creek to follow the southern edge of the 90 Freeway. The R/W between Jefferson and the freeway has been lost, but there are wide parking lots between industrial buildings in this section that would allow an aerial structure to fill the gap. The right-of-way along the south side of the Marina freeway is 90' wide; this continues to the west along the eastbound lanes of the Marina Expressway (the R/W west of Mindanao Way being narrower and used for parking but otherwise intact). There is in addition a very wide median area between the eastbound and westbound expressway lanes, leased out for marginal commercial uses (this median could also theoretically be incorporated into this segment of the transit line).

The railroad right-of-way continues west along the north side of Admiralty Way, being bordered by Admiralty Park. It is possible that a narrow strip of parking lot area belonging to the Admiralty Park, which lies adjacent to a residential area, might be used in addition to the former railroad R/W. The R/W is also intact west of Washington Blvd. to a point just short of Venice Blvd. (there being a small, narrow building on the former rail line here which would need to be removed to access Venice). West of Venice, the R/W is more or less intact, but there has been considerable encroachment by neighboring property owners.

It is assumed that a transit line using this R/W would continue north to the

City of Santa Monica (perhaps in tunnel). Santa Monica is known to be interested in a light rail connection south along the coast to tie in with Marina Del Rey and the LAX area. The Inglewood-Alla R/W might provide a major part of such a link, shortening the section that would require difficult or expensive construction to reach the Santa Monica CBD.

Potential Trip Generators. An Alla Branch/Inglewood Branch transit line would serve a large number of trip generators. At Tijera, there are major apartment complexes near the right-of-way. Farther north, at Sepulveda/Centinela, it would access the Fox Hills Mall, three large hotels, the Howard Hughes Center, some additional nearby office buildings, and a number of big apartment complexes in the Fox Hills area. On the north side of Jefferson, access would be provided to the Playa Vista Development Area D, on the Hughes Aircraft site. North of Jefferson, there are already apartment complexes, several modern office buildings, and the U.S. Postal Service Mail Processing Center right along the roadway, with a large area of modern office/industrial parks behind. The line could also provide peripheral access to Loyola Marymount University, which is on a bluff overlooking Hughes.

The Hughes site covers 900 acres, and is worth hundreds of millions of dollars. The original concept for the site included hotel space, residential units, office buildings, and a marina. There were however objections to the projected density level, and environmentalists have fought to preserve a bird sanctuary in the area. New developers, Maguire Thomas Partners and JMB Realty Co., will take the lead in development of the site, and it is believed that they will be responsive to neighborhood and environmental concerns in this area, perhaps utilizing a low-rise, Mediterranean style architecture (1). It is possible that a transit link could also go a long way towards answering concerns about increasing sprawl and traffic congestion associated with the project.

Crossing over Ballona Creek, the line would access Playa Vista development area C. West of this it would serve Marina Del Rey and surrounding sections of West Los Angeles and Culver City. This area has a large number of potential trip generators, including high-rise condominiums, hotels, motels, many apartment complexes, the Marina Beach Shopping Center, Villa Marina Center, Marina Center and Marina Marketplace, Marina Business Center, Marina Towers, the Daniel Freeman Marina Hospital, a large light industrial area, and the Washington and Lincoln Boulevard commercial strips. A connection could also be made to the Venice commercial/residential/recreational area.

Transit Potential. Another reason for interest in this R/W is that in the event a Metro Rail technology were chosen for the north-south Proposition A corridor from the San Fernando Valley to Marina Del Rey, it is likely that such a route would be extended south to LAX along the Marina Del Rey extension of the Coastal Corridor transit line. This being the case, it might be desirable to have an alternative path allowing Century/Long Beach line-compatible vehicles to gain entry to the City of Santa Monica, and access the proposed Santa Monica LRT line. This route could follow the Alla-Inglewood Branches from the 405 Freeway/ Harbor Subdivision intercept north and west to Venice.

The abandoned Alla-Inglewood Branches could have considerable potential for future transit development, complementing and supplementing the Proposition A

Coastal Corridor/405 Freeway corridor combination as well as providing a link with Santa Monica. Steps should be taken to preserve this former railroad R/W for this reason.

E.2 PE Venice Short Line (Venice Boulevard).

This former interurban right-of-way extends from Pacific Avenue in Venice northeast to the Mid-Towne Center at Pico/San Vicente (Figure E.1). In the event the western extension of Metro Rail were to follow a southerly route along Olympic or Pico, this would bring it very close to the proposed Mid City Center development area at Pico/San Vicente/West. In this case, a feeder line might someday be developed along the full length of Venice Blvd.

Possible Transit Route. The right-of-way takes the form of a very wide median from Pacific to Naples just west of Lincoln; it is very wide west of Washington, but apartment buildings have been constructed on the north side near Pacific (nevertheless, the old interurban railway bridge over a tributary to Ballona Lagoon is still intact). The remaining wide median in this location would certainly allow joint development in conjunction with a transit terminal (it is understood that there are plans to place a branch library on the R/W in this location, but it is not known how much land this will require). At present, the median is used for parking in a number of places.

East of Lincoln, the former median right-of-way has been utilized to provide for Venice Boulevard widening. Here the abandoned interurban line was removed from the center of Venice Boulevard and the surplus land transferred to the highway shoulders, taking the form of lawns and sidewalks. There has been encroachment on these lateral strips in a number of places, primarily west of National Boulevard; however, considering that even with the loss of the curb-side R/W, the roadway is still very wide (with parking lanes and a median left turn lane), a surface transit line might still be possible the full length of Venice Blvd. Very wide lateral concrete "sidewalk" areas were put in place at freeway underpasses, to make room for highway widening; they would certainly benefit any future transit construction. Finally, from Cochran to La Brea, there are lateral dividers and access streets with parking, in addition to the median.

A monorail or other aerial line over the remaining, narrow median or over ;the lateral right-of-way could provide a transit alternative for this corridor that would suffer less than a surface line from the effects of the right-of-way encroachment that has already occurred.

Potential Trip Generators. A Venice Boulevard transit line would provide access to Venice, which has a considerable amount of clustered housing and commercial development (as well as access to the beach). It would also provide service to the proposed 823,000 square foot Marina Place regional shopping mall planned by Culver City on an 18 acre site at Lincoln/Washington. The latter may however be considerably scaled down in size owing to neighborhood concerns over traffic impacts. Nevertheless, this area already has considerable commercial and residential development (see discussion of Marina Del Rey under the previous section, on the Alla-Inglewood Branches).

East of Venice, there are many apartment complexes all along Venice Blvd., with

some very large housing projects at Overland and Clarington (and a few office buildings in this area). The line would serve the Brotman Medical Center, as well as the Culver City CBD and Metro Goldwyn Mayer Studios. Land use becomes commercial and light industrial in the section from Robertson to the Santa Monica Freeway, and there is a big Kaiser Permanente medical facility just east of the freeway. The area at Pico/San Vicente has been proposed for a major mixed-use development to be called Mid City Center.

As this R/W is publicly owned, and could have considerable transit potential at some time in the future, it should be kept intact against any further encroachment.

E.3 PE Redondo Beach-Del Rey Line (Culver Boulevard).

The only part of this former PE right-of-way line remaining is the section along Culver Boulevard beginning at a point near Elenda Street, and proceeding southwest past the 405 Freeway and thence to Marina Del Rey (Figure E.1). This R/W lies entirely on the northern/western border of Culver Boulevard.

The segment from the 405 Freeway to Marina Del Rey has been assumed to be the preferred route for a continuation of the Proposition A Coastal Corridor transit line from Marine Del Rey up to the 405 Freeway. This line would then extend north following the 405 Freeway/Sepulveda to Westwood and thence to the San Fernando Valley.

There are a number of new apartment complexes located along the Culver Boulevard right-of-way; in addition there is commercial development at Centinela. At the west end near the terminus of the Marina Freeway, self-storage buildings have been constructed on the R/W. This may be considered a form of temporary use; however, any structures would have to be demolished at the time when the transit facility is constructed.

Considering the level of traffic congestion on the parallel 405 Freeway, the fact that this corridor would serve the important commercial/residential/recreational center at Marine Del Rey, as well as new office buildings along the 405 Freeway at Palms, Olympic, Santa Monica, and Wilshire Boulevard to the north (together with a LAX link to the south), steps should be taken to preserve this R/W from any permanent encroachment. However, the right-of-way was recently reported to be in escrow, for sale to a housing developer (2). It should be considered highly endangered.

E.4 ATSF Redondo District.

The Redondo District of the ATSF was abandoned earlier in this decade (Figure E.1). This branch line began in southern El Segundo, near Douglas Street on the ATSF Harbor Subdivision, continued southwest into Manhattan Beach, and thence south through Hermosa Beach to Redondo Beach. For most of its length, the right-of-way (which is largely intact), is bordered by access roads on both sides. There was early interest at the LACTC in developing this as a light rail line; as such it would have served commuter, shopping, and recreational trip purposes, connecting beach-front communities with aerospace industry employers to the south of LAX.

Potential Trip Generators. A transit line on the Redondo District would serve the Manhattan Village in northern Manhattan Beach, the Manhattan Beach Municipal Pier, Hermosa Beach Pier, and the Redondo Beach Pier area. The Redondo Beach Pier is a major tourist attraction, with shops, restaurants, marinas, and hotels; there are concentrations of townhouses and apartments here and at the south end of the right-of-way in Hermosa Beach as well. Otherwise, clustered housing is located nearer to the beach in Hermosa and Manhattan Beaches, which also have commercial sections crossing the right-of-way at Pier Ave. and Manhattan Beach Blvd., respectively. At the north end of the R/W is Manhattan Village, a major shopping mall/shopping plaza area; nearby there are a number of office buildings on Rosecrans Ave.

Transit Potential. Patronage work conducted by SCAG for the LACTC indicated that a 38 MPH light rail line with a six minute headway, extending north to Marina Del Rey would generate 32,300 weekday trips; a "wishbone" route configuration was also studied, combining the Redondo District with a second transit line down the ATSF Harbor Subdivision and Hawthorne Boulevard, to generate 44,800 daily trips (3). [Note that modern LRVs have a maximum speed capability 55 MPH and above, being much faster than the model assumption.]

Community opposition to a transit route in Manhattan Beach led the LACTC to drop the beach trolley proposal; however, practically all of the right-of-way is still intact, as Manhattan Beach has purchased the section for recreational use (landscaped hiking/jogging trails). Several short sections have been used for parking near Pier Ave. and Manhattan Beach Blvd.; the segment at Manhattan Village is used for parking. More recently, the City of Hermosa Beach has acquired a 20-acre, 100' wide strip, following the citizens' desire to maintain it as a greenbelt (4); thus conserving most of the remaining R/W.

The decision by the Cities of Manhattan Beach and Hermosa Beach to preserve this right-of-way for other uses may leave the option of transit development at some point in the more distant future, although it is believed that it would take legislative action to allow reconversion of what is now parkland. (There might be potential for joint development of LRT with an historic trolley operation, in keeping with the orientation of this area towards tourism.)

In view of the fact that the right-of-way appears to be protected, and owing to lack of local interest and the fact that it would be difficult for the LACTC to fund another rail line parallel to their Coastal Corridor at present, development of a transit line on the former Redondo District R/W is obviously a very low priority at present.

E.5 Unused Tunnels In The LA CBD.

Downtown Los Angeles has two "orphan tunnels": the former Pacific Electric tunnel once used by Hollywood trains, and the Bunker Hill Downtown People Mover tunnel (Figure E.2). The PE tunnel originally extended from Second and Toluca near Glendale Boulevard to the Subway Terminal Building at Fifth and Olive. The east end of the tunnel was cut off when the Bonaventure Hotel was built in 1975. Hence, the tunnel presently ends inside the Union Bank garage at Fourth and Figueroa, where the City of Los Angeles has an easement to reopen it. The

Bunker Hill tunnel alignment, which was never completed, runs 1500', beginning just south of Third Street at Figueroa and extending east to terminate at Hill Street above Fourth (5).

The Los Angeles DOT and CRA have been interested in finding a way to link the two tunnels, perhaps as a feeder to Metro Rail at Fifth and Hill Street. This would place it very close to the renovated Angel's Flight funicular (6). It is understood that the PE tunnel is offset to the south by one block and is 70' below the Bunker Hill alignment. This would mean a steep grade and a sharp curve for any type of shuttle system using the tunnel; and there is opposition to the idea of using the City West area as a peripheral parking lot for the CBD area.

Transit Potential. As a shuttle line, the PE tunnel section could have two tracks or guideway lanes, while the DPM alignment would be limited to single track in the segment of tunnel which has been completed thus far. It might be possible to use a rubber-tired people mover in the tunnel, or a light rail shuttle. In conjunction with the latter, reference should be made to the Tandy Subway development which uses second-hand PCC cars. The latter are capable of negotiating very sharp curves and steep gradients. Pittsburgh's 21 Fineview line went up a 13% grade, with the aid of sand; under normal conditions, a 10% gradient would be quite feasible. As the PE tunnel was operated with PCC cars during the 1950's, there would be precedent for such an operation. However, modern equipment can be specified which could duplicate the Pittsburgh feat.

Since the construction of CBD transit tunnels is very expensive, the People Mover tunnel and PE subway should certainly be preserved in the event they may someday be needed for transit. These tunnels could be very useful for shuttle service after the Metro Rail CBD segment including the Hill Street station is open in 1993, perhaps providing a link to new development on the west wide of the Harbor Freeway in the LA CBD area. However, they would be much more valuable if tied into a longer route, such as one using the former PE Glendale line and Los Angeles Railway Eagle Rock Blvd. line (see next section). If so used, a second tunnel bore would probably be needed parallel to the present people mover tunnel alignment.

E.6 PE Glendale Line and Los Angeles Railways Eagle Rock Boulevard Line.

The former Pacific Electric Glendale Line ran north from the end of the subway tunnel at Toluca, under the Beverly Blvd. overpass and along Glendale Boulevard --at first running in the street, and then continuing in a median from about Reservoir Street north to Effie St. (Figure E.2). This R/W is still largely intact.

Possible Transit Route. A new light rail service using the People Mover and PE tunnels in the CBD and following the old Glendale PE line would probably need to be operated on three tracks, with the only the middle, reversible track on reservation between Toluca and Reservoir Street past Echo Park (and the outer tracks in the street). This is because the street R/W is constricted to a maximum of about five lanes in this section. Traffic flow is highly directional, about 2400/hour northbound and 420/hour southbound in the PM peak, so street running in the reverse peak direction would be feasible. Trains running

in the direction of peak flow would be on the reservation. [Further, the middle track might need to be in a single bore tunnel from Temple to Park Avenue, owing to limited right-of-way in this section.]

The hypothetical transit line would continue north on double track in the former PE median R/W from Sunset (which flies over Glendale Blvd.) north to Effie, with an underpass to clear the congested Alvarado intersection. A short tunnel might then be needed to bring the route into the median of the Glendale (Route 2) Freeway. From its southern end up to the 5 Freeway, the Glendale Freeway is underutilized, and removal of two lanes for transit would be possible. North of the 5 Freeway interchange, there is considerable traffic congestion, and some widening would be needed or else an aerial structure used over the median.

Where Verdugo Road approaches the Glendale Freeway, there is a short section between the freeway and the arterial highway, used for storage of building materials. This would provide an easy lead into the former Los Angeles Railways Route 5/6 center reservation in Eagle Rock Boulevard. This is quite wide from Verdugo north to Avenue 45. From this point north to Colorado Boulevard, the Eagle Rock Blvd. median has been encroached upon by roadway, with short center islands and left turn lanes on the former right-of-way.

Potential Trip Generators. A transit line following this combination of alignments would serve Echo Park, nearby residential areas, and commercial sections of Sunset and Glendale Boulevards. The segment using the freeway alignment would access an industrial area along San Fernando Road, presumably with an interchange station at the Glendale LRT line undercrossing. Along Eagle Rock Boulevard, service would be provided to a major commercial street with a number of apartment complexes. At Corliss/Westdale, a station would be provided to furnish a connection with nearby Occidental College. At the north end, there is a large shopping plaza at Colorado Boulevard, and a link could be provided to a Colorado Blvd./134 Freeway route to access the Colorado Blvd. commercial strip and Eagle Rock Plaza (see below).

It is doubtful that a route of the kind just described could be constructed in the near future, for the first priority will be to construct the Glendale and Pasadena Proposition A lines. However (despite the long time horizon for a Glendale Blvd./Freeway/Eagle Rock route), considering that all the rights-of-way required are publicly owned and little in the way of R/W purchase would be needed, right-of-way protection is desirable.

Other Proposals. In light of the above discussion, it is interesting to note that a recent proposal calls for a bus tunnel to link the Harbor Freeway transitway to the major City West redevelopment area, with the transit service continuing up a widened Glendale Boulevard (7).

E.7 Los Angeles Railways Colorado Boulevard Right-Of-Way.

The need for a transit link between the San Gabriel and San Fernando Valleys, and tying together the Cities of Pasadena, Glendale, and Burbank, has often been cited. It is often assumed that this would follow the present 134 Freeway route. The latter however would provide poor access to commercial and residential areas in the Eagle Rock section.

Possible Transit Route. The former Los Angeles Railways median R/W in Colorado Blvd., once used by the Route 5 streetcars, might provide a partial solution to this problem. This R/W is largely intact from about Dahlia Avenue to Eagle Rock Blvd. (Figure E.2). Although narrow, this end of Colorado Blvd. appears to be underutilized and it might be possible to reclaim some additional space from the street (or operate a monorail or aerial transit line over the median).

A Pasadena-Glendale link therefore might begin in Pasadena, using the space between the 134 Freeway and Colorado Boulevard, follow the 134 Freeway ramp down to Colorado Blvd. (crossing over Figueroa) and continue west along Colorado, incorporate the Los Angeles Railways R/W. It might then go into a short tunnel at Eagle Rock Blvd. to emerge at the Eagle Rock Plaza, run north along Wilson on structure, rejoin the 134 Freeway corridor, and enter Glendale using a combination of aerial structure and open cut. The link to Burbank might be along the Glenoaks Blvd. PE R/W, as described in Chapter 14.

Potential Trip Generators. This combination of rights-of-way would access the Old Pasadena historical and commercial section, the Ambassador College, Norton Simon Museum, and nearby banks and commercial development; and also some additional office buildings along Colorado Blvd. near Figueroa, apartments and commercial development along Colorado west to Eagle Rock Blvd., the Eagle Rock Plaza shopping mall, the Glendale Adventist Hospital, and the north end of the Glendale CBD (the financial district).

At the Pasadena end a spur track or connecting monorail shuttle might be employed to serve the Rose Bowl (extending over the Rose Bowl parking lots), to provide service to this major recreational trip generator.

Considering current funding constraints, it is uncertain whether a Pasadena-Glendale link could be constructed in the near term. However, since the rights-of-way required are mostly publicly-owned, preservation is desirable.

E.8 UP Glendale Branch.

The UP Glendale Branch is a short segment of rail line originating at the north end of Taylor Yard, crossing San Fernando Road just south of the Glendale Freeway, and continuing north under the freeway to run through a largely industrial area east of San Fernando Road and west of the Forest Lawn Memorial Park (see Figure 14.1). As part of the Glendale Proposition A line, this right-of-way could provide a critical link to Brand Boulevard and Taylor Yard, which is expected to be a major redevelopment area north of the LA CBD (see Chapter 14).

As this line was abandoned in the fall of 1988 (8), it is considered endangered, and it may be desirable to procure it for transit use.

E.9 SP East Long Beach Branch/PE Newport Line.

The abandoned East Long Beach Branch begins near Willow Street and Long Beach Avenue; a transit facility using this right-of-way would originate on the LA-Long Beach line at this point (see Figure C.3). The line would continue

southeast to Anaheim Street (this section of the R/W being the former PE Newport line) and proceed to 7th or to a point southeast of 7th, depending upon whether the intermediate destination were intended to be the VA Hospital/Cal State, or Belmont shore.

Potential Trip Generators. At Long Beach/Willow, access would be provided to the very large Long Beach Memorial Medical Center, the nearby Atlantic Medical Center, and commercial sections of Long Beach and Atlantic Avenues and Willow Street. A grade separation is already provided at California Avenue, and another, quite elaborate highway overcrossing is in place just to the southeast where Hill Street and Orange Avenue intersect on a concrete structure over the top of the former railroad line.

A station at 20th Street/Alamitos Avenue would provide access to the Long Beach City College campus, three parks, major apartment complexes along Cherry in Signal Hill, other apartments along PCH and Orange, the Signal Hill City Hall, a nearby office building, and commercial development along PCH.

At Anaheim Street there are numerous apartment complexes, and a big commercial plaza. Part of the right-of-way has been taken for parking here (a grade separation would probably be needed here to clear Anaheim St. and Redondo Ave. anyway). Just to the southeast a small 7-11 store is located on the R/W and at about 11th, a small apartment building has been built on it. These would need to be removed to restore the right-of-way (or the apartment building could be converted for commercial use, with the LRT line running beneath at the parking garage level).

Southeast of this point, plant nurseries occupy the right-of-way which is otherwise intact down to Termino where the corner of an apartment complex juts out on the former rail line (if the building were acquired, it could be remodeled to eliminate this corner). Again the R/W is intact down to 7th, and thence to Colorado Lagoon. Although there is some wide roadway where part of the old trolley line was converted to paved median and parking, and parkland occupies the R/W southeast of this point, it is assumed that an alignment serving Belmont Shore would portal into a tunnel at 7th (providing a grade separation at the 7th/Ximeno intersection).

Since nearly all of this former interurban/freight right-of-way is intact, consideration should be given to preserving it for possible future use, and preventing any permanent incursions (i.e., other than temporary land uses) to avoid losing right-of-way integrity.

E.10 SP West Los Angeles Branch (Santa Monica Boulevard).

This is the abandoned right-of-way along Santa Monica Boulevard (see Figure 15.1). It begins in West Hollywood at a point just east of La Cienega, and takes the form of a moderately wide grassy median south and west to Doheny in Beverly Hills. The remainder of the R/W for the most point lies between Santa Monica Blvd. West (the main arterial) and Santa Monica Blvd. East (the local access road). This ranges varies from 37' to 59' in width. The section of R/W in West LA and the segments which are still intact in Beverly Hills are used for parking in places; some are even landscaped.

The section in West Hollywood was converted into a linear park. The right-of-way in Beverly Hills has been encroached upon by building construction in the Civic Center area, and west of this point a number of low, two-story parking structures have been built upon it (actually, the lower parking level is below grade/semi-basement level). It is understood that there is a lawsuit between the Southern Pacific and the City of Los Angeles regarding the zoning of the western segment.

Potential Trip Generators. A transit line using the West Los Angeles Branch would serve a major commercial section of West Hollywood, nearby high-rise housing, the Pacific Design Center, the Beverly Hills Civic Center and nearby commercial, office, and apartment development, the Wilshire Boulevard commercial section, Century City, and the important Century City Shopping Center.

Transit Potential. Caltrans looked at the light rail potential of this right-of-way in 1981 (9). More recently the R/W was studied by Beverly Hills and Caltrans with regard to a Route 2 widening project; a consultant proposal in conjunction with this suggested a transit tunnel in addition to parallel highway bores under this section of Santa Monica Boulevard. More recently, it has been proposed to include the Santa Monica Blvd. corridor (as part of several alignment alternatives) in the West Side Metro Rail extension study. A northerly Metro Rail alignment beginning in Hollywood would follow Santa Monica Blvd. from West Hollywood to Century City, while an Olympic/San Vicente/Burton Way/Wilshire Blvd. route would follow this highway corridor only south and west of the Beverly Hills Civic Center.

It is uncertain whether a Metro Rail alignment on the West Los Angeles Branch would be in tunnel or aerial. An aerial structure would not fit in well with the median in West Hollywood, but it might be possible to use aerial construction on the R/W east of Rexford and west of Linden (to Century City). However, encroachment of buildings on the R/W in the Beverly Hills Civic Center area would require an elevated line to veer out over the street. The long section where a linear series of parking garages has been built on the R/W would require taller than usual support pillars; this may be impossible to accomplish without demolishing the parking structures. Hence, part or all of the route might very well need to be in tunnel instead of on the old railroad line.

The former rail corridor appears therefore to be effectively broken in Beverly Hills. If there were local interest in such a project, it might be possible to utilize the West Hollywood median segment for an historic trolley line; a single track line would permit grass to be planted all across the R/W, and leave room for banners, artwork, and such, similar to those already installed on the median. As a low-speed tourist-oriented operation, it would be compatible with the heavily commercial orientation of this part of Santa Monica Boulevard.

The section west of Century City may be redundant for line-haul, fixed guideway transit since Metro Rail would be located not far to the north, on a Westwood underground alignment, and because the Exposition Blvd. light rail line would closely parallel it to the south. It might be possible to use the section from Wilshire west to Sepulveda as a busway (or for highway widening including bus lanes) to help speed up SCRTD and Santa Monica bus service along this corridor.

This would however require restoring the bridge structure over Beverly Glen. It is assumed development of a separate busway would allow the median to remain heavily landscaped. In any case, it would be impossible to use the R/W until the lawsuit is settled.

Consideration should be given to preservation for recreational purposes of parts of the R/W which will not be used for transportation purposes in the future.

E.11 PE Hollywood-Venice Line (San Vicente/Burton Way).

This right-of-way extends from the Mid-Towne Center area at Pico/San Vicente/ Venice Blvd., in a northwesterly direction along San Vicente to La Cienega, where it turns west to follow Burton Way in Beverly Hills (see Figure 15.1). It takes the form of a grassy median in San Vicente and Burton Way. The R/W width varies along San Vicente, being narrow at the southeastern end, then widening. The median R/W has been greatly reduced in width near Genesee, where a lateral divider and parking are provided on the east side of the street.

Potential Trip Generators. A transit line on this right-of-way would serve the Midway Hospital as well as commercial development at Olympic and San Vicente, and would pass about .35 miles south of the LA County Art Museum. It would provide access to an area of Wilshire with considerable high-rise office building development, and to the Beverly Center and the Cedars Sinai Medical Center at Third and San Vicente. Burton Way is bordered by a considerable number of apartment complexes. This alignment would provide access to the Beverly Hills Civic Center area, and lies about .35 miles north of major office developments on Wilshire Blvd., being closer to the commercial area north of Wilshire.

Transit Potential. This right-of-way is primarily of interest at the present time because it may be studied by the LACTC and SCRTD in conjunction with the evaluation of Metro Rail alternatives to the West Side of Los Angeles. An Olympic Blvd. route west of Crenshaw could utilize the western half of the San Vicente R/W and part of the Burton Way median west to the Beverly Hills City Line, where it would presumably portal into tunnel.

In all probability an aerial alignment would be considered for both San Vicente and the eastern end of Burton Way. Since the excess R/W is in a median configuration, it is doubtful that any additional right-of-way protection would be needed.

E.12 PE San Fernando Valley Line (Van Nuys/Parthenia/Sepulveda).

The former PE San Fernando Valley Line right-of-way may prove useful in developing LA County's north-south Proposition A route roughly following the 405 Freeway corridor from the West Side of Los Angeles north to the San Fernando Valley, and continuing north to Sylmar/San Fernando (see Figure 15.1).

Sections of this R/W which are still more or less intact include a very wide part of Van Nuys Boulevard from Burbank Blvd. to Oxnard, just south of the Van Nuys Civic Center (this piece being paved), the segment along Parthenia north of Panorama City Mall (grassy median), and the stretch along Sepulveda from

Parthenia to the 118 Freeway (much of this is a landscaped median while the R/W at north end around Devonshire takes the form of a large paved area).

Possible links between these segments would need to be worked out in future studies by the LACTC, if it is determined that this corridor (rather than the 405 Freeway or Sepulveda south of Parthenia) is the preferred route. However, it will be noted here that it may be possible to place the line on aerial structure over parking lots behind the Panorama City Mall, and next to the Gemco plant on the east side of Van Nuys Blvd. to fill in a major surface R/W gap.

Potential Trip Generators. While it is uncertain how the north-south line would arrive at the San Fernando Valley from the south (tunnel or some combination of tunnel, surface, and aerial alignment?), it would almost certainly serve the Sherman Oaks Galleria and nearby bank buildings, apartments, and hotels. Under a scenario in which the Van Nuys Boulevard alignment were used (including former PE R/W), the line might swing over to Van Nuys Blvd. somewhere in the vicinity of Ventura Boulevard or the Ventura Freeway, accessing commercial plazas, bank buildings, and medical facilities in this area. Farther north, apartment complexes along Burbank Blvd. would be served; and north of this, the Van Nuys Civic Center area, with governmental buildings and commercial development along this section of Van Nuys.

Continuing north, a Sherman Way station would provide access to a major commercial street as well as the Valley Hospital Medical Center; north of this, service could be provided to the Amtrak Station and Gemco plant (where the transit facility would cross the SP Coast Line), and to the Panorama City Mall, a major commercial area with many nearby apartment complexes. Following the old Red Car line west along Parthenia to Sepulveda, access would be provided to commercial development, including a number of motels near Nordhoff, large apartment buildings at Plummer, and sizable commercial plazas and additional apartments at Devonshire.

In view of the large number of potential trip generators along this corridor, it would be prudent to preserve the remaining portions of the PE San Fernando Valley Line right-of-way (which are now publicly owned) until a decision is made by the LACTC on the alignment for this vital north-south Proposition A corridor.

E.13 PE Pasadena Short Line/Monrovia-Glendora Line/SP Lincoln Park Spur.

A short spur track runs just west of, and parallel to, Soto Street from the SP State Street Line (San Bernardino Freeway corridor) north to Valley Boulevard; the right-of-way continues north along Soto and ends before the latter reaches Huntington Drive (Figure E.3). The segment north of Valley has been abandoned. A transit route using this line could continue north along parts of the PE Pasadena Short Line R/W following Huntington Drive and perhaps Fair Oaks. Much of the old Pacific Electric right-of-way here has been preserved in the form of median and lateral R/W from a point west of Eastern Avenue to Fair Oaks, and north along Fair Oaks to Monterrey (with a very wide paved area near Eastern).

Potential Service To Pasadena. One reason for interest in this right-of-way lies in the possibility that some day there may be enough traffic to justify two light rail lines from the LA CBD to Pasadena, especially if longer-distance

commuter traffic from San Bernardino County and the eastern San Gabriel Valley is funneled through Pasadena on the ATSF Second Subdivision.

If the initial Pasadena light rail line were on the ATSF Second Subdivision, there may be enough demand to place an additional branch line farther to the east along Huntington Drive, originating in the LA CBD and joining the other line in South Pasadena. To save on costs, it is assumed that this would utilize a surface alignment, incorporating the spur track along Soto Street--possibly but not necessarily tied in with the conversion of the El Monte Busway to rail.

(This latter facility was designed for eventual rail conversion; earlier work by the SCRTD had suggested that rail conversion of this facility might be justified at the 30,000 per day ridership level. This is a low priority at present.)

A connection to the ATSF right-of-way in South Pasadena would require an alignment along Fair Oaks--possibly combined with a short segment of tunnel, assuming the 710 Freeway extension does not come to pass (there being major public opposition to this highway project).

Potential Trip Generators And Patronage. A future Soto/Huntington Drive route would serve the USC Medical Center, several parks, a rather large medium density residential area along Huntington Drive, and the Fair Oaks commercial section of South Pasadena. Bus patronage along Huntington Drive is high, and the southern end of the line would service a transit dependent area which would sustain heavy local patronage.

Patronage forecasts for the Second Subdivision/Highland Park LRT option discussed in Chapter 13 indicate 56,800 daily weekday trips between the LA CBD and a Pasadena terminus at Hill and Walnut. There is reason to believe that a Soto Street/Huntington Drive line to Pasadena would also generate well over 50,000 trips per day. It is not known what total ridership would be if both a Highland Park and a Soto/Huntington Drive route were in place.

Joint Development Potential. Additionally, there are is often speculation that the Southern Pacific's Los Angeles Transportation Center (a TOFC or trailer-on-flatcar facility) might be closed down and the land developed for other purposes: it lies across the LA River from LAUPT and Chinatown, and there could be potential for a major transit joint venture project on this property. The total area around LATC is about 98 acres by map estimate. If the LATC were someday to undergo commercial redevelopment, a Soto Street/Pasadena branch line would be ideally suited to serve it, being routed in a westerly direction from the 10 Freeway corridor northwest under Mission Street to the LATC property, and crossing the LA River on a new structure to reach the Union Station area. (Joint development involving the SCRTD bus maintenance facility at Mission would also be possible.)

Preservation of this short section of SP trackage leading to Huntington Drive, and avoidance of any further encroachment on the former PE R/W along Huntington/Fair Oaks might facilitate major future long-term improvements on the LA-Pasadena corridor and an important redevelopment project as well.

Possible Alhambra Link. In addition to the above, a short branch line from

Huntington Drive down the Main Street median right-of-way in Alhambra would serve a large commercial plaza at Commercial and Palm Avenue (the latter is constructed on a former railroad R/W). The area below main is fairly open, and no major problems should be encountered in routing a spur track there.

Possible Arcadia Link. Another possibility for long-term development would be to continue a transit line along Huntington Drive on the former PE Monrovia-Glendale Line right-of-way east through San Marino to Arcadia, which would bypass Pasadena entirely. This could provide a "short-cut" to a Santa Fe Second Subdivision transit line for San Bernardino trains.

For the most part, the median right-of-way along this section is fairly wide (the only constricted section lies between San Gabriel Blvd. and Eaton Wash in the LA County unincorporated area east of San Marino). This route would serve the San Marino City Hall and surrounding commercial area, and would also provide access to Santa Anita Park, City Hall, and the Methodist Hospital in Arcadia.

At the eastern end of this alignment, where the eastbound and westbound lanes of Huntington Drive form a one-way couplet, the line might be constructed either along the Santa Anita Park on the west side or along the Santa Anita Golf Course/Arcadia Park to the east. Access to the Second Subdivision would probably be via Santa Clara Street, on aerial structure skirting property now used by a car dealership and a lumber yard.

Such a route would provide higher-speed, limited access transit service with relatively few station stops. Owing to the rather exclusive nature of the residential neighborhoods along this part of Huntington Drive, it would require extensive mitigation measures such as underpasses at intersections, noise berms with trees and shrubbery on either side of the R/W, and grass planted across much of it; some sections might be in open cut. Where the line entered/exited San Marino and Arcadia, ornate floral or sculptured archways announcing the name of each city could span the right-of-way (over the transit line).

Commuter Rail Use. In the event the LACTC acquires the SP State Street Line for commuter rail use to provide a link to the SP Baldwin Park Branch, the Lincoln Park Spur might be useful for off-peak equipment storage (considering that there may be a lack of space at Union Station). Such use would help to preserve the R/W for possible future light rail transit development along Huntington Drive.

E.14 PE Riverside-Corona Line.

The former Pacific Electric Riverside-Corona right-of-way extends for some considerable distance along Magnolia Avenue from a point south of the Riverside CBD to nearly the center of Corona. As there is strong interest in developing a rail passenger transportation system in Riverside County, consideration should be given to preserving this right-of-way for future light rail or other transit use, perhaps tying in with a San Jacinto Subdivision line or a route to San Bernardino (see Appendix C).

Possible Transit Route. Figure E.4 shows a possible transit route configuration linking the City of Riverside with San Bernardino via the SP Riverside and San Bernardino Lines, and extending southwest to Corona along the PE Riverside-

Corona Line. The missing link between the Riverside CBD and the beginning of the PE right-of-way would be provided by a combination of old railroad yards to the east of the 91 Freeway (south to about Cridge Street), and the space between the Santa Fe Third Subdivision rail line and the freeway south of here. A connection from the freeway/ATSF R/W to the Magnolia PE line would be needed along Arlington (perhaps requiring property acquisition or a short tunnel).

Most of the Magnolia alignment from Arlington south to La Sierra takes the form of a narrow vegetated median and lateral grassy strips on either side of the highway, with a considerable offset for residential and commercial structures bordering the roadway. South of La Sierra, the right-of-way consists of a median wide enough for two tracks (three near Corona). The PE R/W disappears at the 15 Freeway overpass on the east side of Corona, and it is assumed that the extension to downtown Corona would be via the Santa Fe spur track along Compton Avenue, up to the Third Subdivision and ending at the old Corona train station.

Potential Trip Generators. The route described above would provide access to a number of trip generators in the Riverside CBD (see discussion in Appendix C), the Riverside City College at Cridge, and the Riverside Plaza Mall at Central, via along the railroad/freeway right-of-way from the CBD to Arlington. Along Magnolia, it would provide access to a number of apartment complexes towards the north end of the PE alignment; the California Baptist College, Sherman Indian High School, Family Medical Center and Parkview Community Hospital between Adams and Jackson; and a commercial area and the Riverside General Hospital/University Medical Center near Van Buren.

Continuing south, it would access the Tyler Mall and considerable commercial development along Magnolia, a Kaiser Permanente facility and several hotels on the segment south of La Sierra, and apartment complexes just south of this point. Continuing west of the 91 Freeway overpass, there are business parks and mobile homes bordering Magnolia, and a new senior housing complex (with commercial development at McKinley). If the line terminated at Main Street on the Santa Fe in Corona, service would be provided to the Corona CBD area to the south, and to a major commercial strip to the north along Main.

Regional Connections. This route would provide a local service, connecting with a proposed Riverside-Orange County commuter rail line at several points. It might be possible to extend the transit line described above, along the Santa Fe Third Subdivision (requiring an easement on the ATSF R/W) to develop a longer-distance link to Yorba Linda, where the abandoned La Habra Branch R/W begins (see Appendix C). This would access a number of major new housing projects at Green River Village and in Yorba Linda, and could be extended via the La Habra Branch into northern Orange County and ultimately to the LA CBD.

The Santa Fe Third Subdivision right-of-way is theoretically wide enough to allow two freight tracks and a separate passenger track, but it should be noted that considerable right-of-way preparation would be needed here. Also, it has been a primary objective of Riverside and Orange County transportation planners to provide a link to Fullerton and southern Orange County via the Olive and Fourth Subdivisions. It is assumed that this is more easily done using a commuter rail technology under a track-sharing arrangement: operating over the same track as ATSF freights and Amtrak trains with added track capacity as

required (and making other railroad facility improvements as needed to avoid freight interference). A commuter rail link (compatible with the LOSSAN corridor and with Santa Fe freight services), seems more appropriate for the link from Riverside and Corona to Orange County than an interurban railway alternative as described above.

Another possibility might be to extend transit service south on the abandoned ATSF Elsinore District R/W (see Figure C.11), which crosses the PE Riverside-Corona Line just to the east of downtown Corona. The present condition of the Elsinore District is not known; it was not surveyed during this study. It may however be possible to combine the intact segments of railroad right-of-way between Corona and Elsinore with new R/W parallel to the 15 Freeway and perhaps even develop service on the old "Railroad Canyon" alignment from Lake Elsinore to Perris. Use of these rights-of-way for public transportation could provide additional links serving growing residential sections of Riverside County.

REFERENCES

1. Bill Boyarsky, "Joint Venture Formed to Develop Property in Playa del Rey Area," Los Angeles Times, Feb. 16, 1989, pp. 1,6.
2. Todd White, "Train rights-of-way talks start to roll for old Red Car lines," Los Angeles Business Journal, May 22, 1989, pp. 1,22.
3. Draft Estimation Of Patronage For Rail Transit Implementation (Stage 2). Phase 1. Prepared by SCAG for LACTC, Sept. 1983. pp. IX-8 to IX-14.
4. "Rail Right of Way Bought for Greenbelt," Los Angeles Times, Section II, October 7, 1988, p. 2.
5. Marc Zasada, "Tunnels to Nowhere," Downtown News, July 11, 1988, pp. 1, 4-5,19.
6. Carol McGraw, "Angel's Flight railway won't be running again until at least 1996," Los Angeles Times, July 26, 1988.
7. Marc Porter Zasada, "'Alice' Takes Her Car to City West," Downtown News, March 6, 1989, pp. 1,6.
8. Notice - System Diagram Map. Amended to the System Diagram Map published by the Union Pacific in the Los Angeles Times, August 12, 1988.
9. Light Rail Transit Feasibility Study. Route 2 (Santa Monica Boulevard) From Sepulveda Boulevard To La Cienega Boulevard. Prepared by Caltrans District 07, Oct. 1981. 56 p.

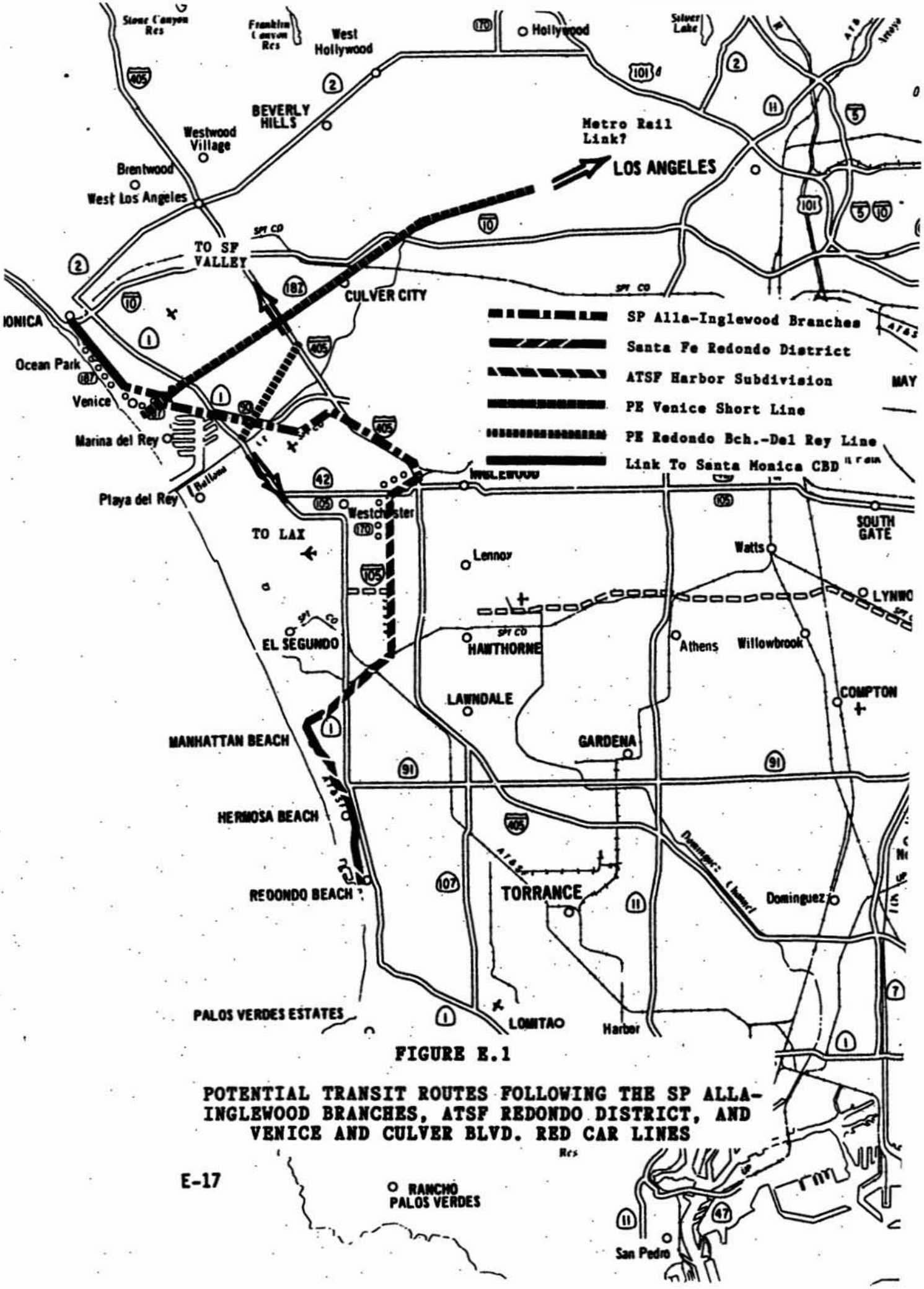
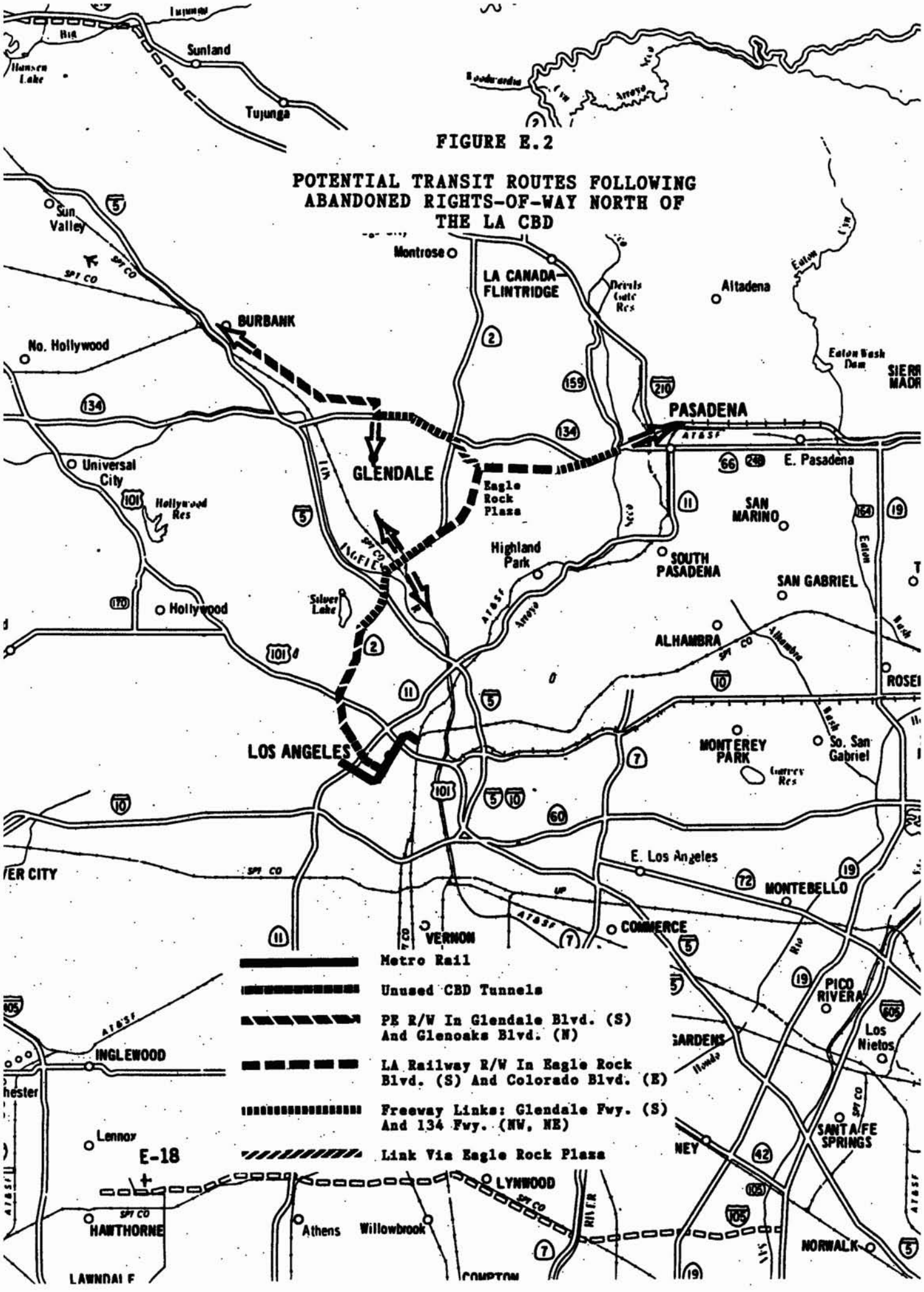


FIGURE E.1

POTENTIAL TRANSIT ROUTES FOLLOWING THE SP ALLA-INGLEWOOD BRANCHES, ATSF REDONDO DISTRICT, AND VENICE AND CULVER BLVD. RED CAR LINES

FIGURE E.2

POTENTIAL TRANSIT ROUTES FOLLOWING ABANDONED RIGHTS-OF-WAY NORTH OF THE LA CBD



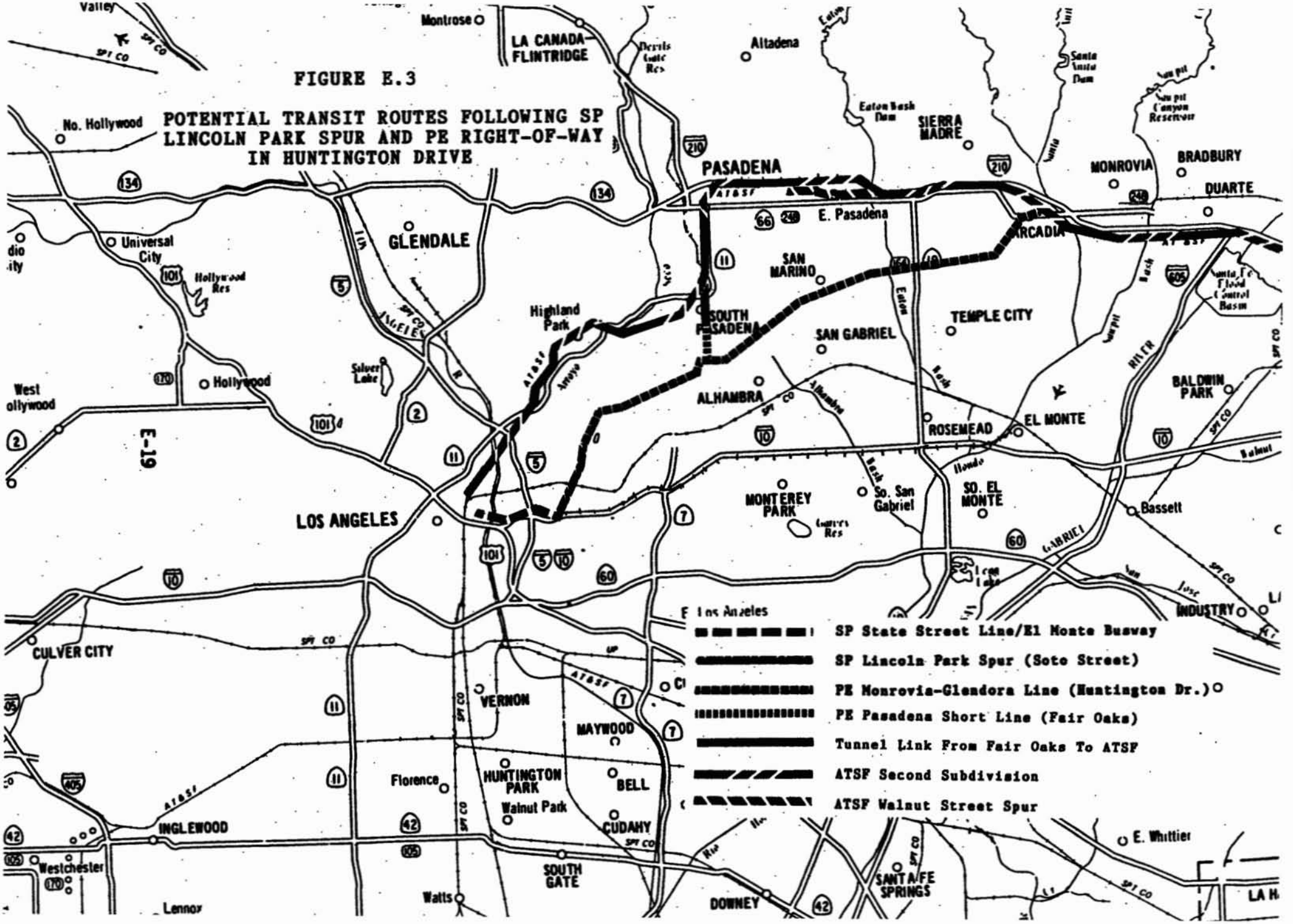


FIGURE E.3
POTENTIAL TRANSIT ROUTES FOLLOWING SP LINCOLN PARK SPUR AND PE RIGHT-OF-WAY IN HUNTINGTON DRIVE
SP State Street Line/El Monte Busway
SP Lincoln Park Spur (Soto Street)
PE Monrovia-Glendora Line (Huntington Dr.)
PE Pasadena Short Line (Fair Oaks)
Tunnel Link From Fair Oaks To ATSF
ATSF Second Subdivision
ATSF Walnut Street Spur
PASADENA
GLENDALE
LOS ANGELES
SOUTH PASADENA
SAN MARINO
TEMPLE CITY
SAN GABRIEL
ALHAMBRA
ROSEMEAD
EL MONTE
MONTEREY PARK
SO. EL MONTE
MONROVIA
BRADBURY
DUARTE
SIERRA MADRE
BALDWIN PARK
INDUSTRY
Bassett
Highland Park
Silver Lake
Hollywood
Universal City
No. Hollywood
West Hollywood
Montrose
LA CANADA FLINTRIDGE
Altadena
E. Pasadena
CULVER CITY
VERNON
MAYWOOD
HUNTINGTON PARK
BELL
CUDAHY
Florence
Walnut Park
INGLEWOOD
Westchester
Lennox
Watts
SOUTH GATE
DOWNEY
SANTA FE SPRINGS
E. Whittier
So. San Gabriel
I-10
I-5
I-210
I-134
I-101
I-110
I-405
I-605
I-19

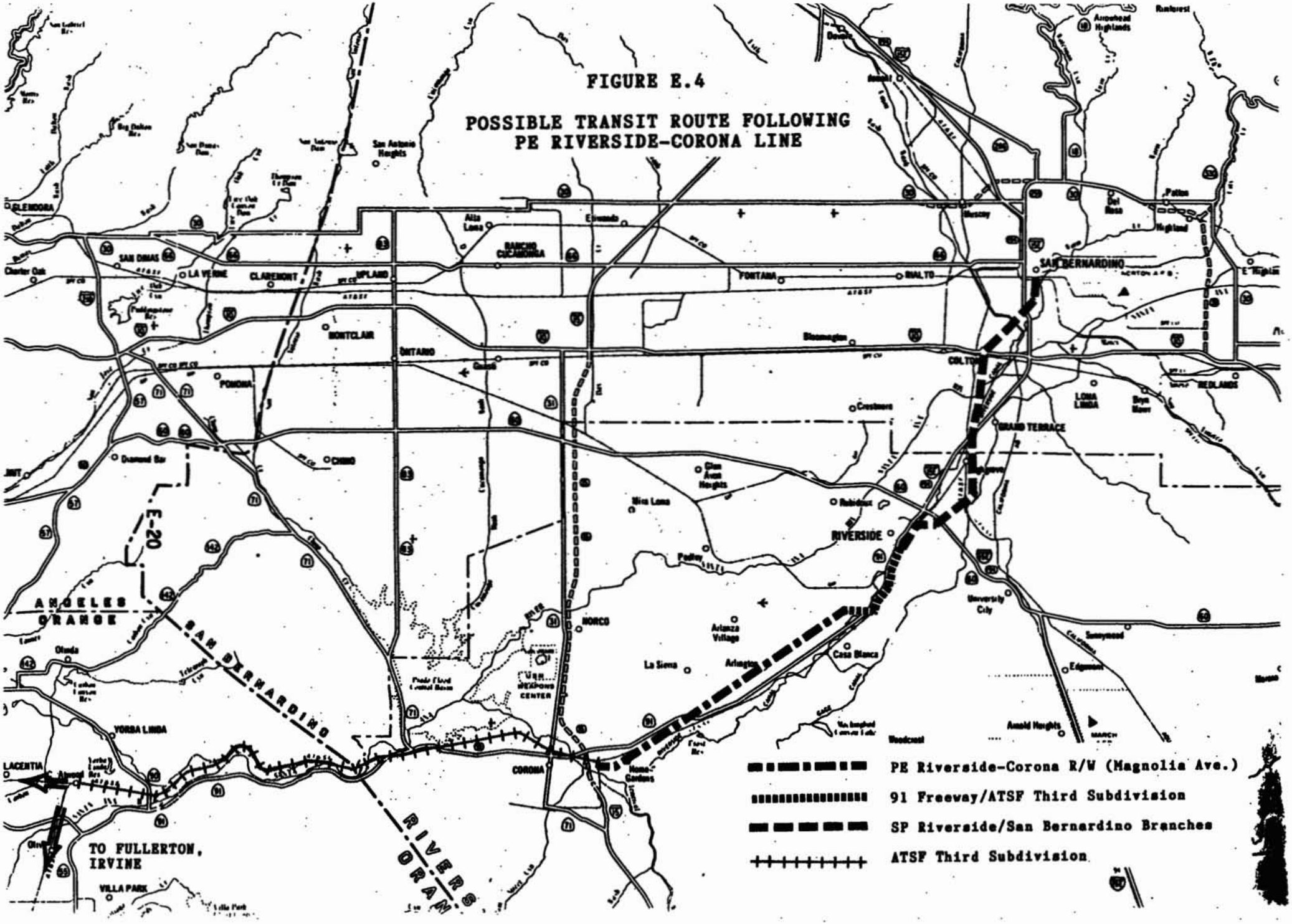


FIGURE E.4
POSSIBLE TRANSIT ROUTE FOLLOWING
PE RIVERSIDE-CORONA LINE
PE Riverside-Corona R/W (Magnolia Ave.)
91 Freeway/ATSF Third Subdivision
SP Riverside/San Bernardino Branches
ATSF Third Subdivision
TO FULLERTON, IRVINE
RIVERSIDE
CORONA
NORCO
ONTARIO
SAN BERNARDINO
I-20

APPENDIX F

To: Jim Gosnell
Gill Hicks

From: Alan Havens

Date: May 19, 1988

Subject: INVENTORIES OF PACIFIC ELECTRIC RIGHTS-OF-WAY

A recent query was made by the TCC concerning the availability of information on former Pacific Electric (Red Car) and other inter-urban rights-of-way in what is now the SCAG region. It is assumed that the intent of this query was to ascertain the current status of these former electric traction rights-of-way and determine how many of them may have potential for transit use in the future.

SCAG staff have been collecting and saving maps and documents relating to former PE lines for several years. The following is an annotated list of the materials currently in our possession:

1. 1981 INVENTORY OF PACIFIC ELECTRIC ROUTES. Prepared by Caltrans District 7 - Public Transportation Branch. February 1982.

This study provides the following:

- o 1914 system map (Figure F.1).
- o Caltrans inventory of former PE routes (map), indicating status: existing freight line/ROW remains, rails removed/ boulevard median/ROW paved over/ROW built upon (Figure F.2).
- o Detailed maps of PE Districts.
- o Detailed descriptions of PE lines, including history, current status, and fine detail map of each line.

2. FIELD EXAMINATION OF FORMER P.E. RIGHTS-OF-WAY. Gerald B. Leonard, July 31, 1975. Study conducted for SCAG's Transportation and Utilities Committee.

This study provides the following:

- o Status of former PE rights-of-way (ROW) in 1975, broken down as follows: ROW still existing (rails intact or removed)/ROW converted to median/ROW paved over/ROW abandoned or built upon (Figures F.3 to F.6).

- o History of PE lines, with descriptions of many of them.

- o ROW segments remaining, by jurisdiction.

3. PACIFIC ELECTRIC RAILWAY 1925. The Metropolitan District of Los Angeles.

This is a wall map of the PE lines as they existed in 1925.

4. LINES OF THE PACIFIC ELECTRIC RAILWAY.

This is a smaller map showing the system as it existed circa 1925.

5. A map showing in addition to PE lines, several former Los Angeles Railway interurban lines.

6. A letter from Gary Spivack, SCRTD Director of Planning, to the Los Angeles City Planning department enumerating a number of rights-of-way which SCRTD staff believe may have transit potential, including many former PE rights-of-way. Attached to this letter are lists and maps of former Yellow Car routes and excerpts from The Electric Interurban Railways In America (G. Hilton and J. Due, Stanford U. Press, 1964) and a second (unidentified) document describing Red Car routes in detail. (Appendix F Attachment and Figure F.7)

* *

Staff have noticed many abandoned and still-intact rights-of-way during field trips in the urbanized portion of the SCAG region. However, other than existing freight railroad lines, no detailed inventories have been made.@

Considering the pressure by developers to re-cycle old railroad/traction rights-of-way for other purposes, an up-date of the status of these former transportation corridors would likely be of interest to a great many people.

@ Note: This situation has since been partially remedied. Extensive field surveys of abandoned railroad and electric traction rights-of-way were conducted during Phase III of the study, in FY 1988-89.

Addenda. An additional study of former Red Car rights-of-way is the following:

Carl W. Semotan, The Development, Demise, Conversion, and Reuse of Railroad Rights of Way: The Pacific Electric Railway. M.S. Thesis, Geography and Urban Studies, California State University at Los Angeles, June 1980. 238 pp. + 16 pp.

Gary S. Spivack
Director of Planning

February 2, 1988

Mr. Richard Platkin
Los Angeles City
Planning Department
505 City Hall
Los Angeles, CA 90012

Dear Mr. Platkin:

The Southern California Rapid Transit District supports the City's carefully studying all the existing and former rail rights of way for possible preservation and reuse as mass transit corridors. The corridors to be studied ought to include all existing freight rail lines (Santa Fe Southern Pacific Company and Union Pacific) and the former transit lines of the Pacific Electric and Los Angeles Railway. The District suggests that, at a minimum, the following existing or former rail corridors be studied in the near term for preservation due to their potential for reuse as low-cost rail transit corridors. Utilization of any of these corridors could have the dual advantages of low cost and the absence of relocation impacts compared to assembling new transit corridors from scratch. Indeed, the assembly of land for a new rail line in many of these corridors may not be economically or environmentally feasible, increasing the importance of zoning these existing corridors so as to ensure their preservation for possible future transit use. The District would appreciate receiving a copy of any City study of transit corridors when completed.

Route 1. The median of Santa Monica Boulevard from Fairfax Avenue to Sepulveda Boulevard.

The District will initiate a study of the western Metro Rail Extension alternatives in 1988. This highway median is part of at least one possible Metro Rail route and should therefore be maintained, at least until the Metro Rail Western Extension Study is completed. Even if the median of Santa Monica Road is not chosen for the Metro Rail Western Extension, this route's potential as a Bus/HOV lane should be investigated.

Route 2. The Exposition Boulevard branch, east of its intersection with Venice Boulevard.

Southern California Rapid Transit District 425 South Main Street, Los Angeles, California 90013 (213) 972-6000

This portion has the potential to be used as either a busway or light rail line. West of Sepulveda Boulevard parts of this alignment might be usable in conjunction with an Olympic Boulevard route for a Metro Rail Western Extension.

Route 3. The median of Venice Boulevard west of San Vicente Boulevard.

This median has potential either in combination with Exposition Boulevard (listed above) or as a light rail feeder line if a Metro Rail Station is adopted at Pico/San Vicente Boulevards.

Route 4. The median of Culver Boulevard southwest of Venice Boulevard.

The Coastal Light Rail Corridor adopted by the LACTC is projected to use the western end of this median as its northern terminus. This street median could provide a connecting route between a light rail line on Exposition Boulevard and the LACTC's proposed Coastal Corridor Transit Line.

Route 5. The former Southern Pacific Inglewood Branch.

This right of way has the potential to connect the new Howard Hughes Center with the projected Commission Coastal Light Rail Line in one direction and the proposed Southwest Corridor Transit Line in the other.

Route 6. The former Los Angeles Railway Route 5 streetcar line.

This should be considered for partial inclusion in a southwest route to LAX and/or as a feeder route to the Hawthorne Boulevard stop on the Century Light Rail Line.

Route 7. The right of way along Electric Avenue in Venice between Main Street and Neibon Way through Santa Monica which formerly constituted the rail loop connecting the Exposition Boulevard Line (Santa Monica Air Line) on the North with the Culver and Inglewood branches on the south.

The City of Los Angeles has sought to buy portions of this right of way in Venice for parking. If all or a substantial portion of this right of way were purchased, it might be possible to redevelop this right of way as a single rail corridor simultaneously serving as a northern extension of the LACTC Coastal Corridor Light Rail Line, a shoppers shuttle for the very congested redeveloped Main Street and a feeder to a Metro Rail Western Extension (if the Western extension runs from Westwood South to Olympic and out Olympic to the Pacific Ocean).

Route 8. All, or some portions of the ATSF Harbor Branch Line, especially that portion along Slauson Boulevard, Florence Avenue, and Aviation Boulevard which might serve as part of a southwest corridor link to LAX.

This line might become available if a consolidated port rail access line is adopted.

Route 9. The existing remnant section of the former Pacific Electric Subway.

This two-track light rail subway tube formerly extended from the Subway Terminal Building at 4th and Hill Streets to a point just south of the intersection of Beverly Boulevard and Glendale Boulevard. Portions of this subway tube have been destroyed in the course of construction of the Bonaventure Hotel and Arco Plaza's garage. While it might be technically possible to reconstruct the demolished section of tunnel, it would be very expensive and it is doubtful whether it would rate a near term high priority compared to other possible regional rail projects. However, the tube currently exists intact from its original northern portal adjacent to Beverly and Glendale Boulevards, south past Beaudry Center I, under the Harbor Freeway and the Union Bank Building to a southeastern terminus at Figueroa Street. This existing section of tube could be reutilized as a low-cost right of way for a short distance moving beltway or other low-cost auxiliary transit system originating beneath the Union Bank building (which straddles the tube due to uncertainty about title to the tube at the time of its construction) and extending under the Harbor Freeway to a station built as part of a new development on the vacant parcel bounded by 3rd and 5th streets, the Harbor Freeway and Boylston Street. Such an auxiliary transit system would offer a grade separated connection between the new Pacific Coast Stock Exchange and the Bunker Hill Redevelopment Area at the Union Bank Building. The initial Union Bank to Beaudry Center segment of auxiliary transit could be expanded to the north portal of the tunnel which has been tentatively designated as a park and ride location by CDA.

Route 10*. The former Pacific Electric Whittier Branch.

Route 11**. The former Pacific Electric Santa Ana Branch.

Route 12*. The former Pacific Electric Wilmington Branch (not the current Southern Pacific line to the Port which is heavily utilized by freight trains, but the parallel former interurban right of way).

Route 13. The former Pacific Electric right of ways to Pasadena including the median of Huntington Boulevard.

Route 14. The former Pacific Electric right of way to San Bernardino.

* These lines might function as branches of the Long Beach Light Rail Line.
** This line might serve as a branch of the Century Light Rail Line.

In addition to this minimal list of former rail transit lines worthy of preservation and study, the following contemporary corridors merit serious consideration:

1. All active service freight main and branch lines, the former for possible commuter rail service; the latter for use as light rail lines or HOV lanes.

2. Freeway medians. While these routes generally bypass city centers, in certain cases where centers are far apart, freeway medians might be used in combination with short beginning, ending, and mid-route non-freeway segments. Possible examples include the 210 freeway median, the I-10 median for a phased San Bernardino Busway Eastern Extension eventually reaching San Bernardino, and the large existing median of the Pomona Freeway as a route to the burgeoning East San Gabriel Valley and the City and County of Riverside.

Attached please find maps and descriptions of all former Pacific Electric Routes, maps of all former Los Angeles Railway Routes, descriptions of some Los Angeles Railway Routes, and a ridership distribution flow map for both systems in a representative year.

If you have any further questions, please contact me at (213) 972-6170.

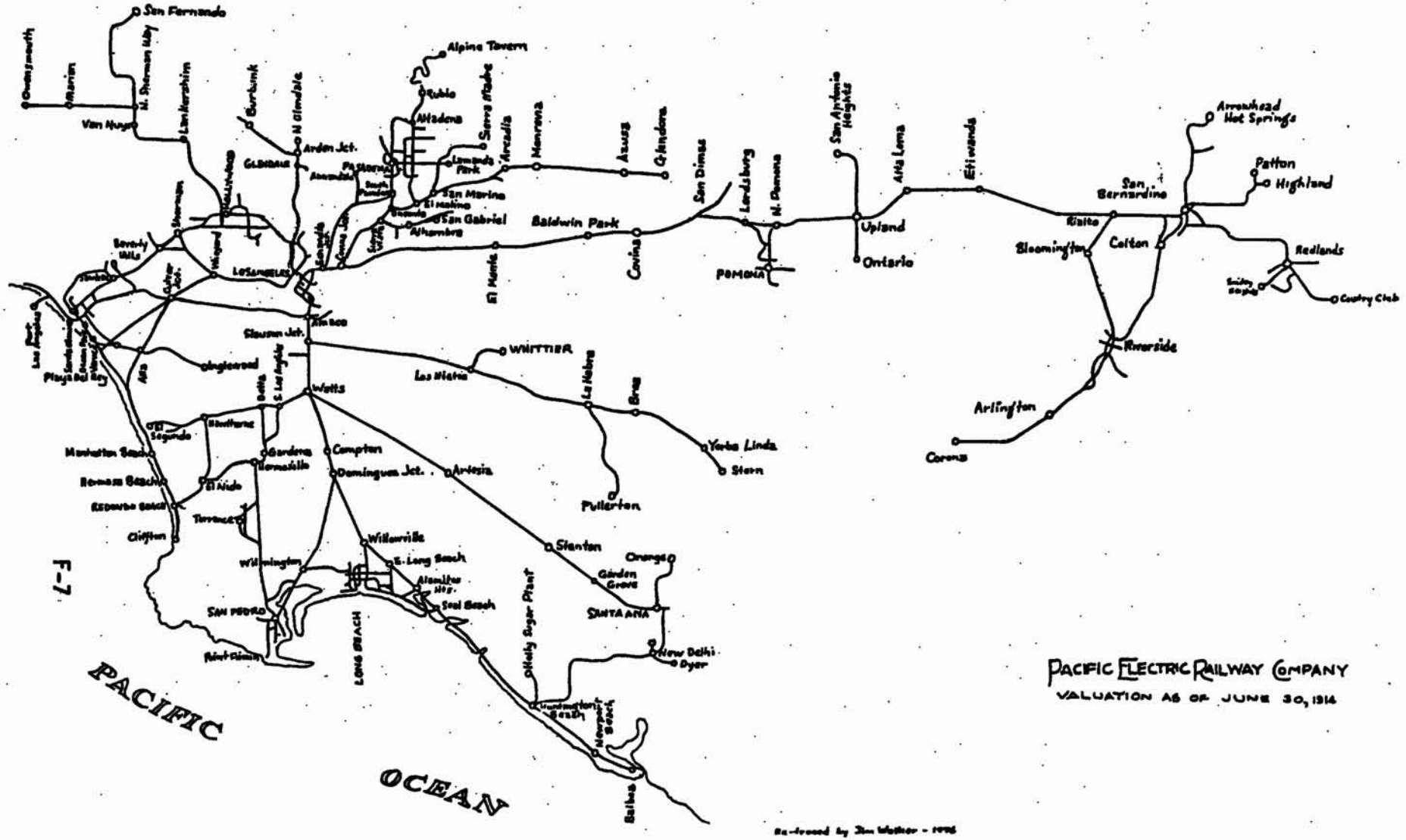
Sincerely,

Gary S. Spivack

Attachments

FIGURE F.1

PACIFIC ELECTRIC INTERURBAN ELECTRIC RAILWAY NETWORK



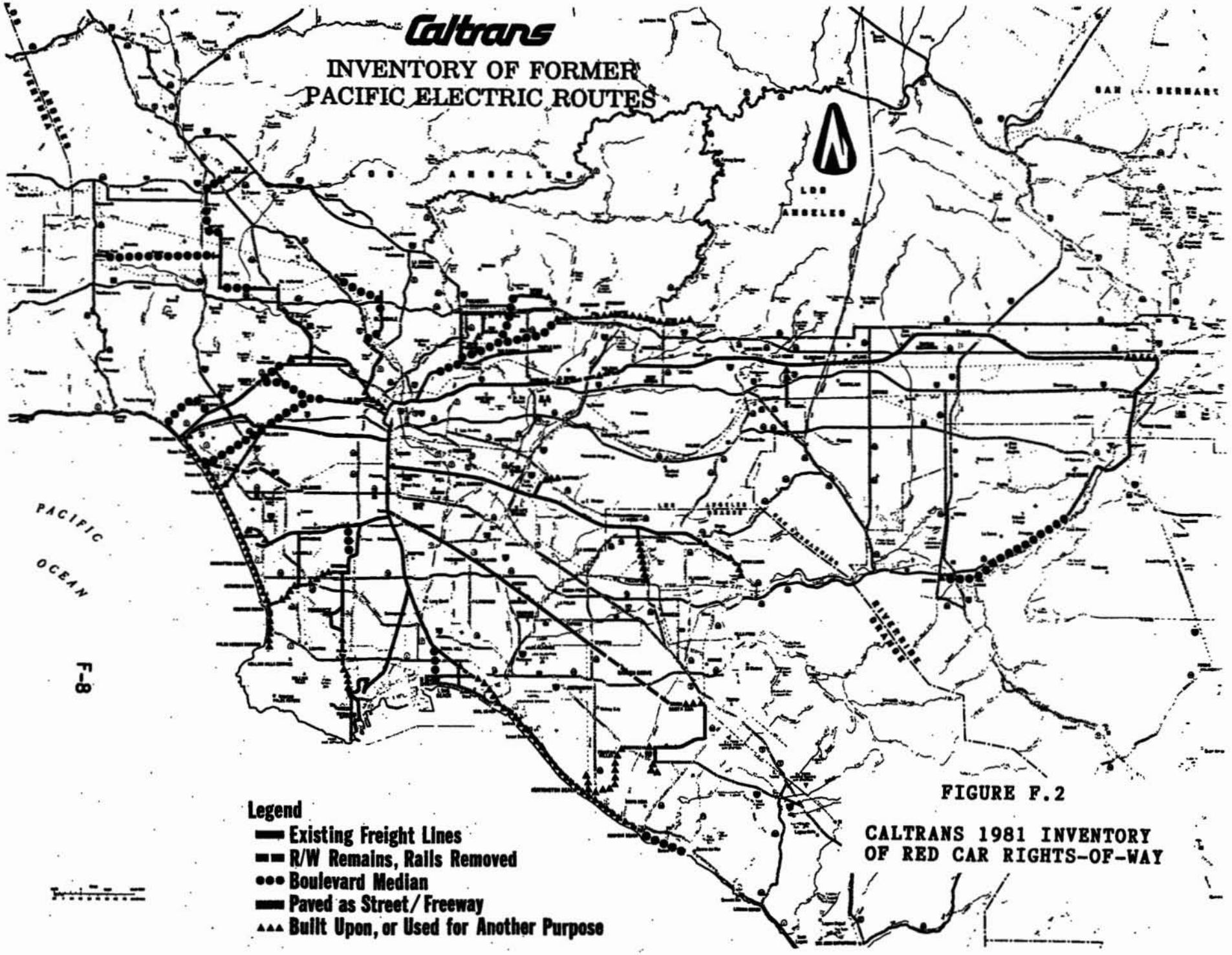
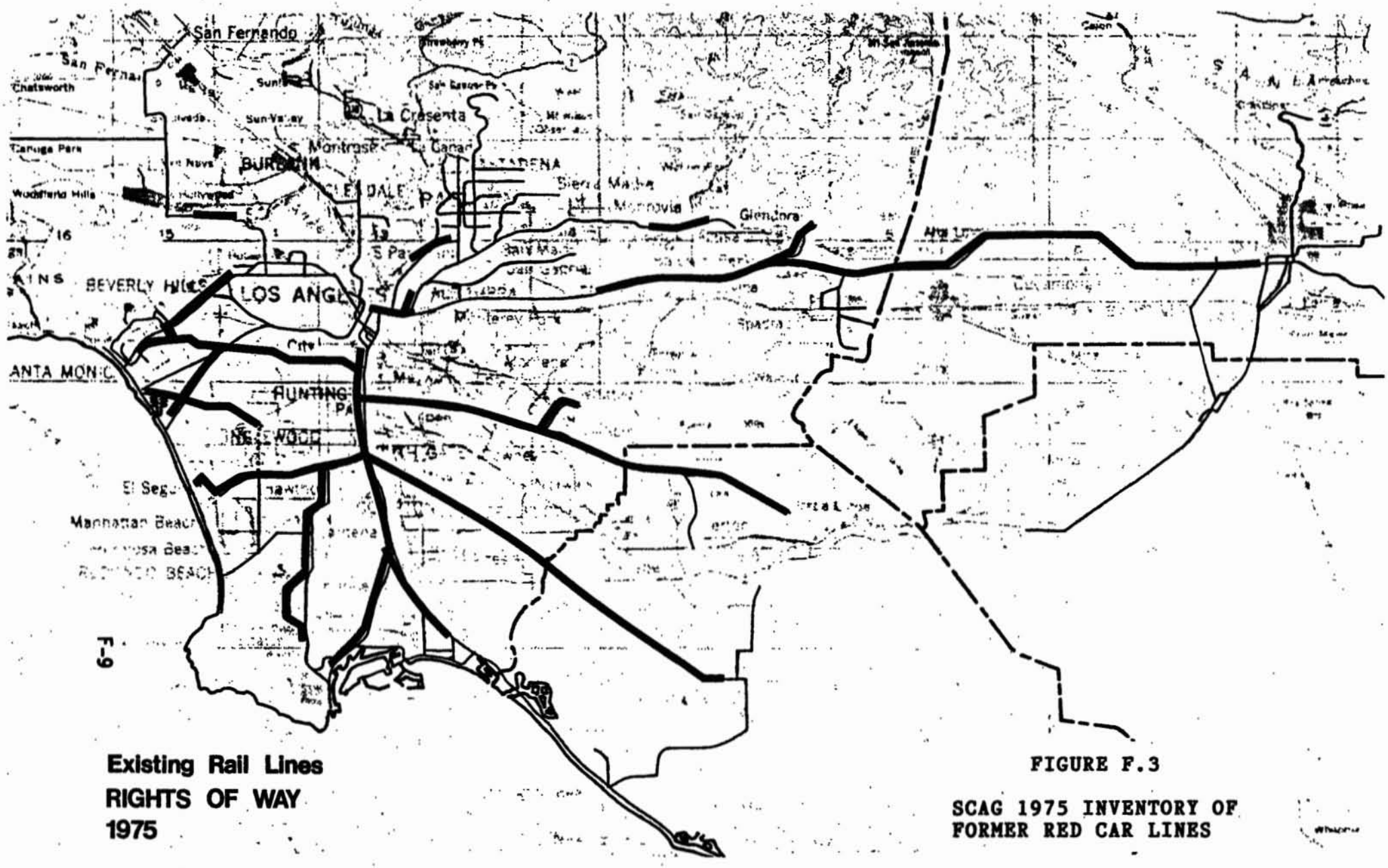


FIGURE F.2

CALTRANS 1981 INVENTORY
OF RED CAR RIGHTS-OF-WAY



F-9

FIGURE F.3

SCAG 1975 INVENTORY OF FORMER RED CAR LINES

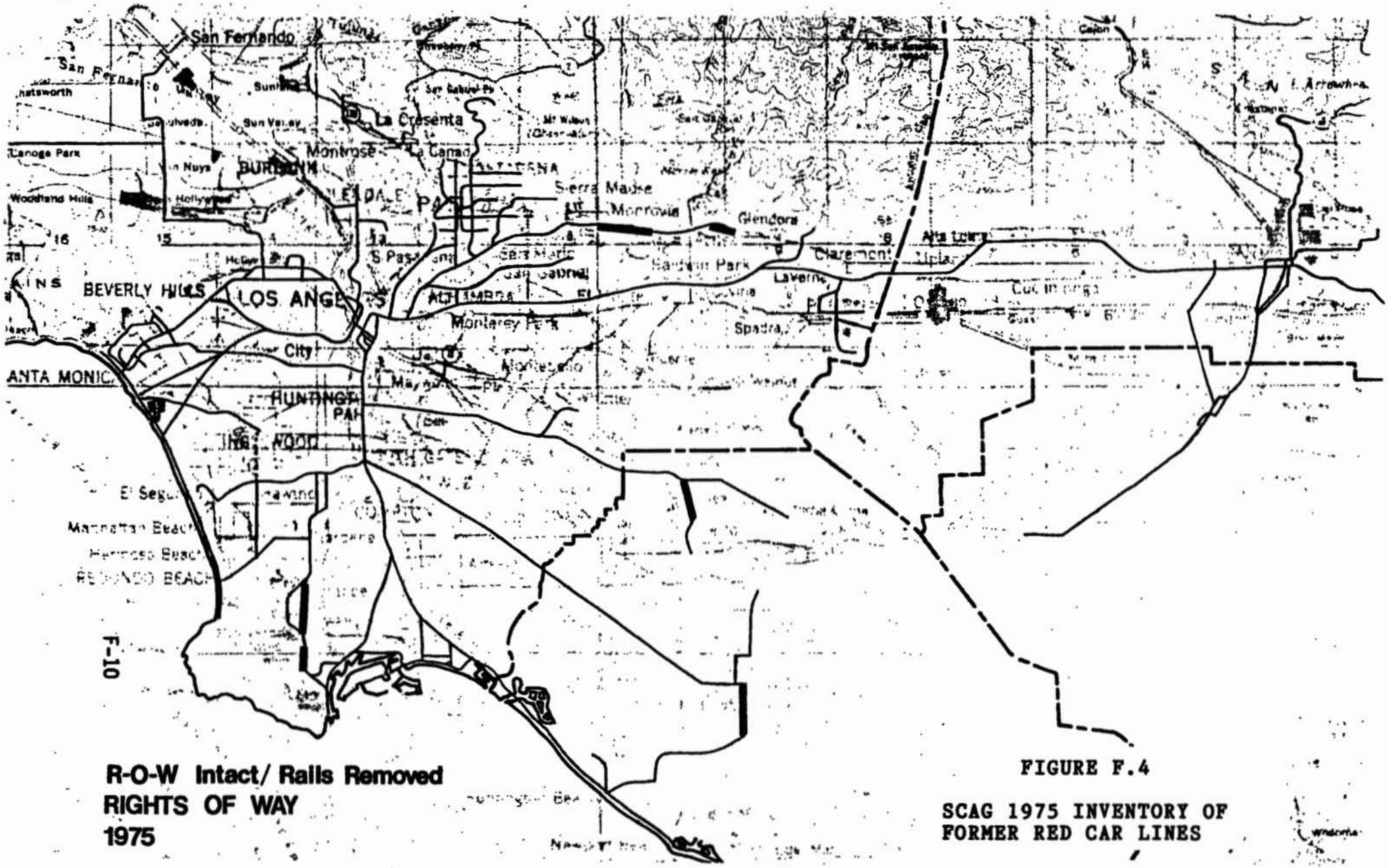


FIGURE F.4

SCAG 1975 INVENTORY OF FORMER RED CAR LINES

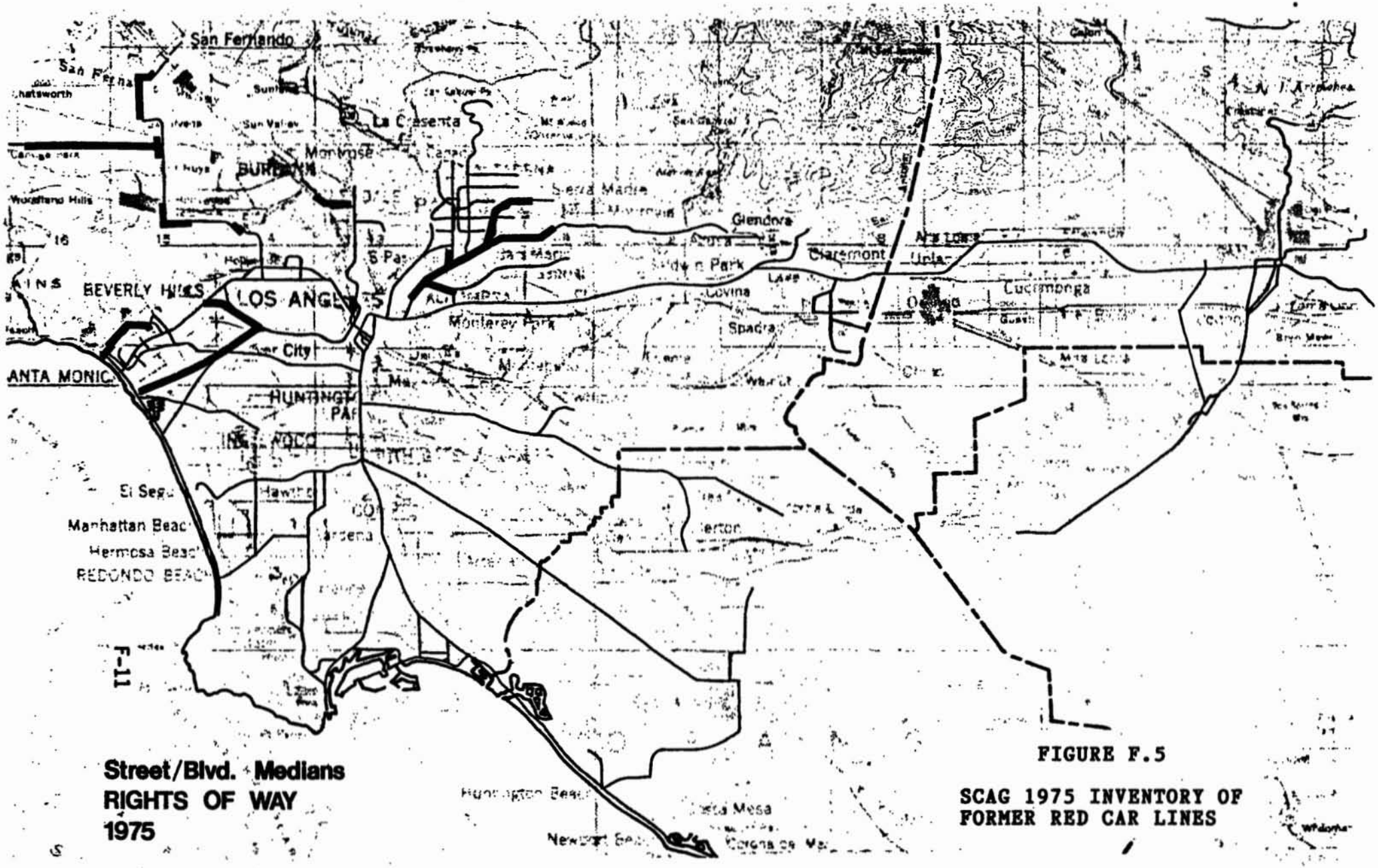


FIGURE F.5

SCAG 1975 INVENTORY OF FORMER RED CAR LINES

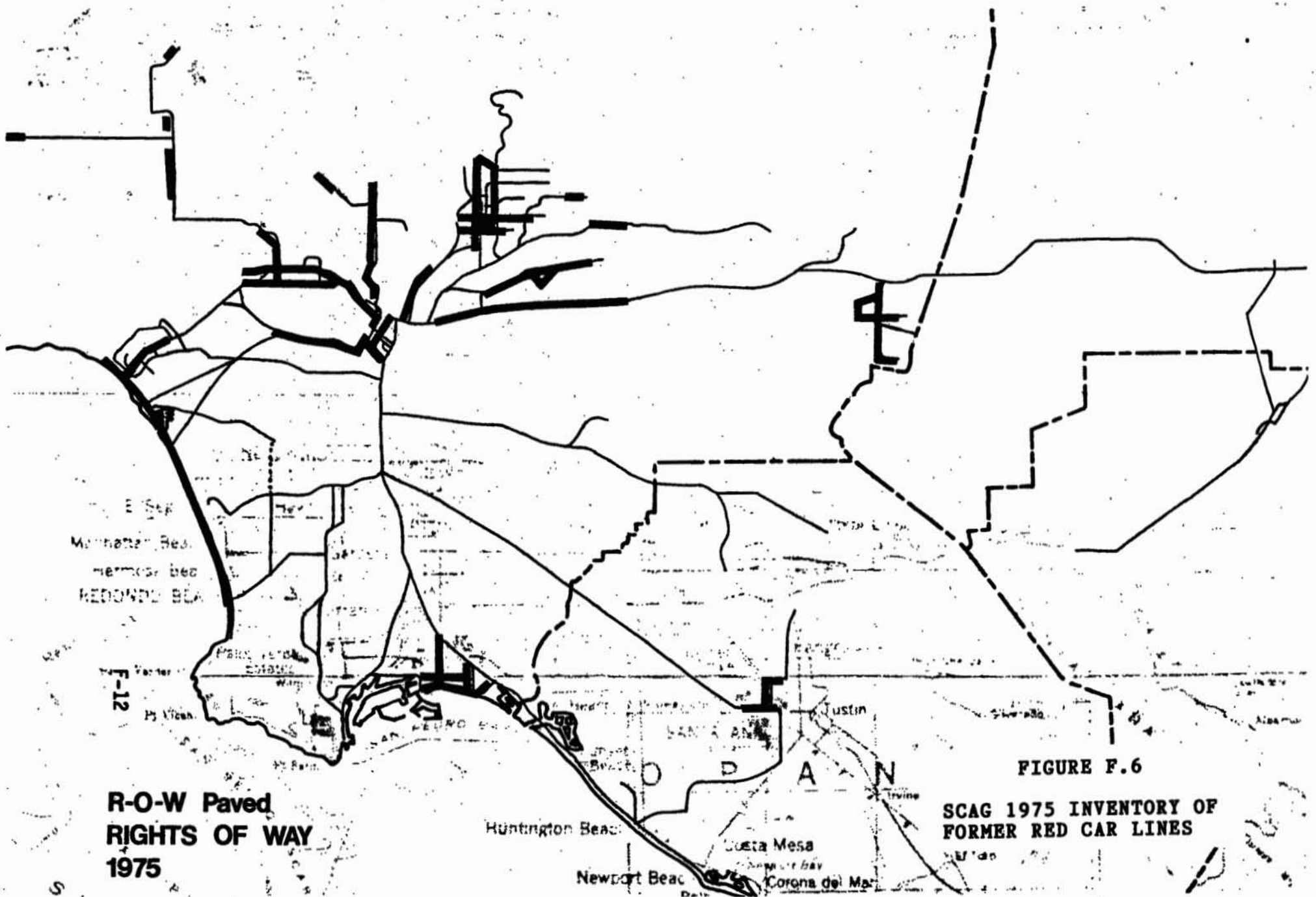
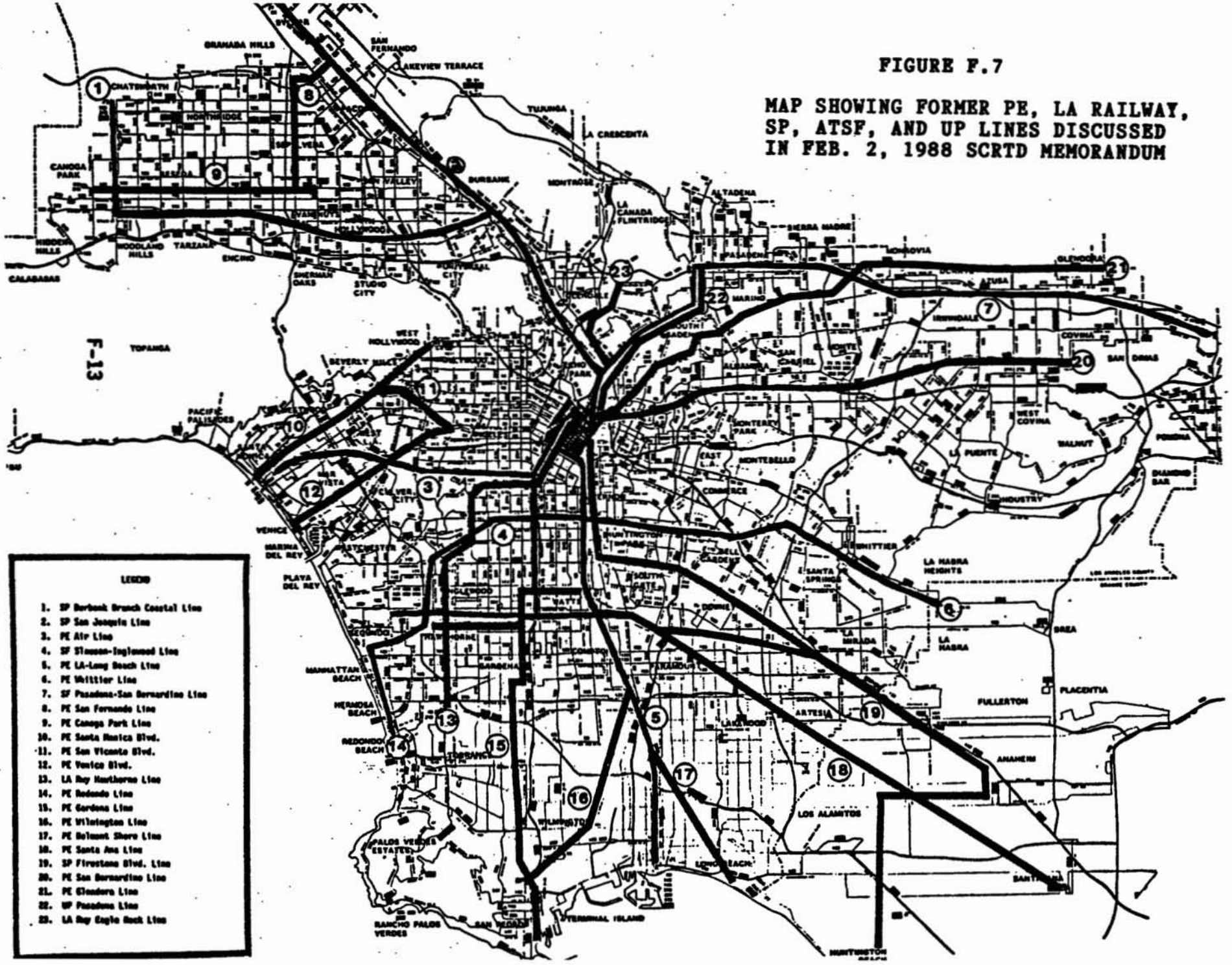


FIGURE F.6

SCAG 1975 INVENTORY OF FORMER RED CAR LINES

FIGURE F.7

MAP SHOWING FORMER PE, LA RAILWAY, SP, ATSF, AND UP LINES DISCUSSED IN FEB. 2, 1988 SCRTD MEMORANDUM



Above right: El Monte Busway, in freeway median next to the SP State Street Line.

Above left: Duwag car on Mannheim LRT line.

APPENDIX G

RAILROAD CORRIDORS NOT CONSIDERED

SP Coast Line. With the exception of several short segments, the SP Coast Line was not considered in this analysis, because it has been assumed to be a more likely candidate for intercity passenger rail service as part of a Southwest Corridor between Santa Barbara and San Diego; and also as a candidate for commuter rail from Ventura County to the LA CBD. This line is heavily used for freight, with prospects for additional TOFC traffic to and from the Bay Area in the near future.

Santa Fe Third Subdivision. The Santa Fe Third Subdivision from LA to Fullerton is already in heavy use by San Diegan intercity trains, and would become the southern part of the Southwest Corridor. Commuter rail has also been considered between LA and southern Orange County. The Santa Fe Third Subdivision from Fullerton to Riverside and San Bernardino may be a better candidate for intercity rail than for conventional transit, and has recently been investigated with respect to commuter rail potential (including the Olive Subdivision as a connector from Placentia to Orange). This railroad line is of course the main transcontinental freight route for the ATSF.

UP And SP Main Lines. The SP Alhambra Line and UP Second Subdivision were not considered for transit, other than possible use of air rights or excess surface right-of-way along the middle segment as a connector to an Ontario Airport (see Appendix D) and a strip of the UP main line near the junction with the Crestmore Branch, where the R/W is particularly wide (in Appendix C). The SP State Street Line right-of-way from LA to El Monte is already occupied by the El Monte Busway, which may someday be a candidate for conversion to rail rapid transit. Again, these lines provide the main transcontinental freight routes for their respective railroads.

(Interestingly enough, although it was not considered a candidate for conversion to transit in this study, the SP State Street Line may be put up for sale by the Southern Pacific in combination with the Baldwin Park Branch; apparently the railroad believes that the Alhambra Line, which should be wide enough to be double tracked throughout, may suffice for their freight needs.)

SP San Pedro Branch. With the exception of the southern end of the line in San Pedro, the SP San Pedro Branch was not considered for transit because it serves a primarily industrial corridor, and because it is assumed that this right-of-way would be dedicated exclusively to development of a consolidated rail corridor for use by the three regional freight carriers (the SP, UP, and ATSF) to the ports. As the rail component of the Alameda Corridor, it will carry very heavy levels of bulk land containerized rail freight. With a double track freight line (with additional sidings and spur tracks in places) and demand for highway upgrading to handle additional truck traffic along this corridor, there would be little room left over for a transit line.

In any case, the LA-Long Beach line will parallel the San Pedro Branch rather

closely, and it is assumed that this LRT facility would provide sufficient line-haul transit service on its nearby alignment. (San Pedro itself would be served by a different transit line, following or roughly paralleling the Harbor Freeway.)

SP Santa Ana Branch. The SP Santa Ana Branch was not considered a likely candidate for transit at this time for several reasons. First, the western end of the line which passes through South Gate, Downey, and Norwalk is fairly heavily used for local freight as well as providing a connection between the SP San Pedro Branch and the City of Industry (via the SP Puente Branch and UP main line) in port service. Following the implementation of the Alameda Corridor project (which will follow the SP San Pedro Branch), the SP will almost certainly want to maintain an alternative route to the City of Industry, even with the diversion of much of its port traffic to the downtown area via Alameda Street and trackage rights on the connecting Union Pacific LA River route.

Hence, traffic levels on this segment of the Santa Ana Branch are likely to remain more or less the same, or even experience modest growth. Taken together with a more difficult connection to the LA-Long Beach Line and lower population densities along a hypothetical Santa Ana Branch transit line as compared with the La Habra Branch, it is suggested that this line should be dropped from consideration for the time being.

The eastern end of the Santa Ana Branch is fairly heavily used by rail freight traffic serving Orange County. From Buena Park south to Santa Ana, the Santa Ana Branch parallels the 5 Freeway very closely. As a transitway/HOV lane combination is planned for development along the freeway (eventually providing a link to a southeastern extension of Metro Rail along the I-5 corridor), this would make development of an additional transit line along this section of the Santa Ana Branch redundant. The OCTD has in fact recently purchased a segment of the Santa Ana Branch from Anaheim to northern Santa Ana for transitway development; the SP freight trains will be diverted over to the parallel Santa Fe Fourth Subdivision.

In this way, a portion of the Santa Ana Branch R/W will be used for express bus transit. Another consideration is the fact that the section from Santa Fe Springs to Santa Ana is paralleled by the LA-San Diego intercity train service on the Santa Fe 3rd and 4th Subdivisions, providing another form of public transport service on a parallel corridor. With I-5 transitway express or subscription bus service, in addition to LOSSAN intercity trains and a West Santa Ana Branch rapid transit line (and perhaps even a La Habra Branch transit line), overall northwest-southeast transit needs in southeastern Los Angeles and northern/western Orange Counties would be well provided for.

SP Puente Branch. The SP Puente Branch, which provides a north-south connection between the SP Santa Ana and La Habra Branches, is heavily used at present in port traffic. It provides a critical link from the SP Wilmington and San Pedro Branches to the important SP City of Industry yards, via the UP Second Subdivision. Possible transit uses are problematical for this route, because it is so short: it would have to be used in combination with other rights-of-way, including the UP main line, freeways, flood control channels, parkland, power line R/W, etc. if it were intended to incorporate it into a north-south transit

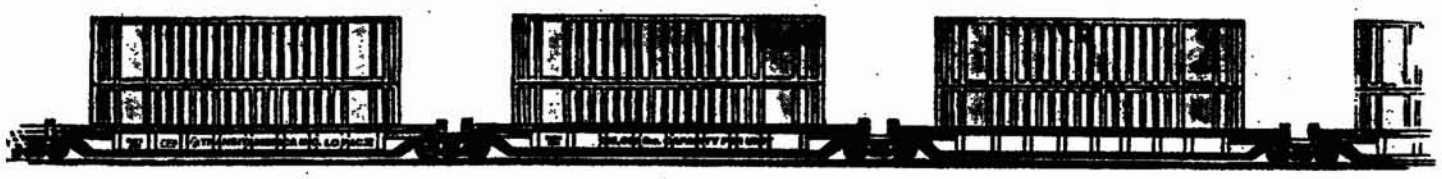
corridor in this part of the region.

This, combined with the fact that the Santa Ana Branch at least can be expected to remain in fairly heavy use for freight traffic after implementation of the Alameda Corridor, would suggest that the Puente Branch may not be a good candidate for transit development, at least for the foreseeable future.

UP San Pedro Branch. Another line not considered for transit is the UP San Pedro Branch; this has a fair amount of local freight traffic, with considerable yard activity in Paramount. It is expected to remain in moderately heavy use even after the Alameda Corridor is implemented: unlike the ATSF Harbor Subdivision (a rather circuitous route for through freight purposes), the UP San Pedro Branch provides a fairly direct path from downtown Los Angeles to the ports. It is true, however, that the UP San Pedro Branch could provide a connection to the Long Beach Municipal Airport. This line might be reconsidered for transit at some point in the more distant future, after the Alameda Corridor has been established and railroad traffic patterns have accommodated to the new facility.

Downtown Rail Yards--UP and ATSF. The UP and Santa Fe main lines serve major rail yards to the south and east of the LA CBD area. Both the UP East LA Yard and Santa Fe Hobard Yard are heavily used in rail intermodal and other freight traffic. They are located in largely industrial sections of Commerce and Vernon. It is certain that these economically-important yard facilities will not be available for any form of redevelopment in the foreseeable future.

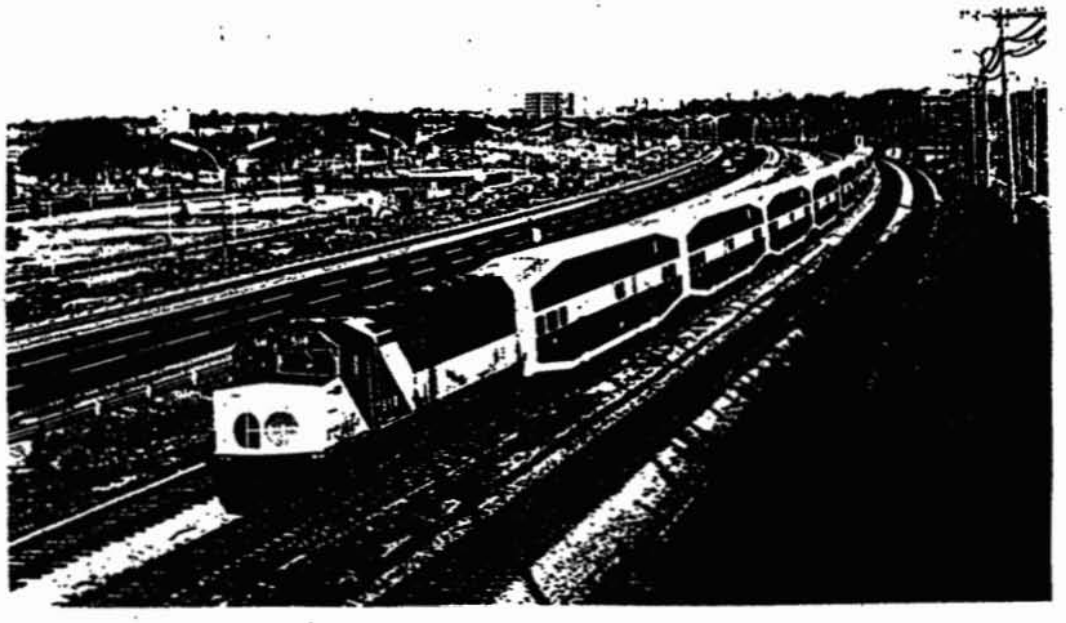
Equipment used in containerized container-on-flatcar (COFC) service includes these modern well cars for double stacking marine containers.



INTERCITY AND COMMUTER RAIL EQUIPMENT

Above: Typical Amtrak intercity train consist with F-40PH diesel passenger locomotive and Amfleet coaches.

Below: Double-deck commuter cars on GO Transit in the Toronto area, for peak-hour service.



APPENDIX H

INTERCITY AND COMMUTER RAIL POTENTIAL

H.1 Introduction.

There have been numerous recent proposals to utilize portions of the regional rail network for commuter rail, operating on the same trackage as freight and intercity rail services. In addition, there has been considerable interest in improving the frequency and quality of the intercity rail service linking Ventura, Los Angeles, and Orange Counties in the SCAG region with the nearby San Diego and Santa Barbara Counties (Figure H.1).

Five commuter rail services are currently under preliminary investigation in the SCAG region: Los Angeles-Ventura, Los Angeles-Saugus, Los Angeles-San Bernardino, Los Angeles-Southern Orange County, and Riverside-Irvine. Two of these, the LA-Oxnard and LA-Southern Orange County services, would operate exclusively over the same tracks as the San Diegan intercity trains on the proposed Santa Barbara-Los Angeles-San Diego Southwest Corridor. Hence, the discussion of commuter rail proposals in the SCAG region will be prefaced by a commentary on the development of the San Diegan and Santa Barbara intercity rail services.

We will not discuss here in any detail truly long-distance intercity rail services, linking the SCAG region with Seattle and the Bay Area, the Middle West, or East Coast cities.

H.2 Southwest Corridor Intercity Service--Historical Background.

Historically, the Santa Barbara-Los Angeles-San Diego corridor has always been broken into two parts, since the rail lines north and south of the Los Angeles CBD were owned and operated by separate railroad companies. While the formation of Amtrak removed such corporate distinctions, the stub track arrangement at Los Angeles Union Station made through operation difficult, and all trains continued to terminate in Los Angeles. This situation had caused the coastal corridor to be operated as two separate rail passenger routes. However, in planning for improved intercity service in Southern California, there is good reason to view Santa Barbara and San Diego as the end points of one continuous travel corridor, with Los Angeles as an intermediate origin/destination station.

Immediately prior to the inception of Amtrak, passenger service north of Los Angeles was provided by the Southern Pacific Transportation Co., whose San Francisco-Los Angeles Coast Daylight provided a single daily round trip between Santa Barbara and Los Angeles. On the Los Angeles-San Diego portion of the route, service was provided by the Santa Fe Railway, which operated three daily trains, known as the San Diegans, in each direction.

When Amtrak was established in May 1971, the route technically became part of a designated Seattle-San Diego basic system route. However, with the exception of a short period of time (May 1971 to June 1972) during which through cars were operated between Seattle and San Diego, the Los Angeles-San Diego portion

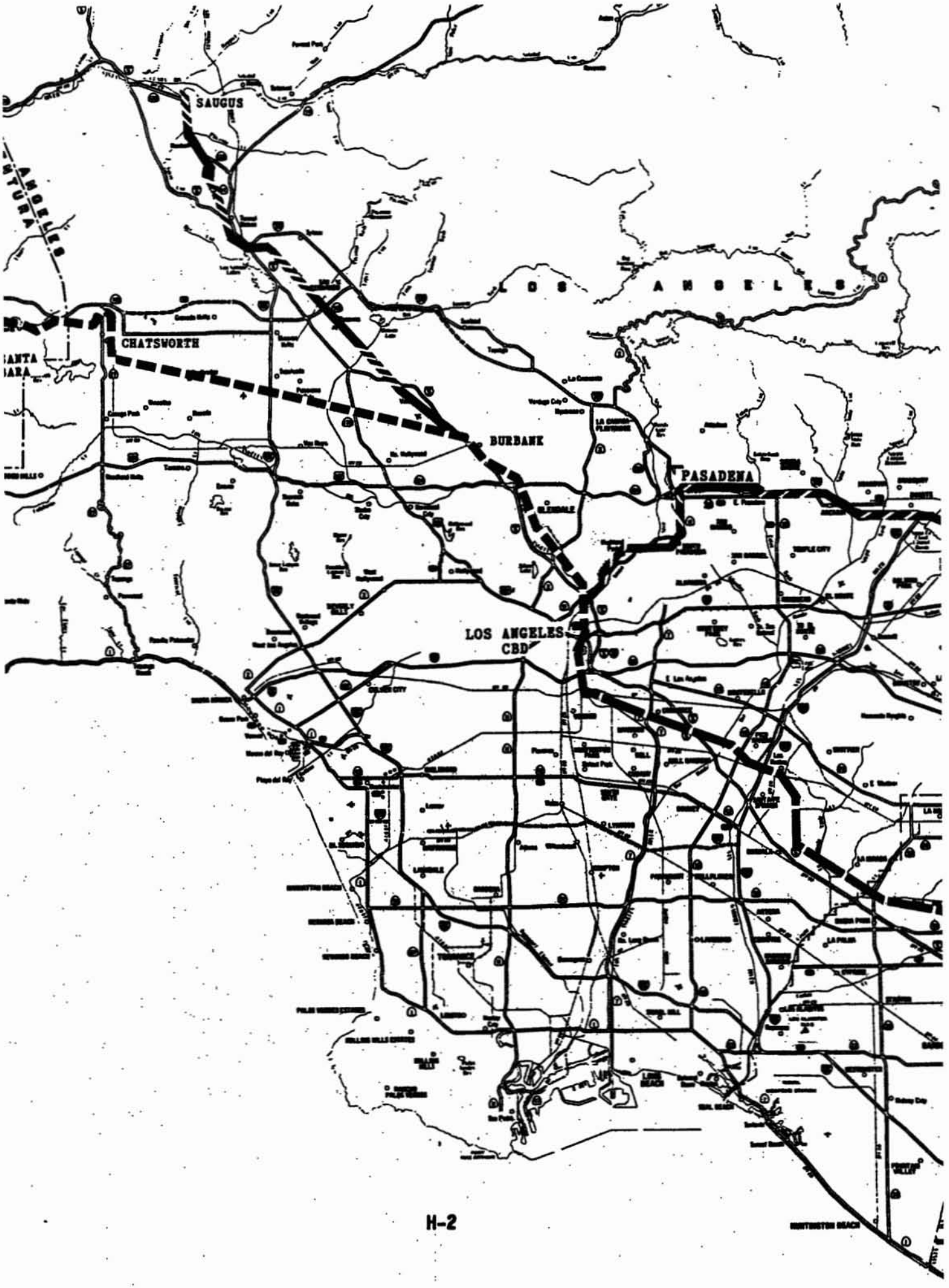
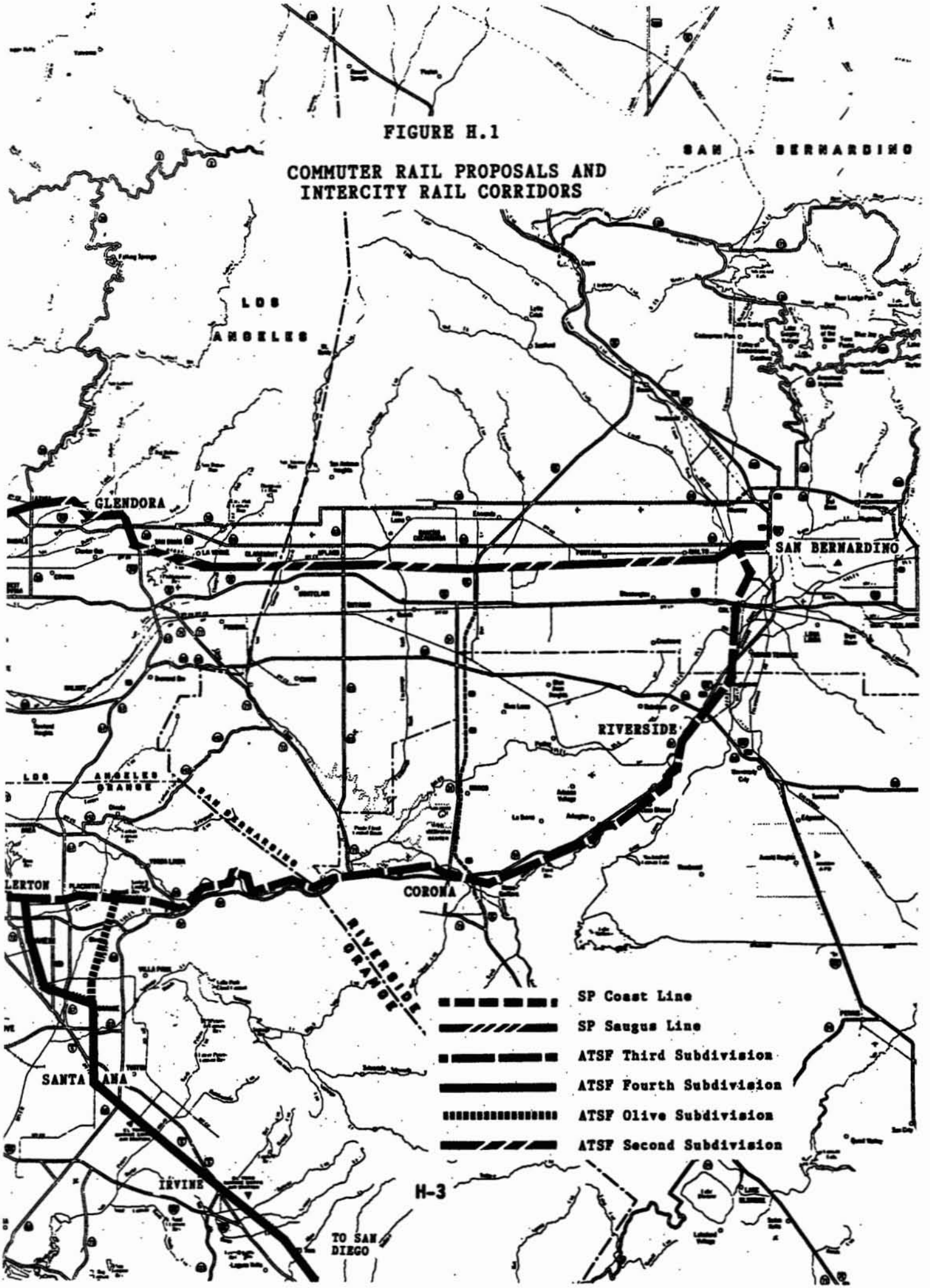

SAUGUS
CHATSWORTH
BURBANK
PASADENA
LOS ANGELES
CBD

FIGURE H.1

COMMUTER RAIL PROPOSALS AND
INTERCITY RAIL CORRIDORS



continued to be operated separately.

Initially, Amtrak maintained the same level of service that had been provided previously by the railroads. The Santa Barbara-Los Angeles section was served by the Seattle-Los Angeles Coast Starlight, which made one daily round trip with intermediate stops at Oxnard and Glendale. The Los Angeles-San Diego portion continued to be served by three daily San Diegan round trips, which functioned primarily as connections to long-haul trains at Los Angeles. Intermediate stops were made at Fullerton, Santa Ana, San Clemente, Oceanside, and Del Mar. Checked baggage service was offered on the Coast Starlight and on two of the three San Diegan round trips. Except for the addition of a San Diegan stop at San Juan Capistrano in May 1974, this level of service was operated with very little change for five years.

On September 1, 1976, a State-supported train was added to the Los Angeles-San Diego segment of the route. A second State-supported train was instituted on April 24, 1977, and a third on February 14, 1978, for a total of six round trips per day between Los Angeles and San Diego. These additions transformed this portion of the route from a simple, long-haul feeder into a major inter-urban rail corridor, second only in ridership to Amtrak's Northeast Corridor. The number of annual passengers more than tripled, reaching a level of 1.2 million by the end of 1979, and the route's performance indicators consistently exceeded Amtrak's national standards. On October 26, 1980, a seventh San Diegan was added by Amtrak.

North of Los Angeles, service was increased to two round trips per day on October 25, 1981 with the addition of the State-supported Spirit of California, which operated in the corridor as part of its Los Angeles-Sacramento route. However, since it served primarily as an overnight train between Northern and Southern California, its schedule between Santa Barbara and Los Angeles was not ideal for meeting local travel needs. Ridership on the train did not reach acceptable levels, and it was discontinued on October 1, 1983.

On August 12, 1985, new feeder service north of Los Angeles was instituted in the form of dedicated bus connections to the San Diegans. On October 25, 1987, an eighth Los Angeles-San Diego round trip was added. Push-pull operation was initiated, using former Metroliner coaches from the Northeast Corridor as cab cars, similar in design to the Amfleet coaches already in use in the San Diegan service. This made it possible to reverse direction at Union Station and at Santa Barbara, without costly terminal operations in which the locomotive is moved to the other end of the train. On June 25, 1988, the Santa Barbara-Los Angeles-San Diego corridor was finally completed with the extension of one LA-San Diego round trip north to Santa Barbara. The eighth train and the extension to Santa Barbara are both State-supported services.

H.3 Santa Barbara Extension.

The extension of one or more San Diegan trains beyond Los Angeles to Santa Barbara has always had strong market potential for both business and recreational travel. Trips between points north and south of Los Angeles, such as Oxnard to Santa Ana, are much more attractive when passengers are able to ride through instead of having to transfer between trains and/or buses enroute.

Such an extension was first recommended in a study prepared for the Southern California Association of Governments (SCAG) in August 1975. It was subsequently included by the California Department of Transportation (Caltrans) as part of the SB 283 "Program of Projects" in 1978, and has been part of the State's rail program ever since. In 1980, Caltrans officially requested Amtrak to extend one San Diegan round trip through to Santa Barbara. Amtrak informed Caltrans that any additional Coast Route service would have to wait until after the arbitration decision in the then-pending Spirit of California case.

After the positive Spirit decision by the National Arbitration Panel in 1981, Amtrak was unable to pursue implementation of the Santa Barbara extension because of fiscal constraints and the continuing Oxnard commuter service legal proceedings. However, local agencies in Santa Barbara and Ventura Counties continued to press for expanded rail service, and, following the introduction of the Los Angeles-Oxnard dedicated connecting bus in August 1985, Caltrans renewed its request to Amtrak for specific funding estimates for various alternative concepts for San Diegan rail service extension to the northwest. Amtrak responded by agreeing to extend one San Diegan to Santa Barbara after push-pull operation was instituted between Los Angeles and San Diego.

On June 25, 1988, the Santa Barbara extension went into service. It is scheduled as a morning departure from Santa Barbara, with the train assuming the schedule of the existing mid-morning southbound San Diegan south of Los Angeles. Returning, the late afternoon departure from San Diego is extended northward, arriving in Santa Barbara in the late evening. In addition to serving the Amtrak stations in Oxnard, Simi Valley, and Glendale utilized by the Coast Starlight, the train will make additional intermediate stops at Chatsworth and Van Nuys/Panorama City in the near future. Also, a stop at Ventura will be added after a platform and shelter are installed by the City adjacent to the Ventura County Fairgrounds, to provide the required station parking. Several additional San Diegan round trip extensions to Santa Barbara are currently planned.

H.4 Los Angeles-San Diego State Rail Study.

In the fall of 1985, the Legislature passed SB 1095 (which took effect January 1, 1986), creating the Los Angeles-San Diego State Rail Corridor Study Group. The Group was chaired by Caltrans and consisted of one member appointed by each of the following:

1. Los Angeles County Transportation Commission
2. Orange County Transportation Commission
3. Southern California Association of Governments
4. San Diego Association of Governments
5. The Speaker of the Assembly
6. The Senate Committee on Rules
7. National Railroad Passenger Corporation (Amtrak)
8. The Atchison, Topeka, and Santa Fe Railway Company
9. The Secretary-Treasurer of the California Labor Federation

The Federal Railway Administration was also identified in the legislation but

declined to participate as a voting member of the Study Group, although they did offer to provide technical assistance.

The Study Group was charged with identifying and prioritizing improvements on the existing rail line between Los Angeles and San Diego that would reduce train running times, improve reliability, and allow for the operation of additional trains (both Amtrak and commuter), while maintaining capacity for current freight operations. The Group was also directed to investigate the feasibility of public acquisition of the segment from Fullerton to San Diego, and to develop an implementation and funding plan.

To perform the Study, $150,000 from the State Transportation Planning and Development (TP&D) Account was appropriated, to be matched from non-state sources. The actual amount of matching funds made available by planning agencies and cities in the corridor was $165,000. The Study Group retained a consultant, Wilbur Smith and Associates, who conducted the work in association with Morrison Knudsen Engineers, Inc. and Arthur Bauer and Associates.

The final study report (1), which was the result of a cooperative effort on the part of all Study Group members, was submitted to the legislature in June of 1987. It represents the first time that all parties with an interest in the corridor, including the Santa Fe Railway and Amtrak, have worked together and reached a consensus on a program to develop and improve the service.

The report outlines a $246 million capital improvement program, which will result in improved travel time, greater reliability, and a higher level of comfort. It will also permit up to 10 Daily Amtrak round trips between Los Angeles and San Diego, and allow commuter rail service to be initiated.

Implementation of an "Early Action Capital Program" developed by the Technical Committee of the Study Group has already begun. The program involves upgrading over 90 miles of main line track between Fullerton and San Diego, replacing the existing 45-year old bolted rail (which is nearing the end of its useful life) with new, continuously welded rail. This project, which was identified as a high priority improvement in the study report, will result in reduced maintenance costs, greater reliability, and improved ride quality.

The State Budget Act of 1987 included a re-appropriation of $4 million in TP&D funds for intercity rail capital improvements, which were made available for the first phase of the project. As required under CTC policy, matching non-State funds were made available for a total of $8 million, broken down as follows:

State of California	$4,000,000
Los Angeles County	800,000
Orange County	800,000
San Diego County	800,000
Amtrak	800,000
Santa Fe Railway	800,000
TOTAL	$8,000,000

This initial phase has resulted in the replacement of approximately 13 miles of

track from Fullerton to Santa Ana. The formal agreement was signed and the work began on June 15, 1987.

The total rail replacement program is estimated to cost $37 million, and will take place over four years. All parties have indicated that they intend to continue funding the program.

Study recommendations were as follows. For the short term (within the next five years):

- Establish a Joint Exercise of Powers Authority (JPA) to plan and implement passenger rail improvements on the corridor, and seek local, State, and Federal funding. (This was done in February 6 of 1989 when the Los Angeles-San Diego Rail Corridor Agency held its first formal meeting.)

- Initiate funding as soon as practicable for essential rail replacement and track upgrading.

- Begin implementation of a LOSSAN Corridor improvement program which will allow running times to be reduced by up to 24 minutes and improve the reliability of service. The program includes upgrading of sidings and provision of double track where needed, installation of crossovers, improved signaling, increased superelevation on curves and curve realignment, grade crossing improvements, and right-of-way fencing to reduce pedestrian interference.

- Implement necessary station improvements, including raised platforms (to 8" above top of rail) and pedestrian underpasses.

- Provide one new Amtrak station in southeast Los Angeles County and one in northern San Diego County.

- Expand Amtrak services incrementally, by adding a ninth train after 1990, and acquiring 10 more passenger cars to increase the capacity of existing trains.

- Further evaluate the financial feasibility of instituting commuter rail services between Los Angeles and Orange County communities, and between Oceanside and downtown San Diego [in San Diego County, which is outside of the SCAG region], initially with two daily round trips in each case.

Recommendations for the long term were:

- Add a tenth San Diegan train by 1995.

- Provide additional intercity service capacity by adding cars as may be required to accommodate growth.

- Acquire the railroad right-of-way between Fullerton and San Diego, which is almost exclusively used for passenger service.

- o Implement additional higher-cost time savings projects subject to availability of funding. These would include the Soledad Canyon track realignment project through Miramar Hills.

- o Evaluate replacement of the obsolete automatic trains stop (ATS) system with new cab signal and speed control systems.

- o Develop a longer-range system development plan for further improvement of the corridor beyond the Year 2000.

- o Create an intergovernmental consortium consisting of the State of California and the commuter rail operators of the corridor, to replace the JPA.

- o Establish an Amtrak California regional office.

H.5 Los Angeles-Santa Barbara Passenger Train Service.

Senate Bill 2446 created the Los Angeles-Santa Barbara State Rail Corridor Study and established the Southern California Regional Intercity State Rail Corridor Study Group. The director of the Department of Transportation designated the Chief of the Division of Mass Transportation to be the chairperson of the group. The following each appointed representatives to the group:

1. The Southern California Association of Governments
2. The Los Angeles County Transportation Commission
3. The Ventura County Association of Governments
4. The Santa Barbara County-Cities Area Planning Council
5. The Orange County Transportation Commission
6. The Riverside County Transportation Commission
7. The San Bernardino Associated Governments
8. The National Railroad Passenger Corporation (Amtrak)
9. The Southern Pacific Transportation Company
10. The California Labor Federation
11. A joint appointee of the Assembly and Senate Committees on Transportation

The purpose of this study was to develop a program of incremental upgrading of service in the corridor between Los Angeles and Santa Barbara and to conduct a separate, comprehensive and accelerated study of a commuter rail service from Los Angeles to Oxnard/Ventura, serving the San Fernando and Simi Valleys. A report was due to the Legislature not later than August 15, 1988 regarding the Valley commuter service, with the report on the entire corridor due on June 30, 1989.

The bill appropriated $150,000 from the Transportation Planning and Development Account to the State Department of Transportation (Caltrans) to be available on a matching basis with funds from nonstate sources. With an additional $ 150,000 local match available from planning agencies and cities along the corridor, the total cost for the study was $ 300,000.

A consultant was selected, comprising the team of Wilbur Smith Associates in

conjunction with Morrison-Knudsen Engineers, Hill International, Arthur Bauer & Associates, and Sharon Greene & Associates. A Technical Advisory Committee was formed for the Phase I study, with representatives present from SCAG, Caltrans, the LACTC, Los Angeles County, VCAG, the Cities of Los Angeles, Glendale, Burbank, Simi Valley, Oxnard, and Ventura, the Southern Pacific Transportation Co., and the offices of State Senators Robbins and Davis. In addition, the Cities of Santa Barbara and Lompoc were represented on the Technical Advisory Committee during Phase II.

Phase I of the study, the Early Action Program for commuter rail development, was completed and a draft report delivered to the State Legislature on August 15, 1988 (2). Phase I study findings were as follows:

- A starter service consisting of two daily, peak hour round trips would permit 3600 daily riders to be carried. This service could be initiated by 1990. Push-pull operation would permit the most efficient operation.

- Existing Amtrak station facilities at LA Union Station, Glendale, and Oxnard can be incorporated into the commuter rail operation. In addition, the Caltrain stations at Burbank Airport, Van Nuys/Panorama City, Chatsworth, Simi Valley, and Moorpark can be utilized with a minimum of upgrading. There is room to install two new stations at Northridge and Camarillo.

- Significant track and signaling improvements would be needed to avoid interference with freight traffic and other passenger trains.

Study recommendations for commuter rail development were:

- Implement a starter service with two daily round trips and 10 station stops.

- Provide additional station parking, particularly at Burbank Airport and Oxnard.

- Provide dedicated feeder/distributer bus services at Burbank Airport and in the LA CBD.

- Implement a track and signaling improvement program, including passing sidings every 10 miles, and centralized traffic control (CTC).

- Designate a bi-county joint powers agency (JPA), involving Los Angeles and Ventura Counties, as the operating entity for the commuter service.

Assuming that all-new rolling stock were purchased, the capital cost of an Early Action Program to initiate commuter service from Los Angeles to Ventura County would be $ 47 million. However, in the event that 10 gallery cars could be borrowed from the Peninsula Commute Service, and rehabilitated engines were used, the initial cost could be reduced to $ 28 million.

As a supplement to the Phase I study, extension of commuter service beyond Oxnard to the nearby City of Ventura was investigated. The 10-mile extension

would require an additional $ 2 million in capital costs, and would make it possible to take advantage of the huge Ventura County Fairgrounds parking lot for park-and-ride access. Additionally, non-work trip potential would be increased, as the station site would be convenient to beach parks and hotels.

The Phase II study considered the improvements needed to provide four Amtrak round trips (primarily San Diegan extensions) from Los Angeles to Santa Barbara (3). Concurrently with the Phase II study, the feasibility of providing commuter service to Warner Center in the San Fernando Valley was investigated. This would use the section of the SP Burbank Branch between Chatsworth and Woodland Hills.

The following were Phase II findings:

- The new San Diegan round trip extended from LA to Santa Barbara has been an immediate success, carrying passengers at a rate of 180,000 per year; and in 1995, between 434,000 and 518,000 annual trips would be carried on this northern coastal corridor section.

- Extension of the train service to Goleta is feasible; however, a further extension to Lompoc and the Santa Ynez Valleys would be provided more effectively by dedicated bus feeder service, at the present time.

- Track and signaling improvements would be needed to avoid interference with freight operations and other passenger trains along the entire line between Los Angeles and Santa Barbara, and for higher speed operation--raising the maximum speed from 70 to 79 MPH and eliminating various speed restrictions in lower speed sections.

A capital improvement program for expansion of intercity rail service to Santa Barbara would cost $ 85 million, including station improvements, new stations, rolling stock and storage/maintenance facilities, and track and signal work (including the track and signalling improvements already identified in Phase I, from Ventura County to LA).

Phase II study recommendations were as follows:

- Improve intercity rail passenger service from Los Angeles to Santa Barbara by extending a second LOSSAN corridor train as soon as equipment can be made available, and expand the service to four daily round trips by 1995.

- Provide additional siding improvements, double tracking, other trackwork, and signaling improvements including centralized traffic control (CTC) to improve the reliability of service between Los Angeles and Santa Barbara.

- Implement capital projects to improve running time on the corridor, and minimize station dwell time at LAUPT.

- Replace jointed rail sections of the track with continuous welded rail (CWR) to improve ride quality.

- o Provide additional intercity stations, including Goleta, and consider relocating the Simi Valley and Van Nuys (Panorama City) stations; provide a bus link to Lompoc.

- o A Memorandum of Understanding (MOU) identifying the roles and responsibilities of the State and local agencies on the corridor should be executed.

H.6 Los Angeles-Saugus Commuter Rail Service.

A consultant study for LA County Supervisor Michael Antonovich on the feasibility of commuter rail service on the Southern Pacific Saugus Line was released in May of 1988. The study concluded that commuter service from Saugus in the Santa Clarita Valley to LA Union Station would be feasible. Intermediate station stops would be at Newhall, Sylmar, San Fernando, Pacoima, Sun Valley, Burbank, and Glendale. From Burbank south to the LA CBD, the service would operate over the SP Coast Line, which is the route followed by LA-Santa Barbara passenger trains (4).

It was estimated that a single commuter round trip from LA to Saugus would generate 700 to 1000 riders per day in 1988, assuming that the Coast Line (LA to Oxnard/Ventura) commuter service were also in place. However, if there were no Coast Line service, three round trips would be required from LA to Saugus, generating 1900 to 2500 boardings per day. Total capital costs are estimated at $ 40.3 million.

The same corridor was considered by the San Fernando Valley Citizen's Advisory Panel on Transportation Solutions, which presented its recommendations to the Los Angeles City Council on August 1, 1988. In presentations to the Panel, advocates for a San Fernando Road LRT route (which follows the Saugus Line right-of-way) indicated that there is a strong reverse commute movement by transit-dependent workers living in the East Los Angeles-Boyle Heights-Lincoln Heights areas to employers in the vicinity of Burbank Airport and along San Fernando Road. The panel recommended that the potential for establishing commuter rail service along this corridor be explored in the near term.

Detailed study of a Los Angeles-Saugus commuter rail service appears justified, including a possible extension beyond Saugus to Lang if warranted by increased growth along State Highway 14. This should include consideration of reverse commuting needs (bidirectional service) during peak hours, to provide employment access for transit dependent workers from East Los Angeles and nearby communities to the San Fernando Road Area, and the relation of such service to the Glendale Proposition A transit route (which parallels the proposed commuter line). It is assumed that the LACTC would be the lead agency on any further commuter rail study on this corridor, which lies completely within Los Angeles County.

Further, possible future Amtrak service to the Lancaster/Palmdale area may be worth investigation.

H.7 Los Angeles-San Bernardino Commuter Rail Service.

Commuter service between Los Angeles and San Bernardino has been promoted by Los Angeles County Supervisor Pete Schabarum (whose district includes the San Gabriel Valley), by State Senator Ruben Ayala from San Bernardino County, and by the San Bernardino Associated Governments. A recent consultant study for Supervisor Schabarum's office investigated both nine-station and 13-station alternatives, operating on the Santa Fe Second Subdivision (5).

The nine-station alternative would include intermediate station stops at Pasadena, Monrovia, Azusa, Glendora, Pomona, Upland, and Fontana; whereas the 13-station alternative would add stations at San Dimas, Claremont, Rancho Cucamonga, and Rialto. Two, three, and four round trips per day were considered; patronage would range from 4100 to 4900 riders per day in 1990 (depending upon the number of trains operated), increasing from 6900 to 8300 per day in the year 2010. Capital costs would range from $ 36.5 to 48.2 million, depending upon how many trains and stations were included.

The consultant study considered push-pull service with locomotive-hauled trains, but also suggested using modern railbuses of European design if an all-day service were desired on this corridor in the future.

Additional patronage forecasts were subsequently made by SCAG using Modified Baseline socio-economic data for the 13-station alternative, with four daily round trips. Model output indicated 8400 home-to-work trips on the commuter rail corridor in 1993 and 11300 in 2010. The majority of the riders would originate from San Bernardino, Rialto, and Fontana; about 50% would be destined for the LA CBD, and 20% bound for the City of Pasadena.

As the Santa Fe Second Subdivision is also under consideration for the Pasadena light rail line, it is possible that the commuter service would terminate in the vicinity of Pasadena, with a transfer to LRT. However, bearing in mind that the Red Cars once provided interurban electric railway service to San Bernardino, an alternative would be to operate hybrid diesel-electric cars that could run directly into the LA CBD on the Pasadena LRT line, or run fast light rail vehicles coupled to a diesel generator (locomotive) unit that can be detached upon arriving at the electrified territory in Pasadena. This subject is discussed in detail in Appendix J of this report.

Because the Second Subdivision is a candidate for public right-of-way purchase, there would be minimal freight interference, and all-day commuter service may be possible in the future. There are also numerous opportunities for joint development along this line (see Chapter 13 and Appendix I).

Before implementation of commuter rail on the LA-San Bernardino corridor can be considered, a detailed study will be needed of the kind of starter service proposed in the Alderon report, with at least four round trips per day between San Bernardino and the LA CBD. This should include consideration of alternatives for coordinating the commuter rail service with the Pasadena LRT line, and for incrementally upgrading the corridor. In the longer term, the potential for increasing levels of service, including more frequent peak hour trains, bidirectional operation, and off-peak commuter service, should be

addressed.

H.8 Los Angeles-Southern Orange County Commuter Rail Service.

The Los Angeles-San Diego State Rail Corridor Study, completed in June of 1987, recommended an initial increment of commuter rail service from the LA CBD to San Juan Capistrano in southern Orange County, with two daily round trips. Intermediate station stops would include Commerce, Pico Rivera, or Norwalk in Los Angeles County, and Fullerton, Anaheim, Santa Ana, North Irvine, Irvine, and Mission Viejo in Orange County, with an alternative terminus in San Clemente.

The capital cost for this commuter rail operation would be $ 61 million (this is included in the $ 246 million total capital program for the Los Angeles-San Diego corridor, described above). The commuter service, operating over the Santa Fe Railway's Third and Fourth Subdivisions, would take advantage of many of the station, track, and signaling improvements which would be made in any case to enhance intercity train service on the LA-San Diego corridor.

Further work in conjunction with a Southern Orange County-Los Angeles Commuter Rail Implementation Program would include at least the following elements:

- Determination of capital improvement projects required, including additional track, interlocking, and siding improvements.
- Investigation of a computer-aided train dispatching (CADS) system for the corridor.
- Station planning, including park-and-ride needs.
- Investigation of institutional issues, including trackage rights agreements, and possible JPA formation.
- For the longer-term, increased levels of commuter rail service, and improvements required to permit higher train frequencies, including a third track from Fullerton to LAUPT on the ATSF Third Subdivision.

H.9 Riverside-Orange County Commuter Rail Service.

A preliminary study has recently been conducted on the feasibility of commuter service from the City of Riverside to Irvine in Orange County. Two routes would be operated, with common end points. There would be four round trips per day, two on each route. One route would operate over the Santa Fe Third, Olive, and Fourth Subdivisions, and have three station stops in Riverside, two stops each in Corona, Anaheim, and Orange, and stops at Santa Ana and Tustin (6).

The other route would operate via Fullerton, on the Santa Fe Third and Fourth Subdivisions. This service would provide a stop in Placentia, two at Fullerton (including the Amtrak Station), and two additional stops in Anaheim. Using push-pull equipment, the trains would change direction in Fullerton on their way to Irvine during the morning peak hour (and vice versa in the afternoon). An option to the Riverside-Irvine commuter service is to extend the northern/eastern end of the line to San Bernardino.

Preliminary patronage forecasts indicate that 5300 riders per day would be carried in 1993, growing to 8500 by 2010. The total capital cost of this commuter service would be $ 78 million.

Further study of the Riverside-Orange County commuter rail corridor could include possible Amtrak service improvements in Riverside County.

H.10 Other Possible Routes.

An earlier Caltrans study (7) investigated the the following commuter rail alternatives:

- Extension the Los Angeles-San Bernardino commuter line using the ATSF Second Subdivision, south from San Bernardino to Riverside via the ATSF Third Subdivision.
- A Los Angeles-San Bernardino route via Ontario and Riverside, using the Union Pacific Second Subdivision.

Both routes are, however, heavily used by freight traffic.

An earlier SCAG study (8) mentions a number of candidate lines which might be considered for possible future passenger rail service (which could be commuter or intercity rail):

- The SP La Habra Branch to East Whittier, La Habra, and Brea.
- The ATSF Third Subdivision from L.A. to Riverside and San Bernardino.
- The SP Alhambra Line/Baldwin Park Branch from LA to San Bernardino.
- The Santa Fe San Jacinto Subdivision from Riverside to Perris.
- The ATSF Redlands Subdivision and SP Redlands Branch.
- The SP Yuma Line to West Palm Springs.

It was felt that many of these routes were either too heavily congested with freight traffic, were not designed for a major rail passenger operation, or would require very considerable upgrading.

A previous study of passenger service on the LA-Santa Barbara corridor (9) considered the possible use of the SP Santa Paula Branch, routing service north from Burbank to Saugus, and thence to Ventura via Fillmore and Santa Paula. As much of the Santa Paula Branch has been abandoned, development of commuter rail service on this corridor would probably be limited to short extensions of other routes at the eastern and western ends of this right-of-way.

Since considerable growth has been projected in Riverside and San Bernardino Counties, and highway traffic congestion is worsening on many corridors in the urbanized portions of the SCAG region, some of the above-mentioned railroad corridors may be worth reconsidering for transit or commuter rail service in the future, once higher-priority commuter rail routes are implemented. It should be noted, for instance, that the Riverside-Irvine County commuter study examined service from Riverside to Fullerton. Since there is also interest in a Los Angeles-southern Orange County commuter line, there may very well be potential

for direct Los Angeles-Riverside commute service on the ATSF Third Subdivision.

In particular, now that the voters in Riverside County have approved a half cent sales tax to finance transportation improvements in that county (including commuter rail), Riverside County has become especially interested in a commute or LRT service from Hemet and Perris to Riverside. It may also be possible to extend such a line north to San Bernardino, over the Southern Pacific.

H.11 Overall Commuter Rail Issues.

The following issues are common to all proposed new commuter rail services:

- It is essential that freight traffic, intercity passenger trains, and commuter rail should not interfere with each other. This will require track and signaling improvements, including: upgrading of passing sidings, double track and crossovers as necessary, and centralized traffic control. Otherwise the service will be unreliable and unattractive to commuters.

- It is necessary to have adequate station parking. Commuter rail operations in other cities rely very heavily upon park-and-ride.

- Adequate feeder/distributor systems are required. This includes re-routing of existing transit bus lines to serve commuter rail stations, employer-provided shuttles, scheduling buses to meet arriving AM peak commuter trains, and interface with the emergent light rail/ rapid transit/transitway systems in Los Angeles and Orange Counties.

- A number of institutional issues need to be resolved in each case. These include the question of establishing a Joint Powers Agency (JPA) or other vehicle for planning and implementing the service, designation of an operator, and the question of ownership of stations, parking lots, and other facilities.

- It is essential that agreements be worked out with the host railroad, on whose tracks the commuter service will operate, with regard to trackage rights and trackage fees, maintenance, liability and indemnification; or that right-of-way be purchased, as an alternative.

- Financial issues need to be resolved. Most commuter rail funding comes from local sources, which may vary from county to county. However, state funds may be available and federal funding may also be possible, particularly where Amtrak and commuter trains will share the same track.

H.12 Additional Considerations.

In addition to recommendations made above for further, detailed studies of specific corridors, the following considerations apply to many or all of our potential commuter rail corridors:

- The role of Los Angeles Union Passenger Terminal (Union Station) needs to be assessed with respect to future commuter rail development. This

will require a study of capacity to handle intercity passenger traffic as well as commuter trains from Ventura, Saugus, San Bernardino, and Orange County, adequacy of rail access to the facility, availability of nearby storage and maintenance facilities, other transit connections, and relationship to City development plans for the Union Station area. It is assumed that the LACTC will be the lead agency in such a study.

- o In the longer term, the concept of a regional rail network should be studied, providing improved connectivity between urbanized areas of Ventura, Los Angeles, San Bernardino, Riverside, and Orange counties. This should include investigation of bi-directional, all-day service, and filling in gaps in the network as necessary to form an integrated network with light rail, rapid transit, and other higher-capacity transit corridors planned in the urbanized parts of the SCAG region.

  It follows that eventual electrification, and through service which would provide a direct connection (without changing trains) between regional centers on either side of the LA CBD, would be possible. This would be similar in concept to Philadelphia's Center City Commuter Connection, which has allowed most commuter trains originating from one suburban area to continue through the center city to a suburban destination on the other side of the CBD.

- o In relation to establishment of such a regional rail system, the feasibility of creating a regional Joint Exercise of Powers Agency, which could implement commuter rail service and improvements for the five-county urbanized area, merits further study. Such a JPA would if established:

  - Plan rail corridor services and facilities
  - Seek, package, and negotiate funding from local, regional, State, and Federal sources
  - -Acquire, hold, or dispose of property along rail corridors; thus facilitating right-of-way acquisition
  - -Implement proposed improvements for corridor services and facilities
  - -Negotiate with rail carriers
  - -Provide for the pooling of locomotives, cars, and maintenance facilities
  - -Procure necessary insurance, and facilitate self-insurance

  Having a regional JPA could streamline the process of establishing and administering a number of commuter rail services within the SCAG region, all of which will face many of the same problems. However, there are other institutional mechanisms for providing commuter rail service. It goes far beyond the scope of this report to recommend a specific framework for initiating commuter rail service in the SCAG region.

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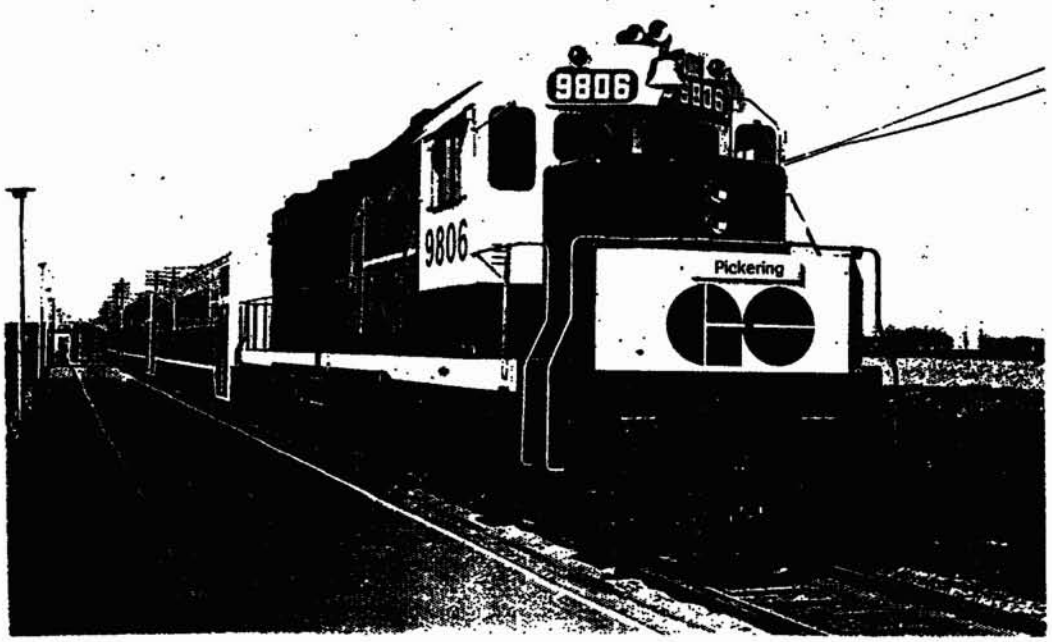
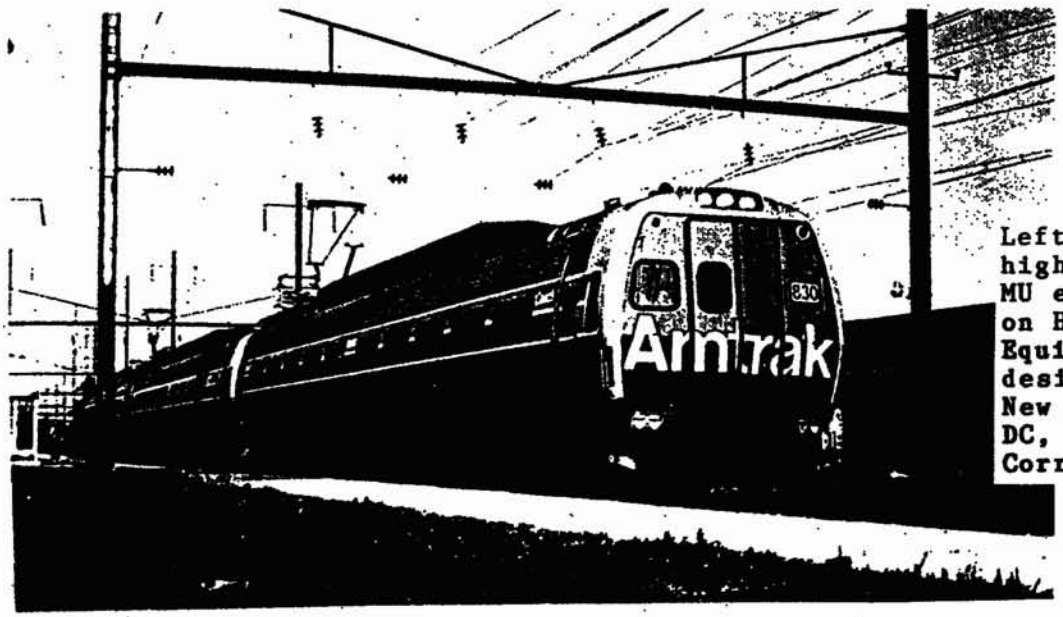
REPRESENTATIVE COMMUTER RAIL OPERATIONS



Above: GO Transit push-pull service with single-level coaches.

NORTHEAST CORRIDOR ELECTRIFIED INTERCITY TRAIN SERVICE



Left: Metroliner high-speed electric MU equipment, here on Harrisburg run. Equipment was designed for the New York-Washington DC, Northeast Corridor service.

APPENDIX I

DETAILED LAND USE ON THE SANTA FE SECOND SUBDIVISION

Prepared by: Peter S. Behrman

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

May 24, 1988

DATE: May 24, 1988
TO: Subject File
FROM: Peter Samuel Behrman
SUBJECT: REVISED R-O-W EVALUATION, FIELD SURVEY RESULTS:
SANTE FE SECOND SUBDIVISION,
LOS ANGELES-SAN BERNARDINO

Field work for the Focused Right-of-Way Evaluation was conducted on Friday, January 29; Thursday, March 17; Friday, March 18, and Monday, March 21, in an area stretching from L.A. Chinatown on the northern border of downtown Los Angeles, to the end of the AT&SF Second Subdivision in downtown San Bernardino. This is a very large area as the line itself is about 60 miles long. Thus, for ease of study and explanation, I have broken it up into a number of subareas which are described below.

Los Angeles (Chinatown)

This area runs from Vignes and Main Streets just north of the Terminal Annex Post Office and Los Angeles Union Passenger Terminal (LAUPT) north to the Los Angeles River. Two tracks lead from the south into the Bullring/Cornfield railroad yard which accounts for almost all of the railroad right-of-way (R-O-W) in this section. At about 54 acres, it is a large area with major pieces of open land not directly used in railroad operations at present. This land contains old platforms that seem to have once been covered with roofs and used as temporary storage or loading/unloading sheds. With the extensive commercial development of Chinatown along Broadway, 1/2 block to the west, the excess yard land could be redeveloped for major commercial uses. In the far distant future when the surrounding land becomes valuable enough to justify air rights development, the entire yard area could be covered and made available for high intensity development.

To the east of the yard, are industrial structures whose condition varies. Some appaer to be rather run down and lightly used while others seem well kept up and are bustling with activity. Included in the later category is a Carnation Dairy Plant at Spring and Mesanger Street and a number of commercial art studios in newly rehabilitated warehouses along Spring Street near the Los Angeles River.

Approximately 1/2 mile to the west of the Railroad yard is Dodger Stadium which might justify the placement of a passenger station in the vicinity, perhaps for use on a seasonal basis.

Los Angeles (Mt. Washington/Highland Park)

At the Los Angeles River the rail yard ends and the tracks

separate into the Southern Pacific Coast Mainline northwest to Burbank and the San Fernando Valley and the Sante Fe Second Subdivision northeast to Pasadena.

Following the Second Subdivision across the L. A. River into the Mt. Washington and Highland Park districts of Los Angeles, the tracks narrow to one but the right-of-way (R-O-W) remains wide enough for one or two additional tracks. From the bridge over the River to Avenue 36, with the exception of a grade crossing at Avenue 33, the railroad is grade separated with the bridges wide enough for at least two tracks. North of its crossing of Figueroa Street, the railroad runs along a street called Marmion Way. While this potentially leaves it open to pedestrian trespass with the resulting safety problems, it provides very good accessibility to the apartments, homes, and the Southwest Museum which it passes. The right-of-way is wide enough for two tracks in this direction and with R-O-W fencing and closure of some of the most minor streets, trains could achieve reasonably fast operating speeds through this area. The railroad is also less than one block from the community commercial district along Figueroa Street which makes it a good site for a passenger station; possibly at Marmion Way and Avenue 54. This would have to be a community station served principally by feeder buses and walk-on traffic as there is very little room for passenger parking. However three SCRTD bus lines pass within one block of this location with a high frequency of service.

Most of the railroad crossings in this area are protected with crossing gates.

The southern end of the Mt. Washington/Highland Park district, near the L.A. River where the railroad R-O-W is grade separated, is an industrial area similar to the area south of the river described in the preceding section. However, such land uses end about where the line first crosses the Pasadena Freeway, thus constituting a small part of the district.

The first significant narrowing of the R-O-W occurs at the bridge over the Pasadena Freeway near Avenue 61.

<u>South Pasadena & Pasadena</u>

The railroad R-O-W widens again to two tracks from Monterrey Road to Orange Grove Avenue in South Pasadena; a distance of about 2/3 mile. From Orange Grove Avenue the R-O-W narrows again to only one track and remains single-tracked all the way to Del Mar Avenue in Pasadena. However, all through South Pasadena and Pasadena the track roadbed and R-O-W is free of debris, has clean ballast and is generally in excellent condition. Additionally, the R-O-W is grade

separated from Fremont Avenue in So. Pasadena to a point just north of the boundary with Pasadena. Further, the R.R. bridge over the Pasadena Freeway at Fremont Avenue is wide enough for two tracks. Where at-grade crossings exist, they are all protected by crossing gates and many have soft-ride (rubberized) grade crossings where the roadway goes over the tracks.

Land uses along the R-O-W in South Pasadena are primarily low and medium density residential; the latter being primarily two and three story garden apartment buildings. However, small office buildings occupy the area between the R-O-W and Fremont Avenue.

In Pasadena, almost all of the structures adjacent to the R-O-W are warehouses or similar light industrial buildings south of the railroad station while north of the station, retail commercial, institutional and office buildings line the R-O-W. In the station area approximately 1 1/2 to 2 blocks of vacant land exist which are prime candidates for development for high intensity commercial or office uses. Such development should also include parking for train users although the land may be too valuable to provide more than a limited number of spaces for commuters. Because of the close proximity of Pasadena to downtown L.A., its continuing development as a major work destination itself, and the substantial amount of bus service in the area, designation of this station as a park and ride facility may not be necessary.

From downtown Pasadena to the city's border with Arcadia, the railroad is located in the median of the 210 Freeway. The R-O-W is thus fully grade separated and protected from infringement by autos and pedestrians. There is only one track at present but the R-O-W is wide enough for at least two. The length of R-O-W within the 210 Freeway is about seven to eight miles and it extends into Arcadia. Because of the lack of stations and cross traffic and the straightness of the route, this section would be a good place for future trains to achieve high operating speeds. Further, due to the severe peak hour congestion of the freeway (I observed stop and go traffic along the 210 Freeway from downtown Passadena to well past its intersection with the 605 Freeway in the period between 4 and 5 PM), a commuter rail service along this route should attract many commuters now using the parallel freeway.

Arcadia, Monrovia, and Duarte

This section traverses the three San Gabriel Valley communities just west of the San Gabriel River. Most of the railroad R-O-W in Arcadia is located in the median of I-210 as mentioned above. However the R-O-W leaves the Freeway

about 1/2 mile west of Santa Anita Avenue where it remains wide and grade separated. The crossing of Santa Anita Avenue is at grade but is protected with crossing gates. At Huntington Drive, the railroad is again grade separated from the street but the R-O-W narrows to only one track width just past Huntington Drive at the border of Monrovia.

The distance from Santa Anita Avenue to Huntington Drive, approximately 2/3 mile, is characterized by a wide R-O-W containing two tracks. This is the area of the Arcadia commercial district and the former site of the Arcadia railroad station. The station site contains vacant land which, given its proximity to downtown Arcadia, could be a good candidate for joint commercial development. While land for parking directly at the station site is limited there is a considerable amount of vacant land about a block away that would be suitable for this purpose.

Old single family residences border the railroad in the far western end of Monrovia but this rapidly give way to medium density three story apartment buildings near Duarte Road and Myrtle Avenue. Myrtle Avenue contains the Duarte central business district and is the site of the still standing Duarte railroad station. While presently closed, the station is still standing and with some rehabilitation this Spanish style building could be a significant landmark for the area.

The R-O-W may be wide enough for two tracks along Duarte Road but contains only one at present. The railroad bridge over Sawpit Wash near the Monrovia-Duarte border is definitely adequate for two tracks.

Light industry and warehousing flank the railroad line along Duarte Road in both Monrovia and Duarte. In Duarte the industrial structures are newer, with many apparently constructed only in the last few years. Further the railroad R-O-W in Duarte is landscaped and shielded from Duarte Road by tall hedges. As the railroad passes under the I-210/605 interchange adjacent to the San Gabriel River it enters an unincorporated area of Los Angeles County.

<u>Unincorporated L.A. County, Azusa, and Glendora</u>

The portion of unincorporated L.A. County traversed by the Santa Fe Second Subdivision where it crosses the San Gabriel River is largely occupied by the Santa Fe Flood Control Basin, part of which has been designated the Santa Fe Dam Recreation Area. As such, the adjacent land is effectively vacant so that no right of way protection or width limitations exist here.

At the border with Azusa and continuing almost to the center of the city, is a major industrial area with tenants such as

Aerojet General and the Wynns Corporation (lubrication products). The railroad again crosses the 210 Freeway in Azusa with a wide bridge that would easily allow for additional tracks. Track spurs to serve the adjacent industries are also located in this area. At Virginia Street, just before the railroad bridges over Foothill Boulevard, the number of tracks reduces to one, but it again expands to two less than 1/2 mile away at San Gabriel Avenue in downtown Azusa. A small railroad station is still standing in Azusa which could be reopened and used for commuters. Within a block or two of the station are old warehouses and single family dwellings, but a sign in the area proclaims that the city's Public Works Department is undertaking a project there. Thus the Area may be in line for renewal. Only a block further however, the railroad R-O-W is bordered by new apartment buildings followed by a large new industrial park extending to the city line.

While the number of tracks in Azusa reduces to one in the eastern third of the city, the R-O-W continues to be wide enough for at least two tracks. Further, for much of its length it is either grade separated or protected by crossing gates.

The railroad enters Glendora as a one track facility passing just to the north of Citrus College. However, it widens to three tracks at Grand Avenue. While the number of tracks varies as the railroad crosses the city, the R-O-W remains very wide throughout.

There is considerable vacant land along the R-O-W in Glendora including the site of the former railroad station. Some of this land could be easily developed while the remainder, currently in agricultural use, may be subject to development restrictions.

The R-O-W parallels Alosta Avenue in eastern Glendora which means that it is adjacent to considerable commercial development on its south side. Single family residences border the R-O-W to the north. While, as stated above, the railroad R-O-W is generally very wide throughout the city, there has been R-O-W encroachment in a small area east of Lone Hill Avenue.

<u>San Dimas, La Verne, Pomona, and Claremont</u>

The eastern end of Los Angeles County is characterized by generally upscale middle class residential communities that are experiencing rapid growth. Thus, for example, the railroad R-O-W in San Dimas is bordered by new apartment and commercial buildings, especially where it runs close to Bonita Avenue. The R-O-W is very wide throughout the community. The San Dimas railroad station is still standing

and in good repair but it is currently used as a Senior Citizen's Center and the location for the Chamber of Commerce. Ostensibly new locations for these facilities could be found, but the cost may have to be born by the buyer-user of the station. The station is in the middle of the city's commercial district on Bonita Avenue and there is little land for parking or extensive railroad joint development. However, one block east of the station is a large amount of open land which would be suitable for commuter parking as well as future development.

In the eastern half of San Dimas and almost all of La Verne, the railroad runs along the north side of Arrow Highway. The San Dimas portion is bordered by new apartments, a shopping center, and a new industrial/business park. The La Verne portion gives way to considerable open land, much of which however is signed for sale for light industrial uses. In the middle of La Verne, the railroad passes along the southern boundary of the University of La Verne.

The railroad R-O-W in both of these towns is quite wide and probably suitable for double tracking. At about White Avenue the R-O-W widens considerably where the Southern Pacific Baldwin Park Branch joins the Santa Fe Second Subdivision. This very wide R-O-W continues through Pomona and most of Claremont, a distance of about 3 1/2 miles. At White Avenue in La Verne the railroad is only about 1/10 mile from the Pomona Raceway with its very large parking lot. South on White Avenue another 1/10 mile (2/10 miles from the R.R. R-O-W) is located the Pomona Fairgrounds with its very extensive parking facilities. In fact, the Fairgrounds parking areas are presently used as a major park-and-ride location for SCRTD express buses to downtown Los Angeles. Perhaps these facilities could be combined with a commuter rail station to yield a major intermodal transfer facility.

The short section of railroad in Pomona is bordered by new light industrial structures which give way to single family residences in Claremont. The railroad station in Claremont is still standing but is closed. However, it is a beautiful building surrounded by a well kept park and new office buildings. The station should definitely be preserved and reused. Because of the relatively high building density and narrow street "village" character of downtown Claremont, there is little room for station parking or additional development. However, about 4-5 blocks to the east, just past the Claremont Colleges, there is a large area of vacant land. This parcel could be jointly developed by the railraod station users and the adjacent college for parking and other uses. (The railroad passes along the southern edge of the Claremont Colleges). Tying this property to the railroad station may be a challenge but it can be done, either through

a series of innovative developments with an internal transportation system (i.e. moving sidewalk, etc.), though a conventional bus or tram shuttle, or through construction of a new station at the site and non-railroad related reuse of the existing station.

Montclair and Upland

The railroad enters San Bernardino County and the City of Montclair as a one track line but with enough R-O-W for at least two tracks. While there is presently no railroad station in Montclair, the intersection of the railroad with Central Avenue would be a good location for one. There is vacant land here suitable for parking and new development although the area is developing very fast and the land will probably not remain vacant much longer. At this point the railroad R-O-W is less than 1/2 mile from the Montclair Plaza Shopping Center which, aside from being one of the largest such centers in the region, is also a major park-and-ride facility for SCRTD express buses to downtown Los Angeles. The center is also served by Omnitrans, the public bus system for western San Bernardino County. In addition to Montclair Plaza, many smaller shopping centers line Central Avenue between the Plaza and the railroad. Thus, this is an area with significant potential for major joint development projects that would not only tie together existing and future commercial development in the area with the railroad, but would also reinforce each other by providing passengers for the commuter rail line, and rail access to the area.

About 1/2 mile past Central Avenue, the railroad enters Upland on a single track. However, as with Montclair, the R-O-W remains wide enough for two tracks. Development along the R-O-W in Upland is new and comprises shops, offices, and residences. There is one very interesting office complex which is comprised of refurbished railroad cars on tracks grouped around a replica of an old railroad station.

Just past Euclid Avenue in Upland the one track widens to three in front of the Upland Railroad Station. While no longer used as such, the building is in excellent condition and is being rented by a furniture store. However, it is still owned by the AT&SF as signs on the building proclaim. The railroad station anchors a very nice downtown shopping mall created from Second Street. While space for parking and future development at the station is limited, there is a semi-paved area about two blocks east, now used for truck and car parking, which may also be available as a parking area for future station users.

The multi-track section of the railroad in Upland ends at about 11th Avenue, a distance of about 2/3 mile from the station, but the R-O-W remains very wide. New apartment

buildings flank the north side of the railroad at the eastern border of Upland while there is a good chunk of open land to the south.

Rancho Cucamonga and Unincorporated San Bernardino County

Apartment buildings and single family home developments border the railroad as it enters Rancho Cucamonga. There is also plenty of vacant land interspersed with small pockets of older industrial sites. However, on both sides of the R-O-W in Rancho Cucamonga, the vacant land is fast being turned into major housing and commercial developments. Large "new towns", such as Victoria and Heritage, are within a short distance of the railroad. With prices as low as $120,000 for a three bedroom house, this area is attracting many families from Los Angeles County. In fact, many of the workers in these households probably commute to downtown Los Angeles and beyond and thus form a large pool of potential users of a commuter rail service in this area.

The Rancho Cucamonga railroad station at Archibald Avenue while presently closed could be minimally rehabilitated for use by future commuter rail patrons. Some vacant land exists around the station for parking and future development. Additional land could eventually be made available through redevelopment of the scattered older industrial and single family parcels in the area. Nearby is a newer industrial park as well as an abandoned winery. The winery buildings are presently in partial use as a furniture showroom. The buildings apapear to be in reasonably good condition and have a lot of character. With rehabilitation, they could form the nucleus of a major commercial, business, light industrial, and perhaps even multiple unit residential project which could be tied into development of the railroad property.

Approximately 2 1/4 miles south of the railroad station on Archibald Avenue, is the Ontario Airport passenger terminal. Through the use of a shuttle bus connector, the railroad line could provide high speed access east to Ontario Airport from downtown Los Angeles and the San Gabriel Valley as well as commuter service west to L.A.

From the Cucamonga Station to Haven Avenue, a distance of approximately 1 mile, the railroad R-O-W contains two tracks although one is apparently not being used and is in poor condition. Considerable open land exists in this area although there are also scattered parcels of industrial buildings.

Freight activity is also currently being maintained along this section of the railroad as two freights were observed during the field work. A long TOFC (Trailer On Flat Car) train passed Vincent Avenue (near Haven Avenue) in Rancho

Cucamonga at 11:17 AM, while another freight was spotted at Benson Avenue (in the area of the former Kaiser Steel plant) at 11:40 AM. (The latter was a short train; probably a switcher movement.)

The I-15 bridge over the Second Subdivision R-O-W provides horizontal clearance for at least two tracks and the R-O-W continues to be very wide for some distance past the Freeway into the unincorporated part of San Bernardino County. Where the railroad passes the old Kaiser Steel plant in this area there are many track spurs. The plant site is being redeveloped into an industrial park and these spurs, which formerly served the steel mill, now prove alternative modal access to the new industries. Beech Avenue, the main street in this area, passes over the railroad providing a grade separation. From this point approximately 1 mile east to Beech Avenue, the R-O-W contains 4 to 6 tracks and is very wide. From Beech Avenue to the Fontana city line at Citrus Avenue, the line reduces to two tracks. In this eastern section of the unincorporated area the railroad line is flanked by open land with scattered pockets of older single family dwellings.

Fontana and Rialto

The railroad passes through the cities of Fontana and Rialto as a single track facility but the R-O-W is very wide with room for 2-4 tracks. Most of the surrounding land uses are industrial but there are apartment and single family housing developments as well. There is also a large amount of vacant land especially in the western half of Rialto (from about Maple Avenue to near the city center on Riverside Avenue.)

The single track expands to two at the site of the Rialto railroad station (no longer standing) but reverts to one a short distance thereafter. There is sufficient land at the former station site for parking and future development tied into the railroad R-O-W. The area surrounding the railroad track in eastern Rialto is mainly characterized by older single family dwellings.

(City of) San Bernardino (Western area)

The Santa Fe Second Subdivision terminates in San Bernardino. The railroad R-O-W narrows to only one track width as it passes into the western end of the city and the Southern Pacific Railroad Bridge, which crosses over the AT&SF at Rialto Avenue, has only enough horizontal clearance for one track under it. However, this narrow R-O-W section is only about 1 1/2 miles long. The R-O-W expands considerably just east of Rancho Road.

Much of the land in this far western portion of the city is

vacant.

(City of) San Bernardino (Central area)

East of Rancho Road, the Second Subdivision ends where it joins the AT&SF Third Subdivision coming up from the south and the First Subdivision to the east. At this point the combined R-O-W widens into a large railroad yard and repair facility. Also located here is the main railroad station for San Bernardino. Because of the size and location of this major railroad facility, it presents one of the highest potentials in the study area for joint urban/transportation development of an existing railroad and surrounding property.

This property (including the existing railroad passenger station) is adjacent to downtown San Bernardino. However, an elevated Freeway, built on fill, separates the property from the downtown shopping area. The latter has seen considerable renovation in the last few years with the construction of the Central City Mall. The Mall contains an elegantly restored downtown department store, Harris', at one end and a new Montgomery Ward store as the anchor on the western end. As a regional shopping center, this mall seems to be about half the size of the largest regional centers. Thus, if expansion to a super regional mall were contemplated, a westward expansion could link the existing downtown area to new development around the railroad station and yards.

To accomplish such an expansion however, two obstacles may have to be overcome. One is the barrier created by the I-215 Freeway and the other is the existence of the Inland Shopping Center, a major retail mall with at least two department stores, less than 1.5 miles away. The first obstacle could be overcome by either reconstructing the I-215 freeway segment in front of the mall or extending the mall above or below the freeway. Overcoming the second obstacle depends on the growth of the market area. While the SanBernardino-Riverside area is expected to be the fastest growing part of the SCAG Region, whether downtown San Bernardino will be able to support a significant growth in retail activity is a question that must be posed to economic and market analysts. If it can, this could provide a significant anchor to a major mixed use development of the Santa Fe and adjoining properties. Such a development could in turn provide ridership and operating subsidies to a commuter rail service originating at this point.

As mentioned above, the railroad property in this area is large. It begins at I-215 and extends west, approximately 1.4 miles to Flower Street. The yard trackage itself extends about one mile from I-215, while the remainder is mostly vacant land. A major street, Mount Vernon Avenue, passes above the middle of the property on a viaduct. From

I-215 to Mount Vernon Avenue, Fifth Street forms the northern boundary of the property. This is the major east-west street in the city and is also designated State Route 66. (Fifth Street becomes Foothill Boulevard as it goes west into Rialto and retains that designation all the way into Los Angeles County.) The tracks actually end at Fourth Street with the block from Fourth to Fifth Streets taken up by the Santa Fe Railroad Repair Shops. It was not possible to tell from a windshield or walking survey, how busy the shops presently are. If all of the property is not presently being used for that purpose it might be made more valuable by its redevelopment to other uses. If it is redeveloped, care should be taken to keep and reuse historic structures, such as an old roundhouse, which would add character and uniqueness to future market oriented projects.

The distance from Fifth Street to Viaduct Boulevard, the southern boundary of this half of the property, is approximately .3 mile while from Viaduct Boulevard to Second Street is .1 mile. Second Street is a major east-west street on the south which also forms the southern boundary of the Central City Mall. The property between Viaduct Boulevard and Second Street is either vacant, or contains structures that are in generally dilapidated condition, although there is a small shopping center in this area just south of the railroad station.

West of Mount Vernon Avenue it is difficult to gauge the amount of railroad property, although it seems extensive. A line just north of Rialto Avenue seems to form the southern boundary, with old residential units bordering Rialto Avenue and the west side of Mount Vernon Avenue. (Rialto Avenue is also a major regional highway whose name changes to Arrow Route [Highway] west of the city of Rialto.) From Fourth Street south to one block north of Rialto Avenue is a distance of approximately .35 mile while from Mount Vernon Avenue to Flower Avenue is about .75 mile. Thus, the approximate area of the railroad property in the eastern half is .2 square mile, and in the western half .25 square mile for a total of .45 square mile or about 12.5 million square feet. Of course these numbers are very rough approximations but they do provide an order of magnitude and point out the considerable amount of developable land at this site.

West of the yard area, existing development drops off rapidly with a predominance of residential development in a semi-rural setting. East of the site is the Central City Mall followed by the City and County government Buildings. There appears to have been major redevelopment of the downtown area in recent years and it seems to have been very well done. They have done an excellent job of integrating new buildings with the old and retaining a compact, pedestrian character to the downtown. While the I-215

Freeway does sever the central business district from the railroad station area, its Second Street interchange provides very good regional highway access to both areas. In addition the Second Street interchange is only about 2 1/2 miles from the I-215/I-10 interchange, providing major east-west regional highway access as well.

Thus the Santa Fe and surrounding property in San Bernardino provide very good potential for future development in conjunction with the initiation of commuter rail service from here to downtown Los Angeles.

Conclusions

While, because of its approximately 60 mile length, the characteristics of the Santa Fe Second Subdivision railroad line change from area to area, there are a number of general conclusions that can be drawn. First, the right-of-way (R-O-W) is in generally good condition and can probably maintain commuter rail service of at least average speed at present. However, track upgrading may be needed to achieve higher than average speeds.

Second, most of the R-O-W is quite wide (perhaps more than 75%-80%) so that a high level two-track service may be possible without the necessity of acquiring much additional right-of-way. This is an extremely fortunate occurrence as R-O-W acquisition is probably the costliest part of public transportation facility development in urban areas.

Third, significant sections of the line are grade separated (perhaps 20%-25%) which allows for safer operations in general and safer high speed operation in particular. Most of the railroad crossings that are not grade separated are protected by crossing gates and many have rubberized "soft ride" grade crossing treatments.

Fourth, most of the former passengers stations that are not currently open and in use by Amtrak for passenger operations are still standing and are, in most cases, attractive landmark structures. Rehabilitation and use of these structures for a commuter rail service will identify the new train operations with those of the past. This gives them a better sense of permanency and route identity important to potential passengers and track-side developers who worry about the staying power of a new service. Use of the existing stations will also create landmarks for the local communities in which they are located. That, in turn, should provide greater stimulus to those communities to participate in development and redevelopment efforts in, around, and nearby the railroad right-of-way.

Fifth, the Second Subdivision R-O-W passes through one of the

fastest developing areas of southern California and the country. Further, because new housing prices in this area are among the lowest in the region, it is attracting many long distance commuters who work but cannot afford to live in areas along the Second Subdivision line closer to the regional center. The parallel I-10 (San Bernardino) and I-210 (Foothill) Freeways are already badly congested during the peak travel periods with sections of stop-and-go traffic extending for many miles. Additionally, approximately half of the study area is without the Foothill Freeway as construction of it east of La Verne is still many years in the future.

Lastly, freight traffic on this line has continued to decline and would not be a significant impediment to the developemnt of extensive future passenger train operations. In fact, if a public entity were to buy the line, freight traffic could be restricted to the late night hours when there are few or no passenger trains, as is done in San Diego.

Thus, based upon the field observations and the resulting conclusions above, there appear to be many positive reasons for giving serious consideration to the development of passenger train service on the Santa Fe Second Subdivision. Further, such a service could not only fulfill mobility objectives but urban development and regional urban form objectives as well.

PB:pb

cc.: G. Hicks
A. Havens
Chron File

APPENDIX J

To: Gill Hicks, Bijan Yarjani Date: Dec. 21, 1988
From: Alan Havens Alan D. Havens
Subject: LA-San Bernardino Rail Service Alternatives

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LOS ANGELES-SAN BERNARDINO COMMUTER RAIL

TECHNOLOGY REQUIREMENTS AND OPTIONS

It is understood that the LACTC will complete a draft EIR document on December 1 on LA-Pasadena LRT routing options. Two route alternatives have survived to go forward in the EIR process: Main Street-Mission Road-Huntington Drive-710 Freeway, and the ATSF Second Subdivision/Marmion Way alternative via Highland Park. The choice between these alternatives will profoundly affect our ability to provide commuter rail service from LA to San Bernardino and the type of service provided.

If the Main Street alternative were chosen, this would leave the ATSF corridor open for the development of conventional diesel push-pull commuter operation --possibly using gallery cars (which are used on the Peninsula Commute Service in the San Francisco Bay Area) or true double-deck commuter equipment (like the GO transit cars used in Toronto). If the ATSF/Marmion Way alternative is chosen, a different operating concept will be required, involving cars that are compatible with the LA-Long Beach car design which will be operated to Pasadena.

Factors Favoring The ATSF Right-of-Way For The Foreseeable Future

Current indications are that use of the ATSF right-of-way is favored, for several reasons:

- The ATSF alternative is apparently gaining support in Highland Park and perhaps in South Pasadena, where it is seen as a way to remove the rail freight service from residential areas (and, in South Pasadena, to avoid any need for the Route 710 Freeway).

- It offers an alternative to using the Route 710 Freeway extension to Pasadena via South Pasadena. This freeway extension is controversial and may not be built for many years (if ever).

- It would avoid objections by some property owners along Huntington Drive, where two independent, parallel roadways would be functionally combined as a one-way couplet to make room for an at-grade LRT line if built here.

- o It could avoid the expense of aerial construction where the LRT line approaches the LA CBD, at the south end of the transit line.

- o The Pasadena Light Rail Alignment Task Force is supporting the use of the ATSF R/W as the preferred alignment for the north-south link between Pasadena's south city limits and its CBD.

- o This Task Force is generating support for extensions of the LRT line via the ATSF R/W from the East Pasadena area to Arcadia and perhaps as far as Irwindale.

- o A recent consultant study of commuter rail on the ATSF R/W done for the LA County Board of Supervisors considered the railbus option highly feasible; this is very close to the light rail concept.

Financially, it seems extremely unlikely that the LACTC, the only agency with monetary resources at its disposal to construct any transit facilities on this corridor, will fund a separate light rail line as well as purchase right-of-way for and construct a parallel commuter rail line. Even though in the long term there may be justification for two rail transit corridors between downtown LA and Pasadena, the LACTC is committed to funding lines in other parts of LA County before they can consider duplicate lines on any one corridor.

On the other hand, purchase of the ATSF ROW for LRT would support early extension of rail transit east through the City of Pasadena on that route and encourage funding the purchase of the R/W east to the LA County Line, and thence to San Bernardino.

Alternative Operational Concepts For LA-San Bernardino Service

If the ATSF R/W is chosen for the light rail line to Pasadena, there are three basic options for commuter operation in eastern LA County/San Bernardino County:

1. Terminate the light rail service initially in Pasadena or South Pasadena, and provide a separate commuter rail service east of this point.

2. Run both light rail and a quiet form of commuter rail equipment down the ATSF R/W from Pasadena to downtown Los Angeles, but terminate the commuter rail at Union Station (while the light rail enters a tunnel to serve the west side of the LA CBD, joining the Flower Street subway now under construction for the LA-Long Beach line).

3. Use quiet commuter rail equipment which can run on the same tracks as the light rail line between Pasadena and downtown Los Angeles, and which can also operate in the LRT tunnel through the west side of the LA CBD.

Problems With Breaking The Service In Pasadena

Option (1) permits complete flexibility in commuter rail equipment design and

operation; it allows the light rail line to be incrementally extended eastward, as far as Irwindale. The latter city is as far as the ATSF would continue to run freight trains west from San Bernardino (to serve the Miller brewery).

[Depending upon the nature of the freight operation, it may be undesirable or impossible to run the LA-Long Beach type of equipment east of this point on the existing track.]

The basic problem with option (1) is that a passenger transfer is required for San Bernardino and eastern LA County train riders in the vicinity of Pasadena. This will will decrease patronage. This may be tolerable if at the outset of operations the LRT line extends beyond Union Station to serve the west side of the LA CBD. Considering the desirability of access to LRV maintenance facilities in Long Beach, it is quite probable that the Pasadena LRT line will push through from the 7th and Flower end. Otherwise it would be necessary for the Pasadena line to use the Metro Rail shops as an interim measure.

(It is most unlikely that the initial increment of LRT line construction will be from LAUPT or some other Metro Rail intercept station north to Pasadena, without a physical connection to the Long Beach line--with the passenger link between the LRT segments via Metro Rail MOS-1.)

As no computer modeling has been done on alternative (1), it is uncertain how much ridership would drop as compared to through-routing. An old transit industry rule of thumb is to expect 15% lower ridership for bus-to-streetcar transfers. Transfer from a commuter train to a conventional transit line might result in an even greater drop in ridership. However, if the transit line penetrates the Los Angeles CBD, this kind of connection is feasible: in the Philadelphia-south Jersey area, for many years people transferred from the PRSL diesel rail cars to the Lindenwold Hi-Speed Line, which has a number of stations in downtown Philadelphia. (This kind of operation will be resumed by NJ Transit in the near future, except that there will be a through trip alternative to Philadelphia via Amtrak.)

In the case of the LA-Pasadena-San Bernardino corridor, however, if it were necessary to transfer first from an auto or bus to commuter rail, then to light rail in Pasadena, and transfer again to Metro Rail or a bus in the LA CBD, there would almost certainly be a great decrease in ridership potential.

Also, it is preferable in this case that the commuter trains penetrate the Pasadena CBD, with a terminus at the Amtrak station. Otherwise, transfers would be needed not only for LA CBD-bound riders but for Pasadena-bound riders as well--that is, for practically all patrons on the commuter line. This may limit the potential to extend the light rail electrification incrementally in an eastward direction, as the opportunity presents itself due to growth in LRT ridership.

If option (1) were chosen, it would be possible to use high-capacity gallery cars or other kinds of double deck push-pull diesel-hauled coaches. However, it

should be noted that we would not be able to gain access to possible commuter rail maintenance facilities near LAUPT for daytime, weekday maintenance work.

It would also be difficult to exchange equipment with other commuter lines which do terminate at Union Station (this would need to be done via San Bernardino and the ATSF Third Subdivision)--or provide through-routing with possible Ventura or Saugus commuter services, much as Amtrak runs one San Diegan round trip through Union Station from San Diego to Santa Barbara. Therefore many of the advantages of using the same kind of equipment as other proposed diesel push-pull commuter services in the area would not be had.

The above-cited problems suggest that there is a great advantage in using a commuter rail technology which can be run to the LA CBD over the LRT tracks (options 2, 3 above).

Requirements For Through-Routing

To operate a through service from San Bernardino to LA without a transfer in Pasadena, it is necessary to have equipment which can:

- o Operate on the same tracks as the light rail system between Pasadena and Chinatown, subject to clearances required by high platform stations along the LRT line and overhead catenary, and:

- o Operate on the same tracks as fairly long freight trains run by either Santa Fe or a new shortline carrier from Irwindale east to San Bernardino.

Additionally:

- o If option (2) is chosen and the commuter service terminates at Union Station, it may be necessary to operate over or cross main line railroad tracks to reach the station. These requirements may be not substantially different from those entailed in operation east of Irwindale. However, it is plausible that railroad labor contracts would require applying main line crew rules to such a service. If so, this would greatly increase operating costs.

  It is suspected that in this case, special trackage and incidental railroad/transit grade separation might be required at the Union Station end, resulting in increased capital costs.

- o If option (3) is chosen, it is necessary to meet tunnel clearances in the new subway tunnel which will conduct the Pasadena trains through to 7th and Flower. Diesel power, and carriage of diesel fuel, is certainly undesirable in the tunnel for health and safety reasons, and would very probably be prohibited by the California PUC (other than maintenance equipment).

- o Under option (3), a turnaround or reversal facility of some sort would be needed south of 7th and Flower. Unless it were decided to route some trains through from San Bernardino to Long Beach, this would be used by all San Bernardino commuter trains.

It is apparent that regulations of the Federal Railroad Administration as well as California Public Utilities Commission must be adhered to in planning such through services, as well as a number of technical considerations. The latter will be elaborated below.

Motive Power

There are several sub-options from the viewpoint of motive power:

a. Operate diesel-powered commuter equipment, probably four- or six-axle railbuses, over the light rail line from Pasadena to LA. This would be possible only under operational option (2).

b. Operate a dual-mode car, which would run under diesel power east of the end of the LRT section (which could be anywhere from Pasadena to Irwindale), and over the LRT line under electric power. This type of equipment would be diesel-electric/electric, with on-board diesel engines and diesel fuel, generators, and electric motors. This applies only to option (2).

   A very similar concept was tested experimentally on the Long Island Railroad using gas-turbine electric/electric cars, with compact turbine engines located in "power pods" on board the commuter rail cars.

c. Operate conventional LRVs under electric power from LA to Pasadena (or wherever the electrification ended) and haul them over the non-electrified part of the San Bernardino line by diesel locomotive. This applies to option (3).

d. Operate modified LRVs under electric power from LA to Pasadena, and couple to them, special diesel-generator units which would provide the power needed to operate over non-electrified territory. This is similar to a Boeing proposal to place a "slug" or power unit between a pair of SLRVs for commuter service on branch lines. This applies to option (3).

   For short commuter trains, the power units might not be provided with their own motive power and simply hauled as trailers by the LRVs; if (as is likely) longer trains were operated, the power units could have their own traction motors as well as providing train-lined DC power to the LRVs. This would provide greater tractive effort, and could allow a faster rate of acceleration.

e. It is possible to electrify the entire line from the outset. However, this may entail unaffordably high capital costs for an initial commuter operation.

Electrification would remain a long-term possibility even if the line is initially operated with some kind of dual-mode equipment. The light rail line can easily be extended incrementally in an eastward direction as demand warrants and funding permits.

f. Perhaps the use of battery or fuel-cell power plants and/or flywheels could be used for line's non-electrified section. Presumably batteries or flywheels would be recharged en route while drawing power from the overhead wire system. However, this would require use of new or experimental technology.

It may not be desirable to operate under diesel power over electrified trackage in residential areas, because the diesels will generate unwanted noise and emissions (elimination of the diesel trains is one of the reasons why communities between LA and Pasadena favor the light rail line). Also, higher acceleration performance can be obtained using all-electric propulsion. As the density of traffic would be high on the LA-Pasadena section of the line, it is desirable to run the fastest equipment possible to avoid scheduling problems. This suggests that diesel railbuses should not be considered for any primary role.

Dual-mode cars are feasible, so long as they do not have to run in a subway tunnel. However, there may be only limited room on board the cars to install diesel engines in addition to the electric motors and control systems, air conditioning, etc., which are also required. Large, bulky engines may be needed to provide the acceleration and high speed required for the more interurban part of the line; it is doubtful that "pancake" under the floor diesel engines like those used on articulated transit buses would provide enough power, unless twin diesels are provided under the center section of a three section (8-axle) articulated car. Therefore dual-mode cars may not be the best option.

It would be possible to haul LRVs with diesel locomotives that are equipped with compatible couplers and anti-climbers. The LRVs could be equipped for push-pull operation, so that the diesel locomotive controls could be operated from the other end of the train, but overall it seems undesirable to haul cars which have their own motors and control systems, with a diesel-electric locomotive.

The concept of a diesel "slug" or power unit has considerable merit, as it would in effect be a small diesel locomotive, sans electric traction motors, feeding power to the traction motors of the modified LRVs. Use of the LRV traction motors would provide traction power over the full length of the train. The power unit could be as large as desired, probably the size of a diesel switcher. All fuel would be carried on board the power unit, so that no flammable liquids would be transported in the tunnel downtown. The dead weight of the train would be reduced when operating over electrified territory, as the power unit would be detached upon entering the LRT line.

It may be desirable to use a modification of this design which would provide electric motors under the power unit as well as on each LRV. This would

eliminate the need for the LRVs to pull the power units, and provide greater tractive effort for a faster rate of acceleration.

Traveling westbound from San Bernardino, the power units would be detached in Pasadena or Irwindale at a pocket track (or off-line siding). Eastbound trains pass just beyond the siding, back in and pick up the power units. In San Bernardino, a Y track or delta interchange arrangement would be used to turn the trains around. Instead, a short section of the line at the San Bernardino terminus could be electrified, with voltage sufficient only to operate the trains in the turn-around movement.

It may even be possible to extend such a short electrified section up to a mile eastward to serve the Central City Mall/CBD area, perhaps crossing beneath the I-215 Freeway via Third and Fourth Streets. If the use of surface streets to make such a connection is unfeasible, a flyover or underpass would be required.

[As it is, with a light rail-compatible technology, it will probably be necessary to use an overpass to grade separate the line from main line railroad tracks near the present junctions of the Santa Fe Second Subdivision with the Third and First Subdivisions, just to the west of the present San Bernardino train station--which it can be assumed will continue to be used by Amtrak long-distance trains in the future.]

This option (with detachable power units) requires that the propulsion and control systems of modified LRVs be capable of drawing power at a constant voltage from overhead trolley wire (most probably with a chopper control system) as well as from the variable voltage power supplied from the diesel engine of the power unit. Conventional diesel locomotives operate on eight throttle positions, with the engine providing the power required for each desired level of acceleration and maximum speed. Although LRVs have the motors wired permanently in series-parallel or in parallel (for dual or monomotor trucks, respectively), and do not require a series-parallel:parallel transition like a main line diesel locomotive, a similar control system should suffice--probably with the power smoothed out if necessary using the chopper control system and the braking resistors.

Also, the diesel-generated, 750 volt DC power would have to be train-lined and conducted from the power unit to the passenger cars, possibly via the couplers. Special wiring and insulation for this electrical coupling would be needed.

The electric braking system would be the same as for any other LRV, with three braking systems: dynamic, friction, and magnetic track brakes (eddy-current brakes can be used for unpowered center trucks of articulated cars and are especially useful for eight-axle cars with unpowered center trucks). Power regeneration capability could be provided if it is to be used by the regular Pasadena LRT trains. If the power units were provided with their own traction motors, they could also be equipped for dynamic braking.

Battery-powered commuter cars have been tested by the British. However, the weight of the batteries, and the small amount of power that can be developed would suggest that this is an inferior option, unless a new type of high-power

density battery is perfected in the next few years. Fuel cells and flywheels which might be used in railcar operation are still in the experimental stage.

Platforms Along The LRT Line

The Pasadena LRT line will have high platforms at station stops, like the connecting LA-Long Beach line. As the LRVs are to be about 8 3/4' wide, this will mean that 10 1/2' wide commuter equipment could not be operated unless the LA-Pasadena section of the line were provided with gauntlet track or passing tracks at LRT stations. The use of narrower or wider cars relates to the issue of seating and aisle space (see below).

It is probably better to utilize a commuter car approximately 9' wide, and able to satisfy the clearances imposed by the light rail line. This would mean the use of high platforms where the two services share the same stations, e.g. in the CBD tunnel (if used), in Pasadena, and on any common trackage along the ATSF R/W east to Irwindale. High platform station stops do allow faster loading/ unloading and easy access for the elderly and handicapped. Additionally, with high platform loading greater flexibility is allowed in door placement and more space for underbody equipment.

This raises the question of whether high- or low-level loading should be used for operation east of the LRT line terminus, which may be located anywhere from Pasadena to Irwindale (subject to incremental LRT extension eastward). From Irwindale east, freight trains would operate on the line at night or during off peak hours; this will impose a different clearance envelope at stations.

High-Platform Sub-Option For The Commuter Line Extension

High platform stations could be used for the entirety of the commuter line east of electrified territory, but this would mean building gauntlet track or a siding (off-line station) at every commuter stop. As there would be relatively few freight movements, this may not impose a severe maintenance penalty since the switches would be locked in one position most of the day. Again, remember that high platforms permit easy loading and unloading for transit and also facilitate E&H access. Capital costs may be somewhat higher, but there is also the option of initially using cheaper timber platforms where there is the possibility that stations may need to be relocated.

There is relatively little difference in cost between off-line stations and gauntlet track. Off-line stations (each located on a siding) permit movement of equipment around a train stopped at a station, permitting a little more operational flexibility to deadhead equipment against the current of traffic on single track or move maintenance equipment along the line during peak hours.

Gauntlet track entails one track lying partly within the width of another track (or two parallel tracks sharing a common rail). This is generally used where clearances are tight and there is not enough room for a siding; hence, passing is impossible on gauntlet track.

In either case (whether gauntlet track or sidings are used), the signaling

system must ensure that both freight and commuter trains always select the correct switch position at every station (otherwise locomotives could smash into and severely damage the station platforms, with potential for derailments and injury to waiting passengers). Narrow commuter trains could be equipped with Vetag or another transponder system to distinguish them from wider trains.

One scenario is to use off-line loading initially, with the station sidings correctly aligned for eventual incorporation into a future second track. This allows a little more flexibility in the initial operation, to move around maintenance equipment, etc. Later, when the line is double tracked, the sidings become part of the second main track, and gauntlet track is installed at all stations, on both sides. This may mean that the platform edges should be designed to later be cut back, much as was done in Frankfurt and in Vancouver, where initially narrow transit cars were operated with the expectation of running wider cars on the same line at a future date.

Low-Platform Sub-Option East Of The LRT Line

The second sub-option for mixed freight and passenger operation from Irwindale eastward, is to utilize low platform commuter station stops. This permits much greater flexibility in placement of track and platform (solving the freight clearance problem) and lower costs for station construction. Low platform stations are used on many commuter rail lines, including the San Francisco area Peninsula Commute.

Now, under operational option (2), the commuter trains would terminate at LAUPT. They would have relatively few obligatory station stops in common with the Pasadena LRT line, probably limited to one stop in Pasadena. If only a few stations were in common, then it is possible to build a longer station with a high level platform at one end and a low level section at the other. This has been used in Brussels on the pre-metro, in Oslo, Stuttgart and elsewhere.

Under option (3), in which the commuter service would utilize the L.A. CBD LRT tunnel, it is necessary either to employ separate high floor-level and low level doors; or doorways which accommodate either platform level, with moving steps. The former approach is used in Pittsburgh's new LRT line, with major station stops accommodated by wide doors along the full length of the articulated car, and some minor, former trolley stops handled by a single narrow door at the front end of each car. However, in our LA-San Bernardino case, major station stops would occur all along the line.

On some European LRT lines, all doors per car are provided with moving steps because both high and low platform stations have substantial passenger volumes. In San Francisco, the Boeing cars have movable steps for subway use only at the center doors located on each half of the 6-axle articulated car; the end doors (to the right of the cab only, for right front end loading in streetcar mode) do not have movable steps because it is difficult to fit them to a curved door.

Some German systems utilize a fixed middle step and a moving upper step, with the potential for a moving lower step that swings below the carbody. The most

elegant system for high/low level steps is the one employed employed by the MUNI in San Francisco; their Metro LRT cars (mentioned above) have two inside steps, both of which move on slides. The mechanism is simple and accident-proof: it is possible for passengers to stand on the steps while they are going up and down. In this case, both steps are part of the floor extension in high platform mode.

If it were decided to go with the moving step option, the solution would be to marry the MUNI concept with two internal steps, to a single folding or sliding step outside the car. This would eliminate complicated mechanisms for double or triple steps on the exterior of the car, and reduce the extent to which the stepwells would cut into the width of the car floor--of potential importance in designing a carbody with adequate structural integrity. (In other words, the space that would be taken up by the third step should instead be used for longitudinal, strengthening members.) Sliding-plug doors similar to the simplified Faiveley design would extend downward to cover the interior stepwell.

This three-step, moving step design would be a more complicated than the use of fixed steps, but the component parts--both the elevator-type internal steps and the folding lower step--are used every day in regular service on LRT lines elsewhere. This concept allows maximum flexibility to use high level or low level platforms anywhere on the line, with the potential for rapid emergency evacuation.

However, it should be noted that movable steps will impose increased maintenance costs, and would restrict underbody space. In the event that a car very similar to the Long Beach car were chosen for this commuter operation, moving steps would be difficult to install without major modifications to the design.

Finally, it should be considered that taken together with specialized facilities to handle the elderly and handicapped (see below), the adoption of adjustable steps add a considerable amount of complication in the design of the cars. This would suggest that high platforms would be, in this case, the superior option.

E & H Provisions

We need be concerned here only with the most serious problem, i.e. loading wheelchairs on the trains. However, it is noted that the features permitting barrier-free wheelchair access are also a boon to elderly or disabled persons whose ability to walk or climb stairs is impaired.

The on-board mechanical lift devices required to load wheelchairs on buses have proven to be mechanically unreliable and are a high cost maintenance item. They can increase normal station dwell time from 20 or 30 seconds to as much as three minutes--and often jam, taking the bus out of operation. Delays of this magnitude are completely unacceptable for rapid transit or commuter rail operation, as it is important to keep to a precise schedule.

Further, failure of a lift device would probably mean taking an entire train out of service. It is difficult to cut individual cars out of a train except at

terminals, and for a commuter service with relatively few trains on the line, taking even a single train out of operation would be deleterious to the quality of service.

The above are among the reasons why the LACTC has specified high platform station stops for its LRT lines, eliminating the need for any kind of lift. If high platform stations are used all along the commuter line, these problems are automatically solved.

In the event that low platform stations are used, provision would need to be made for a very short high platform section with a wheelchair ramp, similar to those built for the Sacramento light rail system. In Sacramento, a simple folding drawbridge is located at the end of the car. At the beginning of a run, the train operator lowers the device over the doorwell, taking that door out of regular service. To load or unload a wheelchair, the operator opens the folding door and lowers the drawbridge by lever, closing the 1' gap between the car and the E&H platform. The length of this operation is not over 30 seconds, and has been done in as little as 10 seconds. As the normal dwell time at station stops is 20 seconds, there is little impact on service. Additionally, the device is so simple that jamming almost never occurs.

However, the Sacramento system requires preempting a regular passenger door, and requires the operator to leave his driving position. In our case, the problem is to bridge the 3' 1 1/2" gap between an 8 3/4' wide car (at floor level) and the 7 1/2' from track centerline clearance imposed by mixed operation with freight trains. If special wheelchair platforms were used, the best solution would be to utilize a separate doorway or hatch for the E&H, with an automatically-operated device to close the gap.

Seating

A critical issue affecting passenger comfort is the quality and arrangement of seating. There is considerable flexibility with respect to the longitudinal spacing of seats. The standards used for local buses or light rail need not apply to a specialized commuter service. Wider spacing between seats is recommended, with either reversible seats or seats which face in one direction only. Well cushioned seats should be used, as on the Lindenwold Hi-Speed Line, which has received high marks for comfort.

Reversible seats may be optimal, as most passengers prefer to ride facing forward. However, it requires more crew time and effort to change over all the seats at the end of the run. Alternatively, seats can be arranged to face in one direction only: as the cars are double ended, they can either face towards the end of the car (away from the mid-point or centrally-located door) or facing forward on the right side and backward on the left side. It is desirable that passengers at the front end of the train be allowed to look forward; and in the back end of the train, backward down the line [unless there is a power unit coupled to the end of the train].

An option is to provide some reversible seats in the middle of the cars, which

passengers could flip over to sit facing one another if they want to engage in conversation, play cards, etc.

Width of the seats should be ample. This relates very closely to the width of the aisle and carbody. To give several examples for rapid transit vehicles used on longer distance lines, BART car seats are 22" wide, with armrests between each pair of seats, while MARTA uses 21" wide seats, without the third armrest. If an 8 3/4' wide car is used, with four seats abreast (2 by 2 seating) seat space may be a little cramped (e.g., 19" or less). In Philadelphia and elsewhere, with 10 1/2' wide cars, 2-3 seating is provided to increase seating capacity. For a LA-San Bernardino service, 2-2 seating with wider seats than normally used for local transit services would be desirable, considering the length of the trip.

One possibility is to maintain the 8 3/4' LRT width at the floor and platform level, but use curved sides such that the car is wider at seat level, similar to the Indiana interurban style which was later emulated by the CTA for its rapid transit cars. The high level ICG commuter cars in Chicago also have a tapered section, with the carbody widening out above the floor level, presumably for the same reason. (Another example is the Amfleet cars used by Amtrak on the Northeast Corridor.) Hence, somewhat wider seats can be provided even with a nominally 8 3/4' wide car. In the case of the Chicago rapid transit cars, a vehicle 8' 8" wide over the threshold plates (floor level) widens out to 9' 4" overall.

Another possibility is to provide 1-2 seating which is used on certain European LRVs, but with plush seats; in fact, certain European intercity rail coaches, including a Fiat high-speed tilt train, utilize this seating arrangement. Since 2-1 seating reduces seating capacity as compared with 2-2 seating, it may also be possible to offer two cushioned seats on one side, and one on the other--plus a smaller, more spartan semi-cushioned plastic seat on the aisle side next to the single plush seat. For inbound trips, the cushioned seats would be taken first, by longer-distance travelers; and the plastic seat would be available to people boarding closer in, making shorter trips.

Yet another strategy might be to offer luxury 2-1 seating on first-class cars, where a premium fare would be charged, and more conventional 2-2 seating on other cars for a regular fare.

It is essential to provide an aisle of adequate width to permit easy access to and egress from the cars, which is a limitation on the use of 2-2 plush seats with 8 3/4' wide cars. With few standees on a longer distance commuter line, an aisle width as narrow as 22" may suffice, but it would be virtually impossible to accept an aisle any narrower than this.
[Wheelchairs would be confined to positions near the doors, where fold-down seats with wheelchair tie-downs would be provided.]

Food Service On Board

One refinement which could make a commuter service more popular would be to provide a cafe/bar service on board one car per train. In the morning, coffee

and donuts could be sold, while in the evening, mixed drinks would be served. There is precedent for doing this: buffet and snack bar cars are provided on Amtrak trains, food service is provided on the light rail trains between Duisberg and Dusseldorf, and the Electroliners which ran on the North Shore Line between Chicago and Milwaulkee had a bar service. In the latter case, one section of the four-section articulated car was devoted to this.

Ride Quality Of The Cars

Ride quality is affected by suspension system, wheel profile, car weight, length of the carbody, presence of articulation, platform overhang, and double-decking. Design of the suspension system is critical; however, there is considerable experience in the U.S. and abroad with suspension systems for equipment which may operate up to 79 MPH. Modern LRVs have a suspension which is not inferior to the type used on diesel-hauled commuter trains: it is typical to use rubber chevron spring primary suspension, and air spring secondary suspension. Equipment specifications should include adequate ride comfort at high speeds.

A related factor is wheel profile. Many railcars have a sidesway problem, in part because of the use of a conical (tapered) wheel profile. This means that the flanges are not in direct contact with the rails except on curves. However, cylindrical and worn-wheel profiles have been used on some modern rapid transit, light rail, and high speed rail lines to stabilize the horizontal movement of the trucks; with cylindrical wheels, the flanges are always in contact with the rails. SEPTA operates Kawasaki LRVs of nearly the same design, with both conical and cylindrical wheels. However, in this case, if the same line is to be used by freight trains, it is not certain whether the level of tolerance needed for cylindrical wheels can be maintained. We may have to rely upon the aspects of suspension system and carbody layout to reduce sidesway.

All modern transit equipment, including push-pull cars, rapid transit and light rail, is relatively light weight. Most of the LRVs placed in service in this country are actually heavier than rapid transit cars because of articulation and other equipment requirements. The term "light rail" is a misnomer, because neither the rails nor the cars are light: the term actually refers to a lower or "light" volume of passengers typically carried, as compared to rapid transit lines (and there is tremendous overlap in this characteristic as well).

Within the light rail category, we must include the 80 MPH Silver Arrows which operated between Cologne and Bonn (now running in Austria) and the 79 MPH, articulated Electroliners which operated from Chicago to Milwaukee (both modern, streamlined designs). These types of electric traction equipment provide, or provided, a high level of ride comfort.

Generally, long single-unit rapid transit cars and articulated LRVs provide a higher level of comfort at speed than do 45' light rail cars. Considering that the high speed Electroliners and certain other interurbans were articulated, it is expected that an articulated car should, if designed properly, provide the required level of comfort for San Bernardino service. However, a 60-75' single

unit-car is quite feasible if the service will terminate at Union Station rather than going through the subway tunnel.

However, many of the LRVs now constructed have considerable overhang at the ends of the cars, which on poorer track or at high speed can result in considerable sidesway or yawing movement. For this reason the Frankfurt transit system developed the U3 car with reduced overhang (increased truck center distance) to supersede the less stable U2 car (the type used also in San Diego). It is suggested that even with an articulated car design, overhang should be reduced for high speed cars, placing the operator's cab to the left side of the front end of the car (as was once very common in light rail practice) rather than in the center.

This, in fact, is the arrangement used on the Lindenwold Hi-Speed Line's rapid transit cars, which have an open cab area like many LRVs. If it is desired to use longer articulated cars in conjunction with this, a three-section articulated car rather than a two-section articulated can be used. The longer three-section articulateds, like the Frankfurt P8 car, provide a very stable ride.

Double decking of one form or another is often used to increase capacity. However, double-deck cars require a rather stiffer suspension system to maintain safety (prevent the cars from tipping over on curves), and there is reason to suspect that the popular gallery car design suffers from a higher level of vibration than single-deck cars. As the clearance from overhead catenary on parts of LRT line may restrict the use of double-deck cars anyway, it is possible that this is a moot point.

Clearances On Curves

The articulated LRVs will exhibit a certain amount of overhang at the end corners of the cars while on curves. If a longer single-bodied car with increased truck-center distance were operated on the same line, the additional overhang would be exhibited at the center of the car. This could pose a problem on curves where an articulated car is on the track on the inside of the curve, passing a single-unit car on the track on the outside of the curve. However, it is expected that on most of the surface alignment on the ATSF, there would be adequate room to increase the space between the tracks on curves.

No problem is expected at stations, as the high-level LRT platforms can be assumed to be on straight track. Raised platforms on even a gentle curve would result in an extra-wide gap, which could make it impossible for the wheelchair-bound to board the trains. Hence, the presence of high platforms should impose no additional clearance problems on curves due to overhang and truck-center distance.

However, in the CBD tunnel, the track geometry may be layed out specifically for the articulated Long Beach LRV, so there might be a clearance problem on curved track underground. For this reason, an articulated car with the same truck

center-distance and no more overhang at the ends than the Long Beach LRV, should be employed in the case of option (3) above. It will not matter in this case whether two- or three-section articulateds (6 or 8 axle cars) are employed, so long as the trains are no longer than the station platforms.

Safety Requirements

The FRA imposes regulations on the design of railroad equipment which will govern what can be run in mixed traffic on Class I railroads. They have also played a leading role in safety investigations in commuter rail and light rail accident cases. In addition, the California PUC has its own requirements.

Although the San Diego Trolley operates on the same tracks as a short line freight carrier on its San Ysidro line, and the New Haven ran Mack railbuses very similar to PCC light rail vehicles on one of its branch lines, light rail cares have not been operated on U.S. main line railroads. SEPTA, NJ Transit, NYMTA, and the ICG have run lightweight, high speed electric MU cars in various carbody configurations on main line tracks. Some of these cars resemble conventional railroad coaches with end doors only; others resemble elongated rapid transit cars. Often transit-type couplers are used, rather than the standard railroad knuckle coupler.

All of these cars have to pass certain FRA-mandated stress tests intended to protect against potentially disastrous results from collisions with freight or intercity passenger trains. Integrity of the carbody is essential; it is important to safeguard against accidents in which a locomotive or another car telescopes through the body of a commuter car. [In fact there were several serious accidents both in Chicago and Philadelphia in which this occurred.]

A second concern is whether the anticlimbers (bumpers) of the commuter cars match the height of the anticlimbers of other equipment they could encounter on the same line. This was a concern in Philadelphia after the Norristown High Speed Line accidents. In point of fact, on certain transit systems, high- and low-floor cars have been run on the same line with complete safety because the high-floor cars had extra bumpers welded onto the end of the car at the correct height to match the anticlimbers of the other cars. With intelligent design, it appears that these kinds of potential accidents can be avoided.

If it is necessary to provide bumpers at several different heights, an option would be to employ buffers above the anticlimbers. Modern streamlined equipment in Europe have buffers which protrude only a little out from the end of the car; something like this, firmly connected to the car frame, might provide a more aesthetic means of providing a bumper at a different height than the normal anticlimber.

It will be useful to know precisely what federal as well as state requirements apply to mixed operation of the kind anticipated, and what has been the actual experience on systems where either light rail or transit-like commuter rail equipment does operate on the same tracks as freight trains?

Train control should not be a problem, because any kind of signaling system could be provided on a light rail or commuter line. The one area where more work is needed is in developing constant-time warning devices on DC traction lines, because of interference between the propulsion and control systems of the light rail or electric MU cars and the grade crossing circuitry. Research is presently underway on this subject by two manufacturers of railway signaling equipment. These constant warning time devices are valuable as they allow trains operating at different speeds to trigger the gates to lower at different distances, with a constant warning time for faster and slower trains. This minimizes delay to motorists.

Actually, operating part of the commuter line under diesel power (the section where the freights are running) will solve this problem, as the constant warning time devices can be restricted to this section. On the electrified line, at least initially, it can be assumed that all of traction equipment will be approaching intersections at the maximum allowable speed for that section, and simply time the gates for this speed.

There is sometimes a problem with lightweight vehicles or even the cab car end of push-pull trains being undetected by signal devices or even being unable to go through spring switches on main line railroads; it is believed that this has sometimes affected operation of RDC cars. Therefore, there may be a need to change some switch mechanisms and signaling equipment on the Santa Fe Second Subdivision, to allow any kind of push-pull or self-propelled passenger equipment to run over it.

Couplers are not a problem, because commuter cars with non-standard couplers have been operated on main line tracks for decades. Nor will there will there be a problem with the braking systems used, because any type of light rail equipment will have redundant, multiple braking systems (dynamic, disc or tread, and track brakes) and a deadman control, features providing a high level of safety.

Mixed operation with freight trains could conceivably be made safer by using flatter ended equipment--as compared to the rounder, tapered ends generally used for light rail vehicles today. However, it is quite easy to design a car with a flatter end and wider anticlimber, reducing overhang and the position of the cab in the process.

FRA regulations pertaining to sway also need to be looked into (this will pertain to the design of the suspension system).

The fact that the LA-San Bernardino line would no longer carry Amtrak trains through Pasadena, and would no longer be a Class 1 railroad, may simplify the design of commuter rail equipment on this corridor. Different track standards may apply. If freight service is restricted to night time or mid-day off-peak periods when there is no passenger service, temporal separation of the two kinds of trains may substitute for certain structural requirements. The San Diego

operation may very well provide a model for our LA-San Bernardino passenger rail service.

Operations

Planning for commuter rail operations must carefully consider the LRT operations on the Pasadena line, as the light rail demand will probably justify a six minute headway. It is assumed that the commuter runs from San Bernardino will operate express from Pasadena into downtown LA; there could conceivably be overtaking problems along the LRT line. This would mean that the commuter trains would run more slowly behind local LRT trains. This can be minimized if separate routes are used through Pasadena (with the double track LRT line on Green Street or Colorado, and the commuter trains using the existing single track in the median of the I-210 Freeway), but could still occur on the Highland Park/Marmion Way section.

It may be possible to dispatch LRT locals to trail San Bernardino express trains where they share trackage. Also, there may be one or more locations where a third (passing) track or a pocket track at a station could be built to allow overtaking and passing between LA and Pasadena. This may very well have an impact on station location or design.

As it happens, owing to the number of curves on the section from Pasadena to LA, the commuter rail service (even without LRT on the same tracks) was expected to be slower than the run on relatively straight track between Pasadena and San Bernardino. Slower running through this section may be an acceptable burden if commuter rail is to use this line.

At any rate, it is clear that the commuter trains, whatever the actual configuration of the equipment, should be equipped to accelerate rapidly to allow the best possible schedule to be maintained on this section of the line and avoid interference with the light rail operation.

Pasadena Routing Options

At present, the Pasadena task force is considering three routes for LRT service through that city's CBD area. The Green Street transit mall option would offer the best access to Pasadena's downtown, with potential future access to the ATSF Second Subdivision on the 210 Freeway alignment in the direction of Arcadia, via the Walnut Street spur track. The 210 Freeway option would build double track along the freeway alignment, with rather narrow high platform station stops near the CBD. This would require quite a walk to Colorado Boulevard.

The routing of commuter rail trains (even those based on a light rail design) through a transit mall is undesirable; even with signal preemption this will entail rather slow running. The Green Street option is certainly very feasible for the LRT line. However, as the ATSF R/W along the 210 Freeway will need to be purchased anyway, it is suggested that the single track between Green Street and the junction with the Walnut Street spur on the east side of town, be used exclusively for commuter rail trains (perhaps running here under catenary) and

quite possibly also LRT express runs. With a single track in this location, it would be easy to provide one or more high platform station stops in the depressed freeway alignment where it comes close to the Pasadena City Hall.

It will be noted that transferring from the San Bernardino line to the local LRT would be possible if a station were provided near Rosemead/Fedco, east of the Walnut Street spur (a good location for a transfer station), for access to all local stops in Pasadena. Commuter trains would also stop at the present Amtrak station on the west side of town. It is suggested that a third stop on the single track section along the 210 Freeway would provide additional access to Pasadena's Civic Center and to new development to the west, near the point where the rail line leaves the freeway corridor.

Bridges

Preliminary engineering drawings for the Highland Park alternative for the Pasadena LRT line show a proposed removal of the existing truss bridge over the LA River. Also, while the extant bridge over the Arroyo Seco is proposed to be retained, its single track deck would be replaced with a new deck wide enough for double track. The hybrid equipment under options (2) and (3) would need to be designed so that permitted axle loadings are not exceeded.

ATSF As A Tenant, Or Short Line Operation?

It is uncertain whether the ATSF would retain trackage rights on the Second Subdivision or whether a short line carrier become the operator. At present, the Santa Fe operates rather long trains to Irwindale, headed by several diesel road switchers. It is doubtful whether there would be cause to change the type of motive power used even if a short line operator were brought in to replace the ATSF service. Hence, it is assumed that the same clearance envelope that is presently applicable to this line under ATSF operation, will apply in the future regardless of who operates the freight service.

Starter Service Concept

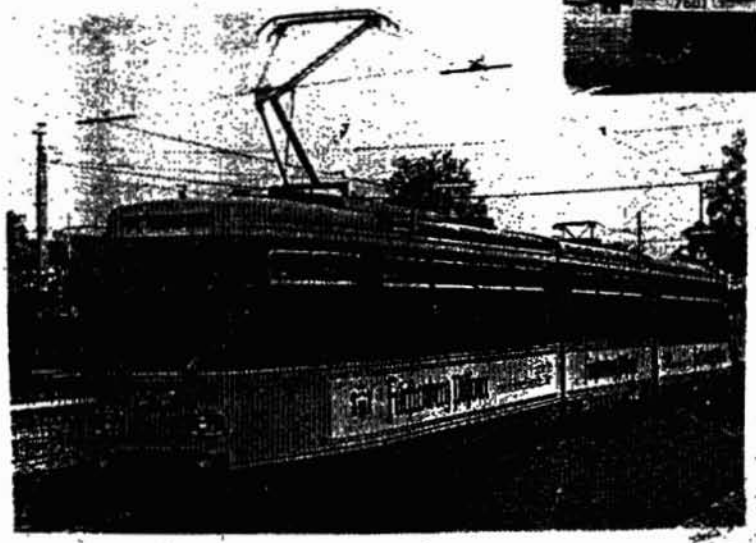
If the Pasadena light rail line could not be opened for operation before 1997, it might be possible to purchase the ATSF R/W and initiate commuter service at an earlier date operating on the existing single track line. However, initial track shifting or double-tracking should nevertheless be undertaken along four bottleneck sections, two of which are in Highland Park, one in South Pasadena, and one in Pasadena from Glenarm to the 210 Freeway. Otherwise, later LRT construction would likely force suspension of the commuter service for a time.

One option would be to provide two round trips of diesel push-pull equipment, which would later be replaced with LRT-compatible equipment when the light rail line opens. Presumably the diesel trains could be used on another corridor such as LA-Orange County or LA-Ventura County after they are retired from San Bernardino service.

Alternatively, it should be noted that the first Long Beach LRVs will be in operation on a test track as early as 1989. It may be possible to use LRT compatible equipment at the outset, basing the design partially on the initial operating experience with the Long Beach cars. This equipment could first terminate at Union Station, and use Metro Rail and Amtrak maintenance facilities, respectively, for the electric traction and diesel components. Later, when the LRT tunnel is open on the west side of the CBD for Pasadena light rail trains, the LRT-compatible commuter equipment could be shifted over to tunnel operation.

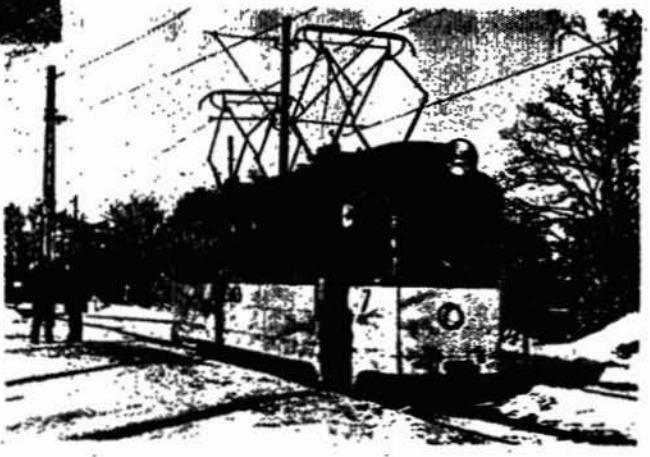
Right: Darmstadt 6-axle urban tram in town center, with trailer.

Below: Albtalbahn 8-axle interurban car in Karlsruhe.

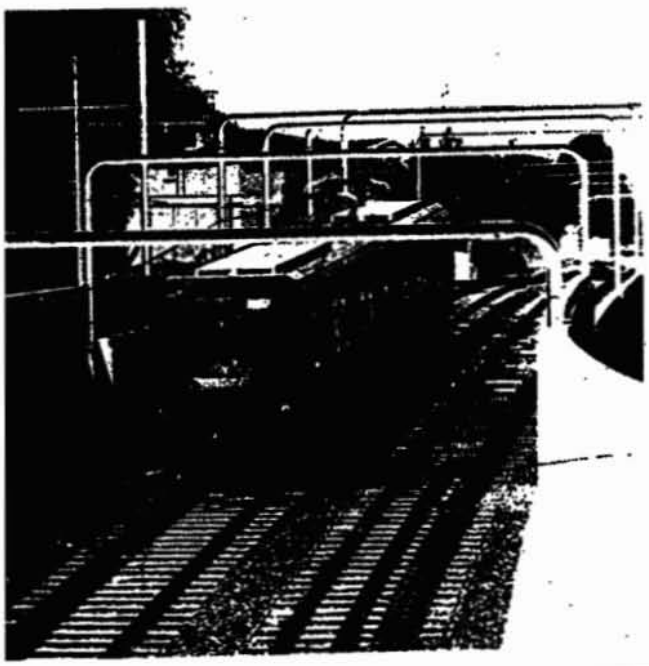


Below left: Constanza, Rumania: 8-axle tram in suburban setting.

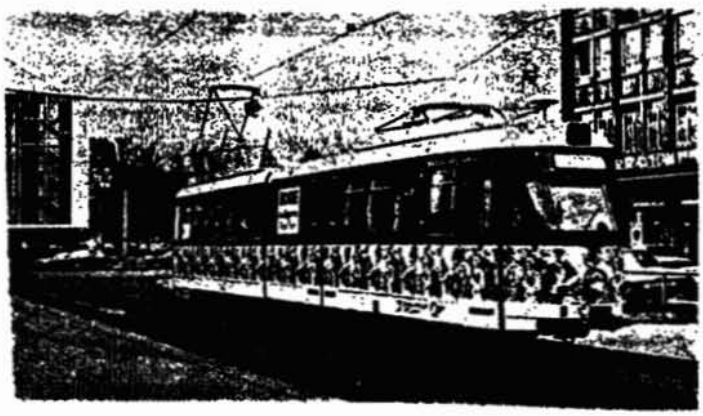
Below: Graakalbane four-axle interurban car in Trondheim, Norway.



UNUSUAL LRT DESIGNS AND APPLICATIONS



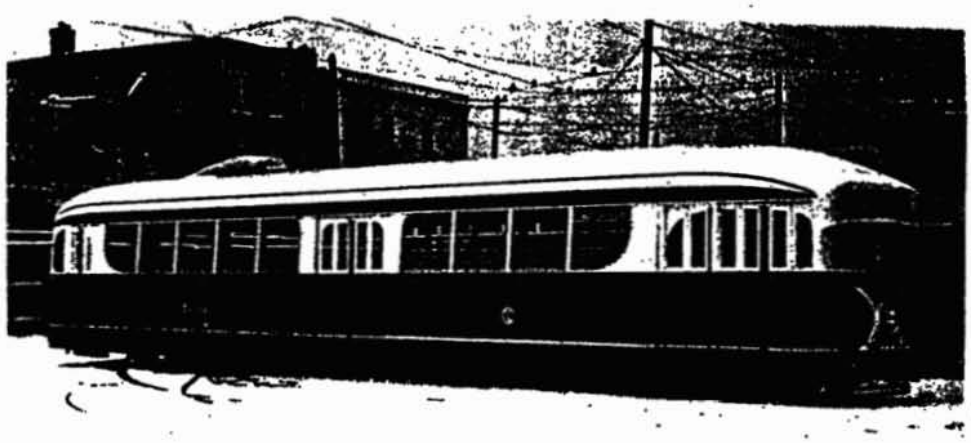
Above:
Lyon rack-and-adhesion tramway, for very steep grades; car is a steel-wheeled version of the city metro vehicle.



Above: Bochum party tram, colorfully decorated. Bogie tram created from joining two articulated cars back-to-back.

Above: Copenhagen tourist tram. Fenders around trucks are a safety feature.

Left: Skirting around wheels of Harbin trams reduces noise and improves safety.



Right: Streamlined Brill demonstrator car in Chicago, featuring multiple door openings.

APPENDIX K

POTENTIAL DEMAND AND TRANSPORTATION SYSTEM CHARACTERISTICS FOR FIVE RAILROAD CORRIDORS

The following factors were used in the Phase I evaluation of demand for the five high-opportunity railroad corridors evaluated in detail during Phase I of the study:

- Year 2010 Population Patterns
- Year 2010 Employment Patterns
- Commercial Centers
- Policy Growth Areas (applicable to the City of LA only)
- Other Activity Centers (colleges, civic centers, sports complexes, museums, hospitals, etc.)
- Existing Transit Service (limited stop/express bus routes)
- Freeway Peak Hour Volumes (based on Caltrans data)
- Freeway Congestion (LOS F0 to F3; sections where peak hour speed is 35 MPH or less).
- Freeway Accident Rates (accidents/mile/year)

Not discussed here are 1984 population and employment; nor are designated or planned City of Los Angeles, LA County, or SCAG regional centers. Generally speaking, all of these centers correspond closely with Year 2010 population or employment concentrations. Definitions relating to the above factors are as follows:

Residential Population Densities:

Very High Density =	40+ Persons/Acre
High Density =	30-39.9 " "
Medium Density =	20-29.9 " "
Moderate Density =	10-19.9 " "
Low Density =	0-9.9 " "

Employment Densities:

Very High Density =	50+ Persons/Acre
High Density =	35-49.9 " "
Medium Density =	20-34.9 " "
Moderate Density =	10-19.9 " "
Low Density =	0- 9.9 " "

The bus routes indicated below for each corridor represent the routes in operation in 1986-1987.

Freeway Congestion:

Congestion levels referred to below all represent Level Of Service F (LOS): start-and-stop traffic with speeds below 35 MPH.

LOS F0 = 15 minutes to one hour of congestion
LOS F1 = one to two hours of congestion
LOS F2 = two to three hours of congestion
LOS F3 = over three hours of congestion

Note that these figures are for accident-free days only. These occur approximately 50% of the time. Accident data can give some indication of congestion the remainder of the time.

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ROUTE 1. SP SANTA MONICA BRANCH

- 2010 Population. The route from Santa Monica to the LA CBD via the Flower Street subway would serve the following areas of at least medium density population:

Santa Monica CBD	High Density
East Santa Monica-West LA	Medium Density
Palms/Culver City	Medium to High Density
Baldwin Hills Area	Medium to Very High Density
Area west of USC	Medium Density
USC Campus	Very High Density

- 2010 Employment. The route would connect the following areas of at least medium density employment:

Santa Monica CBD	High Density
East Santa Monica-West LA	Large Medium Density Area
Northeast Culver City and adjacent section of LA	Medium Density
USC	High Density
LA CBD	Very High Density

- Commercial Areas. The following commercial areas would be served:

Santa Monica Place
Pico/Westwood
Commercial area at National/Venice/Robertson
Fedco at La Cienaga
University Village in the USC area
LA CBD

- Policy Growth Areas. Proposition U allows for higher-density commercial development in the LA CBD--a large area, including the south and east ends of the downtown area.

- Other Activity Centers. The line would provide service to the following:

Santa Monica City Hall/County Court Building/Civic Auditorium
Santa Monica Pier

Santa Monica City College
University of Southern California
Coliseum/LA Memorial Sports Arena
LA County Natural History Museum and Museum of Science and Industry
LA Trade School
Orthopedic Hospital
LA Convention Center
LA Civic Center

- Transit Service. The area covered by this line is presently served by a number of express and limited-stop bus routes that provide transport to the LA CBD. The following is a listing of the bus routes as they were in 1987 (for the SCRTD, 400/500-series routes are express buses; 300-series are limited stop buses):

Santa Monica Route 10	Santa Monica CBD to Centinela
SCRTD Route 434	Santa Monica
SCRTD Route 431	Pico/Overland/Century City
SCRTD Route 436	Venice Blvd.
SCRTD Route 438	Culver Blvd.
SCRTD Route 437	Marina Del Rey
SCRTD Route 439	La Cienega
SCRTD Route 576	La Cienega
SCRTD Route 333	Venice Blvd.
SCRTD Routes 320 & 322	Wilshire limiteds, Santa Monica CBD to San Vicente

- Freeway Volumes. The route closely parallels the Santa Monica Freeway. Peak hour volumes are as follows:

West of 405 Freeway	10,000
405 Freeway to 110 Freeway	15-18,000

- Freeway Congestion. Peak hour congestion figures for freeway segments that parallel the line are as follows:

(AM Peak - Eastbound)	
Route 10 (405 Fwy. to Crenshaw)	LOS F1 to F3
(AM Peak - Westbound)	
Route 10 (Harbor Fwy. to La Cienega)	LOS F0 to F1
(PM Peak - Southbound/Westbound)	
Route 110 (south to Sta. Monica Fwy.)	LOS F2
Route 10 (Harbor Fwy. to Western)	LOS F2
Route 10 (Western to La Cienega)	LOS F0 to F1
(PM Peak - Eastbound/Northbound)	
Route 10 (La Cienega to Harbor Fwy.)	LOS F1
Route 110 (North of Sta. Monica Fwy.)	LOS F3

- Freeway Accidents. Accident rates for freeway segments paralleling the line are as follows:

Route 10 (west of 405 Freeway)	32/Mi./Yr.
Route 10 (405 Fwy. to 110 Fwy.)	60-64/Mi./Yr.
Route 110 (in LA CBD area)	269/Mi./Yr.

ROUTE 2. ATSF HARBOR SUBDIVISION

- 2010 Population. This route would serve the following residential of at least medium population density:

South Central Los Angeles (along the Harbor Fwy.)	Medium Density
Southwest Central Los Angeles (Hyde Park area)	" "
Inglewood	" "
Lawndale/Redondo Beach	" "
Central Torrance	High Density
Long Beach CBD	Very High Density

- 2010 Employment. The route would connect the following employment concentrations of at least medium density:

LA CBD	Very High Density
Inglewood/Lennox/Westchester/LAX	Large Medium Density Area
El Segundo	" " " "
Redondo Beach	Medium Density
Long Beach CBD	High Density

- Commercial Areas. The following commercial centers would be served:

LA CBD
Inglewood
Lawndale-Hawthorne Boulevard
South Bay Center
Old Town Shopping Center
A small commercial area in Torrance
K-Mart/Sepulveda
Long Beach Plaza

- Policy Growth Areas. Higher-density commercial growth is permitted in the following areas along the ATSF Harbor Subdivision in the City of Los Angeles:

LA CBD
Area west of the Harbor Freeway near Zodys
Area east of LAX and west of the 405 Freeway

- Other Activity Centers. This line would provide service to the following additional activity centers:

  LA Civic Center area
  Inglewood City Hall
  Daniel L. Freeman Hospital in Inglewood
  Northrop University near LAX
  Los Angeles International Airport (LAX)
  LA County Health Department in Torrance
  St. Mary Medical center in Long Beach
  Shoreline Village in Long Beach

- Transit Service. The area covered by this line was served in 1987 by the following express routes:

Torrance Transit Line 2	Hawthorne/Anza
Torrance Transit Line 1	Torrance Blvd.
SCRTD Route 439	La Cienega to Hermosa Beach
SCRTD Route 442	Hawthorne Blvd. (Harbor Fwy.)
SCRTD Route 444	Torrance - Hawthorne Blvd.
SCRTD Route 443	Torrance - PCH
SCRTD Route 446	San Pedro via Avalon Blvd.
SCRTD Route 448	Rolling Hills via PCH

- Freeway Volumes. Peak hour volumes for freeways paralleling the line are as follows:

Route 10 (Santa Monica Freeway)	15-18,000
Route 405 (San Diego Freeway)	17-18,000

- Freeway Congestion. This route is paralleled by the 10 (Santa Monica) and 405 (San Diego) Freeways. Congestion encountered on the 110 (Harbor) Freeway may also be pertinent, if this is the access route to the LA CBD; conditions on the 10 (Santa Monica) and 110 Freeways are essentially as reported for the Santa Monica Branch, above.

  Additionally, the following conditions are encountered on the 405 freeway:

(AM Peak: Northbound)	
Anaheim Street to Harbor Fwy.	LOS FO
Harbor Fwy. to Hawthorne	LOS F2
Marina Fwy. to Santa Monica Fwy.	LOS FO
(AM Peak: Southbound)	
Marina Fwy. to Santa Monica Fwy.	LOS FO to F1
(PM Peak: Southbound)	
Santa Monica Fwy. to Venice	LOS F2
Venice to Marine Fwy.	LOS FO
LAX to Hawthorne	LOS F2
Hawthorne to Carson	LOS FO to F2

(PM Peak: Northbound)

La Cienega to Santa Monica Fwy.	LOS F2

- Freeway Accidents. Accident rates for freeway segments paralleling the line are as follows:

110 Freeway in the LA CBD area	269/Mi./Yr.
10 Freeway (110 Fwy. to 405 Fwy.)	60-64/Mi./Yr.
405 Freeway (10 Fwy. to LAX)	64/Mi./Yr.
405 Freeway (LAX to 110 Fwy. near Harbor City)	37/Mi./Yr.
405 Freeway (110 Fwy. near Harbor City, to Long Beach)	34-44/Mi./Yr.

ROUTE 3. SP WEST SANTA ANA BRANCH

The following information applies to the West Santa Ana Branch south and east of Watts, and excludes data for connecting lines such as the LA-Long Beach LRT line and the I-105/Century Freeway automated transit line.

- 2010 Population. The line would serve the following areas of at least medium density residential population:

Lynwood	Medium Density
Bellflower	" "
West Anaheim/Buena Park	" "
Santa Ana CBD	" "

The remainder of the territory between the LA River and Santa Ana is of moderate residential density, constituting a more continuous and extensive residential coverage in this category than that along the parallel Santa Ana Branch rail line which parallels the Santa Ana Freeway).

- 2010 Employment. The route would serve the following areas of at least medium density employment:

Santa Ana	Very High Density

Note: One other employment center lies along the line--a moderate density area in Garden Grove.

- Commercial Areas. The following commercial areas would be served:

Lynwood
Bellflower
Cerritos
Cypress
Garden Grove Mall
Santa Ana CBD

- Other Activity Centers. The line would provide service to the following:

  Cerritos College
  Cypress College
  Santa Ana Civic Center, Library, and Orange County offices

- Transit Service. This line is paralleled by RTD express bus route 460, which follows the 5 Freeway and connects with OCTD local service. However, there is also intercity bus service provided by Greyhound on this corridor. It may be assumed that OCTD express routes will be created when the HOV lanes and transitways are completed on the parallel 5 and 405 Freeways, and on the OCTD-owned segment of abandoned West Santa Ana Branch R/W between Santa Ana and Garden Grove.

- Freeway Volumes. Peak hour volumes for freeways paralleling this route are as follows (LA County data only):

5 Freeway	16-17,000
91 Freeway	10-18,000
405 Freeway	18-19,000

- Freeway Congestion. Peak hour congestion figures for freeway segments that parallel the line are as follows:

(AM Peak - Northbound/Westbound)

5 Freeway	LOS FO to F2
91 Freeway	LOS FO to F1
405 Freeway	LOS FO to F1

(PM Peak - Southbound/Eastbound)

5 Freeway	LOS FO
91 Freeway	LOS FO to F1
405 Freeway	LOS FO to F1

- Freeway Accidents. Accident rates for freeway segments paralleling the line are as follows:

5 Freeway	49 to 72/Mi./Yr.
91 Freeway	19 to 53/Mi./Yr.
405 Freeway	32 to 53/Mi./Yr.

ROUTE 4. ATSF SECOND SUBDIVISION

The following information applies only to the ATSF Second Subdivision between the LA CBD and Irwindale, within Los Angeles County. This data was prepared before the decision was made by the ATSF to the Second Subdivision in its entirety (east to San Bernardino) to public agencies for transit. More information for potential trip generators in Los Angeles County east of Irwindale, and in San Bernardino County, is provided in Appendix I and in text Chapter 13.

- 2010 Population. The route would serve the following residential areas of at least medium density population:

Chinatown	High Density
Lincoln Heights	Medium Density
Highland Park	" "
Pasadena CBD	" "

Note: east of the Pasadena downtown area, the line would serve only low density areas, including Arcadia and Monrovia.

- 2010 Employment. The route would connect the following areas of at least medium density employment:

LA CBD	Very High Density
Chinatown	Medium Density
Pasadena CBD	" "

Note: east of the Pasadena CBD, only low density areas are served, including East Pasadena and Monrovia.

- Commercial Areas. The following commercial areas would be served:

LA CBD
Highland Park
Downtown Pasadena, including The Plaza
Hastings/Santa Anita Fashion Park/Fedco
Santa Anita

- Policy Growth Areas. Higher-density commercial development is permitted in the following areas along the line in the City of Los Angeles:

LA CBD
The vicinity of Chinatown north of the CBD

- Other Activity Centers. The line would provide service to the following:

LA Civic Center area
Chinatown
Southwest Museum
Huntington Memorial Hospital
Ambassador College
Pasadena City Hall and Library
Pasadena City College
LA County Arboretum
Santa Anita Race Track
City of Hope Hospital

- Transit Service. The area covered by this line is served by a number of express and limited stop bus routes to the CBD area; in 1986-87 these were all SCRTD routes (300-series routes are limited stop, while 400-series are

express bus).

The following operating via the Pasadena Freeway:

SCRTD Routes 401 & 402	Pasadena CBD, to Altadena

The following operating along Huntington Drive:

SCRTD Route 379	Huntington Drive

And the following via the El Monte busway:

SCRTD Route 483	Fair Oaks
SCRTD Route 485	Lake Ave.
SCRTD Route 487	San Gabriel Blvd.-Sierra Madre
SCRTD Route 491	Santa Anita Ave.-Sierra Madre
SCRTD Route 494	Huntington Drive-Duarte
SCRTD Route 493	Monrovia

- Freeway Volumes. Peak hour volumes on freeways closely paralleling the western end of the Second Subdivision are as follows:

110 Pasadena Freeway	8-9,000
210 Foothill Freeway	14-17,000

- Freeway Congestion. Peak hour congestion figures for freeway segments paralleling the same section of the line are as follows:

(AM Peak: Southbound/Westbound)

Route 110, Highland Pk.-LA CBD	LOS F1
Route 210, 605 Fwy. to Route 19	LOS FO

(PM Peak: Northbound/Eastbound)

Route 110, LA CBD to 5 Fwy.	LOS F2
Route 210, 134 Fwy. to Monrovia	LOS FO to F1

- Freeway Accidents. Accident rates for freeway segments paralleling the same section of the line are as follows:

110 Fwy., LA CBD to 5 Fwy.	69-115/Mi./Yr.
110 Fwy., 5 Fwy. to South Pasadena	54/Mi./Yr.
210 Fwy., 134 Fwy. to 605 Fwy.	27-30/Mi./Yr.

ROUTE 5. SP BURBANK BRANCH-COAST MAIN LINE COMBINATION

The following data apply to a composite route incorporating the SP Coast Main Line from the LA CBD to Burbank Junction, and thence west to Warner Center in the San Fernando Valley via the Burbank Branch. This was the original Santa Fe Pacific Realty concept. It includes portions of two Proposition A light rail lines: the east-west Valley line and the Glendale line, a proposed light rail

link connecting the Cities of Glendale and Burbank, and a Burbank-North Hollywood connector using the Burbank Branch.

- 2010 Population. This route would serve the following residential areas of at least medium density population:

Tarzana	Medium Density
North Hollywood	High Density
Chinatown	" "

Note: If the segment serving Glendale were routed along Brand Blvd. in the Glendale CBD area, it would also provide service to medium- to high-density residential areas on the east side of Glendale.

- 2010 Employment. The route would connect the following employment concentrations of at least medium density:

Canoga Park	Medium Density
Van Nuys	" "
Northern part of Glendale	" "
Area west of Glendale CBD	" "
Chinatown	" "
LA CBD	Very High Density

- Commercial Areas. The following commercial centers would be served:

The Promenade/Topanga Plaza in Woodland Hills
The Van Nuys commercial center
Lankershim Blvd. in North Hollywood
The Golden Mall/Burbank Towncenter area
The South Brand/Los Feliz commercial section of Glendale
LA CBD

- Policy Growth Areas. Higher-density commercial growth is permitted in the following areas along the route in the city of Los Angeles:

Van Nuys
Lankershim near Chandler in North Hollywood
The vicinity of Chinatown north of the LA CBD
LA CBD

- Other Activity Centers. The route would provide service to the following additional activity centers:

Pierce College
Sepulveda Dam Recreational Area
Van Nuys Civic Center
Valley College
Burbank Civic Center
Glendale Memorial Hospital
Chinatown
LA Civic Center area

Note: if the segment through Glendale were routed along Brand Blvd., it would also serve the Glendale Civic Center, Post Office, and Library.

- Transit Service. The area covered by this line was served in 1987 by the following express bus routes.

  The following serving the San Fernando Valley and using the 101 Ventura and/or Hollywood Freeway:

SCRTD Route 420	Chandler/Lankershim
SCRTD Routes 423 & 427	Ventura Freeway
SCRTD Routes 424 & 425	Ventura Boulevard
SCRTD Route 426	Sherman Way
Encino contract park-and-ride bus route	Encino

  The following serving the SF Valley and using the 5 (Golden State) Freeway:

SCRTD Route 412	Lankershim/Victory
SCRTD Route 413	Victory Blvd.

  And the following serving Burbank:

SCRTD Route 410	San Fernando Rd./Glendale Ave.

- Freeway Volumes. This composite route would closely parallel the following freeways: the 101 (Ventura) Freeway, the 134 (Ventura) Freeway, the 5 (Golden State) Freeway, and (very close to the LA CBD) the 110 (Pasadena) Freeway.

  Peak hour volumes for the appropriate segments of these freeways are as follows:

Route 101, Canoga Pk.-170 Fwy.	18-19,000
Route 134	12,000
Route 5	15-18,000

- Freeway Congestion. Peak hour congestion figures for freeway segments that parallel the route are as follows:

(AM Peak: Eastbound/Southbound)

Route 101 Ventura Fwy.	LOS F1
Route 5, Route 134 to Route 110	LOS F0
Route 5, Route 110 to LA CBD	LOS F1 to F3
Route 110, Route 5 to LA CBD	LOS F1 to F3

(PM Peak: Northbound/Westbound)

Route 110, LA CBD to Route 5	LOS F2
Route 101 Ventura Fwy.	LOS F0 to F2

(PM Peak: Eastbound/Southbound)

Route 101 Ventura Fwy.	LOS FO to F1

o Freeway Accidents. Accident rates for freeway segments paralleling the route are as follows:

Route 101 Ventura Fwy., west of 405 Fwy.	26/Mi./Yr.
Route 101 Ventura Fwy., 405 Fwy. to 170 Fwy.	63/Mi./Yr.
Route 134	24/Mi./Yr.
Route 5, 134 Fwy. to 110 Fwy.	33 to 39/Mi./Yr.
Route 5, 110 Fwy. to LA CBD	81/Mi./Yr.
Route 110, 5 Fwy. to LA CBD	69 to 110/Mi./Yr.

APPENDIX L

RIGHT-OF-WAY WIDTH FOR FIVE RAILROAD CORRIDORS WITH HIGH TRANSIT POTENTIAL

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Right-of-way widths were determined for five railroad lines or combinations of alignments considered to have particularly high transit potential during Phase I of the study. The analysis, completed in August of 1987, was based on examination of State Board of Equalization Land Identification Maps. These are strip maps prepared by the railroads for the state, for tax purposes.

The railroad rights-of-way discussed below are broken down into easily understood line segments. Extra-wide sections of R/W and other railroad-owned parcels of land which may be of interest for development purposes are reported. It will be noted that in a number of cases R/W width increases at old station sites, yards, etc. The dimensions of these wider sections supersede the width given for the R/W in general, except in cases where it is stated that there is a plot of land or strip of given width <u>in addition</u> to the width already given for the R/W in general.

SP SANTA MONICA BRANCH

This R/W is generally of sufficient width for construction of a transit line, but relatively little additional land remains that would be of any value for joint development projects. In addition, strips of R/W along Exposition Blvd. were sold to the city for road development. An account of R/W width by segment follows:

- <u>SP Yard Area east of Long Beach Avenue.</u> This would be of interest if a Santa Monica Branch transit line were to access the LA CBD via the LA River (by means of the UP West LA Branch and/or the Santa Fe track leading to the Amtrak Roundhouse).

  J-Yard lies between Santa Fe Avenue and Alameda Street. The yard area is presently underutilized. It is 1800' long and about 190' wide. The R/W at the west end leading to the Wilmington Branch is only 35' wide.
  From Alameda Street to Long Beach Avenue (the LA-Long Beach Line runs in a north-south direction along Long Beach Ave.), the R/W is 110' wide.
  Additionally, the SP may own an additional total area on either side of the track, measuring about 200' X 300'.

- <u>Santa Monica Branch from Long Beach Avenue to the Harbor Freeway.</u> This section of R/W would be of interest if access to the LA CBD were to be via either Alameda Street or the LA River. A lead into the east side of the LA CBD is provided via the Wilmington Branch, which would access Alameda Street farther north, beyond Olympic.

R/W width between Long Beach Ave. and Hooper is 80'-100'.
From Hooper to San Pedro St., and thence to 32nd: R/W width 60'.
From 32nd to Hill, the R/W is 30'-40' wide.
From Hill to Main, the R/W is 80' wide.
From Main to the Harbor Freeway, the R/W is 60' wide.

- Harbor Freeway to Grammercy Place, including Vermont and Western Avenues. The Harbor Freeway and/or Flower Street would provide access to the Flower Street Subway. R/W width for this and the following segments would apply to any of the three alternative access routes into the CBD. [However, it should be noted that the Harbor Fwy./Flower St. Subway option appears to be the most feasible means of access into downtown LA.]

  R/W in this section, which runs past the USC campus and the museum complex, is only about 25' wide. This is because a strip on the north side was sold to the City of LA to allow them to expand Exposition Blvd.

- Grammercy Place to La Cienega.

  R/W between Grammercy Pl. and 3rd Ave. (past Arlington) is 30'.
  R/W between 3rd Ave. and Cochran (past La Brea) is 50' (except at 11th Ave. where it is 30' for a short stretch).
  R/W from Cochran to Carmona is 75'-80'.
  R/W from Carmona to La Cienaga is 100'.

- La Cienega to San Diego Freeway.

  R/W from La Cienega to National X Washington is 60'.
  R/W from Washington to Canfield (Santa Monica Freeway) is 100'.
  R/W from Canfield to National X Motor (along the freeway) is 80' (except that it narrows to 60' for a short stretch at Palms).
  R/W west of Motor to tunnel under freeway is 100'-120' for only one block (this may be of interest for station development).
  R/W in tunnel under freeway is 30' underground, widening to 40' just west of the tunnel.
  R/W from tunnel to Overland, and thence to the 405 Freeway is 100' (except for Overland to Westwood, where a 200' wide stretch occurs for a long block; this is of interest for possible station development).

- San Diego Freeway to Olympic Boulevard.

  R/W is 100', except for the section from Stewart to Cloverfield, near Olympic, where the R/W is only 60' (40' in places where buildings encroach on the R/W).

- West of Olympic Boulevard Crossing in Santa Monica. This section could be used as an alternative to following Olympic from the Olympic Xing to 17th. The remainder of the line would then turn south to follow Olympic Blvd. and the Freeway to the end of the line. Otherwise, this additional section of R/W extending for several blocks could be used as a maintenance facility, park-and-ride lot, or small supplementary peak-hour station.

R/W in this segment is 100' wide.

It is possible that the SP still owns a strip about 100' wide extending several blocks to the west, and leased out to industries. However, the extreme west end of the R/W was sold to the City of Santa Monica development purposes.

- Mid-Towne Center Area. This is not actually on the Santa Monica Branch, but could be connected to it via a Venice Blvd. alignment to the west. It could also be connected to a proposed Metro Rail tunnel to the east. It is believed that this parcel contains 50 acres.

DOWNTOWN RAIL YARDS ALONG THE LA RIVER, AND UNION STATION

The linear railroad yards along either side of the LA River might be of use for transit in conjunction with development of either the SP Santa Monica Branch or the ATSF Harbor Subdivision. Caltrans aerial photos were used in most cases to develop approximate R/W widths for these yards.

- ATSF Yards on west side of LA River.

  R/W from Redondo Junction to the Santa Monica Fwy. [based in this case on railroad maps] is 300'. A large area, 1200' X 1200', occurs at Washington and Santa Fe, and is occupied by the Amtrak Roundhouse.
  R/W from Santa Monica Fwy. to 4th Street [based on railroad maps] is 175' wide (yard area).
  R/W from 4th Street to 1st Street is 500' wide (yard area). In addition there is an area about 400' X 1600' long, used for truck storage (appears to be mostly a dirt lot).
  R/W north of 1st Street is 400' between 1st and Turner, tapering to 100' at the Santa Ana Freeway.
  R/W north of the Santa Ana Freeway is 100' to Mission Tower (the lead into LAUPT) [matching the width shown on ATSF ROW maps.]

- Union Pacific Yards on east side of LA River.

  R/W north of Santa Monica Freeway is 40'-50' wide.
  R/W from 7th St. to 6th St. widens to 150'-200'.
  R/W from 6th St. to 4th St. is 150' wide.
  R/W from 4th St. to 1st St. is 100' to 200'.
  R/W from 1st St. to Santa Ana Fwy. is 200' wide (up to 300' in places).
  R/W north of the Santa Ana Fwy. to LATC and Mission Tower (the lead into LAUPT) is 100' wide.

- Lead Into Union Station. The R/W from the LA River to LAUPT is 100' wide.

- Union Station. A measurement of the station area, including train sheds, the building and parking lots, indicates that it is about 1800' X 1800'.

The rights-of-way along the LA River, described above, may be of interest from the viewpoint of air rights development, especially as the exceptionally wide yard from 1st to 4th Streets lies across from Little Tokyo and is not too far away from the LAUPT redevelopment area. It is also of interest that the Union Pacific R/W and adjacent land on the east side of the LA River is also very wide from 4th Street north to the Santa Ana Freeway, across from this wide ATSF yard area.

SANTA FE HARBOR SUBDIVISION

- NS alignment, Washington to Slauson. This section would be of interest if access to the LA CBD were to be via the LA River.

  R/W here is typically 60' wide, except for Malabar Yard, which is 130' wide.
  R/W along the curve SW to Slauson is only 30'.

- EW alignment along Slauson, Santa Fe to Western. This section, and the remaining segments of the line, would apply whether the LA River, Alameda Street, or the Harbor Freeway were used for access to the LA CBD.

  R/W here is typically 30' wide. In places it widens to 60' or 100', for the length of a block.

- NE-SW alignment, Western to Inglewood.

  R/W west to 8th (about at Crenshaw) is 30'.
  R/W from 8th to Inglewood is 50'.
  In addition, a section at Eucalyptus is 100' X 200', west of a potential station site at La Brea Ave.

- NE-SW alignment, Inglewood to Manchester.

  MAP NOT AVAILABLE. Assume R/W to be about 50'.

- NS alignment, Manchester to Century.

  MAP NOT AVAILABLE. Assume R/W to be about 60'.

- NS alignment, Century to El Segundo.

  R/W typically 60' wide.
  One block long section at El Segundo is 200' wide, listed as used for parking.

- NE-SW alignment, El Segundo to Douglas.

  R/W is 60' wide on curved section.

- NW-SE diagonal alignment from Douglas to Manhattan Beach.

  R/W in this section is 100' wide.
  However, from Aviation to Inglewood an additional 120' of SC Edison R/W lies east of and parallel to the rail line. This may be of interest from the viewpoint of parking lot and other aspects of station development at Rosecrans.
  R/W just west of Inglewood Ave. is 200' wide for a distance of 1500'.
  R/W on the curve at Inglewood/Manhattan Beach south of 162nd contains a series of parcels totaling 250' X 1600'. These may be of interest from the viewpoint of station development at Manhattan Beach Blvd.

- NS alignment, Manhattan Beach to 182nd St.

  R/W in this section is typically 100'.
  Section from 170th to Artesia is 200' for a distance of 1200'.
  Section at 182nd is 200' for 1200'.
  R/W on curve south of 182nd is 170'.

  These strips may be of interest from the viewpoint of developing a station at Artesia/The Galleria.

- NW-SE diagonal alignment, 190th to Torrance.

  R/W in this section is mostly 100' wide.
  R/W at 190th is 200' for a short distance, possibly of value in developing a 190th/Hawthorne station.

- NS alignment, Torrance to Carson.

  R/W shown as 60', but believed from field survey to be much narrower due to encroachment of the roadway on the rail line here. This may necessitate running around the Torrance CBD area using old SP industrial trackage.

- NW-SE alignment, Carson to Normandie.

  R/W generally 100' wide.
  R/W from Del Amo to Sepulveda is 60'.
  A parcel just south of Carson St. is 300' X 600'.

- EW alignment, Normandie to Wilmington Ave.

  R/W generally 100' wide.
  R/W at Normandie is 150' wide, of possible interest in station development.
  A parcel at Vermont Ave. is 400' X 800' (oil extraction) may be of possible interest for station development.

- NS alignment along Watson Yard, north of PCH.

  MAP MISSING. Assume to be 450' wide.

o NS alignment along Watson Yard, south of PCH.

This is the south half of Watson Yard, which is in active use. The yard is 450' wide. South of L St. the R/W varies from 50' to 100', but appears to be 350' wide just at Anaheim; of possible interest for station development.

SP WEST SANTA ANA BRANCH

State Board of Equalization maps are not available for this R/W. However, based on County maps, most of the right-of-way appears to be 100' wide, all the way from Watts Junction to Santa Ana. This includes sections which have been abandoned, and the segment in active service. Known exceptions are listed below:

o The section in Lynwood from Imperial Highway to the Long Beach Freeway has become part of the Century Freeway, so the railroad R/W as such no longer exists here.

o In Garden Grove, from Nelson St. to Garden Grove Boulevard, the R/W is part of an irregularly-shaped parcel. This is 1250' long following the former railroad alignment in a NW-SE direction, and varies in width from a minimum of 140' to a maximum of 293' in width (this widest segment being 105' long).

o In Garden Grove, from Newhope St. to West Street, the former railroad R/W is 75' wide, but is paralleled by a 25' wide flood control right-of-way called the Newhope Storm channel.

o In Santa Ana, from a line projected north from Jackson Street (the street does not actually cross the rail line) to the Santa Ana River, the R/W is 120' wide. Where the R/W crosses the Santa Ana River, it is 110' wide.

ATSF SECOND SUBDIVISION

o NS alignment along LA River in the LA CBD.

R/W north of Main St. is 50'-60' wide.
Just south of the big SP yard along North Broadway, R/W is 200' wide.

o SW-NE alignment, LA River to South Pasadena.

LA River Bridge: R/W 50' wide.
Ave. 19-Ave. 26: 80'-110'. Extra R/W width of interest if there is a station at Ave. 26.
Ave. 26-Ave. 33: R/W width varies from 50' to 70'.
Ave. 33-Figueroa: R/W width 50' on the average.
Figueroa-Ave. 45: R/W width 50'-55'.
South of Museum Drive: R/W 50'. Apparently some kind of easement was granted to the City of LA here for road widening.
Southwest Museum to Woodside: R/W 60'-65'.

Woodside to Ave. 50: a wide section 90' wide by 700' long. Of interest if there were a Southwest Museum station just to the south.
Ave. 50-56 in Highland Park: R/W only 35'. May be narrower in reality owing to encroachment by narrow roadways on both sides.
Ave. 56-Ave. 60: R/W expands from 45' to 110'.
Ave. 60-61: R/W 60'. A plot 150' by 400' which would have been of interest for station development is believed to have been sold.
Ave. 61-Arroyo Verde. R/W for the trestle over the Arroyo Seco is 60'. East of the bridge, R/W is 170' wide, but is on a steep hillside and is of doubtful value except for addition of one more track (to allow double tracking of the line in this section).
Arroyo Verde to Pasadena Ave.: R/W 45'-80' wide.
Pasadena Ave.-Orange Grove: R/W 45' wide.
Orange Grove-Fremont: R/W 30'-55' wide.
Fremont-Columbia: R/W 30'-55' wide, probably with the addition of 35'-50' of abandoned UP R/W (total: may be 80'-90' at most).

- NS alignment in Pasadena.

  South of Glenarm: R/W 30' (plus 30' of old UP R/W?). In addition there is an area 160' X 300' just south of Glenarm which may be of interest because of the potential for a transit station there.

  Glenarm to Walnut St.: R/W varies widely but generally 30' (in places, 25'-40'). ATSF owns additional property around the Amtrak station at Del Mar: about 300' X 500' north of Del Mar, and a parcel # 38 south of Del Mar reportedly transferred to SFLI (this is 140' X 300'). Finally, the R/W south of Del Mar tapers from 80' to 30'. This additional area in Pasadena is of interest, because of the potential for a transit station in this location.

- Tunnel NE to 210 Freeway. R/W width in tunnel 45'; however, surface R/W north of Walnut is 100' X one block long.

- EW alignment in 210 Freeway median, Marengo to Kinneloa Ave. R/W is 40' wide, with freeway lanes on both sides.

- EW alignment along Walnut St. to Allen Avenue, to Kinneloa. This is not on the main line, but represents a spur track paralleling Colorado Blvd. This would be a means of connecting a Green St./Colorado LRT transit mall or subway alignment over to the ATSF Second Subdivision freeway alignment.

  R/W along Walnut is 60' wide.

- EW alignment in 210 Freeway median, Kinneloa to vicinity of Santa Anita Race Track. R/W is 50' wide, including one track and a 12' wide service road. West of Rosemead, it widens to 60' to accommodate the lead to the Walnut St. spur which goes under the eastbound freeway lanes.

- EW alignment, R/W south of 210 Freeway from west of Santa Anita Ave. to the 605 Freeway in Duarte. The R/W is generally 50' in Arcadia, 50'-60' in Monrovia, and 50' (up to 60' & 75' in places) in Duarte. However, the R/W just east of Huntington Drive in Arcadia is 100' wide, and there is a plot 200' X 200' at the crossing; and several small parcels from Santa Anita to 1st Street total 100' X 900'. These are all of interest as Huntington Drive would be a prospective station location.

  Also, at Myrtle Ave. in Monrovia there is an old depot on a plot 150' X 600' (with a short stretch 100' wide east of Myrtle). This is of interest as a prospective transit station site.

- EW alignment, San Gabriel River crossing. The R/W in this large flood control basin is mostly 50' wide. However, there is a vast amount of vacant land not owned by the railroad along the R/W, which would provide ample room for a park-and-ride station.

- EW alignment, in Azusa and Glendora. The ROW is 100' wide except for a stretch 1800' long from Saldano to San Gabriel Ave. (including Azusa Ave.) where the R/W is 200' wide. There is also a plot 400' X 600' west of Angeleno Ave. These areas are of interest as it is presumed that a transit station would be sited at Azusa Avenue.

  At Glendora Avenue, there is a stretch 2000' long where the R/W is 300' wide; again this is of interest as a potential station site.

- EW alignment in San Dimas, La Verne, and Claremont. The R/W is generally 100' wide, except for an 80' wide section around La Verne University.

  At Garey Avenue in Pomona, the old passenger station area is 180' wide for a distance of 2200'. This is of interest as a potential transit station site.

  The station area in Claremont, where the R/W is 250' wide for a distance of 1200', is again of interest from the viewpoint of transit station development.

  Finally, it should be noted that the SP Baldwin Park Branch parallels the Second Subdivision of the ATSF and would add an additional 80' wide swath for a distance of 13,400'--from White Avenue in La Verne to Indian Hill Ave. in Claremont. The Baldwin Park Branch will probably be up for abandonment soon.

- EW alignment in Montclair, Upland, Ontario, and Rancho Cucamonga. The R/W is generally 100' wide.

  In Upland, there is 2000' long section of R/W east of Euclid Avenue that is 150'-230' wide. This is an old depot site. This could be of value as a transit station might be located there.

At Rancho Cucamonga, the R/W at Haven Avenue is 200' wide for a distance of 1600'. This may be of interest as an alternative park-and-ride station site.

- EW alignment, in Etiwanda, Fontana, Rialto, and San Bernardino. The R/W in this segment is generally 100' wide.

  Additionally, in Fontana, there is a rail yard area one mile long that is 200' wide, from Beech to Cherry. This is too far west for a downtown station site; but it could provide an alternative for new development, or a park-and-ride site. The R/W in the downtown part of Fontana is 150' wide for a distance of 1200'. Part of this is used as a public park.

  In Rialto, the R/W is 200' wide for several blocks. This coincides with a prospective transit station site.

  In San Bernardino, there is a very large railroad yard area, only part of which is in active use. This yard is 1600'-2000' wide and 5600' long, with an additional strip 800' wide by 2000' long. This is the location of the Amtrak station, and would provide some station parking. However, a transit line on this corridor might be extended under the 15E Freeway to end at the Central City Mall/City Hall area. This may be the most promising area for development on the entire line, east of Pasadena.

RIGHTS-OF-WAY AND RAIL YARDS NORTH OF THE LA CBD

North of Union Station, it is of interest to know the width of railroad rights-of-way and linear yards which could provide access to a transit line on the ATSF Second Subdivision to Pasadena and San Bernardino, or along the SP Coast Main Line north to Glendale and possibly north to Burbank, with the option of a connection to the east-west San Fernando Valley line. Widths of these ROW and yards are as follows:

- UP line on east side of LA River. This R/W from Mission Tower north to the ATSF Second Subdivision river crossing, is generally 60' wide, except that it is 80' just south of Avenue 18.

- ATSF line on west side of LA River. This R/W from Mission Tower north to the river crossing of the Second Subdivision is 100' wide.

- SP Bullring Yard. The Bullring Yard lies south of Broadway and extends from a point north of College Street to the North Broadway Street bridge (just south of the ATSF Second Subdivision LA River crossing). The yard is about 3000' long and 650' wide (43 acres).

  There is no track connection from LAUPT to Bullring, although there is some track in the street, extending down to Alameda Street just to the west of Union Station. It is assumed that future transit use of Bullring Yard would involve subway access to the CBD area, with the portal being at the west end of the yard.

- SP track on west side of LA River. North of the Bullring Yard lies the Midway Yard, west of the Los Angeles River, and south of the Pasadena Freeway. Including the R/W used for through tracks, this yard is 190' wide and 2400' long (about 11 acres).

  North of the Pasadena Freeway, the R/W is 80' wide; the R/W at the LA River crossing over to Taylor Yard is 60'.

- SP track on east side of LA River. North of the ATSF Second Subdivision river crossing, the UP trackage on the east side of the LA River is continued north on an SP right-of-way into Taylor Yard. This is 40' throughout.

- Taylor Yard. This lies on the east bank of the LA River and extends from Figueroa Street north to the Glendale Freeway. The yard occupies an area with the following dimensions: southern part, 250' wide by 4000' long; middle part, 1000' wide by 3900' long; and northern part, 500' wide by 2900' long. The R/W narrows to 100' at the Glendale Freeway.

  The Union Pacific Glendale Branch, which is being abandoned, originates from the north end of Taylor Yard.

SP COAST MAIN LINE

The SP Coast Main Line actually extends from Bullring Yard through Taylor Yard and north to Burbank Junction (junction with the Burbank Branch and Saugus Line), where it turns to the west in the direction of Chatsworth and Ventura County. The Coast Line is the route followed by the San Diegan intercity passenger train which was recently extended to Santa Barbara.

The R/W width for the segment of the Coast Main Line from Taylor Yard north to Burbank Junction is generally 100'. The exceptions are as follows:

- The R/W north of Brand Blvd. is 200' wide for a distance of 2200', being wider on the east side of the railroad line. This could be of interest from the viewpoint of station development at Brand, assuming a CBD-Glendale LRT link followed the Coast Line rather than the UP Glendale Branch to access the Glendale CBD via Brand Blvd., north of San Fernando Road.

- At Milford Street, just south of the 134 Freeway, the R/W is 200' wide for a distance of 1200'.

- In Burbank, from Olive to Cypress the R/W is 200' wide for a distance of 2000'. Also, there is an area surrounding the junction with the Burbank Branch east of Victory and north of Cypress that is 400' X 600'. Although the SP-owned properties along the Coast Line are south of the 5 Freeway, they are of some interest owing to their proximity to the proposed Golden Mall development in the Burbank CBD (regardless of who eventually develops this area).

SP BURBANK BRANCH

The width of the R/W along the SP Burbank Branch is as follows:

- Burbank CBD to Burbank city boundary at Clybourn St. R/W width here is 35' except for a short 40' wide stretch east of Victory.

- City of LA section from Clybourn St. to Lankershim. The R/W width in this section is 60'. Of particular interest at Lankershim is an area 230' wide and 1800' long, the proposed site of an intermodal center, where Metro Rail and the east-west Valley LRT line would meet.

- Lankershim to Whitsett along Chandler. The R/W here is 60' wide.

- Whitsett to Woodman. The R/W here is 100' wide. However, at Burbank/ Fulton, the R/W is 230' wide for 2000'. This could have potential for station development.

- Woodman to Hayvenhurst. The R/W here is 100' wide. However, of special interest is the Van Nuys Blvd. station site, where the R/W is 200' wide for a distance of 2400', and 150' wide for 600'.

- Hayvenhurst to Tampa. The R/W here is 100' wide in general (150' wide for an 800' long segment over the LA River). Of particular interest are the proposed station sites at Balboa (where the R/W is 200' wide for a distance of 2000') and Reseda (where the R/W is 230' wide for 2000').

- Tampa to Vanowen. The R/W here is 100' wide throughout.

- Vanowen to Roscoe. The R/W here is 100' wide. Of special interest is the section from Wyandote to Vanowen, where there are segments of R/W 200' wide for 1200'; 275' wide for 1200'; and 230' wide for 600'. This could be of interest for the development of maintenance facilities, as well as for a Sherman Way station site in the event of a transit extension north to Chatsworth.

- Roscoe to Chatsworth. The R/W here is 100' wide except for a 200' wide strip about 800' long at Marilla Street where the Burbank Branch follows the Coast Main Line for a short distance. In addition, the SP owns a spur track on a section of R/W 280' wide by 1200' long following Marilla Street west of the Coast Main Line. Finally, it would be presumed that a transit line extension north on the Burbank Branch would terminate at Devonshire on the Coast Line, where there is a large parcel of land that could be used for a station site and 1500 car parking lot.